Appendix 6
Blackstone 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

November 2021

Prepared by:

Massachusetts Department of Environmental Protection
Massachusetts Division of Watershed Management
Watershed Planning Program
8 New Bond Street
Worcester, Massachusetts 01606

Table of Contents

2018/20 Cycle Impairment Changes

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Aldrich Pond	MA51002	5	5	(Fanwort*)		Added
Arcade Pond	MA51003	5	5	(Fanwort*)		Added
Bacon Brook	MA51-41	2	5	Temperature		Added
Blackstone River	MA51-03	5	5	Ambient Bioassays - Chronic Aquatic Toxicity		Removed
Blackstone River	MA51-03	5	5	(Curly-leaf Pondweed*)		Added
Blackstone River	MA51-03	5	5	(Non-Native Aquatic Plants*)		Added
Blackstone River	MA51-03	5	5	Other Organics		Removed
Blackstone River	MA51-03	5	5	Trash		Changed
Blackstone River	MA51-04	5	5	(Water Chestnut*)		Added
Blackstone River	MA51-06	5	5	Fish Bioassessments		Added
Center Brook	MA51-34	2	5	Temperature		Added
Coes Reservoir	MA51024	4c	4c	(Water Chestnut*)		Added
Cronin Brook	MA51-45	5	5	Temperature		Added
Crystal Lake	MA51031	3	5	Mercury in Fish Tissue		Added
Dark Brook	MA51-16	5	5	(Fanwort*)		Added
Dark Brook	MA51-16	5	5	(Non-Native Aquatic Plants*)		Removed
Dark Brook Reservoir	MA51035	4c	4c	(Brittle Naiad, Najas Minor*)		Added
Dark Brook Reservoir	MA51035	4c	4c	(Non-Native Aquatic Plants*)		Removed
Dorothy Pond	MA51039	4a	4a	(Brittle Naiad, Najas Minor*)		Added
Dorothy Pond	MA51039	4a	4a	(Curly-leaf Pondweed*)		Added
Dorothy Pond	MA51039	4a	4a	(Non-Native Aquatic Plants*)		Removed
Fish Pond	MA51047	5	5	(Curly-leaf Pondweed*)		Added
Fish Pond	MA51047	5	5	(Fanwort*)		Added
Flint Pond	MA51050	4a	4a	(Fanwort*)		Added
Flint Pond	MA51050	4a	4a	(Non-Native Aquatic Plants*)		Removed
Flint Pond	MA51188	4a	4a	(Fanwort*)		Added
Girard Pond	MA51053	4c	4c	(Fanwort*)		Added
Girard Pond	MA51053	4c	4c	(Non-Native Aquatic Plants*)		Removed
Hayes Pond	MA51060	5	5	(Fanwort*)		Added
Hayes Pond	MA51060	5	5	(Non-Native Aquatic Plants*)		Removed
Howe Reservoirs	MA51070	4c	4c	(Non-Native Aquatic Plants*)		Removed
Ironstone Reservoir	MA51074	4c	4c	(Fanwort*)		Added
Ironstone Reservoir	MA51074	4c	4c	(Non-Native Aquatic Plants*)		Removed
Kettle Brook	MA51-01	5	5	(Fanwort*)		Added
Kettle Brook	MA51-01	5	5	(Non-Native Aquatic Plants*)		Removed
Lake Quinsigamond	MA51125	5	5	(Curly-leaf Pondweed*)		Added
Lake Quinsigamond	MA51125	5	5	(Fanwort*)		Added
Lake Quinsigamond	MA51125	5	5	(Water Chestnut*)		Added

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Lake Ripple	MA51135	5	5	(Fanwort*)		Added
Lake Ripple	MA51135	5	5	(Non-Native Aquatic Plants*)		Removed
Lake Ripple	MA51135	5	5	(Water Chestnut*)		Added
Leesville Pond	MA51087	4a	4a	(Fanwort*)		Added
Leesville Pond	MA51087	4a	4a	(Non-Native Aquatic Plants*)		Removed
Manchaug Pond	MA51091	5	5	(Curly-leaf Pondweed*)		Added
Manchaug Pond	MA51091	5	5	(Fanwort*)		Added
Manchaug Pond	MA51091	5	5	(Non-Native Aquatic Plants*)		Removed
Middle River	MA51-02	5	5	Metals		Removed
Middle River	MA51-02	5	5	(Non-Native Aquatic Plants*)		Added
Middle River	MA51-02	5	5	Trash		Changed
Mill Pond	MA51104	4c	4c	(Fanwort*)		Added
Mill River	MA51-35	5	5	(Fanwort*)		Added
Mill River	MA51-36	5	5	(Fanwort*)		Added
Mill River	MA51-36	5	5	Metals		Removed
Mill River	MA51-36	5	5	(Non-Native Aquatic Plants*)		Removed
Miscoe Lake	MA51106	4c	4c	(Fanwort*)		Added
Miscoe Lake	MA51106	4c	4c	(Non-Native Aquatic Plants*)		Removed
Mumford River	MA51-14	5	5	Copper		Removed
Mumford River	MA51-14	5	5	(Dewatering*)		Removed
Mumford River	MA51-14	5	5	(Fanwort*)		Added
Mumford River	MA51-14	5	5	Lead		Removed
Mumford River	MA51-14	5	5	(Water Chestnut*)		Added
Newton Pond	MA51110	4c	4c	(Fanwort*)		Added
North Pond	MA51112	4c	4c	(Brittle Naiad, Najas Minor*)		Added
North Pond	MA51112	4c	4c	(Fanwort*)		Added
Peters River	MA51-18	5	5	Copper		Removed
Peters River	MA51-18	5	5	Lead		Removed
Peters River	MA51-18	5	5	Temperature		Added
Pondville Pond	MA51120	4a	4a	(Fanwort*)		Added
Pondville Pond	MA51120	4a	4a	(Non-Native Aquatic Plants*)		Removed
Poor Farm Brook	MA51-17	5	5	Sedimentation/Siltation		Removed
Poor Farm Brook	MA51-17	5	5	Temperature		Added
Pratt Pond	MA51123	4c	4c	(Fanwort*)		Added
Quinsigamond River	MA51-09	4c	5	Benthic Macroinvertebrates		Added
Quinsigamond River	MA51-09	4c	5	(Curly-leaf Pondweed*)		Added
Quinsigamond River	MA51-09	4c	5	(Fanwort*)		Added
Reservoir No. 6	MA51130	--	5	Mercury in Fish Tissue		Added
Riverlin Street Pond	MA51137	4c	4c	(Curly-leaf Pondweed*)		Added
Sewall Brook	MA51-44	2	5	Temperature		Added
Shirley Street Pond	MA51196	4a	4a	(Water Chestnut*)		Added
Silver Lake	MA51151	4c	4c	(Dewatering*)		Removed
Silver Lake	MA51151	4c	4c	(Water Chestnut*)		Added

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Singletary Brook	MA51-31	5	5	(Non-Native Aquatic Plants*)		Removed
Singletary Pond	MA51152	4c	4c	(Non-Native Aquatic Plants*)		Removed
Stevens Pond	MA51159	4c	4c	(Fanwort*)		Added
Stevens Pond	MA51159	4c	4c	(Non-Native Aquatic Plants*)		Removed
Tatnuck Brook	MA51-15	5	5	(Fanwort*)		Added
Tatnuck Brook	MA51-15	5	5	(Non-Native Aquatic Plants*)		Removed
Tinker Hill Pond	MA51167	4c	4c	(Brittle Naiad, Najas Minor*)		Added
Tinker Hill Pond	MA51167	4c	4c	(Non-Native Aquatic Plants*)		Removed
Unnamed Tributary	MA51-08	5	5	Chloride		Added
Unnamed Tributary	MA51-08	5	5	Trash		Changed
Unnamed Tributary	MA51-20	5	5	(Fanwort*)		Added
Unnamed Tributary	MA51-20	5	5	(Non-Native Aquatic Plants*)		Removed
Unnamed Tributary	MA51-20	5	5	Trash		Changed
Welsh Pond	MA51176	5	5	(Curly-leaf Pondweed*)		Added
West River	MA51-11	5	5	(Fanwort*)		Added
West River	MA51-11	5	5	Lack of a coldwater assemblage		Added
West River	MA51-11	5	5	pH, Low		Removed
West River	MA51-11	5	5	Temperature		Added
West River	MA51-12	5	5	Cadmium		Removed
West River	MA51-12	5	5	Chloride		Removed
West River	MA51-12	5	5	Copper		Removed
West River	MA51-12	5	5	(Curly-leaf Pondweed*)		Added
West River	MA51-12	5	5	Dissolved Oxygen		Added
West River	MA51-12	5	5	(Fanwort*)		Added
West River	MA51-12	5	5	Lead		Removed
West River	MA51-12	5	5	Nutrient/Eutrophication Biological Indicators		Removed
West River	MA51-12	5	5	pH, Low		Removed
West River	MA51-12	5	5	(Water Chestnut*)		Added
Whitins Pond	MA51180	4c	4c	(Fanwort*)		Added
Whitins Pond	MA51180	4c	4c	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Whitins Pond	MA51180	4c	4c	(Water Chestnut*)		Added
Woodbury Pond	MA51185	5	5	(Fanwort*)		Added
Woolshop Pond	MA51186	5	5	(Curly-leaf Pondweed*)		Added
Woolshop Pond	MA51186	5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
Woolshop Pond	MA51186	5	5	(Non-Native Aquatic Plants*)		Removed

Aldrich Pond (MA51002)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	2 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
The Aquatic Life Use for Aldrich Pond (MA51002) is assessed as Not Supporting based on the presence of the non-native aquatic macrophytes, *Myriophyllum heterophyllum* and *Cabomba caroliniana.*

Arcade Pond (MA51003)

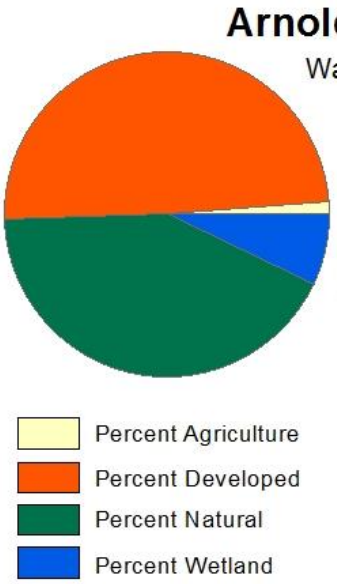
Location:	Northbridge.
AU Type:	FRESHWATER LAKE
AU Size:	20 ACRES
Classification/Qualifier:	B

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
The Aquatic Life Use for Arcade Pond (MA51003) is assessed as Not Supporting based on the presence of the non-native aquatic macrophytes, *Cabomba caroliniana* and *Myriophyllum heterophyllum.*

Arnolds Brook (MA51-32)

Location:	Headwaters, perennial portion, from outlet of unnamed pond at Whitehall Way, Bellingham to mouth at confluence with Peters River, Bellingham.
AU Type:	RIVER
AU Size:	1.7 MILES
Classification/Qualifier:	B

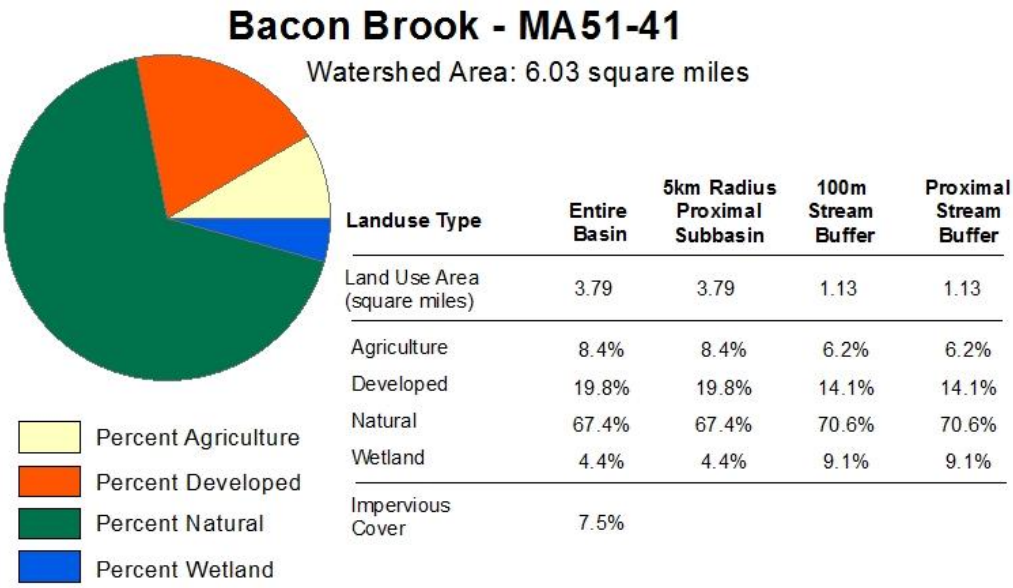


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.25	1.25	0.26	0.26
Agriculture	1.3%	1.3%	2.3%	2.3%
Developed	49.2%	49.2%	39%	39%
Natural	42.4%	42.4%	39.9%	39.9%
Wetland	7.1%	7.1%	18.9%	18.9%
Impervious Cover	20.2%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Arnolds Brook downstream of Pine Grove Avenue in Bellingham (just upstream of Peters River confluence) in July 2007 (SampleID: 4000). The sample was dominated by fluvial fish and contained multiple age classes of Eastern brook trout as well as American brook lamprey so this brook will be considered a Tier 1 Cold Water. MassDEP staff also conducted water quality sampling at Pine Grove Avenue in Bellingham (W1756) during summer of 2008. Except for elevated temperature in early August, water quality data were all indicative of good conditions: minimum DO 6.28mg/L, maximum diel DO shift 1.98mg/L, maximum saturation 99% during the four three to four day deploys. The seasonal average total phosphorus concentration was 0.013mg/L (maximum 0.018mg/L) and there were no acute or chronic ammonia criteria exceedances. The maximum temperature was 23.8°C (above the Tier 1 Cold Water criterion of 20.0°C) but the maximum 24-hour rolling average was only 19.2°C so temperature will be identified with an alert but too limited data are available to make an impairment decision. The Aquatic Life Use for Arnold Brook (MA51-32) will continue to be assessed as Fully Supporting, based on the presence of multiple age classes of EBT and the water quality data indicative of excellent conditions except for elevated temperature. An Alert will be added for temperature and additional monitoring is being recommended.

Bacon Brook (MA51-41)

Location:	Outlet Ironstone Reservoir, Uxbridge to mouth at confluence with the Blackstone River, Uxbridge.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.79	3.79	1.13	1.13
Agriculture	8.4%	8.4%	6.2%	6.2%
Developed	19.8%	19.8%	14.1%	14.1%
Natural	67.4%	67.4%	70.6%	70.6%
Wetland	4.4%	4.4%	9.1%	9.1%
Impervious Cover	7.5%			

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

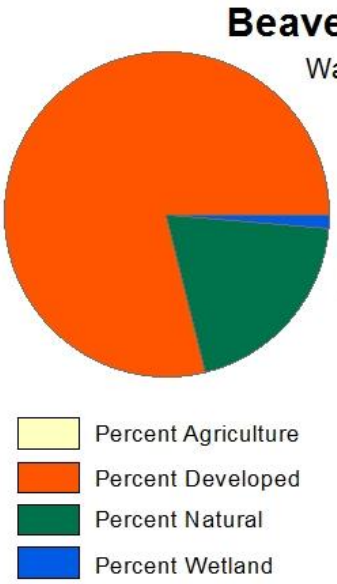
Fish, other Aquatic Life and Wildlife Use: Not Supporting
MassDEP biologists conducted backpack electrofishing at two sites along Bacon Brook as follows: 700ft upstream of River Rd, Uxbridge August 2011 (SampleID: 4587), and upstream of Balm of Life Spring Rd bridge, Uxbridge in September 2008 (SampleID: 4494). DFG biologists conducted sampling in the brook west of River Rd, Uxbridge in July 2001 (SampleID: 419). Results of these surveys indicated the presence of multiple age classes of EBT as well as other fluvial specialist/dependent species. During the summer of 2008 MassDEP staff conducted temperature monitoring in Bacon Brook at Quaker Highway/Rte 146A, Uxbridge (Station W1774). The maximum temperature was 27.1°C, the maximum 24-hour average was 25.3°C, and the 7 DADM exceeded 20°C 65 times during the 96-day deployment. Water quality sampling was also conducted by MassDEP staff ~700ft upstream of River Rd, Uxbridge (W2207) during the summer of 2011. A brief summary of these data are as follows for unattended probe data: minimum DO 6.1mg/L, maximum saturation 86%, maximum diel shift 1.3mg/L, maximum temperature 26.4°C. Attended probe data: minimum DO 6.9mg/L, maximum saturation 87%, maximum temperature 21.9°C, pH range 6.0 to 6.3SU (n=6). The average total phosphorus concentration was low (0.011mg/L, maximum 0.02mg/L). No acute or chronic criteria exceedances for ammonia were found.

Except for one slight chronic criteria exceedance for aluminum (TU 1.5) there were no other exceedances of acute or chronic criteria for any metals (n=3).

The Aquatic Life Use for Bacon Brook (MA51-41), considered a Tier 1 Cold Water resource, is assessed as Not Supporting based on elevated temperature (above the Tier 1 and 2 CWF criteria) documented during the summers of 2008 and 2011. All other data were indicative of good conditions.

Beaver Brook (MA51-07)

Location:	Outlet of small unnamed impoundment north of Beth Israel School and Flag Street School, Worcester to mouth at confluence with Middle River, Worcester (includes underground portion).
AU Type:	RIVER
AU Size:	2.9 MILES
Classification/Qualifier:	B: WWF, HQW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.37	3.51	0.92	0.56
Agriculture	0.1%	0%	0.4%	0%
Developed	78.8%	82.1%	73.7%	84.9%
Natural	19.7%	17%	22.7%	13.3%
Wetland	1.4%	0.9%	3.3%	1.8%
Impervious Cover	34.1%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
During the summer of 2008, MassDEP staff collected nutrient samples from Beaver Brook upstream of Park Avenue, Worcester (W0499). The average total phosphorus concentration was 0.061 mg/L (maximum 0.09 mg/L). No observations of dense or very dense filamentous algae were noted. The Aquatic Life Use for Beaver Brook (MA51-07) will continue to be is assessed as Not Supporting due to bottom deposits, physical substrate habitat alterations and fish kills documented during previous reporting cycles.

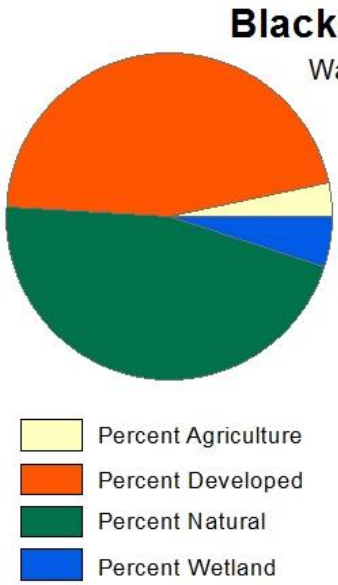
Bell Pond (MA51009)

Location:	Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	10 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Bell Pond (MA51009) so it is Not Assessed.

Blackstone River (MA51-03)

Location:	Confluence of Middle River and Mill Brook (downstream of the railroad spur bridge west of Tobias Boland Way), Worcester to Fisherville Pond Dam (NATID: MA00577), Grafton (through a portion of former 2008 segment: Fisherville Pond MA51048) (mileage includes length of braid).
AU Type:	RIVER
AU Size:	10.4 MILES
Classification/Qualifier:	B: WWF, CSO



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	135.25	13.58	44.07	4.23
Agriculture	3.3%	4.4%	2.6%	3.3%
Developed	45.8%	43%	33.9%	31%
Natural	45.8%	45.6%	52.7%	50.4%
Wetland	5.1%	7%	10.7%	15.3%
Impervious Cover	19.1%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Ambient Bioassays - Chronic Aquatic Toxicity		Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Non-Native Aquatic Plants*)		Added
5	5	Other Organics		Removed
5	5	Trash		Changed

Fish, other Aquatic Life and Wildlife Use: Not Supporting
MassDEP biologists conducted benthic macroinvertebrate sampling in this Blackstone River AU (MA51-03) ~170m downstream of Water Street in Millbury (Station B0661) in July 2008. The RBPIII analysis indicated Severely Impacted conditions compared to the Mumford River reference site (B0091). Normandeau conducted benthic macroinvertebrate sampling at three sites in August 2014 and August 2015 on UBWPAD's behalf. MassDEP's RBPIII analysis of these data indicated upstream of discharge (W0680) in 2014 severely impacted (9.5% comparable) and 2015 sample moderately impacted (43% comparable), the sample downstream the

discharge, near Water Street bridge, Millbury (W1258) moderately impacted (19 and 38% comparable in both years), and downstream of Depot Street, Sutton (MID2) moderately impacted (29% comparable) in 2014 and slightly impacted (71% comparable) in 2015 compared to the Mumford River reference site in those years. Fish sample data from four sites (SampleIDs 2384, 2214, 2962, and 2383) were evaluated against the Blackstone Target Fish Community Model. The % similarity to the TFC was only 14.31% using fish population sample data collected by DFG and/or MassDEP biologists sometime between 2005 and 2017. Periphyton sampling conducted by MassDEP staff in 2008 and more recently by Normandeau staff (summers 2014 through 2017) at benthic sampling sites. Generally periphyton community considered representative of eutrophic (enriched) conditions. A thin green crust/mat observed at most locations was thicker in areas of slower current. Filamentous algae most commonly observed downstream from the discharge (estimated cover in 2017 ranging from 36 to 79%). Habitat quality degradation associated primarily with sedimentation/silation and rapid streamflow fluctuation from stormwater impacts that scour the riverbed (and periphyton growth) continue but construction related impacts for Route 146 interchange project no longer considered problematic. Two non-native aquatic macrophyte species Myriophyllum heterophyllum and Potamogeton crispus also present. Water quality monitoring conducted at 12 sites between 2008 and 2018 by MassDEP staff or as part of the UBWPAD studies. Instream DO was, with rare exception, above 5.0mg/L. The maximum diel shift was 2.76mg/L, maximum saturation 103%, maximum temperature 23.7°C. Seasonal average total phosphorus concentrations upstream from UBWPAD discharge ranged 0.041 to 0.065mg/L (MassDEP and EAL data 2008-2018), just below discharge much higher (0.107 to 0.319mg/L EAL data 2014-2018), and further downstream at Depot Street in Sutton (MID) 0.112-0.293mg/L (2014-2018 EAL data). Ammonia concentrations did not exceed acute criteria but several were above chronic (April and May 2008 in particular). The chronic criteria exceedances (4.8 TU max) were infrequent so not an impairment. No exceedances of any acute or chronic metals criteria except for two chronic cadmium criteria exceedances found upstream from UBWPAD discharge (W0680) in 2008. The Aquatic Life Use for Blackstone River AU (MA51-03) is assessed Not Supporting based on the severely impacted benthic macroinvertebrate community; poor fish community (only 14.3% similar to TFC), biological indicators of nutrient enrichment, elevated total phosphorus, two non-native aquatic macrophytes (Myriophyllum heterophyllum and Potamogeton crispus), habitat quality degradation resulting from flow regime modification (stormwater runoff), physical substrate habitat alterations, and sedimentation/siltation. Too limited data available to delist lead impairment. The chronic aquatic toxicity in ambient bioassays and other organics impairments are being delisted (see additional information in removal comments). The DO impairment is being carried forward because of the rare excursions from criteria.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Ambient Bioassays - Chronic Aquatic Toxicity	Applicable WQS attained; based on new data	Unknown toxicity was originally listed as an impairment in the 1992 reporting cycle for this Blackstone River AU (MA51-03). This impairment decision was based on biological surveys conducted during the summer of 1985. Notes indicate that ammonia and chlorine were both potential toxicants and the results of Microtox™ toxicity tests conducted by MassDEP (at that time was DEQE-DWPC-TSB) staff with results as follows: the EC50 was 11.3% sample (very toxic) in the river at McCracken Road Bridge, Millbury (BS10) and EC10 was 7.8% sample (slight toxicity) in the river downstream of Singing Dam, off chase Road in Sutton (BS12). Most recently water from

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		the Blackstone River collected off of Blackstone River Rd, Worcester (~ 500' upstream from the bridge near Leland Street) used as dilution for the Upper Blackstone Water Pollution Abatement District (UBWPAD) acute and chronic WET tests has had good survival of test organisms. Survival of C. dubia exposed (~7 days) to the river water in 37 tests conducted between October 2008 and April 2018 has been ≥75% in all but one test event when survival was 70% (January 2015 test). Survival of P. promelas exposed to river water (48 hours and one test with 7-day exposure) has been >87% in the six tests conducted between August 2011 and March 2018. Since survival of both C. dubia and P. promelas exposed to Blackstone River water have been above 75% at either 48-hour or 7day exposures during all but one test with since October 2008 which meet the 75% survival guideline outlined in the 2018 CALM guidance manual, the ambient bioassays chronic aquatic toxicity impairment is being delisted.
Other Organics	Applicable WQS attained; original basis for listing was incorrect	Priority organics were first listed as a slight impairment in this Blackstone River AU (MA51-3-03) in the 1992 reporting cycle. The basis for that assessment decision is very unclear although ammonia and chlorine were both mentioned as potential instream toxicants. This impairment was remapped to "Other" in the 2010 reporting cycle and "Other Organics" in the 2016 reporting cycle. Since the original listing information is not clear, both the ammonia and chlorine impairments were delisted in prior reporting cycles (2010 and 2006, respectively), the Other Organics impairment is being delisted.

Supporting Information for Delisted Impairments

Ambient Bioassays - Chronic Aquatic Toxicity

Summary of toxicity data collected more recently indicating improved conditions:

Data Source: (MassDEP Undated 7)

Ambient

Water from the Blackstone River collected off of Blackstone River Rd, Worcester (~ 500' upstream from the bridge near Leland Street) was used as dilution for the Upper Blackstone Water Pollution Abatement District (UBWPAD) (MA0102369) acute and chronic WET tests. Survival of *C.dubia* exposed (~7 days) to the river water in 37 tests conducted between October 2008 and April 2018 has been ≥75% in all but

one test event when survival was 70% (January 2015 test). Survival of *P. promelas* exposed to river water (48 hours and one test with 7-day exposure) has been ≥87% in the six tests conducted between August 2011 and March 2018.

Effluent

Between October 2008 and April 2018 37 valid modified acute WET tests were conducted using *C. dubia* on the Upper Blackstone effluent. The LC_{50}'s were all >100% effluent and ANOEC = 100% effluent. The CNOEC results ranged from 50 to 100% effluent in the 35 valid chronic *C. dubia* tests but was below the CNOEC permit limit of 90% effluent in only one test (January 2012 CNOEC = 50% effluent) of the 35 tests. The one chronic *P. promelas* test conducted in April 2009 met the CNOEC limit (90% effluent).

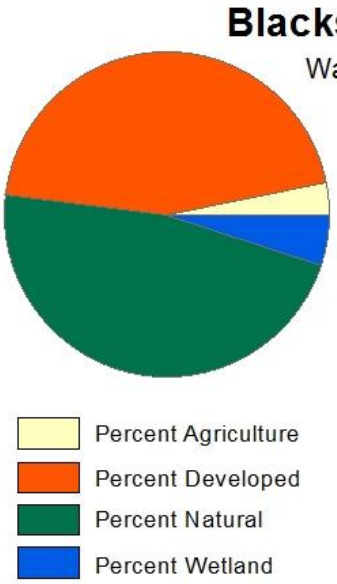
Other Organics

Priority organics were first listed as a slight impairment in this Blackstone River AU (MA51-3-03) in the 1992 reporting cycle. The basis for that assessment decision is very unclear although ammonia and chlorine were both mentioned as potential instream toxicants. This impairment was remapped to "Other" in the 2010 reporting cycle and "Other Organics" in the 2016 reporting cycle. Data Source: (MassDEP 2002a).

Since the original listing information is not clear, and both the ammonia and chlorine impairments (considered to represent the grouped term "priority organics") were delisted in prior reporting cycles (2010 and 2006, respectively), the "Other Organics" impairment is being delisted (original basis for listing considered to be incorrect).

Blackstone River (MA51-04)

Location:	From Fisherville Pond Dam (NATID: MA00577), Grafton to Rice City Pond Dam (NATID: MA00935), Uxbridge (through former 2008 segments: Riverdale Impoundment MA51136 and Rice City Pond MA51131).
AU Type:	RIVER
AU Size:	8.8 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	147.09	4.92	48.48	1.96
Agriculture	3.2%	1.8%	2.6%	1.7%
Developed	44.8%	26.9%	33.5%	27%
Natural	46.8%	62.3%	53.3%	56.8%
Wetland	5.1%	9.1%	10.6%	14.5%
Impervious Cover	18.4%			

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

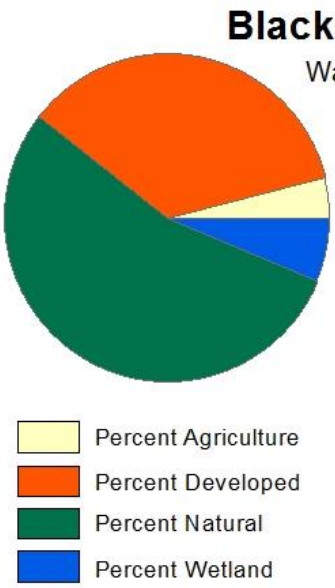
Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Survival of C. dubia exposed (~7 days) to water collected from the Blackstone River at Depot Street Bridge, Grafton (downstream Farnumsville Pond Dam) was ≥90% (n=40 tests between April 2008 and July 2018). The non-native aquatic macrophytes, *Trapa natans*, was reported in this Blackstone River AU (MA51-04) and some of its impoundments. Fish sample data from four sites (SampleIDs 2383, 2391, 2213, 2382) along the river were evaluated against the Blackstone Target Fish Community Model. The % similarity to the TFC was 33% using fish population sample data collected by DFG and/or MassDEP biologists sometime between 2005 and 2017. MassDEP biologists conducted benthic macroinvertebrate sampling upstream from Sutton Street Northbridge (B0093) in July 2008. The RBPIII analysis indicated "Moderately Impacted" compared to the Mumford River (B0091). Water quality monitoring was conducted at seven sites between 2008 (all sites) and 2018 by MassDEP staff, part of the UBWPAD studies (*) and one longterm SMART sampling site (**) upstream to downstream as follows: Rte 122A (below the Fisherville Pond Dam), Grafton (W1242*), ~160' upstream Farnumsville Pond Dam, Grafton (W1901), Depot Street, Grafton (W1243), Sutton Street bridge, Northbridge (W0506), USGS gage

#01110500 near Sutton Street bridge, Northbridge (W0767*,**), upstream Riverdale Dam, Northbridge (W1764), and Church Street, Northbridge (W1244). Instream DO was, with rare exception, above 5.3mg/L. The maximum diel shift was 2.91mg/L, maximum saturation 112%, maximum temperature 24.3°C. In summer of 2008 the seasonal average total phosphorus concentrations ranged from 0.043 to 0.51mg/L (MassDEP data), while in the river at Sutton Street in Northbridge (W0767) was much lower more recently (summers of 2014, 2015, 2017 and 2018 at 0.243, 0.068, 0.107, and 0.114mg/L, respectively) (EAL data). A statistically significant decreasing trend both seasonally and annually of total phosphorus between 1998 and 2013 was found. A few dense/very dense algae observations at some sites sampled in 2008 but no more recent data available to evaluate the total phosphorus reductions. Ammonia concentrations did not exceed acute criteria but several were above chronic (April and May 2008 in particular). The chronic criteria exceedances (3.1 TU max) were infrequent so not an impairment. No exceedances of any acute or chronic metals criteria except for three slight (1.8TU or less) chronic cadmium and one very slight (1.03TU) chronic copper criteria exceedances near Sutton Street bridge, Northbridge (W0767) in 2008. Two additional non-native aquatic macrophyte species *Myriophyllum spicatum* and *Potamogeton crispus* reported in Rice City Pond impoundment but need confirmation.

The Aquatic Life Use for the Blackstone River (MA51-04) is assessed as Not Supporting based on the moderately impacted benthic macroinvertebrate community, poor fish community (33% similar to TFC), habitat quality degradation resulting from flow regime modification (stormwater runoff), physical substrate habitat alterations, and sedimentation/siltation. The former impairments for algae, nutrient enrichment biological indicators and total phosphorus are being carried forward but these conditions should be improving. Too limited data available to delist the cadmium, copper and lead impairments. Non-native aquatic macrophytes, water chestnut (*T. natans*) is being added. An Alert is being identified for unconfirmed reports of non-native aquatic macrophytes, *Myriophyllum spicatum* and *Potamogeton crispus.*

Blackstone River (MA51-05)

Location:	From outlet Rice City Pond Dam (NATID: MA00935), Uxbridge to the most downstream railroad trestle crossing, Millville.
AU Type:	RIVER
AU Size:	9.1 MILES
Classification/Qualifier:	B: WWF



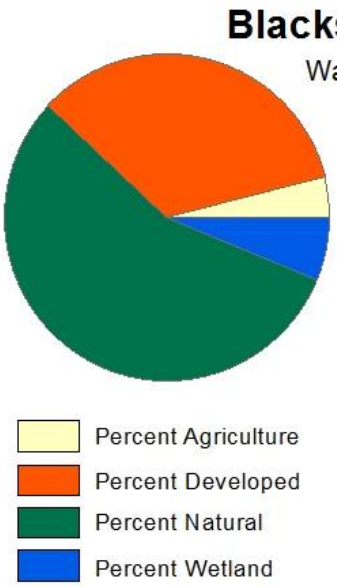
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	260.18	7.16	83.85	2.26
Agriculture	4%	4.5%	3.1%	4.2%
Developed	35.4%	32.2%	28%	24.1%
Natural	54.3%	58.9%	56.7%	63.3%
Wetland	6.3%	4.5%	12.3%	8.5%
Impervious Cover	13.6%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Water quality monitoring was conducted at six sites along this Blackstone River AU (MA51-05) between 2005 and 2018 by MassDEP staff, part of the UBWPAD studies (*) and one longterm SMART sampling site (**) upstream to downstream as follows: Below Rice City Pond sluice gates, Uxbridge (W1779*), Route 16, Uxbridge (W1246), Route 122, Uxbridge (W1765), railroad trestle nearest to Route 122, Millville (W0688), ~ 500' downstream railroad trestle nearest Route 122, Millville (USGS gage 01111230) (W1898**), and ~ 1200' downstream railroad trestle nearest Route 122, Millville (W1596). Benthic macroinvertebrates were sampled ~30 meters upstream Central Street Millville (B0090) in July 2008. The RBPIII analysis indicated Moderately Impacted compared to the Mumford River reference site (B0091). Fish sample data from two sites (SampleIDs 2382 and 2964) were evaluated against the Blackstone Target Fish Community Model. The % similarity to the TFC was 43% using fish population sample data collected by DFG and/or MassDEP biologists sometime between 2005 and 2017. Survival of C. dubia exposed (~48 hours) to Blackstone River water collected ~660' southeast of Industrial Drive, Uxbridge was ≥95% in 20 tests conducted between December 2008 and April 2018. Instream DO was, with one exception, above 5.8mg/L. The maximum diel shift was 3.0mg/L, maximum saturation 117%, maximum temperature was 25.9°C. The seasonal average total phosphorus concentrations ranged from 0.24 to 0.42mg/L (MassDEP data), while in the river below Rice City Pond in Uxbridge (W1779) were lower more recently summers of 2014, 2015, 2017 and 2018 (0.197, 0.084, 0.150, and 0.142mg/L, respectively) (EAL data). Note statistically significant decreasing annual trend of total phosphorus between 1998 and 2013 and USGS reported flow normalized load decreased 69% since 1979 at their gage 01111230 although concentrations still >0.1mg/L. Several dense/very dense algae observations and late winter algal blooms were noted at W1898. More recent data unavailable to evaluate changes associated with phosphorus reductions. No

exceedances of any acute or chronic metals criteria except for five of six (2.5TU or less) chronic cadmium and three of six very slight (1.2TU or less) chronic copper criteria exceedances at the outlet of Rice City Pond spillway (W1779) or at the USGS gage (W1898) in 2008. Ammonia concentrations did not exceed acute criteria, but several were above chronic (April and May 2008 in particular). The chronic criteria exceedances (2.9 TU max) were infrequent (not an impairment). TSS at W1898 ranged from 1.9 to 33 mg/L (January 2008 to May 2013); all but only three <16mg/L. The Aquatic Life Use for this Blackstone River AU (MA51-05) is assessed as Not Supporting based on the moderately impacted benthic macroinvertebrate community, poor fish community (43% similar to TFC), habitat quality degradation resulting from flow regime modification (stormwater runoff). The former impairments for nutrient enrichment biological indicators and total phosphorus are being carried forward although these conditions should be improving. Too limited data available to delist copper, lead, and Polychlorinated Biphenyls (PCBs) impairments. TSS concentrations most often low but influence of stormwater flows/resuspension of sediments in Rice City Pond impoundment likely still problematic, so this impairment is being carried forward. An Alert is being added for the non-native aquatic species *Corbicula fluminea*).

Blackstone River (MA51-06)

Location:	From the most downstream railroad trestle crossing, Millville to the Rhode Island border west of Route 122, Blackstone (mileage includes length of braid).
AU Type:	RIVER
AU Size:	3.8 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	278.72	6.73	89.23	2.18
Agriculture	3.9%	2.5%	3.1%	3.8%
Developed	34.2%	27.2%	27%	18.6%
Natural	55.5%	65.1%	57.5%	66.2%
Wetland	6.4%	5.2%	12.4%	11.3%
Impervious Cover	13.1%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Fish Bioassessments		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Water quality monitoring was conducted at two sites along this Blackstone River AU (MA51-06) during the summer of 2008 as follows: Route 122 crossing nearest Middle Street (W1766) and further downstream at Bridge Street/Canal Street in Blackstone (W1023). With the exception of elevated total phosphorus concentrations at both sites and exceedances of cadmium at the downstream site, the other water quality data were indicative of good conditions as follows: at the upstream site probes were deployed three times for 2 – 5 days with the minimum DO 6.12mg/L, maximum diel shift 1.94mg/L, maximum saturation 117% and maximum temperature 24.4°C. The pH ranged from6.7 to 7.5SU (n=8) and the average total phosphorus concentration was 0.31mg/L (maximum 0.62mg/L). There were no observations of dense or very dense filamentous algae noted. At the downstream site at Bridge Street probes were deployed four times for 2 – 5 days with the minimum DO 6.59mg/L, maximum diel shift 1.92mg/L, maximum saturation 113% and maximum temperature 24.3°C. The pH ranged from 6.8 to 7.7SU (n=8) and the average total phosphorus concentration was 0.28mg/L (maximum 0.64mg/L). There were no observations of dense or very dense filamentous algae noted. Ammonia

concentrations did not exceed acute criteria but two were above chronic in April 2008 (chronic criteria exceedance 1.9 TU max) but not an impairment. During the three rounds of clean metals sampling conducted cadmium slightly exceeded it chronic criteria all three times (TUs ranging from 1.21 to 1.65) and copper slightly exceeded its chronic criterion once (1.16TU) but none of the other metals exceeded any of their acute or chronic criteria. DFG biologists conducted barge electrofishing in the river ~200yds below the Blackstone River Dam at Canal Street in Blackstone in July 2007 (SampleID: 2963). One of six species collected was a fluvial dependant and the sample was dominated moderately tolerant macrohabitat generalists. These data were evaluated against the Blackstone Target Fish Community Model. The % similarity to the TFC was only 20%. MassDEP biologists conducted benthic macroinvertebrate sampling in this Blackstone River AU (MA51-06) in the Blackstone Gorge, ~245 meters downstream/south of the Stone Diversion Dam (west of Country Street, Blackstone), in North Smithfield, Rhode Island in July 2008 (B0660). The RBPIII analysis indicated the sample was Slightly Impacted (71% comparable) when compared to the Mumford River reference site (B0091). There is a report of the non-native aquatic macrophyte, *Potamogeton crispus*, in this Blackstone River AU (MA51-06) but confirmation is needed.

