Appendix 14
Concord River Watershed Assessment and Listing Decision
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
Assabet River	MA82B-01	5	5	Fish Bioassessments		Added
Assabet River	MA82B-01	5	5	Phosphorus, Total	35103	Removed
Assabet River	MA82B-02	5	5	(Curly-leaf Pondweed*)		Added
Assabet River	MA82B-02	5	5	Dissolved Oxygen	35104	Removed
Assabet River	MA82B-02	5	5	Phosphorus, Total	35104	Removed
Assabet River	MA82B-03	5	5	Ambient Bioassays - Chronic Aquatic Toxicity		Added
Assabet River	MA82B-03	5	5	(Curly-leaf Pondweed*)		Added
Assabet River	MA82B-03	5	5	(Non-Native Aquatic Plants*)		Removed
Assabet River	MA82B-03	5	5	Trash		Changed
Assabet River	MA82B-04	5	5	Aquatic Plants (Macrophytes)	35106	Removed
Assabet River	MA82B-04	5	5	Nutrient/Eutrophication Biological Indicators		Added
Assabet River	MA82B-04	5	5	(Water Chestnut*)		Added
Assabet River	MA82B-05	5	5	Aquatic Plants (Macrophytes)	35107	Removed
Assabet River	MA82B-05	5	5	(Curly-leaf Pondweed*)		Added
Assabet River	MA82B-05	5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
Assabet River	MA82B-05	5	5	(Fanwort*)		Added
Assabet River	MA82B-05	5	5	(Non-Native Aquatic Plants*)		Removed
Assabet River	MA82B-05	5	5	Trash		Changed
Assabet River	MA82B-05	5	5	(Water Chestnut*)		Added
Assabet River	MA82B-06	5	5	Algae	35108	Removed
Assabet River	MA82B-06	5	5	Aquatic Plants (Macrophytes)	35108	Removed
Assabet River	MA82B-06	5	5	(Curly-leaf Pondweed*)		Added
Assabet River	MA82B-06	5	5	(Fanwort*)		Added
Assabet River	MA82B-06	5	5	(Non-Native Aquatic Plants*)		Removed
Assabet River	MA82B-06	5	5	Phosphorus, Total	35108	Removed
Assabet River	MA82B-06	5	5	Temperature		Removed
Assabet River	MA82B-06	5	5	(Water Chestnut*)		Added
Assabet River	MA82B-07	5	5	Phosphorus, Total	35109	Removed
Assabet River Reservoir	MA82004	5	5	(Water Chestnut*)		Added
Bartlett Pond	MA82007	4c	4c	(Curly-leaf Pondweed*)		Added
Bartlett Pond	MA82007	4c	4c	(Fanwort*)		Added
Bartlett Pond	MA82007	4c	4c	(Non-Native Aquatic Plants*)		Removed
Bartlett Pond	MA82007	4c	4c	(Water Chestnut*)		Added
Beaver Brook	MA82A-34	5	5	Dissolved Oxygen		Added
Boons Pond	MA82011	4a	4a	(Fanwort*)		Added
Carding Mill Pond	MA82015	5	5	(Curly-leaf Pondweed*)		Added
Carding Mill Pond	MA82015	5	5	(Non-Native Aquatic Plants*)		Removed
Carding Mill Pond	MA82015	5	5	(Water Chestnut*)		Added
Carding Mill Pond	MA82015	5	5	Nutrient/Eutrophication Biological Indicators		Added

