

Appendix 13
Chicopee River Watershed
Assessment and Listing Decision Summary

Final Massachusetts Integrated List of Waters for the
Clean Water Act 2018/2020 Reporting Cycle

CN: 505.1

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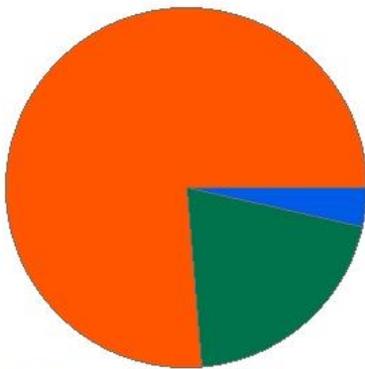
| Waterbody | AU_ID | 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------------|---------|------------------|---------------------|--|-------------------|---------------------------|
| Asnacomet Pond | MA36005 | 2 | 5 | Dissolved Oxygen | | Added |
| Chicopee Brook | MA36-21 | 5 | 5 | Temperature | | Added |
| Chicopee Reservoir | MA36033 | 2 | 4c | (Non-Native Aquatic Plants*) | | Added |
| Chicopee River | MA36-22 | 5 | 5 | (Eurasian Water Milfoil, Myriophyllum Spicatum*) | | Added |
| Chicopee River | MA36-24 | 5 | 5 | (Water Chestnut*) | | Added |
| Cusky Pond | MA36045 | 3 | 4c | (Water Chestnut*) | | Added |
| Dunn Brook | MA36-19 | 2 | 5 | Dissolved Oxygen | | Added |
| Dunn Brook | MA36-19 | 2 | 5 | Phosphorus, Total | | Added |
| East Branch Ware River | MA36-01 | 5 | 2 | Dissolved Oxygen | | Removed |
| East Brookfield River | MA36-13 | 5 | 5 | (Fanwort*) | | Added |
| Forget-Me-Not Brook | MA36-18 | 5 | 5 | Lack of a coldwater assemblage | | Added |
| Forget-Me-Not Brook | MA36-28 | 5 | 5 | Whole Effluent Toxicity (WET) | | Removed |
| Hardwick Pond | MA36066 | 4c | 5 | (Fanwort*) | | Added |
| Hardwick Pond | MA36066 | 4c | 5 | Mercury in Fish Tissue | | Added |
| Kings Brook | MA36-48 | 2 | 5 | Temperature | | Added |
| Lake Lashaway | MA36079 | 4a | 4a | (Fanwort*) | | Added |
| Lake Lashaway | MA36079 | 4a | 4a | (Non-Native Aquatic Plants*) | | Removed |
| Lake Lorraine | MA36084 | 5 | 5 | Dissolved Oxygen | | Added |
| Long Pond | MA36082 | 4c | 5 | Mercury in Fish Tissue | | Added |
| Quaboag Pond | MA36130 | 5 | 5 | (Fanwort*) | | Added |
| Quaboag River | MA36-14 | 2 | 5 | Dissolved Oxygen | | Added |
| Quaboag River | MA36-15 | 5 | 5 | Dissolved Oxygen | | Added |
| Quacumquasit Pond | MA36131 | 4a | 4a | (Fanwort*) | | Added |
| Sevenmile River | MA36-11 | 5 | 5 | Dissolved Oxygen | | Added |
| Silver Brook | MA36-72 | -- | 5 | Temperature | | Added |
| Swift River | MA36-09 | 2 | 4c | (Non-Native Aquatic Plants*) | | Added |
| Swift River | MA36-10 | 2 | 4c | (Non-Native Aquatic Plants*) | | Added |
| Twelvemile Brook | MA36-53 | -- | 5 | Temperature | | Added |
| Unnamed Tributary | MA36-39 | 5 | 5 | Trash | | Changed |
| Ware River | MA36-03 | 5 | 5 | Lack of a coldwater assemblage | | Added |
| Ware River | MA36-03 | 5 | 5 | Temperature | | Added |
| Ware River | MA36-04 | 2 | 4c | (Non-Native Aquatic Plants*) | | Added |
| Ware River | MA36-05 | 5 | 5 | (Non-Native Aquatic Plants*) | | Added |
| Ware River | MA36-06 | 5 | 5 | (Non-Native Aquatic Plants*) | | Added |
| Ware River | MA36-27 | 5 | 2 | Dissolved Oxygen | | Removed |
| Ware River | MA36-27 | 5 | 2 | Temperature | | Removed |

Abbey Brook (MA36-40)

| | |
|----------------------------------|--|
| Location: | Headwaters west of Saint James Avenue, Springfield (through former 2008 segment: Bemis Pond MA36011) to mouth at confluence with the Chicopee River, Chicopee. |
| AU Type: | RIVER |
| AU Size: | 1.5 MILES |
| Classification/Qualifier: | B |

Abbey Brook - MA36-40

Watershed Area: 1.31 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.31 | 1.31 | 0.19 | 0.19 |
| Agriculture | 0% | 0% | 0% | 0% |
| Developed | 76.4% | 76.4% | 22.6% | 22.6% |
| Natural | 20.1% | 20.1% | 59.1% | 59.1% |
| Wetland | 3.5% | 3.5% | 18.3% | 18.3% |
| Impervious Cover | 41.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In July 2007, DFG biologists conducted a backpack electrofishing survey in the Abbey Brook upstream of the Front St crossing, alongside the entrance to Frank Szot Park, downstream of Bemis Pond (SampleID: 2190). Three species were collected and were comprised entirely of tolerant to moderately tolerant individuals. White sucker, a fluvial dependent species, comprised 79% of the sample although not too many fish were collected (n=14).

The Aquatic Life Use for Abbey Brook is assessed as Fully Supporting based on the fish sample dominated by a fluvial dependent species.

Adams Pond (MA36001)

| | |
|----------------------------------|-----------------|
| Location: | Oakham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 30 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Adams Pond, the Aquatic Life Use is Not Assessed. |

Alden Pond (MA36003)

| | |
|----------------------------------|-----------------|
| Location: | Ludlow. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 4 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| Since there are no recent data available for Alden Pond, the Aquatic Life Use will continue to be assessed as Not Supporting with the Nutrient/Eutrophication Biological Indicators impairment being carried forward. |

Asnacomet Pond (MA36005)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 126 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 2 | 5 | Dissolved Oxygen | | Added |

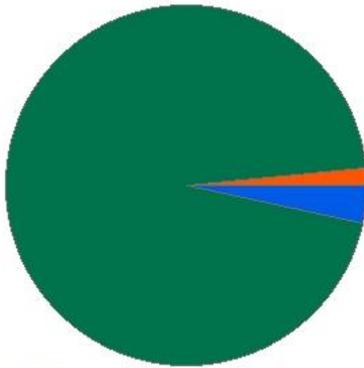
| Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert) |
|---|
| <p>Three surveys were conducted by MassDEP staff at the deep hole of Asnacomet Pond in July, August, and September 2008. Dissolved oxygen concentrations were above 5.0mg/L at depths above 10m in the pond during the three surveys but low DO occurred below this depth at least once which represents ~51% of the surface area of the pond. The pH ranged from 5.0 to 6.6SU with more acidic measurements at depth. All other data collected were indicative of good conditions: the maximum temperature was 25.8°C, chlorophyll a concentrations were all low (<4µg/L), total phosphorus concentrations were all very low (not detected at the surface and maximum concentration near the bottom 0.02mg/L, Secchi disk depths ranged from 6.6 to 7.6m, and there were no non-native aquatic macrophytes found.</p> <p>The Aquatic Life Use for Asnacomet Pond is assessed as Not Supporting because of low DO (~51% of lake surface area). The other data collected were indicative of good water quality conditions except for low pH at depth which is being identified with an Alert.</p> |

Atherton Brook (MA36-30)

| | |
|----------------------------------|---|
| Location: | Headwaters, confluence Town Farm and Osgood brooks, Shutesbury to mouth at inlet Quabbin Reservoir, Pelham. |
| AU Type: | RIVER |
| AU Size: | 1.9 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Atherton Brook - MA36-30

Watershed Area: 2.62 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.62 | 2.62 | 0.78 | 0.78 |
| Agriculture | 0.6% | 0.6% | 0% | 0% |
| Developed | 1.6% | 1.6% | 0.4% | 0.4% |
| Natural | 94.5% | 94.5% | 96.3% | 96.3% |
| Wetland | 3.3% | 3.3% | 3.2% | 3.2% |
| Impervious Cover | 1.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DCR staff collected discrete water quality data 2-3 times per month in 2009 and 2-3 times per month January-September 2019 at DCR station 211A-1 (~100ft downstream of RT.202 Daniel Shays Hwy). the minimum dissolved oxygen was 9.33mg/, the maximum temperature was 18.1°C, and pH ranged from 5.4 to 7.1 SU (n=46) with 11 measurements <6.0SU. Atherton Brook was identified by DCR staff as critically sensitive to acid rain deposition given its limited acid neutralizing capacity and low pH. The seasonal average otal phosphorus concentrations were low (range 0.009 to 0.01mg/L) and the maximum overall concentration was only 0.018mg/L. The maximum chloride concentration was also low (23.3mg/L, n=13).

The Aquatic Life Use for Atherton Brook is assessed as Fully Supporting based on the excellent water quality conditions documented by DCR staff between 2009 and 2019 with the alert for low pH being carried forward.

Beaver Lake (MA36010)

| | |
|----------------------------------|-----------------|
| Location: | Ware. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 150 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| Two non-native aquatic macrophytes, <i>Myriophyllum heterophyllum</i> and <i>Myriophyllum spicatum</i> , were identified in Beaver Lake by MassDEP biologists during a 1998 synoptic survey. No other no new data are available. The Aquatic Life Use for Beaver Lake will continue to be assessed as Not Supporting with the Eurasian Water Milfoil, <i>Myriophyllum Spicatum</i> and non-native aquatic plants (for <i>M. heterophyllum</i> which has no species-specific code) impairments being carried forward. |

Bemis Road Pond (MA36012)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 16 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Bemis Road Pond, the Aquatic Life Use is Not Assessed. |

Bennett Street Pond (MA36014)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 6 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Bennett Street Pond, the Aquatic Life Use is Not Assessed |

Bickford Pond (MA36015)

| | |
|----------------------------------|------------------------|
| Location: | Hubbardston/Princeton. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 163 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

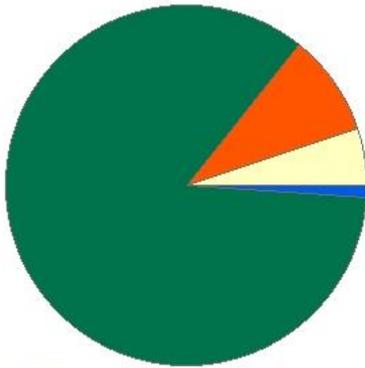
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Bickford Pond, the Aquatic Life Use is Not Assessed. |

BOTTLE BROOK (MA36-46)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion, east of Dunhamtown Brimfield Road, Brimfield to mouth at confluence with Quaboag River, Brimfield. |
| AU Type: | RIVER |
| AU Size: | 2 MILES |
| Classification/Qualifier: | B |

BOTTLE BROOK - MA36-46

Watershed Area: 1.15 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.15 | 1.15 | 0.34 | 0.34 |
| Agriculture | 5.1% | 5.1% | 6.1% | 6.1% |
| Developed | 9.1% | 9.1% | 6.5% | 6.5% |
| Natural | 84.7% | 84.7% | 84.3% | 84.3% |
| Wetland | 1.1% | 1.1% | 3.2% | 3.2% |
| Impervious Cover | 1.9% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDEP staff collected benthic macroinvertebrates in Bottle Brook ~210m upstream of the Dunhamtown Palmer Road crossing nearest the West Brimfield Palmer Rd intersection in Brimfield (B0648) in September 2008. The RBPIII analysis indicated slightly impacted conditions (71% comparable) when compared to the reference site (East Branch Swift River - B0654). DFG biologists conducted backpack electrofishing in the brook in July 2005 at Dunhamtown Palmer Rd (500ft west of West Brimfield Rd (SampleID 1272). Two species were collected including multiple age classes of eastern brook trout so the brook is considered a Tier 1 Existing Use Cold Water. MassDEP staff conducted water quality monitoring in the brook at Dunhamtown Palmer Road crossing, Brimfield (W1855) during the summer of 2008. The minimum DO was 9.0mg/L, maximum saturation 100%, and pH ranged from 6.8 to 7.4SU (n=5). Continuous deployed temperature data were collected from June to September 2008 (103 days). The maximum temperature recorded was 20.9°C and the maximum 7 DADM was 20.6°C and was above the Tier 1 CWF chronic criterion of 20.0°C 11 times but meeting the criterion. The maximum 24-hour rolling average was 20.1°C, always meeting the acute Tier 1 cold water criterion of 23.5°C. The seasonal average total phosphorus concentration was low (0.016mg/L, with a maximum of 0.025mg/L) and there were no observations of dense filamentous algae.

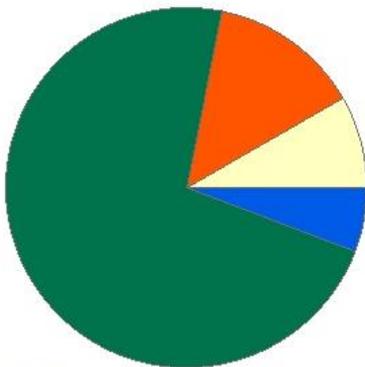
The Aquatic Life Use for Bottle Brook is assessed as Fully Supporting based on the evidence of good biological integrity (benthic community “slightly impacted” and the presence of multiple age classes of eastern brook trout and excellent water quality conditions.

BRADISH BROOK (MA36-58)

| | |
|----------------------------------|--|
| Location: | Headwaters, perennial portion east of New Braintree Road, West Brookfield to Wickaboag Valley Road and inlet of swamp east of Wickaboag Pond, West Brookfield. |
| AU Type: | RIVER |
| AU Size: | 0.7 MILES |
| Classification/Qualifier: | B |

BRADISH BROOK - MA36-58

Watershed Area: 0.88 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.88 | 0.88 | 0.42 | 0.42 |
| Agriculture | 8.3% | 8.3% | 10.7% | 10.7% |
| Developed | 13.5% | 13.5% | 12.3% | 12.3% |
| Natural | 72.5% | 72.5% | 67.6% | 67.6% |
| Wetland | 5.8% | 5.8% | 9.4% | 9.4% |
| Impervious Cover | 4.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In August 2010, DFG biologists conducted a backpack electrofishing survey in Bradish Brook at the New Braintree Rd crossing downstream, ~0.7mi north of Church St, West Brookfield (SampleID: 3403). Multiple age classes of Eastern brook trout comprised the entire sample.

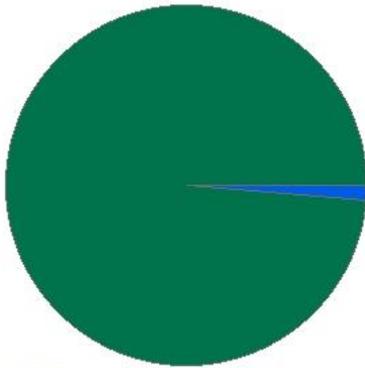
The Aquatic Life Use of Bradish Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicate of excellent habitat and water quality conditions.

BRIGGS BROOK (MA36-61)

| | |
|----------------------------------|---|
| Location: | Headwaters, outlet unnamed pond west of Daniel Shays Highway (Route 202), Shutesbury to mouth at inlet Quabbin Reservoir, Pelham. |
| AU Type: | RIVER |
| AU Size: | 1.4 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

BRIGGS BROOK - MA36-61

Watershed Area: 1.15 square miles



| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.15 | 1.15 | 0.29 | 0.29 |
| Agriculture | 0% | 0% | 0% | 0% |
| Developed | 0% | 0% | 0% | 0% |
| Natural | 98.7% | 98.7% | 96.7% | 96.7% |
| Wetland | 1.3% | 1.3% | 3.3% | 3.3% |
| Impervious Cover | 0.5% | | | |

Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In July 2013, DFG biologists conducted a backpack electrofishing survey in Briggs Brook at the wooded flat via Gate 15, Pelham (SampleID: 4987). The sample was comprised entirely of multiple age classes of Eastern brook trout.

The Aquatic Life Use for Briggs Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicate of excellent habitat and water quality conditions.

Brigham Pond (MA36020)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 45 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert) |
| <p>A potential infestation of the non-native aquatic macrophyte, <i>Myriophyllum heterophyllum</i>, was identified in Brigham Pond in 1998. No other data are available.</p> <p>The Aquatic Life Use of Brigham Pond is Not Assessed but the Alert for the potential presence of the non-native aquatic macrophyte <i>Myriophyllum heterophyllum</i> is being carried forward.</p> |

Brookhaven Lake (MA36021)

| | |
|----------------------------------|------------------|
| Location: | West Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 34 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since no recent data available for Brookhaven Lake, the Aquatic Life Use is Not Assessed. |

Brooks Pond (MA36022)

| | |
|----------------------------------|-------------------------|
| Location: | Petersham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 87 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for this Brooks Pond AU (MA36022), the Aquatic Life Use is Not Assessed. |

Brooks Pond (MA36023)

| | |
|----------------------------------|--|
| Location: | North Brookfield/New Braintree/Spencer/Oakham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 179 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

The non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), was first reported in this Brooks Pond AU (MA36023) by MassDEP in 1998 and the DEP Herbicide Database indicates that treatments for *Myriophyllum heterophyllum* were applied in most years from 2005-2012. *Cabomba caroliniana* (Fanwort) was also reported in the pond in the DEP Freshwater Aquatic Invasive Species Database but this record needs to be confirmed.

The Aquatic Life Use for this Brooks Pond AU (MA36023) is assessed as Not Supporting with the non-native aquatic macrophyte impairment (for *Myriophyllum heterophyllum*) being carried forward. An alert is also being identified for a potential infestation of *C. caroliniana* (Fanwort).

Browning Pond (MA36025)

| | |
|----------------------------------|-----------------|
| Location: | Oakham/Spencer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 106 ACRES |
| Classification/Qualifier: | B |

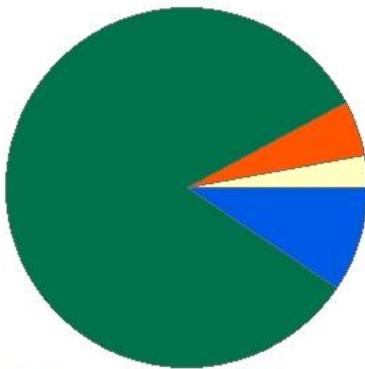
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| <p>During a 2007 survey, DCR Lakes and Ponds staff documented the presence of <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) in Browning Pond.</p> <p>According to CN 118.0: Total Maximum Daily Loads of Phosphorus for Selected Chicopee Basin Lakes, the current estimated phosphorus loading of 200 kg/ha/year does not need to be reduced to meet the target estimated loading in Browning Pond (MassDEP 2002).</p> <p>No other recent data are available.</p> <p>The Aquatic Life Use for Browning Pond is assessed as Not Supporting with the Nutrient/Eutrophication Biological Indicators and non-native aquatic macrophyte plants impairments being carried forward (no specific code is available for the non-native aquatic macrophyte <i>M. heterophyllum</i>).</p> |

Burnshirt River (MA36-37)

| | |
|----------------------------------|---|
| Location: | Headwaters, outlet Stone Bridge Pond, Templeton/Phillipston to mouth at confluence with Canesto Brook, Barre (through former 2008 segment: Williamsville Pond MA36167). |
| AU Type: | RIVER |
| AU Size: | 8.6 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Burnshirt River - MA36-37

Watershed Area: 17.34 square miles



Percent Agriculture Percent Natural
 Percent Developed Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 17.33 | 3.87 | 3.40 | 0.76 |
| Agriculture | 2.9% | 1.6% | 1.8% | 0.3% |
| Developed | 4.9% | 2.2% | 3.7% | 0.9% |
| Natural | 82.7% | 89% | 73.5% | 77.1% |
| Wetland | 9.4% | 7.2% | 21% | 21.7% |
| Impervious Cover | 2.5% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDFG biologists conducted backpack electrofishing at two locations in the Burnshirt River in 2006. A sample was collected in a low gradient reach of the river in August below Stone Bridge Pond, Phillipston-Templeton (SampleID 1693). There were 5 individuals collected with 3 species represented (the macrohabitat generalists: chain pickerel, pumpkinseed, and banded sunfish). All species collected are considered intolerant/moderately tolerant to environmental perturbations. In September a sample was collected further downstream within a high gradient section, along Barre Rd, Phillipston-Templeton (SampleID 1695). A total of 17 individuals, four species, including the fluvial dependent species white sucker representing 24% of the sample were collected and over half of the samples was represented by moderately tolerant fishes. MassDEP staff conducted water quality monitoring further downstream at Rt 62/Hubbardston Rd in Barre (W1849) during the summer of 2008. During the three-day probe deployments in June, July and August, the minimum DO was 7.0mg/L, the maximum DO saturation was 100%, and the maximum DO diel shift was 1.2mg/L, with a maximum temperature of 26.4°C. Discrete pH measurements ranged from 6.1 to 6.4SU (n=6). The seasonal average total phosphorus concentration was 0.014mg/L (n=5) (maximum 0.02mg/L) and there were no observations of dense/very dense filamentous algae present.

DCR staff collected water quality data 2-3 times per month in 2009, 2013, and 2017 also at Rt 62 Hubbardston Rd in Barre (station 103). During the 76 sampling events, the minimum DO was 7.76mg/L, maximum saturation 105%, and maximum temperature 24.1°C. pH was very low (range 4.24 to 6.63SU), with 47 of 76 measurements <6.0SU with more acidic conditions occurring each subsequent year sampled. The pH in 2017 ranged from 4.24 to 5.78SU. There was no evidence of any nutrient enrichment (all ammonia-nitrogen

concentrations ≤ 0.016 mg/L and the seasonal average total phosphorus concentrations ranged from 0.015 to 0.021mg/L with maximums between 0.021 and 0.028mg/L).

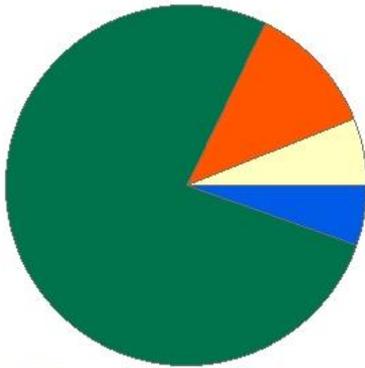
The Aquatic Life Use for the Burnshirt River is assessed as Fully Supporting. The presence of intolerant/moderately intolerant fish species along with fluvial species suggests a biologically intact warmwater fishery. There was no evidence of nutrient enrichment and water quality conditions were all excellent except for low pH which, although considered natural and likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands, is being identified with an Alert since these acidic conditions appear to be getting worse over time.

CADWELL BROOK (MA36-54)

| | |
|----------------------------------|--|
| Location: | Headwaters, south of Mt. Marcy, Wilbraham to mouth at confluence with Twelvemile Brook, Wilbraham. |
| AU Type: | RIVER |
| AU Size: | 1.8 MILES |
| Classification/Qualifier: | B |

CADWELL BROOK - MA36-54

Watershed Area: 1.47 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.46 | 1.46 | 0.35 | 0.35 |
| Agriculture | 6% | 6% | 3.4% | 3.4% |
| Developed | 11.8% | 11.8% | 5.6% | 5.6% |
| Natural | 76.8% | 76.8% | 81% | 81% |
| Wetland | 5.3% | 5.3% | 10% | 10% |
| Impervious Cover | 3.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

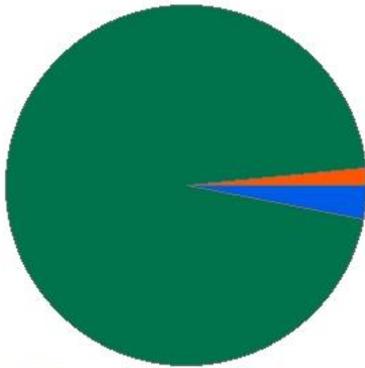
In July 2011, DFG biologists conducted backpack electrofishing in Cadwell Brook, upstream of the Glendale Rd crossing, <1mi S of Crane Hill Rd in Wilbraham (SampleID 3704). The sample was comprised of 95% fluvia specialist species including multiple age classes of Eastern brook trout which dominated the sample. The Aquatic Life Use for Cadwell Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout with are indicative of excellent habitat and water quality conditions.

Cadwell Creek (MA36-29)

| | |
|----------------------------------|--|
| Location: | Headwaters east of Route 202 and northwest of Dodge Hill, Pelham to mouth at inlet Quabbin Reservoir, Belchertown. |
| AU Type: | RIVER |
| AU Size: | 3.2 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Cadwell Creek - MA36-29

Watershed Area: 2.63 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.63 | 2.60 | 0.64 | 0.64 |
| Agriculture | 0% | 0% | 0% | 0% |
| Developed | 1.5% | 1.4% | 0.8% | 0.8% |
| Natural | 95.5% | 95.6% | 93.8% | 93.8% |
| Wetland | 3% | 2.9% | 5.4% | 5.4% |
| Impervious Cover | 0.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

Cadwell Creek was sampled by DFG biologists during July 2007 upstream of the road to the Quabbin Gate 8 crossing (Packardville Rd Sect. 2) in Pelham (SampleID 2123) using the backpack shocking method. The sample was comprised entirely of multiple age classes of Eastern brook trout so will be assessed as a Tier 1 Existing Use Cold Water. DCR staff collected discrete water quality data 2-3 times per month in 2009 and 2-3 times per month from January until September in 2019, at the mouth of Cadwell Creek (station 211B-X)., The minimum DO was 9.14mg/L, the maximum temperature was 18.46°C, and pH ranged from 5.35 to 6.96SU (n=45 surveys) with 14 measurements <6.0SU. Cadwell Creek has been identified by DCR as critically sensitive to acid rain deposition given the creek’s limited acid neutralizing capacity and low pH.

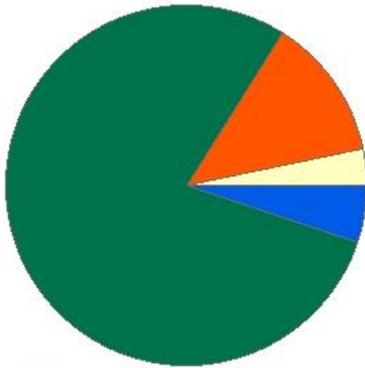
The Aquatic Life Use for Cadwell Creek is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout and except for low pH, excellent water quality conditions. The alert for limited acid neutralizing capacity and low pH is being carried forward.

Calkins Brook (MA36-26)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion, southeast of Baptist Hill, Palmer to mouth at confluence with Twelvemile Brook, Wilbraham. |
| AU Type: | RIVER |
| AU Size: | 2.7 MILES |
| Classification/Qualifier: | B |

Calkins Brook - MA36-26

Watershed Area: 3.24 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 3.24 | 3.24 | 0.79 | 0.79 |
| Agriculture | 3.3% | 3.3% | 2.7% | 2.7% |
| Developed | 12.7% | 12.7% | 10.8% | 10.8% |
| Natural | 78.9% | 78.9% | 76.2% | 76.2% |
| Wetland | 5.1% | 5.1% | 10.4% | 10.4% |
| Impervious Cover | 5.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In August 2006, DFG biologists conducted backpack electrofishing in Calkins Brook between Rt 20 and Dickerson Rd (under tracks to road crossing) in Wilbraham (SampleID 1970). The sample was comprised entirely by fluvial specialists/dependents species (n=6) including multiple age classes of Eastern brook trout. MassDEP staff collected four nutrient samples further downstream east of Crane Hill Road ~60 feet from confluence with Twelvemile Brook, Wilbraham (W1857) during the summer of 2008. The seasonal average total phosphorus concentration was low (0.026mg/L, maximum of 0.034mg/L) and there were no observations of dense/very dense filamentous algae noted.

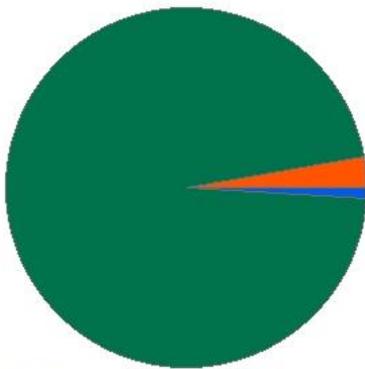
The Aquatic Life Use for Calkins Brook is assessed as Fully Supporting based primarily on the presence of fluvial fishes including multiple age classes of Eastern brook trout.

CAMEL BROOK (MA36-63)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion north of Cooleyville Road in the Shutesbury State Forest, Shutesbury to mouth at confluence with West Branch Swift River, Shutesbury. |
| AU Type: | RIVER |
| AU Size: | 1.4 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

CAMEL BROOK - MA36-63

Watershed Area: 1.13 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.13 | 1.13 | 0.30 | 0.30 |
| Agriculture | 0.3% | 0.3% | 0% | 0% |
| Developed | 2.8% | 2.8% | 0.1% | 0.1% |
| Natural | 95.9% | 95.9% | 98.7% | 98.7% |
| Wetland | 1% | 1% | 1.2% | 1.2% |
| Impervious Cover | 2.2% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In July 2006, DFG biologists conducted backpack electrofishing in Camel Brook at Cooleyville Rd (50m upstream from Rd), Shutesbury, (SampleID 1566). The sample was comprised entirely by multiple age classes of Eastern brook trout.

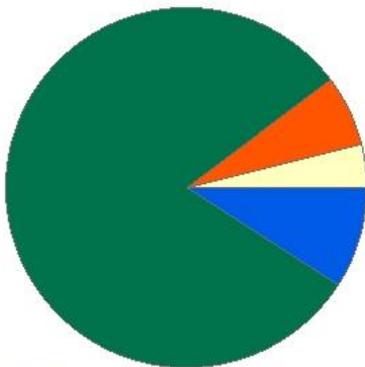
The Aquatic Life Use for Camel Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which are indicative of excellent habitat and water quality conditions.

Canesto Brook (MA36-36)

| | |
|----------------------------------|--|
| Location: | Headwaters, perennial portion, northwest of Hubbardston State Forest near Hubbardston/Templeton town line to mouth at confluence with Ware River, Barre. |
| AU Type: | RIVER |
| AU Size: | 7.3 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Canesto Brook - MA36-36

Watershed Area: 30.93 square miles



Percent Agriculture Percent Natural
 Percent Developed Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 30.92 | 6.98 | 6.09 | 1.41 |
| Agriculture | 3.8% | 2% | 1.4% | 0.2% |
| Developed | 6.5% | 3.3% | 3.2% | 0.9% |
| Natural | 80.5% | 85.5% | 73.8% | 74.4% |
| Wetland | 9.1% | 9.2% | 21.6% | 24.6% |
| Impervious Cover | 2.7% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDFG biologists conducted backpack electrofishing at four locations in Canesto Brook in the summer of 2006. In the headwater area south of the South Rd crossing in Templeton (SampleID 1943), the sample in September was comprised entirely of multiple age classes Eastern brook trout. Further downstream above the pond at Peaceful Acres Campground (SampleID 1941) the sample was dominated by multiple age classes of Eastern brook trout as well as several macrohabitat generalist brown bullhead while below the pond at Flagg Rd in Hubbardston (SampleID 1942) more species were collected including two other fluvial specialists. DCR staff collected nutrient samples 2-3 times per month in the brook at Williamsville Rd (Station C2) in 2013 and 2017. The seasonal average total phosphorus was low both years (0.023mg/L, maximum 0.034mg/L). Ammonia concentrations were also low (0.0025 to 0.0643mg/L). Further downstream near Route 62 in Barre (SampleID 1976) backpack electrofishing in July 2006 documented a sample comprised entirely by fluvial specialists/fluvial dependents including multiple age classes of Eastern brook trout.

The Aquatic Life Use for Canesto Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions as well as the dominance/moderate abundance of other fluvial fish species.

Carter Pond (MA36029)

| | |
|----------------------------------|-------------------------|
| Location: | Petersham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 44 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

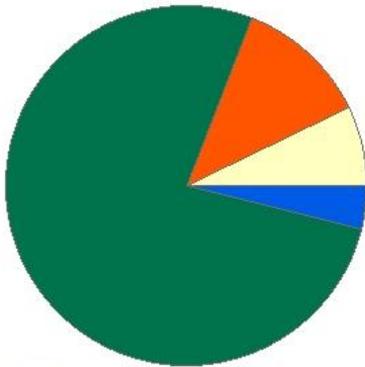
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Carter Pond, the Aquatic Life Use is Not Assessed. |

Chicopee Brook (MA36-21)

| | |
|----------------------------------|---|
| Location: | Headwaters, east of Peaked Mountain, Monson (through former 2008 segment: Chicopee Brook Pond MA36031) to mouth at confluence with Quaboag River, Monson. |
| AU Type: | RIVER |
| AU Size: | 9.9 MILES |
| Classification/Qualifier: | B: CWF |

Chicopee Brook - MA36-21

Watershed Area: 24.01 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 23.99 | 6.26 | 6.51 | 1.54 |
| Agriculture | 7.1% | 7.8% | 7.8% | 8.9% |
| Developed | 12% | 19.6% | 13.9% | 22.7% |
| Natural | 77.1% | 66.3% | 69.9% | 51.3% |
| Wetland | 3.8% | 6.3% | 8.5% | 17.1% |
| Impervious Cover | 4.9% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------|-------------------|---------------------------|
| 5 | 5 | Temperature | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Benthic macroinvertebrates were collected by MassDEP biologists as part of the probabilistic wadeable streams monitoring project (MAP2) ~60m upstream from State Street (B0645) and at Rt 32 crossing nearest Green St in Monson (B0895) in summer 2014. These data were not analyzed using an RBPIII approach, but rather will be compared to biocriteria thresholds, which are currently under development, so these data will be utilized during a future IR reporting cycle. MassDEP staff conducted clean metals sampling in the brook west of Bliss Street, ~990 feet downstream from Oak Street, Monson (W2001) during summer 2008. No exceedances of any acute or chronic metals criteria occurred for either sample. In Aug 2006, DFG biologists conducted backpack electrofishing upstream of the bridge at the road off Rt 32 south (SampleID 1965). The sample was comprised entirely by fluvial specialists/dependents species including multiple age classes of Eastern brook trout. MassDEP staff conducted water quality monitoring at other sites further downstream during the summer of 2008 with the following results: At State Street, Monson (W1853) the min DO during the three two-day continuous probe deployments in June, July, and Aug was 7.21mg/L, max daily DO shift was 1.4mg/L, with a max saturation of 98%. The max temperature during the June-Sept (115-day) thermistor deployment was 25.1°C (max 7DADM 23.8°C exceeding 20°C 62 times) and the max 24-hour rolling avg was 22.5°C (not exceeding the acute criterion

of 23.5°C). Discrete pH measurements ranged from 6.8-6.9SU (n=5). The seasonal avg TP concentration was low (0.02mg/L, max 0.045mg/L) and there were no observations of dense/very dense filamentous algae noted. Further downstream but above Chicopee Brook Pond (W2002) the max temperature was 24.5°C during the June-Sept (115-day) thermistor deployment with a max 7DADM of 22.6°C (exceeding 20°C 50 times) and with a max 24-hour rolling avg of 21.9°C. Downstream from the roll dam at outlet of Chicopee Brook Pond (W2003) the thermistor deployed from June-Sept (115-day) recorded a max temperature 26.4°C, the max 7DADM was 26.4°C (exceeding 20°C 95 times) and the max 24-hour rolling avg was 24.1°C (exceeding the acute criteria of 23.5°C). The seasonal avg TP concentration in the brook at Route 32 crossing nearest Bunyan Road, Monson (W1871) was low (0.025mg/L, max 0.058mg/L, n=5) and there were no observations of dense/very dense filamentous algae noted. Further downstream (450 ft u/s from Rt 32 & ~60 ft d/s of discharge MAG250376) the thermistor deployed between June and Sept (115-day) recorded a max temperature of 27.7°C. The max 7DADM was 26.3°C (exceeding 20°C 95 times) and the max daily mean was 24.1°C, violating both the acute and chronic and acute temperature criterion for a Cold Water. Two-day continuous probes deployed in the brook in June and Aug at Bunyan Drive (W1854) recorded a min DO of 6.62mg/L and a max temperature of 25.7°C. The max saturation was 103%, and the max diel DO shift was 1.8mg/L. The max temperature during the June-Sept (107-day) thermistor deployment was 27.0°C (max 7DADM 25.1°C exceeding 20°C 83 times) and the max 24-hour rolling avg of 23.8°C was above the acute criterion of 23.5°C.