Although the benthic macroinvertebrate results indicated generally good conditions (RPBIII analysis indicating slight impacts), the Aquatic Life Use for this Blackstone River AU (MA51-06) will continue to be assessed as Not Supporting. The % similarity to the TFC was only 20% so Fishes Bioassessment impairment is being added. The chronic cadmium criteria exceedances, elevated total phosphorus levels, and the occasionally elevated total suspended solids continued to be evident during the surveys conducted by MassDEP during the summer of 2008. The other impairments for this Blackstone River AU including flow regime modification, copper, and lead are being carried forward. This use is also identified with an Alert status due to the unconfirmed presence of the non-native aquatic macrophyte, *Potamogeton crispus*.

Brierly Pond (MA51010)

Location:	Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	18 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use is assessed as Not Supporting for Brierly Pond (MA51010) based on the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum.*

Brooklawn Parkway Pond (MA51195)

Location:	Shrewsbury.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available to assess the Aquatic Life Use for Brooklawn Parkway Pond (MA51195) so it is Not Assessed.

Burncoat Park Pond (MA51012)

Location:	Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	6 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available to assess the Aquatic Life Use for Burncoat Park Pond (MA51012) so it is Not Assessed.

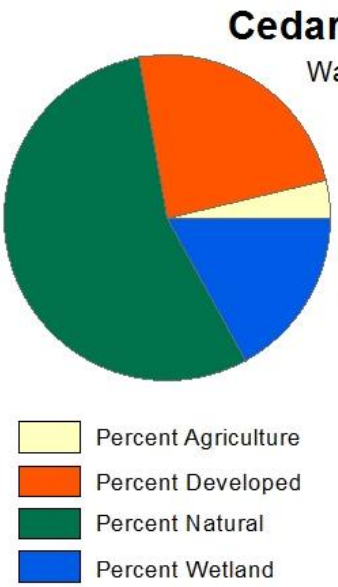
Carpenter Reservoir (MA51015)

Location:	Northbridge.
AU Type:	FRESHWATER LAKE
AU Size:	79 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Carpenter Reservoir (MA51015) so it is Not Assessed.

Cedar Swamp Brook (MA51-33)

Location:	Headwaters, outlet Cedar Swamp, Uxbridge to mouth at confluence with Chockalog River, Douglas.
AU Type:	RIVER
AU Size:	0.8 MILES
Classification/Qualifier:	B

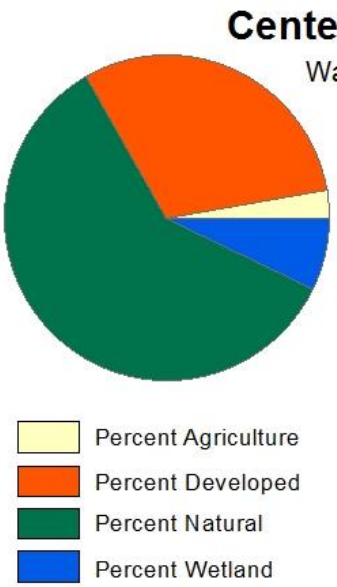


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.53	1.53	0.29	0.29
Agriculture	3.7%	3.7%	4.9%	4.9%
Developed	24.1%	24.1%	6.6%	6.6%
Natural	55.2%	55.2%	51.4%	51.4%
Wetland	17%	17%	37.1%	37.1%
Impervious Cover	8.2%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No recent data are available for Cedar Swamp Brook. The Aquatic Life Use for Cedar Swamp Brook (MA51-33) will continue to be assessed as Not Supporting since no fish were collected or observed by MassDEP biologists during a backpack electrofishing survey in September 2003.

Center Brook (MA51-34)

Location:	From outlet Mill Pond, Upton to mouth at confluence with West River, Upton.
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.38	4.57	2.50	1.50
Agriculture	2.7%	2.9%	1.6%	0.8%
Developed	30.6%	39.8%	30.5%	42.6%
Natural	59.4%	51.2%	52.6%	42.8%
Wetland	7.2%	6%	15.4%	13.8%
Impervious Cover	7.9%			

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
DFG biologists conducted backpack electrofishing at two sites along Center Brook in Upton in August 2010 as follows: near the Station St crossing (SampleID: 3400) and near the Mendon Rd crossing, just E of W. River Street (SampleID: 3401). Results of these surveys indicated the presence of multiple age classes of EBT as well as other fluvial specialist/dependent species. Given the presence of a reproducing brook trout population in Center Brook, the water quality monitoring data will be evaluated as a Tier 1 cold water resource. During the summer of 2008 MassDEP staff conducted temperature monitoring in Center Brook at Mendon Road in Upton (W0514). The maximum temperature was 23.6°C, the maximum 24-hour average was 22.6°C, and the 7 DADM exceeded 20°C 49 times during the 96 day deployment. The other attended probe data can be summarized as follows: minimum DO 7.5mg/L, maximum saturation 104%, maximum temperature 19.4°C, pH range 6.4 to

6.6SU (n=5). The average total phosphorus concentration was low (0.02mg/L, maximum 0.026mg/L). No acute or chronic criteria exceedances for ammonia were found.

The Aquatic Life Use for Center Brook (MA51-34), considered a Tier 1 Cold Water resource, is assessed as Not Supporting based on elevated temperature (above the Tier 1 CWF criteria) documented during the summer of 2008. All other data were indicative of good conditions.

Chase Pond (MA51017)

Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Chase Pond (MA51017) so it is Not Assessed.

Chockalog Pond (MA51018)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Chockalog Pond (MA51018) so it is Not Assessed.

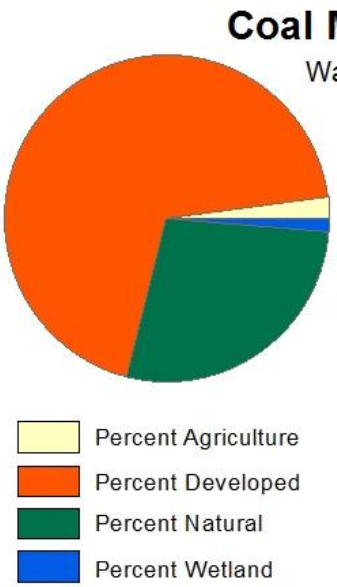
Clark Reservoir (MA51022)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	30 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use of Clark Reservoir (MA51022) so it is Not Assessed.

Coal Mine Brook (MA51-27)

Location:	Headwaters, perennial portion, west of Plantation Street, Worcester to mouth at inlet Lake Quinsigamond, Worcester.
AU Type:	RIVER
AU Size:	0.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.25	1.25	0.16	0.16
Agriculture	2%	2%	0%	0%
Developed	69.1%	69.1%	31.7%	31.7%
Natural	27.5%	27.5%	63.5%	63.5%
Wetland	1.4%	1.4%	4.7%	4.7%
Impervious Cover	32.5%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
DFG biologists conducted backpack electrofishing in Coal Mine Brook downstream of the Sisters of Notre Dame Drive in August 2013 (SampleID: 4950) and further downstream just upstream of Lake Avenue in Worcester in July 2009 (SampleID: 3089). Mulitple age classes of brown trout were collected at the upstream site as well as the downstream site where additional species including one additional fluvial specialist was also collected. DFG biologists report that a fish kill was reported in early August 2010 where six brown trout were recovered, and the cause was listed as thermal stress exasperated by siltation from storm drains. Massive amounts of bank erosion and a fair amount of fine sediment builup in the channel were also observed corroborating the existing impairments. The fish kill that occurred in July 2002 was 15 brook trout. MassDEP staff also conducted water quality monitoring in Coal Mine Brook at Lake Avenue North in Worcester during the summer of 2008 (W1282). With the exception of temperature, the water quality data were indicative of good conditions as follows: Unnattended DO data during the three three to four-day deploys minimum 7.75mg/L, maximum diel DO shift 1.07mg/L, maximum saturation 101%. The pH was good (6.8-7.7SU, n=7) as was the seasonal average total phosphorus which was low (0.03mg/L and maximum 0.045 mg/L) and there were no observations of dense/very dense filamentous algae. No acute or chronic criteria exceedances for ammonia were found. The maximum temperature was high (24.1°C) although the maximum 24 hour average (21.5°C) did not exceed either the Tier

1 or 2 acute temperature criteria (23.5 and 24.1°C, respectively) but too limited data are available (deploys only long enough to calc 2-4DADM) to evaluate chronic criteria exceedances. Specific conductance was as high as 950µS/cm (n=7) with that highest measurement slightly above the estimated chloride chronic criterion (904 µs/cm specific conductance).

The Aquatic Life Use for Coal Mine Brook (MA51-27) is assessed as Not Supporting based on fish kills, sedimentation/ siltation, and temperature. While no Eastern brook trout were documented in recent surveys, multiple age classes of brown trout were found. An Alert is being identified because the estimated chloride was above the chronic criterion once and the potential for baseflow depletion from municipal groundwater withdrawals.

Coes Reservoir (MA51024)

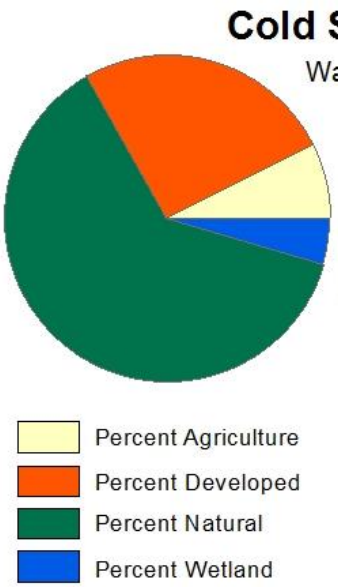
Location:	Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	87 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The non-native aquatic macrophyte, *Myriophyllum spicatum*, was identified in Coes Reservoir during the 1998 MassDEP synoptic survey. Multiple recent reports have also identified an infestation of Trapa natans. The Aquatic Life Use for Coes Reservoir (MA51024) is assessed as Not Supporting based on the presence of two non-native aquatic macrophytes Eurasian water milfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*).

Cold Spring Brook (MA51-42)

Location:	Headwaters, perennial portion north of Route 16, Uxbridge to mouth at inlet Rivulet Pond, Uxbridge.
AU Type:	RIVER
AU Size:	1.1 MILES
Classification/Qualifier:	B: CWF



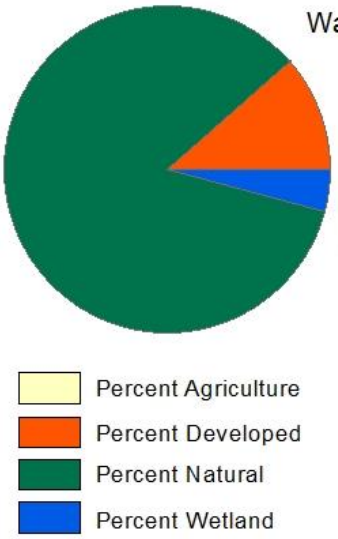
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.43	2.43	0.60	0.60
Agriculture	7.4%	7.4%	5.1%	5.1%
Developed	25.9%	25.9%	24.8%	24.8%
Natural	62.1%	62.1%	62.6%	62.6%
Wetland	4.6%	4.6%	7.6%	7.6%
Impervious Cover	10.3%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Cold Spring Brook east of the confluence with Farrell Brook in Uxbridge in July 2001 (SampleID: 451). The sample was dominated by multiple age classes of Eastern brook trout. MassDEP staff conducted water quality monitoring in the brook slightly further downstream at Hazel Street in Uxbridge (W1768) during the summer 2008. These data can be summarized as follows: during probe deployments the mimum DO was 0.2mg/L, the maximum diel DO shift was 3.2mg/L, the maximum saturation was 94%, maximum temperature 18.8°C. Attended measurements documented pH ranging from 5.8 to 6.3SU with one of eight measurements below 6.1SU. Water was reported as stagnant during four of the eight site visits. The average total phosphorus was low (0.027 mg/L, maximum 0.047mg/L) and there were no observations of dense or very dense filamentous algae noted. No exceedances of acute or chronic ammonia criteria were found. The Aquatic Life Use for Cold Spring Brook (MA51-42) is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout, the biological indicator of excellent water and habitat quality conditions. While there were at least two probe deployments documenting very low DO, flows were also

described as stagnant during half of the site visits. These conditions and the low pH are being identified as Alert issues although they are likely related at least in part to natural conditions in this small subwatershed area.

Cook Allen Brook (MA51-28)

Location:	Headwaters, outlet Reservoir No. 5, Sutton to mouth at inlet Whitins Pond, Northbridge (excluding approximately 0.2 mile through concurrent segment, Reservoir No. 4 MA51128).
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.59	1.59	0.53	0.53
Agriculture	0.4%	0.4%	0.3%	0.3%
Developed	11.4%	11.4%	9.5%	9.5%
Natural	84%	84%	86%	86%
Wetland	4.2%	4.2%	4.3%	4.3%
Impervious Cover	3.8%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
DFG biologists conducted backpack electrofishing in Cook Allen Brook off Mendon Road (East of Route 146 crossing) between Route 146 and Johnson Road in Sutton in June 2005 (SampleID 2661). The sample was dominated by fluvial species and included two different age classes of wild Eastern brook trout. Although the fish sample is indicative of excellent conditions, the sampling location was further downstream in Cook Allen Brook when no fish were collected during the September 2003 survey. The Aquatic Life Use of Cook Allen Brook (MA51-28) will continue to be assessed as Not Supporting based on the lack of fish in the brook downstream from Mendon Street in Sutton most likely a result of flow regulation (periodic no/low flow conditions) by the Whitinsville Water Company (WWC).

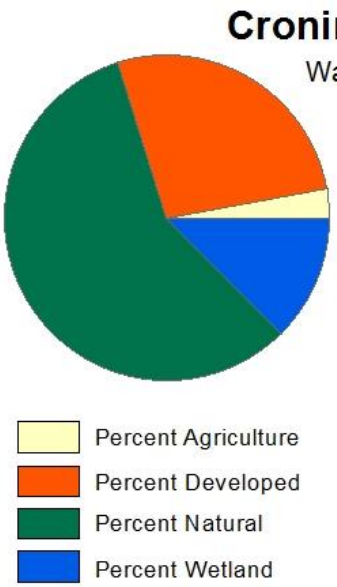
Crane Pond (MA51030)

Location:	Blackstone.
AU Type:	FRESHWATER LAKE
AU Size:	1 ACRE
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use of Crane Pond (MA51030) so it is Not Assessed.

Cronin Brook (MA51-45)

Location:	Headwaters, perennial portion west of Potter Hill Road, Grafton to mouth at confluence with the Blackstone River, Grafton.
AU Type:	RIVER
AU Size:	2.6 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.23	3.23	1.03	1.03
Agriculture	2.9%	2.9%	3.2%	3.2%
Developed	27%	27%	12.5%	12.5%
Natural	57.6%	57.6%	59%	59%
Wetland	12.6%	12.6%	25.3%	25.3%
Impervious Cover	7.8%			

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
DFG biologists conducted backpack electrofishing in Cronin Brook upstream of the Millbury Street bridge at the Millbury/Grafton boundary in June 2013 (SampleID: 4929). The sample was comprised entirely of the tolerant fluvial dependant species white sucker. Further downstream that same day they also conducted sampling near Follette Road in Grafton, west of the transmission corridor (SampleID: 4928). This sample was dominated by fluvial species and included a few multiple age classes of Eastern brook trout. Given the documented presence of multiple age classes of Eastern brook trout Cronin Brook will be assessed as a Tier 1 Cold Water reource. MassDEP staff also conducted water quality sampling in Cronin Brook near Follette Road in Grafton during the summer of 2008. Unnattended DO data during the four three to four-day deploys was as follows: minimum 6.8mg/L, maximum diel DO shift 1.7mg/L, maximum saturation 101%. The maximum temperature was 25.1°C with the maximum 24-hour average 23.3°C (below 23.5°C) and the 7 DADM was above 20.0°C 44 times during

the thermistor deployment from 26 May to 15 October 2008. The pH was good (6.6-7.0SU, n=7). The seasonal average total phosphorus concentration was low 0.036mg/L (maximum 0.051mg/L) and there were no observations of dense/very dense filamentous algae. No acute or chronic criteria exceedances for ammonia were found. In August 2001 DFG biologists also conducted backpack electrofishing slightly further downstream in Cronin Brook east of Gravel Pit Road in Grafton (off Follette Street). This sample was also dominated by fluvial specialist/dependant species and also contained multiple age classes of Eastern brook trout as well as a small brown trout.

While the presence of multiple age classes of Eastern brook trout and most water quality data were indicative of good conditions, the Aquatic Life Use for Cronin Brook (MA51-45) is assessed as Not Supporting based on the exceedances of the Tier 1 Cold Water temperature criterion (7 DADM exceeded 20.0°C 44 times). Although sources are unknown (no dams are present) the main source of thermal stress to water resource appears to be solar input to reaches lacking canopy cover including agriculture, lawns, impervious surfaces, transportation crossings and transmission corridors.

Crystal Lake (MA51031)

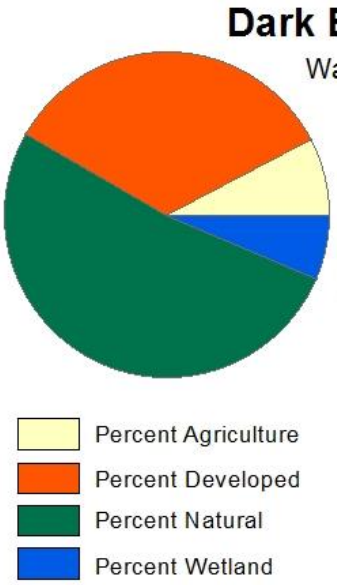
Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	96 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	5	Mercury in Fish Tissue		Added

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Crystal Lake (MA51031) so it is Not Assessed.
Fish Consumption Use: Not Supporting
MassDEP biologists conducted fish toxics sampling at Crystal Lake (also known as Badluck Lake) in June of 2017 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in fish filets, MassDPH issued the following fish consumption advisories: • *"No one should consume any fish from this water body."* Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Crystal (Badluck) Lake (MA51031) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition. Data Source: (MassDPH 2019)

Dark Brook (MA51-16)

Location:	Headwaters, outlet Eddy Pond, Auburn to mouth at confluence with Kettle Brook, Auburn (through former 2008 segment: Auburn Pond MA51004).
AU Type:	RIVER
AU Size:	2.5 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	11.37	6.04	4.00	2.14
Agriculture	7.6%	3.6%	4.9%	1.9%
Developed	34.2%	47.6%	29.7%	40%
Natural	51.7%	43.6%	51.8%	46.3%
Wetland	6.5%	5.2%	13.6%	11.8%
Impervious Cover	14%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The presence of the non-native aquatic macrophyte, *Cabomba caroliniana* in the Auburn Pond impoundment of Dark Brook was documented during a synoptic survey in 1994. A second species *Myriophyllum sp*. (possibly *Myriophyllum heterophyllum*) was also reported, but species confirmation is needed. MassDEP staff conducted some limited water quality sampling of Dark Brook near the Southbridge Street (Rte 12) bridge just downstream of Auburn Pond in Auburn (W0504) during the summer of 2008. The average total phosphorus was 0.037 mg/L while the maximum total phosphorus was 0.052 mg/L. No acute or chronic criteria exceedances for ammonia were found. No observations of dense or very dense filamentous algae were noted.

The Aquatic Life Use for Dark Brook (MA51-16) is assessed as Not Supporting for Dark Brook (MA51-16) based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*) in the Auburn Pond impoundment, elevated in-stream chloride levels documented by the EPA in 2013, and on the historical impairment of the benthic macroinvertebrate community. This use is also identified with an Alert status based on observations of an unidentified species of *Myriophyllum* (possibly a non-native species).

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

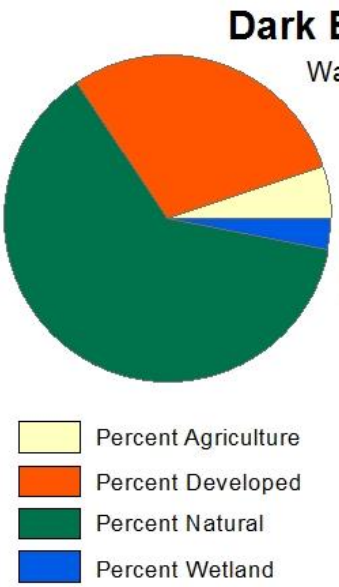
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1994 synoptic survey of Auburn Pond (MassDEP 1994), which is now part of Dark Brook (MA51-16). *Myriophyllum sp*. (possibly *Myriophyllum heterophyllum*) was also reported, but species confirmation is required so no impairment decision for this species is warranted at this time (MassDEP Undated 1). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Dark Brook (MA51-49)

Location:	Headwaters, outlet Dark Brook Reservoir, Auburn to mouth at inlet Stoneville Pond (east of Wallace Avenue), Auburn.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.09	2.98	0.99	0.99
Agriculture	5.1%	4%	0.9%	0.9%
Developed	29.4%	29.9%	33.5%	33.5%
Natural	62.2%	62.9%	60.3%	60.3%
Wetland	3.2%	3.2%	5.3%	5.3%
Impervious Cover	10.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Water quality monitoring was conducted in Dark Brook approximately 620 feet upstream from Inwood Road in Auburn (W2181) as part of the Probabilistic Wadeable Streams) project (MAP2-008) during the summer of 2011. While benthic macroinvertebrate sampling was included as part of this project the data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Fish samples were not collected. The water quality data collected here during the summer of 2011 were indicative of good conditions: minimum DO was 6.6mg/L, the maximum diel DO shift was 0.7mg/L, maximum temperature was 25.2°C, attended pH data ranged from 7.0 to 7.2SU (n=6), average total phosphorus concentration was low (0.019 with maximium 0.027mg/L). No acute or chronic ammonia exceedances were found. There were no violations of any acute or chronic criteria either during any of the three clean metal sampling events. Further downstream MassDEP staff conducted some limited sampling in Dark Brook during the summer of 2008. MassDEP biologists conducted backpack electrofishing in September 2008. Species captured (in order of abundance) included mostly small white sucker (*Catostomus commersonii)*, and one each largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and pumpkinseed (*Lepomis gibbosus*). It should be noted that the largemouth bass and pumpkinseed were young of the year fish.

Although sampling efficiency was rated as good, total numbers of fish were extremely low. A thermistor was also deployed in the brook at this location (Station W1776) with the highest temperature of 24.4°C (maximum 24-hour rolling average 23.6°C). Lastly DFG biologists also conducted backpack electrofishing in Dark Brook south of Berlin Street in Auburn in August 2001 (SampleID: 479). The sample was also well represented by the fluvial species white sucker.

The Aquatic Life Use in Dark Brook (MA51-49) is assessed as Fully Supporting based on the water quality monitoring data collected during the summer of 2011, the temperature data collected during the summer of 2008. While a fluvial fish species was present in the sample, the overall low numbers of fish along with the presence of mostly smaller fish and young of the year (YOY) suggests that flow may be a limiting factor at this location. Management of the Dark Brook Reservoir outflow may be affecting this reach, so an Alert is being identified.

Dark Brook Pond (MA51034)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	18 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Dark Brook Pond (MA51034) so it is Not Assessed.

Dark Brook Reservoir (MA51035)

Location:	[South Basin] Auburn.
AU Type:	FRESHWATER LAKE
AU Size:	58 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Brittle Naiad, Najas Minor*)		Added
4c	4c	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Two non-native aquatic macrophytes, *Myriophyllum spicatum* and *Najas minor*, were identified in this Dark Brook Reservoir AU (MA51035) during a 1998 synoptic survey. *Myriophyllum* sp. (possibly heterophyllum) was also reported in a 1994 synoptic survey. The Aquatic Life Use for Dark Brook Reservoir AU (MA51035) is assessed as Not Supporting due to the presence of two non-native aquatic macrophytes, Eurasian water milfoil (*Myriophyllum spicatum*) and brittle naiad (*Najas minor*). This use is also identified with an Alert status based on observations of an unidentified species of *Myriophyllum* (possibly the non-native *M. heterophyllum*).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophyte Najas minor (brittle naiad) has been utilized.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Two non-native aquatic macrophytes, *Myriophyllum spicatum* and *Najas minor*, were identified in Dark Brook Reservoir (MA51035) during a 1998 synoptic survey (MassDEP 1998). The presence of an aquatic macrophyte identified as Myriophyllum sp. (possibly heterophyllum) was also reported in a 1994 synoptic survey (MassDEP 1994), but confirmation is needed. M. spicatum was already listed. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Najas minor* (brittle naiad) has been utilized.

Dark Brook Reservoir (MA51036)

Location:	[North Basin] Auburn
AU Type:	FRESHWATER LAKE
AU Size:	171 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no new data so the Aquatic Life Use for this Dark Brook Reservoir AU (MA51036) is assessed as Not Supporting due to the presence of the non-native aquatic macrophyte, *Myriophyllum spicatum* documented during the 1998 synoptic survey.

Doctors Pond (MA51194)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	1 ACRE
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Doctors Pond (MA51194) so it is Not Assessed. This waterbody is being mapped as deep marsh and should likely be removed as a lake AU in the next reporting cycle.

Dorothy Pond (MA51039)

Location:	Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	133 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	(Brittle Naiad, Najas Minor*)		Added
4a	4a	(Curly-leaf Pondweed*)		Added
4a	4a	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Three non-native aquatic macrophytes, *Myriophyllum spicatum*, *Najas minor*, and *Potamogeton crispus*, were identified in Dorothy Pond during the 1994 MassDEP synoptic survey. The Aquatic Life Use for Dorothy Pond (MA51039) is assessed as Not Supporting due to the presence of three non-native aquatic macrophytes, including *Myriophyllum spicatum*, *Najas minor* and *Potamogeton crispus*.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes Curly-leaf pondweed (Potamogeton crispus) and Brittle Naiad (Najas minor) have been utilized.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Three non-native aquatic macrophytes, *Myriophyllum spicatum*, *Najas minor*, and *Potamogeton crispus*, were identified in Dorothy Pond in a 1994 synoptic survey (MassDEP 1994). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophytes Curly-leaf pondweed (*Potamogeton crispus*) and Brittle Naiad (*Najas minor*) have been utilized.

Dudley Pond (MA51041)

Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	8 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Dudley Pond (MA51041) so it is Not Assessed.

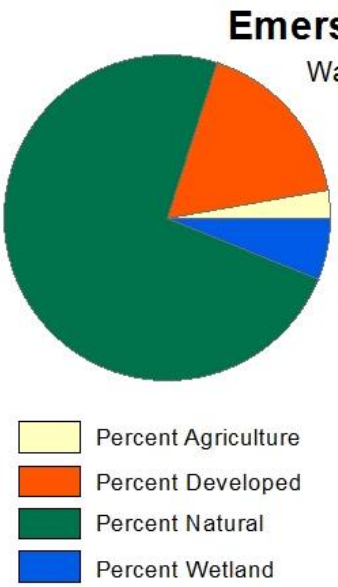
Eddy Pond (MA51043)

Location:	Auburn.
AU Type:	FRESHWATER LAKE
AU Size:	103 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Myriophyllum heterophyllum*, was documented in Eddy Pond during a 1994 synoptic survey. The apparent reduction in open water area between 1996 and 2017 is noted as a concern. The Aquatic Life Use is assessed as Not Supporting for Eddy Pond based on the presence of the non-native aquatic macrophyte, *M. heterophyllum.* An Alert is being identified based on the apparent reduction in open water area.

Emerson Brook (MA51-29)

Location:	Headwaters, outlet Lee Pond, Uxbridge to mouth at confluence with the Blackstone River, Uxbridge.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.73	4.68	2.23	1.37
Agriculture	2.7%	2.9%	2.1%	2.4%
Developed	17.4%	17.2%	12%	12.4%
Natural	73.8%	75.4%	74.9%	76.3%
Wetland	6.2%	4.6%	11%	8.9%
Impervious Cover	5.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
MassDEP staff conducted water quality monitoring Emerson Brook near Quaker Highway (Route 146), Uxbridge (Station W1755) during the summer of 2008. The water quality data were indicative of good conditions as follows: During the DO probe deployments the minimum DO was 7.44mg/L, the maximum saturation was 100%, and the maximum diel DO shift was 0.7mg/L. For the attended data the minimum DO was 7.9mg/L, the maximum saturation was 102%, the maximum temperature was 21.8°C, and pH ranged from 6.0 to 6.5SU (n=7 with four measurements below 6.5SU). Total phosphorus concentrations were low (average 0.006, maximum 0.008 mg/L) and no dense or very dense filamentous algae were noted. No acute or chronic criteria exceedances for ammonia were found. DFG and MassDEP biologisits had also documented the presence of fluvial specialist/dependent species during the summers of 2001 and 2003 including Eastern brook trout however multiple age classes were not collected. The Aquatic Life Use for Emerson Brook (MA51-29) is assessed as Fully Supporting based on the generally good water quality conditions documented during the summer of 2008. With the exception of slightly low pH all other data were indicative of excellent conditions. The former Alert issue for temperature is being carried forward.

Fish Pond (MA51047)

Location:	Northbridge.
AU Type:	FRESHWATER LAKE
AU Size:	8 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Two non-native aquatic macrophytes, *Myriophyllum heterophyllum* and *Cabomba caroliniana,* were found in Fish Pond during the MassDEP 1994 synoptic survey while *Potamogeton crispus* was identified during the MassDEP 2009 survey. *Nymphoides cordata* (Little Floating Heart) was observed near the Fish Pond dam by MassDEP staff in August 2018. This species is aggressive but not not necessarily a non-native. The Aquatic Life Use for Fish Pond (MA51047) is assessed as Not Supporting based on the presence of three species of non-native aquatic macrophytes: fanwort (*Cabomba caroliniana*), *Myriophyllum heterophyllum,* and curly leaf pondweed (*Potamogeton crispus*).

Flint Pond (MA51050)

Location:	[North Basin] Shrewsbury.
AU Type:	FRESHWATER LAKE
AU Size:	93 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
Two non-native aquatic macrophytes, *Myriophyllum spicatum* and *Cabomba caroliniana*, were reported in Flint Pond (MA51050) during the 1994 MassDEP synoptic survey. The Aquatic Life Use for Flint Pond (MA51050) is assessed as Not Supporting based on the presence of non-native aquatic macrophytes, including fanwort (*Cabomba caroliniana*) and Eurasian Water Milfoil *(Myriophyllum spicatum*).

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Two non-native aquatic macrophytes, *Myriophyllum spicatum* and *Cabomba caroliniana*, were reported in Flint Pond (MA51050) during a 1994 synoptic survey (MassDEP 1994). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Flint Pond (MA51188)

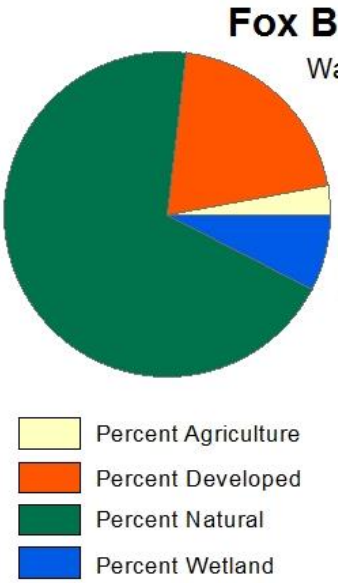
Location:	[South Basin] Shrewsbury/Grafton/Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	173 ACRES
Classification/Qualifier:	B

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 (Alert)
Multiple non-native aquatic macrophytes- *Cabomba caroliniana*, *Myriophyllum heterophyllum*, and *Myriophyllum spicatum* were identified in Flint Pond (MA51188) during the 1998 MassDEP synoptic survey. In 2019 the presence of *Nymphaea nelumbo* (sacred lotus) was also documented. The Aquatic Life Use for Flint Pond (MA51188) is assessed as Not Supporting based on the presence of multiple species of non-native aquatic macrophytes, including *Cabomba caroliniana, Myriophyllum heterophyllum, M. spicatum,* and *Nymphaea nelumbo.* This use is also identified with an alert status due to the unconfirmed reports of the presence of *Najas minor* and *Potamogeton crispus.*

Fox Brook (MA51-39)

Location:	Headwaters, perennial portion, northeast of Thayer Street, Millville to mouth at confluence with the Blackstone River, Blackstone (excluding approximately 0.1 mile through existing segment: Crane Pond MA51030).
AU Type:	RIVER
AU Size:	3.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.44	3.66	1.39	1.15
Agriculture	2.8%	3.3%	4.6%	5.5%
Developed	20.4%	21.9%	14.8%	15.3%
Natural	69.2%	67.5%	64%	61.9%
Wetland	7.6%	7.2%	16.6%	17.3%
Impervious Cover	7.1%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Fox Brook approximately 500 feet north (upstream) of Route 122 in Blackstone in June 2001 (SampleID: 538). The sample was dominated by fluvial specialist/dependant species moderaltely tolerant to pollution. Slightly further downstream MassDEP staff conducted monitoring during the summer of 2008 in Fox Brook at Main St/Rte 122, Blackstone (W1762). These data can be summarized as follows: continuous DO probe data (four three to four day deploys) minimum DO 7.33mg/L, maximum diel DO shift 0.9mg/L, maximum saturation 99%. The maximum temperature recorded during the discrete probe data collection was 21.6°C and was above 20°C only once. The pH was good ranging from 6.7 to 7.2 (n=7), and the total phosphorus concentrations were low (average 0.015 and maximum 0.018mg/L). There were no notes regarding dense/very dense filamentous algae either. No acute or chronic criteria exceedances for ammonia were found. The Aquatic Life Use for Fox Brook (MA51-39) is assessed as Fully Supporting, based the fish sample data (well represented by fluvial species) and the good water quality conditions. Of potential concern is the absence of coldwater fish species in this MassDFG CFR (use is identified with an alert); however notes were made by DFG

biologists that prior to the survey flooding in the stream severely altered the habitat and may have resulted in a temporary displacement of the fish community and lamprey habitat not encountered in the section.

Girard Pond (MA51053)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Cabomba caroliniana,* was reported in Girard Pond during the 1994 synoptic survey. Identification of two other potential non-native aquatic macrophytes *Myriophyllum sp*. and *Najas sp*. were also noted but species identification is needed. The Aquatic Life Use for Girard Pond (MA51053) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Cabomba caroliniana*. This use is also identified with an Alert based on observations of unidentified species of *Myriophyllum* (possibly *M. heterophyllum*) and *Najas* (possibly *N. minor*).

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana,* was reported in a 1994 synoptic survey (MassDEP 1994). *Myriophyllum sp*. and *Najas sp*. were also reported, but species confirmation is required. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

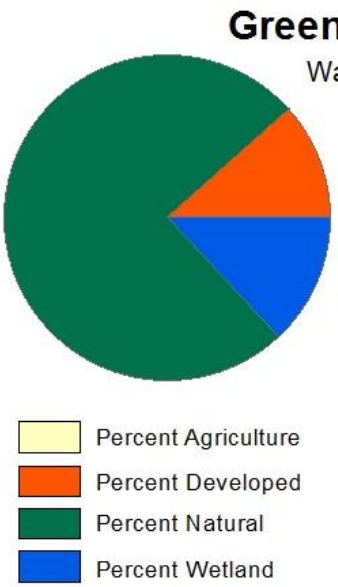
Green Hill Pond (MA51056)

Location:	Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	29 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Green Hill Pond (MA51056) so it is Not Assessed.

Greene Brook (MA51-30)

Location:	Headwaters, perennial portion, north of Linden Street, Douglas to mouth at confluence with Chockalog River, Douglas.
AU Type:	RIVER
AU Size:	1.6 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.92	0.92	0.29	0.29
Agriculture	0.5%	0.5%	0%	0%
Developed	11.6%	11.6%	5.1%	5.1%
Natural	75%	75%	74.3%	74.3%
Wetland	13%	13%	20.6%	20.6%
Impervious Cover	3.8%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
With no new data available, the Aquatic Life Use for Greene Brook (MA51-30) is Not Assessed. The former Alert identified for flow regime concerns because of beaver activity is being carried forward.

Hales Pond (MA51057)

Location:	Wrentham.
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Hales Pond (MA51057) so it is Not Assessed.

Hathaway Pond (MA51059)

Location:	Millbury/Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	8 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Hathaway Pond (MA51059) so it is Not Assessed.

Hayes Pond (MA51060)

Location:	Grafton.
AU Type:	FRESHWATER LAKE
AU Size:	5 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The Aquatic Life Use for Hayes Pond (MA51060) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Cabomba caroliniana.* This use is also identified with an Alert status based on observations of a species of *Myriophyllum*, likely *heterophyllum*. The apparent reduction in open water area is of concern.

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1994 synoptic survey (MassDEP 1994). There was a report of *Myriophyllum sp.* (likely *heterophyllum*) in a 1994 synoptic survey (MassDEP 1994), but confirmation of the species is required. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Holden Reservoir 1 (MA51063)

Location:	Holden.
AU Type:	FRESHWATER LAKE
AU Size:	129 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available for Holden Reservoir No. 1 (MA51063) so the Aquatic Life Use is Not Assessed.

Holden Reservoir 2 (MA51064)

Location:	Holden.
AU Type:	FRESHWATER LAKE
AU Size:	51 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Holden Reservoir No. 2 (MA51064) so it is Not Assessed.

Houghton Pond (MA51067)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Houghton Pond (MA51067) so it is Not Assessed.

Howe Pond (MA51069)

Location:	Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Howe Pond (MA51069) so it is Not Assessed.

Howe Reservoirs (MA51070)

Location:	[East Basin] Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
This Howe Reservoir East Basin AU (MA51070) was originally listed as impaired as a result of flow alterations (remapped to dewatering) in the 1996 reporting cycle. A review of Google Earth imagery between 1995 and 2019 depict a typically minimal amount of surface water (most often a channel showing up during the summer months). The Aquatic Life Use for Howe Reservoirs (MA51070) will contine to be assessed as Not Supporting because of dewatering.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Applicable WQS attained; original basis for listing was incorrect	The original non-native aquatic plant impairment in this Howe Reservoir (East Basin) AU (MA51070) was first listed in the 1996 reporting cycle based on a synoptic survey conducted in September 1994. However, the synoptic survey identifying the non-native aquatic macrophyte Myriphyllum sp. (potentially heterophyllum) was acutally noted on the field sheet for the Howe Reservoir (West Basin) AU (MA51071) not the east basin. Therefore, this non-native aquatic plant impairment is being removed from this Howe Reservoir East Basin AU (MA51070).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

There was an error made. The synoptic survey identifying the non-native aquatic macrophyte *Myriphyllum* sp. (potentially *heterophyllum*) was actually noted on the field sheet for the Howe

Reservoir (West Basin) AU (MA51071) not the east basin. Therefore, this non-native aquatic plant impairment is being removed from this Howe Reservoir East Basin AU (MA51070).

Howe Reservoirs (MA51071)

Location:	[West Basin] Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	7 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
No recent data are available to assess the Aquatic Life Use for Howe Reservoirs (MA51071) so it is Not Assessed. This use is identified with an Alert status, however, based on observations of *Myriophyllum* sp., possible the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, made during the September 1994 synoptic survey.

Hunt Pond (MA51072)

Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Hunt Pond (MA51072) so it is Not Assessed.