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Clamshell Pond	MA82018	3	4c	(Water Chestnut*)		Added
Coles Brook	MA82B-22	5	5	Chloride		Added
Concord River	MA82A-07	5	5	(Curly-leaf Pondweed*)		Added
Concord River	MA82A-07	5	5	(Fanwort*)		Added
Concord River	MA82A-07	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Concord River	MA82A-07	5	5	(Water Chestnut*)		Added
Concord River	MA82A-08	5	5	(Fanwort*)		Added
Concord River	MA82A-08	5	5	(Fish Passage Barrier*)		Added
Concord River	MA82A-08	5	5	(Water Chestnut*)		Added
Concord River	MA82A-09	5	5	Trash		Changed
Dudley Pond	MA82029	5	5	(Curly-leaf Pondweed*)		Added
Dudley Pond	MA82029	5	5	(Non-Native Aquatic Plants*)		Removed
Dudley Pond	MA82029	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Eames Brook	MA82A-13	5	5	(Non-Native Aquatic Plants*)		Removed
Eames Brook	MA82A-13	5	5	Trash		Changed
Elizabeth Brook	MA82B-12	5	5	Benthic Macroinvertebrates		Removed
Farm Pond	MA82035	5	5	(Curly-leaf Pondweed*)		Added
Farm Pond	MA82035	5	5	(Fanwort*)		Added
Farm Pond	MA82035	5	5	(Non-Native Aquatic Plants*)		Removed
Farrar Pond	MA82036	3	5	Mercury in Fish Tissue		Added
Fisk Pond	MA82038	4c	4c	(Water Chestnut*)		Added
Fort Meadow Reservoir	MA82042	5	5	(Fanwort*)		Added
Fort Meadow Reservoir	MA82042	5	5	(Non-Native Aquatic Plants*)		Added
Framingham Reservoir #1	MA82044	5	5	(Water Chestnut*)		Added
Great Meadows Pond #3	MA82053	4c	4c	(Non-Native Aquatic Plants*)		Removed
Great Meadows Pond #3	MA82053	4c	4c	(Water Chestnut*)		Added
Grist Mill Pond	MA82055	5	5	Aquatic Plants (Macrophytes)		Removed
Grist Mill Pond	MA82055	5	5	(Curly-leaf Pondweed*)		Added
Grist Mill Pond	MA82055	5	5	(Non-Native Aquatic Plants*)		Removed
Grist Mill Pond	MA82055	5	5	Nutrient/Eutrophication Biological Indicators		Added
Grist Mill Pond	MA82055	5	5	(Water Chestnut*)		Added
Hager Pond	MA82056	5	5	Aquatic Plants (Macrophytes)		Removed
Hager Pond	MA82056	5	5	(Curly-leaf Pondweed*)		Added
Hager Pond	MA82056	5	5	(Non-Native Aquatic Plants*)		Removed
Hager Pond	MA82056	5	5	Nutrient/Eutrophication Biological Indicators		Added
Hager Pond	MA82056	5	5	(Water Chestnut*)		Added
Heard Pond	MA82058	5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Heard Pond	MA82058	5	5	(Fanwort*)		Added
Heard Pond	MA82058	5	5	(Non-Native Aquatic Plants*)		Removed
Heard Pond	MA82058	5	5	(Water Chestnut*)		Added
Heart Pond	MA82059	5	5	Mercury in Fish Tissue		Added
Heart Pond	MA82059	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Heart Pond	MA82059	5	5	(Water Chestnut*)		Added
Hocomonco Pond	MA82060	5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
Hop Brook	MA82A-05	5	5	Aquatic Plants (Macrophytes)		Removed
Hop Brook	MA82A-05	5	5	Benthic Macroinvertebrates		Added
Hop Brook	MA82A-05	5	5	(Non-Native Aquatic Plants*)		Removed
Hop Brook	MA82A-05	5	5	Nutrient/Eutrophication Biological Indicators		Added
Hop Brook	MA82A-05	5	5	(Water Chestnut*)		Added
Lake Cochituate	MA82125	5	5	(Curly-leaf Pondweed*)		Added
Lake Cochituate	MA82125	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Lake Cochituate	MA82126	5	5	(Curly-leaf Pondweed*)		Added
Lake Cochituate	MA82126	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Lake Cochituate	MA82126	5	5	(Water Chestnut*)		Added
Lake Cochituate	MA82127	5	5	(Curly-leaf Pondweed*)		Added
Lake Cochituate	MA82127	5	5	(Water Chestnut*)		Added
Little Chauncy Pond	MA82070	4c	5	(Curly-leaf Pondweed*)		Added
Little Chauncy Pond	MA82070	4c	5	Mercury in Fish Tissue		Added
Meadow Pond	MA82129	4c	3	(Non-Native Aquatic Plants*)		Removed
Nashoba Brook	MA82B-14	5	5	Fish Bioassessments		Removed
Nashoba Brook	MA82B-14	5	5	Temperature		Added
North Brook	MA82B-21	2	5	(Curly-leaf Pondweed*)		Added
North Brook	MA82B-21	2	5	Temperature		Added
North Great Meadows	MA82084	4c	4c	(Non-Native Aquatic Plants*)		Removed
North Great Meadows	MA82084	4c	4c	(Water Chestnut*)		Added
Nutting Lake	MA82088	5	5	(Non-Native Aquatic Plants*)		Removed
Nutting Lake	MA82088	5	5	(Water Chestnut*)		Added
River Meadow Brook	MA82A-10	5	5	(Non-Native Aquatic Plants*)		Removed
River Meadow Brook	MA82A-10	5	5	Temperature		Added
River Meadow Brook	MA82A-10	5	5	Trash		Changed