Discrete pH measurements ranged from 6.5 to 6.8SU (n=6). The seasonal avg TP concentration was 0.026mg/L (max 0.06mg/L). No observations of dense or very dense filamentous algae were noted.

The Aquatic Life Use for Chicopee Brook is assessed as Not Supporting since temperatures exceeded the cold water criterion of 20°C at 5 sampling sites along the brook during summer 2008 even though all other data were indicative of excellent conditions (multiple age classes of Eastern brook trout and other fluvial fish were present and all other water quality data were indicative of excellent conditions). The temperature violations are not considered to be natural due to the presence of multiple dams along the brook.

Chicopee Reservoir (MA36033)

| | |
|----------------------------------|-----------------|
| Location: | Chicopee. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 22 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 2 | 4c | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

DCR Lakes and Ponds staff reported an infestation of the non-native aquatic macrophyte, *Najas minor*, (Brittle water nymph) in the Chicopee Reservoir in 2005 and 2007.

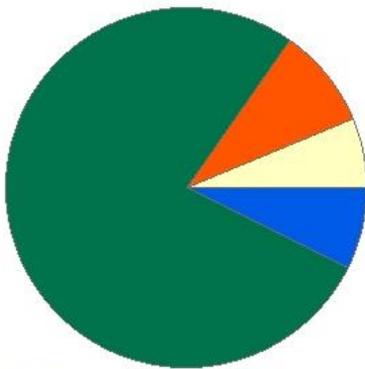
The Aquatic Life Use for Chicopee Reservoir is assessed as Not Supporting because of the presence of the non-native aquatic macrophyte species *Najas minor*, (Brittle naiad). Since a species-specific impairment code is not available, the generic non-native aquatic plants impairment is being added.

Chicopee River (MA36-22)

| | |
|----------------------------------|--|
| Location: | Source, confluence of Ware River and Quaboag River, Palmer (through former 2008 segment: Red Bridge Impoundment MA36171) to Red Bridge Impoundment Dam (NATID: MA00723), Wilbraham/Ludlow. |
| AU Type: | RIVER |
| AU Size: | 2.8 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Chicopee River - MA36-22

Watershed Area: 663.22 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 661.53 | 12.35 | 174.65 | 3.38 |
| Agriculture | 6.2% | 10.9% | 6.1% | 8.4% |
| Developed | 9.1% | 17.5% | 8.9% | 16.3% |
| Natural | 77.4% | 65.6% | 70.1% | 64.7% |
| Wetland | 7.3% | 6% | 15% | 10.5% |
| Impervious Cover | 3.3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|--|-------------------|---------------------------|
| 5 | 5 | (Eurasian Water Milfoil, <i>Myriophyllum Spicatum</i> *) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The non-native aquatic macrophyte, *Myriophyllum spicatum* (Eurasian Water Milfoil), was identified by MassDEP staff in this Chicopee River AU (MA36-22) during a 2017 field survey. MassDEP staff also recorded the presence of *Potamogeton* species during their 2008 surveys, however species confirmation is needed. During the summer of 2008 MassDEP staff conducted water quality sampling from upstream to downstream near the intersection of New Hampshire Avenue and Springfield Street, Palmer (W1033), upstream of the Red Bridge Impoundment, ~450 feet upstream from the Belchertown/Ludlow/Wilbraham border (W2013) and at the deep hole ~300 feet upstream of Red Bridge Dam, Ludlow/Wilbraham (W2012). At the most upstream site (W1033), continuous probes were deployed for two days each in June, July and August. The minimum DO was 7.04mg/L (mean minimums ranged from 7.20 to 8.21mg/L over the three deploys), the maximum saturation was 107%, the maximum diel DO shift was 1.7mg/L, and the maximum temperature recorded was 25.1°C. Discrete measurements at this site included pH measurements which ranged from 6.8 to 7.3SU (n=6), a maximum temperature of 25.8°C, and a maximum saturation of 109%. The seasonal average total phosphorus concentration was low (0.046mg/L, maximum 0.07 mg/L), and there were no observations of dense or very

dense filamentous algae noted. Further downstream at W2103, depth profiles were made in July and August (9 measurements total). Dissolved oxygen was plentiful to a maximum of 5.2m in depth ranging from 6.8 to 8.6mg/L and the maximum saturation was 97%. pH ranged from 6.2 to 7.1SU (one measurement <6.5SU) and the maximum temperature was 26.3°C at the surface in July. At the deep hole in the river ~300 feet upstream of Red Bridge Dam, Ludlow/Wilbraham (W2012) depth profiles were conducted in July, August and September (28 measurements total). The maximum depth measured during the surveys was 12.6m. Oxygen depletion (<5.0mg/L was documented at 7m during the July survey, 11m during the August survey, and only at 12.6m in September. The maximum temperature was 25.9°C at the surface in July and pH ranged from 6.2 to 7.2SU in the three profiles with the lower measurements at depths below 4.9m (9 measurements <6.5SU).

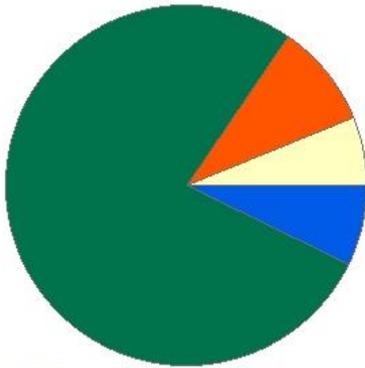
The Aquatic Life Use for this Chicopee River AU (MA36-22) is assessed as Not Supporting. An impairment is being added because of the presence of the non-native aquatic macrophyte species Eurasian Water Milfoil (*Myriophyllum spicatum*). An alert is being identified for the potential infestation of *Potamogeton crispus*. The water quality data collected during the summer of 2008 was indicative of generally good conditions for a warm water fishery although low DO occurred at depths below 7m at times in the Red Bridge Impoundment reach of the river. This area comprises an extremely small reach of the river (somewhere less than ~0.03%) so it is not identified as an impairment.

Chicopee River (MA36-23)

| | |
|----------------------------------|--|
| Location: | Red Bridge Impoundment Dam (NATID: MA00723), Wilbraham/Ludlow to Wilbraham Pumping Station (old WWTP), Wilbraham/Ludlow. |
| AU Type: | RIVER |
| AU Size: | 3.8 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Chicopee River - MA36-23

Watershed Area: 683.16 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 681.46 | 9.37 | 179.66 | 3.13 |
| Agriculture | 6.1% | 2.4% | 6% | 3.7% |
| Developed | 9.3% | 21.6% | 9% | 15.8% |
| Natural | 77.4% | 72% | 70.2% | 74.2% |
| Wetland | 7.2% | 4% | 14.8% | 6.3% |
| Impervious Cover | 3.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDEP staff conducted water quality monitoring in this Chicopee River AU (MA36-23) at the Route 90 crossing in Wilbraham/Ludlow (W2005) during the summer of 2008. Continuous probes were deployed in June and August. The minimum DO was 7.33mg/L, the maximum saturation was 98%, the maximum diel DO shift was 0.95mg/L, and the maximum temperature measured during the deploys was 22.7°C. Discrete pH measurements ranged from 6.7 to 7.15U (n=6), the maximum temperature was 25.8°C, the minimum DO was 7.2mg/L, and the maximum saturation was 112%. Nutrient sampling that summer was conducted a little further downstream at Miller Street/Cottage Avenue bridge, Ludlow/Wilbraham (W1032). The seasonal average total phosphorus concentration was low (0.027mg/L, maximum 0.03mg/L, n=5). No observations of dense filamentous algae were noted. All these data were indicative of good water quality for a warmwater fishery.

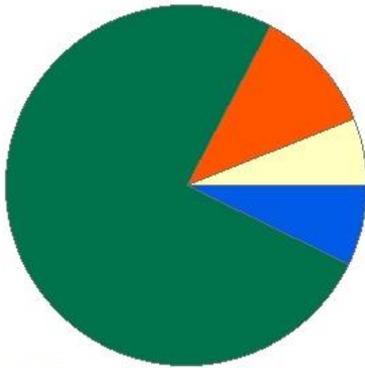
The Aquatic Life Use for this Chicopee River AU (MA36-23) is assessed as Fully Supporting based on the good water quality conditions documented during the summer of 2008. The alert for the potential impacts of hydropower operations is being carried forward.

Chicopee River (MA36-24)

| | |
|----------------------------------|--|
| Location: | Wilbraham Pumping Station (old WWTP), Wilbraham/Ludlow to Chicopee Falls Dam (NATID: MA00719), Chicopee. |
| AU Type: | RIVER |
| AU Size: | 8.8 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Chicopee River - MA36-24

Watershed Area: 714.23 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 712.52 | 9.25 | 186.24 | 2.04 |
| Agriculture | 6% | 1.3% | 5.9% | 2% |
| Developed | 11.2% | 65% | 9.7% | 29.5% |
| Natural | 75.6% | 28.6% | 69.5% | 53.4% |
| Wetland | 7.2% | 5.1% | 14.9% | 15% |
| Impervious Cover | 4.3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------------|-------------------|---------------------------|
| 5 | 5 | (Water Chestnut*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Benthic macroinvertebrate sampling was conducted by MassDEP biologists in this Chicopee River AU (MA36-24) upstream of the River Street/West Street bridge Springfield/Ludlow) (B0655) in September 2008. The RBPIII analysis indicated the sample was “not impacted” (84% comparable) when compared to the East Branch Swift River reference site (B0654). MassDEP staff also conducted water quality monitoring in the river at River Street/West Street bridge (W1031) during the summer of 2008. Continuous probes were deployed in June, July and August documenting a minimum DO of 6.8mg/L (mean minimums during the deploys ranging from 6.94 to 8.31mg/L), maximum saturation 101%, the maximum diel DO shift 0.63mg/L. One long thermistor was deployed at this site documenting a maximum temperature of 27.3°C and a maximum 24-hour rolling average temperature of 26.1°C. Discrete pH measurements ranged from 6.8 to 7.2SU (n=9) and the seasonal average total phosphorus concentration was low (0.028mg/L, maximum 0.031mg/L) and there were no observations of dense or very dense filamentous algae noted. All data were indicative of good water quality for a warmwater fishery. In September 2009, the Midwest Biodiversity Institute staff conducted boat electrofishing in the river upstream of the Chicopee dam (~1.1 miles downstream of Robinson Veteran’s Memorial Bridge) (SampleID 3284). The sample was comprised of 17% fluvial specialists/dependents and 69% of the sample were intolerant/moderately intolerant fish. According to the USGS Non-Indigenous Aquatic Species database (which

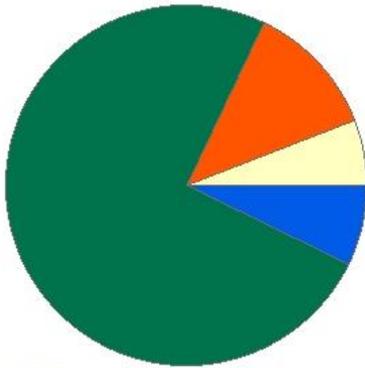
informs the DEP Freshwater Invasive Species database, there is a record of the non-native species, *Trapa natans*, (Water chestnut) in the Chicopee Falls section of the Chicopee River (MA36-24). The Aquatic Life Use for this Chicopee River AU (MA36-24) is assessed as Not Supporting. While the benthic, fish and water quality data were indicative of good conditions, an impairment for the presence of the non-native aquatic macrophyte species *Trapa natans* (water chestnut) is being added. The Alert due to the potential impacts of hydromodification resulting from the hydropower operations is being carried forward.

Chicopee River (MA36-25)

| | |
|----------------------------------|--|
| Location: | Chicopee Falls Dam (NATID: MA00719), Chicopee to mouth at confluence with Connecticut River, Chicopee. |
| AU Type: | RIVER |
| AU Size: | 3 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Chicopee River - MA36-25

Watershed Area: 722.68 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 720.96 | 9.80 | 187.41 | 1.62 |
| Agriculture | 5.9% | 1.1% | 5.9% | 1.9% |
| Developed | 12% | 77.7% | 9.9% | 34.8% |
| Natural | 74.9% | 17.8% | 69.4% | 48.4% |
| Wetland | 7.2% | 3.4% | 14.9% | 14.9% |
| Impervious Cover | 4.7% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDEP staff conducted limited water quality monitoring at two sites along this Chicopee River AU (MA36-25) during the summer of 2008. Discrete sampling of the river at Route 116 bridge, Chicopee (W0475) were indicative of good water quality conditions for a warmwater fishery: the minimum DO was 8.2mg/L (n=5), the maximum saturation was 107%, the maximum temperature was 27.3°C (n=5), pH ranged from 7.1-8.0SU (n=5), the seasonal average total phosphorus concentration was low (0.032mg/L) (maximum 0.038mg/L), and there was one observation of dense or very dense filamentous algae. At the southern end of Route 116 bridge, Chicopee (W2056) the seasonal average total phosphorus was also 0.032mg/L (maximum 0.036 mg/L) and there were no observations of dense or very dense filamentous algae.

The Aquatic Life Use of this Chicopee River AU (MA36-25) is assessed as Fully Supporting based on the limited water quality data collected during the summer of 2008 which were indicative of good conditions. The alert for potential effects of hydropower operations and CSOs is being carried forward.

Cloverdale Street Pond (MA36036)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 19 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

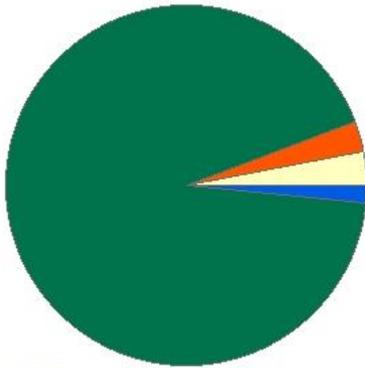
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since no recent data are available for Cloverdale Street Pond, the Aquatic Life Use is Not Assessed. |

COBB BROOK (MA36-62)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion east of Town Farm Road, Shutesbury to mouth at inlet Quabbin Reservoir, Shutesbury. |
| AU Type: | RIVER |
| AU Size: | 1.6 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

COBB BROOK - MA36-62

Watershed Area: 0.84 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.84 | 0.84 | 0.29 | 0.29 |
| Agriculture | 3% | 3% | 1.5% | 1.5% |
| Developed | 2.7% | 2.7% | 3.3% | 3.3% |
| Natural | 92.7% | 92.7% | 91.4% | 91.4% |
| Wetland | 1.6% | 1.6% | 3.8% | 3.8% |
| Impervious Cover | 1.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In August 2008, DFG biologists conducted backpack electrofishing in Cobb Brook at Rt 202 inside gate 15 Quabbin, upstream of the confluence w/ Quabbin, Shutesbury (SampleID 2736). The sample was comprised entirely by young Eastern brook trout.

The Aquatic Life Use for Cobb Brook is assessed as Fully Supporting based on the presence of young Eastern brook trout indicative of excellent habitat and water quality conditions.

Comins Pond (MA36037)

| | |
|----------------------------------|-----------------|
| Location: | Warren. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 26 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

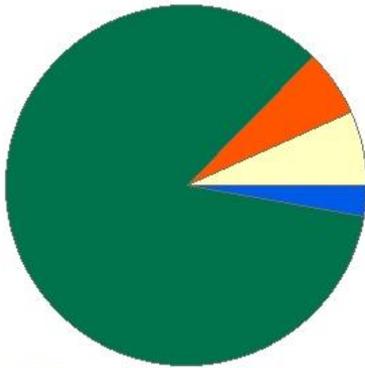
Records of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil) were reported in the DEP Freshwater Aquatic Invasive Species database, but further confirmation is needed. The Aquatic Life Use for Comins Pond is Not Assessed, but an alert is being identified for the potential infestation of *Myriophyllum heterophyllum*.

CONANT BROOK (MA36-45)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Conant Brook Reservoir dam (NATID: MA00965), Monson to mouth at confluence with Chicopee Brook, Monson. |
| AU Type: | RIVER |
| AU Size: | 1.9 MILES |
| Classification/Qualifier: | B |

CONANT BROOK - MA36-45

Watershed Area: 8.91 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 8.90 | 4.88 | 2.72 | 1.37 |
| Agriculture | 6.7% | 9.3% | 8.3% | 12.6% |
| Developed | 6% | 8.5% | 4.9% | 7.2% |
| Natural | 84.6% | 79.2% | 82.6% | 76.9% |
| Wetland | 2.7% | 3% | 4.3% | 3.4% |
| Impervious Cover | 2.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In July 2013, DFG biologists conducted backpack electrofishing in Conant Brook upstream of the road crossing on Wales Rd (SampleID 4757). The sample was dominated by fluvial specialists/fluvial dependents including two large brown trout but no other cold-water species. MassDEP staff collected discrete water quality data in Conant Brook at Route 32 crossing, Monson (W1862) 5 times during the summer of 2008 and all met warmwater criteria: minimum DO 8.2mg/L, maximum temperature 22.3°C, pH ranged 6.6 to 7.1SU (n=5), the seasonal average total phosphorus was low (0.019mg/L, maximum 0.039mg/L, n=5) and there were no observations of dense/very dense filamentous algae noted.

The Aquatic Life Use for Conant Brook is assessed as Fully Supporting based on the dominance of fluvial fish in the brook in the summer of 2013 and the good water quality conditions documented during the summer of 2008.

Conant Brook Reservoir (MA36038)

| | |
|----------------------------------|-----------------|
| Location: | Monson. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 4 ACRES |
| Classification/Qualifier: | B |

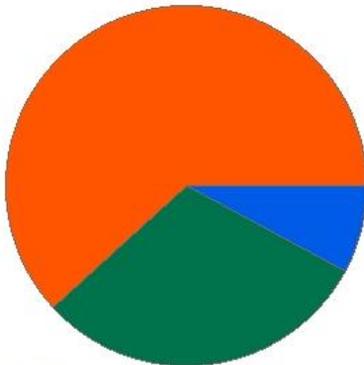
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Conant Brook Reservoir, the Aquatic Life Use is Not Assessed. |

Cooley Brook (MA36-38)

| | |
|----------------------------------|--|
| Location: | From the outlet of Chicopee Reservoir, Chicopee to mouth at confluence with the Chicopee River, Chicopee (segment mileage includes length of channelized diversion south of Route 90, a "braid" that confluences with the Chicopee River upstream of the mouth of Cooley Brook). |
| AU Type: | RIVER |
| AU Size: | 1.2 MILES |
| Classification/Qualifier: | B |

Cooley Brook - MA36-38

Watershed Area: 5.32 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 5.32 | 3.65 | 0.91 | 0.68 |
| Agriculture | 0.8% | 0.6% | 1.5% | 2% |
| Developed | 61.3% | 63.2% | 18.5% | 12.1% |
| Natural | 30.1% | 28.6% | 56.1% | 58.8% |
| Wetland | 7.7% | 7.6% | 23.9% | 27.1% |
| Impervious Cover | 24.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

In September 2009, DFG biologists conducted backpack electrofishing in Cooley Brook at the Outflow of the Chicopee Reservoir (lower reservoir) (SampleID 3153). No coldwater species were collected, however, the sample was dominated by fluvial specialists/dependents.

The Aquatic Life Use for Cooley Brook is assessed as Fully Supporting based on the presence of fluvial species in the fish sample collected in September 2009. The alert for total phosphorus is being carried forward.

Cranberry Meadow Pond (MA36040)

| | |
|----------------------------------|-------------------|
| Location: | Spencer/Charlton. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 69 ACRES |
| Classification/Qualifier: | B |

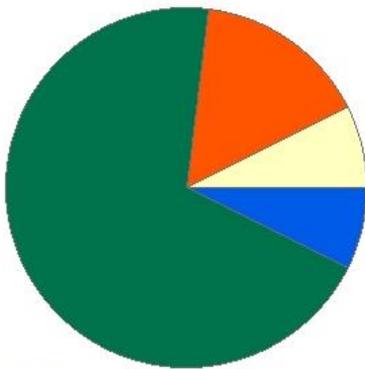
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There are no data available, therefore Aquatic Life Use for Cranberry Meadow Pond is Not Assessed. |

Cranberry River (MA36-20)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Cranberry Meadow Pond, Spencer to mouth at confluence with Sevenmile River, Spencer (through former 2008 segment: Howe Pond MA36073). |
| AU Type: | RIVER |
| AU Size: | 3.6 MILES |
| Classification/Qualifier: | B |

Cranberry River - MA36-20

Watershed Area: 6.53 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 6.52 | 6.11 | 2.47 | 2.33 |
| Agriculture | 7.4% | 7.2% | 4.9% | 5.1% |
| Developed | 15.7% | 15.3% | 16.7% | 16.4% |
| Natural | 69.7% | 70% | 65.2% | 65.1% |
| Wetland | 7.3% | 7.5% | 13.2% | 13.4% |
| Impervious Cover | 5.2% | | | |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

There is a report of an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Howe Pond, which is part of this Cranberry River AU (MA36-20) however this has not been confirmed. The Spencer Wastewater Treatment Plant (WWTP) staff collected water from the Cranberry River at the South Spencer Road Crossing for use in the facility's whole effluent toxicity (WET) tests. Between August 2007 and February 2019 survival of *C. dubia* exposed (approximately 7 days) to the Cranberry River water was good (range 80 to 100%, n=27). The Spencer WWTP effluent has also generally been in compliance with their whole effluent toxicity (WET) testing limits. Between August 2007 and February 2019, a total of 27 modified acute and chronic whole effluent toxicity tests were conducted on the facility's treated effluent. Except for the March 2011 test (LC₅₀=79.5% effluent) no acute whole effluent toxicity was detected (the LC₅₀s were all >100% effluent). Of the 26 valid chronic tests, the CNOECs were ≥ 92% effluent (the permit limit) in 24 tests. The CNOEC results were 12.5 and 50% effluent in the February and March 2011 tests, respectively.

The Aquatic Life Use of Cranberry River is assessed as having Insufficient Information although there has been good survival of *C. dubia* exposed to Cranberry River water between August 2007 and February 2019. The former alerts due to occasional low dissolved oxygen concentrations and the absence of brook trout and other fluvial species are being carried forward and a new alert is being identified because of the potential infestation of *M. heterophyllum* in the Howe Pond impoundment of Cranberry River.

Crystal Lake (MA36043)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 16 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Crystal Lake, the Aquatic Life Use is Not Assessed. |

Cunningham Pond (MA36044)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 27 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Cunningham Pond, the Aquatic Life Use is Not Assessed. |

Cusky Pond (MA36045)

| | |
|----------------------------------|-----------------|
| Location: | New Braintree. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 28 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------------|-------------------|---------------------------|
| 3 | 4c | (Water Chestnut*) | | Added |

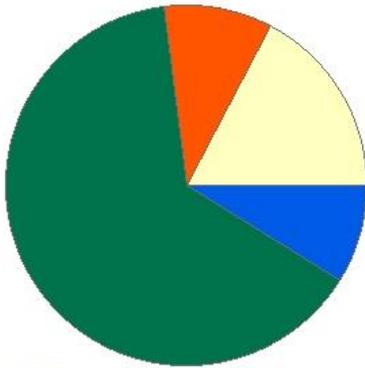
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
|---|
| <p>There is a report of the non-native aquatic macrophyte, <i>Trapa natans</i>, in Cusky Pond in the DEP Freshwater Aquatic Invasive Species database.</p> <p>The Aquatic Life Use for Cusky Pond is assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte water chestnut (<i>Trapa natans</i>).</p> |

DANFORTH BROOK (MA36-50)

| | |
|----------------------------------|--|
| Location: | Headwaters, east of Charity Road, Hardwick to mouth at confluence with Ware River, Hardwick. |
| AU Type: | RIVER |
| AU Size: | 5.8 MILES |
| Classification/Qualifier: | B |

DANFORTH BROOK - MA36-50

Watershed Area: 5.45 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 5.45 | 3.32 | 1.95 | 1.14 |
| Agriculture | 17.3% | 18.4% | 14.7% | 16.2% |
| Developed | 9.7% | 11.8% | 8.8% | 12.1% |
| Natural | 64.2% | 61.5% | 56.7% | 52.2% |
| Wetland | 8.8% | 8.3% | 19.7% | 19.5% |
| Impervious Cover | 3.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DFG biologists conducted backpack electrofishing at four sites along Danforth Brook from upstream to downstream as follows: At the Ruggles Rd crossing (north), a high gradient section of the brook, (SampleID 1930), a total of 58 individuals were collected with 5 species represented. 62% of the sample was comprised of fluvial specialists/dependents. At Barre Rd, south of Hardwick center (SampleID 1692), in a low gradient section of the brook, 37 individuals from 4 species were collected. This sample was dominated by tolerant macrohabitat generalist species, except for the moderately tolerant pumpkinseed which made up 5% of the sample. Further downstream at Rt 32A/Mechanic St, Gilbertville (SampleID 1215) sampling in August 2005 resulted in the capture of five species and the sample was dominated (70%) by fluvial specialists/dependents. In July 2012 (SampleID 4179) six species were collected in the brook also dominated (79%) by fluvial specialists. MassDEP staff conducted nutrient sampling near the mouth of Danforth Brook (W1860), three times during the summer of 2008. The seasonal average total phosphorus concentration was 0.11 mg/L (maximum 0.14mg/L). No observations of dense or very dense filamentous algae were noted.

The Aquatic Life Use for Danforth Brook is assessed as Fully Supporting based on the fish data indicative of an intact warmwater assemblage generally dominated by fluvial specialist/dependant species. An Alert is being identified because of elevated Total Phosphorus although no other data are available to indicate nutrient-related impairment.

Dean Pond (MA36049)

| | |
|----------------------------------|-------------------|
| Location: | Brimfield/Monson. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 10 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| An infestation of <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) was reported by DCR staff in Dean Pond. The Aquatic Life Use of this Dean Pond AU (MA36049) will continue to be assessed as Not Supporting because of the non-native aquatic macrophyte infestation (<i>M. heterophyllum</i>). Since no species-specific code is available the generic non-native aquatic plants impairment is being carried forward. |

Dean Pond (MA36050)

| | |
|----------------------------------|-----------------|
| Location: | Oakham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 64 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert) |
| <p>Permit applications between 2003 and 2006 indicated that Dean Pond was treated with herbicides for <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) and <i>Myriophyllum sp.</i>, but these records require confirmation by DWM personnel.</p> <p>The Aquatic Life Use for this Dean Pond AU (MA36050) will continue to be assessed having Insufficient information with the alert for a potential infestation of the non-native aquatic macrophyte <i>M. heterophyllum</i> being carried forward.</p> |

Demond Pond (MA36051)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 120 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert) |
|--|

| |
|---|
| <p>The presence of <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) in Demond Pond was reported in the DEP Freshwater Aquatic Invasive Species database but this record requires further confirmation. The Aquatic Life Use for Demond Pond remains assessed as having insufficient information. The Alert for the potential presence of the non-native aquatic macrophyte <i>M. heterophyllum</i> is being carried forward.</p> |
|---|

Dimmock Pond (MA36053)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 9 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Dimmock Pond, the Aquatic Life Use is Not Assessed. |

Doane Pond (MA36054)

| | |
|----------------------------------|-------------------|
| Location: | North Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 28 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

There is a record of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), in Doane Pond in the DEP Freshwater Aquatic Invasive Species database that needs confirmation. There are no other recent data available.

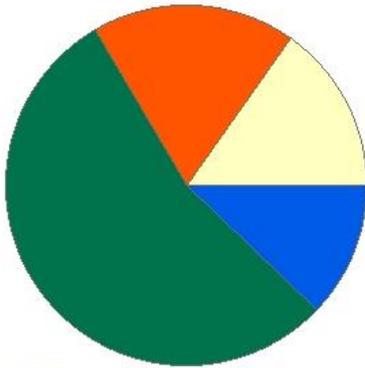
The Aquatic Life Use for Doane Pond is Not Assessed but an alert is being identified for the potential infestation with the non-native aquatic macrophyte *M. heterophyllum*.

Dunn Brook (MA36-19)

| | |
|----------------------------------|---|
| Location: | From confluence with Forget-Me-Not Brook, East Brookfield/Brookfield to mouth at confluence with Quaboag River, Brookfield. |
| AU Type: | RIVER |
| AU Size: | 2.4 MILES |
| Classification/Qualifier: | B: WWF |

Dunn Brook - MA36-19

Watershed Area: 6.75 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 6.75 | 4.27 | 2.95 | 2.16 |
| Agriculture | 15.2% | 13.2% | 11% | 9.1% |
| Developed | 18.2% | 15.3% | 12.8% | 13% |
| Natural | 54.5% | 55.6% | 55.7% | 54.1% |
| Wetland | 12.1% | 15.9% | 20.4% | 23.8% |
| Impervious Cover | 5.6% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------------|-------------------|---------------------------|
| 2 | 5 | Dissolved Oxygen | | Added |
| 2 | 5 | Phosphorus, Total | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

MassDEP staff conducted water quality monitoring in Dunn Brook ~350 feet upstream of the Route 9 crossing, East Brookfield (W1873) during the summer of 2008. Probes were deployed on four separate occasions between June and September for two to four days each to measure dissolved oxygen and temperature. The minimum DO was 0.20mg/L (in July) and the mean minimum DOs ranged from 0.22 to 1.89mg/L during the four deploys with a maximum diel shift of 4.09mg/L. The maximum saturation during the deploys was only 81% (and as low as 20% during the July deployment) and the maximum temperature was 27.2°C. Discrete pH measurements ranged from 6.1 to 6.7SU (n=8) and the seasonal average total phosphorus concentration was high (0.16mg/L, maximum 0.23mg/L, n=5) although there were no observations of dense or very dense filamentous algae present. Notes were made of *Potamogeton* sp. present, but the species was not confirmed. Ammonia concentrations were low (range <0.02 to 0.09mg/L).

The Aquatic Life Use of Dunn Brook is assessed as Not Supporting based on the consistently low dissolved oxygen concentrations and high total phosphorus concentrations (one indication of nutrient enrichment was the large diel DO shifts). The former alert issues for low DO and elevated total phosphorus were suspected to be associated (in part) with the large wetland area upstream of the sample location, the low gradient nature of the

brook above Rt.9, as well as the sampling location downstream from the North Brookfield Wastewater Treatment Plant discharge (MA0101061). It should be noted that the North Brookfield WWTP (under their 2007 permit), reduced their load of biological oxygen demand (BOD) and were held to more stringent total phosphorus limits (0.2mg/L April to October). This limit was further reduced to 0.1mg/L in their 2019 permit with a compliance schedule to achieve this limit as facility upgrades may be needed.

Eames Pond (MA36056)

| | |
|----------------------------------|-----------------|
| Location: | Paxton. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 58 ACRES |
| Classification/Qualifier: | B |

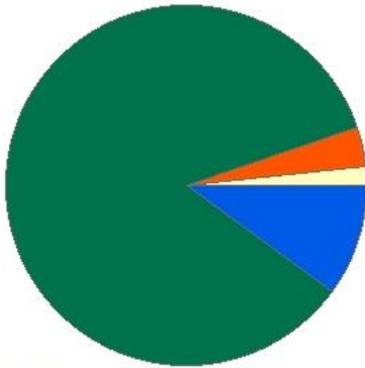
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| No recent data are available for Eames Pond. The Aquatic Life Use for Eames Pond will continue to be assessed as Not Supporting with the dissolved oxygen impairment being carried forward. |

EAST BRANCH FEVER BROOK (MA36-47)

| | |
|----------------------------------|---|
| Location: | Headwaters, outlet Brooks Pond, Petersham to mouth at inlet Quabbin Reservoir, Petersham. |
| AU Type: | RIVER |
| AU Size: | 5.2 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

EAST BRANCH FEVER BROOK - MA36-47

Watershed Area: 8.74 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 8.74 | 3.92 | 1.57 | 0.78 |
| Agriculture | 1.7% | 0.8% | 0.2% | 0% |
| Developed | 3.5% | 2.8% | 0.8% | 1.1% |
| Natural | 84.8% | 87.6% | 75.7% | 73.4% |
| Wetland | 10% | 8.8% | 23.3% | 25.5% |
| Impervious Cover | 1.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in East Branch Fever Brook at West St crossing (SampleID 2618) in August 2008. Only a short reach of the low gradient section of the brook was sampled since the water was deep and silty due to the presence of beaver dams. Only two fish -- a chain pickerel and a brown bullhead were captured. DCR staff also conducted water quality sampling in the brook at West Street, Petersham (station 215) 2-3 times per month from 2008 until September 2019. DO ranged from 3.5 to 18.6mg/L (n=299) with four measurements below 4.0mg/L. The maximum temperature was 24.9°C (n=299), pH ranged from 3.3 to 6.81SU (n=294) with 254 measurements were <6.0SU. Total phosphorus data were collected 2-6 times per year from 2008-2019. The seasonal average total phosphorus concentrations (usually n=2) were low (range 0.015 to 0.030mg/L) and the overall maximum was only 0.042mg/L. Chloride and ammonia concentrations were also low (no acute or chronic exceedances). MassDEP staff also conducted limited sampling in the brook at West Street, Petersham (W2020) in the summer of 2008 with similarly low pH and total phosphorus concentrations (maximum was 0.023 mg/L). Further downstream in a high gradient section of the brook near Camel Hump Rd crossing backpack electrofishing by DFG biologists (SampleID 2617) resulted in the capture of nine species (101 fish). This sample was dominated by fluvial specialists and included two wild Eastern brook trout >140mm. Benthic macroinvertebrates sampling was conducted by MassDEP biologists ~100 meters downstream/west from Camel Hump Rd, in Petersham (B0653) in September 2008. The RBPIII analysis indicated the sample was "slightly impacted" (71% comparable) when compared to the East Branch Swift River reference site (B0654). DCR staff conducted water quality sampling at Camels Hump Rd, Petersham (station 215G) 1-3 times per month in 2013 and 2017. DO ranged from 6.3 to 14.9mg/L (n=47), the maximum temperature was 25.0°C (n=47), pH ranged from 4.73 to 6.05SU (n=47), and the seasons average total phosphorus concentration was low (0.02mg/L).

both years). Chloride and ammonia concentrations were also low (no acute or chronic exceedances). Further downstream in the brook at an old dam, northeast of Rattlesnake Hill, Petersham (W2022) MassDEP staff also conducted limited sampling during the summer of 2008. DO ranged from 4.8 to 12.5mg/L, the maximum temperature was 22.7°, pH ranged 5.2-6.3SU, and the maximum total phosphorus concentration was 0.015 mg/L. DCR staff also conducted monitoring in the brook at Dugway Rd, Petersham (station 215F) 1-3 times per month in 2008, 2013, and 2017. DO ranged from 6.9 to 16mg/L (n=72), the maximum temperature was 24.5°C (n=72), pH ranged from 5.12 to 6.93SU (n=77) with 36 measurements <6.0SU, and the seasonal average total phosphorus concentrations were low (range 0.016 to 0.022mg/L). Chloride and ammonia concentrations were also low (no acute or chronic exceedances).