Indian Lake (MA51073)

Location:	Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	187 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There continues to be a small infestation of the non-native aquatic macrophyte *Myriophyllum spicatum* near the eastern shore of Indian Lake. A prolonged algal bloom was also documented in Indian Lake during the summer of 2014 and subsequent years were also posted some of which were for preventative applications of alum or copper sulfate. The Aquatic Life Use for Indian Lake (MA51073) is assessed as Not Supporting due to the presence of the non-native aquatic macrophyte, *Myriophyllum spicatum* and the more recent data indicating the presence of prolonged harmful algal blooms. The historic impairment for low dissolved oxygen is being carried forward. Sources of total phosphorus include stormwater runoff from the urbanized watershed (MS4 and residential areas) and internal nutrient recycling (phosphorus release from anoxic sediments).

Ironstone Reservoir (MA51074)

Location:	Uxbridge.
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
4c	4c	(Fanwort*)		Added
4c	4c	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Cabomba caroliniana,* was identified in Ironstone Reservoir during the 1998 synoptic survey. There is also a report of *Myriophyllum heterophyllum* in the reservoir but it needs confirmation when flowering heads are present. The Aquatic Life Use for Ironstone Reservoir (MA51074) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Cabomba caroliniana*. This use is also identified with an Alert status based on unconfirmed reports of the non-native *Myriophyllum heterophyllum.*

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana,* was identified in a 1998 synoptic survey (MassDEP 1998). There is also a report of *Myriophyllum heterophyllum* in the DEP Freshwater Aquatic Invasive Species database, but it needs confirmation when flowering heads are evident (MassDEP Undated 1). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Jenks Reservoir (MA51075)

Location:	Bellingham.
AU Type:	FRESHWATER LAKE
AU Size:	26 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Jenks Reservoir (MA51075) is assessed as Not Supporting due to the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum.*

Joels Pond (MA51076)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Joels Pond (MA51076) so it is Not Assessed.

Joes Rock Pond (MA51077)

Location:	Wrentham
AU Type:	FRESHWATER LAKE
AU Size:	12 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Joes Rock Pond (MA51077) so it is Not Assessed.

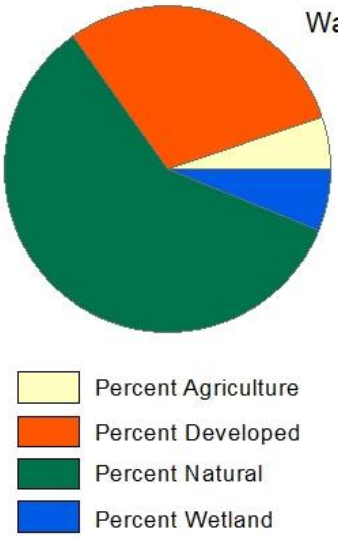
Jordan Pond (MA51078)

Location:	Shrewsbury.
AU Type:	FRESHWATER LAKE
AU Size:	18 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Jordan Pond (MA51078) so it is Not Assessed.

Kettle Brook (MA51-01)

Location:	Outlet Kettle Brook Reservoir #1, Leicester to inlet Leesville Pond, Auburn (as of 2010 excluding the approximately 0.4 miles through segment; Waite Pond MA51170) (through former 2010 segments: City Pond MA51021, Smiths Pond MA51156, and Stoneville Pond MA51160).
AU Type:	RIVER
AU Size:	7 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	30.33	11.86	12.74	4.61
Agriculture	5.1%	0.8%	3.9%	0.5%
Developed	29.8%	42.8%	23.9%	36.1%
Natural	58.9%	51.6%	61.1%	54.1%
Wetland	6.2%	4.7%	11.1%	9.3%
Impervious Cover	10.8%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
DFG biologists conducted backpack electrofishing in Kettle Brook between the Willow Hill Road bridge and the Auburn Street bridge (parallel to Rt. 9) in Leicester (SampleID: 1732) in August 2006. The sample contained one fluvial dependant species and 16% of species collected were considered intolerant/moderately intolerant to pollution. Further downstream in Kettle Brook (~425ft upstream of Stafford Street in Worcester) MassDEP staff conducted benthic, fish, and water quality monitoring as part of a probabilistic wadeable streams monitoring project (MAP2) While benthic macroinvertebrate sampling was included as part of this project (B0728) the data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria

thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. MassDEP biologists also conducted backpack electrofishing in this reach of Kettle Brook in August 2011 (SampleID: 4585). Two fluvial specialist/dependant species were collected while 20% of the samplewas considered moderately intolerant to pollution. The water quality monitoring data collected in Kettle Brook upstream of Stafford Street during the summer of 2011 (W2208) can be summarized as follows: The minimum DO measured by the unnattended probe during the three four-day deploys was 7.3mg/L and the maximum diel DO shift was 1.0mg/L. The maximum temperature was 26.6°C during the thermistor deployment from 25 May to 11 October 2011. The pH was good (6.9-7.2SU, n=6). The seasonal average total phosphorus concentration was low 0.031mg/L (maximum 0.042mg/L) and there were no observations of dense/very dense filamentous algae. No acute or chronic ammonia criteria exceedances were found. With the exception of copper and lead there were no exceedances of any other dissolved metal acute or chronic criteria during the three clean metals sampling surveys. Copper slightly exceeded the acute and chronic criteria once (1.49 and 1.9TUs, respectively) and lead exceeded the chronic criteria once (4.38TU). Further downstream, the non-native aquatic macrophyte *Cabomba caroliniana* was documented in the Stoneville Pond impoundment of Kettle Brook during the 1994 MassDEP synoptic survey while *Myriophyllum sp.* ("possibly *heterophyllum*") was also noted.

The Aquatic Life Use for this Kettle Brook AU (MA51-01) will continue to be assessed as Not Supporting based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*) in the Stoneville Pond impoundment. The historic impairments for benthic macroinvertebrate bioassessment, nutrient/eutrophication biological indicators, and dewatering are being carried forward until more recent data are available which indicate supporting conditions although it is noted that there was a lack of any evidence of nutrient enrichment problems and the total phosphorus concentrations were low. This use is being identified with an Alert status based on observations of an unidentified species of *Myriophyllum* (possibly *Myriophyllum heterophyllum*), as well as exceedances of the copper and lead acute and/or chronic toxicity criteria in one grab sampling event.

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

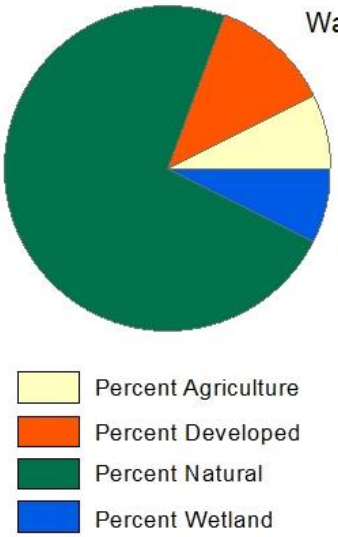
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The 1994 synoptic survey field sheet listed *Cabomba caroliniana* as present in Stoneville Pond (MassDEP 1994), which is now part of Kettle Brook (MA51-01). The presence of *Myriophyllum sp.* ("possibly *heterophyllum*") was also noted (MassDEP 1994). There is also a report from a private citizen of *Myriophyllum heterophyllum* in Stoneville Pond (MassDEP Undated 1), however confirmation by MassDEP staff is required. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte Cabomba caroliniana (fanwort) has been utilized.

Kettle Brook (MA51-19)

Location:	Outlet Kettle Brook Reservoir #4, Paxton, to inlet Kettle Brook Reservoir #1, Leicester (as of 2010 excluding approximately 0.8 mile through segment Kettle Brook Reservoir #3 MA51081 and approximately 0.5 mile through segment Kettle Brook Reservoir #2 MA51080).
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	A: PWS, ORW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.89	3.04	2.38	1.85
Agriculture	7.3%	8%	8.5%	9.8%
Developed	12%	9.8%	9.5%	7.4%
Natural	73.3%	76.5%	71.3%	74.3%
Wetland	7.4%	5.7%	10.6%	8.6%
Impervious Cover	3.7%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
In July 2008 MassDEP biologists conducted benthic macroinvertebrate samping in Kettle Brook ~300 meters downstream/south from Earle Street in Leicester, MA (B0100). The RBPIII analysis indicated the benthic community was “Slightly Impacted” when compared to the Mumford River reference site (Unique ID: B0091). The Aquatic Life Use for Kettle Brook (MA51-19) is assessed as Fully Supporting based on the RBPIII analysis of the benthic macroinvertebrate samples collected from this Kettle Brook AU (MA51-19) indicating 62% comparability (slightly Impacted) when compared to the Mumford River reference site.

Kettle Brook Reservoir No. 1 (MA51079)

Location:	Leicester.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Kettle Brook Reservoir No. 1 (MA51079) so it is Not Assessed.

Kettle Brook Reservoir No. 2 (MA51080)

Location:	Leicester.
AU Type:	FRESHWATER LAKE
AU Size:	29 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Kettle Brook Reservoir No. 2 (MA51080) so it is Not Assessed.

Kettle Brook Reservoir No. 3 (MA51081)

Location:	Paxton/Leicester.
AU Type:	FRESHWATER LAKE
AU Size:	36 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Kettle Brook Reservoir No. 3 (MA51081) so it is Not Assessed.

Kettle Brook Reservoir No. 4 (MA51082)

Location:	Paxton.
AU Type:	FRESHWATER LAKE
AU Size:	114 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Kettle Brook Reservoir No. 4 (MA51082) so it is Not Assessed.

Lake Hiawatha (MA51062)

Location:	Bellingham/Blackstone.
AU Type:	FRESHWATER LAKE
AU Size:	58 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
No recent data are available to assess the Aquatic Life Use for Lake Hiawatha (MA51062) so it is Not Assessed. This use is identified with an Alert status however based on the reference by the Lake Hiawatha Association to annual de-weeding activities (including invasive species and algae blooms).

Lake Quinsigamond (MA51125)

Location:	Shrewsbury/Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	474 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Lake Quinsigamond (MA51125) is assessed as Not Supporting based on the presence of multiple species of non-native aquatic macrophytes, including fanwort (*Cabomba caroliniana*), *Myriophyllum heterophyllum,* Eurasian water milfoil (*M. spicatum*), and curly-leaf Pondweed (*Potamogeton crispus*) documented during a 1994 MassDEP synoptic survey, and water chestnut (*Trapa natans*) documented by MassDEP staff and others in June 2017. The algae and low dissolved oxygen impairments are being carried forward.

Lake Ripple (MA51135)

Location:	Grafton.
AU Type:	FRESHWATER LAKE
AU Size:	47 ACRES
Classification/Qualifier:	B: WWF

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1998 MassDEP synoptic survey of Lake Ripple. *Myriophyllum* sp. was also noted in the same survey but species confirmation needs to be made when flowering heads are present. More recently an infestation with *Trapa natans* has also been reported. The Aquatic Life Use of Lake Ripple (MA51135) is assessed as Not Supporting based on the presence of non-native aquatic macrophytes, including *Cabomba caroliniana* and *Trapa natans.* This use is also identified with an Alert status due to the reported presence of one or more species of *Myriophyllum*, potentially *spicatum,* but species confirmation is needed.
Primary Contact Recreation Use: Not Supporting
The Primary Contact Recreational Use of Lake Ripple (MA51135) remains assessed as Not Supporting with the aquatic plants (macrophytes) impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Fanwort (Cabomba Caroliniana) and Water chestnut (Trapa natans).
Secondary Contact Recreation Use: Not Supporting
The Secondary Contact Recreational Use of Lake Ripple (MA51135) remains assessed as Not Supporting with the aquatic plants (macrophytes) impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Fanwort (*Cabomba Caroliniana*) and Water chestnut (*Trapa natans*).
Aesthetic Use: Not Supporting
The Aesthetics Use of Lake Ripple (MA51135) remains assessed as Not Supporting with the aquatic plants (macrophytes) impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Fanwort (Cabomba Caroliniana) and Water chestnut (Trapa natans).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes fanwort (Cabomba caroliniana) and water chestnut (Trapa natans) have been utilized.

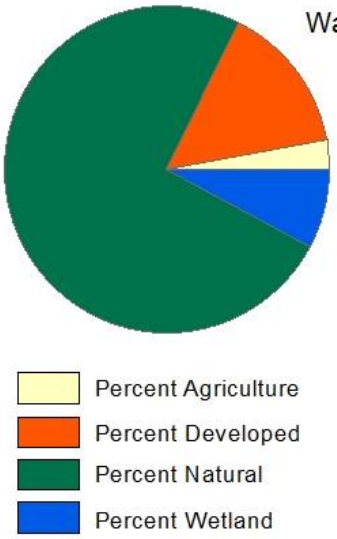
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1998 synoptic survey of Lake Ripple (MassDEP 1998). *Myriophyllum* sp. was noted in the same survey but species confirmation needs to be made when flowering heads are present (MassDEP 1998). There are also reports of *Trapa natans* and *Myriophyllum spicatum* in the DEP Freshwater Aquatic Invasive Species database (MassDEP Undated 1), but the *M. spicatum* report should be confirmed by DEP staff. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophytes fanwort (*Cabomba caroliniana*) and water chestnut (*Trapa natans*) have been utilized.

Laurel Brook (MA51-23)

Location:	Headwaters, perennial portion, north of Yew Street, Douglas to mouth at confluence with Scadden Brook near the outlet of Sawmill Pond, Uxbridge (through former 2008 segment: Bazely Pond MA51008).
AU Type:	RIVER
AU Size:	3.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.47	2.47	0.84	0.84
Agriculture	2.8%	2.8%	1.9%	1.9%
Developed	15%	15%	8.3%	8.3%
Natural	74.3%	74.3%	76.4%	76.4%
Wetland	7.9%	7.9%	13.3%	13.3%
Impervious Cover	3.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Although no new data have been collected, the Aquatic Life Use for Laurel Brook will continue to be assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout documented by DFG and MassDEP biologists in the brook between September 2003 and August 2007. The former Alerts for low flow and termperature are being carried forward.

Leesville Pond (MA51087)

Location:	Auburn/Worcester.
AU Type:	FRESHWATER LAKE
AU Size:	34 ACRES
Classification/Qualifier:	B: WWF

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 (Alert)
MassDEP staff identified *Cabomba caroliniana* in Leesville Pond during a 1994 synoptic survey. There are also more recent reports of *Myriophyllum spicatum* and *M. heterophyllum* but confirmation is needed for both of these species. The Aquatic Life Use is assessed as Not Supporting for Leesville Pond (MA51087) based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*). The historic impairiments for low DO and elevated phosphorus are being carried forward. This use is also identified with an Alert status based on unconfirmed reports of the presence of two additional non-natrive aquatic macrophytes, *M. spicatum* and *M. heterophyllum*.

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The MassDEP identified *Cabomba caroliniana* at Leesville Pond during a 1994 synoptic survey in June (MassDEP 1994). There are also reports of *Myriophyllum spicatum* and *Myriophyllum heterophyllum* (MassDEP Undated 1), but confirmation is needed for both species. The generic “Non-Native Aquatic Plants” impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Lynde Brook Reservoir (MA51090)

Location:	Leicester.
AU Type:	FRESHWATER LAKE
AU Size:	130 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use in Lynde Brook Reservoir (MA51090) so it is Not Assessed.

Manchaug Pond (MA51091)

Location:	Douglas/Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	364 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Fanwort*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Two non-native aquatic macrophytes are known to be present in Manchaug Pond: fanwort (*Cabomba caroliniana*) and curly-leaf pondweed (*Potamogeton crispus*). One additional non-native aquatic macrophyte, *Myriophyllum heterophyllum*, may be present however confirmation is needed. Additionally there are reports of an infestation of the Asian clam (*Corbicula fluminea*) however this infestation also needs confirmation (evidence of live specimens). The Aquatic Life Use for Manchaug Pond (MA51091) is assessed as Not Supporting based on the presence of two species of non-native aquatic macrophytes, including fanwort (*Cabomba caroliniana*) and curly-leaf pondweed (*Potamogeton crispus*). Alerts are being identified for the potential infestations of *M. heterophyllum* and the non-native macroinvertebrate *Corbicula fluminea.* The low dissolved oxygen impairment based on monitoring conducted at the deep hole in September 2003 when ~25% of the lake area was affected is being carried forward.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes "Curly-leaf pondweed (Potamogeton crispus) and Fanwort (Cabomba caroliniana) have been utilized.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Two non-native aquatic macrophytes were identified in MassDEP synoptic surveys – *Potamogeton crispus* in 1994 (MassDEP 1994) and *Cabomba caroliniana* in 1998 (MassDEP 1998). The field sheet from the 1994 synoptic survey also listed *Myriophyllum heterophyllum* "from previous survey" but does not give any further details (MassDEP 1994), so DEP staff should confirm its presence in a future survey.

The Manchaug Pond website references the following invasives: fanwort (*Cabomba caroliniana),* variable milfoil (*Myriophyllum heterophyllum),* and Asian clam (*Corbicula fluminea*) (Manchaug Pond Foundation Undated). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophytes "Curly-leaf pondweed (*Potamogeton crispus*) and Fanwort (*Cabomba caroliniana*) have been utilized.

Marble Pond (MA51093)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	8 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The non-native aquatic macrophyte, *Myriophyllum heterophyllum,* was identified in Marble Pond during the MassDEP 1994 synoptic survey. The Aquatic Life Use for Marble Pond (MA51093) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*

Martin Street Pond (MA51095)

Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	3 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Martin Street Pond (MA51095) so it is Not Assessed.

Merrill Pond No. 3 (MA51098)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	13 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Merrill Pond No. 3 (MA51098) so it is Not Assessed.

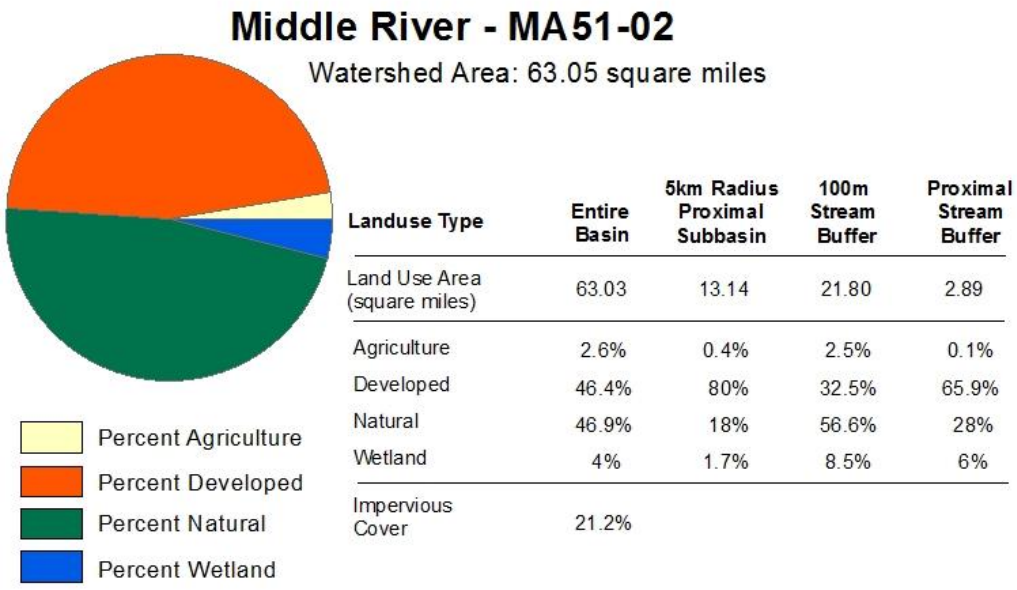
Merrill Pond No. 4 (MA51099)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	20 ACRES
Classification/Qualifier:	B

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 Merrill Pond No. 4 but this needs verification. The Aquatic Life Use for Merrill Pond No. 4 (MA51099) is noted as having Insufficient Information but this use is identified with an Alert because of an unconfirmed report of infestation by *H. heterophyllum*.

Middle River (MA51-02)

Location:	Headwaters, outlet Coes Pond, Worcester to confluence with the unnamed tributary locally known as "Mill Brook" (downstream of the railroad spur bridge west of Tobias Boland Way), Worcester (through former 2000 segment: Middle River Pond MA51101) (prior to 2000 this segment did not include river between Coes and Curtis ponds).
AU Type:	RIVER
AU Size:	3.4 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	63.03	13.14	21.80	2.89
Agriculture	2.6%	0.4%	2.5%	0.1%
Developed	46.4%	80%	32.5%	65.9%
Natural	46.9%	18%	56.6%	28%
Wetland	4%	1.7%	8.5%	6%
Impervious Cover	21.2%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
While benthic macroinvertebrate sampling was conducted as part of a probabilistic wadeable streams monitoring project (MAP2) in the Middle River ~1200' downstream of Fremont Street in Worcester (MAP2-050), the data were not analyzed using an RBPIII so will not be used as part of the Aquatic Life Use assessment for this reporting cycle. MassDEP biologists conducted barge electrofishing here in Aug. 2011 (SampleID: 4591). Notes indicated the barge operation was problematic however the sample was dominated by fluvial specialist/dependant species and ~10% of the sample was moderately intolerant to pollution. MassDEP staff also conducted water quality monitoring near Fremont Street in Worcester during the

summer of 2011 (W2203). The min. DO during the continuous three four-day deploys was 5.3mg/L, the max. diel DO shift was 2.5mg/L, and the max. saturation 112%. While the max. T was slightly high (28.9°C), both the max. 24-hour average (25.9°C) and the max. 3-5 DADM (26.29°C) met guidelines in the 2018 CALM. The pH was good (6.8-7.3SU, n=8). The seasonal average TP concentration was low 0.03mg/L (max. 0.045mg/L) and no observations of dense/very dense filamentous algae were made. No acute or chronic NH3 criteria exceedances were found. Except for one chronic lead exceedance (1.77TU) no other exceedances of any acute or chronic metals criteria were found (n=3). MassDEP biologists conducted benthic macroinvertebrate sampling ~500m downstream from McKeon Road, Worcester (B0097) in July 2008. The RBPIII analysis indicated the sample was "Moderately Impacted" when compared to the Mumford River reference site (B0091). Normandeau Environmental Consultants conducted benthic macroinvertebrate sampling in Aug. 2014 and 2015 as part UBWPAD study. The RBPIII analysis indicated that 2014 sample was moderately impacted (29% comparable) and the 2015 sample was slightly impacted (67% comparable) compared to the Mumford River reference site conditions. Survival of *C. dubia* exposed (~48 hours) to Middle River samples collected just north of McKeon Road in Worcester was ≥95% in 19 tests conducted between July 2008 and Sept. 2016. Slightly further downstream MassDEP staff also conducted water quality sampling in the Middle River at Millbury Street, Worcester during the summer of 2008 (W0502). Continuous DO data during the four two to four-day deploys was as follows: min. 7.11mg/L and max. diel DO shift 1.4mg/L, max. saturation 102%. The max. T was 24.8°C and pH was good (6.8-7.6SU, n=9). The seasonal average TP concentration was 0.056mg/L (max. 0.066mg/L) with three observations of dense/very dense filamentous algae. No acute or chronic criteria exceedances for NH3 were found. Except for two chronic cadmium exceedances (1.85, 2.84TUs) no other metals criteria exceedances were found (n=3). Near the end of this AU (SampleID: 3278), boat electrofishing by the Midwest Biodiversity Institute staff in Aug. 2009 found one fluvial dependant species and 59% of the sample was moderately intolerant to pollution. A non-native aquatic macrophyte, *Myriophyllum heterophyllum*, was identified in a 2017 MassDEP field survey of the Middle River.

The Aquatic Life Use for the Middle River (MA51-02) will continue to be assessed as Not Supporting based on the moderately impacted benthic macroinvertebrate community documented during the 2008 and 2014 surveys (the 2015 surveys indicated somewhat improved conditions) associated with habitat degradation and upstream dams/impoundments, the non-native aquatic macrophyte *Myriophyllum heterophyllum*, and observations of dense/very dense filamentous algae in the river near Millbury Street in 2008. Stormwater runoff in this highly urbanized watershed is an issue. Physical substrate habitat alterations (channelization) impairment is being maintained (0.2-mile reach between Southbridge Street and McKeon Road in Worcester culverted underground). The metals impairment is being delisted (see additional information in removal comments).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Metals	Applicable WQS attained; based on new data	Metals were first listed as an impairment for Middle River in the 1992 reporting cycle based on data collected from the river at the Millbury Street bridges (BS09 and BS09B) during the 1988/1989 surveys. A total of 7 surveys were conducted on 14 and 15 June and 2 and 3 August 1988 and 11 July, 14 August, and 18 September 1989. Copper and zinc were the two metals which were most often above detection limits but the metals impairment was identified as slight at that time. More recently results of clean metals sampling in the Middle River downstream from Fremont Street (W2203) in 2011 and at Millbury Street (W0502) in 2008 found one chronic lead exceedance (1.77TU) in 2011 (allowed) and two chronic cadmium exceedances (1.85, 2.84TUs) in 2008 (not warranting an impairment decision). Furthermore, neither site had any other acute or chronic metals criteria

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		exceedances (3 samples collected at both sites). Neither copper nor zinc exceeded acute or chronic criteria in any of the 2008 or 2011 samples. Therefore, based on these more recent clean technique sampling data which are considered representative of current conditions, since an an impairment decision is not warranted (neither the single lead nor two cadmium chronic criteria exceedances resulted in an impairment decision since neither site was found to have an exceedance for any metal in all three samples as outlined in the 2018 CALM guidance manual), the metals impairment for the Middle River is being delisted.

Supporting Information for Delisted Impairments

Metals

Summary of recent metals data indicating improved conditions: Results of clean metals sampling in the Middle River downstream from Fremont Street (W2203) in 2011 and at Millbury Street (W0502) in 2008 found one chronic lead exceedance (1.77TU) in 2011 (allowed) and two chronic cadmium exceedances (1.85, 2.84TUs) in 2008 (not warranting an impairment decision). Furthermore, neither site had any other acute or chronic metals criteria exceedances (3 samples collected at both sites).

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W2203	MIDDLE RIVER	2011	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W2203	MIDDLE RIVER	2011	3	0	0	0	1	0	0	0	0	0	0

Unique ID	**Sample Date**	**As CMC TU**	**As CCC TU**	**Cd CMC TU**	**Cd CCC TU**	**Cr III CMC TU**	**Cr III CCC TU**	**Cu CMC TU**	**Cu CCC TU**	**Pb CMC TU**	**Pb CCC TU**	**Ni CMC TU**	**Ni CCC TU**	**Se CCC TU**	**Ag CMC TU**	**Zn CMC TU**	**Zn CCC TU**

W2203	7/19/2011	0.0	0.0	0.14	0.00	0.00	0.01	0.23	0.34	0.02	0.50	0.01	0.05	0.22	0.12	0.07	0.07
W2203	8/24/2011	0.0	0.0	0.14	0.97	0.00	0.01	0.26	0.37	0.03	0.68	0.01	0.05	0.22	0.19	0.07	0.07
W2203	9/8/2011	0.0	0.0	0.28	0.00	0.00	0.02	0.58	0.78	0.07	1.77	0.01	0.08	0.22	0.63	0.16	0.16

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W0502	MIDDLE RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W0502	MIDDLE RIVER	2008	3	2	0	0	0	0	0	0	0	0	0

UNIQUE_ID	Date	Cd Violation CMC	Cd Violation CCC	Cr Violation CMC	Cr Violation CCC	Cu Violation CMC	Cu Violation CCC	Pb Violation CMC	Pb Violation CCC	Ni Violation CMC	Ni Violation CCC	Ag Violation CMC	Zn Violation CMC	Zn Violation CCC	As Violation CMC	As Violation CCC	Al Violation CMC	Al Violation CCC	Se Violation CCC
W0502	6/19/2008	0.12	0.91	0.00	0.01	0.18	0.27	0.02	0.46	0.01	0.07	0.08	0.06	0.06	0.01	0.03	0.03	0.23	0.56
W0502	9/12/2008	0.29	1.85	0.00	0.01	0.46	0.64	0.01	0.29	0.01	0.08	0.30	0.14	0.14	0.01	0.02	0.07	0.57	0.56
W0502	9/22/2008	0.41	2.84	0.00	0.00	0.25	0.35	0.00	0.11	0.01	0.08	0.11	0.14	0.14	0.01	0.02	0.07	0.57	0.56

Mill Pond (MA51104)

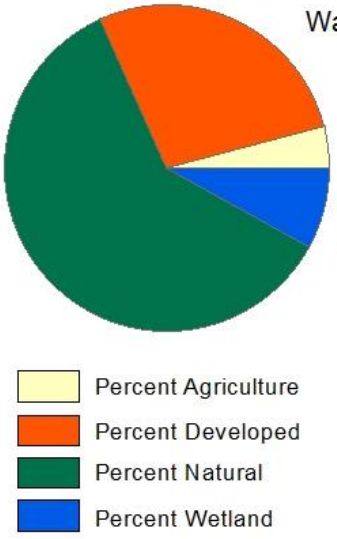
Location:	Upton.
AU Type:	FRESHWATER LAKE
AU Size:	10 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Mill Pond (MA51104) is assessed as Not Supporting based on the presence of two non-native aquatic macrophytes, *Cabomba caroliniana* and *Myriophyllum heterophyllum* documented by MassDEP staff during the summer of 1994.

Mill River (MA51-35)

Location:	Headwaters, outlet North Pond, Milford/Upton to Mendon/Blackstone corporate boundary (through former 2008 segments: Fiske Millpond MA51049, Mill Pond (formerly known as Milford Street Pond) MA51102, Hopedale Pond MA51065 and Spindleville Pond MA51158) (formerly part of 2010 segment: Mill River MA51-10).
AU Type:	RIVER
AU Size:	11.8 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	24.07	9.33	7.18	2.87
Agriculture	4.1%	6.4%	2.6%	5.3%
Developed	27.7%	21.5%	22%	15.3%
Natural	60.1%	62.4%	57.8%	58%
Wetland	8.1%	9.7%	17.7%	21.4%
Impervious Cover	9.8%			

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

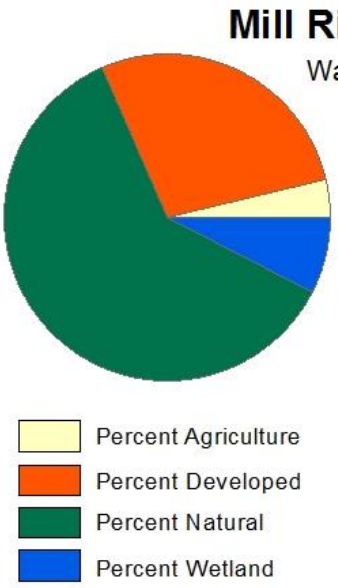
Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte *Myriophyllum heterophyllum* was documented in Fiske Mill Pond impoundment of this Mill River AU (MA51-35) during the synoptic survey in 1994 and two non-native aquatic macrophytes *M. heterophyllum* and *Cabomba caroliniana* were documented during the synoptic survey of the Hopedale Pond impoundment of the Mill River in 1998. Between June 2008 and April 2018, water from Mill River was collected just upstream from the Hopedale WWTP (approximately 1000 feet south west of Malquinn Drive, Hopedale) for use as dilution water in the Hopedale WWTF's WET tests. Survival of *C. dubia* exposed (~7 days) to the river water ranged from 70 to 100% and was very good ($\geq$ 80% in 41 out of 42 tests). Survival was

<75% in only the December 2015 test (70%). Between June 2008 and April 2018, 42 valid acute and 39 valid chronic WET tests were conducted on the Hopedale WWTF effluent using *C. dubia* as the test organism. The LC_{50}s were all >100% effluent except in one test (February 2010) where the limit was not met (LC_{50} = 77.9% effluent). The CNOEC results ranged from 25 to 100% effluent in the 39 valid tests. The CNOEC permit limit (≥61% effluent) was not met in 7 out of the 39 valid chronic tests (~18% of the tests).

The Aquatic Life Use for this Mill River AU (MA51-35) is assessed as Not Supporting based on the presence of two nonnative aquatic macrophytes fanwort (*Cabomba caroliniana*) and *M. heterophyllum* in either the Fiske Mill Pond and/or Hopedale Pond impoundments. The former metals impairment associated with 1.0 miles of this Mill River AU associated with landfill leachate from the Draper Mill Landfill is being carried forward. Occasional chronic toxicity in the Hopedale WWTP effluent is being identified with an Alert.

Mill River (MA51-36)

Location:	From Mendon/Blackstone corporate boundary to 1000 feet upstream of the Rhode Island border, Blackstone (through former 2008 segment: Harris Pond MA51058) (formerly part of 2010 segment: Mill River MA51-10) (the lower 1000 feet represents "All Interstate surface waters that are public water supply in Rhode Island from 1000 feet upstream of the State Line" which are designated as Class A/PWS/ORW in 314CMR4.00, January 2007).
AU Type:	RIVER
AU Size:	4.1 MILES
Classification/Qualifier:	B: TWS, WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	33.06	6.27	9.69	1.86
Agriculture	3.7%	3.2%	2.5%	3.1%
Developed	27.9%	34.3%	22%	26%
Natural	60.8%	56.5%	58.9%	59.5%
Wetland	7.6%	6%	16.5%	11.4%
Impervious Cover	10%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
DFG biologists conducted backpack or barge electrofishing at three sites in August 2008 from upstream to downstream along this Mill River AU (MA51-36) as follows: near the Gravel pit crossing off Elm St, Blackstone (east of the intersection with Carol Lane) (Sample ID: 2631), near the Elm St, Blackstone crossing,

downstream/southeast of Horse Farm (181 Elm Street) (SampleID: 2630), and upstream of Summer St (Attilio Valati Nature Park)) (Sample ID: 2629). All three samples were dominated by fluvial specialist/dependant species that were primarily moderately tolerant to pollution. The most downstream sampling station also had two American brook lamprey, a Tier 2 cold water species. Benthic macroinvertebrate sampling was conducted in this Mill River AU (MA51-36) approximately 200 meters downstream/southeast from Park Street, Blackstone, MA (B0089) in July 2008. The RBPIII analysis indicated the sample was "Not Impacted" when compared to the Mumford River reference site condition (B0091). Water quality sampling was also conducted at Summer Street, Blackstone (W0508) during the summer 2008. The water quality data were indicative of good conditions as follows: minimum DO 7.6mg/L, maximum saturation 96%, maximum temperature 19.2°C, pH range 6.5 to 6.8SU, average total phosphorus 0.041 mg/L (maximum 0.052 mg/L), only one observation of dense/very dense filamentous algae, no exceedances of acute or chronic ammonia criteria, and no exceedances of any acute or chronic metals criteria during any of the three clean metals surveys. Lastly the non-native aquatic macrophyte *Cabomba caroliniana* (fanwort) was identified in a 1998 synoptic survey in the Harris Pond impoundment of this Mill River AU.

Despite all other indicators of good water quality conditions, the Aquatic Life use for the lower Mill River (MA51-36) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Cabomba caroliniana* in the Harris Pond impoundment. The generic "Non-Native Aquatic Plants" is not needed since the specific macrophyte is being used. The metals impairment is being delisted (see additional information in the removal comment).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Metals	Applicable WQS attained; original basis for listing was incorrect	The original metals impairment was associated with 1.0 miles of the Mill River AU (MA51-10) which was subsequently split into two new AUs (MA51-35 and MA51-36) in the 2012 reporting cycle. The metals impairment was for 1.0 miles of the Mill River in the upstream Mill River AU (MA51-35) associated with the Draper Mill Landfill leachate much farther upstream then this lower Mill River AU (MA51-36). Furthermore, there were no exceedances of any acute or chronic metals criteria during any of the three clean metals surveys conducted in the Mill River at Summer Street, Blackstone (W0508) during the summer of 2008. Based on these data and information the metals impairment is being delisted from this lower Mill River AU (MA51-36).
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophyte Cabomba caroliniana (fanwort) has been utilized.

Supporting Information for Delisted Impairments

Metals

The metals impairment was for 1.0 miles of the Mill River in the upstream Mill River AU (MA51-35) associated with the Draper Mill Landfill leachate much farther upstream then this lower Mill River AU (MA51-36) (the AU split from Mill River AU (MA51-10) into two new AUs (MA51-35 and MA51-36) in the 2012 reporting cycle.

Summary of recent metals data indicating improved conditions: There were no exceedances of any acute or chronic metals criteria during any of the three clean metals surveys conducted in the Mill River at Summer Street, Blackstone (W0508) during the summer of 2008. Based on these data and information the metals impairment is being delisted from this lower Mill River AU (MA51-36).

Clean metals data from this Mill River AU (MA51-36) Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data in the Mill River at Summer Street, Blackstone (W0508)

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W0508	MILL RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

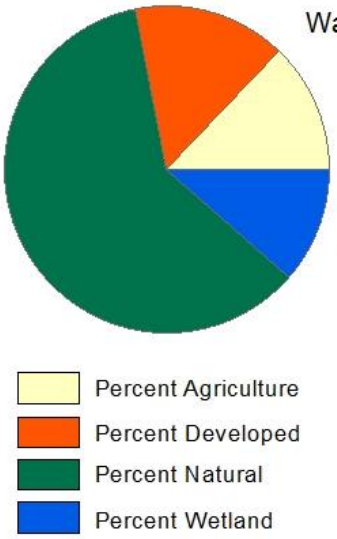
Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W0508	MILL RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified in a 1998 synoptic survey at Harris Pond (MassDEP 1998), which is now considered part of this Mill River segment (MA51-36). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Miscoe Brook (MA51-21)

Location:	Headwaters, perennial portion, east of Adams Road, Grafton to mouth at inlet Silver Lake, Grafton (through former 2008 segment: Cider Millpond MA51019).
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B

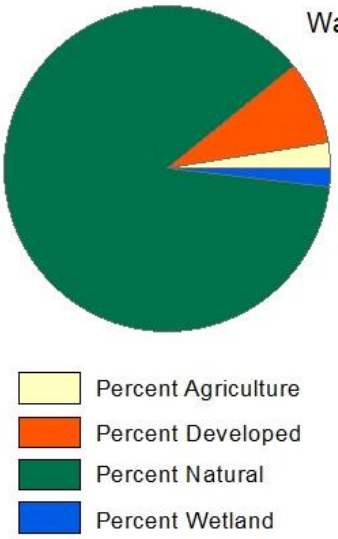


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.94	4.94	1.39	1.39
Agriculture	12.9%	12.9%	12.2%	12.2%
Developed	15.3%	15.3%	10.7%	10.7%
Natural	60.2%	60.2%	56.1%	56.1%
Wetland	11.6%	11.6%	21%	21%
Impervious Cover	5.3%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Miscoe Brook downstream of the Merriam Rd crossing (next to George Hill Rd) in Grafton in July 2013 (SampleID 4937). The sample was compristed of 16% fluvial specialists/dependents and 95% intolerant/moderately intolerant although no cold water fish (Eastern brook trout) were in the sample. The Aquatic Life Use for Miscoe Brook (MA51-21) is assessed as Fully Supporting based on the presence of fluvial specialist/dependent species and the dominance intolerant/moderately intolerant species. However, the use is identified with an Alert status based on the absence of EBT in recent fish sample (2013) when compared to sampling in the same area in 2003, when EBT was the second-most abundant species.

Miscoe Brook (MA51-37)

Location:	Headwaters, perennial portion, from the Mendon/Upton/Northbridge corporate boundaries to mouth at confluence with Taft Pond Brook, Northbridge/Upton.
AU Type:	RIVER
AU Size:	0.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.80	0.80	0.23	0.23
Agriculture	2.6%	2.6%	0%	0%
Developed	8.3%	8.3%	5.1%	5.1%
Natural	87.3%	87.3%	90%	90%
Wetland	1.8%	1.8%	4.9%	4.9%
Impervious Cover	2.9%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
MassDEP biologists conducted backpack electrofishing in Miscoe Brook downstream of Oak Drive, Upton/South St, Northbridge in September 2006 (SampleID: 2006). The sample dominated by multiple age classes of Eastern brook trout. The Aquatic Life Use for Miscoe Brook (MA51-37) is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout. The former alert related to no/low flow conditions as noted by DWM staff during sampling efforts in September 2003 is being carried forward.