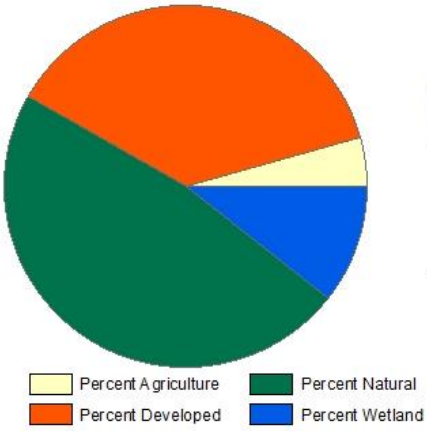
Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
River Meadow Brook	MA82A-10	5	5	(Water Chestnut*)		Added
Saxonville Pond	MA82097	5	5	(Fanwort*)		Added
Saxonville Pond	MA82097	5	5	(Water Chestnut*)		Added
Sudbury Reservoir	MA82106	4a	4a	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
Sudbury Reservoir	MA82106	4a	4a	(Water Chestnut*)		Added
Sudbury River	MA82A-03	5	5	(Curly-leaf Pondweed*)		Added
Sudbury River	MA82A-03	5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
Sudbury River	MA82A-03	5	5	Fish Bioassessments		Added
Sudbury River	MA82A-03	5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
Sudbury River	MA82A-03	5	5	(Water Chestnut*)		Added
Sudbury River	MA82A-04	5	5	(Non-Native Aquatic Plants*)		Removed
Sudbury River	MA82A-04	5	5	(Water Chestnut*)		Added
Sudbury River	MA82A-25	5	5	(Water Chestnut*)		Added
Sudbury River	MA82A-26	5	5	(Water Chestnut*)		Added
Unnamed Tributary	MA82A-15	5	5	Ambient Bioassays - Chronic Aquatic Toxicity		Added
Unnamed Tributary	MA82A-22	5	5	(Curly-leaf Pondweed*)		Added
Unnamed Tributary	MA82A-22	5	5	Trash		Changed
Unnamed Tributary	MA82A-31	4c	4c	(Non-Native Aquatic Plants*)		Removed
Unnamed Tributary	MA82A-31	4c	4c	(Water Chestnut*)		Added
Warners Pond	MA82110	4a	4a	(Non-Native Aquatic Plants*)		Removed
Warners Pond	MA82110	4a	4a	(Water Chestnut*)		Added
Waushakum Pond	MA82112	5	5	Aquatic Plants (Macrophytes)		Removed
Waushakum Pond	MA82112	5	5	Chlorophyll-a		Added
White Pond	MA82118	3	5	Dissolved Oxygen		Added
White Pond	MA82118	3	5	Harmful Algal Blooms		Added
Whitehall Reservoir	MA82120	5	5	(Fanwort*)		Added
Winning Pond	MA82123	4c	4c	(Non-Native Aquatic Plants*)		Added
Winning Pond	MA82123	4c	4c	(Water Chestnut*)		Added

Allowance Brook (MA82A-37)

Location:	From outlet small unnamed pond south of Hiram Road, Framingham to mouth at confluence with Hop Brook, Sudbury.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B

ALLOWANCE BROOK - MA82A-37

Watershed Area: 4.49 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.49	4.30	1.17	1.10
Agriculture	4.4%	3.5%	8.5%	6.7%
Developed	37.3%	37.4%	24.8%	25.5%
Natural	47.7%	48.4%	41.2%	42%
Wetland	10.6%	10.7%	25.5%	25.9%
Impervious Cover	13.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
The Aquatic Life Use of Allowance Brook (locally known as Landham Brook) is assessed as fully supporting based on the presence of a reproducing Eastern brook trout population documented by DFG biologists during backpack electrofishing sampling events in July 2006 at two locations – near Heneway Road at Garden in the Woods in and downstream from Colonial Drive (Sample IDs 1667 & 1666, respectively).