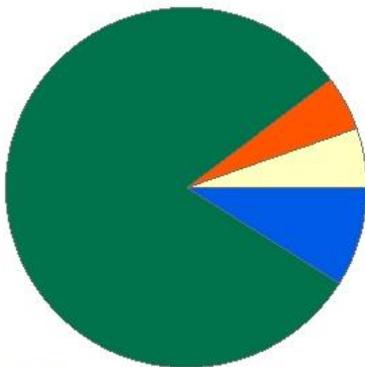
The Aquatic Life Use of East Branch Fever River is assessed as Fully Supporting based on the benthic macroinvertebrate and fish samples indicative of relatively good biotic integrity and the generally good water quality conditions. DO and temperature data usually met standards and there was no evidence of any nutrient enrichment or toxic pollutants. Low pH was frequently measured and although is considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands), it is being identified as an Alert issue since it appears to be getting lower over time. Since a *Potamogeton* sp. was noted on one of the 2008 field sheets at a sampling site in 2008, an alert is also being identified for the possible infestation of *Potamogeton crispus* however species confirmation is needed.

East Branch Swift River (MA36-35)

| | |
|----------------------------------|--|
| Location: | Headwaters, confluence of Shattuck and Popple Camp brooks, Phillipston to mouth at inlet Pottapaug Pond, Petersham (through former 2008 segment: Connor Pond MA36039). |
| AU Type: | RIVER |
| AU Size: | 9.8 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

East Branch Swift River - MA36-35

Watershed Area: 33.16 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 33.15 | 10.05 | 7.00 | 2.47 |
| Agriculture | 5.3% | 3.4% | 2.9% | 2.4% |
| Developed | 4.9% | 6.4% | 2.9% | 4.7% |
| Natural | 80.9% | 83.4% | 76.4% | 81.2% |
| Wetland | 8.9% | 6.8% | 17.8% | 11.7% |
| Impervious Cover | 1.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing at three sites along the upper reaches of the East Branch Swift River in August 2006. The most upstream sample was North of the Rt 101 crossing (SampleID 1688) in a low gradient reach which had beaver dams. This sample was comprised primarily of macrohabitat generalist species as well as one single tolerant fluvial fish (white sucker). Further downstream south of the Rt 101 crossing (SampleID 1689) the sample was dominated by white sucker as well as the moderately intolerant macrohabitat species pumpkinseed. And further downstream in a high gradient reach in the river at the inlet to Brown’s Pond (SampleID 1694) the sample was dominated by fluvial specialists/dependents species including one small brown trout (<140mm). Further downstream in the river near Connor Pond outlet (station 216D) DCR staff conducted water quality sampling 2-3 times per month in 2010, 2014, 2015, and 2018. Except for one low DO measurement (3.96mg/l) all measurements were >5.0mg/L (n=103), the maximum temperature was 26.7°C (n=103) and pH ranged from 4.76 to 7.16SU (n=93 with 26 measurements <6.0SU). The seasonal average total phosphorus concentration (usually n=11 measurements) was low (range 0.030 to 0.035mg/L), with a maximum of 0.043mg/L. The maximum chloride concentration (data collected 2 times per month from September 2018 to December 2018) was only 12.2mg/L and ammonia concentrations (collected 2-3 times per month in 2014, 2015, and 2018) were also low (maximum 0.111mg/L) with no violations of acute or chronic criteria. MassDEP biologists conducted benthic macroinvertebrates sampling in the East Branch Swift River upstream at Glen Valley Rd, Petersham (B0654) in September 2008. The RBPIII status analysis indicated the sample was “not impacted” (this was the reference site for 2008 surveys in the Chicopee River Watershed). The dominant taxon comprised only 7.77% of the sample. MassDEP conducted limited water quality monitoring near the mouth of

the river at Rte 32A Hardwick Road, Petersham (W2025) during the summer of 2008. The minimum DO was 8.2mg/L, maximum saturation was 96%, maximum temperature was 22.5°C, pH 6.3 to 6.8SU, and the total phosphorus concentration was 0.023mg/L. DCR staff also collected discrete data 2-3 times per month from 2008-2019 at Rte 32A (station 216). DO ranged from 5.71 to 20.49mg/L in all but one sample (n=299), the maximum temperature was 25.02°C (n=299), and pH ranged from 4.77 to 7.63 (n=294 with 51 measurements <6.0SU). Total phosphorus data were collected 4-5 times per year with the seasonal average (usually n=2) ranging from 0.018 to 0.028mg/L (maximum concentration 0.045mg/L). The maximum chloride (data collected 2-3 times per month from September 2018 to June 2019) was only 15.9mg/L and ammonia concentrations (samples collected 2-4 times per year from 2012 to 2019) were all low (maximum concentration 0.0542mg/L) and there were no violations of acute or chronic criterion.

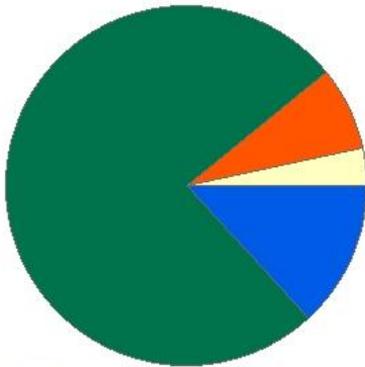
The Aquatic Life Use for the East Branch Swift River is assessed as Fully Supporting based on the benthic, fish and water quality data indicative of generally good conditions. Low pH was frequently measured and although is considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands), it is being identified as an Alert issue since it appears to generally be getting lower over time.

East Branch Ware River (MA36-01)

| | |
|----------------------------------|---|
| Location: | Headwaters, outlet Bickford Pond, Hubbardston to mouth at confluence with West Branch Ware River (forming headwaters of Ware River), Barre. |
| AU Type: | RIVER |
| AU Size: | 12.4 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

East Branch Ware River - MA36-01

Watershed Area: 38.14 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 37.91 | 10.25 | 12.73 | 2.53 |
| Agriculture | 3.4% | 2.6% | 2.2% | 1.2% |
| Developed | 7.5% | 5.1% | 6.1% | 4.3% |
| Natural | 75.9% | 76.4% | 70% | 58.3% |
| Wetland | 13.2% | 15.9% | 21.7% | 36.2% |
| Impervious Cover | 2.9% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 5 | 2 | Dissolved Oxygen | | Removed |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DCR staff conducted water quality sampling in the East Branch Ware River at Lombard Rd, Hubbardston (station 108C) 2-3 times per month in 2011, 2015, and 2019. The data were indicative of good conditions: the min DO was 5.49mg/L (n=70), the max temperature was 23.56°C (n=71), pH ranged from 5.68 to 6.91SU (n=70), the seasonal avg total phosphorus (May-Sept) concentrations were low (range 0.008-0.012mg/L) (overall max only 0.014 mg/L, n=26), the max chloride concentration was 13mg/L (n=13), and the max ammonia reading was only 0.0509mg/L (n=35) with no violations of either acute or chronic criteria. MassDEP biologists conducted benthic macroinvertebrate sampling in the East Branch Ware River ~100 m downstream from Old Colony Rd, Princeton (B0652) in Sept 2008. The RBPIII analysis indicated the sample was “slightly impacted” (71% comparable) when compared to the East Branch Swift River reference station (B0654). MassDEP staff also conducted water quality sampling in the river at this location at the Old Colony Rd Crossing, Princeton (W1848) during summer 2008. Probes were deployed for three days in June, July, and Aug. The min DO was 6.41mg/L (mean min DOs were 6.48 and 7.06mg/L in July and Aug, the max saturation was 96.2%, and the max diel shift was 1.42mg/L, the max temperature was 27.3°C with a max 24-hour rolling avg of 24.1°C. The seasonal avg total phosphorus concentration was 0.019mg/L (n=5) with a max of only 0.025mg/L and there were no observations

of dense or very dense filamentous algae noted. Seine net sampling was conducted in the river near the intersection of River Rd and Rt.68, Rutland (SampleID 2823) by an outside party under a collection permit in July 2008. The sample was well represented by fluvial specialist/dependant species and 81% of the sample was considered intolerant/moderately intolerant to pollution. Further downstream at Rt. 68, Rutland (station 108A), DCR staff also collected data 2-3 times per month in 2011, 2015, and 2019. The data were indicative of generally good conditions: the min DO was 4.04mg/L with six measurements <5.0mg/L (n=69), the max temperature was 24.11°C (n=70), pH ranged from 5.13 to 6.69SU (n=69), the seasonal avg total phosphorus (May-Sept) concentrations were low (range 0.016-0.032mg/L) (overall max only 0.093 mg/L, n=26), the max chloride concentration was 32.9mg/L (n=12), and the max ammonia concentration was only 0.103mg/L (n=36) with no violations of either acute or chronic criteria. Further downstream in the East Branch Ware River at Intervale Rd, Rutland (station 108) DCR staff conducted water quality sampling 2-3 times per month from 2008-2019. The DO concentrations ranged from 4.1 to 20.97mg/L (n=294) with only 6 measurements <5.0mg/L, the max temperature was 25.54°C, and pH ranged from 4.43 to 7.13SU. The seasonal avg total phosphorus concentrations were low (usually n=2) ranging from 0.019 to 0.036mg/L. The max chloride was 23.4mg/L (n=13), and the max ammonia concentration was only 0.0389mg/L (n=30) with no violations of either acute or chronic criteria. MassDEP staff also collected one nutrient sample in the East Branch Ware River at Intervale Road, Rutland (W2108) during summer 2008. The total phosphorus concentration was low (0.015mg/L). The Aquatic Life Use for the East Branch Ware River is assessed as Fully Supporting based on the benthic and fish data indicative of good biotic integrity as well as the water quality data collected by both DCR and MassDEP staff. While pH was often low, these conditions are considered naturally occurring related to the presence of wetlands and the low buffering capacity of the ecosystem. Since nearly all of the hundreds of discrete dissolved oxygen measurements made by DCR over the span of 11 years (plus all MassDEP unattended sondes data from 2008) were above 5.0mg/L, the impairment for DO is being removed (see additional information in removal comment).

| 2018/20 Delisted Impairment | Delisting Reason | Delisting Comment |
|-----------------------------|--|---|
| Dissolved Oxygen | Applicable WQS attained; reason for recovery unspecified | Low DO was originally listed as an impairment for East Branch Ware River in the 2002 reporting cycle based on data collected by DCR staff at their Station 108 in Rutland between 1995 and 1999 when DO was <6.0mg/L in 13 of the 130 measurements (10%). At that time notes indicated that low DO coincided with low streamflow measurements and was possibly naturally occurring. Between 2008 and 2019, the DO data collected in the river at Station 108 by DCR staff were even more infrequently (~5%) below 6.0mg/L (15 of 294 measurements). Furthermore, this watershed has little development (IC only 2.9% and the %natural and wetland area in the proximal stream buffer 94.5%) meeting the screening guidelines outlined in the 2018 CALM Guidance Manual for “passing” the evaluation of natural conditions regarding low DO. Based on the very infrequent low DO measured by MassDEP and DCR staff between 2008 and 2019 combined with the “natural” screening guidelines being met for low DO conditions, the dissolved oxygen impairment is being delisted for the East Branch Ware River. |

Supporting Information for Delisted Impairments

Dissolved Oxygen

Data sources: (MassDCR Undated, MassDEP Undated)

DCR staff collected water quality data 2-3 times per month in 2011, 2015, and 2019 at the East Branch Ware River (MA36-01) at station 108C (Lombard Rd, Hubbardston). Dissolved oxygen readings were obtained on 70 occasions with 0 recordings < 5.0 mg/L. QUABBIN 108C:

| Row Labels | Dissolved Oxygen Total | | | pH Total | | | Water Temperature Total | | | | | |
|-------------------------|------------------------|-------|-------|----------|------|------|-------------------------|------|-------|-------|-------|-------|
| | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | | | |
| 108C | | | | | | | | | | | | |
| Count of FinalResult | 26 | 25 | 19 | 70 | 25 | 26 | 19 | 70 | 26 | 26 | 19 | 71 |
| Min of FinalResult4 | 7.8 | 5.49 | 8.03 | 5.49 | 5.78 | 5.68 | 6.04 | 5.68 | 0.08 | 0.01 | 1.8 | 0.01 |
| Max of FinalResult3 | 15.74 | 18.69 | 14.3 | 18.69 | 6.9 | 6.67 | 6.91 | 6.91 | 23.56 | 21.99 | 22.98 | 23.56 |
| Average of FinalResult2 | 11.54 | 11.42 | 11.15 | 11.39 | 6.18 | 6.13 | 6.31 | 6.20 | 11.54 | 10.00 | 11.22 | 10.89 |

Data Sources: (MassDEP Undated, MassDEP Undated)

2008 Multiprobe Data of MassDEP Site W1848 East Branch Ware River [Old Colony Road crossing, Princeton] (MassDEP Undated)

| Unique ID | Gear Type | Project Name | OWMIDs Used to Build File | |
|--|---------------------------------------|-------------------------|---------------------------|-------------------------|
| W1848 | Data Sonde | Chicopee (2008) | 36-0864, 36-1119, 36-1292 | |
| Station ID | Station Description | Mile Point | Latitude (dec-degrees) | Longitude (dec-degrees) |
| EWB60.75 | [Old Colony Road crossing, Princeton] | | 42.45425813 | -71.95072628 |
| Watershed | SARIS_PALIS_CAMIS | Water Body | | |
| Chicopee | 3628250 | EAST BRANCH WARE RIVER/ | | |
| Station File Start Time | 6/13/2008 9:00 AM | | | |
| Station File End Time | 8/18/2008 8:30 AM | | | |
| Total Station File Duration (Hours) | 1583.5 | | | |
| Total Station File Count | 3168 | | | |
| Analytes | | | | |
| | Temperature (Celsius) | DO (mg/L) | DOsat (%) | |
| Observed Deployment Time (Hours) | 215.0 | 143.0 | 143.0 | |
| Observed Count | 433 | 288 | 288 | |
| Avg [†] | 21.7 | 7.2 | 84 | |
| SD [†] | 2.3 | 0.4 | 5 | |
| Min [†] | 17.8 | 6.4 | 76 | |
| Max [†] | 27.3 | 8.0 | 96 | |
| Median [†] | 21.6 | 7.3 | 83 | |
| IQR [†] | 3.1 | 0.6 | 9 | |
| Mean of the Daily Mean [†] | 21.7 | 7.3 | | |
| Mean of the Daily Min [†] | 19.7 | 6.7 | | |
| Mean of the Daily Max [†] | 24.2 | 7.9 | | |
| MWAT [†] | - | | | |
| Amount of Time > 20 deg. C (Hours) | 156.1 | | | |
| Max Duration > 20 deg. C (Hours) | 71.5 | | | |
| Avg Daily Amount of Time > 20 deg. C (Hours) | 16.9 | | | |
| Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Max Duration > 28.3 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Max Duration > 29.4 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 3.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 4.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 5.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 6.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |

[†]Units are those of the analyte listed. SD is unitless.

DO probe data

| Uniquel D | Waterbody | AU_Class | Qualifier | Start.Date | Days | OWMID.Minimum .DO | Daily Mean Minimum DO | Maximum Daily DO Shift | OWMI D Mean DO | OWMID Maximum Saturation | Violates Criteria |
|-----------|------------------------|----------|-----------|------------|------|-------------------|-----------------------|------------------------|----------------|--------------------------|-------------------|
| W1848 | EAST BRANCH WARE RIVER | A | PWS, ORW | 07/18/08 | 3 | 6.41 | 6.48 | 1.42 | 7.06 | 96.2 | None |
| W1848 | EAST BRANCH WARE RIVER | A | PWS, ORW | 08/15/08 | 3 | 6.96 | 7.06 | 1.01 | 7.43 | 90.7 | None |

DO graph



Discrete attended DO data MassDEP Site W1848 East Branch Ware River [Old Colony Road crossing, Princeton] (MassDEP Undated):

| Projname | Watershed | SARIS_PALIS | Waterbody | UNIQUE_ID | DESCRIPTOR | DATE | dDATE | TIME | FLOWSTAT | DEPTH | TEMP | PH | SPCOND | DO | DOSAT | ResComm |
|--------------------------|-----------|-------------|----------------------|----------------|----------------------|-----------|------------|---------|----------|-------|------|----|--------|----|-------|---------|
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 5/20/2008 9:06:06 AM | 5/20/2008 | 9:06:06 AM | Flowing | 0.2 | 11.8 | 6.3 | 60 | 9.6 | 72 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 6/13/2008 8:40:31 AM | 6/13/2008 | 8:40:31 AM | Flowing | 0.2 | 18.3 | 6.6 | 67 | 8.3 | 89 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 6/16/2008 9:28:04 AM | 6/16/2008 | 9:28:04 AM | Flowing | 0.2 | 17.9 | 6.6 | 68 | 8.4 | 90 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 6/17/2008 9:00:30 AM | 6/17/2008 | 9:00:30 AM | Flowing | 0.2 | 17.6 | 6.6 | 70 | 8.5 | 91 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 7/18/2008 8:53:33 AM | 7/18/2008 | 8:53:33 AM | Flowing | -- | 20.8 | 6.8 | 79 | 8.1 | 92 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 7/21/2008 8:39:52 AM | 7/21/2008 | 8:39:52 AM | Flowing | -- | 22.3 | 6.6 | 80 | 7.5 | 88 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 7/22/2008 9:03:29 AM | 7/22/2008 | 9:03:29 AM | Flowing | 0.1 | 21.7 | 6.7 | 83 | 7.9 | 91 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 8/15/2008 8:33:01 AM | 8/15/2008 | 8:33:01 AM | Flowing | -- | 18.8 | 6.3 | 68 | 7.8 | 86 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 8/18/2008 8:59:30 AM | 8/18/2008 | 8:59:30 AM | Flowing | -- | 19.8 | 6.4 | 69 | 7.9 | 88 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 8/19/2008 9:23:50 AM | 8/19/2008 | 9:23:50 AM | Flowing | -- | 21.2 | 6.4 | 70 | 7.7 | 88 | | |
| Chicopee (2008) Chicopee | Chicopee | 3628250 | East Branch Wa W1848 | [Old Colony Ro | 9/23/2008 9:04:30 AM | 9/23/2008 | 9:04:30 AM | Flowing | 0.4 | 12.1 | 6.8 | 65 | 9.7 | 90 | | |

Data sources: (MassDCR Undated, MassDEP Undated)

DCR staff collected water quality data 2-3 times per month in 2011, 2015, and 2019 at the East Branch Ware River (MA36-01) at station 108A (Rt. 68, Rutland). Dissolved oxygen readings were obtained on 69 occasions with 6 recordings < 5.0 mg/L. QUABBIN 108A:

| Row Labels | Dissolved Oxygen | | | Dissolved Oxygen Total | | | pH | | | pH Total | | | Water Temperature | | | Water Temperature Total | | | |
|-------------------------|------------------|-------|-------|------------------------|------|------|------|------|------|----------|------|------|-------------------|-------|-------|-------------------------|------|------|-------|
| | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | 2011 | 2015 | 2019 | |
| 108A | | | | | | | | | | | | | | | | | | | |
| Count of FinalResult | 26 | 25 | 18 | 69 | 25 | 26 | 18 | 69 | | | | | 26 | 26 | 18 | | | | 70 |
| Min of FinalResult4 | 4.98 | 4.04 | 4.94 | 4.04 | 5.13 | 5.49 | 5.8 | 5.13 | | | | | 0.05 | 0.02 | -0.2 | | | | -0.2 |
| Max of FinalResult3 | 15.38 | 17.45 | 14.45 | 17.45 | 6.42 | 6.56 | 6.69 | 6.69 | | | | | 23.87 | 24.11 | 22.86 | | | | 24.11 |
| Average of FinalResult2 | 9.67 | 10.19 | 9.53 | 9.82 | 5.86 | 5.91 | 6.14 | 5.95 | | | | | 11.37 | 10.38 | 11.19 | | | | 10.95 |

DCR staff collected water quality data 2-3 times per month from 2008 - 2019 at the East Branch Ware River (MA36-01) at station 108 (Intervale Rd, Rutland). Dissolved oxygen readings were obtained on 294 occasions with 6 recordings < 5.0 mg/L. QUABBIN 108:

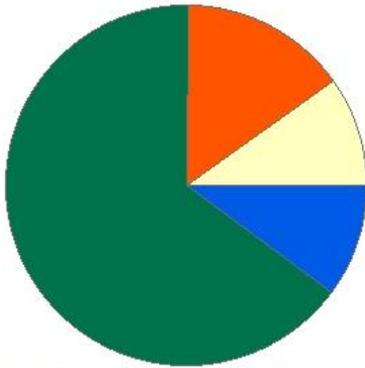
| Column Labels | | | | | | | | | | | | | Dissolved Oxygen Total |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------------|
| Dissolved Oxygen | | | | | | | | | | | | | |
| 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| Row Labels | | | | | | | | | | | | | |
| 108 | | | | | | | | | | | | | |
| Count of FinalResult | 20 | 24 | 25 | 26 | 26 | 26 | 26 | 25 | 26 | 26 | 26 | 18 | 294 |
| Min of FinalResult4 | 5.69 | 6.36 | 6.02 | 6.23 | 5.05 | 4.55 | 6.75 | 4.48 | 5.78 | 6.58 | 4.1 | 4.92 | 4.1 |
| Max of FinalResult3 | 14.86 | 13.88 | 12.73 | 15.62 | 15.53 | 18.52 | 20.97 | 20.61 | 14.12 | 14.16 | 14.74 | 14.98 | 20.97 |
| Average of FinalResult2 | 9.19 | 9.62 | 9.09 | 10.77 | 10.47 | 10.77 | 11.90 | 10.97 | 10.12 | 10.70 | 10.63 | 9.95 | 10.39 |

East Brookfield River (MA36-13)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Lake Lashaway, East Brookfield to mouth at inlet Quaboag Pond, East Brookfield. |
| AU Type: | RIVER |
| AU Size: | 2.4 MILES |
| Classification/Qualifier: | B: WWF |

East Brookfield River - MA36-13

Watershed Area: 71.56 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 70.99 | 12.73 | 25.04 | 4.40 |
| Agriculture | 9.8% | 7% | 6.6% | 4.7% |
| Developed | 15% | 16.1% | 13.7% | 15.8% |
| Natural | 65.2% | 65.3% | 62.2% | 56.7% |
| Wetland | 10.1% | 11.6% | 17.5% | 22.7% |
| Impervious Cover | 4.9% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------|-------------------|---------------------------|
| 5 | 5 | (Fanwort*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

During the summer of 2008, probes were deployed by MassDEP staff in the East Brookfield River downstream of Lake Lashaway discharge pipes and Rt.9 bridge, East Brookfield (W1038) in June, July and August. The minimum DO was 5.6mg/L (mean minimums ranged from 5.68 to 7.44mg/L) during the three deploys, the maximum saturation was 98%, the maximum diel DO shift was only 0.83mg/L, and the maximum temperature was 27.5°C with a maximum 24-hour rolling average of 26.6°C. Discrete pH measurements ranged from 6.9 to 7.1SU (n=7) and the seasonal average total phosphorus concentration was low (0.016mg/L) with a maximum concentration of 0.022 (n=5). No observations of dense or very dense filamentous algae were present either. The maximum ammonia concentration was also very low (0.07mg/L). During the summer of 2008 an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), was also identified in the East Brookfield River. The non-native *Cabomba caroliniana* (Fanwort) was also observed by MassDEP staff at a site "located near the mouth of the East Brookfield River before it flows into Quaboag Pond" (W1016) during the summer of 2003.

The Aquatic Life Use of the East Brookfield River is assessed as Not Supporting based on the presence of two non-native aquatic macrophyte species. The generic non-native aquatic plant impairment is being carried forward for *M. heterophyllum* since a species-specific code is not available and Fanwort (*C. caroliniana*) is being

added as an impairment. All other water quality data collected near the upper reach of the river during the summer of 2008 were indicative of good conditions. The Dissolved oxygen impairment is being carried forward without any newer data near the mouth of the East Brookfield River where low DO was documented during the summer of 2003 at Shore Road East Brookfield (W1016).

Edson Pond (MA36180)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 36 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since no recent data are available for Edson Pond, the Aquatic Life Use is Not Assessed. |

Fivemile Pond (MA36061)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 36 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

The presence of Asian clam, *Corbicula fluminea*, in Fivemile Pond was reported in the DCR Non-Native Aquatic Species Database in 2007, but confirmation is needed. The non-native aquatic macrophyte, *Myriophyllum heterophyllum*, was reported to have been observed in the pond in 1978 during a baseline water quality study but 1998 DWM field sheets indicate that the species found could be *M. verticillatum*. The Aquatic Life Use for Fivemile Pond will continue to be assessed as having Insufficient Information with the alert for *M. heterophyllum* being carried forward and an alert for *C. fluminea* being added.

Fivemile Pond South (MA36182)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 4 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

MassDEP biologists observed aquatic macrophytes in Fivemile Pond South in 1998 which were possibly *Myriophyllum verticillatum* or *Myriophyllum heterophyllum*. No other more recent data are available. The Aquatic Life Use for Fivemile Pond South is Not Assessed but an alert is being identified for the possible presence of the non-native aquatic macrophyte *M. heterophyllum* (Variable-leaf milfoil).

Forest Lake (MA36063)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 45 ACRES |
| Classification/Qualifier: | B |

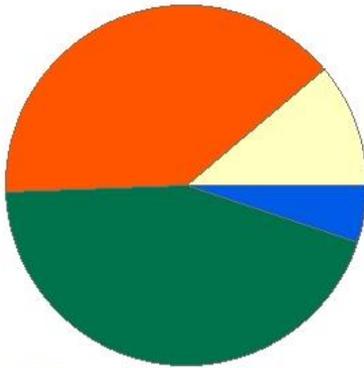
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| <p>MassDEP staff reported the presence of the non-native aquatic macrophyte, <i>Myriophyllum spicatum</i> (Eurasian water milfoil), in Forest Lake during a 1998 synoptic survey.</p> <p>The Aquatic Life Use for Forest Lake is assessed as Not Supporting with the Eurasian Water Milfoil, <i>Myriophyllum Spicatum</i> impairment being carried forward.</p> |

Forget-Me-Not Brook (MA36-18)

| | |
|----------------------------------|---|
| Location: | Headwaters, North Brookfield to North Brookfield WWTP discharge (NPDES: MA0101061), North Brookfield. |
| AU Type: | RIVER |
| AU Size: | 1.2 MILES |
| Classification/Qualifier: | B: CWF, HQW |

Forget-Me-Not Brook - MA36-18

Watershed Area: 1.26 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.26 | 1.26 | 0.33 | 0.33 |
| Agriculture | 11.1% | 11.1% | 14.6% | 14.6% |
| Developed | 39.5% | 39.5% | 21.6% | 21.6% |
| Natural | 44.3% | 44.3% | 54.1% | 54.1% |
| Wetland | 5.1% | 5.1% | 9.6% | 9.6% |
| Impervious Cover | 11% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|--------------------------------|-------------------|---------------------------|
| 5 | 5 | Lack of a coldwater assemblage | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

DFG biologists conducted backpack electrofishing in this Forget-Me-Not Brook AU (MA36-18) upstream of northernmost crossing of East Brookfield Road in North Brookfield (SampleID 3404) in August 2010. The sample was comprised entirely by the fluvial specialist blacknose dace. MassDEP staff conducted nutrient sampling in the brook at East Brookfield Road/Donovan Road intersection, ~1100 ft upstream of the North Brookfield WWTP discharge (W1040) during the summer of 2008. The seasonal average total phosphorus concentration was low (0.024mg/L, maximum 0.032mg/L, n=5) and no observations of dense or very dense filamentous algae were noted. Ammonia-nitrogen concentrations were also low (range <0.02 to 0.04mg/L). MassDEP staff also deployed continuous dissolved oxygen and temperature probes in the brook at East Brookfield Road (upstream from North Brookfield WWTP discharge, North Brookfield) (W1990) in June, July, and August 2008 for three days each. The minimum DO was 7.21mg/L (the 3-day mean minimums ranged from 7.35 to 8.11mg/L). The maximum temperature was 23.4°C (elevated for a designated cold water) with a maximum 24-hr rolling average of 21.8°C (meeting acute temperature criterion of 23.5°C), although too limited data were available to evaluate chronic temperature exceedances. Discrete pH measurements ranged from 6.9 to 7.0SU (n=5). North Brookfield Wastewater Treatment Facility (WWTF) staff collected water from Forget-Me-Not Brook upstream from WWTP and the southernmost crossing of East Brookfield Road in North Brookfield for use as dilution water in the facility's

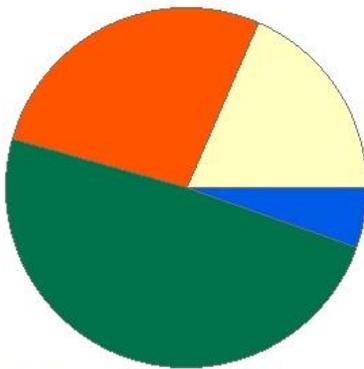
whole effluent toxicity tests. Between May 2006 and February 2019 survival of *C. dubia* exposed (approximately 7 days) to the brook water ranged from 80 to 100% (n=53). Between May 2006 and May 2007 survival of *P. promelas* exposed (approximately 7 days) to the brook ranged from 68 to 100% (n=8) with one test less than 75%. The Aquatic Life Use for this Forget-Me-Not Brook AU (MA36-18) is assessed as Not Supporting based on the lack of cold-water fish in this designated cold-water stream. Except for some temperature measurements above 20°C, all other water quality data available were indicative of good conditions. The former alert for elevated total phosphorus is being removed based on the low seasonal average concentration in the brook ~1100 ft upstream of the North Brookfield WWTP discharge (W1040) in 2008 and the elevated temperature alert is being carried forward.

Forget-Me-Not Brook (MA36-28)

| | |
|----------------------------------|--|
| Location: | North Brookfield WWTP discharge (NPDES: MA0101061), North Brookfield to mouth at confluence with Dunn Brook, East Brookfield/Brookfield. |
| AU Type: | RIVER |
| AU Size: | 1.3 MILES |
| Classification/Qualifier: | B: WWF |

Forget-Me-Not- Brook - MA36-28

Watershed Area: 2.20 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.20 | 2.19 | 0.75 | 0.75 |
| Agriculture | 18.5% | 18.6% | 18.9% | 18.9% |
| Developed | 27.2% | 27.1% | 14.9% | 14.9% |
| Natural | 49% | 48.9% | 56.5% | 56.5% |
| Wetland | 5.4% | 5.4% | 9.6% | 9.6% |
| Impervious Cover | 8.6% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------------------------|-------------------|---------------------------|
| 5 | 5 | Whole Effluent Toxicity (WET) | | Removed |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Town of North Brookfield is authorized (NPDES permit MA0101061 issued in March 2007) to discharge a monthly average flow of 0.76MGD of treated effluent to this Forget-Me-Not Brook AU (MA36-28). The permit required modified acute and chronic whole effluent toxicity tests be conducted in February, May, August and November each year using *C. dubia* as the test species with LC₅₀ and CNOEC limits of 100% effluent. Between May 2006 and February 2019 no acute whole effluent toxicity was detected by *C. dubia* or *P. promelas* (all LC50s were >100% effluent) (n=55 *C. dubia* tests and nine *P. promelas* tests between May 2006 and May 2007). It should be noted that four of the 54 valid chronic tests (7.4%) had *C. dubia* CNOEC results of 50% effluent (November 2007, August 2012, August 2014, and November 2016), although no other chronic whole effluent toxicity was detected (CNOECs were 100% effluent). Of the five valid *P. promelas* tests the CNOEC results were all 100% effluent. Benthic macroinvertebrate sampling was conducted by MassDEP biologists in this Forget-Me-Not Brook AU downstream from the North Brookfield WWTP outfall (B0107) in September 2008. The RBP III analysis indicated the site was “slightly impacted” (57% comparable) when compared to the East Branch Swift River reference site (B0654). However, it was noted that ~40% of the community in the sample consisted of filtering-collector taxa, indicative of a community structured in response to high loading of particulates.

MassDEP biologists noted that although the 2008 sampling showed a reduction in the hyperdominance of filter feeders compared to 1998, this site continued to have an unbalanced benthic community. MassDEP staff also deployed probes in Forget-Me-Not Brook to continuously measure dissolved oxygen and temperature for three days each west of East Brookfield Road 1300 feet downstream of WWTP discharge in North Brookfield (W1039) in June, July and August. The minimum dissolved oxygen was 6.5mg/L during these deployments (three-day mean minimums during the deploys ranged from 6.77 to 7.82mg/L), the maximum saturation was 95%, and the maximum diel DO shift was only 1.6mg/L. The maximum temperature was 24.6°C meeting warm water standards. Discrete pH measurements ranged from 7.2 to 7.6SU (n=5). The seasonal average total phosphorus concentration was 0.071mg/L (maximum 0.14mg/L, n=5) and no observations of dense or very dense filamentous algae were noted. The ammonia-nitrogen concentrations were also low (0.04 to 0.28mg/L). The Aquatic Life Use for this Forget-Me-Not Brook AU (MA36-28) will continue to be assessed as Not Supporting with the benthic macroinvertebrates impairment being carried forward. The whole effluent toxicity impairment is being delisted (see additional detail in removal comments).

| 2018/20 Delisted Impairment | Delisting Reason | Delisting Comment |
|-------------------------------|--|---|
| Whole Effluent Toxicity (WET) | Applicable WQS attained; based on new data | The original listing for unknown toxicity in this Forget-Me-Not Brook AU (MA36-28) was in the 2002 reporting cycle (remapped to Whole Effluent Toxicity (WET) in the 2010 reporting cycle) which was based on when the North Brookfield WWTP exhibited chronic WET in 4 of 9 tests. More recent WET tests conducted on the North Brookfield Wastewater Treatment Facility (WWTF) treated effluent have not indicated any acute toxicity between May 2006 and February 2019 by <i>C. dubia</i> or <i>P. promelas</i> (all LC50s were >100% effluent) (n=55 <i>C. dubia</i> tests and 9 <i>P. promelas</i> tests between May 2006 and May 2007). While four of the 54 valid chronic tests had <i>C. dubia</i> CNOEC results at 50% effluent (November 2007, August 2012, August 2014, and November 2016), no chronic whole effluent toxicity was detected in any of the other tests (CNOECs were 100% effluent). Of the five valid <i>P. promelas</i> tests the CNOEC results were all 100% effluent. Since very few tests (7%) exhibited only slight chronic toxicity and none have exhibited any since November 2016, the Whole Effluent Toxicity (WET) impairment is being delisted. |

Supporting Information for Delisted Impairments

Whole Effluent Toxicity (WET)

Data Source: (MassDEP Undated)

The Town of North Brookfield is authorized (NPDES permit MA0101061 issued in March 2007) to discharge a monthly average flow of 0.76MGD of treated effluent to Forget-Me-Not Brook. The permit required modified acute and chronic whole effluent toxicity tests be conducted in February, May, August, and November each year using *C. dubia* as the test species with LC₅₀ and CNOEC limits of 100% effluent.