Miscoe Lake (MA51106)

Location:	Wrentham (size indicates portion in Massachusetts) (entire portion in MA is from 1000 feet upstream of the state line, these interstate surface waters are public water supply in Rhode Island and designated in MA as Class A/PWS/ORW).
AU Type:	FRESHWATER LAKE
AU Size:	5 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The Aquatic Life Use for Miscoe Lake (MA51106) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Cabomba caroliniana.* This use is also identified with an Alert status based on the unconfirmed presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum.*

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

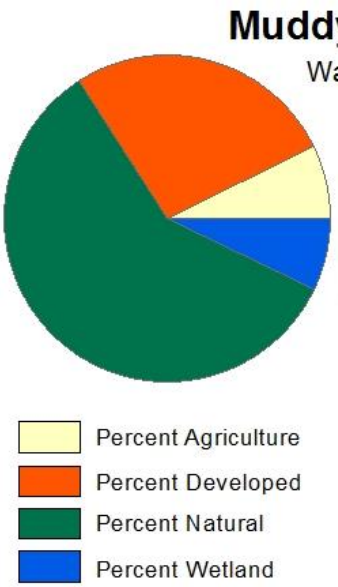
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

During a 1994 synoptic survey, MassDEP staff reported the presence of the non-native aquatic macrophyte, *Cabomba caroliniana*, as well as "*Myriophyllum* (*heterophyllum*?)". Species confirmation for the *Myriophyllum* sp. record is required (MassDEP 1994). he generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Muddy Brook (MA51-40)

Location:	Headwaters, outlet small unnamed pond north of Nipmuc Regional High School, Mendon to mouth at confluence with Mill River, Mendon.
AU Type:	RIVER
AU Size:	5.1 MILES
Classification/Qualifier:	B

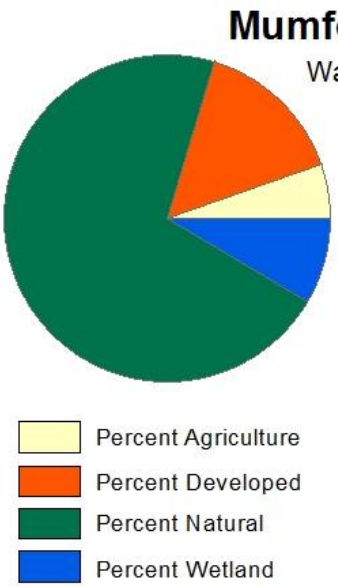


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.23	5.50	2.01	1.84
Agriculture	7.2%	6.8%	3%	3.2%
Developed	27%	27.1%	19.9%	19.4%
Natural	58.7%	58.5%	61%	60.8%
Wetland	7.2%	7.6%	16.2%	16.6%
Impervious Cover	8.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing at three sites along Muddy Brook in Mendon from upstream to downstream as follows: north of Milford Street (Rte 16) in July 2001 (SampleID: 417), Hartford Ave in August 2010 (SampleID: 3402) and near the mouth south of Hartford Avenue in July 2001 (SampleID: 416). American brook lamprey were at all three sites as well as other fluvial species and multiple age classes of Eastern brook trout were also documented at the two downstream locations. MassDEP staff conducted water quality sampling near the mouth of Muddy Brook at Bellingham Road in Mendon (W1760) during the summer of 2008. During the four DO probe deployments the minimum DO was 7.02mg/L, the maximum saturation was 101%, and the maximum diel DO shift was 1.1mg/L. The attended data can be summarized as follows: minimum DO 7.0mg/L (n=8), maximum saturation 99%), maximum temperature 19.0°C, pH range 6.2 to 6.6SU (3 of 7 measurements below 6.5SU). The total phosphorus concentrations were low (average 0.012 maximum 0.02mg/L). No conditions of dense or very dense filamentous algae were noted. No acute or chronic criteria exceedances for ammonia were found. The Aquatic Life Use for Muddy Brook (MA51-40) is assessed as Fully Supporting based on the fish and water quality data indicative of good conditions.

Mumford River (MA51-13)

Location:	Headwaters, outlet Tuckers Pond, Sutton to Douglas WWTP discharge (NPDES: MA0101095), Douglas.
AU Type:	RIVER
AU Size:	4.2 MILES
Classification/Qualifier:	B: WWF, HQW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	29.67	11.00	9.09	3.03
Agriculture	5.3%	3.2%	4%	2.6%
Developed	15.1%	22.7%	14.9%	22.2%
Natural	71%	66.3%	67.3%	63.9%
Wetland	8.6%	7.7%	13.8%	11.3%
Impervious Cover	5.1%			

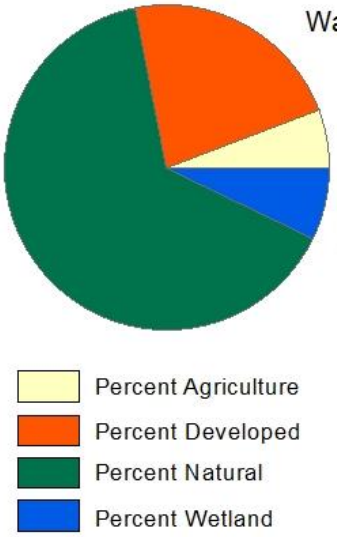
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
MassDEP conducted monitoring (benthic, fish, water quality) in the upper part of this Mumford River AU (MA51-13) ~1/2mi downstream of Main Street in Sutton as part of the Probablistic Wadeable Streams surveys during the summer of 2011. While the taxonomy for the benthic sample (B0705) is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Only a few fish (n=5) were captured during the barge electrofishing effort in August 2011 however notes were made that sampling was difficult (SampleID: 4590). It should be noted however that at least one fluvial species and two moderately tolerant macrohabitat generalist species were present despite poor efficiency. The water quality monitoring data (W2182) can be summarized as follows: the minimum DO was 4.9mg/L although below 5.0mg/L only once. The maximum saturation was 135%, the maximum diel shift was 5.5mg/L, pH ranged from 6.9 to 8.8SU (n=6) and there were notes made that dense/very dense algal and aquatic plants were often present including notes about *Myriophyllum* although no species identification was made. The maximum temperature during the long-term thermistor deployment was 31.2°C and the 7 DADM was above 27.7°C eight times. The average total phosphorus concentration was low (0.010 with a maximum 0.012mg/L). No acute or chronic ammonia criteria

exceedances were found. No acute or chronic exceedances for ammonia were found. One round of clean metals sampling was also conducted at this site in August 2011 (W2182). Except for one chronic lead exceedance (7TU) there were no exceedances of any acute or other chronic criteria. Further downstream in this Mumford River AU (MA51-13), benthic macroinvertebrate sampling was conducted approximately 125 meters downstream/south from Manchaug Street in Douglas (station B0091) in July 2008. This site was used as a reference site. Benthic sampling was also conducted at this location by Normandeau biologists during the summer of 2014 for use as the reference site for the Upper Blackstone Water Pollution Abatement Districts studies on the Blackstone River. Between April 2008 and July 2018, water from the Mumford River located approximately 55 feet east of North Street in Douglas (downstream of the Douglas Mill Pond Dam) was collected for use as dilution water in the Douglas WWTF WET tests. Survival of *C.dubia* exposed (~7 days) to the river water was $\geq$ 80% in 40 of the 41 tests submitted and was less than 75% in only one test event (April 2015 survival was 70%).

The Aquatic Life Use for this Mumford River AU (MA51-13) is assessed as Fully Supporting based primarily on the benthic macroinvertebrate community (considered reference site conditions) and the good survival (~7-day) of *C. dubia* exposed to river water samples for over a decade. In the upper reach of this AU, however, several Alerts are being identified: indications of enriched conditions (large diel DO shift as high as 5.5mg/L in July 2011 and notes about dense/very dense algal cover although the total phosphorus concentrations were low and DO met standards), elevated temperature (maximum 31.2°C and above the 27.7°C 7DADM eight times), observations of an unidentified species of *Myriophyllum* (possibly a non-native species as *M. heterophyllum* is present in Tuckers Pond), and the single chronic criteria exceedance for lead (7 TU).

Mumford River (MA51-14)

Location:	From Douglas WWTP discharge (NPDES: MA0101095), Douglas to mouth at confluence with Blackstone River, Uxbridge (through former 2008 segments: Gilboa Pond MA51052, Lackey Pond MA51083, Meadow Pond MA51193, Linwood Pond MA51088, Whitin Pond MA51178, and Caprons Pond MA51014).
AU Type:	RIVER
AU Size:	9.4 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	56.16	7.12	17.26	2.24
Agriculture	5.7%	6%	3.8%	1.9%
Developed	22.5%	39.8%	20.6%	40.8%
Natural	64.6%	49.1%	63.1%	47.3%
Wetland	7.2%	5.1%	12.5%	10%
Impervious Cover	7.5%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Copper		Removed
5	5	(Dewatering*)		Removed
5	5	(Fanwort*)		Added
5	5	Lead		Removed
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Water quality monitoring was conducted in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025). These data were indicative of good conditions as follows: the minimum DO was 7.34mg/L, the maximum diel DO shift was 0.6 mg/L, the maximum DO saturation was 102%. The pH

ranged from 6.4 to 6.8SU (n=7). The average total phosphorus was 0.045 mg/L (maximum 0.057 mg/L), and there were no observations of dense or very dense filamentous algae noted. With the exception of one slight chronic lead criteria exceedance (1.36TU) there were no acute or chronic exceedances for any metals (n=3). MassDEP biologists conducted benthic sampling in the Mumford River approximately 100 meters downstream/east from the confluence with Gilboa Brook in Uxbridge (station B0272) in July 2008. The RBPIII analysis indicated "Slightly Impacted" conditions when compared to the reference (Unique ID: B0091) (67% comparable). Infestations of several non-native aquatic species have been documented in various impoundments including *Cabomba caroliniana, Myriophyllum heterophyllum* and *Trapa natans*. The Aquatic Life Use for the lower Mumford River AU (MA51-14) is assessed as Not Supporting based on the presence of non-native aquatic macrophytes, fanwort (*Cabomba caroliniana*)*, Myriophyllum heterophyllum* and waterchestnut (*Trapa natans*). This use is identified with an Alert status based on an old observation of an unidentified species of *Nasturtium* (possibly a non-native species).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Copper	Applicable WQS attained; original basis for listing was incorrect	Metals were first listed in 1992 reporting cycle and were remapped to copper and lead in the 2010 reporting cycle. In the 1992 cycle metals was identified as a Threat for a total of 0.5 miles (most likely for a half mile downstream from the Douglas WWTP discharge). EPA automatically listed this Threatened cause as an impairment during the subsequent reporting cycle (not an intentional impairment listing by MassDEP staff but rather a misuse of the Threatened cause category in the WBS database at that time). No detectable levels of copper were found during the water quality sampling in the Mumford River at Depot Street in Uxbridge (MF07) in June and August 1988 (all results <0.02mg/L, n=4). Clean metals sampling was conducted by MassDEP at one site in the in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008. This site was in the upper part of the Mumford River AU but downstream from the Douglas WWTP discharge. None of the three samples collected exceeded any acute or chronic metals criteria. These data, considered to be representative of current conditions based on a review of Google Earth imagery between July 2007 and September 2017 which depict similar land use conditions, support the delisting of copper as an impairment from this Mumford River AU (MA51-14).
Dewatering	Applicable WQS attained, due to restoration activities	Low flow alterations (remapped to Dewatering in 2016) impairment was originally listed in the 2002 reporting cyle for the Lackey Pond AU (MA51083). The impairment was based on observations during the summer of 1997 synotpic survey when the dam was in disrepair and little

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		water was being held (mostly a channel remaining). The Lackey Pond AU was incorporated into this Mumford River AU (MA51-14) in the 2010 reporting cycle amd so the low flow alteration impairment was carried into the Mumford River AU. A restoration project on the Lackey Pond Dam however was completed between 1998 and 2000. The impoundment height is now managed by DFG to maximize deep and shallow marsh habitat for use by waterfowl and marsh birds. Based on restoration project the dewatering impairment is being removed from this Mumford River AU (MA51-14).
Lead	Applicable WQS attained; original basis for listing was incorrect	Metals were first listed in 1992 reporting cycle and were remapped to copper and lead in the 2010 reporting cycle. In the 1992 cycle metals was identified as a Threat for a total of 0.5 miles (likely for a half mile downstream from the Douglas WWTP discharge). EPA automatically listed this Threatened cause an impairment during the subsequent reporting cycle (not an intentional impairment listing by MassDEP staff but rather a misuse of the Threatened category in the WBS database at that time). One detectable level of lead was found during the water quality sampling in the Mumford River at Depot Street in Uxbridge (MF07) in June and August 1988 (0.06mg/L), while the other three results were below detection (<0.05mg/L). Most recently there was one slight exceedance of the chronic lead criteria (1.36TU) and no other acute or chronic lead criteria exceedances or any other metals during the clean metals sampling conducted in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008 (n=3). These data are considered to be representative of current conditions based on a review of Google Earth imagery between July 2007 and September 2017 which depict similar land use conditions. A single chronic exceedance of any metal does not warrant an impairment decision according to the CALM guidance manual and therefore lead is being delisted as a cause of impairment for this Mumford River AU (MA51-14).

Supporting Information for Delisted Impairments

Copper

In the 1992 cycle metals was identified as a Threat for a total of 0.5 miles (likely for a half mile downstream from the Douglas WWTP discharge as was the practice of assessment staff at that time). EPA automatically listed this Threatened cause as an impairment during the subsequent reporting cycle (not an intentional impairment listing by MassDEP staff but rather a misuse of the Threatened cause category in the WBS database at that time).

Metals Data supporting delisting:

No detectable levels of copper were found during the water quality sampling in the Mumford River at Depot Street in Uxbridge (MF07) in June and August 1988 (all results <0.02mg/L, n=4) and there was one detectable level of lead (0.06mg/L), while the other three results were below detection (<0.05mg/L).

More recently clean metals sampling was conducted by MassDEP at one site in the in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008. This site was in the upper part of the Mumford River AU but downstream from the Douglas WWTP discharge. Most recently there was one slight exceedance of the chronic lead criteria (1.36TU) and no other acute or chronic lead criteria exceedances or any other metals during the clean metals sampling conducted in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008 (n=3). These data, considered to be representative of current conditions based on a review of Google Earth imagery between July 2007 and September 2017 which depict similar land use conditions, support the delisting of copper as an impairment from this Mumford River AU (MA51-14)

Data Source: (MassDEP Undated 4) Station W1025 is Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W1025	MUMFORD RIVER	2008	3	0	0	0	0	0	0	0	0	0

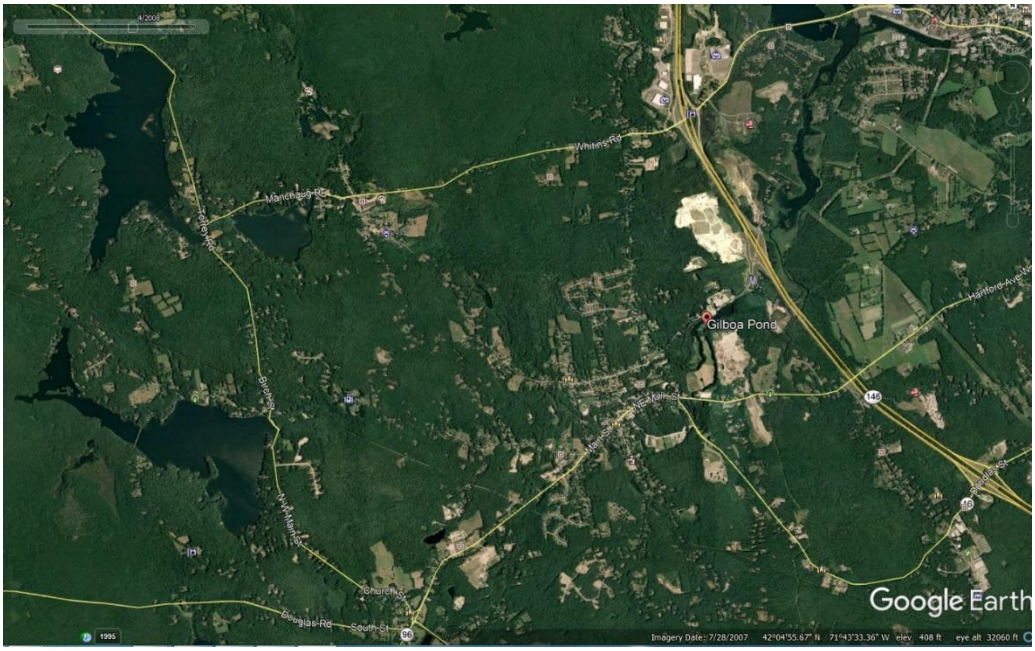
Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W1025	MUMFORD RIVER	2008	3	0	0	0	1	0	0	0	0	0	0

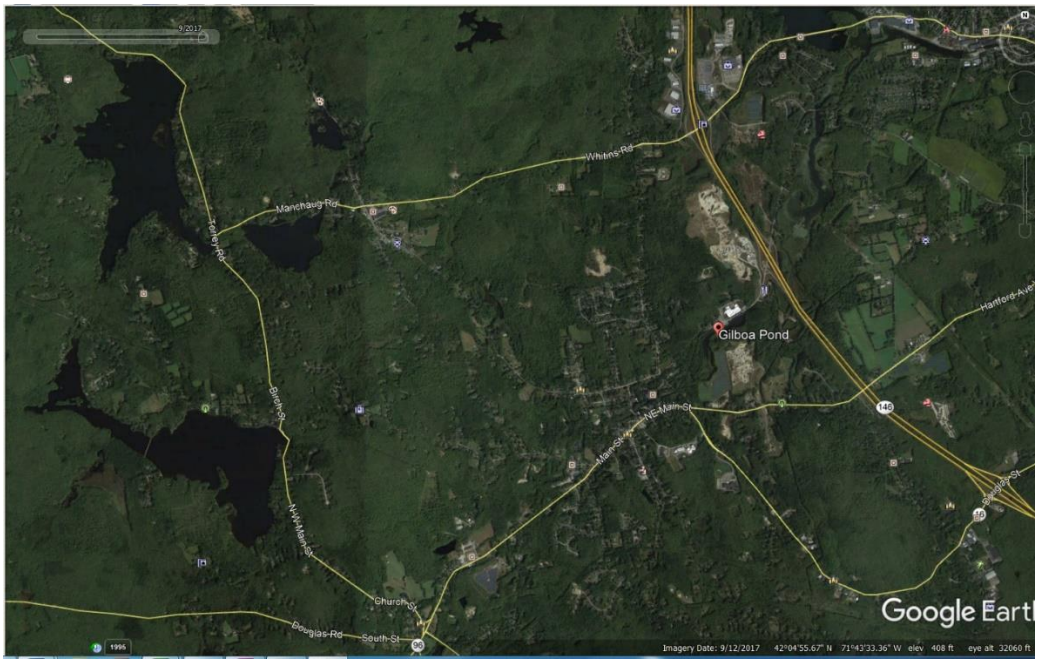
A	B	C	F	H	K	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO
						Cd Violation	Cd Violation	Cr Violation	Cr Violation	Cu Violation	Cu Violation	Pb Violation	Pb Violation	Ni Violation	Ni Violation	Ag Violation	Zn Violation	Zn Violation	As Violation	As Violation	Al Violation	Al Violation	Se Violation
UNIQUE_ID	STAID_YR	Waterbody	Date	Un	Hardne	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CMC	CCC	CMC	CCC	CMC	CCC	CCC
W1025	W1025	MUMFORD RIVER/	6/19/2008	mg/L	20	0.30	-99.00	0.00	0.01	0.24	0.32	0.05	1.36	0.00	0.03	0.62	0.06	0.06	0.00	0.00	0.03	0.23	0.56
W1025	W1025	MUMFORD RIVER/	9/12/2008	mg/L	16	0.38	-99.00	0.00	0.01	0.28	0.36	0.02	0.42	0.00	0.02	-99.00	0.08	0.08	0.00	0.00	0.07	0.57	0.56
W1025	W1025	MUMFORD RIVER/	9/22/2008	mg/L	13	0.49	-99.00	0.00	0.02	0.27	0.34	0.02	0.57	0.00	0.02	-99.00	0.09	0.09	0.00	0.00	0.07	0.57	0.56

Data Source: (Google Earth Pro Undated)

Google Earth imagery taken July 2007



Latest imagery taken September 2017



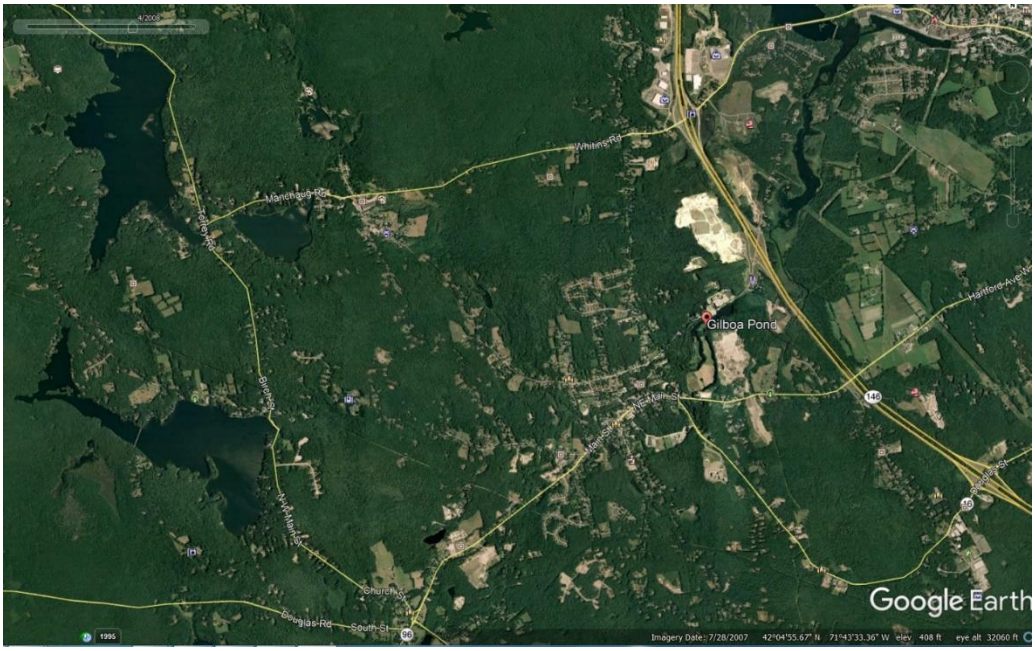
Dewatering

Dewatering is being removed as an impairment for this Mumford River AU (MA51-14). Lackey Pond was incorporated into this Mumford River AU (MA51-14) in the 2010 reporting cycle. A restoration project on the Lackey Pond Dam was completed between 1998 and 2000. The impoundment height is now managed by DFG to maximize deep and shallow marsh habitat for use by waterfowl and marsh birds.

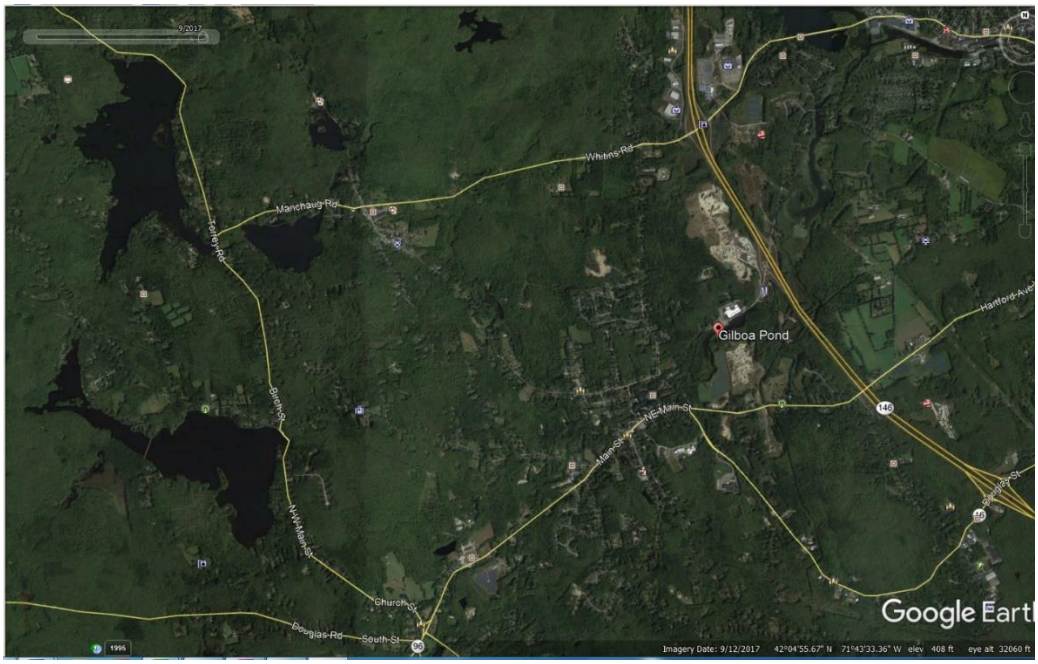
Google Earth imagery in July 2007 and September 2017 do not show any dewatering in the Lackey Pond impoundment of the Mumford River. Based on this information the dewatering impairment is being removed.

Data Source: (Google Earth Pro Undated)

Google Earth imagery taken July 2007



Latest imagery taken September 2017



Lead

In the 1992 cycle metals was identified as a Threat for a total of 0.5 miles (likely for a half mile downstream from the Douglas WWTP discharge as was the practice of assessment staff at that time). EPA automatically listed this Threatened cause as an impairment during the subsequent reporting cycle (not an intentional impairment listing by MassDEP staff but rather a misuse of the Threatened cause category in the WBS database at that time).

Metals Data supporting delisting:

No detectable levels of copper were found during the water quality sampling in the Mumford River at Depot Street in Uxbridge (MF07) in June and August 1988 (all results <0.02mg/L, n=4) and there was one detectable level of lead (0.06mg/L), while the other three results were below detection (<0.05mg/L). More recently clean metals sampling was conducted by MassDEP at one site in the in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008. This site was in the upper part of the Mumford River AU but downstream from the Douglas WWTP discharge. Most recently there was one slight exceedance of the chronic lead criteria (1.36TU) and no other acute or chronic lead criteria exceedances or any other metals during the clean metals sampling conducted in the Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook (W1025) during the summer of 2008 (n=3). These data, considered to be representative of current conditions based on a review of Google Earth imagery between July 2007 and September 2017 which depict similar land use conditions, support the delisting of copper as an impairment from this Mumford River AU (MA51-14)

Data Source: (MassDEP Undated 4) Station W1025 is Mumford River downstream of Gilboa Dam but upstream of the confluence with Gilboa Brook

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W1025	MUMFORD RIVER	2008	3	0	0	0	0	0	0	0	0	0

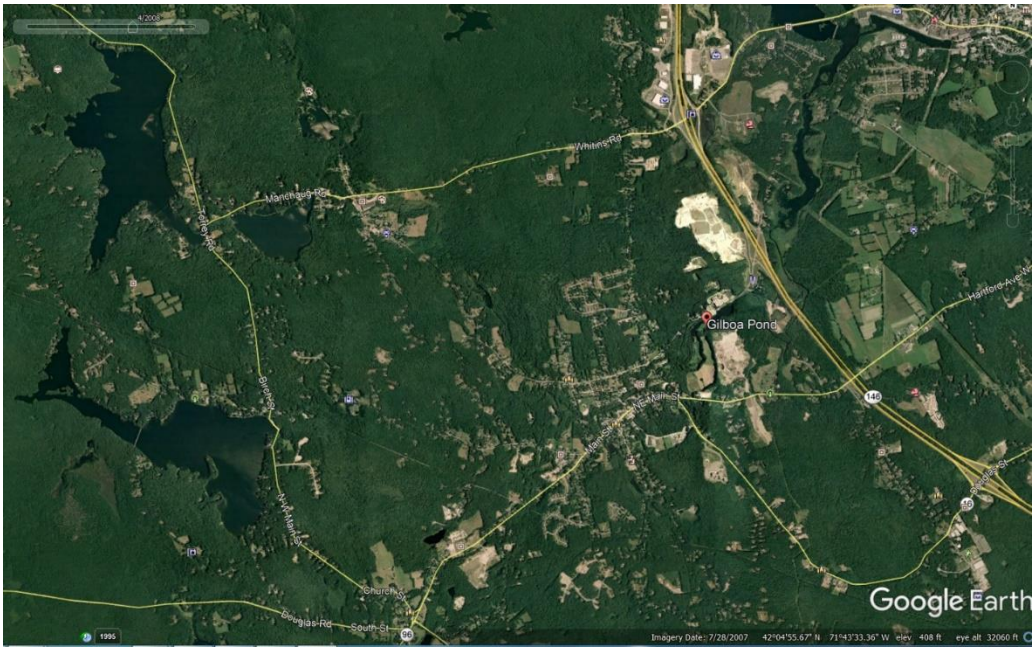
Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W1025	MUMFORD RIVER	2008	3	0	0	0	1	0	0	0	0	0	0

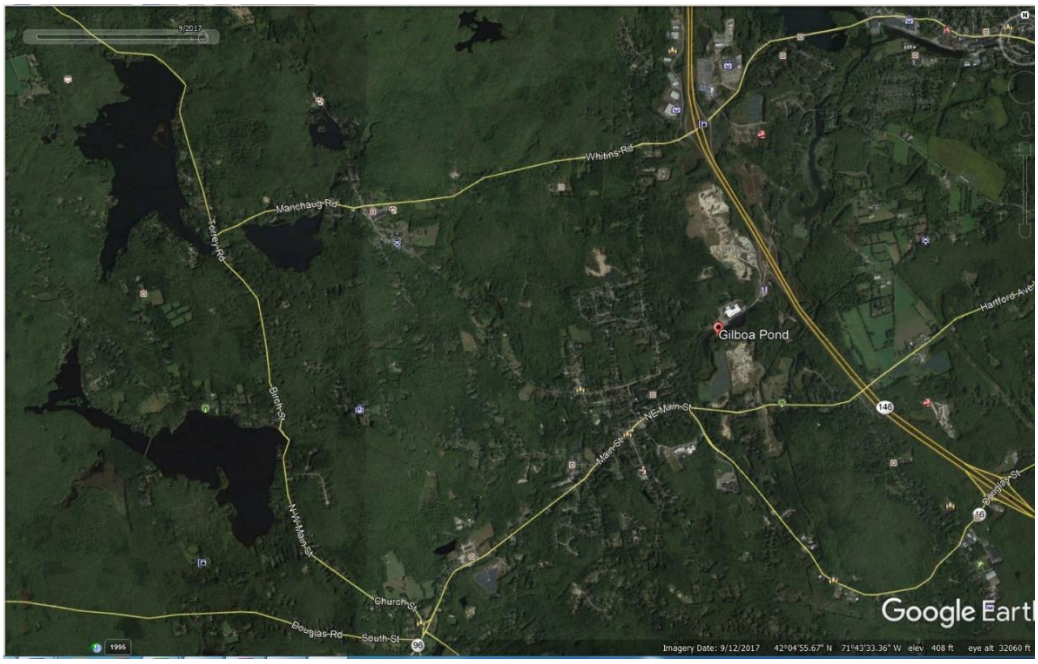
UNIQUE_ID	STAID_YR	Waterbody	Date	Un	Hardne	Cd Violation CMC	Cd Violation CCC	Cr Violation CMC	Cr Violation CCC	Cu Violation CMC	Cu Violation CCC	Pb Violation CMC	Pb Violation CCC	Ni Violation CMC	Ni Violation CCC	Ag Violation CMC	Zn Violation CMC	Zn Violation CCC	As Violation CMC	As Violation CCC	Al Violation CMC	Al Violation CCC	Se Violation CCC
W1025	W1025	MUMFORD RIVER/	6/19/2008	mg/L	20	0.30	-99.00	0.00	0.01	0.24	0.32	0.05	1.36	0.00	0.03	0.62	0.06	0.06	0.00	0.00	0.03	0.23	0.56
W1025	W1025	MUMFORD RIVER/	9/12/2008	mg/L	16	0.38	-99.00	0.00	0.01	0.28	0.36	0.02	0.42	0.00	0.02	-99.00	0.08	0.08	0.00	0.00	0.07	0.57	0.56
W1025	W1025	MUMFORD RIVER/	9/22/2008	mg/L	13	0.49	-99.00	0.00	0.02	0.27	0.34	0.02	0.57	0.00	0.02	-99.00	0.09	0.09	0.00	0.00	0.07	0.57	0.56

Data Source: (Google Earth Pro Undated)

Google Earth imagery taken July 2007



Latest imagery taken September 2017



Newton Pond (MA51110)

Location:	Shrewsbury/Boylston.
AU Type:	FRESHWATER LAKE
AU Size:	54 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Two non-native aquatic macrophytes, *Cabomba caroliniana* and *Myriophyllum heterophyllum,* were documented in Newton Pond (MA51110) during a 1998 synoptic survey. The Aquatic Life Use for Newton Pond (MA51110) will continue to be assessed as Not Supporting based on the presence of two non-native aquatic macrophytes, *Myriophyllum heterophyllum* and fanwort (*Cabomba caroliniana*). The species specific fanwort impairment is being added.

Nipmuck Pond (MA51111)

Location:	Mendon.
AU Type:	FRESHWATER LAKE
AU Size:	85 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
No recent data are available to assess the Aquatic Life Use for Nipmuck Pond (MA51111). However, this use is identified with an Alert status based on unconfirmed reports of an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* in the pond.

North Pond (MA51112)

Location:	Hopkinton/Milford.
AU Type:	FRESHWATER LAKE
AU Size:	231 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Brittle Naiad, Najas Minor*)		Added
4c	4c	(Fanwort*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for North Pond (MA51112) is assessed as Not Supporting due to the presence of the following non-native aquatic macrophytes: *Cabomba caroliniana* (Fanwort), *Egeria densa, Myriophyllum heterophyllum, Najas minor* (Brittle Naiad), and *Utricularia inflata.*

Number 1 Pond (MA51114)

Location:	Sutton
AU Type:	FRESHWATER LAKE
AU Size:	9 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Number 1 Pond (MA51114) so it is Not Assessed.

Number 2 Pond (MA51115)

Location:	Sutton/Oxford.
AU Type:	FRESHWATER LAKE
AU Size:	9 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Number 2 Pond (MA51115) so it is Not Assessed.

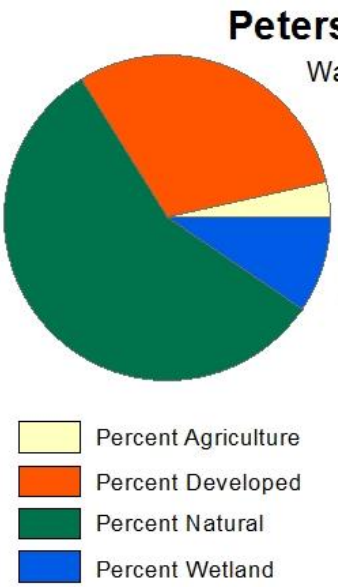
Peabody Pond (MA51119)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	6 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Peabody Pond (MA51119) so it is Not Assessed.

Peters River (MA51-18)

Location:	Headwaters, outlet Silver Lake, Bellingham to Rhode Island border east of Route 126, Bellingham.
AU Type:	RIVER
AU Size:	4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	10.18	6.77	2.37	1.61
Agriculture	3.6%	2.6%	2.6%	2.3%
Developed	30.3%	34.3%	23.5%	27.1%
Natural	56.7%	52.9%	52.4%	46.5%
Wetland	9.5%	10.2%	21.5%	24.1%
Impervious Cover	11.9%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Copper		Removed
5	5	Lead		Removed
5	5	Temperature		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
DFG biologists conducted backpack electrofishing in the Peters River upstream of Wrentham Rd in Bellingham towards the confluence with Arnold Brook in July 2007 (SampleID: 4001). The sample was comprised of seven species, dominated by fluvial specialists and had two coldwater species (several large Eastern brook trout and American brook lamprey). Further downstream MassDEP biologists also conducted backpack electrofishing approximately 1/4mi upstream of Wrentham Rd in September 2011 (SampleID: 4613). This sample was dominated by the Tier II coldwater species American brook lamprey. MassDEP staff also conducted water quality monitoring in the Peters River upstream of Wrentham Rd during the summer of 2011 (W2192). Unnattended DO data during the three four-day deploys was as follows: minimum 5.7mg/L, minimum daily

mean 6.1mg/L, and maximum diel DO shift 1.3mg/L. The maximum temperature was 26.4°C with the maximum 24 hour average 24.4°C (above 24.1°C once) and the 7 DADA was above 21.0°C 21 times during the thermistor deployment from 26 May to 29 September 2011. The pH was good (6.8-6.9SU, n=6). The seasonal average total phosphorus concentration was low 0.029mg/L (maximum 0.041mg/L) and there were no observations of dense/very dense filamentous algae. No acute or chronic exceedances for ammonia were found. Further downstream near Paine St, Bellingham MassDEP staff conducted water quality monitoring in the Peters River during the summer of 2008 (Station W1022). Data collected at this site can be summarized as follows: minimum DO 7.4mg/L, maximum saturation 90%, pH ranged from 6.5 to 6.9SU, maximum attended temperature 19.0°C. A thermistor was also deployed at this site in June for 96 days with the following results: maximum temperature 24.3°C, and the maximum 7 DADA 22.1°C exceeding the Tier 2 Chronic criterion 22 times. The total phosphorus concentrations were low (average and maximum 0.021 and 0.031mg/L, respectively). There were no observations of dense/very dense filamentous algae present either. No acute or chronic exceedances for ammonia were found.

Given the presence of American brook lamprey in the Peters River, the water quality monitoring data will be evaluated as a Tier 2 cold water resource. Although all other water quality monitoring data are indicative of good conditions, the Aquatic Life Use for Peters River (MA51-18) is assessed as Not Supporting based on elevated temperatures that exceeded Tier 2 cold water guidelines. The former impairments for copper and lead are being delisted (see additional information in removal comments).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Copper	Applicable WQS attained; based on new data	Metals was original identified as an impairment in the 1998 reporting cycle and remapped to copper and lead impairments in the 2010 reporting cycle. The original impairments were based on data collected from the Peters River during the Blackstone River Initiative sampling conducted by MassDEP and EPA personnel during dry weather surveys conducted in 1991 and wet weather surveys conducted in 1993. Clean metals sampling was conducted by MassDEP at two sites in the Peters River as follows: approximately 1300 feet upstream from Wrentham Road, Bellingham (W2192) in 2011 and at Paine St, Bellingham (Station W1022) in 2008. None of the three samples collected at either site in either year had any exceedances of any metals criteria. These data, combined with the data collected during the summer of 2005 as part of the Blackstone TMDL development project, supports the delisting of copper as an impairment from the Peters River.
Lead	Applicable WQS attained; based on new data	Metals was original identified as an impairment in the 1998 reporting cycle and remapped to copper and lead impairments in the 2010 reporting cycle. The original impairments were based on data collected from the Peters River during the Blackstone River Initiative sampling conducted by MassDEP and EPA personnel

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		during dry weather surveys conducted in 1991 and wet weather surveys conducted in 1993. Clean metals sampling was conducted by MassDEP at two sites in the Peters River as follows: approximately 1300 feet upstream from Wrentham Road, Bellingham (W2192) in 2011 and at Paine St, Bellingham (Station W1022) in 2008. None of the three samples collected at either site in either year had any exceedances of any metals criteria. These data, combined with the data collected during the summer of 2005 as part of the Blackstone TMDL development project, supports the delisting of lead as an impairment from the Peters River.