Ashland Reservoir (MA82003)

Location:	Ashland.
AU Type:	FRESHWATER LAKE
AU Size:	168 ACRES
Classification/Qualifier:	B

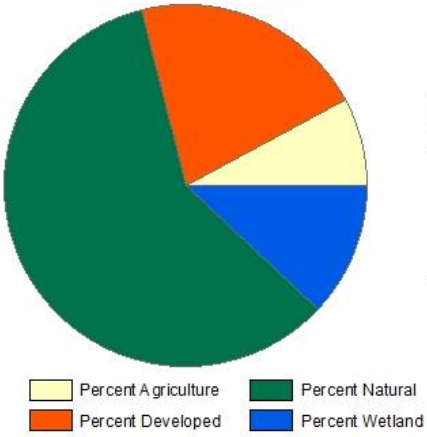
Fish, other Aquatic Life and Wildlife Use: Not Supporting
An infestation of the non-native aquatic macrophyte *Myriophyllum heterophyllum* was documented in Ashland Reservoir in the summer of 1993. The Aquatic Life Use of Ashland Reservoir is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum.*

Assabet Brook (MA82B-17)

Location:	Headwaters, outlet Fletchers Pond, Stow to mouth at confluence with the Assabet River, Stow.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B

Assabet Brook - MA82B-17

Watershed Area: 20.1 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	20.01	4.34	6.38	1.25
Agriculture	7.8%	6.7%	8%	9.1%
Developed	21.2%	26.6%	16.7%	23.4%
Natural	59.1%	50.4%	52.5%	39%
Wetland	12%	16.4%	22.8%	28.5%
Impervious Cover	6.6%			

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

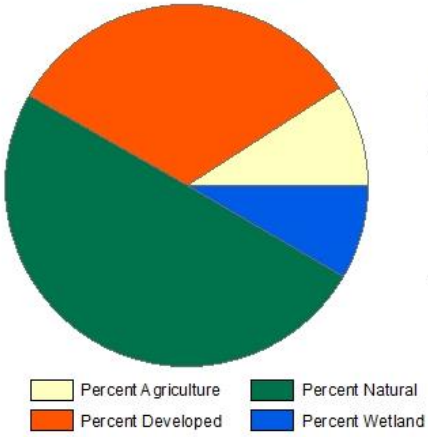
OARS volunteers collected water quality data (water temperature, pH, dissolved oxygen, total suspended solids, and ammonia) 6-8 times per year from 2009-2017 in Assabet Brook off White Pond Road in Stow (site ELZ-004). Data for most of these parameters were generally indicative of good water quality. However, there were 1-2 instances per year, in most years, where dissolved oxygen was <4.0 mg/L. There were several instances of total phosphorus measurements as high as 0.16 mg/L, but most measurements were <0.1 mg/L (and considerably lower than values reported in the last assessment report (O'Brien-Clayton 2005)). There is a relatively large percentage of wetlands (28.5%) in the proximal stream buffer, which makes it difficult to determine whether the instances of poor water quality are natural or the result of anthropogenic influences. Without fish or benthic macroinvertebrate data coupled with continuous dissolved oxygen data, there is Insufficient Information to assess the Aquatic Life Use of Assabet Brook. The Alert Status for both occasional low dissolved oxygen and occasional elevated total phosphorus is maintained. A recommendation will be made for additional sampling of the biota.