Effluent

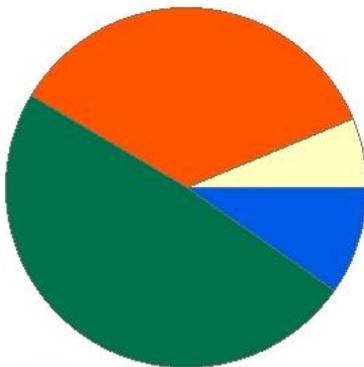
Whole effluent toxicity tests have been conducted on the North Brookfield Wastewater Treatment Facility (WWTF) treated effluent. Between May 2006 and February 2019 no acute whole effluent toxicity was detected by *C. dubia* or *P. promelas* (all LC₅₀s were >100% effluent) (n=55 *C. dubia* tests and 9 *P. promelas* tests between May 2006 and May 2007). Except for four of the 54 valid chronic tests where the *C. dubia* CNOEC results were 50% effluent (November 2007, August 2012, August 2014, and November 2016), no chronic whole effluent toxicity was detected (CNOECs were 100% effluent). Of the five valid *P. promelas* tests the CNOEC results were all 100% effluent.

Fuller Brook (MA36-41)

| | |
|----------------------------------|--|
| Location: | From the Ludlow/Chicopee corporate boundary where the stream name changes from Higher Brook, to mouth at confluence with the Chicopee River, Chicopee. |
| AU Type: | RIVER |
| AU Size: | 1.9 MILES |
| Classification/Qualifier: | B |

Fuller Brook - MA36-41

Watershed Area: 11.13 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 11.13 | 2.85 | 2.69 | 0.68 |
| Agriculture | 6.2% | 3.5% | 7.1% | 3.5% |
| Developed | 35.2% | 55.6% | 27.5% | 32.9% |
| Natural | 48.8% | 33.9% | 42% | 41.5% |
| Wetland | 9.7% | 7.1% | 23.4% | 22.1% |
| Impervious Cover | 12.5% | | | |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

No recent data are available for Fuller Brook.

The Aquatic Life Use for Fuller Brook is Not Assessed. The former alert for elevated total phosphorus is being carried forward.

Gaston Pond (MA36065)

| | |
|----------------------------------|-------------------------|
| Location: | Barre. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 15 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

The potential presence of a non-native aquatic macrophyte *Myriophyllum* species was found during a 1997 survey of Gaston Pond. No other recent data are available.

The Aquatic Life Use for Gaston Pond is Not Assessed with the alert for the potential presence of a non-native aquatic macrophyte *Myriophyllum* sp. being carried forward.

Hardwick Pond (MA36066)

| | |
|----------------------------------|-----------------|
| Location: | Hardwick. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 67 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------|-------------------|---------------------------|
| 4c | 5 | (Fanwort*) | | Added |
| 4c | 5 | Mercury in Fish Tissue | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Two non-native aquatic macrophyte species, *Cabomba caroliniana* (Fanwort) and *Myriophyllum heterophyllum* (Variable-leaf milfoil), were identified in Hardwick Pond during a 1998 synoptic survey.

The Aquatic Life Use of Hardwick Pond is assessed as Not Supporting with the generic non-native Aquatic Plant impairment being carried forward for *M. heterophyllum* and a Fanwort impairment being added.

Fish Consumption Use: Not Supporting

MassDEP biologists conducted fish toxics sampling at Hardwick Pond in May 2016 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in largemouth bass filets, MassDPH issued the following fish consumption advisories:

- *"Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any of the affected fish species (largemouth bass) from this water body."*
- *"The general public should limit consumption of affected fish species (largemouth bass) to two meals per month."*

Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Hardwick Pond (MA36066) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition.

Data Source: (MassDPH 2019)

Haviland Pond (MA36069)

| | |
|----------------------------------|-----------------|
| Location: | Ludlow. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 25 ACRES |
| Classification/Qualifier: | B |

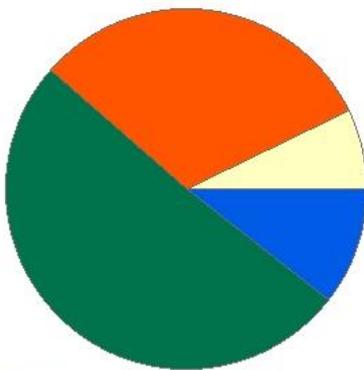
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Haviland Pond, the Aquatic Life Use is Not Assessed. |

Higher Brook (MA36-42)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion, south of Route 21, Ludlow (through former 2008 segment: Harris Pond MA36067) to mouth at Ludlow/Chicopee corporate boundary where the stream name changes to Fuller Brook. |
| AU Type: | RIVER |
| AU Size: | 6.3 MILES |
| Classification/Qualifier: | B |

Higher Brook - MA36-42

Watershed Area: 9.75 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 9.74 | 4.48 | 2.46 | 1.19 |
| Agriculture | 7.1% | 11% | 7.7% | 9.5% |
| Developed | 31.5% | 42.6% | 28.4% | 35.1% |
| Natural | 50.9% | 36.6% | 40.5% | 30.2% |
| Wetland | 10.5% | 9.8% | 23.4% | 25.2% |
| Impervious Cover | 11.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Not Assessed

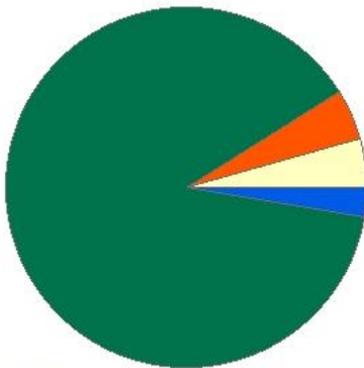
Since there are no recent data available for Higher Brook, the Aquatic Life Use is Not Assessed.

Hop Brook (MA36-32)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion, upstream of West Street, New Salem to mouth at inlet Quabbin Reservoir, New Salem. |
| AU Type: | RIVER |
| AU Size: | 3.7 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Hop Brook - MA36-32

Watershed Area: 5.51 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 5.51 | 4.87 | 1.61 | 1.52 |
| Agriculture | 4.4% | 4.3% | 2.7% | 2.8% |
| Developed | 4.5% | 4.4% | 4.1% | 4.3% |
| Natural | 88.5% | 88.6% | 87.1% | 86.7% |
| Wetland | 2.6% | 2.7% | 6% | 6.2% |
| Impervious Cover | 2.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DCR staff collected discrete water quality data at two locations in the lower half of Hop Brook, at Russell Rd (South) (station 212B) and at Gate 22 Rd (station 212), New Salem, with the following results: At 212B data were collected 1-4 times per month in 2011, 2012, and 2016. The minimum DO was 7.31mg/L (n=76), and the maximum temperature was 21.82°C (n=76 with only three measurements above 20°C). pH ranged from 6.13 to 6.95SU (n=76) and the seasonal average total phosphorus concentrations were low (always n=11) ranging from 0.014 to 0.024mg/L. At station 212 data were collected 2-3 times per month from 2008 to 2019. Dissolved oxygen measurements (n=297) were all above 6.0 mg/L except for two measurements and only once below the 1-day minimum criteria of 5.0mg/L. The maximum temperature was 21.75°C (n=297) with only 10 measurements exceeding the coldwater criterion of 20°C. pH ranged from 5.03 to 7.64SU (n=292), with 46 measurements <6.0SU. The seasonal average total phosphorus (usually n=2) were low (range 0.014 to 0.034mg/L). The maximum chloride concentration was only 30.3mg/L. Benthic macroinvertebrates were collected by MassDEP biologists from Hop Brook ~455m upstream of the inlet to Quabbin Reservoir, in New Salem (B0901) in July 2014 but these data were not analyzed using an RBPIII approach and will be used in a future reporting cycle. In July 2013, DFG biologists conducted backpack electrofishing in Hop Brook upstream from the Stone Bridge (via Gate 22) in New Salem (SampleID 4986). Except for two brown bullhead the sample was comprised entirely of fluvial specialist/dependant species including young Eastern brook trout. The Aquatic Life Use of Hop Brook is assessed as Fully Supporting based on the fish sampling and water quality data. The presence of young Eastern brook trout and the other fluvial species were indicative of excellent habitat and water quality conditions. While a small proportion of discrete temperature and dissolved oxygen readings did not always meet coldwater criteria, the excursions were minimal. pH was often low however in the

brook near Gate 22 Rd (station 212), New Salem, and although considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands) is being identified with an alert since it appears to be getting lower over time.

Horse Pond (MA36072)

| | |
|----------------------------------|-------------------|
| Location: | North Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 63 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

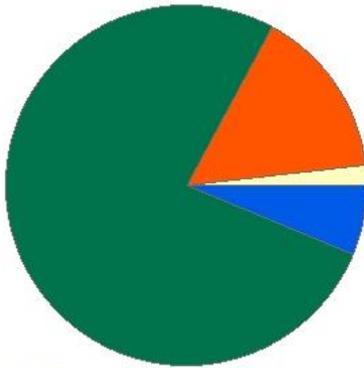
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Horse Pond, the Aquatic Life Use is Not Assessed. |

JABISH BROOK (MA36-43)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Knights Pond, Belchertown to Jabish Canal, Belchertown. |
| AU Type: | RIVER |
| AU Size: | 7.5 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

JABISH BROOK - MA36-43

Watershed Area: 10.04 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 10.03 | 4.74 | 2.20 | 1.11 |
| Agriculture | 1.8% | 2.1% | 2.3% | 2.7% |
| Developed | 15.3% | 25.7% | 9.5% | 14.7% |
| Natural | 76.7% | 66.5% | 72.2% | 66.4% |
| Wetland | 6.2% | 5.7% | 15.9% | 16.1% |
| Impervious Cover | 5.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DFG biologists conducted backpack electrofishing in Jabish Brook between Upper and Lower Pratt Pond dams (Rt 202 1st right north of Kopec St. Rd crossing SampleID 1270) in August 2005 but no fish were collected in this reach. Further downstream at the Rt 202/Kopec Ave crossing, ~400 ft east of Rt 202 upstream of the road crossing (SampleID 1115) the sample collected that same day was comprised entirely by two fluvial fish species including multiple age classes of Eastern brook trout. In July 2006, DFG biologists also conducted backpack electrofishing in the brook on Jabish St below the Rt 9 section (SampleID 1956). The sample was dominated by fluvial specialists/dependents including multiple age classes of Eastern brook trout. Benthic macroinvertebrate sampling was conducted by MassDEP biologists in Jabish Brook ~100m downstream from Jabish St in Belchertown (B0650) in September 2008. The RBPIII analysis indicated “slightly impacted” conditions (76% comparable) when compared to the East Branch Swift River reference station (B0654). MassDEP staff also conducted water quality monitoring at Rt 21 (Jabish St) crossing, Belchertown (W1874) during the summer of 2008. Two-day continuous probes were deployed in June, July and August 2008 recorded a minimum DO of 7.9mg/L, a maximum DO saturation of 97.4%, and a maximum temperature of 23.2 °C. The maximum diel DO shift was 0.65mg/L. Discrete pH measurements ranged from 6.5 to 6.8SU (n=6) and the seasonal average total phosphorus concentration was low (0.013mg/L, maximum 0.031mg/L, n=5). Further downstream at the Aldrich Street crossing (upstream of canal diversion), Belchertown (W1859), the seasonal average total phosphorus concentration was also low (0.016mg/L, n=3).

The Aquatic Life Use for this Jabish Brook AU (MA36-43) is assessed as Fully Supporting based on the benthic, fish, and generally good water quality conditions. Since multiple age classes of Eastern brook trout were present, this Jabish Brook AU is considered a Tier 1 Existing Use Coldwater. While too limited temperature data

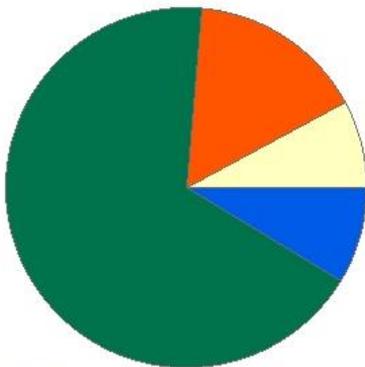
were available to render an impairment decision, this brook has multiple impoundments, so the elevated stream temperature that occurred in July is being identified as an alert issue.

JABISH BROOK (MA36-73)

| | |
|----------------------------------|--|
| Location: | From Jabish Canal, Belchertown to mouth at confluence with Swift River, Belchertown (formerly part of 2016 segment: Jabish Brook MA36-43). |
| AU Type: | RIVER |
| AU Size: | 6.5 MILES |
| Classification/Qualifier: | B |

JABISH BROOK - MA36-73

Watershed Area: 19.33 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 19.33 | 6.02 | 4.19 | 1.44 |
| Agriculture | 7.8% | 12.8% | 5.1% | 10.9% |
| Developed | 15.8% | 18.3% | 10.4% | 10.5% |
| Natural | 67.7% | 57.7% | 66% | 58.8% |
| Wetland | 8.6% | 11.3% | 18.4% | 19.8% |
| Impervious Cover | 5.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Not Assessed

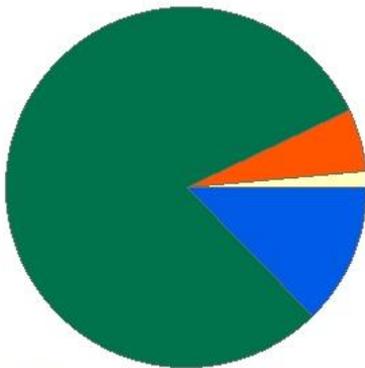
Since there are no recent data available for this Jabish Brook AU (MA36-73), the Aquatic Life Use is Not Assessed.

JOSLIN BROOK (MA36-44)

| | |
|----------------------------------|---|
| Location: | Headwaters, outlet Lovewell Pond, Hubbardston to mouth at confluence with Mason Brook, Hubbardston. |
| AU Type: | RIVER |
| AU Size: | 3.3 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

JOSLIN BROOK - MA36-44

Watershed Area: 5.87 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 5.87 | 5.10 | 1.45 | 1.28 |
| Agriculture | 1.4% | 1.4% | 0.6% | 0.4% |
| Developed | 5.7% | 5.1% | 4.8% | 5.1% |
| Natural | 80.3% | 80.6% | 72.3% | 71.2% |
| Wetland | 12.7% | 12.8% | 22.3% | 23.4% |
| Impervious Cover | 2.2% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DCR staff collected water quality data 2-3 times per month in 2010, 2014, and 2018 in Joslin Brook at the Lovewell Pond Outlet (station 128). The minimum dissolved oxygen was 5.84mg/L (n=77), the maximum temperature was 26.7°C (n=77), pH was low ranging from 4.67 to 6.53SU (n=71), the seasonal average total phosphorus concentrations were low (range 0.019 to 0.027mg/L). The maximum ammonia measurement was also low (0.129 mg/L). DFG biologists conducted backpack electrofishing in Joslin Brook in the high gradient reach at the Grimes Rd crossing (SampleID 2393) in August 2007 just downstream from the outlet of Lovewell Pond. The sample was comprised entirely of macrohabitat generalists (six species) reflecting the influence of the pond in this reach. Slightly further downstream near Grimes Road, DFG biologists were going to conduct backpack electrofishing in August 2007 but notes indicated the stream was all swamps and beaver ponds so no sampling was conducted. MassDEP staff conducted limited nutrient sampling near the mouth of the brook at New Westminster Road crossing, Hubbardston (W1861) during the summer of 2008. The seasonal average total phosphorus concentration was low (0.026mg/L, the maximum 0.035 mg/L, n=3). No observations of dense or very dense filamentous algae were noted.

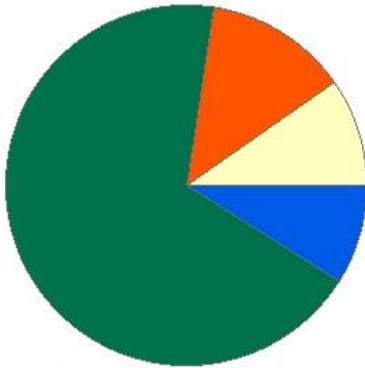
The Aquatic Life Use for Joslin Brook is assessed as Fully Supporting based on the water quality data indicative of generally good conditions. pH was often low however and although considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands) is being identified with an alert since it appears to be getting lower over time.

KINGS BROOK (MA36-48)

| | |
|----------------------------------|--|
| Location: | Headwaters, west of Saint John Street, Palmer to mouth at confluence with Quaboag River, Palmer. |
| AU Type: | RIVER |
| AU Size: | 3.3 MILES |
| Classification/Qualifier: | B |

KINGS BROOK - MA36-48

Watershed Area: 162.40 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 161.77 | 10.68 | 56.60 | 3.31 |
| Agriculture | 9.7% | 4.2% | 8.3% | 4.8% |
| Developed | 12.8% | 6.8% | 11.4% | 6.9% |
| Natural | 68.6% | 84.5% | 63.6% | 79% |
| Wetland | 8.9% | 4.6% | 16.7% | 9.4% |
| Impervious Cover | 4.4% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------|-------------------|---------------------------|
| 2 | 5 | Temperature | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

In July 2005, DFG biologists conducted backpack electrofishing in Kings Brook at Rt 67 in Palmer, 0.1 mi north of Kings Bridge Rd (SampleID 1117). The sample was dominated by fluvial specialists/dependents species including multiple age classes of Eastern brook trout and slimy sculpin (12 species, 219 were collected) so this brook is considered a Tier 1 Existing Use cold water. MassDEP staff deployed a continuous temperature probe in the brook at the Rt 67 crossing in Palmer (W1864) from June to September 2008 (115 days). The maximum temperature was 22.7°C with a maximum 7 DADM of 21.4°C (Tier 1 criterion of 20°C exceeded 36 times). The maximum 24-hour rolling average was 20.8°C, meeting the acute criterion (23.5°). Discrete measurements were also collected as follows: minimum DO 8.5mg/L (n=5), maximum saturation of 105%, pH ranged from 6.9 to 7.2SU (n=5), the seasonal average total phosphorus concentration was low (0.019mg/L, maximum 0.025mg/L) and there were no observations of dense or very dense filamentous algae noted. MassDEP collected benthic macroinvertebrates from Kings Brook at the Rt 67 crossing in Palmer (B0944) in August 2015 as part of the probabilistic wadeable streams monitoring project (MAP2). These data were not analyzed using an RBPIII approach so will be used in a future reporting cycle.

The Aquatic Life Use for Kings Brook is assessed as Not Supporting since temperatures exceeded the Tier 1 Existing Use cold water criterion of 20°C more than 11 times during the summer of 2008 even though all other

data were indicative of excellent conditions (multiple age classes of Eastern brook trout, slimy sculpin and other fluvial fish were present and all other water quality data were indicative of excellent conditions). The temperature violations are not considered to be natural due to the presence the Lizak Pond dam upstream of Old Warren Rd. Other dams further upstream, in addition to the beaver ponds, may also exacerbate these conditions.

Knights Pond (MA36077)

| | |
|----------------------------------|-----------------|
| Location: | Belchertown. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 36 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Knights Pond, the Aquatic Life Use is Not Assessed. |

Lake Lashaway (MA36079)

| | |
|----------------------------------|-----------------------------------|
| Location: | North Brookfield/East Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 274 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 4a | 4a | (Fanwort*) | | Added |
| 4a | 4a | (Non-Native Aquatic Plants*) | | Removed |

| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
|---|
| <p>During a synoptic survey during the summer of 1998 MassDEP staff identified the non-native aquatic species, <i>Cabomba caroliniana</i> (Fanwort) in Lake Lashaway. No other recent data are available although there were historic accounts of moderately high total phosphorus levels with oxygen depletion in the hypolimnion, and secchi disk transparency frequently below 2.0 meters.</p> <p>The Aquatic Life Use for Lake Lashaway is assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte species <i>C. caroliniana</i> (Fanwort). The generic non-native aquatic plant impairment is be delisted (see removal comment) and the species-specific Fanwort impairment is being added.</p> |

| 2018/20 Delisted Impairment | Delisting Reason | Delisting Comment |
|-----------------------------|--------------------------------|--|
| Non-Native Aquatic Plants | Clarification of listing cause | The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte <i>Cabomba caroliniana</i> (fanwort) has been utilized. |

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic species, *Cabomba caroliniana*, was recorded in Lake Lashaway during a 1998 MassDEP synoptic survey (MassDEP 1998).

Lake Lorraine (MA36084)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 28 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 5 | 5 | Dissolved Oxygen | | Added |

| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
|---|
| <p>The non-native aquatic macrophyte, <i>Myriophyllum heterophyllum</i>, was observed in Lake Lorraine during a 1978 baseline water quality study. Lake Lorraine was sampled by MassDEP staff as part of the nutrient criteria development project in July 2003 and again in September 2005 at the deep hole, southeastern lobe, Springfield (W1083). In July 2003, oxygen depletion was recorded only at a depth of 10m. The profile data collected in September 2005 indicate oxygen depletion at ~8m in depth which represents about 20% of the lake area. The integrated depth chlorophyll a sample was low (2µg/L) as were the total phosphorus concentrations in September 2005 -- at 0.5m 0.009mg/L and at 9.4m 0.014 mg/L.</p> <p>The Aquatic Life Use for Lake Lorraine is assessed as Not Supporting. The generic non-native aquatic plant impairment is being carried forward due to the presence of <i>M. heterophyllum</i> (no species-specific code is available) and a new impairment is being added for low dissolved oxygen (~20% of the lake surface area).</p> |

Lake Whittemore (MA36165)

| | |
|----------------------------------|-----------------|
| Location: | Spencer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 52 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data are available for Lake Whittemore, so the Aquatic Life Use is Not Assessed. |

Long Pond (MA36082)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 167 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------|-------------------|---------------------------|
| 4c | 5 | Mercury in Fish Tissue | | Added |

| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
|---|
| <p>The DCR database of non-native aquatic species indicated infestations of the non-native aquatic macrophytes, <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) and <i>Utricularia inflata</i> (Swollen bladderwort) in this Long Pond AU (MA36082) during 2008.</p> <p>The Aquatic Life Use for the Long Pond AU (MA36082) is assessed as Not Supporting with the generic non-native aquatic plant impairment being carried forward for the non-native aquatic macrophytes <i>M. heterophyllum</i> and <i>U. inflata</i> (no species-specific codes for either species are available).</p> |
| Fish Consumption Use: Not Supporting |
| <p>MassDEP biologists conducted fish toxics sampling at Long Pond in Rutland in May 2016 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in fish filets, MassDPH issued the following fish consumption advisories:</p> <ul style="list-style-type: none"> • <i>"Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body."</i> • <i>"The general public should limit consumption of all fish from this water body to two meals per month."</i> <p>Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Long Pond (MA036082) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition.</p> <p>Data Source: (MassDPH 2019)</p> |

Long Pond (MA36083)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 14 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

Myriophyllum sp., was identified in this Long Pond AU (MA36083) by MassDEP during a synoptic survey during the summer of 1998. Species confirmation is needed when flowering heads are present. The Aquatic Life Use for this Long Pond AU (MA36083) is Not Assessed but the alert for the potential infestation of the non-native form of *Myriophyllum* is being carried forward.

Lovewell Pond (MA36085)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 82 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data available for Lovewell Pond, so the Aquatic Life Use is Not Assessed. |

Mare Meadow Reservoir (MA36090)

| | |
|----------------------------------|--------------------------|
| Location: | Westminster/Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 240 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data available for Mare Meadow Reservoir, so the Aquatic Life Use is Not Assessed. |

Mare Meadow Reservoir North (MA36178)

| | |
|----------------------------------|-------------------------|
| Location: | Westminster. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 38 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

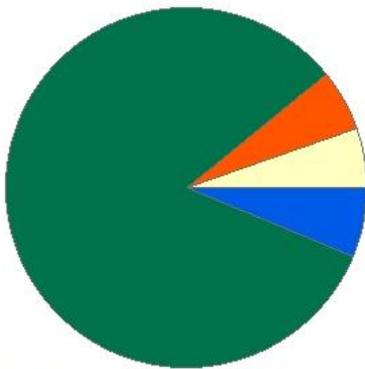
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data are available for Mare Meadow Reservoir North, so the Aquatic Life Use is Not Assessed. |

Middle Branch Swift River (MA36-33)

| | |
|----------------------------------|---|
| Location: | Headwaters just north of portions of Wendell and New Salem State Forests (south of the Swift River School), Wendell to mouth at inlet Quabbin Reservoir, New Salem. |
| AU Type: | RIVER |
| AU Size: | 6.9 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Middle Branch Swift River - MA36-33

Watershed Area: 9.14 square miles



Percent Agriculture Percent Natural
 Percent Developed Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 8.39 | 7.51 | 1.69 | 1.48 |
| Agriculture | 5.3% | 5.5% | 2.9% | 3.3% |
| Developed | 5.5% | 5.8% | 6.8% | 7% |
| Natural | 82.9% | 82% | 72.2% | 70.1% |
| Wetland | 6.3% | 6.7% | 18.1% | 19.6% |
| Impervious Cover | 2.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DFG biologists conducted backpack electrofishing at two sites in the Middle Branch Swift River in July 2006. The most upstream site was adjacent to Moosehorn Rd, New Salem close to the Wendell town line (SampleID 1567). The sample was dominated by multiple age classes of Eastern brook trout and was comprised entirely by two fluvial specialist species. Further downstream adjacent to Nielsen Rd at Bears Den Recreational Area, New Salem (SampleID 1563) electrofishing resulted in the capture of five fluvial specialists/fluvial dependents species also including but not dominated by multiple age classes of Eastern brook trout. This river will be assessed as a Tier 1 Existing Use Coldwater Fishery. DCR staff conducted water quality sampling at three sites further downstream along the Middle Branch Swift River in New Salem as follows: Elm St (213B), Fay Rd (213A) where data were collected 2-3 times per month in 2011, 2012, and 2016, and further downstream at Orange Millington Rd (213) where data were collected 2-3 times per month from 2008-2019. At the most upstream site (n=77 sampling events) the minimum DO was 8.18mg/L, maximum temperature 20.28°C (with only once exceedance above 20°C), and pH ranged from 5.66 to 6.93SU (four times <6.0SU). The seasonal average total phosphorus concentrations were low (range 0.016 to 0.022mg/L (n=11), maximum 0.043mg/L). At site 213A, the minimum DO was 4.06mg/L (with 13 of 77 measurements below 6.0mg/L and three below 5.0mg/L), the maximum temperature was 23.15 °C (exceeding 20°C 12 times (16%)), and pH ranged from 5.78 to 7.52SU with 7 measurements <6.0SU. The seasonal average total phosphorus concentrations were low (range 0.022 to 0.054mg/L (n=11)). At the most downstream site (213) the minimum DO was only 3.33mg/L with measurements frequently below 6.0mg/L (56 of 299 measurements) and below 5.0mg/L (27 of 299 or ~9%), the maximum temperature was 24.78°C with 56 of 299 measurements (~19%) above 20°C, and pH ranged from 4.95 to 7.07SU (with 125 of 294

measurements <6.0SU). The seasonal average total phosphorus concentrations were low (range 0.017 to 0.027mg/L (n= 1-4), maximum 0.039mg/L). There were no exceedances of acute or chronic ammonia or chloride criteria either at any of the sites sampled (maximum ammonia concentration 0.08 mg/L and maximum chloride concentration 24.3 mg/L).

The Aquatic Life Use for the Middle Branch Swift River is assessed as Fully Supporting. In the high gradient reach upstream from Elm Street in New Salem, the river supports multiple age classes of Eastern brook trout indicative of excellent habitat and water quality conditions (Tier 1 Existing Use Coldwater Fishery). Downstream from this road however the river changes character flowing through a series of large wetlands and beaver dams. This low gradient reach of the river may also receive some overflow from Lake Mattawa which straddles the Chicopee and Millers watersheds as it has dams on both its north and south sides although the influence of this lake overflow on the Middle Branch Swift River is considered negligible during the summers when flows are most often lower. The discrete DO and temperature data collected by DCR staff in this low gradient reach of the Middle Branch Swift River (sites 213A & 213) frequently did not meet cold water standards however these conditions are considered naturally occurring since this watershed is ~89.2% natural/wetland and the impervious cover is only 2.3%. The pH was also frequently low in the river which is considered natural and likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands but is being identified as an Alert.

Minechoag Pond (MA36093)

| | |
|----------------------------------|-----------------|
| Location: | Ludlow. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 21 ACRES |
| Classification/Qualifier: | B |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There is a proposed site-specific total phosphorus criterion of 0.030 mg/L for Minechoag Pond. A 52% reduction in total phosphorus loading is recommended. No other recent data are available. The Aquatic Life Use for Minechoag Pond is Not Assessed. |

Mona Lake (MA36094)

| | |
|----------------------------------|-----------------|
| Location: | Springfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 11 ACRES |
| Classification/Qualifier: | B |

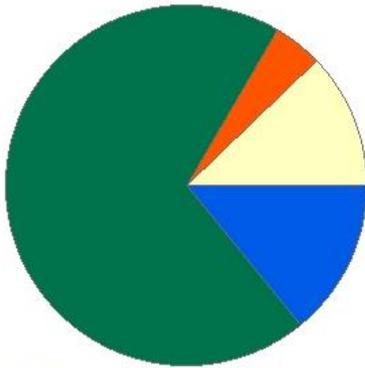
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There is a proposed site-specific total phosphorus criterion of 0.030mg/L for Mona Lake. A 60% reduction in the total phosphorus loading is recommended. No other recent data are available. The Aquatic Life Use for Mona Lake is Not Assessed. |

MOOSE BROOK (MA36-51)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet small unnamed pond north of Route 32, Barre to mouth at confluence with Ware River, Hardwick. |
| AU Type: | RIVER |
| AU Size: | 8 MILES |
| Classification/Qualifier: | B |

MOOSE BROOK - MA36-51

Watershed Area: 10.05 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 10.05 | 3.02 | 1.96 | 0.91 |
| Agriculture | 12.1% | 15.9% | 10.5% | 17.2% |
| Developed | 4.5% | 3.7% | 2.6% | 2.1% |
| Natural | 69.4% | 73.2% | 57.9% | 64.7% |
| Wetland | 14% | 7.2% | 29% | 16% |
| Impervious Cover | 1.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDFG biologists conducted backpack electrofishing in Moose Brook in August 2006 upstream of Old Hardwick Rd (SampleID 1690) and upstream of Cutler Rd in Barre (SampleID 1691). Both samples in the area affected by beavers were dominated by fluvial specialists/fluvial dependents. MassDEP staff conducted water quality monitoring in the brook ~1800 feet south (downstream) of Taylor Hill Road, Hardwick (due east of Brook Road) (W1851) during the summer of 2008. All data were indicative of good water quality for a warmwater fishery: Continuous three-day deployed probe data in June, July and August recorded a minimum DO concentration of 7.38mg/L (mean minimum DO ranged from 7.44 to 8.21mg/L over the three deploys), the maximum DO saturation was 97.6%, the maximum diel DO shift was only 0.71mg/L, and the maximum temperature was 25.7°C. Discrete pH measurements ranged from 6.8 to 7.0SU (n=6) and the seasonal average total phosphorus concentration was low (0.044mg/L, n=5) with a maximum of 0.064mg/L. No observations of dense or very dense filamentous algae were noted.

The Aquatic Life Use for Moose Brook is assessed as Fully Supporting based on the dominance of fluvial fish species and the water quality data indicative of good conditions.

Moose Hill Reservoir (MA36179)

| | |
|----------------------------------|--------------------|
| Location: | Spencer/Leicester. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 52 ACRES |
| Classification/Qualifier: | B |

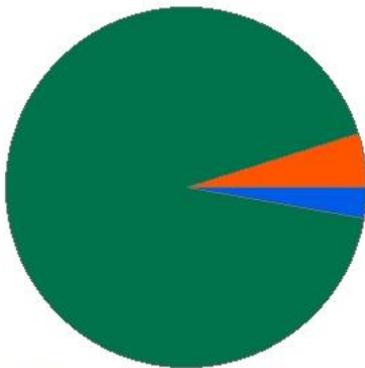
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No data are available, so the Aquatic Life Use for Moose Hill Reservoir is Not Assessed. |

MOOSEHORN BROOK (MA36-66)

| | |
|----------------------------------|---|
| Location: | Headwaters, east of Daniel Shays Highway (Route 202), New Salem to mouth at inlet Quabbin Reservoir, New Salem. |
| AU Type: | RIVER |
| AU Size: | 1.3 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

MOOSEHORN BROOK - MA36-66

Watershed Area: 1.85 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.85 | 1.85 | 0.42 | 0.42 |
| Agriculture | 0.2% | 0.2% | 0% | 0% |
| Developed | 4.9% | 4.9% | 5.2% | 5.2% |
| Natural | 92.3% | 92.3% | 86.8% | 86.8% |
| Wetland | 2.7% | 2.7% | 8% | 8% |
| Impervious Cover | 1.5% | | | |

Fish, other Aquatic Life and Wildlife Use: Not Assessed

Since there are no recent data available for Moosehorn Brook, the Aquatic Life Use is Not Assessed.

Moosehorn Pond (MA36097)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 67 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| <p>The non-native aquatic macrophyte, <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil), was identified by MassDEP staff during a synoptic survey of Moosehorn Pond during the summer of 1998.</p> <p>The Aquatic Life Use is assessed as Not Supporting with the generic non-native aquatic plant impairment being carried forward for <i>M. heterophyllum</i> (no species-specific code is available).</p> |

Moulton Pond (MA36098)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 65 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

The presence of *Myriophyllum* sp. was noted by MassDEP staff during a synoptic survey of Moulton Pond during the summer of 1998. However, it is unclear if any non-native members of the genus were present. In addition, *Cabomba caroliniana* was reported in the DEP Freshwater Aquatic Invasive Species database but this record needs confirmation.

Too limited data/information are available to assess the Aquatic Life Use of Moulton Pond, so it is assessed as having Insufficient Information. The alert is being carried forward for the potential presence of non-native aquatic macrophytes (unidentified *Myriophyllum* species and the unconfirmed report of *Cabomba caroliniana*).