Supporting Information for Delisted Impairments

Copper

Clean metals sampling was conducted by MassDEP at two sites in the Peters River as follows: approximately 1300 feet upstream from Wrentham Road, Bellingham (W2192) in 2011 and at Paine St, Bellingham (Station W1022) in 2008. None of the three samples collected at either site in either year had any exceedances of any metals criteria. These data, combined with the data collected during the summer of 2005 as part of the Blackstone TMDL development project, support delistings of both lead and copper as impairments from the Peters River.

Data Source: (The Louis Berger Group, Inc. 2008)

A total of four storms were surveyed to assess the water quality in the Blackstone River during wet weather conditions. A storm was defined by at least 0.5 inches of rainfall, and three days of less than 0.1 inches of rainfall per day prior to a storm. Rainfall information was available through either the NWS stations at the Worcester and Providence Airports or through the network of real-time rainfall stations at Weather Underground. In the following discussion two rainfall stations were used to represent the rainfall record, Bellingham, MA and North Smithfield, RI. During Storm WW-01 (July 8, 2005), Storm WW-03 (October 7-8, 2005), and Storm WW-04 (October 23, 2005) samples were collected along the Blackstone River within Rhode Island. Storm WW-02 (September 15, 2005) was focused on the Mill River and Peters River (during low-flow conditions in the Blackstone River). The goal of the WW-02 survey was to determine the water quality along the entire length of each tributary, including the section within the closed culvert underneath parts of the City of Woonsocket.

4.1.2 Storm WW-02, on September 15, 2005, involved only the Mill River and Peter River watersheds. The storm produced 1.76 inches of rainfall over a roughly 3-hour period. The antecedent dry period criteria were met. The low flow in the Blackstone River allowed access to Station W-16. The prestorm samples were collected as part of the dry weather sampling event DW-11 that occurred on September 14, 2005, approximately 24 hours prior to the start of WW-02. The storm was very intense and of short duration (Figure 4-8). The two rainfall gaging stations were located near the top and directly west of the bottom of the watersheds. Rainfall patterns from the two stations were similar in size and timing,

indicating that the rainfall was distributed across the watershed. Based on the Intensity-Duration-Frequency curves available for Providence (NOAA, 1977), the storm was approximately a 1-2 year event. There were two peaks in the hydrograph from the Peters River USGS station (Figure 4-9). The first occurred approximately 2.5 hours after the start of the storm which is an indication of the local runoff. The second peak occurred approximately 10 hours after the start of the storm; it is an indication of the time of concentration in the watershed, rather than of multiple storm cells. The hyetographs only support a single storm cell. A total of seven samples were collected, distributed through the first flush of the event along the rising limb of the hydrograph and through the peak of the flow.

Dissolved Copper

During dry weather there were three minor acute dissolved copper exceedances in any of the rivers, two of which occurred at the MA/RI State line. The largest number of dry weather chronic exceedances also occurred at the MA/RI State line (W-01), where 60% of the surveys had concentrations that exceeded the standards. The exceedances of dissolved copper at the lower Blackstone River stations were a direct result of the high concentrations at the State line that carried through to the mouth of the river. Copper concentrations in the Branch River, Mill River, Peters River, and Abbott Run Brook met chronic criteria. These four tributaries contributed copper on average at less than 4.7%, 1.7%, 0.4%, and 4.6% respectively, at their points of confluence with the Blackstone River. Most of the sampled outfalls also met regulatory standards.

During wet weather, the acute criteria were exceeded approximately half of the time at the State line; chronic criteria were exceeded during each storm. Most of the copper load measured in Manville (downstream end of Reach 1) was attributable to loading from Massachusetts. However, copper concentrations in the Branch River also exceeded the acute and chronic criteria. The Peters River only exceeded the regulatory standards slightly during the second sampled storm. The Mill River exceeded the acute criteria once. Load analysis for Reach 1 did not suggest additional significant sources of copper in addition to the sources that were monitored. There were no significant sources within Reaches 2 and 3. Some of the sampled outfalls in all three reaches exceeded the regulatory criteria for copper.

The dry weather profile for the 1991 BRI was similar to that observed in the BTMDL study. In general, concentrations during the BTMDL study were lower and the ranges between maximum and minimum were smaller than the BRI study. There appears to be a measurable reduction in copper from Massachusetts over the 14 years. This change can also be seen in the downstream stations.

Clean metals sampling data collected in the Peters River ~1300 feet upstream from Wrentham Road, Bellingham (W2192) (Site MAP2-032) in 2011 at Paine St, Bellingham (Station W1022) in 2008 showing no exceedances of criteria.

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn..CMC	As CMC	Al CMC
W2192	PETERS RIVER	2011	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W2192	PETERS RIVER	2011	3	0	0	0	0	0	0	0	0	0	0

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W1022	PETERS RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W1022	PETERS RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Lead

Clean metals sampling was conducted by MassDEP at two sites in the Peters River as follows: approximately 1300 feet upstream from Wrentham Road, Bellingham (W2192) in 2011 and at Paine St, Bellingham (Station W1022) in 2008. None of the three samples collected at either site in either year had any exceedances of any metals criteria. These data, combined with the data collected during the summer of 2005 as part of the Blackstone TMDL development project, support delistings of both lead and copper as impairments from the Peters River.

Data Source: (The Louis Berger Group, Inc. 2008)

A total of four storms were surveyed to assess the water quality in the Blackstone River during wet weather conditions. A storm was defined by at least 0.5 inches of rainfall, and three days of less than 0.1 inches of rainfall per day prior to a storm. Rainfall information was available through either the NWS stations at the Worcester and Providence Airports or through the network of real-time rainfall stations at Weather Underground. In the following discussion two rainfall stations were used to represent the rainfall record, Bellingham, MA and North Smithfield, RI. During Storm WW-01 (July 8, 2005), Storm WW-03 (October 7-8, 2005), and Storm WW-04 (October 23, 2005) samples were collected along the Blackstone River within Rhode Island. Storm WW-02 (September 15, 2005) was focused on the Mill River

and Peters River (during low-flow conditions in the Blackstone River). The goal of the WW-02 survey was to determine the water quality along the entire length of each tributary, including the section within the closed culvert underneath parts of the City of Woonsocket.

4.1.2 Storm WW-02, on September 15, 2005, involved only the Mill River and Peter River watersheds. The storm produced 1.76 inches of rainfall over a roughly 3-hour period. The antecedent dry period criteria were met. The low flow in the Blackstone River allowed access to Station W-16. The prestorm samples were collected as part of the dry weather sampling event DW-11 that occurred on September 14, 2005, approximately 24 hours prior to the start of WW-02. The storm was very intense and of short duration (Figure 4-8). The two rainfall gaging stations were located near the top and directly west of the bottom of the watersheds. Rainfall patterns from the two stations were similar in size and timing, indicating that the rainfall was distributed across the watershed. Based on the Intensity-Duration-Frequency curves available for Providence (NOAA, 1977), the storm was approximately a 1-2 year event. There were two peaks in the hydrograph from the Peters River USGS station (Figure 4-9). The first occurred approximately 2.5 hours after the start of the storm which is an indication of the local runoff. The second peak occurred approximately 10 hours after the start of the storm; it is an indication of the time of concentration in the watershed, rather than of multiple storm cells. The hyetographs only support a single storm cell. A total of seven samples were collected, distributed through the first flush of the event along the rising limb of the hydrograph and through the peak of the flow.

Dissolved Lead

During dry weather there were no acute dissolved lead exceedances in any of the rivers. Chronic criteria in the Blackstone River were exceeded only during one sampling event at all Blackstone River stations, suggesting that the source during that event was in Massachusetts. The Branch River exceeded the chronic criteria during three of out of four dry weather events, in part due to its low hardness. The chronic criteria were exceeded twice in the Mill River out of six sampling events, although one sample was likely affected by elevated lead concentrations in the Blackstone River. Lead concentrations in the Peters River and Abbott Run Brook met chronic criteria. These four tributaries contributed lead on average at 45% (Branch River), 11% (Mill River), 1% (Peters River), and 16% (Abbott Run Brook) at their respective points of confluence with the Blackstone River. All but one of the sampled outfalls met regulatory standards.

During wet weather there were no acute dissolved lead exceedances in any of the rivers. The chronic criteria were exceeded only once at a Woonsocket station in the Blackstone River, and once for the Branch River. The Mill and Peters Rivers did not exceed the criteria. Load analysis for Reach 1 did not suggest additional significant sources of lead in addition to the sources that were monitored. There were no significant sources within Reaches 2 and 3. Some of the sampled outfalls exceeded the regulatory criteria for lead during wet weather.

The dry weather concentrations reported in the BTMDL are considerably lower than those reported in the BRI in 1991. This may be a direct result of the improved technology being used in the laboratory now as compared with 14 years ago. The available lead data do not support listing the Blackstone River, Mill River, and Peters River on the 303(d) list.

Clean metals sampling data collected in the Peters River ~1300 feet upstream from Wrentham Road, Bellingham (W2192) (Site MAP2-032) in 2011 at Paine St, Bellingham (Station W1022) in 2008 showing no exceedances of criteria.

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn..CMC	As CMC	Al CMC
W2192	PETERS RIVER	2011	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W2192	PETERS RIVER	2011	3	0	0	0	0	0	0	0	0	0	0

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W1022	PETERS RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W1022	PETERS RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Pondville Pond (MA51120)

Location:	Auburn/Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	36 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
During the 1994 synoptic survey, Pondville Pond was found to have the non-native aquatic macrophyte fanwort (*Cabomba Caroliniana*). The Aquatic Life Use for Pondville Pond (MA51120) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba Caroliniana*).
Primary Contact Recreation Use: Not Supporting
The Primary Contact Recreational Use of Pondville Pond (MA51120) remains assessed as Not Supporting with the algae impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific code Fanwort Cabomba Caroliniana).
Secondary Contact Recreation Use: Not Supporting
The Secondary Contact Recreational Use of Pondville Pond (MA51120) remains assessed as Not Supporting with the algae impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific code Fanwort Cabomba Caroliniana).
Aesthetic Use: Not Supporting
The Aesthetics Use of Pondville Pond (MA51120) remains assessed as Not Supporting with the algae impairment being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific code Fanwort Cabomba Caroliniana).

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

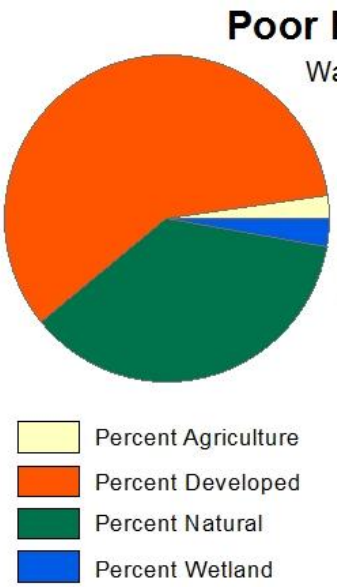
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified in a 1994 synoptic survey (MassDEP 1994). T he generic “Non-Native Aquatic Plants” impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Poor Farm Brook (MA51-17)

Location:	Headwaters, West Boylston to the inlet of Shirley Street Pond, Shrewsbury (through former 2008 segment: City Farm Pond MA51020).
AU Type:	RIVER
AU Size:	3.6 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.88	3.85	1.26	1.26
Agriculture	2.2%	2.2%	3%	3%
Developed	58.8%	58.8%	38.2%	38.2%
Natural	36.2%	36.2%	51%	51%
Wetland	2.8%	2.8%	7.7%	7.7%
Impervious Cover	24.5%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Sedimentation/Siltation		Removed
5	5	Temperature		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Multiple age classes of brook trout were documented in Poor Farm Brook by DFG biologists in June 2001 so this brook will be assessed according to Tier 1 Cold Water guidance. Water quality sampling was conducted by MassDEP in Poor Farm Brook at Route 70 in Shrewsbury (W1753) during the summer of 2008. With the exception of temperature all other water quality data were indicative of good conditions as follows: minimum DO during four three to four day probe deployments was 8.09mg/L, maximum diel DO shift was 1.65mg/L, maxiumum saturation 107%. The pH was good ranging from 6.6 to 7.4SU (n=7), the average total phosphorus concentration was low - 0.014 mg/L (maximum 0.021 mg/L), and there were no observations of dense or very dense filamentous algae. No acute or chronic exceedances for ammonia were found. Temperature however was above Tier 1 Cold Water resource guidelines: The maximum temperature was 27.2°C and the 7 DADM

(maximum 24.9°C) was above 20.0°C 51 times during the thermistor deployment between 26 June and 15 Octoer 2008 although the maximum 24 hour average (22.8°C) did not exceed the acute criterion (23.5°C).

The Aquatic Life Use for Poor Farm Brook (MA51-17) is assessed as Not Supporting, based the exceedances of the Tier 1 Cold Water temperature criteria. The dewatering impairment is being carried forward. The sedimentation/siltation impairment is being delisted (see additional information in the removal comment).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Sedimentation/Siltation	Applicable WQS attained; original basis for listing was incorrect	City Farm Pond (MA51020) was originally listed as impaired for sedimentation/siltation in the 1996 reporting cycle based on a synoptic survey of the pond in July 1994 when siltation was noted affected ~1 acre of the 2-acre pond. In the 2010 reporting cycle the City Farm Pond AU was incorporated into the Poor Farm Brook AU (MA51-17) and the sedimentation/siltation impairment was carried forward in it. According to the information in the Blackstone River Watershed 2003 – 2007 Water Quality Assesment Report, there are no longer any flashboards on the City Farm Pond dam and the pond was described as a big shallow meadow. There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DWM-WPP field sampling crews during the surveys conducted in Poor Farm Brook at Route 70 in Shrewsbury (W1753) during the summer of 2008. Furthermore, the former City Farm Pond AU represents an extremely small area along the Poor Farm Brook AU, and given the removal of the flashboards at City Farm Pond and the lack of any objectionable conditions, the sedimentation/siltation impairment is being removed.

Supporting Information for Delisted Impairments

Sedimentation/Siltation

In the 2010 reporting cycle the City Farm Pond AU was incorporated into the Poor Farm Brook AU (MA51-17) and the sedimentation/siltation impairment was carried forward in it. There are no longer any flashboards on the City Farm Pond dam and the pond was described as a big shallow meadow. There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DWM-WPP field sampling crews during the surveys conducted in Poor Farm Brook at Route 70 in Shrewsbury (W1753) during the summer of 2008. Furthermore, the former City Farm Pond AU represents an extremely small area along the Poor Farm Brook AU, and given the removal of the flashboards at City Farm Pond and the lack of any objectionable conditions, the sedimentation/siltation impairment is being removed.

Pout Pond (MA51121)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	9 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Pout Pond (MA51121) so it is Not Assessed.

Pout Pond (MA51122)

Location:	Boylston.
AU Type:	FRESHWATER LAKE
AU Size:	14 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Pout Pond (MA51122) so it is Not Assessed..

Pratt Pond (MA51123)

Location:	Upton
AU Type:	FRESHWATER LAKE
AU Size:	40 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Two non-native aquatic macrophytes, *Cabomba caroliniana* and *Myriophyllum heterophyllum*, were identified in the MassDEP 1998 synoptic survey of Pratt Pond. The Aquatic Life Use for Pratt Pond (MA51123) is assessed as Not Supporting based on the presence of two non-native aquatic macrophytes, *Myriophyllum heterophyllum* and fanwort *(Cabomba caroliniana).* The species specific fanwort impairment is being added for this reporting cycle.

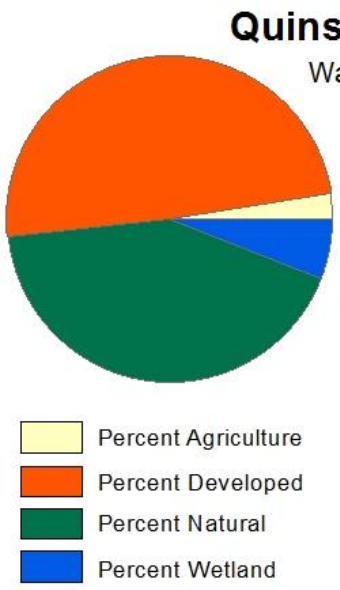
Pratts Pond (MA51124)

Location:	Grafton.
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Pratts Pond (MA51124) so it is Not Assessed.

Quinsigamond River (MA51-09)

Location:	Headwaters, outlet Flint Pond, Grafton to confluence with the Blackstone River in Fisherville Pond, Grafton (excluding approximately 0.5 mile through existing segment: Lake Ripple MA51135) (through former 2008 segments: Hovey Pond MA51068 and a portion of Fisherville Pond MA51048).
AU Type:	RIVER
AU Size:	5.2 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	37.91	5.44	10.58	1.44
Agriculture	2.4%	5.3%	1.5%	1.5%
Developed	49.4%	43.2%	37.8%	35.6%
Natural	42.1%	44.8%	46%	47.9%
Wetland	6.1%	6.7%	14.8%	14.9%
Impervious Cover	19.3%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	5	Benthic Macroinvertebrates		Added
4c	5	(Curly-leaf Pondweed*)		Added
4c	5	(Fanwort*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Four non-native aquatic macrophytes have been observed by MassDEP staff in the Quinsigamond River: *Myriophyllum heterophyllum*, *Potamogeton crispus* and in the Hovey Pond impoundment *Cabomba caroliniana* and *Myriophyllum spicatum*. Between October 2008 and July 2015, water from the Quinsigamond River was collected near the railroad tracks ~ 0.3 miles downstream from DCR's Irish Dam at Flint Pond in Grafton, for use as dilution water in the Wyman Gordan Company Runoff Management Facility's WET tests. Survival of *C.dubia*

exposed (~48 hours) to the river water was ≥90% (n=17 tests). MassDEP biologists conducted benthic macroinvertebrates sampling in the Quinsigamond River at the USGS gage #01110000 downstream of the Hovey Pond outlet (west of Route 140), Grafton (B0658) in July 2008. The RBPIII analysis of the sample indicated moderately impacted conditions (43% comparability) compared to the Mumford River reference site (B0091). MassDEP staff conducted 26 SMART sampling surveys in the river at the former Bridge Street Bridge in Grafton (Station QU02A, W0689) from 2008 through 2013. Water quality here was good (minimum DO 7.0mg/L, maximum saturation 111%, maximum temperature 25.9°C, pH 6.8 to 7.3SU, total phosphorus concentrations ranged from 0.010 to 0.032 mg/L (no statistically significant trend for either the seasonal or year round data so is considered stable) and there were only three times when dense to very dense filamentous algae was observed (n=26). No acute or chronic exceedances for ammonia were found. Further downstream in the river below Lake Ripple at Brigham Hill Road, Grafton (W2188) MassDEP conducted sampling as part of the probablisitic monitoring survey during the summer of 2011 (MAP2-026). Unnattended DO data during the two four-day deploys was as follows: minimum 7.1mg/L and maximum diel DO shift 0.6mg/L. The maximum temperature was 29.2°C with the maximum 24 hour average 27.63°C. The pH was good (6.8-7.2SU, n=6). The seasonal average total phosphorus concentration was 0.055mg/L (maximum 0.19mg/L) and there were two observations of dense/very dense filamentous algae. No acute or chronic exceedances for ammonia were found. There were no exceedances of any acute or chronic metals criteria at this site either (n=3). Further downstream MassDEP staff conducted water quality monitoring in the Quinsigamond River at Pleasant Street in Grafton during the summer of 2008 (W1018). Data collected at this site were indicative of generally good conditions--minimum DO 6.44mg/L, maximum daily DO shift was 3.2 mg/L, maximum saturation 117%, pH ranged from 6.8 to 7.5SU, maximum temperature 25.7°C. The total phosphorus concentrations were low (average 0.028 mg/L maximum 0.043 mg/L). No observations of dense or very dense filamentous algae were noted. No acute or chronic exceedances for ammonia were found.

The Aquatic Life Use for the Quinsigamond River (MA51-09) is assessed as Not Supporting based on the moderately impacted benthic macroinvertebrate community, and the presence of numerous non-native aquatic macrophytes, including *Cabomba caroliniana, Myriophyllum heterophyllum, M. spicatum* and *Potamogeton crispus*. Since there were a few indicators of nutrient enrichment it being identified as an Alert.

Ramshorn Pond (MA51126)

Location:	Sutton/Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	131 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available for Ramshorn Pond (MA51126) so the Aquatic Life Use is not assessed.

Reservoir No. 4 (MA51128)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	10 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Reservoir No. 4 (MA51128) so it is Not Assessed.

Reservoir No. 6 (MA51130)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	14 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Reservoir No. 6 (MA51130) so it is Not Assessed.
Fish Consumption Use: Not Supporting
MassDEP biologists conducted fish toxics sampling at Reservoir No. 6 in Sutton in July 2017 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in fish 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 fish from this water body."* • *"The general public should limit consumption of all fish from this water body to two meals per month."* Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Reservoir No. 6 (MA51130) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition. Data Source: (MassDPH 2019)

Riley Pond (MA51134)

Location:	Northbridge.
AU Type:	FRESHWATER LAKE
AU Size:	7 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Riley Pond (MA51134) so it is Not Assessed.

Riverlin Street Pond (MA51137)

Location:	Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	2 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Curly-leaf Pondweed*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Two non-native aquatic macrophytes, *Myriophyllum heterophyllum* and *Potamogeton crispus*, were reported in Riverlin Street Pond during the MassDEP 1994 synoptic survey. The Aquatic Life Use for Riverlin Pond (MA51137) is assessed as Not Supporting based on the presence of the non-native aquatic macrophytes, *Myriophyllum heterophyllum* and curly leaf pondweed (*Potamogeton crispus).* The species-specific code culy leaf pondweed is being added for this reporting cycle.

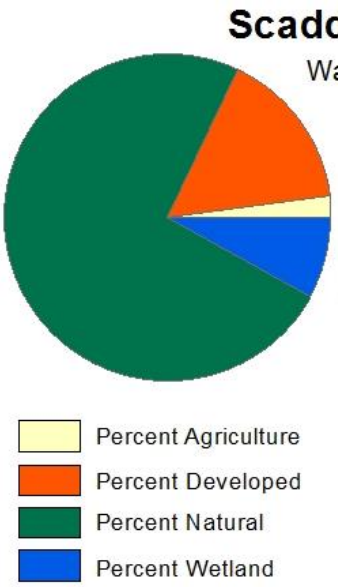
Rivulet Pond (MA51138)

Location:	Uxbridge.
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Rivulet Pond (MA51138) is assessed as Not Supporting based on the 1994 synoptic survey noting the non-native aquatic macrophyte, *Myriophyllum heterophyllum.* However, the record was qualified with the term "likely", and the presence of *M. heterophyllum* should be confirmed.

Scadden Brook (MA51-24)

Location:	Headwaters, perennial portion, north of Davis Street, Douglas to mouth at inlet Lee Pond, Uxbridge (through former 2008 segment: Lee Reservoir MA51086).
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.66	4.66	1.38	1.38
Agriculture	2%	2%	1.2%	1.2%
Developed	15.9%	15.9%	8.4%	8.4%
Natural	73.9%	73.9%	75.9%	75.9%
Wetland	8.1%	8.1%	14.5%	14.5%
Impervious Cover	4.7%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Although no new data have been collected, the Aquatic Life Use for Scadden Brook will continue to be assessed as Fully Supporting based on fish data collected by DFG and MassDEP biologists in 2003 and 2004 when fluvial dependent/specialist species dominated the samples. This is a fairly small subwatershed that has not experienced much development (Google Earth images in July 2003 similar to those in September 2017). The former Alert identified for the potential presence of *Myriophyllum heterophyllum* in Lee Reservoir is being carried forward.

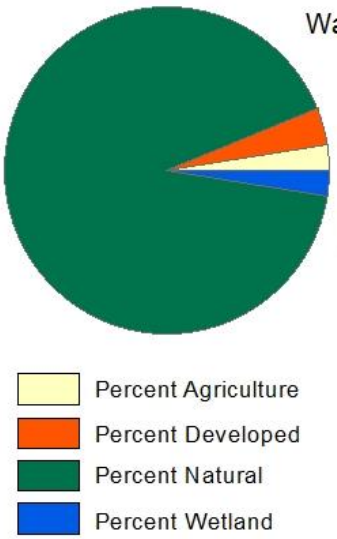
Schoolhouse Pond (MA51144)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	7 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Schoolhouse Pond (MA51144) so it is Not Assessed.

Scott Brook (MA51-53)

Location:	Headwaters west of Reservoir Street, Holden to mouth at inlet Holden Reservoir 1, Holden.
AU Type:	RIVER
AU Size:	0.8 MILES
Classification/Qualifier:	A: PWS, ORW

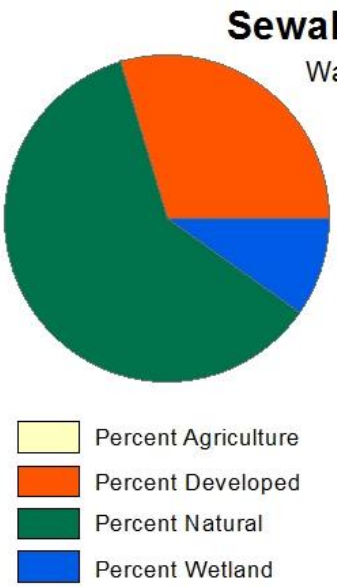


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.16	1.16	0.51	0.51
Agriculture	2.4%	2.4%	4.1%	4.1%
Developed	3.8%	3.8%	3.2%	3.2%
Natural	91.3%	91.3%	87.1%	87.1%
Wetland	2.6%	2.6%	5.5%	5.5%
Impervious Cover	1.8%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in Scott Brook ~100 m upstream of South Road in Holden in August 2006 (SampleID 1727). The sample was comprised entirely of multiple age classes of Eastern brook trout. The Aquatic Life Use of Scott Brook (MA51-53) is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout.

Sewall Brook (MA51-44)

Location:	Headwaters, west of Baypath Drive, Boylston to inlet Sewall Pond, Boylston.
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.87	1.87	0.68	0.68
Agriculture	0.3%	0.3%	0.1%	0.1%
Developed	29.5%	29.5%	28.3%	28.3%
Natural	60.4%	60.4%	52.4%	52.4%
Wetland	9.8%	9.8%	19.2%	19.2%
Impervious Cover	10.8%			

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 (Alert)
DFG biologists conducted backpack electrofishing in Sewall Brook downstream of Sewall Street in Boylston near the YMCA Harrington Summer Camp in June of 2001 (SampleID 440) and again in July 2013 (SampleID: 4934). Multiple age classes of Eastern brook trout and two other fluvial species were collected in the June 2001 survey. Staff at the YMCA camp indicated that the brook dried up during the summer. During the July 2013 survey notes were made that sampling was only conducted in pools and there were undoable sections in between. The only fluvial dependant species present in the sample was white sucker. Given the presence of a reproducing brook trout population that was documented in Sewall Brook however, the water quality monitoring data will be evaluated as a Tier 1 cold water resource. Water quality monitoring was conducted by MassDEP staff near the lowest Sewall Street crossing in Boylston (W1761) during the summer of 2008. With the exception of temperature these data were indicative of good conditions and can be summarized as follows: minimum

deployed probe DO data 7.6mg/L, maximum diel DO shift 2.07mg/L, maximum saturation 117%, attended pH data ranging from 6.9 to 7.4SU (n=7), average total phosphorus concentration 0.015mg/L (maximum 0.021mg/L) and no records of dense/very dense filamentous algae present. No acute or chronic exceedances for ammonia were found. The maximum temperature was 27.5°C with the maximum 24 hour average 23.1°C (below the guidance of 23.5°C) and the 7 DADM (highest 21.2°C) was above 20.0°C 48 times during the 96 day thermistor deployment beginning on 26 June 2011.

The Aquatic Life Use for Sewall Brook (MA51-44) is assessed as Not Supporting, based on the violations of the Tier 1 coldwater resource temperature criteria. The lack of any Eastern brook trout in the brook during the most recent survey is noted as an Alert as are reports of seasonally dry streambed.

Sewall Pond (MA51191)

Location:	Boylston.
AU Type:	FRESHWATER LAKE
AU Size:	13 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Sewall Pond (MA51191) so it is Not Assessed.

Shirley Street Pond (MA51196)

Location:	Shrewsbury.
AU Type:	FRESHWATER LAKE
AU Size:	19 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
MassDEP staff reported the presence of the non-native aquatic macrophyte *Trapa natans* in Shirley Street Pond in 2016. The Aquatic Life Use for Shirley Street Pond (MA51196) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte water chestnut (*Trapa natan*).

Sibley Reservoir (MA51148)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	25 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Sibley Reservoir (MA51148) has been virtually completely dewatered based on all Google Earth imagery since ~2003. The Aquatic Life Use for Sibley Reservoir (MA51148) will continue to be assessed as Not Supporting based on the historic observations of dewatering. Sibley Reservoir dam is being breached so this lake AU will be removed.

Silver Hill Pond (MA51149)

Location:	Milford.
AU Type:	FRESHWATER LAKE
AU Size:	6 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Silver Hill Pond (MA51149) so it is Not Assessed.

Silver Lake (MA51150)

Location:	Bellingham.
AU Type:	FRESHWATER LAKE
AU Size:	42 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Silver Lake (MA51150) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*.

Silver Lake (MA51151)

Location:	Grafton.
AU Type:	FRESHWATER LAKE
AU Size:	25 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The Aquatic Life Use for Silver Lake (MA51151) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Trapa natans.* This use is identified with an Alert status based on unconfirmed observations of additional non-native aquatic macrophytes, including *Cabomba caroliniana* and *Myriophyllum heterophyllum*.
Primary Contact Recreation Use: Not Assessed
The Primary Contact Recreational Use of this Silver Lake AU (MA511151) is Not Assessed. The original Flow Alteration impairment (now Dewatering) was based on observations of the lake during the summer of 1997 when the lake water level was down ~5 feet and the dam was leaking, and there was a note of an extensive mudflat. Based on a review of all available Google Earth images of Silver Lake in Grafton 1995 through 2018) there is no evidence of the lake being dewatered (see screen capture of images below for Aug 2003, September 2006, September 2010, May 2015, and April 2018). Therefore, the Dewatering impairment is being delisted.
Secondary Contact Recreation Use: Not Assessed
The Secondary Contact Recreational Use of this Silver Lake AU (MA511151) is Not Assessed. The original Flow Alteration impairment (now Dewatering) was based on observations of the lake during the summer of 1997 when the lake water level was down ~5 feet and the dam was leaking, and there was a note of an extensive mudflat. Based on a review of all available Google Earth images of Silver Lake in Grafton 1995 through 2018) there is no evidence of the lake being dewatered (see screen capture of images below for Aug 2003, September 2006, September 2010, May 2015, and April 2018). Therefore, the Dewatering impairment is being delisted.
Aesthetic Use: Not Assessed
The Aesthetics Use of this Silver Lake AU (MA511151) is Not Assessed. The original Flow Alteration impairment (now Dewatering) was based on observations of the lake during the summer of 1997 when the lake water level was down ~5 feet and the dam was leaking, and there was a note of an extensive mudflat. Based on a review of all available Google Earth images of Silver Lake in Grafton 1995 through 2018) there is no evidence of the lake being dewatered (see screen capture of images below for Aug 2003, September 2006, September 2010, May 2015, and April 2018). Therefore, the Dewatering impairment is being delisted.

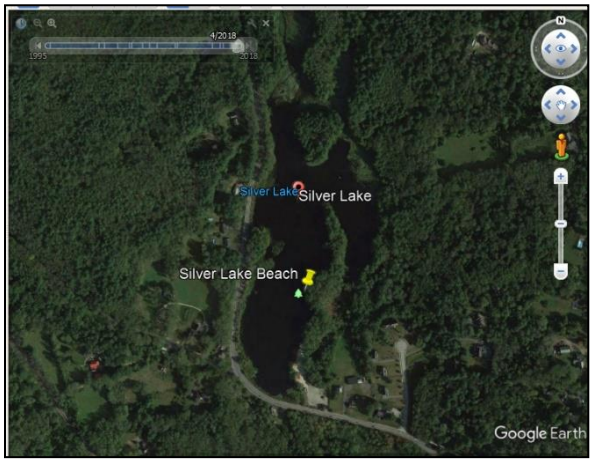
2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Dewatering	Applicable WQS attained; based on new data	The original Flow Alteration impairment (now Dewatering) was based on observations of the lake during the summer of 1997 when the lake water level was down ~5 feet and the dam was leaking, and there was a note of an extensive mudflat. Based on a review of all available Google Earth images of Silver Lake in Grafton 1995 through 2018) there is no evidence of the lake being dewatered (see screen capture of images below for Aug 2003, September 2006, September 2010, May 2015, and April 2018). Therefore, the Dewatering impairment is being delisted.

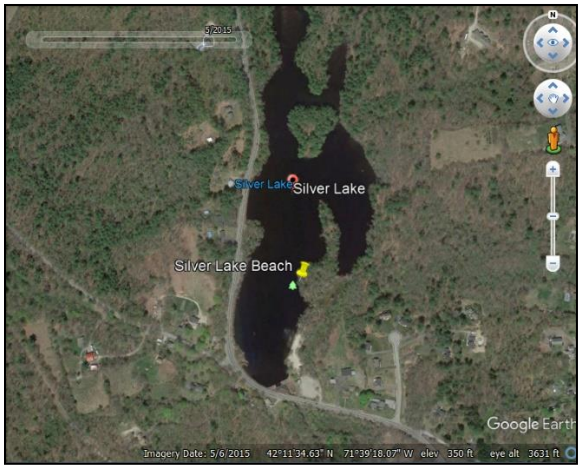
Supporting Information for Delisted Impairments

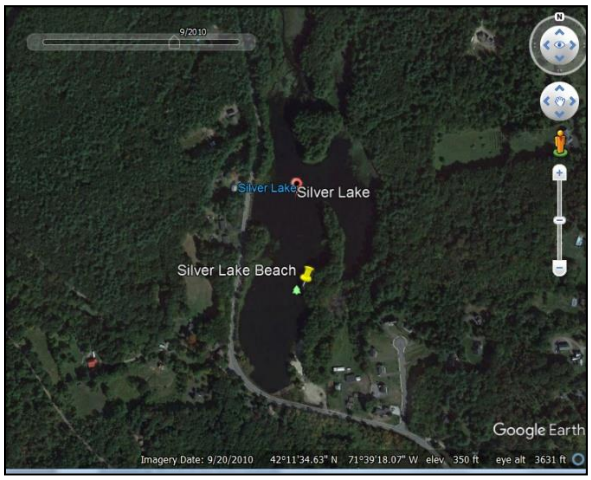
Dewatering

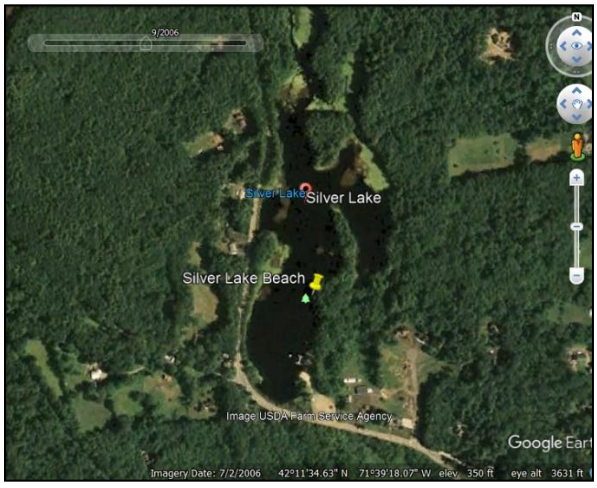
Based on a review of all available Google Earth images of Silver Lake in Grafton there is no evidence of the lake being dewatered as was noted during the summer of 1997 (see screen capture of Silver Lake images below for August 2003, September 2006, September 2010, May 2015, and April 2018). Based on the more recent imagery showing no evidence of Dewatering in Silver Lake in Grafton this impairment is being delisted.

Google Earth Images (Google Earth Pro Undated):




Silver Lake
Silver Lake
Silver Lake Beach
Google Earth
Imagery Date: 5/6/2015 42°11'34.63" N 71°39'18.07" W elev 350 ft eye alt 3631 ft

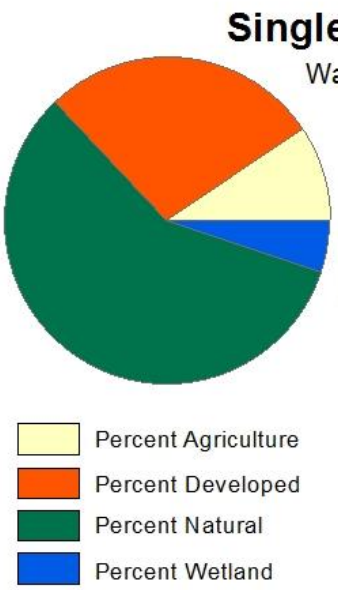

Silver Lake
Silver Lake
Silver Lake Beach
Google Earth
Imagery Date: 9/20/2010 42°11'34.63" N 71°39'18.07" W elev 350 ft eye alt 3631 ft


Silver Lake
Silver Lake
Silver Lake Beach
Image USDA Farm Service Agency
Google Earth
Imagery Date: 7/2/2006 42°11'34.63" N 71°39'18.07" W elev 350 ft eye alt 3631 ft


Silver Lake
Silver Lake
Silver Lake Beach
Image USDA Farm Service Agency
Google Earth
Imagery Date: 7/6/2003 42°11'34.63" N 71°39'18.07" W elev 350 ft eye alt 3631 ft

Singletary Brook (MA51-31)

Location:	Headwaters, outlet Singletary Pond, Millbury to mouth at confluence with the Blackstone River, Millbury (excluding approximately 0.4 miles through existing segment: Brierly Pond MA51010).
AU Type:	RIVER
AU Size:	1.5 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.78	3.95	2.27	1.52
Agriculture	9.4%	6.3%	5.6%	5.3%
Developed	27.7%	30.9%	27%	31.4%
Natural	57.7%	58.6%	58.9%	55.6%
Wetland	5.2%	4.2%	8.5%	7.7%
Impervious Cover	8.2%			

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

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack in Singletary Brook downstream of the Sycamore Street crossing in Millbury in June 2013 (SampleID: 4930). The sample was represented by two species including one fluvial specialist and one intolerant macrohabitat generalist. MassDEP staff also conducted water quality sampling in the brook at Sycamore Street during the summer of 2008. The water quality data were indicative of good conditions as follows: minimum DO measured during the four three or four-day probe deployments was 7.06mg/L, the maximum diel DO shift was 1.31mg/L, the maximum saturation was 98.2%. The attended pH data ranged from 6.8 to 7.1SU (n=7). The seasonal average total phosphorus concentration was low 0.035mg/L (maximum 0.057mg/L) and there were no observations of dense/very dense filamentous algae. No acute or chronic exceedances for ammonia were found.

The Aquatic Life Use for Singletary Brook (MA51-31) is assessed as Fully Supporting based on the fish and water quality sample data collected during the summers of 2013 and 2008. This use is also identified with an Alert status based on the low number of individuals and poor diversity of the fish community.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Applicable WQS attained; original basis for listing was incorrect	The presence of M. heterophyllum was documented in Brierly Pond (MA51010) during a synoptic MassDEP survey in July 1994. The non-native aquatic macrophyte impairment was innapropriately applied to the Singletary Brook AU (MA51-31) in the 2012 reporting cycle. The description of the Singletary Brook AU [Headwaters, outlet Singletary Pond, Millbury to confluence with the Blackstone River, Millbury (excluding the approximately 0.4 miles through Brierly Pond segment MA51010)] specifically excludes Brierly Pond but an error was made associating the Brierly Pond infestation to the brook. Therefore the non-native aquatic macrophyte impairment for the Singletary Brook AU is being delisted to correct the error.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

MA51-31 1st became a segment in 2012. The description then was: Headwaters, outlet Singletary Pond, Millbury to confluence with the Blackstone River, Millbury (excluding the approximately 0.4 miles through Brierly Pond segment MA51010). MA51010 first became a segment in 1998.