Assabet River (MA82B-01)

Location:	Headwaters, outlet Assabet River Reservoir, Westborough to the Westborough WWTP discharge (NPDES: MA0100412), Westborough.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	B: WWF, HQW

Assabet River - MA82B-01

Watershed Area: 8.38 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	8.17	7.5	2.01	1.92
Agriculture	9.1%	8.5%	6%	5.9%
Developed	32.6%	31.9%	23.6%	24.3%
Natural	49.9%	51.4%	56.4%	56.9%
Wetland	8.4%	8.2%	14%	12.9%
Impervious Cover	10.1%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Fish Bioassessments		Added
5	5	Phosphorus, Total	35103	Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting

DFG biologists conducted backpack electrofishing at twice in this Assabet River AU (MA82B-01) upstream from Mill Road (Sample ID 3994) in May 2012 and (Sample ID 5827) in May 2016. The fish data were found to be 21.18% similar to the Target Fish Community model for the Concord. OARS volunteers collected water quality data 6-8 times per year from 2012-2017 at Mill Road in Westborough (site ABT-312). OARs data (temperature, pH, dissolved oxygen, TSS, ammonia, total phosphorus) were generally indicative of good water quality. Further downstream MassDEP biologists conducted benthic macroinvertebrate sampling upstream from Maynard Street in Westborough (B0358) in July 2006. While used as the reference site for RBPIII comparisons to downstream sampling sites, the assemblage was less than ideal (i.e., low total and EPT taxa richness, high HBI, 40% of sample filter-feeding caddisflies) which was consistent with findings of the prior 2001 benthic survey. MassDEP also conducted water quality monitoring in the river at Maynard Street (W1468) during the summer of 2006 and OARS volunteers collected water quality data here as well from 2009-2012 (site ABT-311). Evaluation of these data (temperature, pH, dissolved oxygen, total suspended solids, ammonia, total phosphorus) documented

good water quality conditions. Monitoring of total phosphorus was also conducted by USEPA at ABT-311 in 2012. Survival of *Ceriodaphnia dubia* exposed (~7-days) to Assabet River water collected upstream from the Westborough WWTP discharge for use as a site control in the Town's WET tests was good (≥80%) in the tests conducted between June 2004 and March 2018 (n=54).

The Aquatic Life Use for this Assabet River AU (MA82B-01) will remain assessed as Not Supporting. The impairments for dewatering (formerly identified as low flow alterations) and benthic macroinvertebrates are being maintained while fish bioassessments impairment is being added based on the low comparability to the Concord Target Fish Community model. The seasonal average total phosphorus concentrations in this AU are ≤0.04 mg/L. Since these concentrations have decreased from the elevated concentrations documented during the 1987 survey, total phosphorus is being delisted as a cause of impairment (see Removal Comment for justification).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Phosphorus, Total	Applicable WQS attained; based on new data	This Assabet River AU (MA82B-01) was first listed as impaired for "Nutrients" in the 1992 303d List of Impaired Waters based on the 1987 DEQE Assabet River Basin water quality survey data. During that survey, the seasonal average (May to September) of total phosphorus concentrations at two sites (AS01 at the outlet of the Dam and AS02 at Maynard Street) in this Assabet River AU were 0.11 and 0.15mg/L, respectively. Subsequently, OARS volunteers collected TP samples from 2013-2017 at site ABT-312 (roughly 1/3 mile upstream of DEQE site AS02), and from 2009-2010 at site ABT-311 (at Maynard Street which was same location as site AS02 in 1987) and MassDEP sampling in the river at Maynard Street (W1468) during the summer of 2006. The seasonal average TP concentrations of OARS and MassDEP data in this Assabet River AU, excluding those determined to be collected during stagnant conditions, averaged ≤0.04 mg/L each year. Based on these more recent data which document seasonal average TP concentrations in an acceptable range, the Total Phosphorus cause of impairment warrants being delisted.