Muddy Pond (MA36102)

| | |
|----------------------------------|-------------------------|
| Location: | Oakham/Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 23 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Muddy Pond, the Aquatic Life Use is Not Assessed. |

Murphy Pond (MA36103)

| | |
|----------------------------------|-----------------|
| Location: | Ludlow. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 6 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Murphy Pond, the Aquatic Life Use is Not Assessed. |

Old Reservoir (MA36114)

| | |
|----------------------------------|-----------------------------|
| Location: | Barre. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 37 ACRES |
| Classification/Qualifier: | B: HQW (overlaps B/CWF/HQW) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
| No recent data available for Old Reservoir. The Aquatic Life Use for Old Reservoir will continue to be assessed as Not Supporting with the flow regime modification impairment being carried forward. |

Palmer Reservoir (MA36115)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 8 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Palmer Reservoir, the Aquatic Life Use is Not Assessed. |

Paradise Lake (MA36116)

| | |
|----------------------------------|-----------------|
| Location: | Monson. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 17 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Paradise Lake, the Aquatic Life Use is Not Assessed. |

Pattaquattic Pond (MA36117)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 18 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Pattaquattic Pond, the Aquatic Life Use is Not Assessed. |

Peppers Mill Pond (MA36121)

| | |
|----------------------------------|-----------------|
| Location: | Ware. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 11 ACRES |
| Classification/Qualifier: | B |

| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| Since there are no recent data available for Peppers Mill Pond, the Aquatic Life Use is Not Assessed. |

Perry Hill Pond (MA36122)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 23 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

The presence of an unidentified *Myriophyllum* sp. was observed by MassDEP staff during a synoptic survey of Perry Hill Pond during the summer of 1998. However, it is unclear if any non-native members of the genus were present.

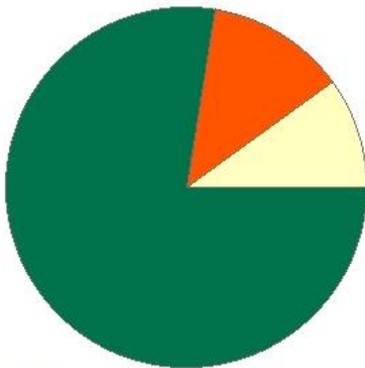
The Aquatic Life Use for Perry Hill Pond is Not Assessed with the Alert for the potential presence of a non-native *Myriophyllum* species being carried forward.

PINNACLE CREEK (MA36-55)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet unnamed pond north of Peck Road, Monson to mouth at confluence with Twelvemile Brook, Monson. |
| AU Type: | RIVER |
| AU Size: | 1 MILES |
| Classification/Qualifier: | B |

PINNACLE CREEK - MA36-55

Watershed Area: 0.53 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.53 | 0.53 | 0.13 | 0.13 |
| Agriculture | 9.9% | 9.9% | 1.2% | 1.2% |
| Developed | 12.4% | 12.4% | 6.6% | 6.6% |
| Natural | 77.1% | 77.1% | 91.1% | 91.1% |
| Wetland | 0.7% | 0.7% | 1% | 1% |
| Impervious Cover | 5.7% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in Pinnacle Creek upstream of Wilberham Rd at Reimer Rd, Monson (SampleID 1205) in August 2005. The sample was comprised entirely of multiple age classes of Eastern brook trout.

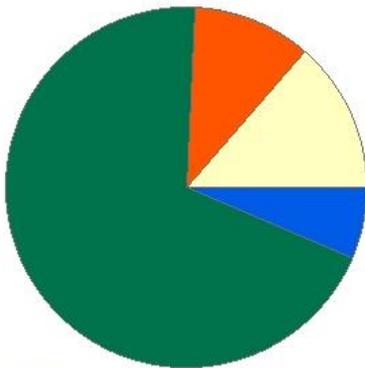
The Aquatic Life Use for Pinnacle Creek is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

PLEASANT BROOK (MA36-68)

| | |
|----------------------------------|--|
| Location: | Headwaters, east of Williamsville Road, Barre to mouth at confluence with Prince River, Barre. |
| AU Type: | RIVER |
| AU Size: | 3.4 MILES |
| Classification/Qualifier: | B |

PLEASANT BROOK - MA36-68

Watershed Area: 3.01 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 3.01 | 3.01 | 0.61 | 0.61 |
| Agriculture | 13.6% | 13.6% | 3.6% | 3.6% |
| Developed | 10.7% | 10.7% | 7.2% | 7.2% |
| Natural | 69.4% | 69.4% | 80% | 80% |
| Wetland | 6.4% | 6.4% | 9.2% | 9.2% |
| Impervious Cover | 3.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in Pleasant Brook ~100m downstream of Fisher Rd in Barre (SampleID 1560) in July 2006. The sample was comprised entirely by multiple age classes of Eastern brook trout. Further downstream near the Route 62 crossing in Barre (SampleID 882) in August 2003, DFG biologists backpack electrofishing documented a sample dominated by fluvial specialists also including multiple age classes of Eastern brook trout.

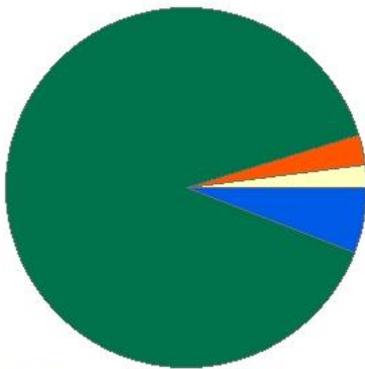
The Aquatic Life Use for Pleasant Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

POPPLE CAMP BROOK (MA36-67)

| | |
|----------------------------------|--|
| Location: | Headwaters, perennial portion north of Lincoln Road, Phillipston to mouth at confluence with Shattuck Brook (forming headwaters East Branch Swift River), Phillipston. |
| AU Type: | RIVER |
| AU Size: | 1.7 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

POPPLE CAMP BROOK - MA36-67

Watershed Area: 1.39 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.39 | 1.39 | 0.36 | 0.36 |
| Agriculture | 2% | 2% | 0% | 0% |
| Developed | 2.7% | 2.7% | 0% | 0% |
| Natural | 89.5% | 89.5% | 80.2% | 80.2% |
| Wetland | 5.8% | 5.8% | 19.8% | 19.8% |
| Impervious Cover | 1% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In August 2008, DFG biologists conducted backpack electrofishing in Popple Camp Brook upstream of the Lincoln Rd crossing in Phillipston (SampleID 2616). Multiple beaver dams were present, but the sample was dominated by multiple age classes of Eastern brook trout. Golden shiner were also present. The Aquatic Life Use for Popple Camp Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

Pottapaug Pond (MA36125)

| | |
|----------------------------------|-------------------------|
| Location: | Petersham/Hardwick. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 568 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The non-native aquatic macrophyte, *Myriophyllum heterophyllum*, was identified during a 2006 survey of Pottapaug Pond by GeoSyntec Consultants.

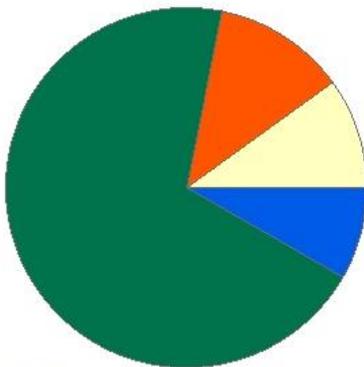
The Aquatic Life Use of Pottapaug Pond will continue to be assessed as Not Supporting. The generic non-native aquatic plant impairment will be carried forward because of the presence of *M. heterophyllum* since a species-specific code is not available.

Prince River (MA36-08)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Hemingway Pond, Barre to mouth at confluence with Ware River, Barre (excluding approximately 0.6 miles through Old Reservoir, segment MA36114). |
| AU Type: | RIVER |
| AU Size: | 7.1 MILES |
| Classification/Qualifier: | B: CWF, HQW |

Prince River - MA36-08

Watershed Area: 14.03 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 14.03 | 4.85 | 2.99 | 1.05 |
| Agriculture | 9.9% | 13.7% | 4% | 6.3% |
| Developed | 11.9% | 23.6% | 10.5% | 22.8% |
| Natural | 69.9% | 55.7% | 73% | 57.3% |
| Wetland | 8.3% | 7% | 12.5% | 13.6% |
| Impervious Cover | 4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDEP staff conducted water quality monitoring in the Prince River off Rt 122, upstream of the Galloway Brook confluence in Barre (W1850) during the summer of 2008. The minimum DO during the three three-day probe deployments in June, July, and August was 6.54mg/L (mean minimum DO during the three deploys ranged from 6.61 to 8.10mg/L), the maximum saturation was 100%, and the maximum diel DO shift was 1.8mg/L which were all indicative of excellent conditions. The maximum temperature was 24.3°C, high for a designated cold water, although the maximum 24-hour rolling average of 21.7°C (in July) met the acute criterion (23.5 °C). Too limited continuous temperature data were collected to evaluate how frequently the 3-5DADM exceeded the chronic criterion of 20°C. The pH ranged from 6.2 to 6.5SU and the seasonal average total phosphorus concentration was low (0.033mg/L) (maximum 0.047mg/L, n=5). No observations of dense or very dense filamentous algae were noted.

The Aquatic Life Use of the Prince River is assessed as Fully Supporting based on the excellent water quality conditions except for temperature documented during the summer of 2008. An Alert is being identified for the elevated temperature in this designated cold water with a recommendation for additional long-term temperature data collection.

Quabbin Reservoir (MA36129)

| | |
|----------------------------------|--|
| Location: | Petersham/Pelham/Ware/Hardwick/Shutesbury/Belchertown/New Salem. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 24010 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

| Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert) |
|--|
| <p>GeoSyntec Consultants reported the presence of the non-native aquatic macrophyte, <i>Myriophyllum heterophyllum</i>, in Quabbin Reservoir during a 2006 survey. MA DCR staff collected water quality samples and conducted depth profiles at three stations on multiple occasions per year from 2009 to 2019 in Quabbin Reservoir. At the Quabbin CVA intake (station 202), dissolved oxygen concentrations were $\geq 5.23\text{mg/L}$ in >99% of the 5011 measurements (minimum was 4.77mg/L with slightly low DOs to a depth of 7m on 15 July 2010). The maximum temperature was 26.32°C, chlorophyll a concentrations were usually low (only four of 2045 records were >16µg/L), Secchi disk depth was good (range 7.0 to 42.5m), and specific conductance was very low (maximum 51µS/cm, n=4972). The pH ranged from 4.84 to 7.75SU and was frequently <6.0SU (~21% of 4972 measurements). At Shaft 12 (station 206) similar conditions were found: dissolved oxygen concentrations were $\geq 5.04\text{mg/L}$ in >99% of the 3615 measurements (minimum was 4.25mg/L with slightly low DOs to a depth of 7m on 15 July 2010, with the other low DOs at the bottom). The maximum temperature was 26.84°C, chlorophyll a concentrations were usually low (only six of 1477 records were >16µg/L), Secchi disk depth was good (range 6.3 to 34.7m, n=170), and specific conductance was very low (maximum 52.8µS/cm, n=3615). The pH ranged from 5.04 to 7.77SU and was frequently <6.0SU (~18% of 3615 measurements). At Den Hill (station DEN) dissolved oxygen concentrations were $\geq 5.0\text{mg/L}$ in ~96% of the 1688 measurements (minimum was 1.27mg/L with low DOs to the bottom on 15 July 2010, and all other low DOs were at depths >15m). The maximum temperature was 26.93°C, chlorophyll a concentrations were usually low (only two of 577 records were >16µg/L), Secchi disk depth was good (range 3.5 to 19.4m, n=102), and specific conductance was very low (maximum 71.2µS/cm, n=1688). The pH ranged from 4.94 to 7.71SU and was frequently <6.0SU (~24% of 1688 measurements). DCR staff collected nutrient samples (total phosphorus and ammonia nitrogen) at nine sites in Quabbin Reservoir on 36 to 37 occasions from 2010 to 2019. The stations sampled included 202M (Quabbin CVA Intake Mid (Metalimnion)), 202D (Quabbin CVA Intake Deep (Hypolimnion)), 202S (Quabbin CVA Intake Surface (Epilimnion)), 206D (Shaft 12 Deep (Hypolimnion)), 206M (Shaft 12 Mid (Metalimnion)), 206S (Shaft 12 Surface (Epilimnion)), DEND (Den Hill Deep (Hypolimnion)), and DENM (Den Hill Mid (Metalimnion)). Total phosphorus concentrations were low, with seasonal averages (usually n=2 sampled in May and July) ranging from 0.003 to 0.011mg/L across all stations. Ammonia concentrations were also low (range 0.0025 to 0.0343mg/L).</p> <p>The Aquatic Life Use for Quabbin Reservoir continues to be assessed as Not Supporting due to the presence of the non-native aquatic macrophyte <i>M. heterophyllum</i>. The generic non-native aquatic plant impairment is being carried forward since a species-specific code is not available. Dissolved oxygen depletion was occasionally noted at the Den Hill site most often at depths >15m but oxygen depletion was not problematic at the other stations except for one date (15 July 2010). The concentrations of total phosphorus in the reservoir are low. Quabbin Reservoir and its tributaries also frequently have low pH which is being identified with an alert.</p> |

Quaboag Pond (MA36130)

| | |
|----------------------------------|-----------------------------|
| Location: | Brookfield/East Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 544 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------|-------------------|---------------------------|
| 5 | 5 | (Fanwort*) | | Added |

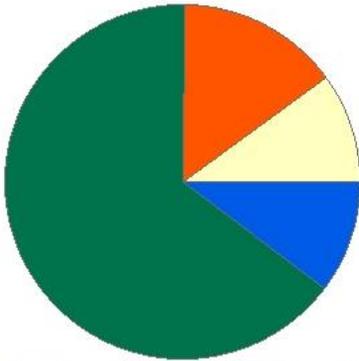
| Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert) |
|---|
| <p>Three non-native species, <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil), <i>Cambomba caroliniana</i> (Fanwort), and <i>Myriophyllum spicatum</i> (Eurasian water milfoil) were found in Quaboag Pond in August 2003. MassDEP staff conducted a deep-hole profile in Quaboag Pond in August 2004. The profile indicated low DO (0.8mg/L) in water at 3.5m depth but DO was much higher (7.9mg/L) at a depth of 1.6m. No measurements were taken between 1.6 and 3.5m. The 3.35m (10.9ft) depth represents ~5% of the pond surface area and the 2.4m (7.8ft) depth represents ~24% of pond surface area. It should also be noted that DO measurements made by MassDEP staff along the northeastern shore in the vicinity of the East Brookfield River inlet (W1265 and W1266) were also low DO (≤ 4.2mg/L) in August 2004. MassDEP staff also collected nutrient samples at the deep hole and along the northeast shore in August 2004; results of the analysis were 0.05 and 0.1mg/L, respectively of total phosphorus - both above the recommended criteria for lakes (0.025mg/L). MA DPH staff also indicated 20 days of algal blooms during the summer of 2012.</p> <p>The Aquatic Life Use for Quaboag Pond is assessed as Not Supporting. The prior impairments of algae, total phosphorus, Eurasian Water Milfoil, <i>Myriophyllum spicatum</i> and the generic non-native aquatic plants (for <i>M. heterophyllum</i>) and are all being carried forward. The non-native aquatic macrophyte Fanwort (<i>C. caroliniana</i>) impairment is being added. Low DO is also identified as an Alert issue data (too limited data available to calculate an accurate % of lake lake surface area below 5.0mg/L).</p> |

Quaboag River (MA36-14)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Quaboag Pond, Brookfield to Route 67 bridge, West Brookfield. |
| AU Type: | RIVER |
| AU Size: | 6.1 MILES |
| Classification/Qualifier: | B: WWF |

Quaboag River - MA36-14

Watershed Area: 105.79 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 105.16 | 8.55 | 37.70 | 3.44 |
| Agriculture | 10% | 12.5% | 7.5% | 11.7% |
| Developed | 14.9% | 10.1% | 12.7% | 5.2% |
| Natural | 64.9% | 61.4% | 61.2% | 54.1% |
| Wetland | 10.3% | 16% | 18.6% | 29% |
| Impervious Cover | 4.8% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 2 | 5 | Dissolved Oxygen | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

MassDEP staff conducted some water quality monitoring at seven stations throughout this Quaboag River AU (MA36-14) during the summer of 2008. Four sites were in the large wetland complex downstream from Route 148 bridge in the upper half of the AU (W1991, W1992, W1993, W1994) and three were further downstream: Old Long Hill Road, West Brookfield (W1995), ~500 feet downstream from the railroad crossing upstream from Route 19/67, West Brookfield (W1997), ~250 feet upstream from Route 19/67, West Brookfield (W1996). Additional monitoring was conducted throughout the summer in the river at Old Long Hill Road, West Brookfield (W1995). Probes were deployed for DO and temperature (either five or two day deploys) at these sites sometime in September 2008. During these continuous probe deployments the minimum DO concentrations were low (range 0.88 to 3.5mg/L with mean minimum DO range 1.12 to 3.72mg/L) well below criteria for a warmwater fishery. DO saturations were also low ($\leq 70\%$) and the maximum diel DO shift ranged from 0.66 to 3.32mg/L (just once > 3.0 mg/L at W1991 but all other data were < 1.3 mg/L). The maximum temperature measured at all sites was 25.5°C. Discrete pH measurements ranged from 5.8 to 7.0SU (twice below 6.0SU) and the seasonal average total phosphorus concentration was 0.04mg/L at Old Long Hill Road, West Brookfield (W1995) (maximum 0.056mg/L, n=5). No observations of dense or very dense filamentous algae were noted at this site.

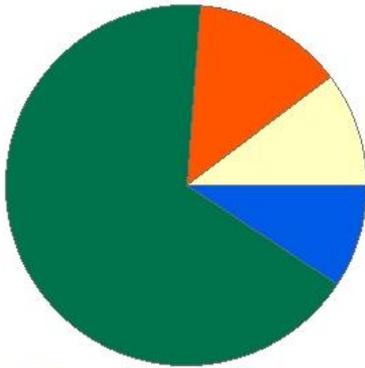
The Aquatic Life Use for this Quaboag River AU (MA36-14) is assessed as Not Supporting due to the low dissolved oxygen concentrations. The prior Alert for low DO is no longer needed.

Quaboag River (MA36-15)

| | |
|----------------------------------|---|
| Location: | Route 67 bridge, West Brookfield to Warren WWTP discharge (NPDES: MA0101567), Warren. |
| AU Type: | RIVER |
| AU Size: | 6.2 MILES |
| Classification/Qualifier: | B: WWF |

Quaboag River - MA36-15

Watershed Area: 146.52 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 145.89 | 10.42 | 51.80 | 3.57 |
| Agriculture | 10.3% | 5.9% | 8.7% | 6.2% |
| Developed | 13.4% | 13.6% | 11.7% | 13.6% |
| Natural | 67.1% | 75.7% | 62.4% | 69.9% |
| Wetland | 9.2% | 4.9% | 17.2% | 10.4% |
| Impervious Cover | 4.5% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 5 | 5 | Dissolved Oxygen | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

MassDEP staff conducted water quality monitoring at four sites along this Quaboag River AU (MA36-15) during the summer of 2008. In the uppermost area discrete measurements were taken in September 2008 ~150 ft downstream from Route 19/67, West Brookfield (W1998) and slightly further downstream ~860 ft downstream from Route 19/67, West Brookfield (W2000). Both DO and pH were low at these sites (minimum DO 1.8mg/L, pH 5.9SU, saturation was low (~20%), and the maximum temperature was 20.2°C. A probe was deployed for five days in the river ~1500 ft upstream of Long Hill Road crossing, West Brookfield (W1867) in September. The dissolved oxygen was extremely low (minimum 0.34mg/L), the maximum saturation was 93.1% the maximum diel DO shift was 5.22mg/L, and the maximum temperature was 23.87°C. Discrete pH measurements were 5.8 and 6.5SU (n=2). Further downstream at Gilbert Road bridge, Warren (W1011) water quality sampling was conducted between May and September. The minimum DO was 7.7mg/L, the maximum saturation was 105%, the maximum temperature was 25.9°C, pH ranged from 6.9 to 7.4SU, and the seasonal average total phosphorus concentration was 0.037mg/L (maximum 0.04 mg/L, n=5). There were no observations of dense or very dense filamentous algae noted. Benthic macroinvertebrates sampling was conducted by MassDEP biologists in the Quaboag River upstream of Gilbert Rd in Warren (B0647) in September 2008. The RBPIII analysis indicated the sample was "not impacted" (95% comparable) when compared to the East Branch Swift

River reference station (B0654). Survival of *C. dubia* exposed (approximately 7 days) to the Quaboag River water collected upstream from the Warren WWTP discharge for use as dilution water in the facility's whole effluent toxicity (WET) tests ranged from 70 to 100% (n=53) and was less than 75% in only one test between February 2006 and February 2019.

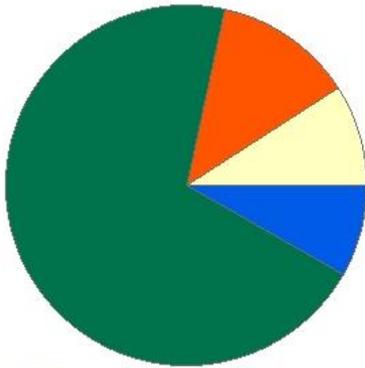
The Aquatic Life Use for this Quaboag River AU (MA36-15) is assessed as Not Supporting because of the low DO conditions documented in a large reach of the river during the summer of 2008. The pH was also somewhat low in this upper reach but was considered natural (wetland influence). The other data were indicative of generally good conditions near the lower end of this section of the Quaboag River: benthic macroinvertebrate assemblage was not impacted, survival of *C. dubia* exposed (~7day) was >75% in all but one of 53 tests conducted between February 2006 and 2019, and all water quality data (including DO) met standards.

Quaboag River (MA36-16)

| | |
|----------------------------------|---|
| Location: | Warren WWTP discharge (NPDES: MA0101567), Warren to Route 32 bridge, Palmer/Monson (mileage includes length of braids). |
| AU Type: | RIVER |
| AU Size: | 8.7 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Quaboag River - MA36-16

Watershed Area: 179.85 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 179.22 | 8.97 | 61.16 | 2.17 |
| Agriculture | 9.1% | 5.7% | 8.1% | 8.1% |
| Developed | 12.5% | 13.7% | 11.3% | 12.1% |
| Natural | 70.2% | 78% | 64.9% | 72.4% |
| Wetland | 8.2% | 2.5% | 15.7% | 7.4% |
| Impervious Cover | 4.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

The Town of Warren is authorized to discharge a monthly average flow of 1.5 MGD of treated effluent to this Quaboag River AU (MA36-16) (MA permit MA0101567 issued in September 2000 and reissued in September 2016). The permit required quarterly modified acute and chronic whole effluent toxicity (WET) tests with an LC₅₀ limit of ≥100% effluent and a CNOEC limit >13% effluent. The most recent permit requires definitive acute and chronic tests using *C. dubia* with limits of LC₅₀ ≥100 and CNOEC ≥14.3% effluent, respectively. No acute whole effluent toxicity was detected by *C. dubia* between February 2006 and February 2019 (n=53 tests). Two of 51 valid chronic tests did not meet the permit limit (August 2006 and November 2013 with CNOECs <6.25 and 13% effluent, respectively) but all other tests had CNOECs ranging from 50 to 100% effluent. MassDEP staff conducted water quality monitoring ~3600 feet south of the Rt 67/Warren Rd junction, at roadside park, Palmer (W1868) during the summer of 2008. The data were indicative of excellent conditions: minimum DO 8.0mg/L, maximum saturation 105%, maximum temperature 25.7°C, pH ranged from 7.2 to 7.75 (n=5), the seasonal average total phosphorus concentration was low (0.045 mg/L, n=5) (maximum 0.053mg/L) and there were no observations of dense filamentous algae. Further downstream benthic macroinvertebrate samples were collected from the river by MassDEP staff East of Rt 67, upstream near USGS flow gauging station 01176000 in Palmer/Brimfield (B0646) in September 2008. The RBPIII analysis indicated the sample was “not impacted” (89% comparable) when compared to the East Branch Swift River reference station (B0654). MassDEP staff also deployed probes in the river here (W0491) for two days each in June, July and August 2008. The minimum dissolved oxygen was 6.77mg/L (mean minimums during the probe deployments ranged from 6.83 to 7.77mg/L), the maximum saturation was 109.6%, the maximum diel DO shift was 1.79mg/L, and the maximum temperature was 26.2°C. The MassDEP SMART data collected at this site (SMART ID QRG) between 2005 and

2013 can be summarized as follows: lowest DO 8.3 mg/L, highest temperature 26.1°C in July 2012, pH ranged from 6.5 to 8.7SU, and there were no exceedances of any toxic pollutants (i.e., maximum chloride 33mg/L, maximum ammonia 0.13 mg/L), the seasonal average total phosphorus concentrations (usually between two and five samples) ranged from 0.043 to 0.08mg/L. A statistically significant decrease was found in total phosphorus concentrations over time, in both the seasonal data (May to September; n=46) and in all data (n=88) from 1998 to 2012 (data at stations W0491 and W1868).

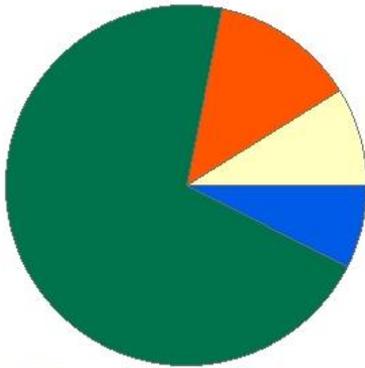
The Aquatic Life Use for this Quaboag River AU (MA36-16) is assessed as Fully Supporting based on the effluent toxicity, benthic, and water quality data that were indicative of good conditions.

Quaboag River (MA36-17)

| | |
|----------------------------------|---|
| Location: | Route 32 bridge, Palmer/Monson to mouth at confluence with Ware River (forming headwaters of Chicopee River), Palmer. |
| AU Type: | RIVER |
| AU Size: | 5.3 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Quaboag River - MA36-17

Watershed Area: 212.08 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 211.43 | 6.22 | 69.05 | 1.03 |
| Agriculture | 8.8% | 3.3% | 8% | 2.1% |
| Developed | 13% | 25.7% | 11.8% | 23.8% |
| Natural | 70.8% | 67.7% | 65.2% | 61.5% |
| Wetland | 7.5% | 3.4% | 15% | 12.5% |
| Impervious Cover | 4.7% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDEP staff conducted water quality monitoring in the lower half of this Quaboag River AU (MA36-17) during the summer of 2008. Probes were deployed for two days each in the river at Palmer St bridge, Palmer (W1015) in June, July and August. The minimum DO was 6.23mg/L (mean minimums ranged from 6.57 to 7.59mg/L during the three deploys), the maximum saturation was 111%, the maximum diel DO shift was 2.72mg/L, and the maximum temperature was 26.0°C. Discrete pH measurements ranged from 6.7 to 7.4SU (n=6), the maximum saturation was 112% and the maximum discrete temperature was 26.5°C. The seasonal average total phosphorus concentration was low (0.042mg/L) and there were no observations of dense or very dense filamentous algae noted. Further downstream ~170 feet upstream of Main Street crossing, Palmer (W1875) discrete measurements were recorded as follows: minimum DO concentration of 8.4mg/L, maximum saturation 101%, maximum temperature 23.8°C, pH ranged from 6.9 to 7.2SU. The seasonal average total phosphorus concentration was 0.042mg/L (n=5) and there were no observations of dense or very dense filamentous algae noted.

The Aquatic Life Use for this Quaboag River AU (MA36-17) continues to be assessed as Fully Supporting based on the good water quality conditions documented during the summer of 2008.

Quacumquasit Pond (MA36131)

| | |
|----------------------------------|---|
| Location: | Brookfield/East Brookfield/Sturbridge. (also known as South Pond) |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 223 ACRES |
| Classification/Qualifier: | B |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------|-------------------|---------------------------|
| 4a | 4a | (Fanwort*) | | Added |

| Fish, other Aquatic Life and Wildlife Use: Not Supporting |
|--|
| <p>Three non-native species <i>Myriophyllum spicatum</i> (Eurasian water milfoil), <i>Cabomba caroliniana</i> (Fanwort), and <i>Myriophyllum heterophyllum</i> (Variable-leaf milfoil) were documented in Quacumquasit Pond in 1995. No other recent data are available. Although exotic species are not considered a pollutant, EPA approved a total phosphorus TMDL for Quacumquasit Pond in December 2007 and the target load listed is considered a preventative TMDL. The 319 grant awarded for sediment and phosphorus load reductions includes aquatic vegetation management as a project task.</p> <p>The Aquatic Life Use for Quacumquasit Pond will continue to be assessed as Not Supporting with the Eurasian Water Milfoil (<i>M. spicatum</i>) and generic non-native aquatic plants impairments being carried forward (no species-specific code for <i>M. heterophyllum</i> is available so the generic code is used). The fanwort (<i>C. caroliniana</i>) impairment is being added.</p> |

Queen Lake (MA36132)

| | |
|----------------------------------|-------------------------|
| Location: | Phillipston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 139 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)

There is a report of an infestation of the non-native aquatic macrophyte, *Cabomba caroliniana* (Fanwort) in Queen Lake in the MassDEP Freshwater Aquatic Invasive Species database, however, further confirmation by DEP biologists is needed.

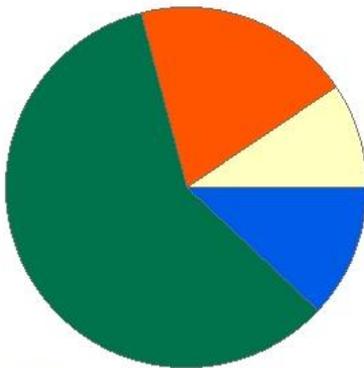
The Aquatic Life Use for Queen Lake is Not Assessed. An alert is being identified for the potential infestation with the non-native aquatic macrophyte Fanwort (*C. caroliniana*).

ROARING BROOK (MA36-56)

| | |
|----------------------------------|--|
| Location: | Headwaters, west of Summit Street, Belchertown to confluence with Broad Brook Canal/Jabish Canal, Belchertown. |
| AU Type: | RIVER |
| AU Size: | 2.8 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

ROARING BROOK - MA36-56

Watershed Area: 2.92 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.91 | 2.91 | 0.76 | 0.76 |
| Agriculture | 9.4% | 9.4% | 15.7% | 15.7% |
| Developed | 19.7% | 19.7% | 18.2% | 18.2% |
| Natural | 59% | 59% | 44.4% | 44.4% |
| Wetland | 11.9% | 11.9% | 21.7% | 21.7% |
| Impervious Cover | 5.7% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

Benthic macroinvertebrates samples were collected from Roaring Brook, ~245 meters upstream/west of Rockrimmon Street in Belchertown (0892) in July 2014 but these data were not analyzed using an RBPIII approach and will be used in a future reporting cycle. In July 2006, DFG biologists conducted backpack electrofishing in Roaring Brook downstream of the Rt 21 crossing north of Pleasant Run Rd in Belchertown (SampleID 1957). Fluvial specialist species dominated the sample which included multiple age classes of Eastern brook trout.

The Aquatic Life Use for Roaring Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which are indicative of excellent habitat and water quality conditions.

ROCKY RUN (MA36-64)

| | |
|----------------------------------|--|
| Location: | Headwaters, north of Freeman Road, Shutesbury to mouth at confluence with West Branch Swift River, Shutesbury. |
| AU Type: | RIVER |
| AU Size: | 1.7 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

ROCKY RUN - MA36-64

Watershed Area: 1.20 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.19 | 1.19 | 0.37 | 0.37 |
| Agriculture | 0.3% | 0.3% | 0% | 0% |
| Developed | 2% | 2% | 0.7% | 0.7% |
| Natural | 95.9% | 95.9% | 96.2% | 96.2% |
| Wetland | 1.7% | 1.7% | 3.1% | 3.1% |
| Impervious Cover | 1.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in Rocky Run upstream of New Boston Rd, inside of the Quabbin gate, Shutesbury (SampleID 3524) in August 2010. The entire sample was comprised of multiple age classes of Eastern brook trout as well as slimy sculpin.

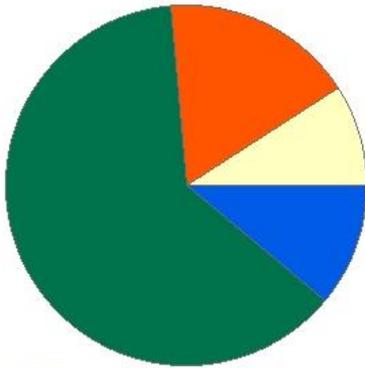
The Aquatic Life Use for Rocky Run is assessed as Fully Supporting based on the presence of cold-water fish (multiple age classes of Eastern brook trout and slimy sculpin) which is indicative of excellent habitat and water quality conditions.

Sevenmile River (MA36-11)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Browning Pond, Spencer to confluence with Cranberry River, Spencer. |
| AU Type: | RIVER |
| AU Size: | 7.3 MILES |
| Classification/Qualifier: | B: WWF, HQW |

Sevenmile River - MA36-11

Watershed Area: 31.53 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 30.98 | 6.21 | 10.55 | 2.11 |
| Agriculture | 9.1% | 13.7% | 6% | 9.3% |
| Developed | 17.2% | 35.2% | 15.5% | 31.9% |
| Natural | 62.6% | 43.4% | 59.8% | 40.8% |
| Wetland | 11% | 7.7% | 18.8% | 18% |
| Impervious Cover | 5.5% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 5 | 5 | Dissolved Oxygen | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

MassDEP biologists conducted benthic macroinvertebrate sampling in this Sevenmile River AU (MA36-11) ~100 meters downstream from Cooney Rd in Spencer (B0643). The RBPIII status analysis indicated the sample was "slightly impacted" (62% comparable) when compared to the East Branch Swift River reference site (B0654). *Potamogeton sp.* was noted during the summer of 2008 surveys however species confirmation is needed. Water quality monitoring of the river at Cooney Rd, Spencer (W0490), was conducted 46 times between February 2005 and April 2013 under the SMART monitoring program, with the following results: DO ≥ 7 mg/L, maximum temperature 22°C, pH ranged from 5.9 to 7.0SU, the seasonal average total phosphorus and was low (range 0.016 to 0.031mg/L) (maximums 0.016 to 0.077mg/L). Ammonia and chloride concentrations were also low (<0.02- to 0.07mg/L and 9 to 16mg/L, respectively). During the summer of 2008 MassDEP staff deployed probes in the river here in June, July and August, finding a minimum DO of 6.02mg/L (mean minimum concentrations during the deploys ranged from 6.46 to 7.27mg/L), maximum saturation 92%, maximum diel DO shift 1.75mg/L, and a maximum temperature of 25.1°C. Discrete pH measurements ranged from 6.7 to 7.0SU (n=6). In September 2008 MassDEP staff deployed a continuous probe in the river at Smithville Rd crossing, Spencer (W1876). The minimum DO was 5.43mg/L (mean minimum 7.13mg/L), the maximum saturation was 91.6%, the maximum diel DO shift was 2.26mg/L, and the maximum temperature was 22.8°C. Discrete pH (n=7) ranged 6.4-

6.7SU. The seasonal average total phosphorus concentration was low (0.02mg/L, n=5) as were the ammonia concentrations (range 0.02- 0.04mg/L). During the summer of 2008, MassDEP staff also deployed probes for 3-5 days in June, July, August and September, in the river upstream of Rte 9 bridge, Spencer (W1036). Here the minimum DO was lower (3.72mg/L) with the 3-5 day mean minimums during the deploys ranging from 4.22 to 5.36mg/L. The maximum DO saturation was 132.3%, and the maximum diel shift was 5.73mg/L. One observation of dense or very dense filamentous algae was noted. The maximum temperature was 26.2°C. Discrete pH measurements ranged from 6.2 to 6.5SU (n=9) and the seasonal average total phosphorus concentration was low (0.029mg/L, n=5) as were the ammonia concentrations (range 0.03 to 0.07mg/L). There was a statistically significant trend of decreasing annual total phosphorus concentrations (1998-2013 at sites W04090, W1036 and W1876) but not during the summer season.