So MA51-31 never contained MA51010--they were always 2 separate segments. The presence of *M. heterophyllum* was documented in Brierly Pond (MA51010) during a synoptic MassDEP survey in July 1994 (MassDEP 1994). The non-native aquatic macrophyte impairment was innapropriately applied to the Singletary Brook AU (MA51-31) in the 2012 reporting cycle. The description of the Singletary Brook AU [Headwaters, outlet Singletary Pond, Millbury to confluence with the Blackstone River, Millbury (excluding the approximately 0.4 miles through Brierly Pond segment MA51010)] specifically excludes Brierly Pond but an error was made associating the Brierly Pond infestation to the brook. Therefore the non-native aquatic macrophyte impairment for the Singletary Brook AU is being delisted to correct the error.

Singletary Pond (MA51152)

Location:	Sutton/Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	341 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Myriophyllum spicatum*, was identified in Singletary Pond during the 1998 MassDEP synoptic survey. There are also reports of two additional non-native aquatic macrophytes in the pond (*Cabomba caroliniana* and *M. heterophyllum*) however confirmation is needed. The Aquatic Life Use is assessed as Not Supporting for Singletary Pond (MA51152) based on the presence of the non-native aquatic macrophyte *Myriophyllum spicatum.* This use is also identified with an Alert status based on unconfirmed observations of *Cabomba caroliniana* and *M. heterophyllum.*

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The presence of only Eurasian Water Milfoil (Myriophyllum spicatum) is confirmed in Singletary Pond so this generic non-native aquatic plant impairment cause can be removed.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Myriophyllum spicatum*, was identified during a 1998 synoptic survey (MassDEP 1998). There is also a report of *Cabomba caroliniana* in Singletary Pond (MassDEP Undated 1), but confirmation is needed so an impairment decision is not warranted. The presence of only Eurasian Water Milfoil (*Myriophyllum spicatum*) is confirmed in Singletary Pond so the generic "Non-Native Aquatic Plants" impairment cause can be removed.

Slaughterhouse Pond (MA51153)

Location:	Millbury/Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	10 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Slaughterhouse Pond (MA51153) so it is Not Assessed.

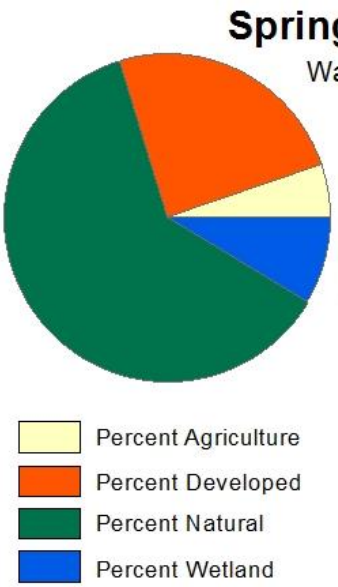
Southwick Pond (MA51157)

Location:	Leicester/Paxton.
AU Type:	FRESHWATER LAKE
AU Size:	43 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Southwick Pond (MA51157) so it is Not Assessed.

Spring Brook (MA51-25)

Location:	Headwaters, perennial portion, north of Lovell Street, Mendon to mouth at confluence with Muddy Brook, Mendon.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.13	2.13	0.75	0.75
Agriculture	5.4%	5.4%	1.4%	1.4%
Developed	24.4%	24.4%	16.4%	16.4%
Natural	61.6%	61.6%	64.9%	64.9%
Wetland	8.6%	8.6%	17.2%	17.2%
Impervious Cover	7.9%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Spring Brook near Providence Street crossing, Mendon in July 2008 (SampleID 2654). The sample was dominated by a fluvial dependant species (white sucker) and also contained multiple age classes of Eastern brook trout. Notes were made that the water was only in pools. The Aquatic Life Use for Spring Brook (MA51-25) is assessed as Fully Supporting based on the fish sampling data but this use is identified with an Alert due to low flows (water only in pools).

Stevens Pond (MA51159)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	85 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Stevens Pond (MA51159) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*).

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

During a 1994 MassDEP synoptic survey of Stevens Pond, biologists observed the non-native aquatic macrophyte, *Cabomba caroliniana* (MassDEP 1994). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Stoneville Reservoir (MA51161)

Location:	Auburn.
AU Type:	FRESHWATER LAKE
AU Size:	60 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available for Stoneville Reservoir (MA51161) so the Aquatic Life Use is not assessed.

Stump Pond (MA51162)

Location:	Oxford.
AU Type:	FRESHWATER LAKE
AU Size:	20 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Stump Pond (MA51162) so it is Not Assessed.

Sutton Falls (MA51163)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
No recent data are available to assess the Aquatic Life Use for Sutton Falls (MA51163) so it is Not Assessed. The Harmful Algal Blooms that impair recreational and aesthetic uses, however, are identified as an Alert issue.

Swans Pond (MA51164)

Location:	Sutton/Northbridge.
AU Type:	FRESHWATER LAKE
AU Size:	32 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Swans Pond (MA51164) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum.*

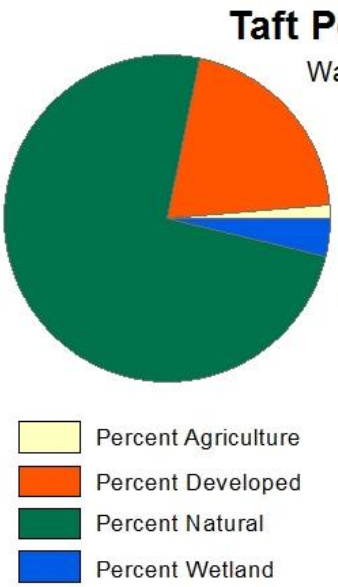
Taft Pond (MA51165)

Location:	Upton.
AU Type:	FRESHWATER LAKE
AU Size:	11 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Taft Pond (MA51165) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* documented in MassDEP herbicide application files (2001 to 2009).

Taft Pond Brook (MA51-26)

Location:	Headwaters, outlet Taft Pond, Upton to mouth at confluence with West River, Northbridge.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	B

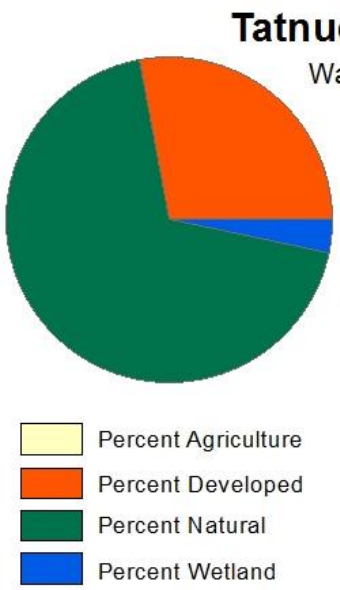


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.39	2.39	0.75	0.75
Agriculture	1.2%	1.2%	0.2%	0.2%
Developed	20.7%	20.7%	17.3%	17.3%
Natural	74.4%	74.4%	73.8%	73.8%
Wetland	3.8%	3.8%	8.7%	8.7%
Impervious Cover	4.8%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Taft Pond Brook near the Gravel Pit Road access off South Street in Upton in July 2008 (SampleID: 2653). Sample was dominated by multiple age classes of Eastern brook trout. MassDEP staff collected nutrient samples at one station approximately 50 feet downstream from the unnamed dirt road west off the southern end of South Street in Upton (W1428) on 5 occasions during the 2008 sampling season. Total phosphorus concentrations were low (average 0.014 mg/L, maximum 0.021 mg/L). No observations of dense or very dense filamentous algae were noted. At the downstream end of the brook near South St, Uxbridge DFG biologists conducted backpack electrofishing in July 2008 (SampleID: 2668) however no fish were collected and notes were made that the habitat was rocky w/ drop down pools and it looks to dry out in the summer. The Aquatic Life Use for Taft Pond Brook (MA51-26) is assessed as Fully Supporting based the presence of multiple age classes of EBT and the low total phosphorus concentrations. The use is identified with an Alert status based on the absence of fish in the brook near the confluence with the West River, and the observation that the stream may go dry.

Tatnuck Brook (MA51-15)

Location:	From outlet Holden Reservoir #2, Holden to inlet Coes Reservoir, Worcester (through former 2008 segments: Cook Pond MA51027 and Patch Reservoir MA51118).
AU Type:	RIVER
AU Size:	3.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	10.75	5.70	4.24	1.86
Agriculture	0.8%	0.1%	0.9%	0%
Developed	27.8%	45.2%	17.1%	30.6%
Natural	68.2%	51.7%	75.9%	64.3%
Wetland	3.2%	3%	6.1%	5.1%
Impervious Cover	10.6%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The non-native aquatic macrophyte fanwort (*Cabomba caroliniana*) was identified in the 1998 synoptic survey of Cook Pond impoundment of the Tatnuck Brook AU (MA51-15). MassDEP biologists sampled the benthic macrobinvertebrate community in the brook approximately 300 meters downstream/south from June Street, Worcester (B0101) in July 2008. The RBPIII analysis indicated the sample was "Slightly Impacted" (67% comparability) when compared to the Mumford River reference site (B0091). Nutrient sampling was also conducted in the brook at June Street in Worcester (W1426) on 5 occasions during the summer of 2008. The total phosphorus concentrations were low (average 0.028 mg/L, maximum 0.036 mg/L). There were no

observations of dense or very dense filamentous algae noted either. No acute or chronic exceedances for ammonia were found.

The Aquatic Life Use for this reach of Tatnuck Brook (MA51-15) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte *Cabomba caroliniana,* documented in the Cook Pond impoundment of Tatnuck Brook. The benthic macroinvertebrate bioassessment, siltation/sedimentation, and flow regime modification impairments are being carried forward until more recent data are collected to confirm the appropriateness of their delisting.

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana,* was identified in a 1998 synoptic survey of Cook Pond (MassDEP 1998), which is now a part of Tatnuck Brook (MA51-15). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

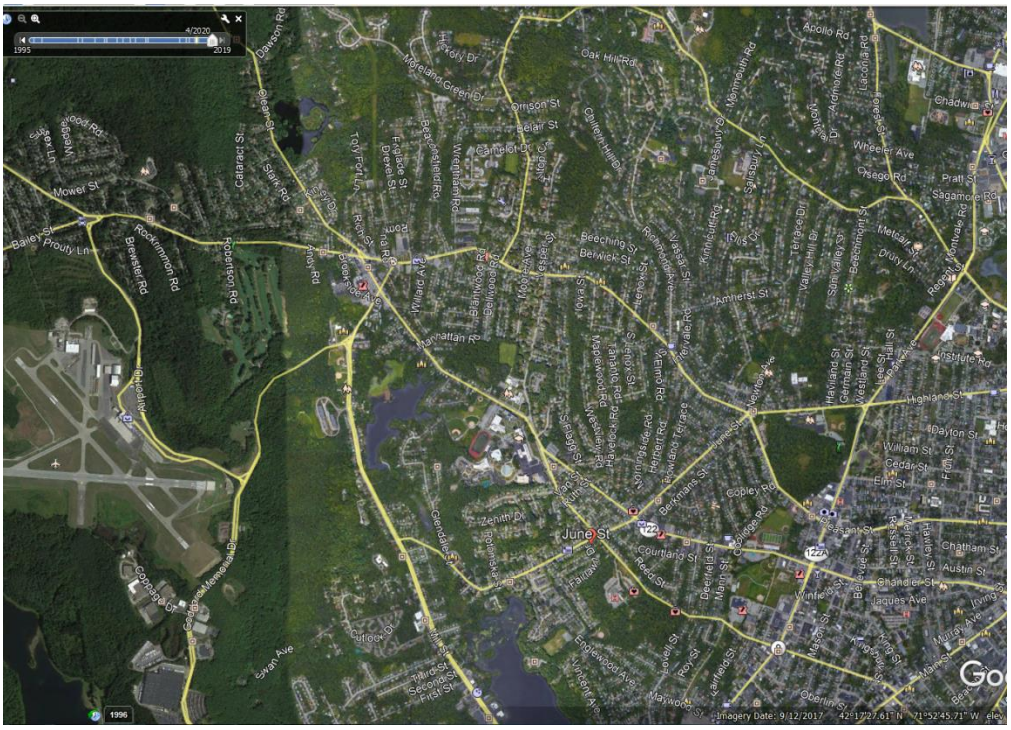
Table 3A. Summary of habitat analysis (i.e. comparability to the reference habitat condition) and RBP III analysis of macroinvertebrate communities sampled in the Blackstone River Watershed on 7, 8, 9 and 10 July 2008. Shown are the calculated metric values, metric scores (in italics) based on comparability to the reference station (Mumford River – B0091), and the corresponding assessment designation for each biomonitoring station. Complete habitat evaluations are presented in Appendix 1. Refer to Table 1 for a listing and description of sampling stations. (NOTE: Table 3 has been split into Table 3A and Table 3B in order to fit this document)

SAMPLING STATION	B0091		B0100		B0659		B0101		B0092		B0656		B0658		B0089		B0098		B0272	
STREAM	Mumford River		Kettle Brook		Tinkerville Brook		UNT to Middle River		West River		Cook Allen Brook		Quinsigamond River		Mill River		UNT to Middle River		Mumford River	
HABITAT SCORE	162		184		152		125		177		186		177		164		145		165	
HABITAT % REFERENCE	–		114%		94%		77%		109%		115%		109%		101%		90%		102%	
HABITAT COMPARABILITY	–		Comparable		Comparable		Support		Comparable		Comparable		Comparable		Comparable		Comparable		Comparable	
TAXA RICHNESS	25	6	24	6	23	6	23	6	25	6	26	6	10	2	26	6	12	2	14	2
BIOTIC INDEX	3.95	6	4.38	6	3.98	6	5.15	4	4.07	6	3.01	6	5.48	4	3.77	6	5.22	4	4.45	6
EPT INDEX	15	6	13	4	9	0	6	0	13	4	7	0	3	0	14	6	3	0	9	0
EPT/CHIRONOMIDAE	8.88	6	1.63	0	1.02	0	4.00	2	6.00	4	1.41	0	7	6	5.18	4	14.7	6	25.3	6
SCRAPER/FILTERER	0.51	6	0.07	0	0.41	6	0.41	6	0.64	6	0.38	6	–	0	1.23	6	0.60	6	0.22	4
REFERENCE AFFINITY	100%	6	58%	4	47%	2	84%	6	82%	6	33%	0	63%	4	81%	6	70%	6	63%	6
% DOMINANT TAXON	17%	6	16%	6	27%	4	21%	4	20%	6	27%	4	31%	2	16%	6	23%	4	27%	4
TOTAL METRIC SCORE	42		26		24		28		38		22		18		40		28		28	
% COMPARABILITY TO REFERENCE	–		62%		57%		67%		90%		52%		43%		95%		67%		67%	
BIOLOGICAL CONDITION -DEGREE IMPACTED	REFERENCE		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		NON-IMPAIRED		SLIGHTLY/ MODERATELY IMPAIRED		MODERATELY IMPAIRED		NON-IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED	

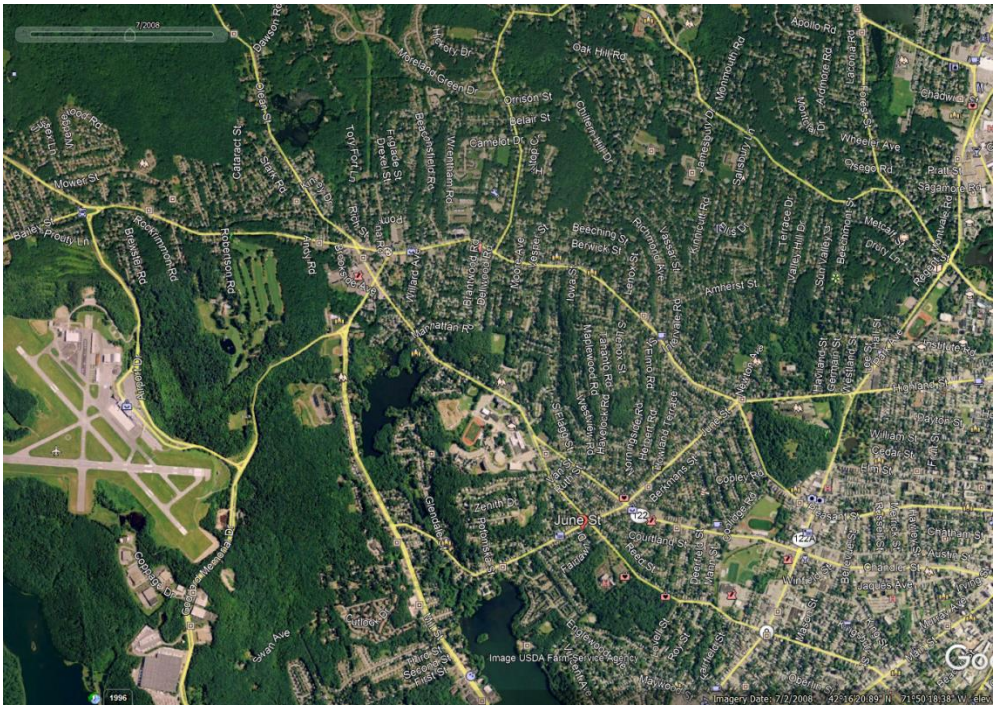
MassDEP – Division of Watershed Management – Technical Memorandum CN 325.5
Blackstone River Watershed 2008 Benthic Macroinvertebrate Bioassessment 8

Similar land use in drainage area (Google Earth Pro Undated):

September 2019



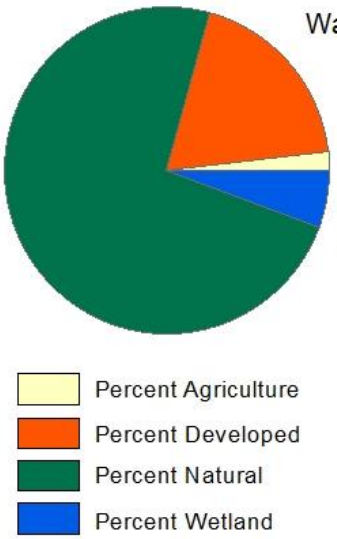
July 2008



May 1996

Tatnuck Brook (MA51-48)

Location:	Headwaters, south of Brennan Way, Holden to inlet Holden Reservoir 1, Holden.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	A: PWS, ORW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.34	1.34	0.71	0.71
Agriculture	1.8%	1.8%	0.6%	0.6%
Developed	19%	19%	12.9%	12.9%
Natural	73.3%	73.3%	76%	76%
Wetland	5.8%	5.8%	10.5%	10.5%
Impervious Cover	6.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in Tatnuck Brook upstream of Reservoir Street crossing, north of Bailey Road in Holden in June 2011. The sample was comprised entirely of a few small Eastern brook trout. The Aquatic Life Use is assessed as Fully Supporting for this Tatnuck Brook AU (MA51-48) due to the presence of Eastern brook trout which is indicative of excellent habitat and water quality conditions.

Tinker Hill Pond (MA51167)

Location:	Auburn.
AU Type:	FRESHWATER LAKE
AU Size:	37 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Brittle Naiad, Najas Minor*)		Added
4c	4c	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Najas minor*, was identified during a 1998 synoptic survey of Tinker Hill Pond. Observation of an unidentified species of *Myriophyllum* was also made. The Aquatic Life Use for Tinker Hill Pond (MA51167) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, Brittle naiad (*Najas minor*). This use is also identified with an Alert status based on observations of an unidentified species of *Myriophyllum* (possibly a non-native species).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophyte Najas minor (brittle naiad) has been utilized.

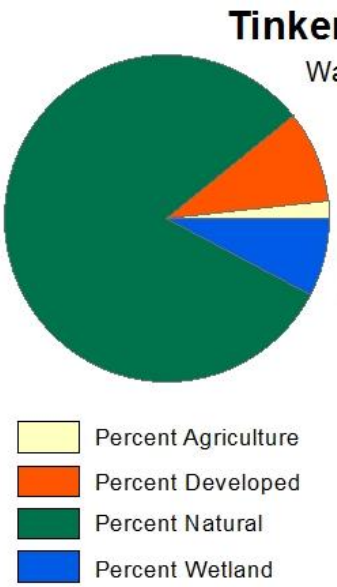
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Najas minor*, was identified during a 1998 synoptic survey of Tinker Hill Pond (MassDEP 1998). The presence of *Myriophyllum sp*. was also reported in the same survey (MassDEP 1998), but species confirmation is needed. The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Najas minor* (brittle naiad) has been utilized.

Tinkerville Brook (MA51-22)

Location:	Headwaters, perennial portion, north of Walnut Street, Douglas to Rhode Island border, Douglas.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.76	3.56	0.95	0.92
Agriculture	1.6%	1.6%	1.1%	1.1%
Developed	9.2%	9.4%	5.6%	5.7%
Natural	81.5%	81%	75.7%	75.3%
Wetland	7.8%	7.9%	17.5%	17.8%
Impervious Cover	2.8%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

Although no new data have been collected, the Aquatic Life Use for Tinkerville Brook will continue to be assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout documented by DFG biologists in June 2006 (SampleID 1700).

Town Farm Pond (MA51168)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	6 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Town Farm Pond (MA51168) so it is Not Assessed.

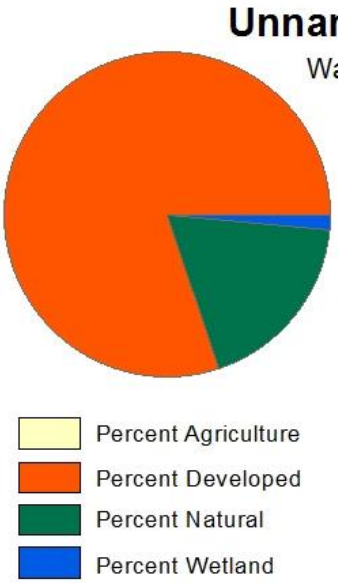
Tuckers Pond (MA51169)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	26 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Tuckers Pond (MA51169) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*.

Unnamed Tributary (MA51-08)

Location:	(Also known as "Mill Brook") Headwaters, outlet Indian Lake, Worcester to mouth at confluence with Middle River (downstream of the railroad spur bridge west of Tobias Boland Way), Worcester (through former 2008 segment: Salisbury Pond MA51142).
AU Type:	RIVER
AU Size:	5.6 MILES
Classification/Qualifier:	B: WWF, CSO



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	12.83	6.17	2.59	0.79
Agriculture	0.1%	0.1%	0.1%	0%
Developed	80%	88.6%	68.5%	79.3%
Natural	18.4%	11.1%	27.3%	19.7%
Wetland	1.5%	0.2%	4.1%	1%
Impervious Cover	44.9%			

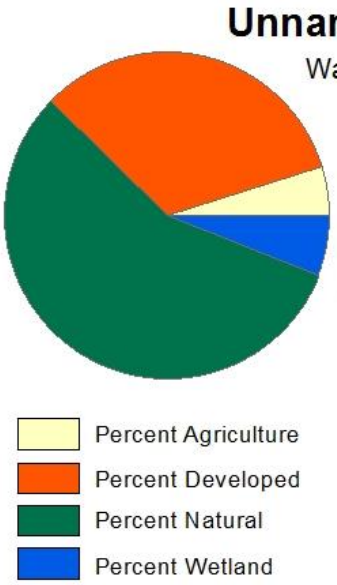
2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Chloride		Added
5	5	Trash		Changed

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Between August 2007 and November 2013, nine valid acute *C.dubia* whole effluent toxicity (WET) tests were conducted on the Saint Gobain Abrasives Outfall 001 effluent. The LC_{50}'s were all > 100% effluent with the exception of the August 2007 test when the LC50 was 66% effluent. Between August 2007 and November 2013, nine valid acute *C.dubia* tests were conducted on the Saint Gobain Abrasives Outfall 003 effluent. The LC_{50}'s were all > 100% effluent with the exception of three test events (July 2009, July 2010, and March 2012) when the LC_{50}'s were 83, 68.3, and 74.3% effluent, respectively. MassDEP staff conducted water quality monitoring in this Unnamed tributary locally known as Mill Brook at the northern inlet to Salisbury Pond, downstream of

where east and west pipes emerge from underground (Tire Warehouse, 195 Grove Street, Worcester) (W2062) during the summer of 2008. Unnattended data collected at this site during the three three to four day deploys can be summarized as follows: minimum DO 6.4mg/L, maximum diel DO shift 1.2mg/L, maximum saturation 94%, maximum temperature 25.0°C. The pH ranged from 6.8 to 7.2SU (n=7). The seasonal average total phosphorus concentrations was 0.036mg/L (maximum 0.048mg/L) and there were no observations of dense/very dense filamentous algae present. No acute or chronic exceedances for ammonia were found. There were no exceedances of any dissolved metal acute or chronic criteria during the three clean metals sampling surveys but it should be noted that the specific conductance measurements were elevated (range 608 to 1345µS/cm) and above the chronic chloride estimator of 904 µS/cm in 5 of 7 measurments with two of three averaged samples plus one independent sample elevated with TUs above 1 (1.19, 1.38, and 1.26) warranting an impairment decision. Between July 2008 and September 2016, 19 valid acute *C.dubia* WET tests were conducted on the City of Worcester's QCSOSTF discharge. Little to no acute toxicity was detected in 14 of the 19 tests (i.e., LC_{50}'s >100% and ANOECs $\geq$50% effluent). The remaining five tests exhibited various degrees of acute toxicity with LC_{50}'s ranged from 17.7 to 70.7% effluent with the June 2013 test being the most toxic (LC_{50}=17.7% effluent). The Aquatic Life Use is assessed as Not Supporting for this Unnamed Tributary (MA51-08) based on the estimated chronic chloride exceedances documented during the summer of 2008. The historical impairments (un-ionized ammonia, metals, nutrient/eutrophication biological indicators, other organics, physical substrate habitat alterations, and sedimentation/siltation are being carried forward at this time since the 2008 sampling site was too far upstream to warrant delistings.

Unnamed Tributary (MA51-20)

Location:	From the outlet of Leesville Pond, Worcester to the confluence with Middle River, Worcester (through former 2008 segments: Curtis Ponds, [South Basin] MA51033 and [North Basin] MA51032).
AU Type:	RIVER
AU Size:	1.4 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	32.57	11.64	13.48	4.60
Agriculture	4.8%	0.5%	3.7%	0.6%
Developed	32.9%	46.7%	25.9%	36%
Natural	56.4%	48.3%	59.7%	54.6%
Wetland	6%	4.5%	10.8%	8.8%
Impervious Cover	12.2%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
MassDEP biologists conducted benthic macroinvertebrate sampling in this station Unnamed Tributary to the Middle River approximately 500 meters downstream/northwest from Webster Street in Worcester (B0098) in July 2008. The RBPIII analysis indicated the sample was Slightly Impacted (67% comparable) when compared to the Mumford River reference site (B0091). The non-native aquatic macrophyte Cabomba caroliniana was observed in the Curtis Pond North impoundment of this Unnamed Tributary during the MassDEP synoptic survey in the summer of 1994.

Although the benthic sample collected in July 2008 was indicative of good conditions, the Aquatic Life Use for this Unnamed Tributary (MA51-20) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*) in the Curtis Pond North impoundment. The other historic impairments (Dewatering, Nutrient/Eutrophic Biological Indicators, and Sedimentation/Siltation) are also being carried forward.

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

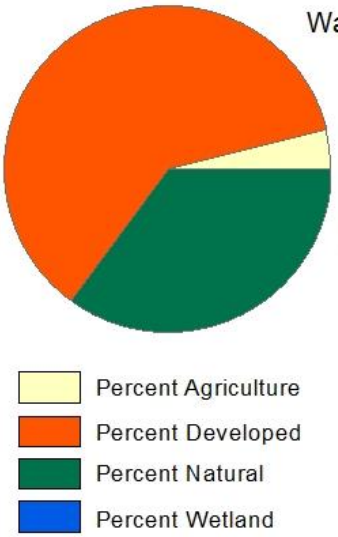
Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1994 synoptic survey of Curtis Pond (North) (MassDEP 1994), which is now considered part of Unnamed Tributary (MA51-20). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Unnamed Tributary (MA51-38)

Location:	Unnamed tributary to Dark Brook, from perennial portion near the Route 90, 290EB, 395SB, 12NB interchange, Auburn to mouth at confluence with the Dark Brook south of Water Street, Auburn (sections culverted).
AU Type:	RIVER
AU Size:	0.8 MILES
Classification/Qualifier:	B

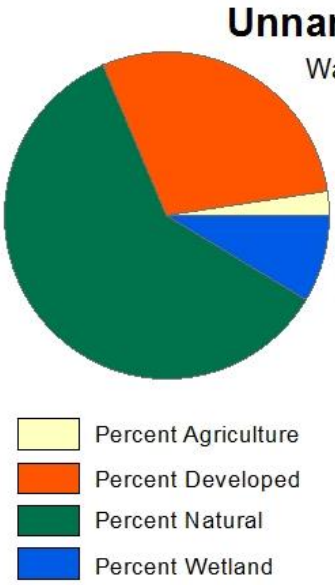


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.69	0.69	0.21	0.21
Agriculture	3.8%	3.8%	1%	1%
Developed	60.5%	60.5%	66.5%	66.5%
Natural	34.7%	34.7%	30.9%	30.9%
Wetland	0.9%	0.9%	1.6%	1.6%
Impervious Cover	30.8%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Unnamed Tributary MA51-38 is assessed as Not Supporting based on elevated chloride levels documented in the 2013-2014 EPA study.

Unnamed Tributary (MA51-46)

Location:	Unnamed Tributary eventually to Tatnuck Brook, headwaters, perennial portion, east of Bailey Road, Holden to mouth at confluence with unnamed tributary to Tatnuck Brook, Holden.
AU Type:	RIVER
AU Size:	0.3 MILES
Classification/Qualifier:	A: PWS, ORW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.41	0.41	0.27	0.27
Agriculture	2.3%	2.3%	1.5%	1.5%
Developed	29.2%	29.2%	26.7%	26.7%
Natural	59.8%	59.8%	59.3%	59.3%
Wetland	8.7%	8.7%	12.5%	12.5%
Impervious Cover	11.2%			

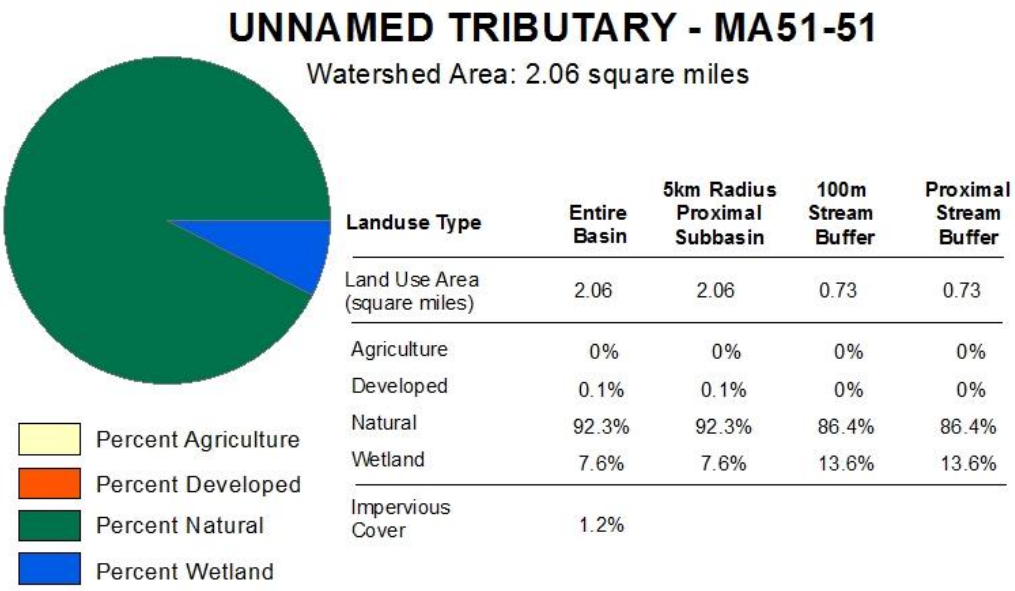
Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
MassDEP biologists conducted backpack electrofishing in this Unnamed Tributary (MA51-46) ~175 ft upstream of Chapin Road in Holden in September 2011 (SampleID: 4600) as part of the probabilistic wadeable streams monitoring project (MAP2). No fish were captured. DWM staff also conducted water quality sampling during the summer of 2011 near Chapin Road in Holden (W2184). The water quality data can be summarized as follows: the minimum DO during the three four-day deployments was 4.3mg/L with a mean minimum DO of 4.6mg/L, and maximum diel DO shift 1.6mg/L. The maximum temperature measured by the thermistor deployed between May and October was 20.4°C. The attended pH data were low ranging from 5.7 to 6.0SU (n=5) as was hardness (6.1 t 21.2mg/L $CaCO_3$). The average total phosphorus concentration was 0.032mg/L (maximum 0.044mg/L, n=5) and there were no observations of any dense/very dense filamentous algae observed during any of the surveys. No acute or chronic ammonia criteria exceedances were found. With the exception of copper and lead there were no exceedances of any other dissolved metal acute or chronic criteria during the three clean metals sampling surveys. Copper slightly exceeded the acute and chronic criteria once (1.01 and 1.2TUs, repectively) and lead exceeded the chronic criteria twice (1.13 and 6.15TUs). While all surveys were noted as “flowing” depths of the stream during the sampling events, when recorded, ranged from

0.0 to 0.2m. DFG biologists planned to sample a little further downstream near Bailey Road in Holden in June 2011 but found that water was stagnant in the culvert giving way to a large swamp so no sampling was conducted (SampleID: 3878).

Because of the extremely small size of this drainage area (only 0.41mi^2), it is best professional judgement that while there is often slightly low DO, low pH, and no fish were found, these conditions may well be associated with natural conditions associated with influence of groundwater in this Unnamed Tributary (MA51-46). These issues as well as the few slightly elevated concentrations of copper and lead, are being identified with an Alert.

Unnamed Tributary (MA51-51)

Location:	Unnamed tributary to Wallis Pond, headwaters south of Webster Street (Route 16), Douglas to mouth at inlet of Wallis Pond, Douglas.
AU Type:	RIVER
AU Size:	1.8 MILES
Classification/Qualifier:	B

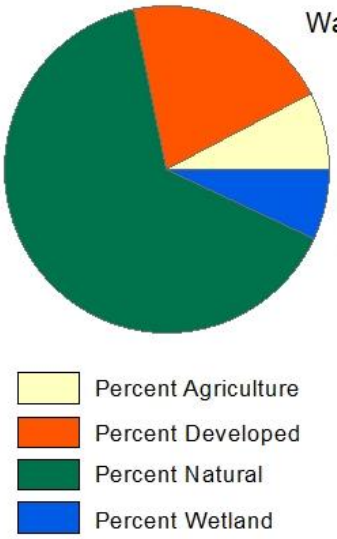


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.06	2.06	0.73	0.73
Agriculture	0%	0%	0%	0%
Developed	0.1%	0.1%	0%	0%
Natural	92.3%	92.3%	86.4%	86.4%
Wetland	7.6%	7.6%	13.6%	13.6%
Impervious Cover	1.2%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in this Unnamed Tributary to Wallis Pond upstream of Ridge Terrace Road in Douglas State Forest, Douglas in June 2006 (SampleID 1579). Only two fish were collected however they were multiple age classes of Eastern brook trout. The Aquatic Life Use for this Unnamed Tributary (MA51-51) is assessed as Fully Supporting based on the presence multiple age classes of Eastern brook trout.

Unnamed Tributary (MA51-52)

Location:	Unnamed tributary to Manchaug Pond, headwaters west of Oak Street, Douglas to mouth at inlet of southwestern lobe of Manchaug Pond, Douglas.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B



UNNAMED TRIBUTARY - MA51-52

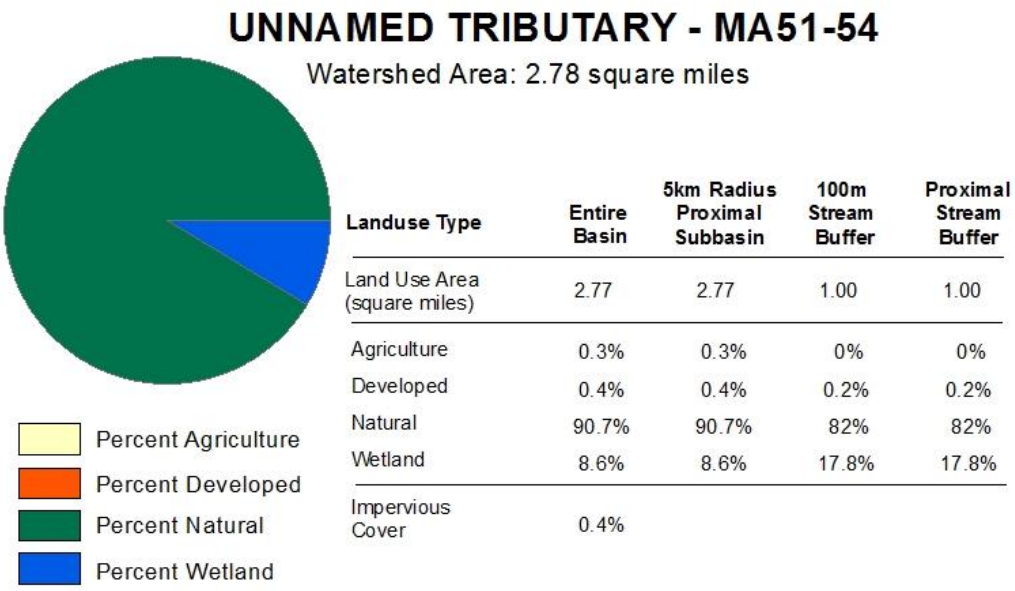
Watershed Area: 0.33 square miles

Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.33	0.33	0.08	0.08
Agriculture	7.6%	7.6%	0%	0%
Developed	20.7%	20.7%	9.5%	9.5%
Natural	64.6%	64.6%	75.3%	75.3%
Wetland	7%	7%	15.2%	15.2%
Impervious Cover	6.9%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in this Unnamed Tributary to Manchaug Pond upstream of Lakeshore Drive near the Campground access in Douglas in July 2008 (SampleID 2662). The sample was dominated by multiple age classes of Eastern brook trout and also contained two other fluvial specialist/dependant species. The Aquatic Life Use for Unnamed Tributary (MA51-52) 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.

Unnamed Tributary (MA51-54)

Location:	Unnamed tributary to Whitin Reservoir, headwaters east of Grassy Pond, Douglas to mouth at inlet Whitin Reservoir, Douglas.
AU Type:	RIVER
AU Size:	2.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.77	2.77	1.00	1.00
Agriculture	0.3%	0.3%	0%	0%
Developed	0.4%	0.4%	0.2%	0.2%
Natural	90.7%	90.7%	82%	82%
Wetland	8.6%	8.6%	17.8%	17.8%
Impervious Cover	0.4%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
Backpack electrofishing was conducted at three sites along this Unnamed Tributary to Whittin Reservoir in Douglas from upstream to downsteam as follows: DFG biologists SampleIDs 1730 and 1728 in August 2006 and MassDEP biologists conducted sampling ~975ft DS of "Ridge Trail" in Douglas State Forest SampleID 4589 in August 2011. No fish were collected in any of the three surveys. A thermistor was also deployed in this Unnamed Tributary by MassDEP staff near the Ridge Trail in the Douglas State Forest (W2224) during the summer of 2011 as part of the Reference Site Network (RSN) project. Between 13 June and 18 October the maximum temperature recorded was 21.0°C. The temperature was above 20°C for a total of 26 hours of the 3039.5-hour deployment. Three nutrient samples were also collected during the summer of 2011. The average total phosphorus concentration was 0.008mg/L (maximum 0.015mg/L). Too limited data are available to assess the Aquatic Life Use for Unnamed tributary (MA51-54) so it is reported as Insufficient Information. While no fish were observed or collected, there absence is considered natural for this very small stream well protected in the Douglas State Forest.