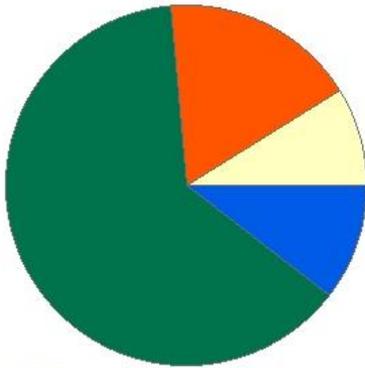
The Aquatic Life Use for this Sevenmile River AU (MA36-11) is assessed as Not Supporting because of low DO in the river just upstream of Route 9 so the prior alert for low DO is being removed. While water quality conditions were good at sites further upstream, supersaturation and large diel DO shifts (5.73mg/L in July) in the river at the Rt.9 bridge were also present although there was little other evidence of nutrient enrichment problems documented. It is noted that the river does flow through a large wetland upstream of the Route 9 bridge where the Town of Spencer draws water from the 70-foot-deep, gravel-packed Meadow Road Well, which can yield up to 1.7 million gallons of water per day. Low flow alterations resulting from the water supply withdrawals may exacerbate low DO conditions in the river. The incidence of slightly low pH is considered natural and likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands, consequently the prior alert for low pH is being removed. An Alert is being identified because of the potential infestation of *P. crispus* but this needs confirmation.

Sevenmile River (MA36-12)

| | |
|----------------------------------|--|
| Location: | Confluence with Cranberry River, Spencer to mouth at confluence with East Brookfield River, East Brookfield. |
| AU Type: | RIVER |
| AU Size: | 2.5 MILES |
| Classification/Qualifier: | B: WWF |

Sevenmile River - MA36-12

Watershed Area: 41.21 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 40.65 | 8.05 | 14.18 | 3.05 |
| Agriculture | 8.8% | 9.3% | 5.8% | 7% |
| Developed | 17.6% | 22.3% | 16% | 19.9% |
| Natural | 63.2% | 57.4% | 60.1% | 50.7% |
| Wetland | 10.4% | 11% | 18% | 22.5% |
| Impervious Cover | 5.8% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

In the summer of 2008, MassDEP biologists conducted benthic macroinvertebrate sampling in the Sevenmile River downstream from Bridge Street in East Brookfield (B0642). The RBPIII analysis indicated the sample was "non/slightly impacted" (81% comparable) when compared to the East Branch Swift River reference site (B0654). Limited nutrient sampling was conducted in the river at Bridge Street crossing, East Brookfield (W1870) during the summer of 2008. The seasonal total phosphorus concentration was low (0.03mg/L) (maximum 0.047mg/L, n=5) as were the ammonia concentrations (range 0.02 to 0.09mg/L). The Aquatic Life Use for this Sevenmile River AU (MA36-12) is assessed as Fully Supporting based on the healthy benthic macroinvertebrate community in the river near Bridge Street, East Brookfield.

Shaw Pond (MA36138)

| | |
|----------------------------------|-----------------|
| Location: | Leicester. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 64 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

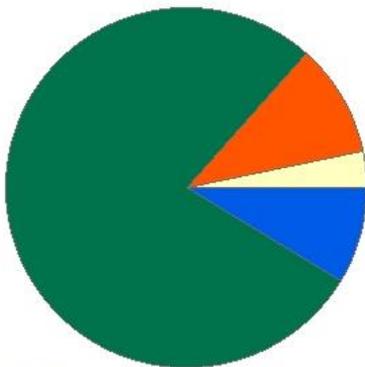
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No data are available, so the Aquatic Life Use for Shaw Pond is Not Assessed. |

SILVER BROOK (MA36-72)

| | |
|----------------------------------|---|
| Location: | Headwaters, perennial portion east of Spring Hill Road, Barre to mouth at confluence with East Branch Swift River, Petersham (excluding the approximately 0.5 mile through Carter Pond, Petersham). |
| AU Type: | RIVER |
| AU Size: | 2 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

SILVER BROOK - MA36-72

Watershed Area: 2.44 square miles



Percent Agriculture Percent Natural
 Percent Developed Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.44 | 2.44 | 0.50 | 0.50 |
| Agriculture | 3.2% | 3.2% | 1% | 1% |
| Developed | 10.2% | 10.2% | 5% | 5% |
| Natural | 78% | 78% | 78.2% | 78.2% |
| Wetland | 8.6% | 8.6% | 15.9% | 15.9% |
| Impervious Cover | 3.3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------|-------------------|---------------------------|
| -- | 5 | Temperature | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

MassDFG biologists conducted backpack electrofishing in Silver Brook near Dana Hill Road and the powerlines in Barre (SampleID 4739 in July 2013 and SampleID 3827 in August 2011) upstream of Carter Pond. Both samples were dominated by fluvial specialists/dependents species including multiple age classes of Eastern brook trout. Based on these samples the brook is considered to support a Tier 1 Cold Water Existing Use. Further downstream DCR staff collected discrete water quality data 2-3 times per month in 2010, 2014, 2015, and 2018 in the brook at Glen Valley Rd (216C). Dissolved oxygen measurements ranged from 4.59 to 21.23mg/L (n=102) with 6 measurements <5.0mg/L (5 of these measurements were in 2015). The maximum temperature measurement was 25.7°C with 20 of 102 measurements above 20°C. The pH measurements ranged from 5.3 to 7.56SU (n=92) with six measurements <6.0SU. The seasonal average total phosphorus concentrations were low (range 0.015 to 0.047mg/L). Ammonia data collected 2-3 times per month in 2014, 2015, and 2018 were also low (maximum 0.157mg/L) as was chloride data collected twice per month from September 2018 to December 2018 (maximum 14.2mg/L) and there were no violations of acute or chronic criteria.

The Aquatic Life Use of Silver Brook is assessed as Not Supporting based on the elevated temperatures downstream of Carter Pond in this Tier 1 Existing Use Cold Water resource. While multiple age classes of

Eastern brook trout were documented upstream of Carter Pond, instream temperatures near the mouth of the brook were above 20°C in ~20% of measurements. Alerts for low DO and pH are being identified although low DO was primarily documented only in 2015 whereas the other years met cold water standards and low pH is considered natural/likely due to wetlands influence.

Spectacle Pond (MA36142)

| | |
|----------------------------------|-----------------|
| Location: | Wilbraham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 9 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

An unconfirmed species of *Myriophyllum* was noted in Spectacle Pond. No other recent data are available. Too limited data are available to assess the Aquatic Life Use of Spectacle Pond, so it will continue to be assessed as having Insufficient Information. The alert for the potential infestation of a non-native form of *Myriophyllum* is being carried forward.

Springfield Reservoir (MA36145)

| | |
|----------------------------------|-----------------|
| Location: | Ludlow. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 393 ACRES |
| Classification/Qualifier: | A: PWS, ORW |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There are no recent data available for Springfield Reservoir, so the Aquatic Life Use is Not Assessed. |

Stone Bridge Pond (MA36148)

| | |
|----------------------------------|-------------------------|
| Location: | Templeton. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 32 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|---|
| <p>Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)</p> <p>DCR staff collected nutrient sampling 2-3 times per month in 2013 and 2017 in Stone Bridge Pond at Burnshirt R. @ Stone Bridge (station B4). The seasonal average total phosphorus concentration was 0.021 in 2017 and 0.026mg/L in 2013 (maximums 0.031 and 0.034mg/L). The maximum ammonia concentration was low (0.0884mg/L).</p> <p>Too limited data are available to assess the Aquatic Life Use for Stone Bridge Pond, so it is assessed as having Insufficient Information. An alert is being identified since the seasonal average total phosphorus concentration in 2013 just slightly exceeded recommended criterion for lakes (0.025 mg/L).</p> |
|---|

Sugden Reservoir (MA36150)

| | |
|----------------------------------|-----------------|
| Location: | Spencer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 85 ACRES |
| Classification/Qualifier: | B |

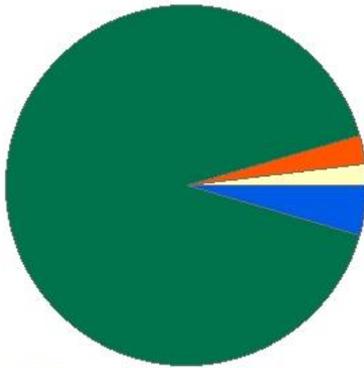
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data are available, so the Aquatic Life Use for Sugden Reservoir is Not Assessed. |

Swift River (MA36-09)

| | |
|----------------------------------|--|
| Location: | Outlet Winsor Dam (NATID: MA00588), Belchertown to Upper Bondsville Mill Dam (NATID: MA00560), Belchertown/Palmer. |
| AU Type: | RIVER |
| AU Size: | 5.6 MILES |
| Classification/Qualifier: | B: CWF |

Swift River - MA36-09

Watershed Area: 194.55 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 193.77 | 4.83 | 37.31 | 0.88 |
| Agriculture | 1.9% | 5.9% | 1.3% | 7% |
| Developed | 2.6% | 6.1% | 2.4% | 7.6% |
| Natural | 91.1% | 82.9% | 85.5% | 74.4% |
| Wetland | 4.5% | 5.1% | 10.8% | 10.9% |
| Impervious Cover | 1.2% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 2 | 4c | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

The non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), was identified in a 2017 MassDEP survey of this Swift River AU (MA36-09). The presence of *Potamogeton sp.* was also reported during a 2010 survey but confirmation of the species is needed. MassDEP staff conducted water quality monitoring during the summer of 2008 at two sites along this Swift River AU (MA36-09): in the upstream section of the river at the USGS flow gaging station #01175500 west of River Road, Ware/Belchertown (W0493) and one further downstream in the middle of the AU at Cold Spring Road/Old Belchertown Road, Belchertown/Ware (W1012). At the upstream site probes were deployed for two days each in June, July and August 2008. The minimum DO was 9.32mg/L (mean minimums ranged from 9.36 to 9.81mg/L during the three deploys), the maximum saturation was 107.3%, the maximum diel DO shift was 1.17mg/L, the maximum temperature was 17.1 °C. Discrete pH measurements at this site ranged from 6.1 to 6.8SU (n=32) between 2005 and 2013 (includes MassDEP’s SMART monitoring data). The discrete minimum DO during those surveys was 9.2mg/L, the maximum saturation was 113%, and the maximum temperature was 18.6°C. The seasonal average total phosphorus concentrations were all low (0.005mg/L) as were the ammonia nitrogen concentrations (<0.02 mg/L). Further downstream (W1012) the minimum DO during the two day probe deployments in June, July and August 2008 was 8.34mg/L (mean minimum DOs ranged from 8.40 to 9.03mg/L during the three deploys), the

maximum saturation was 115%, the maximum diel DO shift was 2.50mg/L, and the maximum temperature was 17.3°C. Discrete pH measurements ranged from 6.3 to 6.8SU (n=7). The seasonal average total phosphorus concentration was low (0.007mg/L) and there was one observation of dense filamentous algae noted. There was a statistically significant reduction in total phosphorus concentrations (sites W0403 and W1012) both annually and seasonally based on the long-term analysis (1998 to 2013) of total phosphorus data.

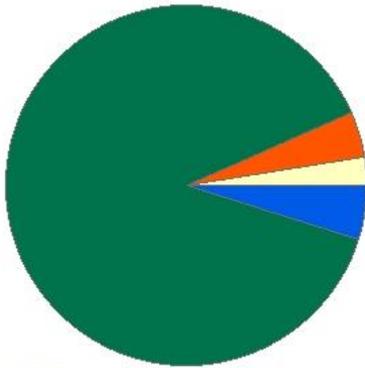
The Aquatic Life Use for this Swift River AU (MA36-09) is assessed as Not Supporting because of the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum* (the generic non-native aquatic plants impairment is being added since a species-specific code is not available). All other water quality data were indicative of good conditions for a designated coldwater fishery. The Alert for low pH is being removed (lowest measurement only 6.1SU indicative of only slight excursions from criteria) but a new Alert is being identified due to the potential presence of a non-native aquatic macrophyte *Potamogeton sp.* (possibly *P. crispus*) but confirmation of the species is needed.

Swift River (MA36-10)

| | |
|----------------------------------|--|
| Location: | Upper Bondsville Mill Dam (NATID: MA00560), Belchertown/Palmer to mouth at confluence with Ware River, Palmer. |
| AU Type: | RIVER |
| AU Size: | 3.9 MILES |
| Classification/Qualifier: | B: CWF, CSO |

Swift River - MA36-10

Watershed Area: 215.83 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 215.04 | 6.62 | 42.12 | 1.77 |
| Agriculture | 2.5% | 11.3% | 1.7% | 8.7% |
| Developed | 4.1% | 22.6% | 3.8% | 21.5% |
| Natural | 88.6% | 57.6% | 83.1% | 57.5% |
| Wetland | 4.8% | 8.5% | 11.4% | 12.4% |
| Impervious Cover | 1.7% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 2 | 4c | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

During a 2017 field survey, MassDEP staff noted an infestation of the non-native aquatic macrophyte species *Myriophyllum heterophyllum* (Variable-leaf milfoil) in this Swift River AU (MA36-10). MassDEP staff conducted water quality monitoring in the river during the summer of 2008 at Rt 181 in Belchertown/Palmer (W1013). Probes were deployed for two days in June, July and August documenting a minimum DO of 8.88mg/L (mean minimums ranged from 9.04 to 9.60mg/L during the three deploys), a maximum saturation of 103%, a maximum diel DO shift of only 0.51mg/L, and a maximum temperature of 19.2°C. Discrete pH measurements ranged from 6.5 to 6.8SU (n=6) and the maximum temperature was 19.6°C. The seasonal average total phosphorus concentration was low (0.009mg/L) and there were no observations of dense filamentous algae noted. All the data were indicative of good water quality for this Class B designated cold water resource.

The Aquatic Life Use of this Swift River AU (MA36-10) is assessed as Not Supporting because of the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum* (the generic non-native aquatic plants impairment is being added since a species-specific code is not available). All other water quality data were indicative of good conditions for a designated coldwater fishery.

Thayer Pond (MA36181)

| | |
|----------------------------------|-------------------------|
| Location: | Rutland. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 46 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| No recent data are available for Thayer Pond, so the Aquatic Life Use is Not Assessed. |

Thompson Lake (MA36154)

| | |
|----------------------------------|-----------------|
| Location: | Palmer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 34 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

The non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), was listed in the herbicide permit files and Thompson Lake has been treated with herbicides. Confirmation of the presence of non-native macrophytes by DWM personnel is needed.

There are too limited data available to assess the Aquatic Life Use of Thompson Lake, so it is assessed as having Insufficient Information. The alert for the possible presence of the non-native aquatic macrophyte *M. heterophyllum* is being carried forward.

Thompsons Pond (MA36155)

| | |
|----------------------------------|-----------------|
| Location: | Spencer. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 116 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)

No data are available for Thompsons Pond other than conflicting reports of the presence of a *Myriophyllum* species.

Too limited data are available to assess the Aquatic Life Use of Thompsons Pond, so it is assessed as having Insufficient Information. The Alert for the potential presence of non-native aquatic macrophyte *Myriophyllum* species is being carried forward.

Town Barn Beaver Pond (MA36156)

| | |
|----------------------------------|-------------------------|
| Location: | Petersham. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 20 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

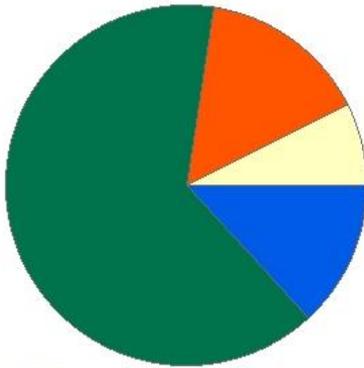
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There are no recent data available for Town Barn Beaver Pond, so the Aquatic Life Use is Not Assessed. |

TURKEY HILL BROOK (MA36-49)

| | |
|----------------------------------|--|
| Location: | Outlet Thompsons Pond, Spencer to mouth at confluence with Sevenmile River, Spencer. |
| AU Type: | RIVER |
| AU Size: | 3.9 MILES |
| Classification/Qualifier: | B |

TURKEY HILL BROOK - MA36-49

Watershed Area: 17.52 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 16.96 | 4.87 | 5.64 | 1.69 |
| Agriculture | 7.4% | 13.9% | 5.6% | 9.8% |
| Developed | 15.1% | 13% | 13% | 12.7% |
| Natural | 64.3% | 68% | 61.4% | 68.3% |
| Wetland | 13.2% | 5.1% | 20.1% | 9.2% |
| Impervious Cover | 4.1% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDFG biologists conducted backpack electrofishing in Turkey Hill Brook near Farm Road crossing in Spencer (SampleID: 1201) and further downstream downstream at the Wire Village Rd crossing, North of Hastings Rd in Spencer (SampleID 1202) in July 2005. Both samples were dominated by fluvial specialist/dependant species including a few stocked brown trout. MassDEP staff conducted water quality monitoring in the brook at the junction of Wire Village and Hastings Roads in Spencer (W1856) during the summer of 2008. All data were indicative of good water quality as follows: during the three probe deployments in June, July and August the minimum DO was 7.78mg/L (mean minimum DO during the deploys ranged from 7.84 to 8.48mg/L), the maximum DO saturation was 99.5%, the maximum diel DO shift was 1.05mg/L, the maximum temperature was 23.6°C with a maximum 24-hour rolling average of 22.2°C although too limited data were collected to calculate a 3-5DADM. Discrete pH measurements ranged from 6.9-7.1SU (n=8) and the seasonal average total phosphorus concentration was low (0.013mg/L) with a maximum of 0.018 mg/L (n=5). No observations of dense or very dense filamentous algae were noted. In September 2008, MassDEP biologists conducted benthic macroinvertebrates sampling in Turkey Hill Brook ~100 meters downstream/southwest from Hastings Rd, in Spencer (B0651). The RBPIII analysis indicated the sample was “slightly impacted” (67% comparable) when compared to the East Branch Swift River reference (B0654).

The Aquatic Life Use for Turkey Hill Brook is assessed as Fully Supporting based on the benthic macroinvertebrate, fish population, and water quality data collected during the summers of 2005 and 2008.

Turkey Hill Pond (MA36157)

| | |
|----------------------------------|-----------------|
| Location: | Rutland/Paxton. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 90 ACRES |
| Classification/Qualifier: | B |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

An infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil), was reported in Turkey Hill Pond during a 1998 synoptic survey.

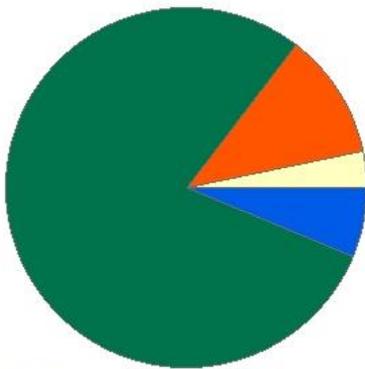
The Aquatic Life Use for Turkey Hill Pond is assessed as Not Supporting with the generic non-native aquatic plant impairment being carried forward (no species-specific code available for *M. heterophyllum*).

TWELVEMILE BROOK (MA36-53)

| | |
|----------------------------------|--|
| Location: | Headwaters, perennial portion west of Zuell Hill Road, Monson to mouth at confluence with Chicopee River, Wilbraham (excluding the approximately 0.25 miles through Pulpit Rock Pond, Monson). |
| AU Type: | RIVER |
| AU Size: | 7.2 MILES |
| Classification/Qualifier: | B |

TWELVEMILE BROOK - MA36-53

Watershed Area: 14.41 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 14.40 | 9.09 | 3.31 | 2.34 |
| Agriculture | 3.2% | 3.1% | 2.3% | 2.3% |
| Developed | 11.4% | 12.4% | 9.2% | 9.5% |
| Natural | 79.1% | 77.8% | 75.7% | 75.9% |
| Wetland | 6.3% | 6.8% | 12.8% | 12.3% |
| Impervious Cover | 4.3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|-------------|-------------------|---------------------------|
| -- | 5 | Temperature | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

DFG biologists conducted backpack electrofishing in the upper reaches of Twelvemile Brook (near the confluence with Pinnacle Creek) off the Sand Hill Rd bridge crossing in Monson (SampleID 1216) in July 2005. The sample was comprised of fluvial specialists and was dominated by multiple age classes of Eastern brook trout, so this brook is considered a Tier 1 Existing Use Cold Water. MassDEP staff conducted limited water quality monitoring much further downstream ~75 ft downstream from Crane Hill Rd in Wilbraham (W1858) during the summer of 2008. Except for temperature the data were indicative of good conditions: two-day probe deployments in June, July and August 2008 documented a minimum DO of 7.5mg/L (the mean minimum DO ranged from 7.7 to 8.3mg/L during the three deploys), the maximum saturation was 100%, the maximum diel shift was 1.0mg/L. The maximum temperature was 25.7°C with a 24-hour rolling maximum of 23.9°C which slightly exceeded the Tier 1 Existing Use Cold Water criterion of 23.5°C. Too limited data were collected to evaluate chronic temperature criteria exceedances. Discrete pH measurements ranged from 6.8 to 7.1SU (n=5). The Aquatic Life Use for Twelve Mile Brook is assessed as Not Supporting. In the upper reaches this brook supported multiple age classes of Eastern brook trout. Water quality data collected further downstream below

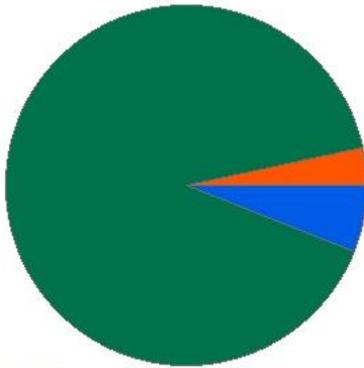
multiple small dams were indicative of good conditions except for temperature which exceeded acute criteria for this Tier 1 Existing Use Cold Water resource, so temperature is being added as an impairment.

UNDERHILL BROOK (MA36-65)

| | |
|----------------------------------|--|
| Location: | From outlet of unnamed pond south of Osborne Road, New Salem to mouth at inlet Quabbin Reservoir, New Salem. |
| AU Type: | RIVER |
| AU Size: | 1.5 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

UNDERHILL BROOK - MA36-65

Watershed Area: 2.15 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 2.15 | 2.15 | 0.61 | 0.61 |
| Agriculture | 0.9% | 0.9% | 2.2% | 2.2% |
| Developed | 3.3% | 3.3% | 2.3% | 2.3% |
| Natural | 89.8% | 89.8% | 85% | 85% |
| Wetland | 5.9% | 5.9% | 10.4% | 10.4% |
| Impervious Cover | 1.2% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in Underhill Brook at the crossing of Underhill Rd and Brown Rd, New Salem (SampleID 2752) in August 2008. The sample was comprised entirely of fluvial specialist species including multiple age classes of Eastern brook trout.

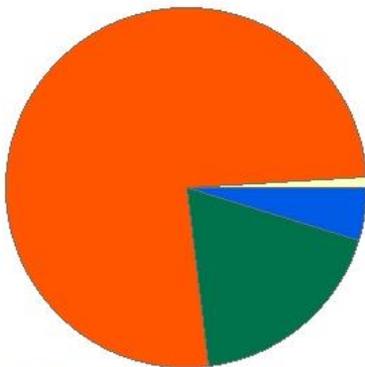
The Aquatic Life Use for Underhill Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-39)

| | |
|----------------------------------|--|
| Location: | Unnamed tributary to the Chicopee River locally known as "Poor Brook" from headwaters near the Conrail tracks, Springfield to mouth at confluence with the Chicopee River, Chicopee. |
| AU Type: | RIVER |
| AU Size: | 2.2 MILES |
| Classification/Qualifier: | B |

Unnamed tributary - MA36-39

Watershed Area: 1.68 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 1.68 | 1.68 | 0.27 | 0.27 |
| Agriculture | 1% | 1% | 0% | 0% |
| Developed | 75.9% | 75.9% | 47.8% | 47.8% |
| Natural | 18.3% | 18.3% | 45.7% | 45.7% |
| Wetland | 4.7% | 4.7% | 6.5% | 6.5% |
| Impervious Cover | 43.6% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------|-------------------|---------------------------|
| 5 | 5 | Trash | | Changed |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDEP staff conducted water quality monitoring in this Unnamed Tributary AU (MA36-39) locally known as "Poor Brook" ~25 ft upstream of the drainage swale that receives non-contact cooling water (MAG250947) discharge, in the cloverleaf of Route 20 eastbound to Route 291 eastbound, Springfield (W2007), ~3 ft downstream from MAG250947 discharge pipe in eastbound cloverleaf of Route 20 to Route 291, Springfield) (W2006), ~20 feet downstream of drainage swale receiving MAG250947 discharge, in eastbound cloverleaf of Rt 20 to Rt 291, Springfield (W2008) and ~50 feet from emergence from culvert downstream from Cottage Street, Springfield (W1865) during the summer of 20008. Long-term (112-day) temperature loggers were deployed (June to October 2008) at the three upstream sites (W2007, W2006, and W2008). There was no evidence of any thermal impact: the maximum temperatures recorded were 25.4, 25.9, and 25.5°C, respectively with 24-hour rolling maximums of 22.7, 21, and 22.5°C, respectively. Limited nutrient sampling was conducted at the most downstream station (W1865) with a seasonal average total phosphorus concentration of 0.072mg/L (n=5, maximum 0.12mg/L) and there were no observations of dense filamentous algae. Two clean metals samples were collected and there were no violations of either acute or chronic criteria in either sample.

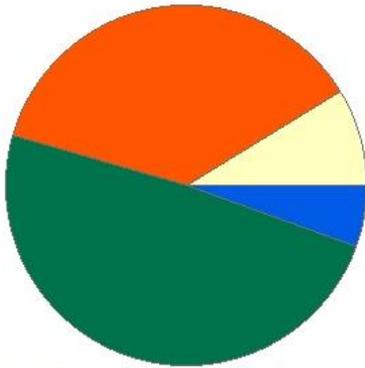
The Aquatic Life Use for this Unnamed Tributary AU (MA36-39) is assessed as Fully Supporting based on the limited water quality data available including the lack of any temperature impacts from the non-contact cooling water discharge. The prior alerts for elevated conductivity and habitat degradation associated with erosion and sedimentation are being carried forward.

Unnamed Tributary (MA36-52)

| | |
|----------------------------------|---|
| Location: | Unnamed tributary to Higher Brook, headwaters north of Route 21, Ludlow to mouth at confluence with Higher Brook, Ludlow. |
| AU Type: | RIVER |
| AU Size: | 1.3 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-52

Watershed Area: 0.57 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.57 | 0.57 | 0.32 | 0.32 |
| Agriculture | 8.7% | 8.7% | 6.3% | 6.3% |
| Developed | 36.8% | 36.8% | 38.6% | 38.6% |
| Natural | 49% | 49% | 48.5% | 48.5% |
| Wetland | 5.5% | 5.5% | 6.6% | 6.6% |
| Impervious Cover | 14.6% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed Tributary AU (MA36-52) is identified as a CFR by DFG. DFG biologists conducted backpack electrofishing in the vicinity of Miller St crossing in Ludlow in September 2012 (SampleID 4140) and July 2007 (SampleID 2106). Both samples were dominated by fluvial specialist species including multiple age classes of Eastern brook trout.

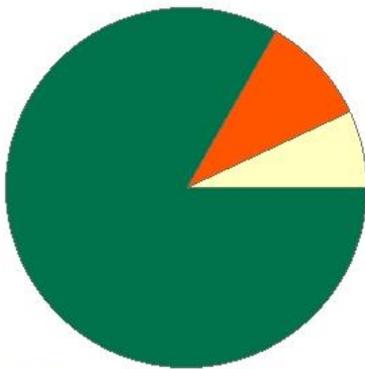
The Aquatic Life Use for this Unnamed Tributary AU (MA36-52), a tributary to Higher Brook, is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-57)

| | |
|----------------------------------|--|
| Location: | Unnamed tributary to Foscett Mill Stream, perennial portion, east of Route 20, Brimfield to mouth at confluence with Foscett Mill Stream, Brimfield. |
| AU Type: | RIVER |
| AU Size: | 0.5 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-57

Watershed Area: 0.78 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.78 | 0.78 | 0.22 | 0.22 |
| Agriculture | 6.9% | 6.9% | 6.7% | 6.7% |
| Developed | 9.7% | 9.7% | 8.7% | 8.7% |
| Natural | 82.7% | 82.7% | 84.4% | 84.4% |
| Wetland | 0.7% | 0.7% | 0.2% | 0.2% |
| Impervious Cover | 2.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed Tributary AU (MA36-57) to Foscett Mill Stream is identified as a CFR by DFG. DFG biologists conducted backpack electrofishing in the brook at the bridge crossing on Old Palmer Rd just past Sutcliff Rd in Monson (SampleID 1220) in July 2005. The sample was dominated by fluvial specialist species including Eastern Brook Trout and slimy sculpin.

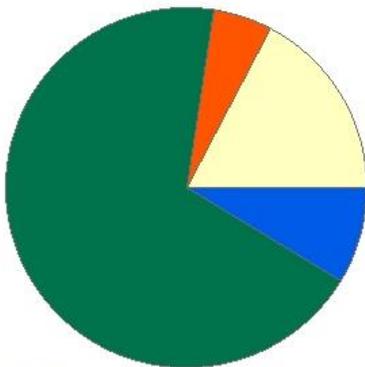
The Aquatic Life Use for this Unnamed Tributary AU (MA36-57) to Foscett Mill Stream is assessed as Fully Supporting based on the presence of fluvial specialist species including Eastern Brook Trout and slimy sculpin which is indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-59)

| | |
|----------------------------------|---|
| Location: | Unnamed tributary to Fivemile River, headwaters north of Moore Road, New Braintree to mouth at confluence with Fivemile River south of Robinson Road, Oakham. |
| AU Type: | RIVER |
| AU Size: | 2 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-59

Watershed Area: 0.87 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.87 | 0.87 | 0.34 | 0.34 |
| Agriculture | 17.2% | 17.2% | 13.1% | 13.1% |
| Developed | 5.3% | 5.3% | 5% | 5% |
| Natural | 68.9% | 68.9% | 67.3% | 67.3% |
| Wetland | 8.6% | 8.6% | 14.7% | 14.7% |
| Impervious Cover | 2.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed Tributary AU (MA36-59) is identified as a CFR by DFG. DFG biologists conducted backpack electrofishing in this Unnamed Tributary to Fivemile River at the Rt 148 crossing south of Robinson Rd in Oakham (SampleID 3376) in July 2010. The sample was dominated by fluvial specialists including multiple age classes of Eastern brook trout.

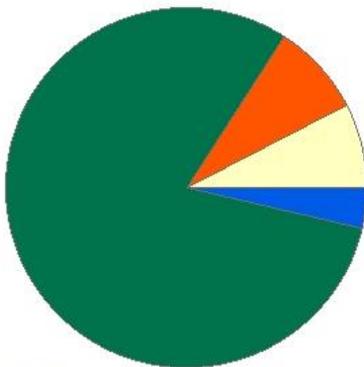
The Aquatic Life Use for this Unnamed Tributary AU (MA36-59) to Fivemile River is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-60)

| | |
|----------------------------------|--|
| Location: | Unnamed tributary to Jabish Brook, headwaters, perennial portion south of Cold Spring Road, Belchertown to mouth at confluence with Jabish Brook, Belchertown. |
| AU Type: | RIVER |
| AU Size: | 1.4 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-60

Watershed Area: 0.65 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.65 | 0.65 | 0.26 | 0.26 |
| Agriculture | 7.5% | 7.5% | 5.2% | 5.2% |
| Developed | 8.4% | 8.4% | 6.7% | 6.7% |
| Natural | 80.5% | 80.5% | 81.3% | 81.3% |
| Wetland | 3.6% | 3.6% | 6.9% | 6.9% |
| Impervious Cover | 2.2% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed Tributary AU (MA36-60) to Jabish Brook is identified as a CFR by DFG. DFG biologists conducted backpack electrofishing in the brook upstream of the Franklin St Ext crossing, just north of Michael Sears Rd in Belchertown (SampleID 2121) in July 2007. The sample was comprised entirely by multiple age classes of Eastern brook trout.

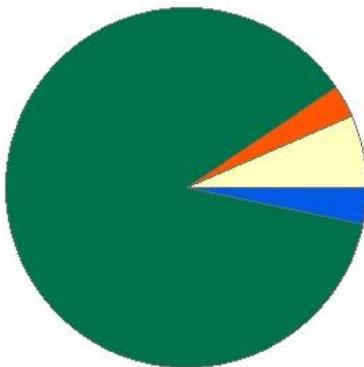
The Aquatic Life Use for this Unnamed Tributary AU (MA36-60) to Jabish Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-70)

| | |
|----------------------------------|---|
| Location: | Unnamed tributary to the Ware River, perennial portion, west of Tucker Road, West Brookfield to mouth at confluence with the Ware River, New Braintree. |
| AU Type: | RIVER |
| AU Size: | 0.9 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-70

Watershed Area: 0.98 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.98 | 0.98 | 0.40 | 0.40 |
| Agriculture | 6.5% | 6.5% | 4.4% | 4.4% |
| Developed | 2.9% | 2.9% | 1.1% | 1.1% |
| Natural | 87.4% | 87.4% | 88.8% | 88.8% |
| Wetland | 3.2% | 3.2% | 5.7% | 5.7% |
| Impervious Cover | 2.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

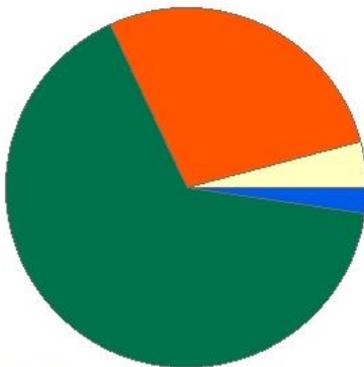
This Unnamed Tributary AU (MA36-70) to the Ware River is identified as a CFR by DFG. DFG biologists conducted backpack electrofishing in the brook at Gilbertville Rd, New Braintree (SampleID 3387) in July 2010. The sample was dominated by fluvial specialist species including multiple age classes of Eastern brook trout. The Aquatic Life Use for this Unnamed Tributary AU (MA36-70) to the Ware River is assessed as Fully Supporting based on the presence of fluvial specialist species including Eastern Brook Trout which is indicative of excellent habitat and water quality conditions.

Unnamed Tributary (MA36-71)

| | |
|----------------------------------|---|
| Location: | Unnamed tributary to the Ware River, headwaters, outlet small unnamed pond west of Dugan Road, Ware to mouth at confluence with the Ware River, Ware. |
| AU Type: | RIVER |
| AU Size: | 1.4 MILES |
| Classification/Qualifier: | B |

Unnamed Tributary - MA36-71

Watershed Area: 0.62 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 0.62 | 0.62 | 0.18 | 0.18 |
| Agriculture | 4.1% | 4.1% | 7.4% | 7.4% |
| Developed | 27.8% | 27.8% | 32.3% | 32.3% |
| Natural | 65.8% | 65.8% | 55.2% | 55.2% |
| Wetland | 2.3% | 2.3% | 5.1% | 5.1% |
| Impervious Cover | 8.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed Tributary AU (MA36-71) to the Ware River is identified as a CFR by DFG. DFG biologists sampled this tributary at Longview Dr across from Teresa's Rest, Rt 32 in Ware (SampleID 1275) in July 2005. The sample was comprised entirely of fluvial specialist species including multiple age classes of Eastern brook trout. The Aquatic Life Use for this Unnamed Tributary AU (MA36-71) to the Ware River is assessed as Fully Supporting based on the presence of fluvial specialist species including the presence of multiple age classes of Eastern Brook Trout which is indicative of excellent habitat and water quality conditions.

Waite Pond (MA36161)

| | |
|----------------------------------|-------------------------|
| Location: | Hubbardston. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 35 ACRES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

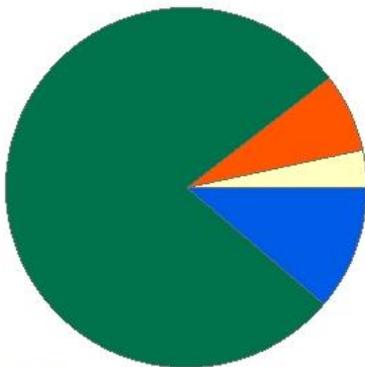
| |
|---|
| Fish, other Aquatic Life and Wildlife Use: Not Assessed |
| There are no recent data available for Waite Pond, so the Aquatic Life Use is Not Assessed. |

Ware River (MA36-03)

| | |
|----------------------------------|---|
| Location: | MDC intake, Barre to dam at South Barre Reservoir (NATID: MA00091), Barre (through former 2008 segments: Powder Mill Pond MA36126 and South Barre Reservoir MA36141). |
| AU Type: | RIVER |
| AU Size: | 2.1 MILES |
| Classification/Qualifier: | B: CWF, HQW |

Ware River - MA36-03

Watershed Area: 99.80 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 99.56 | 8.23 | 25.74 | 1.83 |
| Agriculture | 3.4% | 3.6% | 1.9% | 2.2% |
| Developed | 7% | 9.8% | 5.3% | 10.2% |
| Natural | 78.5% | 79.6% | 71.6% | 75.5% |
| Wetland | 11.2% | 6.9% | 21.2% | 12.1% |
| Impervious Cover | 2.7% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|--------------------------------|-------------------|---------------------------|
| 5 | 5 | Lack of a coldwater assemblage | | Added |
| 5 | 5 | Temperature | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

MassDEP staff conducted water quality monitoring in this Ware River AU (MA36-03) just south of Route 122 at the weir downstream of Shaft #8 water supply intake, Barre (W0494) during the summer of 2008 as well as part of the SMART monitoring program conducted roughly every other month between 2005 and 2013. Probes were deployed for three days in June, July and August 2008. During these deployments the minimum DO was 7.40mg/L (mean minimums ranged from 7.43 to 8.51mg/L during the three deploys), the maximum saturation was 108%, and the maximum diel DO shift was 0.88mg/L. A long term (99-day) temperature logger was also deployed between June and September 2008. The maximum temperature was 26.6°C, and both acute and chronic criteria for designated cold waters were exceeded (the maximum 24-hour rolling average was 25.4°C exceeding the acute cold water criterion of 23.5°C and the 7DADM exceeded 20°C 79 times). The seasonal average total phosphorus concentration was low (0.021mg/L, n=6, maximum 0.044mg/L) and there were no observations of dense filamentous algae noted. Discrete probes measurements at this site during the SMART monitoring (n=54) between 2005 and 2013 can be summarized as follows: minimum DO 6.1mg/L, maximum saturation 108%, maximum temperature 24.8°C, pH ranged from 5.4 to 6.8SU (nine times <6.0SU). Seasonal

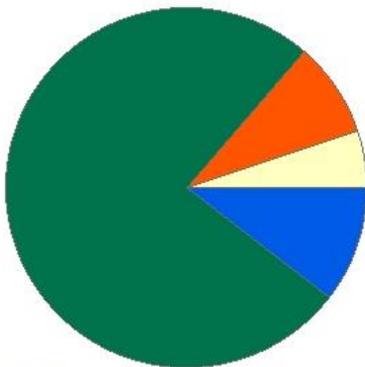
average total phosphorus concentrations were low (range 0.024 to 0.047mg/L. The maximum chloride concentration was only 24 mg/L, and ammonia concentrations were also low (maximum 0.09mg/L). Nutrient sampling was also conducted during the summer 2008 ~20 feet downstream of Vernon Avenue, Barre (W1847). The seasonal average total phosphorus concentration was low (0.026mg/L, n=5 with a maximum of 0.032mg/L) and there were no observations of dense filamentous algae noted. A long-term statistical analysis of total phosphorus data (sites W0494, W1006, and W1847) indicated a statistically significant decrease both seasonally (n=51) and year-round (n=97) between 1998 and 2013. MassDFG biologists conducted backpack electrofishing in this Ware River AU (MA36-03) downstream of the Powder Mill Pond Dam at Vernon Avenue crossing, south of Rt 122 (SampleID 2401) in August 2007 and slightly further downstream conducted boat electrofishing accessed at the dam (SampleID 2330) in September 2007. Both samples contained fluvial specialists/dependent species including both intolerant and moderately tolerant species however no coldwater species were collected. MassDEP staff noted *Potamogeton sp.* in Powder Mill Pond, but species identification is needed. The Aquatic Life Use for this Ware River AU (MA36-03) is assessed as Not Supporting because of elevated water temperature exceeding both acute and chronic criteria for this designated cold water and the lack of cold-water fish during the August 2007 surveys. The presence of dams/impoundments is considered problematic. The other water quality data were indicative of generally good conditions with the occasionally low pH considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands). The alert for *Myriophyllum sp.* in Powder Mill Pond is being carried forward and a recommendation is also being made to identify the species of *Potamogeton* present.

Ware River (MA36-04)

| | |
|----------------------------------|--|
| Location: | Dam at South Barre Reservoir (NATID: MA00091), Barre to Wheelwright Pond Dam (NATID: MA00616), New Braintree/Hardwick (mileage includes length of braids). |
| AU Type: | RIVER |
| AU Size: | 4.9 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Ware River - MA36-04

Watershed Area: 128.94 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 128.70 | 11.21 | 34.24 | 4.55 |
| Agriculture | 5.1% | 13.8% | 3.2% | 9.4% |
| Developed | 8.5% | 16.1% | 7.2% | 15.5% |
| Natural | 76% | 63.6% | 70.6% | 63% |
| Wetland | 10.4% | 6.6% | 19% | 12.1% |
| Impervious Cover | 3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 2 | 4c | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Barre Wastewater Treatment Plant (WWTP) staff collected water from this Ware River AU (MA36-04) at the Route 32 Bridge for use as dilution water in the facility's whole effluent toxicity tests. Between August 2007 and November 2019 survival of *C. dubia* exposed (48 hours and ~7-days) to the Ware River water was $\geq 90\%$ (n=49 at 48 hours, n=27 at ~7 days). Nutrient sampling was conducted by MassDEP staff at the Rt 32 (Wheelwright Rd) crossing in the locality of Barre Plains, Barre (W1869) during the summer of 2008. The seasonal average total phosphorus concentration was low (0.026mg/L, n=5) and there were no observations of dense filamentous algae. MassDFG biologists conducted barge electrofishing downstream of the Rt 32 crossing at the Barre Plains, South Barre (SampleID 2968) in August 2007. The sample was well represented by fluvial specialists/dependents species including both intolerant/moderately tolerant species. MassDEP staff reported an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil) in this reach of the river during a 2017 field survey. The Town of Barre is authorized to discharge an average monthly flow of 0.3MGD of treated effluent to the Ware River (NPDES MA0103152). Between August 2007 and November 2019, whole effluent toxicity (WET) tests conducted using *C. dubia* had LC₅₀'s that ranged from 25% to >100% effluent (n=49). Four tests were acutely toxic to *C. dubia* (not meeting the LC₅₀ limit $\geq 100\%$ effluent. Three of the four acutely toxic samples were in

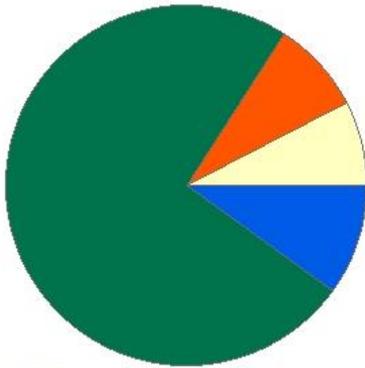
February but no acute toxicity has been detected since February 2010. Results of the *C. dubia* chronic tests (CNOEC) ranged from 25 to 100% effluent (n=26). The Hardwick-Wheelwright Wastewater Treatment Plant (WWTP) staff collected water from the Ware River near the Benjamin Roach Fields off of Route 32, Hardwick for use as dilution water in the facility's whole effluent toxicity tests. Between May 2008 and August 2014 survival of *C. dubia* exposed (48 hours) to the Ware River water was $\geq 95\%$ (n=13). MassDEP staff conducted limited sampling further downstream ~1000 ft upstream from Barre/New Braintree/Hardwick border, Barre (W2010) in August/September 2008. The minimum DO recorded during the five-day probe deployment was 6.5mg/L, the maximum saturation was 88%, the maximum diel DO shift was 1.34mg/L, and the maximum temperature was 20.6°C. A second probe was deployed on this date further downstream ~200 feet upstream of the Wheelwright Pond Dam, Hardwick/New Braintree (W2009). Here the minimum DO was 5.1mg/L (mean minimum 5.64mg/L), the maximum saturation was 81%, the maximum diel DO shift was 1.49mg/L, and the maximum temperature was 21.7°C. The Hardwick-Wheelwright Wastewater Treatment Plant (WWTP) staff changed their dilution water collection location in 2015 to ~300m upstream from the Wheelwright Pond Dam. Between May 2015 and August 2018 survival (48 hours) of *C. dubia* exposed to Ware River water collected at this location was 100% (n=8 tests). The Aquatic Life Use of this Ware River AU (MA36-04), is assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte species *Myriophyllum heterophyllum*. The other data collected were indicative of good conditions (fish community well represented by fluvial and intolerant/moderately tolerant species, survival of *C. dubia* test organisms exposed to water from the river collected at three sites was excellent ($\geq 90\%$ survival), the limited water quality data were indicative of generally good conditions and there was no evidence of nutrient enrichment. The former alerts for acute toxicity in the Barre WWTP discharge and low pH are being removed.

Ware River (MA36-05)

| | |
|----------------------------------|---|
| Location: | Wheelwright Pond Dam (NATID: MA00616), New Braintree/Hardwick to Ware Impoundment dam (NATID: MA00594), Ware. |
| AU Type: | RIVER |
| AU Size: | 11.5 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Ware River - MA36-05

Watershed Area: 165.83 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 165.59 | 6.43 | 46.00 | 2.31 |
| Agriculture | 7.5% | 7.3% | 6.6% | 9.6% |
| Developed | 8.4% | 11.5% | 7.6% | 12.1% |
| Natural | 74.1% | 77.2% | 67.9% | 70.7% |
| Wetland | 9.9% | 4% | 17.9% | 7.6% |
| Impervious Cover | 3% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 5 | 5 | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Except May 2013 (LC₅₀ 70.7% effluent) no evidence of any acute toxicity to *C. dubia* was detected in Hardwick-Wheelwright WPCF treated effluent between May 2008 and Aug 2018 (n=21 tests). MassDEP staff conducted water quality monitoring at four sites along this Ware River AU (MA36-05) during the summer 2008. Data at the most upstream site ~200ft upstream Red Bridge Rd/Hardwick Rd, Hardwick/New Braintree (W2011) can be summarized as follows: min DO during four 2-5 day probe deployments June to Sept 5.9mg/L, max saturation 115%, max diel DO shift 3.06mg/L, max temperature 26.9°C. Discrete pH measurements 6.3 to 6.7SU (n=6). Total phosphorus was low (0.029mg/L) in Sept sample and no dense/very dense filamentous algae was noted. MassDFG biologists conducted barge electrofishing south of Hardwick Rd (SampleID 2969) in Aug 2007. Fluvial specialists/dependents moderately tolerant to pollution dominated the sample. Benthic macroinvertebrates were collected ~425m downstream Red Bridge/Hardwick roads, Hardwick/New Braintree (B0899) in July 2014 as part of MassDEP’s probabilistic wadeable streams monitoring project (MAP2). These data were not analyzed using an RBPIII approach so will be used in a future reporting cycle. The non-native aquatic macrophyte, *Myriophyllum heterophyllum* (Variable-leaf milfoil) was observed in the river in 2014. Sampling conducted further downstream at Creamery Rd/Unitas Rd, Hardwick/New Braintree (W1008) summer 2008 can be summarized as follows: min DO 5.9mg/L, max saturation 120%, max diel DO shift 3.66mg/L, max temp 26.8°C. Discrete pH measurements 6.3 to 7.1SU (n=6). The seasonal average total phosphorus concentration was 0.036mg/L (max 0.046mg/L) and there were no observations of dense or very dense filamentous algae. Macroinvertebrates were also collected ~150m downstream from Bridge St, Hardwick (B0669) in Sept 2008. The RBPIII analysis indicated the benthos were “not impacted” (100% comparable) when compared to

the East Branch Swift River reference site (B0654). MassDFG biologists conducted backpack electrofishing in the river at Bridge St (SampleID 2418) in Aug 2007. The sample was dominated by fluvial specialists/dependents moderately tolerant to pollution. Sampling data at Old Gilbertville Rd/Bridge St, Ware/Hardwick (W1866) can be summarized as follows: min DO 7.2mg/L, max saturation 102%, max diel DO shift 0.82mg/L, max temperature 27.54°C. Discrete pH measurements 6.7 to 7.1SU (n=6). The seasonal average total phosphorus concentration 0.079mg/L (max 0.24mg/L) with no observations of dense or very dense filamentous algae. Between May 2008 and Aug 2018 *C. dubia* survival (48 hours) exposed to Ware River water collected just upstream from Hardwick Gilbertville WPCF discharge in Hardwick (diluent for facility's WET tests) was $\geq 75\%$ (n=22 tests). Except for Aug 2008 (LC₅₀ =70.7% effluent), no acute toxicity was detected in the effluent discharge. Water quality data downstream from this discharge at Upper Church St, Ware (W1009) data can be summarized as follows: min DO 7.7mg/L, max saturation 112%, max diel DO shift 2.15mg/L, max temperature 23.1°C. Discrete pH measurement range 6.7 to 7.3SU (n=4) with one observation of dense filamentous algae.

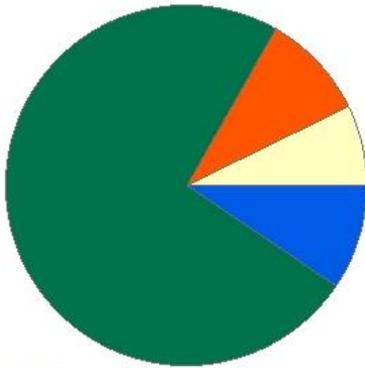
The Aquatic Life Use for this Ware River AU (MA36-05) is assessed as Not Supporting due to the infestation of the non-native aquatic macrophyte species *M. heterophyllum* so the generic non-native aquatic plants impairment is being added. The benthic, fish and water quality data were indicative of generally good conditions except for diel DO shifts above 3mg/L in July at two sites (one indicator of nutrient enrichment although no others were found). Since the seasonal average total phosphorus concentrations were <0.1mg/L (i.e. below EPA recommended concentrations for flowing waters), so the former alert for total phosphorus is being removed. The alert for acute toxicity in both Hardwick WPCFs (Wheelwright and Gilbertville discharges) is also being removed.

Ware River (MA36-06)

| | |
|----------------------------------|--|
| Location: | Ware Impoundment dam (NATID: MA00594), Ware to Thorndike Dam (NATID: MA00563), Palmer. |
| AU Type: | RIVER |
| AU Size: | 10.1 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Ware River - MA36-06

Watershed Area: 214.70 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 214.46 | 7.73 | 58.03 | 1.63 |
| Agriculture | 7.2% | 5.4% | 6.7% | 4.7% |
| Developed | 9.5% | 20.5% | 8.7% | 22% |
| Natural | 73.9% | 69.6% | 67.2% | 63.8% |
| Wetland | 9.4% | 4.5% | 17.3% | 9.5% |
| Impervious Cover | 3.4% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------------------|-------------------|---------------------------|
| 5 | 5 | (Non-Native Aquatic Plants*) | | Added |

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)

Survival (~7-day) of *C. dubia* exposed to Ware River water collected in this Ware River AU (MA36-06) downstream of South Street, Ware (used as site control water in the Ware WWTP whole effluent toxicity tests between Aug 2007 and November 2019) was $\geq 80\%$ in all but one test (February 2011 when survival was 60%) (n=52). Modified acute and chronic whole effluent toxicity tests were conducted on the Ware WWTP treated effluent between Aug 2007 and November 2019 (n=51 valid tests). Except for the November 2012 test (LC₅₀ =66% effluent), all other *C. dubia* tests were not acutely toxic with LC₅₀'s >100 % effluent. Of the 44 valid chronic tests, all but eight met the CNOEC limits of 7 or 10% effluent. Four of the eight tests not in compliance were in February (2008, 2009, 2011, 2014). It should also be noted that all valid tests after February 2014 have met the CNOEC permit limit. In July 2014, MassDEP biologists collected benthic macroinvertebrates samples from the Ware River ~685 meters upstream from Palmer Road (Route 32), Ware (B0898) as part of the MassDEP probabilistic wadeable streams monitoring project (MAP2). These data were not analyzed using an RBPIII approach, but rather will be compared to biocriteria thresholds (currently under development) so these data will be used in a future reporting cycle. Benthic macroinvertebrates were also collected ~120 meters downstream/west from Route 32, Ware (B0104) in Sept 2008. The RBP analysis indicated the benthic community was "not impacted" (100% comparable) when compared to the East Branch Swift River reference

station (B0654). Infestations the non-native aquatic macrophyte species, *Myriophyllum heterophyllum* (Variable-leaf milfoil) were observed in the Ware River at Route 32/Gibbs Crossing, Ware. *Potamogeton* sp. was also noted. MassDEP staff also conducted water quality monitoring at Route 32 at Gibbs Crossing, Ware (W0492) during summer 2008 as well as part of the SMART monitoring program almost every other month between 2005 and April 2013. During summer 2008 probes were deployed four times for two days between June and Aug. The min DO was 6.1mg/L, the max saturation was 122%, the max diel DO shift was 2.83mg/L, and the max temperature was 27.0°C. Discrete pH measurements ranged from 6.9-7.3SU (n=6). The seasonal avg TP concentration was 0.026mg/L and there were no observations of dense filamentous algae. Discrete data collected during the SMART monitoring program here (station WA09A) can be summarized as follows (n=46 sampling events): lowest dissolved oxygen 7.9 mg/L, max saturation 113%, max temperature 25.1°C, pH range 6.2 to 7.5SU, and seasonal avg TP concentrations ranged from 0.028 to 0.046mg/L. The max ammonia and chloride concentrations were low (0.12 and 33 mg/L, respectively). Further downstream at Summer Street crossing, Palmer (W1872) a limited amount of sampling was conducted during summer 2008. The min DO was 6.4mg/L, the max saturation was 92%, the max temperature was 25.3°C, and pH ranged from 6.5-6.8SU (n=5). The seasonal avg TP concentration was 0.03mg/L (n=5) and there was one observation of dense filamentous algae. Statistically significant decreases in TP have occurred between 1998 and 2013 both annually and seasonally (stations W0492 and W1872) in this Ware River AU (MA36-06).

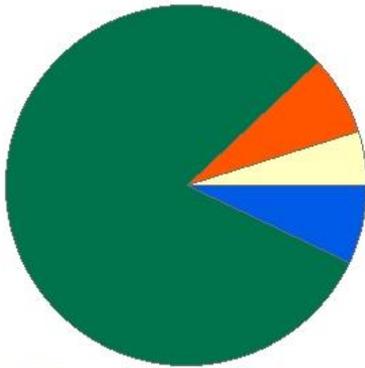
The Aquatic Life Use for this Ware River AU (MA36-06) is assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte species *Myriophyllum heterophyllum* so the non-native aquatic plants impairment is being added (no species-specific code is available). The benthic and water quality data were generally indicative of good conditions. The former alert for whole effluent toxicity in the Ware WWTP discharge is being removed since no problems have been noted after February 2014. An Alert is being identified due to the possibility of an infestation of *Potamogeton crispus*, but species identity needs to be confirmed.

Ware River (MA36-07)

| | |
|----------------------------------|--|
| Location: | Thorndike Dam (NATID: MA00563), Palmer to mouth at confluence with Quaboag River (forming headwaters of Chicopee River), Palmer. |
| AU Type: | RIVER |
| AU Size: | 2.5 MILES |
| Classification/Qualifier: | B: WWF, CSO |

Ware River - MA36-07

Watershed Area: 433.79 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 432.75 | 10.37 | 100.98 | 2.65 |
| Agriculture | 4.9% | 9.4% | 4.7% | 7.9% |
| Developed | 7% | 25.8% | 6.7% | 23.6% |
| Natural | 81.1% | 59.1% | 73.8% | 59% |
| Wetland | 7.1% | 5.8% | 14.8% | 9.4% |
| Impervious Cover | 2.6% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

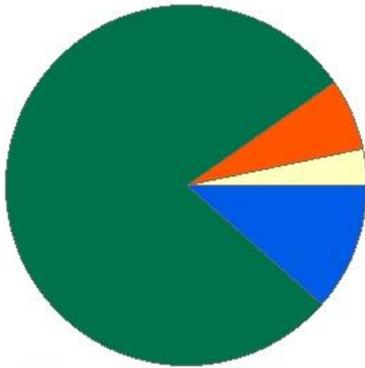
MassDEP staff conducted water quality monitoring in this Ware River AU (MA36-07) at Route 181, Palmer (W1014) during the summer of 2008. MassDEP staff noted the presence of *Potamogeton sp.* Three two-day probe deployments were made in June, July and August. The minimum DO recorded was 6.92mg/L, the maximum saturation was 100%, the maximum diel DO shift was 1.02mg/L, and the maximum temperature was 26.7°C. Discrete pH measurements ranged from 6.8 to 7.3SU (n=6). The seasonal average total phosphorus concentration was 0.03mg/L (n=5) and there were no observations of dense filamentous algae. The Aquatic Life Use for this Ware River AU (MA36-07) will continue to be assessed as Fully Supporting based on the good water quality conditions documented during the summer of 2008. An Alert is being identified due to the possibility of an infestation of *Potamogeton crispus*, but species identity needs to be confirmed.

Ware River (MA36-27)

| | |
|----------------------------------|---|
| Location: | Confluence of East Branch Ware and West Branch Ware rivers, Barre to MDC intake, Barre. |
| AU Type: | RIVER |
| AU Size: | 4.9 MILES |
| Classification/Qualifier: | A: PWS, ORW |

Ware River - MA36-27

Watershed Area: 96.26 square miles



Percent Agriculture Percent Natural
 Percent Developed Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 96.02 | 13.93 | 24.94 | 3.25 |
| Agriculture | 3.2% | 1% | 1.8% | 0.5% |
| Developed | 6.5% | 2.8% | 4.8% | 1.9% |
| Natural | 78.9% | 84.3% | 71.7% | 72.1% |
| Wetland | 11.4% | 11.8% | 21.7% | 25.5% |
| Impervious Cover | 2.6% | | | |

| 2016 AU Category | 2018/20 AU Category | Impairment | ATTAINS Action ID | Impairment Change Summary |
|------------------|---------------------|------------------|-------------------|---------------------------|
| 5 | 2 | Dissolved Oxygen | | Removed |
| 5 | 2 | Temperature | | Removed |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DCR staff conducted water quality monitoring in this Ware River AU (MA36-27) at Barre Falls (station 105) 1-3 times per month in 2008, 2012, and 2016. The minimum dissolved oxygen measured was 5.33mg/L (n=70 with only four measurements (~6%) <6.0mg/L – three times in 2008 and once in 2012), the maximum temperature was 25.8°C (n=70), and pH ranged from 5.5 to 6.9SU (n=77 with 21 measurements <6.0SU). The seasonal average total phosphorus concentrations were low (range 0.033 to 0.038mg/L) (overall maximum only 0.048mg/L). The maximum ammonia concentration was also very low (0.0402mg/L). Further downstream MassDEP staff conducted water quality monitoring further downstream east of Riverside Cemetery ~175 feet downstream from the dilapidated crossing of Covered Bridge Road, Barre (W1877) during the summer of 2008. Probes were deployed for three days each in June, July and August. The minimum DO was 6.26mg/L (mean minimum DOs ranged from 6.47 to 7.74mg/L during the three deploys), the maximum DO saturation was 98%, the maximum diel DO shift was only 0.82mg/L. The maximum temperature recorded was 27.3°C during the long-term (99-day) thermistor deployment (the maximum 7DADM was 26.2°C and the maximum 24-hour average was 25.6°C meeting both acute chronic and criterion for a warm water fishery). Discrete pH measurements ranged from 6.1 to 6.6SU (n=6). DCR staff also conducted sampling 1-

3 times per month from 2008 to 2019 at Riverside Cemetery (station 103A). Dissolved oxygen measurements were <5.0mg/L on only four of 272 sampling events (minimum 4.14mg/L, the maximum temperature was 23.3°C (n=273), and pH ranged from 4.4to 6.9SU (n=273 with 131 measurements <6.0SU). Total phosphorus samples were collected 2-6 times per year. The seasonal average concentrations (usually from two samples) were low (0.019 to 0.039mg/L) the overall maximum was only 0.045mg/L. Low concentrations of ammonia-nitrogen and chlorides were also measured (maximum ammonia 0.027mg/L (n=29), maximum chloride only 20.7mg/L (n=21), none of which exceeded any acute or chronic criteria. DCR staff also conducted water quality monitoring in the Ware River at Shaft #8 (station 101). The minimum dissolved oxygen measured (sampling 2-3 times/month in 2018 and 2019) was 7.72mg/L (n=46), the maximum temperature was 25.7°C (n=46) and pH ranged from 5.0 to 7.0SU (n=46 with 15 measurements <6.0SU). Total phosphorus sampling was conducted four times per year between 2012 and 2019. The seasonal average total phosphorus concentrations (usually n=2) ranged from 0.022 to 0.036mg/L with an overall maximum concentration of 0.043mg/L. Low concentrations of ammonia-nitrogen and chlorides were also measured (maximum ammonia 0.031mg/L (n=30), maximum chloride only 24.5mg/L (n=13), none of which exceeded any acute or chronic criteria.

The Aquatic Life Use for this Ware River AU (MA36-27) is assessed as Fully Supporting based on the MassDEP data collected during the summer of 2008 and DCR data collected at three sites along this section of the river between 2008 and 2019 which were indicative of good conditions for a Warm Water (the Ware River is not designated Cold Water in the MA SWQS nor is it identified as a cold water resource water by DFG biologists). The dissolved oxygen and temperature impairments are being delisted (see additional information in removal comments). Low pH was frequently measured and although is considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands), it is being identified as an Alert issue. There was no indication of any nutrient enrichment or toxic pollutants.

| 2018/20 Delisted Impairment | Delisting Reason | Delisting Comment |
|-----------------------------|--|--|
| Dissolved Oxygen | Applicable WQS attained; based on new data | Low DO was originally listed as an impairment for this Ware River AU (MA36-27) in the 2002 reporting cycle based on data collected by DCR every other week between 1995 and 1999 at Barre Falls, Barre (station 105). At the time the lowest DO was 3.7mg/L with four of the 101 measurements (~4%) <6.0mg/L. These conditions were associated with low flow conditions. More recently the minimum DO measured by DCR staff 1-3 times per month at this same location in 2008, 2012, and 2016 was 5.33mg/L (n=70 with four measurements (~6%) <6.0mg/L – three times in 2008 and once in 2012). In terms of spatial coverage additional DO monitoring has also been conducted. Probes were deployed in the river east of Riverside Cemetery in Barre (W1877) during the summer of 2008 for three days each in June, July and August. The minimum DO was 6.26mg/L (mean minimum DOs ranged from 6.47 to 7.74mg/L during the three deploys). DCR staff also measured DO one to three times per month from 2008 to 2019 at Riverside Cemetery (station 103A) finding only nine of 272 measurements (~3% of the samples) <6.0mg/L (minimum 4.14mg/L). Further downstream the minimum DO measured by DCR staff 2-3 times per month in 2018 and 2019 at Ware River Shaft #8 was excellent (7.72mg/L, n=46). Given the very infrequent (less than 10%) excursions of DO <6.0mg/L in this Class A waterbody and all minimum DOs were above |

| 2018/20 Delisted Impairment | Delisting Reason | Delisting Comment |
|-----------------------------|---|--|
| | | the one-day minimum for warm waters (4.0mg/L as described in the 2018 CALM Guidance Manual), the dissolved oxygen impairment is being delisted for this Ware River AU (MA36-27). |
| Temperature | Applicable WQS attained; original basis for listing was incorrect | Temperature was first identified as an impairment in this Ware River AU (MA36-27) during the 2002 reporting cycle based on data collected by DCR staff every other week between 1995 and 1999 at Barre Falls, Barre (station 105). At the time the highest temperature measured by MDC in this segment of the Ware River was 27°C which met warm water standards and should not have being identified as an impairment. The Ware River is not a designated Cold Water habitat in the MA SWQS nor is it identified as a Coldwater Fish Resource (CFR) water by DFG biologists. Most recently the maximum temperature measured by DCR staff 1-3 times per month at this same location in 2008, 2012, and 2016 was 25.8°C (n=70) which also all meet warmwater criteria so the temperature impairment is being delisted for this Ware River AU (MA36-27). |

Supporting Information for Delisted Impairments

Dissolved Oxygen

Data sources: (MassDCR Undated, MassDEP Undated)

DCR staff collected water quality data 1-3 times per month in 2008, 2012, and 2016 at the Ware River (MA36-27) at station 105 (Ware River, Barre Falls). Dissolved oxygen readings were obtained on 70 occasions with 0 recordings < 5.0 mg/L. QUABBIN 105:

| Row Labels | Dissolved Oxygen | | | Dissolved Oxygen Total | pH | | | pH Total | Water Temperature | | | Water Temperature Total |
|-------------------------|------------------|-------|-------|------------------------|------|------|------|----------|-------------------|-------|-------|-------------------------|
| | 2008 | 2012 | 2016 | | 2008 | 2012 | 2016 | | 2008 | 2012 | 2016 | |
| 105 | | | | | | | | | | | | |
| Count of FinalResult | 18 | 26 | 26 | 70 | 25 | 26 | 26 | 77 | 18 | 26 | 26 | 70 |
| Min of FinalResult4 | 5.33 | 5.75 | 6.27 | 5.33 | 5.5 | 5.76 | 5.73 | 5.5 | 0.1 | 0.22 | 0.04 | 0.04 |
| Max of FinalResult3 | 13.37 | 14.51 | 14.38 | 14.51 | 6.9 | 6.31 | 6.54 | 6.9 | 25.61 | 25.83 | 25.82 | 25.83 |
| Average of FinalResult2 | 8.56 | 10.24 | 10.09 | 9.75 | 6.17 | 6.05 | 6.23 | 6.15 | 13.69 | 10.70 | 10.51 | 11.40 |

Samples <6.0mg/L:

| Site | StationDescription | UniquelD | SampleDateTime | FlowCondition | Parameter | Units | FinalResult |
|------|-------------------------|------------------------------|----------------|---------------|------------------|-------|-------------|
| 105 | Ware River, Barre Falls | 105_2008-06-10 12:00:00_LDOD | 6/10/2008 | -- | Dissolved Oxygen | mg/L | 5.93 |
| 105 | Ware River, Barre Falls | 105_2008-07-08 12:00:00_LDOD | 7/8/2008 | -- | Dissolved Oxygen | mg/L | 5.46 |
| 105 | Ware River, Barre Falls | 105_2008-07-22 12:00:00_LDOD | 7/22/2008 | -- | Dissolved Oxygen | mg/L | 5.33 |
| 105 | Ware River, Barre Falls | 105_2012-08-28 12:00:00_LDOD | 8/28/2012 | -- | Dissolved Oxygen | mg/L | 5.75 |

Data Sources: (MassDEP Undated, MassDEP Undated)

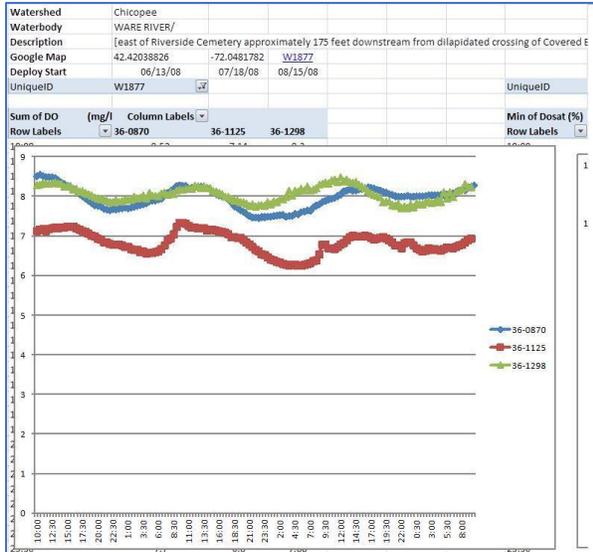
2008 Multiprobe Data of MassDEP Site W1877 Ware River [east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre]

| Unique ID | Gear Type | Project Name | OWMIDs Used to Build File | |
|---|--|-----------------|---------------------------|-------------------------|
| W1877 | Data Sonde | Chicopee (2008) | 36-0870, 36-1125, 36-1298 | |
| Station ID | Station Description | Mile Point | Latitude (dec-degrees) | Longitude (dec-degrees) |
| 103A | [east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre] | | 42.42036826 | -72.04817823 |
| Watershed | SARIS_PALIS_CAMIS | Water Body | | |
| Chicopee | 3626500 | WARE RIVER/ | | |
| Station File Start Time | 6/13/2008 10:00 AM | | | |
| Station File End Time | 8/18/2008 9:30 AM | | | |
| Total Station File Duration (Hours) | 1583.5 | | | |
| Total Station File Count | 3168 | | | |
| Analytes | | | | |
| | Temperature (Celsius) | DO (mg/L) | DOsat (%) | |
| Observed Deployment Time (Hours) | 215.0 | 215.0 | 215.0 | |
| Observed Count | 433 | 433 | 433 | |
| Avg* | 21.6 | 7.6 | 87 | |
| SD* | 2.4 | 0.6 | 5 | |
| Min* | 17.6 | 6.3 | 74 | |
| Max* | 26.3 | 8.6 | 98 | |
| Median* | 21.1 | 7.9 | 88 | |
| IQR* | 4.1 | 1.1 | 4 | |
| Mean of the Daily Mean* | 21.7 | 7.6 | | |
| Mean of the Daily Min* | 20.0 | 7.2 | | |
| Mean of the Daily Max* | 23.7 | 7.9 | | |
| MWAT* | -- | | | |
| Amount of Time > 20 deg. C (Hours) | 144.5 | | | |
| Max Duration > 20 deg. C (Hours) | 71.5 | | | |
| Avg Daily Amount of Time > 20 deg. C (Hours) | 17.5 | | | |
| Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Max Duration > 28.3 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Max Duration > 29.4 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 3.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 4.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 5.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 6.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |
| <i>Units are those of the analyte listed. SD is unitless.</i> | | | | |