Waite Pond (MA51170)

Location:	Leicester.
AU Type:	FRESHWATER LAKE
AU Size:	49 ACRES
Classification/Qualifier:	B: WWF

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
No recent data are available to assess the Aquatic Life Use for Waite Pond (MA51170). This use is identified with an Alert Status however because of an unconfirmed report of the presence of *Myriophyllum heterophyllum.*

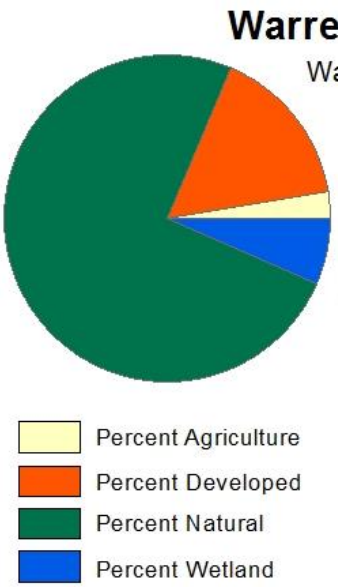
Wallum Lake (MA51172)

Location:	Douglas (size indicates portion in Massachusetts excluding approximately 30 acres; these 30 acres represent "All Interstate surface waters that are public water supply in Rhode Island from 1000 feet upstream of the State Line" which are designated as Class A/PWS/ORW in 314CMR4.00, January 2007).
AU Type:	FRESHWATER LAKE
AU Size:	109 ACRES
Classification/Qualifier:	B: TWS

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data were available to assess the Aquatic Life Use for Wallum Lake (MA51172) so it is Not Assessed.

Warren Brook (MA51-47)

Location:	Headwaters, west of North Street, Upton to mouth at confluence with West River, Upton.
AU Type:	RIVER
AU Size:	3.6 MILES
Classification/Qualifier:	B: CWF



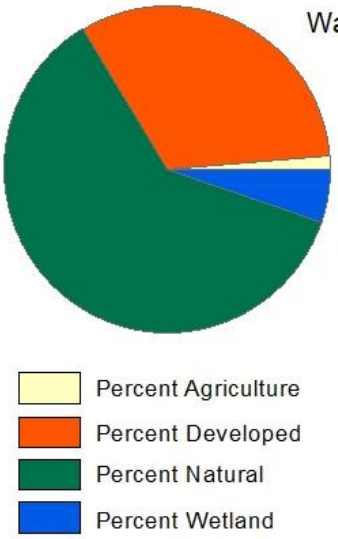
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.05	4.34	1.60	1.31
Agriculture	2.6%	2.8%	3.7%	4.1%
Developed	16.1%	17.3%	19.5%	21.5%
Natural	74.7%	73.4%	63.6%	60.3%
Wetland	6.6%	6.6%	13.2%	14.1%
Impervious Cover	4%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing at several sites along Warren Brook. Information from these sites can be summarized as follows (upstream to downstream): upstream of Grafton Road in August 2006 (SampleID: 1725) – no fish as the brook was dry, downstream of the northernmost of two Fowler Street crossings in July 2001 (SampleID: 422), downstream of the southernmost of the two Fowler Street crossings in August 2001 (SampleID: 443), and upstream (north) of Route 140 in July 2000 (SampleID: 102) -- all three sites were dominated by multiple age classes of Eastern brook trout. Water quality monitoring was also conducted in Warren Brook at Route 140, Upton (W1439) during the summer of 2008. During the unattended probe deployments the minimum DO was 7.22mg/L, the maximum diel DO shift was 1.5mg/L, and the maximum DO saturation was 100%. Attended data can be summarized as follows: Minimum DO 7.2mg/L, maximum saturation 95%, maximum temperature 21.1°C (only one of eight measurements above 20°C), and pH ranged from 6.3 to 6.6SU (two of seven measurements below 6.5SU). The total phosphorus was low (average 0.015, maximum 0.022 mg/L) and there were no observations of dense or very dense filamentous algae. No acute or chronic exceedances for ammonia were found.

The Aquatic Life Use for Warren Brook (MA51-47) is assessed as Fully Supporting based on the presence of multiple age classes of Eastern brook trout and the water quality data indictative of generally good conditions (exception the single temperature measurement above 20°C which is being identified as an Alert).

Wellman Brook (MA51-50)

Location:	Headwaters, outlet unnamed pond east of Martin Road, Douglas to mouth at inlet of Gilboa Pond (an impoundment of the Mumford River), Douglas.
AU Type:	RIVER
AU Size:	0.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.90	0.90	0.23	0.23
Agriculture	1.2%	1.2%	3.2%	3.2%
Developed	32.5%	32.5%	20.2%	20.2%
Natural	61.1%	61.1%	68.8%	68.8%
Wetland	5.3%	5.3%	7.7%	7.7%
Impervious Cover	12.3%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in Wellman Brook downstream/southwest of Route 16 between Route 16 & Davis Street in East Douglas in August 2007 (SampleID 2389). The sample was dominated by multiple age classes of Eastern brook trout. The Aquatic Life Use for Wellman Brook (MA51-50) is assessed as Fully Supporting based on the presence and abundance of multiple age classes of Eastern brook trout.

Welsh Pond (MA51176)

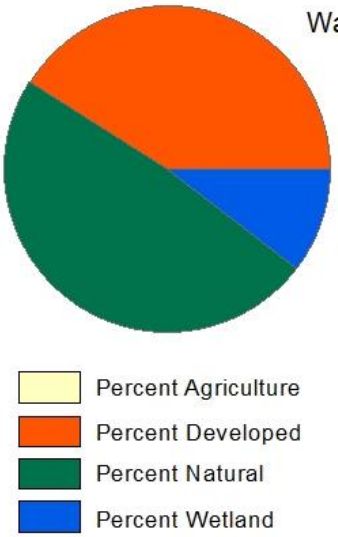
Location:	Sutton
AU Type:	FRESHWATER LAKE
AU Size:	8 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Two non-native aquatic macrophytes, *Myriophyllum heterophyllum* and *Potamogeton crispus*, have been documented in Welsh Pond during surveys conducted in 1994 and 2009, respectively. The Aquatic Life Use for Welsh Pond (MA51176) is assessed as Not Supporting based on the presence of two non-native aquatic macrophytes *Myriophyllum heterophyllum* and curly leaf pondweed (*Potamogeton crispus*).

West Brook (MA51-43)

Location:	Headwaters, perennial portion west of Route 290 and north of Gulf Street, Shrewsbury to culvert entrance between Baker and Elmo avenues, Shrewsbury (isolated Quinsigamond River tributary) (through former 2014 segment: Mill Pond MA51105).
AU Type:	RIVER
AU Size:	3.2 MILES
Classification/Qualifier:	B



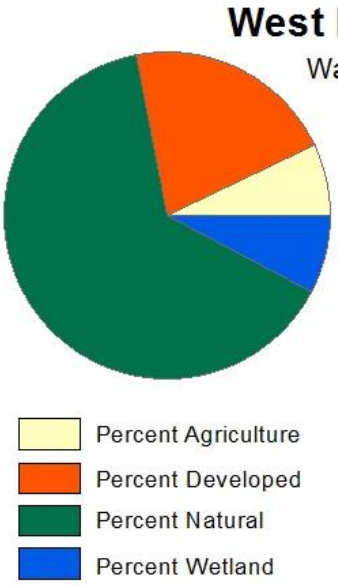
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.83	2.72	0.89	0.89
Agriculture	0.4%	0.4%	0.2%	0.2%
Developed	41%	40.8%	29%	29%
Natural	48.2%	48%	46.9%	46.9%
Wetland	10.5%	10.8%	24%	24%
Impervious Cover	12.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in West Brook downstream of the Westbrook Crossing Drive bridge in Shrewsbury in September 2010 (SampleID: 3410) and further downstream of Main Street crossing in July 2008 (SampleID: 2652). The fish samples in this small watershed were not diverse with only one moderately tolerant macrohabitat generalist species (redfin pickerel) at the upstream site and only two macrohabitat generalist fish at the downstream site. MassDEP staff also conducted water quality monitoring in West Brook near Sadler Avenue in Shrewsbury during the summer of 2008 (W1758). All of these data were indicative of good conditions as summarized here: minimum DO from the unnattended probes during the four three or four-day deploys 6.16mg/L, maximum diel DO shift 1.4mg/L, maximum temperature 25.7°C. The pH was good (6.9-7.1SU, n=7). The seasonal average total phosphorus concentration was low 0.021mg/L (maximum 0.034mg/L) and there was one observation of dense/very dense filamentous algae. No acute or chronic exceedances for ammonia were found.

The Aquatic Life Use for West Brook (MA51-43) is assessed as Fully Supporting based primarily on the water quality data that were indicative of good conditions and the fish samples which were both found to have at least one moderately tolerant macrohabitat generalist species.

West River (MA51-11)

Location:	Headwaters, outlet Silver Lake, Grafton to Upton WWTP discharge (NPDES: MA0100196), Upton (through former 2008 segment: Lake Wildwood MA51181).
AU Type:	RIVER
AU Size:	3.7 MILES
Classification/Qualifier:	B: CWF, HQW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	14.41	7.99	4.55	2.61
Agriculture	7.1%	5.2%	7%	5.1%
Developed	21%	27.5%	22.8%	32.6%
Natural	64.2%	62.4%	55.3%	51%
Wetland	7.8%	4.9%	14.9%	11.3%
Impervious Cover	6.3%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Fanwort*)		Added
5	5	Lack of a coldwater assemblage		Added
5	5	pH, Low		Removed
5	5	Temperature		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
DFG and MassDEP biologists conducted backpack electrofishing in the West River upstream of the Moroney Road bridge in Grafton. In July 2008 (SampleID: 2586) DFG biologists captured two fluvial species while in November 2008, although a few fluvial fish (white sucker) were present, MassDEP biolosgists collected a sample dominated by a tolerant macrohabitat generalist species. In July 2013 DFG biologists sampled this reach again (SampleID: 4931) finding only macrohabitat generalist species with one moderately intolerant of pollution. MassDEP staff conducted water quality monitoring in the West River at Moroney Road in Upton (W1759) during

the summer 2008. Attended probe data: minimum DO 7.12mg/L, maximum saturation 98%, maximum temperature 19.6°C, pH range 6.4 to 6.6SU (n=4). The average total phosphorus concentration was low (0.034mg/L, maximum 0.047mg/L) and there was one observation of dense/very dense filamentous algae. Further downstream in the Wildwood Lake impoundment of this West River AU, the non-native aquatic macrophyte, *Cabomba caroliniana*, was identified during a 1998 synoptic and the Town of Upton has also treated Wildwood Lake for an infestation of *Myriophyllum heterophyllum*. MassDEP biologists also conducted backpack electrofishing in the West River furthere downstream between the dilapidated dam just below Williams Street to just below Glen Ave Upton in November 2008 (SampleID: 4511). Fluvial specialists/ dependent species were well represented in this sample. Water quality monitoring here was also conducted during the summer of 2008 (W1432). Unnattended DO data during the four three to four-day deploys was as follows: minimum 4.69mg/L, minimum daily mean 5.28mg/L, and maximum diel DO shift 1.65mg/L. The maximum temperature during the long-term thermistor deployment was 29.0°C with the maximum 24 hour average 26.7°C and the 7 DADM was above 20.0°C 77 times during the thermistor deployment from 26 May to 17 October 2008. The pH was good (6.3-6.9SU, n=7). The seasonal average total phosphorus concentration was low 0.03mg/L (maximum 0.043mg/L) and there were no observations of dense/very dense filamentous algae. No exceedances of acute or chronic ammonia criteria were found at either sampling location.

The Aquatic Life Use for this West River AU (MA51-11) is assessed as Not Supporting based on elevated temperatures during the summer of 2008 that exceed Cold Water criteria (maximum temperature above 20°C at 29°C, maximum 24 hour average above 23.5°C at 26.7°C, and the 7 DADM above 20°C 77 times) which were all documented in the river below the Wildwood Lake Dam, the lack of any coldwater fish species in this designated coldwater stream, and the presence of the non-native aquatic macrophytes, *Cabomba caroliniana* and *Myriophyllum heterophyllum* in the Wildwood Lake impoundment. While the pH was slightly below 6.5SU in two of the 11 measurements taken during the 2008 surveys, they are not outside the ranged considered to be problematic given the tendency of Massachusetts waters to be slightly acidic so the pH impairment is being delisted (see additional justification in removal comments).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
pH, Low	Applicable WQS attained; based on new data	The original listing for low pH was in the 1992 reporting cycle based on data collected in the river in 1988. Limited notes indicated low buffering capacity. The pH in the river at two sites in the 1988 survey (WR01 Hartford Ave bridge Upton and WR02 Pleasant Street bridge Upton) ranged from 6.1 to 6.4SU (n=4). The pH data collected in the summer of 2008 by MassDEP staff at two water quality monitoring sites in this West River AU (MA51-11) ranged from 6.3 to 6.9SU (n=11) with only two measurements slightly below 6.5SU. These data were all with 0.5SU of the SWQS of 6.5SU and and given the presence of wetlands in the system (~15% along the 100m stream buffer) the occasional slightly low pH is considered naturally occurring as outlined in the 2018

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		CALM guidance manual. Since the occasional slightly low pH is considered naturally occuring it is being delisted.

Supporting Information for Delisted Impairments

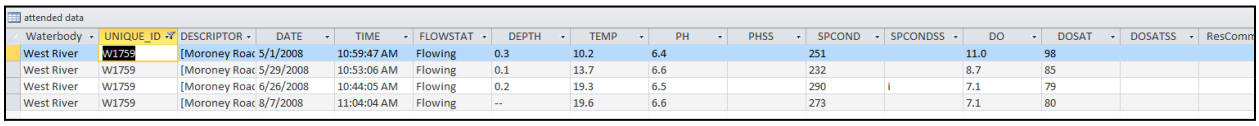
pH, Low

The pH data collected in the summer of 2008 by MassDEP staff at two water quality monitoring sites in this West River AU (MA51-11) ranged from 6.3 to 6.9SU (n=11) with only two measurements slightly below 6.5SU. These data were all with 0.5SU of the SWQS of 6.5SU and given the presence of wetlands in the system (~15% along the 100m stream buffer) the occasional slightly low pH is considered naturally occurring as outlined in the 2018 CALM guidance manual. Since the occasional slightly low pH is considered naturally occurring it is being delisted

West River water quality monitoring data: Data Sources: (MassDEP Undated 4, MassDEP Undated 8)

Attended probe measurements were collected at station W1759 (Moroney Rd, Upton) during the 2008 sampling season. 4 discrete temperature readings, all met warmwater criteria. 4 discrete pH readings, 1 of which did not meet the criterion (6.5 SU) but was not considered a 'severe' violation of the criterion (on 5/1/2008, the pH was 6.4 SU).

Attended Data				
Unique ID	Waterbody	Count pH	Count pH <6.5 or >8.3SU	Count pH <6.0 or >8.8SU Severe
W1759	WEST RIVER	4	1	0

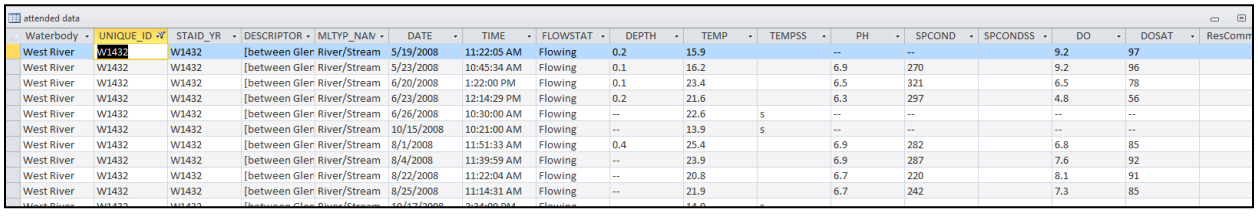


attended data

Waterbody	UNIQUE_ID	DESCRIPTOR	DATE	TIME	FLOWSTAT	DEPTH	TEMP	PH	PHSS	SPCOND	SPCONDSS	DO	DOSAT	DOSATSS	ResComm
West River	W1759	[Moroney Roac	5/1/2008	10:59:47 AM	Flowing	0.3	10.2	6.4		251		11.0	98		
West River	W1759	[Moroney Roac	5/29/2008	10:53:06 AM	Flowing	0.1	13.7	6.6		232		8.7	85		
West River	W1759	[Moroney Roac	6/26/2008	10:44:05 AM	Flowing	0.2	19.3	6.5		290	i	7.1	79		
West River	W1759	[Moroney Roac	8/7/2008	11:04:04 AM	Flowing	--	19.6	6.6		273		7.1	80		

Attended probe measurements were collected at station W1432 during the 2008 sampling season (below Lake Wildwood and Williams St, Upton). Seven discrete pH readings were measured, one did not meet criterion (6.5 SU) but was not considered 'severe' violation (was 6.3 SU).

Attended Data					
Unique ID	Waterbody	Count	Count pH	Count pH <6.5 or >8.3SU	Count pH <6.0 or >8.8SU Severe
W1432	WEST RIVER	11	7	1	0

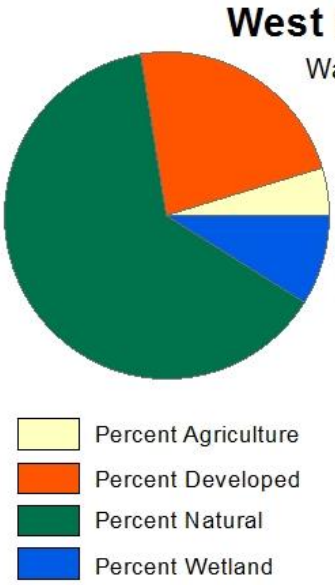


attended data

Waterbody	UNIQUE_ID	STAID_YR	DESCRIPTOR	MLTYP_NAM	DATE	TIME	FLOWSTAT	DEPTH	TEMP	TEMPSS	PH	SPCOND	SPCONDSS	DO	DOSAT	ResComm
West River	W1432	W1432	[between Glen	River/Stream	5/19/2008	11:22:05 AM	Flowing	0.2	15.9		--	--		9.2	97	
West River	W1432	W1432	[between Glen	River/Stream	5/23/2008	10:45:34 AM	Flowing	0.1	16.2		6.9	270		9.2	96	
West River	W1432	W1432	[between Glen	River/Stream	6/20/2008	1:22:00 PM	Flowing	0.1	23.4		6.5	321		6.5	78	
West River	W1432	W1432	[between Glen	River/Stream	6/23/2008	12:14:29 PM	Flowing	0.2	21.6		6.3	297		4.8	56	
West River	W1432	W1432	[between Glen	River/Stream	6/26/2008	10:30:00 AM	Flowing	--	22.6	s	--	--		--	--	
West River	W1432	W1432	[between Glen	River/Stream	10/15/2008	10:21:00 AM	Flowing	--	13.9	s	--	--		--	--	
West River	W1432	W1432	[between Glen	River/Stream	8/1/2008	11:51:33 AM	Flowing	0.4	25.4		6.9	282		6.8	85	
West River	W1432	W1432	[between Glen	River/Stream	8/4/2008	11:39:59 AM	Flowing	--	23.9		6.9	287		7.6	92	
West River	W1432	W1432	[between Glen	River/Stream	8/22/2008	11:22:04 AM	Flowing	--	20.8		6.7	220		8.1	91	
West River	W1432	W1432	[between Glen	River/Stream	8/25/2008	11:14:31 AM	Flowing	--	21.9		6.7	242		7.3	85	

West River (MA51-12)

Location:	From Upton WWTP discharge (NPDES: MA0100196), Upton to mouth at confluence with the Blackstone River, Uxbridge (through former 2008 segments: Harrington Pool MA51197 and West River Pond MA51177).
AU Type:	RIVER
AU Size:	9.4 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	37.04	7.35	12.01	2.61
Agriculture	4.7%	4.9%	4.1%	4%
Developed	22.9%	22.4%	21.5%	15.9%
Natural	63.4%	61.6%	56.9%	62.2%
Wetland	9%	11.1%	17.6%	18%
Impervious Cover	6.5%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Cadmium		Removed
5	5	Chloride		Removed
5	5	Copper		Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	Dissolved Oxygen		Added
5	5	(Fanwort*)		Added
5	5	Lead		Removed
5	5	Nutrient/Eutrophication Biological Indicators		Removed
5	5	pH, Low		Removed
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Between April 2008 and April 2018, no evidence of any acute whole effluent toxicity was detected in the any of the 44 modified acute whole effluent toxicity tests conducted on the Upton WWTF effluent (MA0100196) using *C. dubia* or the 33 tests conducted using *P. promelas*. This facility discharges to an Unnamed tributary just upstream of its confluence with this West River AU (MA51-12). Most of the CNOEC results for the 40 valid *C. dubia* chronic and the 33 valid *P. promelas* tests met the ≥98% effluent limit. The three *C. dubia* tests that failed were October 2012, April 2014, and January 2016 tests (CNOEC of 25, 6.25, and 50% effluent, respectively) and the four *P. promelas* tests were October 2008, April 2009, July 2012, and October 2015 (CNOEC results of 12.5, 6.25, <6.25, and 6.25% effluent, respectively). All chronic tests conducted since April 2016 have met the CNOEC permit limit. MassDEP biologists conducted benthic macroinvertebrate sampling in this West River AU (MA51-12) ~ 40m upstream from West River Street in Upton (B0092) in July 2008. The RBPIII analysis indicated the sample was not impacted (90% comparable) to the Mumford River reference site (B0091). Further downstream in the West River at East Hartford Avenue in Uxbridge (W0515) two non-native aquatic macrophytes were found*: Potamogeton crispus* during a 2005 survey and *Myriophyllum heterophyllum* during a 2017 survey. MassDEP staff conducted 26 water quality monitoring surveys as part of the SMART project here between 2008 and 2013. A brief summary of these data is as follows: minimum DO 0.2mg/L with 8 of 27 measurements <5.0mg/L, maximum saturation 100%, maximum temperature 23.6°C, pH range from 6.0 to 6.7SU (n=27) with a median of 6.4SU. The total phosphorus concentrations ranged from 0.007 to 0.046mg/L with a statistically significant decreasing trend (both seasonally and annually) between 1998 and 2013. No acute or chronic ammonia exceedances were found. In addition to the SMART monitoring project MassDEP staff also conducted more intenstive water quality sampling of the West River here during the summer of 2008 (W0515). Unnattended DO data during the four two to five-day deploys was as follows: minimum 2.91mg/L, minimum daily mean 3.01mg/L, and maximum diel DO shift 2.4mg/L, maximum saturation 109%. The maximum temperature was 24.4°C. All of the pH data at this site in 2008 (including SMART data was good (6.2-6.7SU, n=15). The seasonal (May to September) average total phosphorus concentration was low (0.028mg/L) with a maximum concentration of 0.03mg/L and there were no observations of dense/very dense filamentous algae. No exceedances of acute or chronic ammonia criteria were found. There were also no exceedances of any acute or chronic criteria for any metals (n=3). The non-native aquatic macrophytes *Cabomba caroliniana* and *Trapa natans* were documented in the West River Pond impoundment in a 1998 MassDEP synoptic survey and a 2009 survey, respectively. The Aquatic Life Use for the lower West River (MA51-12) is assessed as Not Supporting, based on the presence of non-native aquatic macrophytes (*Cabomba caroliniana, Myriophyllum heterophyllum, Potamogeton crispus* and *Trapa Natans*) and low dissolved oxygen. The other impairments (low pH, cadmium, copper, lead, chloride and Nutrient/Eutrophication Biological Indicators are being delisted (see additional information in removal comments). This use is also identified with an Alert status based on occasional elevated TN and TP levels.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Cadmium	Applicable WQS attained; based on new data	Metals was original identified as an impairment in the 1998 reporting cycle and remapped to cadmium, copper, and lead impairments in the 2010 reporting cycle. The original impairments were based on data collected from one site in the West River (Station #10) during the Blackstone River Initiative sampling conducted by MassDEP and EPA personnel during dry weather surveys

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		conducted in 1991 and wet weather surveys conducted in 1993. Clean metals sampling was conducted by MassDEP at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria. These data, considered to be representative of current conditions, support the delisting of cadmium as an impairment from this West River AU (MA51-12).
Chloride	Applicable WQS attained; based on new data	Salinity/TDS/chlorides was originally identified as a slight impairment in the 1992 reporting cycle for 2.0 miles of this West River AU (MA51-12) and this was remapped to a chloride impairment in the 2010 reporting cycle. There are no other notes made regarding this original impairment although it was most likely associated with the Upton WWTP discharge. The RBPIII analysis of the benthic macroinvertebrate community collected in the West River closest to the Upton WWTP discharge, ~ 40m upstream from West River Street in Upton (B0092) in July 2008, indicated the sample was not impacted (90% comparable) to the Mumford River reference site (B0091). Furthermore, chloride sampling was also conducted further downstream by MassDEP at one site in the West River at East Hartford Avenue in Uxbridge (W0515) as part of the SMART monitoring project. The chloride concentrations were all low ranging from 24 to 93 mg/L (n=42) from 2008 through 2013. Therefore, based on the good condition of the benthic macroinvertebrate community and the lack of any acute or chronic chloride criteria exceedances, the chloride impairment is being delisted from this West River AU (MA51-12).
Copper	Applicable WQS attained; based on new data	Metals was original identified as an impairment in the 1998 reporting cycle and remapped to cadmium, copper, and lead impairments in the 2010 reporting cycle. The original impairments were based on data collected from one site in the West River (Station #10) during the Blackstone River Initiative sampling conducted by MassDEP and EPA personnel during dry weather surveys conducted in 1991 and wet weather surveys conducted in 1993. Clean metals sampling was conducted by MassDEP at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria. These data, considered to be representative of current

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		conditions, support the delisting of copper as an impairment from this West River AU (MA51-12).
Lead	Applicable WQS attained; based on new data	Metals was original identified as an impairment in the 1998 reporting cycle and remapped to cadmium, copper, and lead impairments in the 2010 reporting cycle. The original impairments were based on data collected from one site in the West River (Station #10) during the Blackstone River Initiative sampling conducted by MassDEP and EPA personnel during dry weather surveys conducted in 1991 and wet weather surveys conducted in 1993. Clean metals sampling was conducted by MassDEP at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria. These data, considered to be representative of current conditions, support the delisting of lead as an impairment from this West River AU (MA51-12).
Nutrient/Eutrophication Biological Indicators	Applicable WQS attained; based on new data	Organic enrichment/low DO and nutrients were originally identified as an impairment in this West River AU (MA51-12) in the 1992 reporting cycle and these were remapped to a Nutrient/Eutrophication Biological Indicators impairment in the 2010 reporting cycle. Notes were made that all sites sampled in August during the 1988 survey had low DO and that this segment has extensive wetlands. Most recently, the RBPIII analysis of the benthic macroinvertebrate community collected in the West River closest to the Upton WWTP discharge, ~ 40m upstream from West River Street in Upton (B0092) in July 2008, indicated the sample was not impacted (90% comparable) to the Mumford River reference site (B0091). Furthermore, water quality sampling conducted further downstream by MassDEP staff in the West River at East Hartford Avenue in Uxbridge (W0515) from 2008 through 2013 has documented that while DO is still low (frequently below the SWQS of 5.0mg/L) there were no other indications of nutrient enrichment (the maximum diel DO shift was 2.4mg/L below the CALM guidance of 3.0mg/L, the maximum saturation was 109% also below the CALM guidance of 125%, the maximum pH was only 6.7SU, and there has been a statistically significant decrease in both the seasonal and annual total phosphorus concentrations in the West River between 1998 and 2013 with a maximum concentration of 0.03mg/L and there were no observations of dense/very dense filamentous algae. Therefore, based on the good

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		condition of the benthic macroinvertebrate community and the lack any biological indications of nutrient enrichment as well as the statistically significant decreasing trend of total phosphorus, the Nutrient/Eutrophication Biological Indicators impairment is being delisted from this West River AU (MA51-12). Low DO, although some likely a result of natural conditions associated with the influence of wetlands, will be listed as an impairment.
pH, Low	Applicable WQS attained; based on new data	The original listing for low pH was in the 1992 reporting cycle based on data collected in the river in 1988. Limited notes indicated low buffering capacity. The pH in the river at four sites in the 1988 survey (WR03A Mendon Street Upton, WR03 in the Army Corp Project property in Uxbridge, WR04 above dam at Route 16 bridge Uxbridge, and WR05 Helca Street bridge Uxbridge) ranged from 3.9 to 6.4SU (n=8). (Note though that the 3.9SU measument was the only one that was extremely low the others ranged from 6.1 to 6.4SU.) The pH data collected by MassDEP staff in this West River AU (MA51-12) at East Hartford Avenue in Uxbridge (W0515) between 2008 and 2013 ranged from 6.0 to 6.7SU (n= 35). These data were all with 0.5SU of the SWQS of 6.5SU and given the presence of wetlands in the system (~18% along the 100m stream buffer) the slightly low pH is considered naturally occurring as outlined in the 2018 CALM guidance manual and so it being delisted.

Supporting Information for Delisted Impairments

Cadmium

Clean metals sampling was conducted by MassDEP staff at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria (including cadmium, copper, and lead). These data, considered to be representative of current conditions, support the delisting of these three metals as an impairment from this West River AU (MA51-12).

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC

W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Chloride

The original listing for Salinity/TDS/chlorides was in the 1992 reporting cycle. This impairment was identified as a slight problem for 2.0 river miles not the entire segment length. There were no other notes made however this impairment was remapped to chlorides in the 2010 reporting cycle although it was most likely associated with the Upton WWTP discharge.

Data and information supporting the delisting of chloride as an impairment in this West River AU:
The RBPIII analysis of the benthic macroinvertebrate community collected in the West River closest to the Upton WWTP discharge, ~ 40m upstream from West River Street in Upton (B0092) in July 2008, indicated the sample was not impacted (90% comparable) to the Mumford River reference site (B0091).

Data Source: (Mitchell 2014)

The segment MA51-12 at station B0092 (WEST RIVER/ , approx. 40 meters upstream/northwest from West River Street, Upton, MA was sampled on 7/8/2008 the RBPIII status was determined to be " NI "when compared to the reference (Unique ID: B0091). This station had a habitat score of 177 considered to be “Comparable” when compared to the reference.

	Proj Code	Years	UNIQUE ID	Field ID	RefPC	Richness	HBI	EPT Index	EPT CHIR	SC FC	FC Total	% Dom Taxon	Tot HabSc
201	Blackstone 2008	2008	B0092	WR01	B0091	25	4.07	13	6	0.64	0.47	19.63%	177
	% Richness	% HBI	% EPT Index	% EPT CHIR	% SC FC	DomTaxon Score	% Tot Habsc						
201	100%	97%	87%	68%	126%	6	109%						

Table 3A. Summary of habitat analysis (i.e. comparability to the reference habitat condition) and RBP III analysis of macroinvertebrate communities sampled in the Blackstone River Watershed on 7, 8, 9 and 10 July 2008. Shown are the calculated metric values, metric scores (in italics) based on comparability to the reference station (Mumford River – B0091), and the corresponding assessment designation for each biomonitoring station. Complete habitat evaluations are presented in Appendix 1. Refer to Table 1 for a listing and description of sampling stations. (NOTE: Table 3 has been split into Table 3A and Table 3B in order to fit this document)

SAMPLING STATION	B0091		B0100		B0659		B0101		B0092		B0656		B0658		B0089		B0098		B0272	
STREAM	Mumford River		Kettle Brook		Tinkerville Brook		UNT to Middle River		West River		Cook Allen Brook		Quinsigamond River		Mill River		UNT to Middle River		Mumford River	
HABITAT SCORE	162		184		152		125		177		186		177		164		145		165	
HABITAT % REFERENCE	--		114%		94%		77%		109%		115%		109%		101%		90%		102%	
HABITAT COMPARABILITY	--		Comparable		Comparable		Support		Comparable		Comparable		Comparable		Comparable		Comparable		Comparable	
TAXA RICHNESS	25	*6*	24	*6*	23	*6*	23	*6*	25	*6*	26	*6*	10	*2*	26	*6*	12	*2*	14	*2*
BIOTIC INDEX	3.95	*6*	4.38	*6*	3.98	*6*	5.15	*4*	4.07	*6*	3.01	*6*	5.48	*4*	3.77	*6*	5.22	*4*	4.45	*6*
EPT INDEX	15	*6*	13	*4*	9	*0*	6	*0*	13	*4*	7	*0*	3	*0*	14	*6*	3	*0*	9	*0*
EPT/CHIRONOMIDAE	8.88	*6*	1.63	*0*	1.02	*0*	4.00	*2*	6.00	*4*	1.41	*0*	7	*6*	5.18	*4*	14.7	*6*	25.3	*6*
SCRAPER/FILTERER	0.51	*6*	0.07	*0*	0.41	*6*	0.41	*6*	0.64	*6*	0.38	*6*	–	*0*	1.23	*6*	0.60	*6*	0.22	*4*
REFERENCE AFFINITY	100%	*6*	58%	*4*	47%	*2*	84%	*6*	82%	*6*	33%	*0*	63%	*4*	81%	*6*	70%	*6*	63%	*6*
% DOMINANT TAXON	17%	*6*	16%	*6*	27%	*4*	21%	*4*	20%	*6*	27%	*4*	31%	*2*	16%	*6*	23%	*4*	27%	*4*
TOTAL METRIC SCORE	*42*		*26*		*24*		*28*		*38*		*22*		*18*		*40*		*28*		*28*	
% COMPARABILITY TO REFERENCE	--		62%		57%		67%		90%		52%		43%		95%		67%		67%	
BIOLOGICAL CONDITION -DEGREE IMPACTED	REFERENCE		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		NON-IMPAIRED		SLIGHTLY/ MODERATELY IMPAIRED		MODERATELY IMPAIRED		NON-IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED	

MassDEP – Division of Watershed Management – Technical Memorandum CN 325.5
Blackstone River Watershed 2008 Benthic Macroinvertebrate Bioassessment 8

Table 4. Selected macroinvertebrate RBPIII community metrics and impairment status for nine sampling stations in the Blackstone River Watershed sampled by MassDEP/DWM in 2008 and on at least one previous occasion. See text for a description of the metrics.

Water Body	Year	Community Metrics: Total Richness	EPT Richness	Biotic Index	% Dominant Taxon	Impairment Status
Mumford River, Uxbridge (B0091)	1998	28	8	4.04	17	Reference
	2003	19	8	4.45	19	Reference
	2008	25	15	3.95	17	Reference
Unnamed tributary to Middle River, Worcester[1] (B0098)	1998	18	7	3.88	23	Slightly-Impaired
	2008	12	3	5.22	23	Slightly-Impaired
Kettle Brook, Leicester (B0100)	1998	27	10	4.72	16	Reference
	2008	24	13	4.38	16	Slightly-Impaired
Unnamed tributary to Middle River, Worcester[2] (B0101)	1998	18	6	5.08	23	Slightly-Impaired
	2008	23	6	5.15	21	Slightly-Impaired
West River, Upton (B0092)	1998	28	10	5.34	21	Non-Impaired
	2008	25	13	4.07	20	Non-Impaired
Mill River, Blackstone (B0089)	1998	26	11	4.31	27	Non-Impaired
	2008	26	14	3.77	16	Non-Impaired
Middle River, Worcester (B0097)	1998	16	1	6.86	30	Mod-Impaired
	2008	21	2	5.66	15	Mod-Impaired
Blackstone River, Northbridge (B0093)	1998	23	2	7.63	22	Mod-Impaired
	2008	20	4	6.44	21	Mod-Impaired
Blackstone River, Millville (B0090)	1998	15	5	6.41	41	Mod-Impaired
	2003	12	6	5.47	56	Mod-Impaired
	2008	18	9	5.14	35	Mod-Impaired

Notes: [1] This site designated as Kettle Brook (KB02) in 1998
[2] This site designated as Tatnuck Brook (TB02) in 1998

Furthermore, chloride sampling was also conducted further downstream by MassDEP at one site in the West River at East Hartford Avenue in Uxbridge (W0515) as part of the SMART monitoring project. The chloride concentrations were all low ranging from 24 to 93 mg/L (n=42) from 2008 through 2013. Therefore, based on the good condition of the benthic macroinvertebrate community and the lack of any acute or chronic chloride criteria exceedances, the chloride impairment is being delisted from this West River AU (MA51-12).

Copper

Clean metals sampling was conducted by MassDEP staff at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria (including cadmium, copper, and lead). These data, considered to be representative of current conditions, support the delisting of these three metals as an impairment from this West River AU (MA51-12).

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Lead

Clean metals sampling was conducted by MassDEP staff at one site in the West River at East Hartford Avenue in Uxbridge (W0515) in 2008. None of the three samples collected exceeded any acute or chronic metals criteria (including cadmium, copper, and lead). These data, considered to be representative of current conditions, support the delisting of these three metals as an impairment from this West River AU (MA51-12).

Data Source: (MassDEP Undated 4)

Acute Metals- CMC Relate Data

Unique ID	Waterbody	Year	Count	Cd CMC	Cr CMC	Cu CMC	Pb CMC	Ni CMC	Ag CMC	Zn CMC	As CMC	Al CMC
W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0

Chronic Metals- CCC Relate Data

Unique ID	Waterbody	Year	Count	Cd CCC	Cr CCC	Cu CCC	Pb CCC	Ni CCC	Zn..CMC	Zn..CCC	As CCC	Al CCC	Se CCC
W0515	WEST RIVER	2008	3	0	0	0	0	0	0	0	0	0	0

Nutrient/Eutrophication Biological Indicators

Most recently, the RBPIII analysis of the benthic macroinvertebrate community collected in the West River closest to the Upton WWTP discharge, ~ 40m upstream from West River Street in Upton (B0092) in July 2008, indicated the sample was not impacted (90% comparable) to the Mumford River reference site (B0091). Data Source: (Mitchell 2014)

The segment MA51-12 at station B0092 (WEST RIVER/, approx. 40 meters upstream/northwest from West River Street, Upton, MA was sampled on 7/8/2008 the RBPIII status was determined to be "Non-Impaired" (90% comparable) when compared to the Mumford River reference site (Unique ID: B0091). This station had a habitat score of 177 considered to be “Comparable” when compared to the reference.