DO probe data summary:

| Unique ID | Waterbody | AU_Class | Qualifier | Start.Date | Days | OWMID.Minimum .DO | Daily Mean Minimum DO | Maximum Daily DO Shift | OWMID Mean DO | OWMID Maximum Saturation | Violates Criteria |
|-----------|------------|----------|-----------|------------|------|-------------------|-----------------------|------------------------|---------------|--------------------------|-------------------|
| W1877 | WARE RIVER | A | PWS, ORW | 06/13/08 | 3 | 7.47 | 7.66 | 0.82 | 7.97 | 97.7 | None |
| W1877 | WARE RIVER | A | PWS, ORW | 07/18/08 | 3 | 6.26 | 6.47 | 0.81 | 6.84 | 90.2 | None |
| W1877 | WARE RIVER | A | PWS, ORW | 08/15/08 | 3 | 7.72 | 7.74 | 0.78 | 8.07 | 94.8 | None |

DO probe deployment graph:



Attended probes measurements were conducted at station W1877 during the sampling season. Dissolved oxygen readings were obtained on 6 occasions with 0 measurements <4 mg/L (MassDEP Undated):

| Watershed | Waterbody | UNIQUE_ID | DESCRIPTOR | DATE | TIME | FLOWSTAT | DEPTH | TEMP | PH | SPCOND | DO | DOSAT | ResComm |
|-----------|------------|-----------|------------------|-----------|-------------|----------|-------|------|-----|--------|-----|-------|---------|
| Chicopee | Ware River | W1877 | [east of Riversi | 6/13/2008 | 9:52:02 AM | Flowing | 0.5 | 19.4 | 6.6 | 108 | 8.1 | 88 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 6/16/2008 | 10:16:04 AM | Flowing | 0.4 | 18.1 | 6.5 | 99 | 8.0 | 86 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 7/18/2008 | 9:43:33 AM | Flowing | -- | 22.2 | 6.4 | 104 | 7.2 | 84 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 7/21/2008 | 9:34:34 AM | Flowing | -- | 23.0 | 6.4 | 92 | 7.0 | 83 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 8/15/2008 | 9:34:32 AM | ** | -- | 18.0 | 6.1 | 55 | 7.9 | 85 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 8/18/2008 | 9:49:30 AM | ** | -- | 18.6 | 6.1 | 63 | 8.1 | 88 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 6/18/2008 | 4:05:00 PM | Flowing | -- | 19.6 | -- | -- | -- | -- | |
| Chicopee | Ware River | W1877 | [east of Riversi | 9/26/2008 | 11:12:00 AM | Flowing | -- | 13.6 | -- | -- | -- | -- | |

Data Sources: (MassDEP Undated, MassDEP Undated)

DCR staff collected water quality data 1-3 times per month in most months from 2008-2019 at the Ware River (MA36-27) at station 103A (Ware River @ Riverside Cemetery). Dissolved oxygen readings were obtained on 272 occasions with 4 recordings < 5.0 mg/L. QUABBIN 103A:

| Column Labels | Dissolved Oxygen Total | | | | | | | | | | | | |
|-------------------------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Row Labels | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| 103A | | | | | | | | | | | | | |
| Count of FinalResult | 18 | 20 | 25 | 21 | 26 | 23 | 25 | 22 | 26 | 26 | 23 | 17 | 272 |
| Min of FinalResult4 | 6.89 | 7.36 | 6.18 | 7.62 | 6.28 | 7.36 | 6.89 | 4.16 | 5.31 | 7.64 | 4.14 | 6.46 | 4.14 |
| Max of FinalResult3 | 14.83 | 13.37 | 14.48 | 16.61 | 15.11 | 15.74 | 24.5 | 19.08 | 14.53 | 14.47 | 15.18 | 15.19 | 24.5 |
| Average of FinalResult2 | 9.79 | 9.64 | 10.40 | 10.89 | 11.03 | 10.84 | 13.57 | 10.24 | 10.31 | 10.92 | 10.21 | 10.54 | 10.75 |

DCR DO data at 103A <6.0mg/L:

| Waterbody | Site | UniqueID | SampleDateTime | FlowCondition | Parameter | Units | FinalResult |
|------------|------|-------------------------------|----------------|---------------|------------------|-------|-------------|
| Ware River | 103A | 103A_2015-07-14 12:00:00_LD0d | 7/14/2015 | -- | Dissolved Oxygen | mg/L | 5.21 |
| Ware River | 103A | 103A_2015-07-28 12:00:00_LD0d | 7/28/2015 | -- | Dissolved Oxygen | mg/L | 4.94 |
| Ware River | 103A | 103A_2015-08-11 12:00:00_LD0d | 8/11/2015 | -- | Dissolved Oxygen | mg/L | 4.88 |
| Ware River | 103A | 103A_2015-08-25 12:00:00_LD0d | 8/25/2015 | -- | Dissolved Oxygen | mg/L | 4.16 |

| | | | | | | | |
|------------|------|-------------------------------|-----------|----|------------------|------|------|
| Ware River | 103A | 103A_2016-06-28 12:00:00_LDOD | 6/28/2016 | -- | Dissolved Oxygen | mg/L | 5.66 |
| Ware River | 103A | 103A_2016-07-26 12:00:00_LDOD | 7/26/2016 | -- | Dissolved Oxygen | mg/L | 5.31 |
| Ware River | 103A | 103A_2016-08-09 12:00:00_LDOD | 8/9/2016 | -- | Dissolved Oxygen | mg/L | 5.74 |
| Ware River | 103A | 103A_2018-07-10 08:43:11_LDOD | 7/10/2018 | -- | Dissolved Oxygen | mg/L | 5.65 |
| Ware River | 103A | 103A_2018-09-04 08:47:00_LDOD | 9/4/2018 | -- | Dissolved Oxygen | mg/L | 4.14 |

DCR staff collected water quality data 2-3 times per month in 2018 and 2019 at the Ware River (MA36-27) at station 101 (Ware River Shaft #8). Dissolved oxygen readings were obtained on 46 occasions with 0 recordings < 5.0 mg/L. QUABBIN 101:

| Row Labels | Dissolved Oxygen | | Dissolved Oxygen Total | pH | | pH Total | Water Temperature | | Water Temperature Total |
|-------------------------|------------------|-------|------------------------|------|------|----------|-------------------|-------|-------------------------|
| | 2018 | 2019 | | 2018 | 2019 | | 2018 | 2019 | |
| 101 | | | | | | | | | |
| Count of FinalResult | 26 | 20 | 46 | 26 | 20 | 46 | 26 | 20 | 46 |
| Min of FinalResult4 | 7.72 | 8.15 | 7.72 | 5.03 | 6.04 | 5.03 | -0.06 | -0.2 | -0.2 |
| Max of FinalResult3 | 15.84 | 16.07 | 16.07 | 6.43 | 7.07 | 7.07 | 25.68 | 22.45 | 25.68 |
| Average of FinalResult2 | 11.69 | 12.04 | 11.84 | 5.75 | 6.56 | 6.10 | 10.36 | 9.95 | 10.18 |

Temperature

Data sources: (MassDCR Undated, MassDEP Undated)

DCR staff collected water quality data 1-3 times per month in 2008, 2012, and 2016 at the Ware River (MA36-27) at station 105 (Ware River, Barre Falls). 70 discrete temperature readings, 0 of which failed warmwater criteria, were measured. QUABBIN 105:

| Row Labels | Dissolved Oxygen | | | Dissolved Oxygen Total | pH | | | pH Total | Water Temperature | | | Water Temperature Total |
|-------------------------|------------------|-------|-------|------------------------|------|------|------|----------|-------------------|-------|-------|-------------------------|
| | 2008 | 2012 | 2016 | | 2008 | 2012 | 2016 | | 2008 | 2012 | 2016 | |
| 105 | | | | | | | | | | | | |
| Count of FinalResult | 18 | 26 | 26 | 70 | 25 | 26 | 26 | 77 | 18 | 26 | 26 | 70 |
| Min of FinalResult4 | 5.33 | 5.75 | 6.27 | 5.33 | 5.5 | 5.76 | 5.73 | 5.5 | 0.1 | 0.22 | 0.04 | 0.04 |
| Max of FinalResult3 | 13.37 | 14.51 | 14.38 | 14.51 | 6.9 | 6.31 | 6.54 | 6.9 | 25.61 | 25.83 | 25.82 | 25.83 |
| Average of FinalResult2 | 8.56 | 10.24 | 10.09 | 9.75 | 6.17 | 6.05 | 6.23 | 6.15 | 13.69 | 10.70 | 10.51 | 11.40 |

Data Sources: (MassDEP Undated, MassDEP Undated)

2008 Multiprobe Data of MassDEP Site W1877 Ware River [east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre]:

| Unique ID | Gear Type | Project Name | OWMIDs Used to Build File | |
|--|--|-----------------------|---------------------------|-------------------------|
| W1877 | Data Sonde | Chicopee (2008) | 36-0870, 36-1125, 36-1298 | |
| Station ID | Station Description | Mile Point | Latitude (dec-degrees) | Longitude (dec-degrees) |
| 103A | [east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre] | | 42.42038826 | -72.04817823 |
| Watershed | SARIS_PALIS_CAMIS | Water Body | | |
| Chicopee | 3626500 | WARE RIVER/ | | |
| Station File Start Time | 6/13/2008 10:00 AM | | | |
| Station File End Time | 8/18/2008 9:30 AM | | | |
| Total Station File Duration (Hours) | 1583.5 | | | |
| Total Station File Count | 3168 | | | |
| | | Analytes | | |
| | | Temperature (Celsius) | DO (mg/L) | DOsat (%) |
| Observed Deployment Time (Hours) | 215.0 | 215.0 | 215.0 | |
| Observed Count | 433 | 433 | 433 | |
| Avg* | 21.6 | 7.6 | 87 | |
| SD* | 2.4 | 0.6 | 5 | |
| Min* | 17.6 | 6.3 | 74 | |
| Max* | 26.3 | 8.6 | 98 | |
| Median* | 21.1 | 7.9 | 88 | |
| IQR* | 4.1 | 1.1 | 4 | |
| Mean of the Daily Mean* | 21.7 | 7.6 | | |
| Mean of the Daily Min* | 20.0 | 7.2 | | |
| Mean of the Daily Max* | 23.7 | 7.9 | | |
| MWAT* | -- | | | |
| Amount of Time > 20 deg. C (Hours) | 144.5 | | | |
| Max Duration > 20 deg. C (Hours) | 71.5 | | | |
| Avg Daily Amount of Time > 20 deg. C (Hours) | 17.5 | | | |
| Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Max Duration > 28.3 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 28.3 deg. C (Hours) | 0.0 | | | |
| Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Max Duration > 29.4 deg. C (Hours) | 0.0 | | | |
| Avg Daily Amount of Time > 29.4 deg. C (Hours) | 0.0 | | | |
| Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 3.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 3.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 4.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 4.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 5.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 5.0 mg/L (Hours) | | 0.0 | | |
| Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |
| Max Duration < 6.0 mg/L (Hours) | | 0.0 | | |
| Avg Daily Amount of Time < 6.0 mg/L (Hours) | | 0.0 | | |
| <i>*Units are those of the analyte listed. SD is unitless.</i> | | | | |

2008 Temperature Probe Data of MassDEP Site W1877 Ware River [east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre] (MassDEP Undated)

| Unique ID | Gear Type | Project Name | OVMIDs Used to Build File | |
|--|--|-----------------|---------------------------|-------------------------|
| W1877 | Temperature Logger | Chicopee (2008) | 36-1608 | |
| Station ID | Station Description | Mile Point | Latitude (dec-degrees) | Longitude (dec-degrees) |
| 103A | (east of Riverside Cemetery approximately 175 feet downstream from dilapidated crossing of Covered Bridge Road, Barre) | | 42.42038826 | -72.04817823 |
| Watershed | SARIS_PALIS_CAMIS | Water Body | | |
| Chicopee | 3626500 | WARE RIVER/ | | |
| Station File Start Time | 6/18/2008 4:30 PM | | | |
| Station File End Time | 9/26/2008 11:00 AM | | | |
| Total Station File Duration (Hours) | 2394.5 | | | |
| Total Station File Count | 4790 | | | |
| Analytes | | | | |
| | Temperature (Celsius) | DO (mg/L) | DOsat (%) | |
| Observed Deployment Time (Hours) | 2394.5 | 0.0 | 0.0 | |
| Observed Count | 4790 | 0 | 0 | |
| Avg* | 20.4 | -- | -- | |
| SD* | 2.8 | -- | -- | |
| Min* | 11.6 | -- | -- | |
| Max* | 27.3 | -- | -- | |
| Median* | 20.5 | -- | -- | |
| IQR* | 3.2 | -- | -- | |
| Mean of the Daily Mean* | 20.5 | -- | -- | |
| Mean of the Daily Min* | 19.1 | -- | -- | |
| Mean of the Daily Max* | 22.0 | -- | -- | |
| MWAT* | 24.2 | -- | -- | |
| Amount of Time > 20 deg. C (Hours) | 1442.8 | -- | -- | |
| Max Duration > 20 deg. C (Hours) | 536.3 | -- | -- | |
| Avg Daily Amount of Time > 20 deg. C (Hours) | 14.6 | -- | -- | |
| Amount of Time > 28.3 deg. C (Hours) | 0.0 | -- | -- | |
| Max Duration > 28.3 deg. C (Hours) | 0.0 | -- | -- | |
| Avg Daily Amount of Time > 28.3 deg. C (Hours) | 0.0 | -- | -- | |
| Amount of Time > 29.4 deg. C (Hours) | 0.0 | -- | -- | |
| Max Duration > 29.4 deg. C (Hours) | 0.0 | -- | -- | |
| Avg Daily Amount of Time > 29.4 deg. C (Hours) | 0.0 | -- | -- | |
| Amount of Time < 3.0 mg/L (Hours) | -- | -- | -- | |
| Max Duration < 3.0 mg/L (Hours) | -- | -- | -- | |
| Avg Daily Amount of Time < 3.0 mg/L (Hours) | -- | -- | -- | |
| Amount of Time < 4.0 mg/L (Hours) | -- | -- | -- | |
| Max Duration < 4.0 mg/L (Hours) | -- | -- | -- | |
| Avg Daily Amount of Time < 4.0 mg/L (Hours) | -- | -- | -- | |
| Amount of Time < 5.0 mg/L (Hours) | -- | -- | -- | |
| Max Duration < 5.0 mg/L (Hours) | -- | -- | -- | |
| Avg Daily Amount of Time < 5.0 mg/L (Hours) | -- | -- | -- | |
| Amount of Time < 6.0 mg/L (Hours) | -- | -- | -- | |
| Max Duration < 6.0 mg/L (Hours) | -- | -- | -- | |
| Avg Daily Amount of Time < 6.0 mg/L (Hours) | -- | -- | -- | |

**Units are those of the analyte listed. SD is unitless.*

Temperature probe data (MassDEP Undated)

| OWMID | Unique ID | Date | Days | Average Daily Average (Chronic) | Average Daily Maximum (Chronic) | Maximum Daily Average (Acute) | Maximum Daily Maximum | Violates Criteria |
|---------|-----------|----------|------|---------------------------------|---------------------------------|-------------------------------|-----------------------|--------------------------|
| 36-0870 | W1877 | 06/13/08 | 2 | 21.1 | 23.1 | 21.7 | 23.9 | C-CW1/C-CW2/ |
| 36-1125 | W1877 | 07/18/08 | 2 | 24.4 | 26.4 | 24.4 | 26.9 | C-CW1/C-CW2/A-CW1/A-CW2/ |
| 36-1298 | W1877 | 08/15/08 | 2 | 19.7 | 21.5 | 19.8 | 21.7 | C-CW1/ |

Attended probes measurements at station W1877 during the sampling season. 8 discrete temperature readings, 0 of which failed warmwater criteria, were measured. (MassDEP Undated)

| Watershed | Waterbody | UNIQUE_ID | DESCRIPTOR | DATE | TIME | FLOWSTAT | DEPTH | TEMP | PH | SPCOND | DO | DOSAT | ResComm |
|-----------|------------|-----------|------------------|-----------|-------------|----------|-------|------|-----|--------|-----|-------|---------|
| Chicopee | Ware River | W1877 | [east of Riversi | 6/13/2008 | 9:52:02 AM | Flowing | 0.5 | 19.4 | 6.6 | 108 | 8.1 | 88 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 6/16/2008 | 10:16:04 AM | Flowing | 0.4 | 18.1 | 6.5 | 99 | 8.0 | 86 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 7/18/2008 | 9:43:33 AM | Flowing | -- | 22.2 | 6.4 | 104 | 7.2 | 84 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 7/21/2008 | 9:34:34 AM | Flowing | -- | 23.0 | 6.4 | 92 | 7.0 | 83 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 8/15/2008 | 9:34:32 AM | ** | -- | 18.0 | 6.1 | 55 | 7.9 | 85 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 8/18/2008 | 9:49:30 AM | ** | -- | 18.6 | 6.1 | 63 | 8.1 | 88 | |
| Chicopee | Ware River | W1877 | [east of Riversi | 6/18/2008 | 4:05:00 PM | Flowing | -- | 19.6 | -- | -- | -- | -- | |
| Chicopee | Ware River | W1877 | [east of Riversi | 9/26/2008 | 11:12:00 AM | Flowing | -- | 13.6 | -- | -- | -- | -- | |

The WARE RIVER was sampled beginning (W1877) on 06/18/08 and lasting 99 days over the index period. The maximum 7 DADM was 26.2°C and the maximum 7 DADA was 24.2°C. The maximum mean daily temperature was 25.4°C while the maximum of the daily maximum was 27.3°C. There were no violations of the WWF criterion.

| Temperature Data | AU_Class | Qualifier | Date | Maximum 7 DADM | Maximum 7 DADA | Index Period Days | Days CWF Tier1 Chronic Violated | Days Tier 2 Chronic Violated | Days WWF Chronic Violated | Maximum Daily Mean Acute | Maximum Daily Maximum | |
|------------------|------------|-----------|----------|----------------|----------------|-------------------|---------------------------------|------------------------------|---------------------------|--------------------------|-----------------------|------|
| W1877 | WARE RIVER | A | PWS, ORW | 06/18/08 | 26.2 | 24.2 | 99 | 80 | 40 | 0 | 25.4 | 27.3 |

| Temperature Rolling Data | | | | | | |
|--------------------------|---------|---------|-----------------------|-----------------------|--------------|------------------|
| | AU_ID_1 | OWMID | Start | Stop | Result Count | Max 24hr Rolling |
| 261 | MA36-27 | 36-1298 | 8/15/2008 10:00:00 AM | 8/18/2008 9:30:00 AM | 96 | 19.8 |
| 262 | MA36-27 | 36-1125 | 7/18/2008 10:00:00 AM | 7/21/2008 9:30:00 AM | 96 | 24.7 |
| 263 | MA36-27 | 36-0870 | 6/13/2008 10:00:00 AM | 6/16/2008 10:00:00 AM | 97 | 22.0 |
| 264 | MA36-27 | 36-1608 | 6/18/2008 4:30:00 PM | 9/26/2008 11:00:00 AM | 4742 | 25.6 |

DCR staff collected water quality data 1-3 times per month in most months from 2008-2019 at the Ware River (MA36-27) at station 103A (Ware River @ Riverside Cemetery). 273 discrete temperature readings, 0 of which failed warmwater criteria, were measured. DCR temperature data at 103A:

| Water Temperature | | | | | | | | | | | | | Water Temperature Total |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------|
| 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 18 | 20 | 25 | 21 | 26 | 23 | 25 | 23 | 26 | 26 | 23 | 17 | 273 | |
| -0.01 | 0.09 | 0 | 0.28 | 0.17 | -0.04 | -0.01 | 0.14 | -0.03 | -0.04 | -0.03 | -0.1 | -0.1 | |
| 22.8 | 22.01 | 21.94 | 21.05 | 23.34 | 22.93 | 21.99 | 21.28 | 23.1 | 21.09 | 22.75 | 21.3 | 23.34 | |
| 12.62 | 12.34 | 10.06 | 12.28 | 9.72 | 10.54 | 9.86 | 10.38 | 9.31 | 9.06 | 10.29 | 10.48 | 10.46 | |

DCR staff collected water quality data 2-3 times per month in 2018 and 2019 at the Ware River (MA36-27) at station 101 (Ware River Shaft #8). 46 discrete temperature readings, 0 of which failed warmwater criteria, were measured. QUABBIN 101:

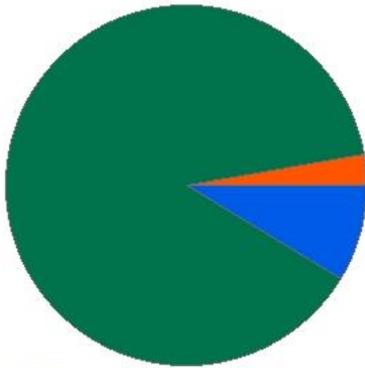
| Row Labels | Dissolved Oxygen | | Dissolved Oxygen Total | pH | | pH Total | Water Temperature | | Water Temperature Total |
|-------------------------|------------------|-------|------------------------|------|------|----------|-------------------|-------|-------------------------|
| | 2018 | 2019 | | 2018 | 2019 | | 2018 | 2019 | |
| 101 | | | | | | | | | |
| Count of FinalResult | 26 | 20 | 46 | 26 | 20 | 46 | 26 | 20 | 46 |
| Min of FinalResult4 | 7.72 | 8.15 | 7.72 | 5.03 | 6.04 | 5.03 | -0.06 | -0.2 | -0.2 |
| Max of FinalResult3 | 15.84 | 16.07 | 16.07 | 6.43 | 7.07 | 7.07 | 25.68 | 22.45 | 25.68 |
| Average of FinalResult2 | 11.69 | 12.04 | 11.84 | 5.75 | 6.56 | 6.10 | 10.36 | 9.95 | 10.18 |

West Branch Fever Brook (MA36-34)

| | |
|----------------------------------|--|
| Location: | Headwaters, perennial portion, just north (upstream) of Route 122, Petersham to mouth at inlet Quabbin Reservoir, Petersham. |
| AU Type: | RIVER |
| AU Size: | 3.4 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

West Branch Fever Brook - MA36-34

Watershed Area: 4.46 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 4.45 | 3.73 | 0.83 | 0.80 |
| Agriculture | 0.7% | 0.8% | 0.5% | 0.5% |
| Developed | 2.7% | 2.9% | 1.7% | 1.7% |
| Natural | 88.1% | 87% | 74% | 73.2% |
| Wetland | 8.6% | 9.3% | 23.8% | 24.6% |
| Impervious Cover | 1.4% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

Benthic macroinvertebrate sampling was conducted by MassDEP biologists in the West Branch Fever Brook ~610 meters upstream of road crossing of the restricted portion of Monson Turnpike, Petersham (B0902) in July 2014 as part of the probabilistic Wadeable Streams Monitoring Project (MAP2). These data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development and these data will be used in a future reporting cycle. MassDEP staff also conducted limited water quality monitoring in West Branch Fever Brook ~200 feet upstream of road crossing of the restricted portion of Monson Turnpike, Petersham (W2021) during the summer of 2008. The minimum DO was 5.8mg/L (n=2) with a maximum saturation of 88%, the maximum temperature was 23.3°C, and pH measurements were 5.8-6.0SU. The seasonal average total phosphorus concentration was low (0.011mg/L, maximum 0.016 mg/L, n=3). There were no observations of dense filamentous algae. DCR staff also conducted water quality sampling 1-3 times per month in 2008, 2013, and 2017 (site 215B -- W Br Fever Brook Mouth) with the following results: Dissolved oxygen was good (range 5.28 to 14.97mg/L, n=72), the maximum temperature was 25.1°C (n=72), although pH was low (range 4.95 to 6.93SU, n=77 with 48 measurements <6.0SU). The seasonal average total phosphorus concentrations (May-September) were low (range 0.017 to 0.018mg/L) (overall maximum 0.028mg/L, n=72) as were ammonia results (maximum 0.0278mg/L and based on the equation used to calculate chronic and acute ammonia thresholds in freshwater, there were no violations of either criterion). The Aquatic Life Use for West Branch Fever Brook is assessed as Fully Supporting based on the water quality data indicative of generally good conditions. pH was often low however in the brook (site 215B -- W Br Fever Brook Mouth, Petersham) and although considered natural (likely due to the combination of low buffering

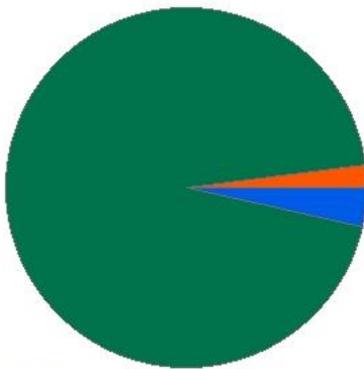
capacity and natural organic acids produced by proximate wetlands) is being identified with an alert since it appears to be getting lower over time.

West Branch Swift River (MA36-31)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet of small unnamed impoundment east of Cooleyville Road (in Wendell State Forest), Wendell to mouth at inlet Quabbin Reservoir, Shutesbury/New Salem. |
| AU Type: | RIVER |
| AU Size: | 6.3 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

West Branch Swift River - MA36-31

Watershed Area: 14.01 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 14.00 | 7.37 | 3.28 | 2.14 |
| Agriculture | 0.9% | 0.8% | 0.5% | 0.6% |
| Developed | 2% | 1.9% | 0.8% | 0.8% |
| Natural | 93.7% | 95% | 89.4% | 92.8% |
| Wetland | 3.4% | 2.3% | 9.2% | 5.8% |
| Impervious Cover | 1.6% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in the West Branch Swift River at two locations in July 2006. At the upstream site 100m downstream of Jennings Rd (SampleID 1568) only a few fish were collected with multiple age classes of Eastern brook trout present (there was evidence of beaver dams in the area). Further downstream upstream of Cooleyville Rd (SampleID 1928), the sample was dominated by fluvial specialists/dependents species including multiple age classes of Eastern brook trout as well as landlocked salmon. A similar fish community was documented by MassDEP biologists in this reach of the river in September 2011. Given the presence of multiple age classes of Eastern brook trout this river is considered a Tier 1 Existing Use Cold Water resource. During the summer of 2011, MassDEP staff began sampling the West Branch Swift River as part of a reference site network project ~640 feet upstream from Cooleyville Road, Shutesbury (W2218). The maximum DO was 8.0 mg/L during the 7-day probe deployment in August 2011, the maximum saturation was 92%, and the maximum temperature was 21.7°C. A thermistor deployed from June to October 2011 (115 days) recorded a maximum temperature of 25.5°C. The 7 DADM (maximum 23.2°C) exceeded 20°C 48 times although the maximum 24-hour rolling average (22.9°C) did not exceed the acute criterion (23.5°C). The thermistor deployed between May and November 2012 (191-days), recorded a maximum temperature of 24.1°C with a maximum 7 DADM of 22.9°C (violating the chronic criterion 59 times). The maximum 24-hour rolling average in the summer 2012 was 22.2°C. Discrete measurements at this site between 2011 and 2015 can be summarized as follows: minimum DO 8.2mg/L and a max saturation of 98%. (n=14) maximum temperature 22.7°C (n=39), and pH ranged from 5.2 to 6.3SU (n=13) (eight times <6.0SU). DCR staff also conducted water quality sampling in the river 2-3 times per month in 2011, 2012, and 2016 at Cooleyville

Rd (211F). Of the 78 measurements made the minimum DO was 7.87mg/L, maximum temperature 20.08°C, and the pH ranged from 4.77 to 6.31SU (65 measurements <6.0SU). Seasonal average total phosphorus concentrations were low (range 0.008 to 0.015mg/L, n=11 samples each year), with a maximum of 0.023mg/L. Ammonia-nitrogen concentrations were also low (maximum 0.143mg/L) and there were no violations of acute or chronic criteria. DCR staff also conducted sampling 1-3 times per month from 2008 to 2019 at Rt.202-Daniel Shays Hwy (station 211). Dissolved oxygen measurements were <6.0mg/L on only four of 301 sampling events (minimum 4.72mg/L, the maximum temperature was 20.22°C (twice >20°C), and pH ranged from 4.4 to 7.23SU (n=296) with 120 measurements <6.0SU. Total phosphorus samples were collected 2-6 times per year. The seasonal average concentrations (usually from two samples) were low (0.009 to 0.024mg/L). The maximum concentration was 0.038mg/L. Low concentrations of ammonia-nitrogen and chlorides were also measured (maximum ammonia 0.016mg/L (n=29), maximum chloride only 8.37mg/L (n=21), none of which exceeded any acute or chronic criteria.

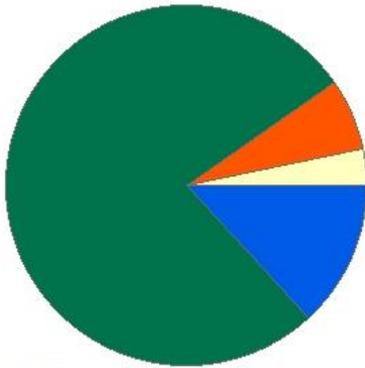
The Aquatic Life Use for the West Branch Swift River is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which are indicative of excellent habitat and water quality conditions as well as almost all the water quality data. Although some elevated temperatures were documented (exceeding chronic 7DADM criteria during the summers of 2011 and 2012), these conditions are considered naturally occurring (this subwatershed is ~97% natural/wetland and IC only 1.6% meeting the natural screening guidelines in the 2018 CALM Guidance Manual). Low pH was frequently measured and although is considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands), it is being identified as an Alert issue.

West Branch Ware River (MA36-02)

| | |
|----------------------------------|--|
| Location: | Headwaters, outlet Brigham Pond, Hubbardston to mouth at confluence with East Branch Ware River (forming headwaters of Ware River), Barre. |
| AU Type: | RIVER |
| AU Size: | 4.5 MILES |
| Classification/Qualifier: | A: PWS, ORW (Tributary) |

West Branch Ware River - MA36-02

Watershed Area: 16.63 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 16.63 | 5.26 | 3.53 | 0.83 |
| Agriculture | 3.2% | 3.5% | 1.7% | 1.9% |
| Developed | 6.4% | 5.1% | 4.5% | 4% |
| Natural | 77.3% | 75.9% | 68.7% | 53.9% |
| Wetland | 13.1% | 15.5% | 25% | 40.2% |
| Impervious Cover | 2.6% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

DCR staff conducted water quality monitoring in the West Branch Ware River 2-3 times per month in 2010, 2014, and 2018 at Brigham Pond outlet (115) and 1-3 times per month from 2008-2019 at Brigham Road bridge, Hubbardston (107A). At the upstream sampling site (115) all but one DO measurement was above 5.92mg/L (minimum 4.98mg/L, n=77), the maximum saturation was 144.6% (four measurements above 125% in November and December 2014) and all others below 125%, the maximum temperature was 27.59°C, and pH ranged from 4.66 to 7.06SU (n=71 with 49 measurement below 6.0SU). Nutrient concentrations (n=52) were all very low (maximum total phosphorus and ammonia concentrations 0.0316 and 0.0865mg/L, respectively). Further downstream at site 117A) all but one DO measurement was above 5.24mg/L (minimum 4.91mg/L, n=292), the maximum saturation was 163.4% (n=282) with 11 measurements above 125% eight of which were between November 2014 and April 2015) with all others below 125%, the maximum temperature was 25.61°C (n=292), and pH ranged from 3.93 to 7.06SU (n=292 with 138 measurement below 6.0SU). Nutrient concentrations were also very low (maximum total phosphorus and ammonia concentrations of 0.043 (n= 47) and 0.046mg/L (n=30), respectively). The maximum chloride concentration was also very low (27.1mg/L, n=12 samples collected between January and June 2019).

The Aquatic Life Use for the West Branch Ware River is assessed as Fully Supporting based on the water quality data indicative of generally good conditions. Low pH was frequently measured and although is considered natural (likely due to the combination of low buffering capacity and natural organic acids produced by proximate wetlands), it is being identified as an Alert issue. While both sites did have supersaturated conditions, these were atypical and since nutrient concentrations were very low, not considered problematic.

Wickaboag Pond (MA36166)

| | |
|----------------------------------|------------------|
| Location: | West Brookfield. |
| AU Type: | FRESHWATER LAKE |
| AU Size: | 316 ACRES |
| Classification/Qualifier: | B |

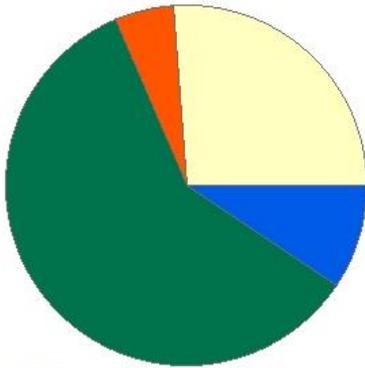
| |
|--|
| Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert) |
| <p>Herbicide permits for Wickaboag Pond indicate the treatment of <i>Myriophyllum</i> sp. and <i>Myriophyllum heterophyllum</i> however, the confirmation of the non-native aquatic macrophyte, <i>Myriophyllum heterophyllum</i>, must be confirmed by DWM personnel. No other recent data are available.</p> <p>Too limited data are available to assess the Aquatic Life Use for Wickaboag Pond, so it is assessed as having Insufficient Information. The alert for the potential infestation of <i>Myriophyllum heterophyllum</i> is being carried forward.</p> |

WINIMUSSET BROOK (MA36-69)

| | |
|----------------------------------|--|
| Location: | Headwaters, west of Padre Road, New Braintree to mouth at confluence with the Ware River, New Braintree. |
| AU Type: | RIVER |
| AU Size: | 3.2 MILES |
| Classification/Qualifier: | B |

WINIMUSSET BROOK - MA36-69

Watershed Area: 5.75 square miles



Percent Agriculture
 Percent Natural
 Percent Developed
 Percent Wetland

| Landuse Type | Entire Basin | 5km Radius Proximal Subbasin | 100m Stream Buffer | Proximal Stream Buffer |
|------------------------------|--------------|------------------------------|--------------------|------------------------|
| Land Use Area (square miles) | 5.75 | 5.75 | 2.20 | 2.20 |
| Agriculture | 26.1% | 26.1% | 25.3% | 25.3% |
| Developed | 5.3% | 5.3% | 4.4% | 4.4% |
| Natural | 59.3% | 59.3% | 55.8% | 55.8% |
| Wetland | 9.3% | 9.3% | 14.5% | 14.5% |
| Impervious Cover | 2.3% | | | |

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing East of West Rd (downstream), New Braintree (SampleID 2167), downstream of West Rd crossing, S of Wine Rd, New Braintree (SampleID 2179) and NW of Wine Rd downstream of Wine Rd, 1/3mi E of West Rd, New Braintree (SampleID 2386) in July 2007. The samples were comprised either solely or dominated by young or multiple age classes of Eastern brook trout. The Aquatic Life Use for Winimusset Brook is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout which are indicative of excellent habitat and water quality conditions.

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