	Proj Code	Years	UNIQUE ID	Field ID	RefPC	Richness	HBI	EPT Index	EPT CHIR	SC FC	FC Total	% Dom Taxon	Tot HabSc
201	Blackstone 2008	2008	B0092	WR01	B0091	25	4.07	13	6	0.64	0.47	19.63%	177
	% Richness	% HBI	% EPT Index	% EPT CHIR	% SC FC	DomTaxon Score	% Tot Habsc						
201	100%	97%	87%	68%	126%	6	109%						

Table 3A. Summary of habitat analysis (i.e. comparability to the reference habitat condition) and RBP III analysis of macroinvertebrate communities sampled in the Blackstone River Watershed on 7, 8, 9 and 10 July 2008. Shown are the calculated metric values, metric scores (in italics) based on comparability to the reference station (Mumford River – B0091), and the corresponding assessment designation for each biomonitoring station. Complete habitat evaluations are presented in Appendix 1. Refer to Table 1 for a listing and description of sampling stations. (NOTE: Table 3 has been split into Table 3A and Table 3B in order to fit this document)

SAMPLING STATION	B0091		B0100		B0659		B0101		B0092		B0656		B0658		B0089		B0098		B0272	
STREAM	Mumford River		Kettle Brook		Tinkerville Brook		UNT to Middle River		West River		Cook Allen Brook		Quinsigamond River		Mill River		UNT to Middle River		Mumford River	
HABITAT SCORE	162		184		152		125		177		186		177		164		145		165	
HABITAT % REFERENCE	--		114%		94%		77%		109%		115%		109%		101%		90%		102%	
HABITAT COMPARABILITY	--		Comparable		Comparable		Support		Comparable		Comparable		Comparable		Comparable		Comparable		Comparable	
TAXA RICHNESS	25	*6*	24	*6*	23	*6*	23	*6*	25	*6*	26	*6*	10	*2*	26	*6*	12	*2*	14	*2*
BIOTIC INDEX	3.95	*6*	4.38	*6*	3.98	*6*	5.15	*4*	4.07	*6*	3.01	*6*	5.48	*4*	3.77	*6*	5.22	*4*	4.45	*6*
EPT INDEX	15	*6*	13	*4*	9	*0*	6	*0*	13	*4*	7	*0*	3	*0*	14	*6*	3	*0*	9	*0*
EPT/CHIRONOMIDAE	8.88	*6*	1.63	*0*	1.02	*0*	4.00	*2*	6.00	*4*	1.41	*0*	7	*6*	5.18	*4*	14.7	*6*	25.3	*6*
SCRAPER/FILTERER	0.51	*6*	0.07	*0*	0.41	*6*	0.41	*6*	0.64	*6*	0.38	*6*	–	*0*	1.23	*6*	0.60	*6*	0.22	*4*
REFERENCE AFFINITY	100%	*6*	58%	*4*	47%	*2*	84%	*6*	82%	*6*	33%	*0*	63%	*4*	81%	*6*	70%	*6*	63%	*6*
% DOMINANT TAXON	17%	*6*	16%	*6*	27%	*4*	21%	*4*	20%	*6*	27%	*4*	31%	*2*	16%	*6*	23%	*4*	27%	*4*
TOTAL METRIC SCORE	*42*		*26*		*24*		*28*		*38*		*22*		*18*		*40*		*28*		*28*	
% COMPARABILITY TO REFERENCE	--		62%		57%		67%		90%		52%		43%		95%		67%		67%	
BIOLOGICAL CONDITION -DEGREE IMPACTED	REFERENCE		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED		NON-IMPAIRED		SLIGHTLY/ MODERATELY IMPAIRED		MODERATELY IMPAIRED		NON-IMPAIRED		SLIGHTLY IMPAIRED		SLIGHTLY IMPAIRED	

Table 4. Selected macroinvertebrate RBPIII community metrics and impairment status for nine sampling stations in the Blackstone River Watershed sampled by MassDEP/DWM in 2008 and on at least one previous occasion. See text for a description of the metrics.

Water Body	Year	Community Metrics: Total Richness	EPT Richness	Biotic Index	% Dominant Taxon	Impairment Status
Mumford River, Uxbridge (B0091)	1998	28	8	4.04	17	Reference
	2003	19	8	4.45	19	Reference
	2008	25	15	3.95	17	Reference
Unnamed tributary to Middle River, Worcester[1] (B0098)	1998	18	7	3.88	23	Slightly-Impaired
	2008	12	3	5.22	23	Slightly-Impaired
Kettle Brook, Leicester (B0100)	1998	27	10	4.72	16	Reference
	2008	24	13	4.38	16	Slightly-Impaired
Unnamed tributary to Middle River, Worcester[2] (B0101)	1998	18	6	5.08	23	Slightly-Impaired
	2008	23	6	5.15	21	Slightly-Impaired
West River, Upton (B0092)	1998	28	10	5.34	21	Non-Impaired
	2008	25	13	4.07	20	Non-Impaired
Mill River, Blackstone (B0089)	1998	26	11	4.31	27	Non-Impaired
	2008	26	14	3.77	16	Non-Impaired
Middle River, Worcester (B0097)	1998	16	1	6.86	30	Mod-Impaired
	2008	21	2	5.66	15	Mod-Impaired
Blackstone River, Northbridge (B0093)	1998	23	2	7.63	22	Mod-Impaired
	2008	20	4	6.44	21	Mod-Impaired
Blackstone River, Millville (B0090)	1998	15	5	6.41	41	Mod-Impaired
	2003	12	6	5.47	56	Mod-Impaired
	2008	18	9	5.14	35	Mod-Impaired

Notes: [1] This site designated as Kettle Brook (KB02) in 1998
[2] This site designated as Tatnuck Brook (TB02) in 1998

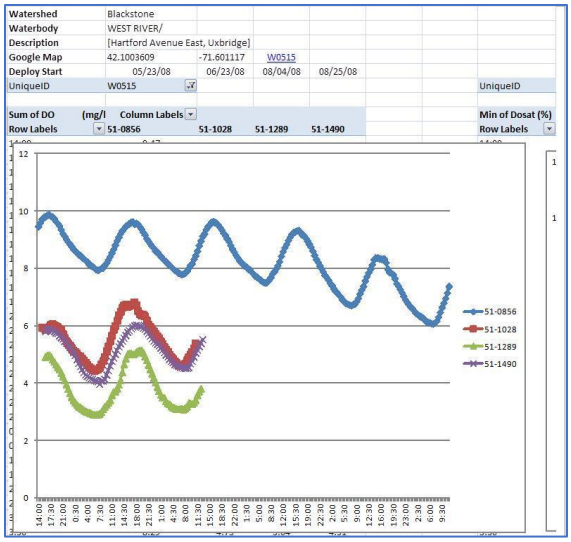
Furthermore, water quality sampling conducted further downstream by MassDEP staff in the West River at East Hartford Avenue in Uxbridge (W0515) from 2008 through 2013 has documented that while DO is still low (frequently below the SWQS of 5.0mg/L) there were no other indications of nutrient enrichment (the maximum diel DO shift was 2.4mg/L below the CALM guidance of 3.0mg/L, the maximum saturation was 109% also below the CALM guidance of 125%, the maximum pH was only 6.7SU, and there has been a statistically significant decrease in both the seasonal and annual total phosphorus concentrations in the West River between 1998 and 2013 with a maximum concentration of 0.03mg/L and there were no observations of dense/very dense filamentous algae. Therefore, based on the good condition of the benthic macroinvertebrate community and the lack any biological indications of nutrient enrichment as well as the statistically significant decreasing trend of total phosphorus, the Nutrient/Eutrophication Biological Indicators impairment is being delisted from this West River AU (MA51-12). Low DO, although some likely a result of natural conditions associated with the influence of wetlands, will be listed as an impairment.

Data Sources: (MassDEP Undated 4, MassDEP Undated 8) DO probe data W0515 is at East Hartford Ave, Uxbridge (SMART station WR03)

Unique ID	Waterbody	Class	Class Qu	Start Date	Days	OWMID Min DO	Daily Mean Minimum DO	Maximum Daily DO Shift	OWMID Mean DO	OWMID Maximum Saturation
W0515	WEST RIVER	B	WWF	05/23/08	5	6.08	7.21	1.84	8.21	108.9

W0515	WEST RIVER	B	WWF	06/23/08	2	4.44	4.53	2.40	5.52	82.2
W0515	WEST RIVER	B	WWF	08/04/08	2	2.91	3.01	2.25	3.85	62.3
W0515	WEST RIVER	B	WWF	08/25/08	2	3.98	4.26	2.06	5.11	68.7

DO probe deployment graph



Data Source: (MassDEP Undated 4)

lab data - main

Waterbody	UNIQUE_ID	STAID_YR	DESCRIPTOR	StartDate	StartTime	FLOWSTAT	DWM_Name	DWM_Units	ResVal	DWMQual	DWM_Meth
West River	W0515	WR03	[Hartford Avenue East, Uxbri	3/5/2008	10:33:00 AM	Flowing	Total Phosphor	mg/L	0.009		USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	4/29/2008	10:30:00 AM	Flowing	Total Phosphor	mg/L	0.028		USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	5/27/2008	10:12:00 AM	Flowing	Total Phosphor	mg/L	0.027		USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	6/24/2008	10:15:00 AM	Flowing	Total Phosphor	mg/L	0.028		USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	8/5/2008	10:15:00 AM	Flowing	Total Phosphor	mg/L	0.028	h	USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	8/26/2008	10:50:00 AM	Flowing	Total Phosphor	mg/L	0.030		USGS I-4650-03
West River	W0515	WR03	[Hartford Avenue East, Uxbri	10/15/2008	10:02:00 AM	Flowing	Total Phosphor	mg/L	0.019		USGS I-4650-03

The seasonal (May to September) average total phosphorus concentration *(W0515) was 0.028mg/L with a maximum concentration of 0.03mg/L.

UniqueID	Year	Fieldsheets	Filamentous Dense or Very Dense	TP Average	TP Max	pH Max	Max Daily DO Shift	Max Saturation
W0515	2005	6	0	0.064	0.19	6.8		
W0515	2006	5	0	0.022	0.037	6.6		
W0515	2007	6	1	0.018	0.032	6.9		
W0515	2008	10	0	0.024	0.03	6.7	2.4	109
W0515	2009	6	0	0.032	0.046	6.5		

W0515	2010	3	0	0.027	0.029	6.3		

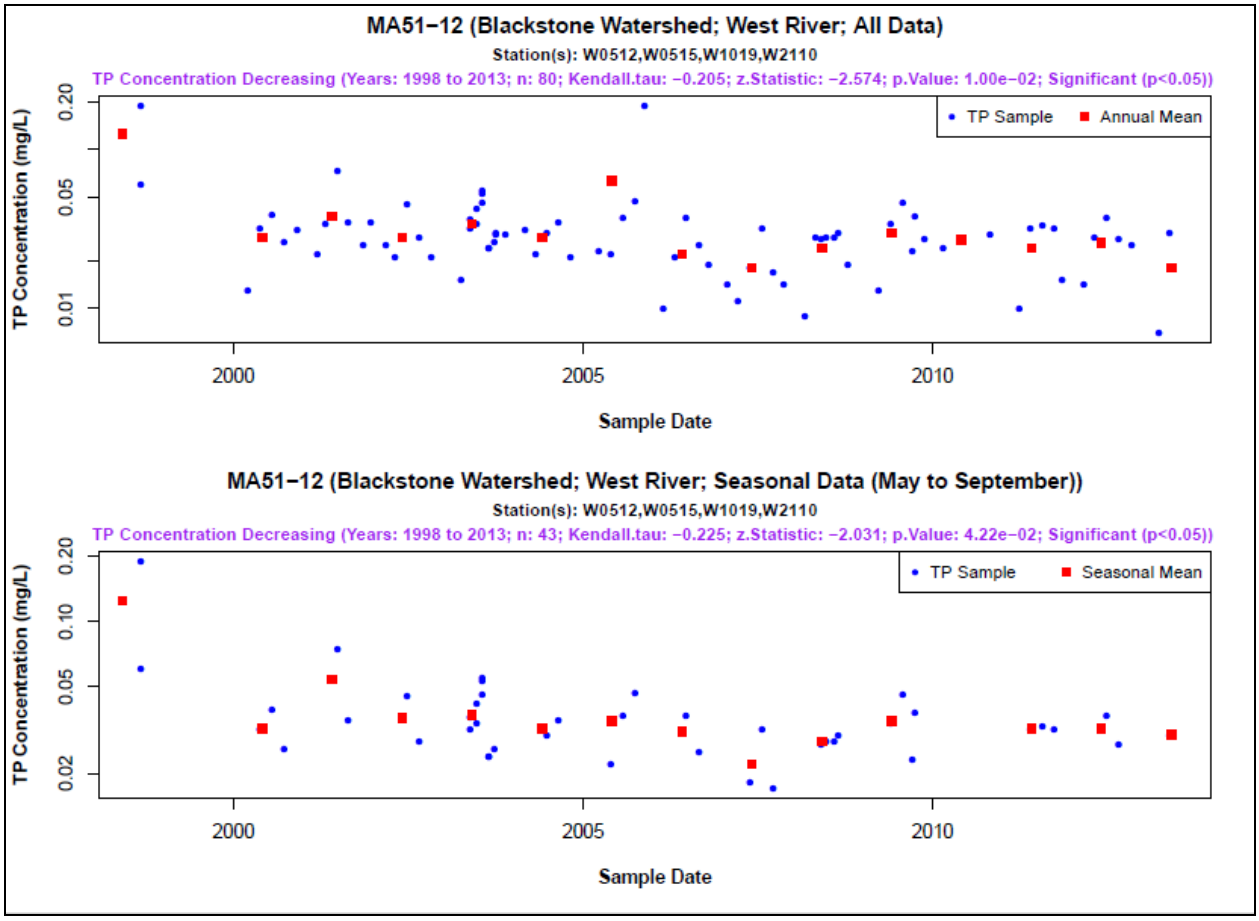
Data Sources: (Beaudoin 2016a, Beaudoin 2016b) MassDEP conducted SMART monitoring at East Hartford Ave, Uxbridge (StationWR03, W0515) on 26 surveys from 2008 through 2013. Dense to very dense algal growths were not observed at this station in this time period. Total phosphorus concentrations at this location ranged from 0.007 to 0.046 mg/L during this period, which is one indicator of high water quality.

Total Phosphorus	SMART
min	0.007
25	0.02025
median	0.028
75	0.0315
max	0.046

Data Source: (USGS 2014, MassDEP Undated 5) USGS Data, Station 01111208 - West River at Hecla St, Uxbridge

Monitoring Location	CharacteristicName	Year	CollectionMethod	Start Date	Start Date	Count	Min	Max	Average
USGS-01111208	Total Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3) mg/l	2007	Equal width increment (ewi)	05/30/07	10/04/07	3	0.230	0.600	0.477
USGS-01111208	Total Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3) mg/l	2007	Point sample	10/04/07	10/04/07	1	0.210	0.210	0.210
USGS-01111208	Total Nitrogen, mixed forms (NH3), (NH4), organic, (NO2) and (NO3) mg/l	2009	Composite - Multiple point samples	04/28/09	09/16/09	21	0.470	1.070	0.657
USGS-01111208	Total Phosphorus mg/l	2007	Equal width increment (ewi)	05/30/07	10/04/07	3	0.026	0.033	0.029
USGS-01111208	Total Phosphorus mg/l	2007	Point sample	10/04/07	10/04/07	1	0.021	0.021	0.021
USGS-01111208	Total Phosphorus mg/l	2009	Composite - Multiple point samples	04/28/09	09/16/09	21	0.027	0.136	0.057

Data Sources: (MassDEP Undated 4)



pH, Low

Most recent water quality data West River (W0515) at East Hartford Ave, Uxbridge (SMART station WR03) MassDEP conducted SMART monitoring on the West River at East Hartford Ave, Uxbridge (Station WR03, W0515) on 26 surveys from March 2008 through May 2013. The pH data ranged from 6.0 to 6.7SU (n= 35). These data were all with 0.5SU of the SWQS of 6.5SU and given the presence of wetlands in the system (~18% along the 100m stream buffer) the slightly low pH is considered naturally occurring as outlined in the 2018 CALM guidance manual and so it being delisted. The in-situ data were collected with attended probes; a summary of these data is provided in the table below.

SMART Attended Data collected at WR03 (W0515) from 2008-2013

West River 2008-2013						
Analyte	**Temp**	**pH**	**SpCond**	**TDS**	**DO**	**%Sat**
n=	27	27	27	27	27	27
25th percentile	5.55	6.3	189	122.5	4.4	49.5
min	0.2	6	135	88	0.2	2
median	15	6.4	221	144	6.4	63
max	23.6	6.7	275	179	13.4	100

75th percentile	20.15	6.5	243.5	158.5	10.55	87.5

attended data

UNIQUE_ID	STAID_YR	DESCRIPTOR	MLTYP_NAM	DATE	TIME	FLOWSTAT	DEPTH	TEMP	TEMPSS	PH	SPCOND	SPCONDSS	DO	DOSAT	ResCor
W0515	WR03	[Hartford Aven River/Stream		5/23/2008	1:57:03 PM	Flowing	0.4	16.0		6.5	233		9.5	99	
W0515	WR03	[Hartford Aven River/Stream		5/28/2008	11:36:01 AM	Flowing	0.2	18.8		6.5	244		7.7	83	
W0515	WR03	[Hartford Aven River/Stream		6/23/2008	2:43:34 PM	Flowing	0.2	22.2		6.3	277		5.8	67	
W0515	WR03	[Hartford Aven River/Stream		6/25/2008	11:16:04 AM	Flowing	0.4	20.7		6.2	284		5.4	61	
W0515	WR03	[Hartford Aven River/Stream		8/4/2008	3:54:31 PM	Flowing	0.6	24.2		6.2	266		4.6	56	
W0515	WR03	[Hartford Aven River/Stream		8/6/2008	12:42:02 PM	Flowing	--	21.4		6.3	268		3.7	42	
W0515	WR03	[Hartford Aven River/Stream		8/25/2008	3:56:29 PM	Flowing	--	22.5		6.4	240		5.5	64	
W0515	WR03	[Hartford Aven River/Stream		8/27/2008	1:08:30 PM	Flowing	--	20.4		6.4	240		5.5	62	
W0515	WR03	[Hartford Aven River/Stream		3/5/2008	10:41:01 AM	Flowing	0.4	2.7		6.3	217		13.4	99	
W0515	WR03	[Hartford Aven River/Stream		4/29/2008	10:45:27 AM	Flowing	0.8	11.4		6.3	214		8.3	76	
W0515	WR03	[Hartford Aven River/Stream		5/27/2008	10:26:17 AM	Flowing	0.6	18.7		6.7	243		7.8	84	
W0515	WR03	[Hartford Aven River/Stream		6/24/2008	10:27:57 AM	Flowing	0.5	21.6		6.5	272		5.5	62	
W0515	WR03	[Hartford Aven River/Stream		8/5/2008	10:26:23 AM	Flowing	0.6	21.8		6.3	275		3.6	40	
W0515	WR03	[Hartford Aven River/Stream		8/26/2008	10:58:39 AM	Flowing	0.5	19.4		6.4	244		5.0	54	
W0515	WR03	[Hartford Aven River/Stream		10/15/2008	10:13:56 AM	Flowing	0.7	13.1		6.4	236		6.4	61	

Whitin Reservoir (MA51179)

Location:	Douglas.
AU Type:	FRESHWATER LAKE
AU Size:	342 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use for Whitin Reservoir (MA51179) so it is Not Assessed.

Whitins Pond (MA51180)

Location:	Northbridge/Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	163 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Fanwort*)		Added
4c	4c	(Non-Native Fish/Shellfish/Zooplankton*)		Added
4c	4c	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

MassDEP staff reported the presence of multiple non-native aquatic macrophytes - *Cabomba caroliniana, Myriophyllum heterophyllum*, and *Trapa natans* in Whitins Pond in 2017. More recently, in 2018, the presence of live specimens of the aquatic invertebrate *Corbicula fluminea* (Asian clam) was also confirmed by DEP biologists.

The Aquatic Life Use for Whitins Pond (MA51180) is assessed as Not Supporting based on the presence of several species of non-native aquatic plants, including fanwort (*Cabomba caroliniana*), *Myriophyllum heterophyllum,* and water chestnut (*Trapa natans*), as well as on the presence of the non-native Asian clam (*Corbicula flumine*).

Windle Pond (MA51184)

Location:	Grafton/Shrewsbury.
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No recent data are available to assess the Aquatic Life Use of Windle Pond (MA51184) so it is Not Assessed.

Woodbury Pond (MA51185)

Location:	Sutton.
AU Type:	FRESHWATER LAKE
AU Size:	5 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)
Two non-native aquatic macrophytes*, Cabomba caroliniana* and *Myriophyllum heterophyllum*, were identified in Woodbury Pond during the 1994 MassDEP synoptic survey. One other additional species of *Myriophyllum* was also noted as a concern. The Aquatic Life Use for Woodbury Pond (MA51185) is assessed as Not Supporting based on the presence of *Cabomba caroliniana* and M*yriophyllum heterophyllum.* The use is also identified with an Alert Status based on observations of an unidentified species of *Myriophyllum* (possibly another non-native aquatic macrophyte).

Woolshop Pond (MA51186)

Location:	Millbury.
AU Type:	FRESHWATER LAKE
AU Size:	5 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophyte, *Potamogeton crispus*, was identified in Woolshop Pond in the 1994 MassDEP synoptic survey while *Myriophyllum spicatum* was reported during a 2009 MassDEP survey. The 1994 survey notes that *Myriophyllum sp.* (possibly *heterophyllum*) was also present but confirmation was needed. The Aquatic Life Use for Woolshop Pond (MA51186) is assessed as Not Supporting based on the presence of two non-native macrophytes, Eurasian Water Milfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*). The potential presence of *M. heterophyllum* is being identified as an Alert issue.
Primary Contact Recreation Use: Not Supporting
The Primary Contact Recreational Use of Woolshop Pond (MA51186) remains assessed as Not Supporting with the aquatic plants (macrophytes) and turbidity impairments being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Curly-leaf pondweed (Potamogeton crispus) and Eurasian Water Milfoil (Myriophyllum spicatum).
Secondary Contact Recreation Use: Not Supporting
The Secondary Contact Recreational Use of Woolshop Pond (MA51186) remains assessed as Not Supporting with the aquatic plants (macrophytes) and turbidity impairments being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Curly-leaf pondweed (Potamogeton crispus) and Eurasian Water Milfoil (Myriophyllum spicatum).
Aesthetic Use: Not Supporting
The Aesthetics Use of Woolshop Pond (MA51186) remains assessed as Not Supporting with the aquatic plants (macrophytes) and turbidity impairments being carried forward. The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific codes Curly-leaf pondweed (Potamogeton crispus) and Eurasian Water Milfoil (Myriophyllum spicatum).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes "Curly-leaf pondweed (Potamogeton crispus) and Eurasian Water Milfoil (Myriophyllum spicatum) have been utilized.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Potamogeton crispus*, was identified in a 1994 synoptic survey of Woolshop Pond (MassDEP 1994). The same field sheet also noted the presence of *Myriophyllum sp.* (possibly *heterophyllum*) (MassDEP 1994), but confirmation is needed. An infestation of *Myriophyllum spicatum* was reported during a 2009 MassDEP survey (MassDEP Undated 1). The generic "Non-Native Aquatic Plants" impairment is not needed since the specific macrophytes "Curly-leaf pondweed (*Potamogeton crispus*) and Eurasian Water Milfoil (*Myriophyllum spicatum*) have been utilized.

References

Arsenault, Charlene. "Indian Lake being treated with alum for harmful algal blooms." The Patch. June 24, 2017. https://patch.com/massachusetts/worcester/indian-lake-being-treated-alum-harmal-algal-blooms (accessed August 7, 2019).

Beaudoin, Therese. "Blackstone River Watershed SMART Monitoring Program 2005-2010 Technical Memorandum." CN 424.0, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2016a.

Beaudoin, Therese. "Blackstone River Watershed SMART Monitoring Program 2011-2013 Technical Memorandum." CN 413.0, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2016b.

Beskenis, Joan. "Blackstone River Algal Biomass Measured as Chlorophyll a at Selected Main Stem and Impoundment Stations - 2008." CN 325.4, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2009.

Boyer, David. "RE: beaver/tatnuck pictures." Email to Therese Beaudoin (MassDEP DWM) about a suspected illicit discharge to Beaver Brook, Central Regional Office, Wastewater Program, Massachusetts Department of Environmental Protection, Worcester, MA, October 12, 2016.

Burmeister, Jacquelyn. "RE: Indian Lake." Email to Therese Beaudoin (MassDEP DWM) about non-native plants in Indian Lake, Department of Public Works, City of Worcester, Worcester, MA, August 7, 2019.

CDM Smith. "Appendix to Blackstone River Water Quality Monitoring Program. 2017 Sampling Season Report." *In-Situ Temperature and Dissolved Oxygen Monitoring. Blackstone River June - November 2017.* Millbury, MA, April 5, 2018.

Celona, Michael. "Re: Cyanobacteria and attached Advisory Table for MassDEP." E-mail to Laurie Kennedy (MassDEP Watershed Planning Program) dated 17 September 2015 regarding Harmful Algal Blooms in 2009-2015, Massachusetts Department of Public Health, Boston, Massachusetts, 2015.

City of Worcester. "Health Advisory: Indian Lake closed." Department of Public Works web page. August 31, 2018. http://www.worcesterma.gov/announcements/health-advisory:-indian-lake-closed (accessed August 7, 2019).

—. "Indian Lake to be closed Monday for algae treatment." Department of Public Works web page. June 19, 2015. http://www.worcesterma.gov/announcements/indian-lake-to-be-closed-monday-for-algae-treatment (accessed August 7, 2019).

—. "Indian Lake to be closed Thursday for algae treatment." Department of Public Works web page. August 2, 2016. http://www.worcesterma.gov/announcements/indian-lake-to-be-closed-thursday-for-algea-treatment (accessed August 7, 2019).

—. "Refilling Indian Lake." Department of Public Works web page. March 13, 2019. http://www.worcesterma.gov/dpw/psas/refilling-indian-lake (accessed August 6, 2019).

—. "Worcester's Indian Lake closed after high levels of bacteria detected." MassLive. July 24, 2019. https://www.masslive.com/worcester/2019/07/worcesters-indian-lake-closed-after-high-levels-of-bacteria-detected.html (accessed August 7, 2019).

Coffin, Peter. "RE: cleaning up of beaver brook @ carwash." Email to volunteer Paul Taylor and copying Therese Beaudoin (MassDEP DWM) among others, Blackstone Headwaters Coalition, Worcester, MA, May 19, 2015.

FERC. "Blackstone Hydroelectric Project Woonsocket Falls Project Massachusetts/Rhode Island Public Scoping Meeting." *Blackstone Hydro, Inc. Project No. 3023-014.* Woonsocket, RI: FERC, May 10, 2019.

Foskett, Steven H., Jr. "Indian Lake at Morgan Park in Worcester to be closed Friday for weed treatment." Worcester Telegram & Gazette. June 28, 2019. https://www.telegram.com/news/20180628/indian-lake-at-morgan-park-in-worcester-to-be-closed-friday-for-weed-treatment (accessed August 6, 2019).

Google Earth Pro. "Google Earth. Satellite imagery of unnamed pond east of Martin Road, Douglas, MA." September 12, 2017a. (accessed January 14, 2020).

—. "Satellite imagery of Arcade Pond, Northbridge, MA taken on 9/12/2017." September 12, 2017b. (accessed January 14, 2020).

—. "Satellite imagery of Blackstone watershed water bodies in Auburn, Grafton, Northbridge, and Uxbridge, MA." September 12, 2017c. (accessed January 14, 2020).

—. "Satellite imagery of Houghton Pond, Uxbridge, MA." September 12, 2017d. (accessed December 17, 2019).

—. "Satellite imagery of Joels Pond." September 12, 2017e. (accessed December 30, 2019).

—. "Satellite Imagery of Joes Rock Pond, Wrentham, MA." June 22, 2019. (accessed December 19, 2019).

—. "Satellite imagery of the Blackstone watershed in Massachusetts." Undated. (accessed January 16, 2020).

GZA GeoEnvironmental, Inc. *2017 Annual Monitoring Report: Poor Farm Brook and Vicinity, Shrewsbury, MA.* Norwood, MA, December 2017.

Hartman, Elaine M, Celeste Philbrick-Barr, John Paar III, Peter M Nolan, and Gerald M. Szal. *Blackstone River Initiative Phase 1: Dry Weather Assessment Interim Report of Data 1991.* Pub. 51-AB-4, U.S. EPA Region 1, Massachusetts Division of Water Pollution Control, Rhode Island Dept. of Environmental Management, University of Rhode Island, 1991.

Heath, Douglas. "Acute road salt contamination of Dark Brook and the Auburn Water District's Church Street Wellfield in Auburn, Massachusetts." United States Environmental Protection Agency Region 1, Boston, Massachusetts, 2014.

Indian Lake Watershed Association. "Studies. Cyanobacteria Discovered In Indian Lake." 2014. https://www.ilwa.org/studies (accessed August 7, 2019).

Johnson, Arthur S, Laurie E Kennedy, and Robert M. Nuzzo. "A Report on Biological Conditions in the Blackstone River and Selected Tributaries - Results of the 1985 Biomonitoring Survey." Pub. 51-C-2, Technical Services Section, Division of Water Pollution Control, Massachusetts Department of Environmental Protection, North Grafton, MA, 1992.

Kashiwagi, M., and T. Richards. "Development of Target Fish Community Models for Massachusetts Mainstem Rivers Technical Report." Division of Fisheries and Wildlife, Massachusetts Department of Fish and Game, Westborough, Massachusetts, 2009.

Kautza, Adam. "Re: Coal Mine Brook -- a few questions and fish kill info." Email conversation with Jason Stolarski (MassWildlife) and Laurie Kennedy (MassDEP DWM), Massachusetts Division of Fisheries and Wildlife, Massachusetts Department of Fish and Game, Westborough, MA, April 6, 2020.

Keller, Dick. "Coal Mine Brook." *Voicemail Message Subject: Coal Mine Brook.* Worcester, MA, December 30, 1999.

Kimball, Warren. "SMART Monitoring Program Water Quality Screening Chart, unpublished." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, February 10, 2012.

Lake Hiawatha Association. "Lake Hiawatha Association Newsletter. Spring 2018." *Lake Hiawatha Bellingham/Blackstone, MA.* 2018. https://www.lakehiawatha.net/meeting-notes (accessed September 30, 2019).

Lycott. *Diagnostic Feasibility Study for the Management of Indian Lake, Worcester MA.* Southbridge, MA: Lycott Environmental Research Inc., 1989.

Maietta, Robert, Tim Prior, and Jane Ryder. "2008 Blackstone River Watershed Fish Population Assessment." CN 325.3, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2010.

Manchaug Pond Foundation. "Established Invaders we need to keep in check!" Weed Watchers/Aquatic Plants Survey Team. Undated. https://www.manchaugpond.org/conservation/aquatic-plants/ (accessed August 19, 2019).

MassDCR. "Excel spreadsheet of non-native aquatic and wetland species in Massacusetts lakes and ponds (entitled "MA Waterbodies July 2008 Robinson working") revised July 17, 2008." Working version corrected by MassDEP Division of Watershed Management staff Laurie Kennedy and Richard McVoy as of April 23, 2009, Lakes and Ponds Program, Massachusetts Department of Conservation and Recreation, Boston, Massachusetts, 2008.

MassDEP. "2015 Scanned Project Files, Blackstone watershed lake survey data, 1995-1998, D01-10.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 1998.

MassDEP. "2015 Scanned Project Files, Blackstone watershed survey data, 1994, D01-09.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 1994.

MassDEP. "3/31, Big Y Foods, Inc., Worcester (CERO)." Weekly Report to the Commissioner, Massachusetts Department of Environmental Protection, Worcester, MA, MA, April 7, 2009.

MassDEP. "Blackstone River Basin 1998 Water Quality Assessment Report." CN 48.0, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2001.

MassDEP. "Blackstone River Watershed 2003-2007 Water Quality Assessment Report." CN 240.0, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2010.

MassDEP. "Freshwater Aquatic Invasive Species Database Open Project Files." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 1.

MassDEP. *Herbicide Database, as of January 2017.* Database. Prod. Division of Watershed Management Massachusetts Department of Environmental Protection. Worcester, Massachusetts, 2017.

MassDEP. "Integrated Listing History 1992-2014 INTLIST_HISTORY.xlsx." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2015.

MassDEP. "Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2018 Reporting Cycle." CN 455.0, Watershed Planning Program, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2018.

MassDEP. "Open file analysis of 2005-2016 specific conductance and chloride data using 2018 CALM guidance." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, Undated 2.

MassDEP. "Open file analysis of 2005-2017 fish community data in comparison with the Target Fish Community model." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 3.

MassDEP. "Open file analysis of DWM WPP water quality data collected between 2000 and 2014 using CALM guidance." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 4.

MassDEP. "Open file analysis of USGS water quality data 2005-2014." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, Undated 5.

MassDEP. "Open files of fish and benthic macroinvertebrate data from the 2011-2015 probabilistic wadeable streams monitoring project (MAP2)." Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA, Undated 6.

MassDEP. "Open Files of NPDES permit information, whole effluent toxicity testing (ToxTD) data, and associated georeferencing data." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 7.

MassDEP. "Open files of unpublished, validated water quality monitoring data, field sheet data, and GIS datalayers in development." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 8.

MassDEP. "Open files: analyses of UBWPAD water quality monitoring and benthic macroinvertebrate data collected 2014-2018." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, Undated 9.

MassDEP. "Scanned historical 305B reports and 303d coding sheets Blackstone91_02_searchable.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2002a.

—. "Source Water Assessment and Protection (SWAP) Report for Shrewsbury Water Department." *Central Region: Source Water Assessment & Protection (SWAP) Program Reports.* April 2003. https://www.mass.gov/lists/source-water-assessment-and-protection-swap-program-documents (accessed August 15, 2019).

MassDEP. "Total Maximum Daily Load of Phosphorus for Lake Quinsigamond & Flint Pond, Grafton, MA." CN 115, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2002b.

MassDEP. "Total Maximum Daily Load of Phosphorus for Leesville Pond, Auburn-Worcester, MA. (MA51087)." CN 117, Division of Watershed Management, Masssachusetts Department of Environmental Protection, Worcester, MA, 2002c.

MassDEP. "Total Maximum Daily Loads of Phosphorus for Indian lake." CN 116, Divison of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2002d.

MassDFG. *Fish Population Data 1998-2014.* Database. Prod. Division of Fisheries and Wildlife Massachusetts Department of Fish and Game. Westborough, Massachusetts, 2014.

MassDFG. *Fish Population Data 1998-2017.* Database. Prod. Division of Fisheries and Wildlife, Massachusetts Department of Fish and Game. Westborough, Massachusetts, 2018.

MassDPH. "Freshwater Fish Consumption Advisory List." Bureau of Environmental Health, Massachusetts Department of Public Health. July 2019. https://www.mass.gov/doc/public-health-freshwater-fish-consumption-advisories-2019-0/download (accessed 2020).

MassGIS. "Coldwater Fisheries Resources (1:25, 000) Shapefile, Data Provided By Division of Fisheries and Wildlife." Bureau of Geographic Information, Boston, Massachusetts, 2017a.

MassGIS. "MassDEP Approved Zone II Wellhead Protection Areas Feature Class, Data Provided By MassDEP." Bureau of Geographic Information, Boston, Massachusetts, 2018a.

MassGIS. "MassDEP Wetlands (2005) 1:5,000 Shapefile, Data Provided By MassDEP Wetlands Conservancy Program." Bureau of Geographic Information, Boston, Massachusetts, 2017b.

MassGIS. "USGS 1:25,000 topographic quadrangles 15-minute series, vintage 1982-1990." Bureau of Geographic Information, Boston, MA, 2018b.

Metcalf & Eddy. "Final Report to Town of Hopkinton on Diagnostic Feasibility Study of North Pond Hopkinton, Massachusetts." Metcalf & Eddy, Wakefield, Massachusetts, 1987.

mindat.org. "Blazeley Pond, Worcester County, Massachusetts, United States." 2019. https://zh.mindat.org/feature-4929988.html (accessed December 30, 2019).

Mitchell, Peter. "Blackstone River Watershed 2008 Benthic Macroinvertebrate Bioassessment Tech Memo." CN 325.2, Division of Watershed Management, Department of Environmental Protection, Worcester, MA, 2014.

Monroe, Natalie S. "In The Matter of TOWN OF SHREWSBURY." *14DEPR 228.* Shrewsbury, MA: MassDEP, November 23, 2007.

Myers, Jason. "RE: Whole effluent toxicity test reports for NPDES permit MA0000817 (SAINT-GOBAIN) outfalls 001 and 003." Email to Laurie Kennedy (MassDEP DWM), Saint Gobain, Worcester, MA, March 1, 2019.

Normandeau. "Blackstone River 2014 Periphyton and Benthic Macroinvertebrate Study. Final Report." Normandeau Associates, Inc., Bedford, NH, 2015.

Normandeau. "Blackstone River 2015 Periphyton and Benthic Macroinvertebrate Study. Final Report." Normandeau Associates, Inc., Bedford, NH, 2016.

Nuzzo, Robert. "FW Corbicula confirmations." Email to David Wong (MassDEP DWM) confirming the presence of live specimens of Corbicula fluminea in Whitins Pond, Northbridge, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, August 8, 2018.

Nuzzo, Robert. "RE: B0728." Email to Therese Beaudoin (MassDEP DWM), Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, July 24, 2019.

O'Shea, Leslie K. "1988 West River Survey: Water Quality Data, Wastewater Discharge Data, Water Quality Analysis." Pub. 51-ABC-1, Technical Services Branch, Division of Water Pollution Control, Massachusetts Department of Environmental Protection, Westborough, Massachusetts, 1991a.

O'Shea, Leslie K. "Blackstone River Water Quality Data 1988 and 1989." Pub. 51-A-8, Technical Services Branch, Division of Water Pollution Control, Massachusetts Department of Environmental Protection, Westborough, Massachusetts, 1991b.

Peet, Jenny. "RE: Emailing: LittleFloatingHeart FishP08162018." Email to David Wong (MassDEP BWR) and other DEP DWM staff, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, August 21, 2019.

Sargent, Patrick. "Bent on cleaning up city fishing holes, duo rings bell for volunteers." *Worcester Sun.* April 17, 2016. https://worcester.ma/2016/04/bent-on-cleaning-up-city-fishing-holes-duo-rings-bell-for-volunteers/ (accessed August 7, 2019).

Savoie, Jennifer G, John R Mullaney, and Brent C Gardner. "Analysis of trends of water quality and streamflow in the Blackstone, Branch, Pawtuxet and Pawcatuck Rivers, Massachusetts and

Rhode Island, 1979 to 2015." Scientific Investigations Report 2106-5178, United States Geological Survey, United States Department of the Interior, Northborough, Massachusetts, MA, 2017.

Snook, Hilary. "Rice City Pond Project 1994-1995 Section 319 Nonpoint Source Program." Pub. 51-E-8, United States Environmental Protection Agency Region 1, Lexington, MA, 1996.

Straub, Jim. "RE: Little Floating Heart: Invasive or Native." Email to David Wong (MassDEP BWR), Lakes & Ponds Program, Massachusetts Department of Conservation and Recreation, Boston, MA, August 22, 2019.

The Louis Berger Group, Inc. "Water Quality - Blackstone River Final Report 2: Field Investigations." Providence, RI, 2008.

Thomas, Susan. "Re: Beaver Brook trash." Email to Therese Beaudoin (MassDEP DWM), Blackstone River Coalition, Worcester, MA, August 8, 2019.

Thomas, Susan. "Re: Flint Pond sacred lotus by rt 20." Email to Therese Beaudoin (MassDEP DWM), Blackstone River Coalition, Worcester, MA, July 29, 2019.

UBWPAD. "Open Files of UBWPAD external data submittals to MassDEP 2/4/2016 - 3/30/2019." Upper Blackstone Water Pollution Abatement District, Millbury, MA, Undated.

USGS. "USGS 01110500 Blackstone River at Northbridge, MA: provisional gage data subject to revision." November 19, 2019a. https://waterdata.usgs.gov/nwis/uv?site_no=01110500 (accessed November 19, 2019).

—. "USGS 01111230 Blackstone River at Millville, MA: provisional gage data subject to revision." December 4, 2019b. https://nwis.waterdata.usgs.gov/ma/nwis/uv?cb_00060=on&format=gif_default&site_no=01111230&period=&begin_date=2008-11-28&end_date=2008-12-05 (accessed December 4, 2019).

USGS. *USGS Water Quality Data 2005-2014.* Database retrieved from the Water Quality Portal at https://www.waterqualitydata.us/. Prod. New England Water Science Center USGS. Northborough, Massachusetts, 2014.

Wong, David. "RE: Emailing: LittleFloatingHeart FishP08162019." Email to Therese Beaudoin (MassDEP DWM), Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, August 21, 2019.

Worcester T&G. "State probes fish kill at Coal Mine Brook." *Worcester Telegram & Gazette.* June 12, 2010. https://www.telegram.com/article/20100612/NEWS/100619917 (accessed 2019).