Supporting Information for Delisted Impairments

Phosphorus, Total

USGS Total Phosphorus Data (USGS 2014)

MonitoringLocation	CharacteristicName	Year	CollectionMethod	Start Date	Start Date	Count	Min	Max	Average
USGS-421602071380801	Total Phosphorus mg/l	2010	Grab sample (dip)	08/03/10	08/03/10	1	0.035	0.035	0.035
USGS-421602071380801	Total Phosphorus mg/l	2010	USGS	08/09/10	08/09/10	1	0.028	0.028	0.028

EPA Assabet River Study Data for Site ABT-311, Collected July 11, 2012 (Faber 2013)

Site ID	Description	Town	Team	Location		Time	TP
				Latitude	Longitude		(ug/L)
ABT-311	Maynard Street	Westborough	A	N 42.273927	W -71.632147	13:13	30

OARS NH3 and TP Data for Site ABT-312 (OARS 2018)

Station	Year	Count NH3	Count Acute NH3 Violations	Count Chronic NH3 Violations	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l
ABT-312	2012	6	0	0						
ABT-312	2013	7	0	0	7	2	0	0.01	0.06	0.021
ABT-312	2014	6	0	0	7	2	0	0.01	0.09	0.031
ABT-312	2015	7	0	0	7	2	0	0.01	0.09	0.027
ABT-312	2016	7	0	0	7	3	1	0.01	0.18*	0.044
ABT-312	2017	7	0	0	7	1	0	0.01	0.03	0.016

* MassDEP external data review did not find any obvious QC issues with the 7/17/2016 TP data point of 0.18 mg/L. However, it is uncharacteristic of this site and is an outlier amongst all OARS data collected on this date. The Drought Management Taskforce indicated that this part of the state was under a drought warning from July through the end of 2016, and in fact, the OARS data collected in August and September were done so under stagnant conditions. For these reasons, it is BPJ of MassDEP staff that the July, August, and September 2016 data are not representative of typical conditions. The remaining 2016 data include March (<0.01 mg/L), May (<0.01 mg/L), June (0.04 mg/L), and November (0.04 mg/L).

MassDCR Drought Status History (MassDCR 2017)

drought-status-history.pdf 1 / 2

RECENT DROUGHT HISTORY

					Drought Level by Regions				
Year	Begin Date	End Date	Comment	Western	CT River	Central	Northeast	Southeast	Cape & Islands
	12/28/2001	1/31/2003							
2001	12/28/2001			Advisory	Advisory	Advisory	Advisory	Advisory	Advisory
2002			February 2002	Advisory	Watch	Watch	Watch	Advisory	Advisory
2002			March 2002	Watch	Watch	Watch	Watch	Watch	Watch
2002			April 2002	Watch	Watch	Watch	Watch	Watch	Watch
2002			May 2002	Watch	Watch	Watch	Watch	Watch	Watch
2002			June 2002	Advisory	Advisory	Advisory	Advisory	Advisory	Advisory
2002			July 2002	Advisory	Advisory	Advisory	Advisory	Advisory	Advisory
2002			August 2002	Advisory	Advisory	Advisory	Advisory	Watch	Watch
2002			September 2002	Advisory	Advisory	Advisory	Advisory	Watch	Watch
2002			October 2002	Advisory	Advisory	Advisory	Advisory	Advisory	Advisory
2002			December 2002	Normal	Normal	Normal	Normal	Normal	Advisory
2003		1/31/2003	As of January 31, 2003	Normal	Normal	Normal	Normal	Normal	Normal
	10/1/2007	3/18/2008							
2007	10/1/2007			Normal	Advisory	Advisory	Advisory	Advisory	Normal
2008		3/18/2008	As of March 18, 2008	Normal	Normal	Normal	Normal	Normal	Normal
	8/1/2010	11/19/2010							
2010	8/1/2010			Normal	Normal	Advisory	Advisory	Normal	Normal
2010			October 2010	Normal	Advisory	Advisory	Advisory	Normal	Normal
2010		11/19/2010	As of November 19, 2010	Normal	Normal	Normal	Normal	Normal	Normal

Water quality sampling was conducted at one station (W1468) on 5 occasions during the 2006 sampling season. The average total phosphorus was 0.019 mg/L while the maximum total phosphorus was 0.023 mg/L. No observations of dense or very dense filamentous algae were noted. The maximum daily DO shift was NA and the maximum DO saturation was NA%.

Nutrient Relate Data – Data Source (MassDEP Undated 6)

Unique ID	Waterbody	Count	NH3-N Violations	Year	Count	TP Avg	TP Max	Fieldsheets	Filamentous Dense or Very Dense	Max Daily DO Shift	Max Saturation
W1468	ASSABET RIVER	5	0	2006	5	0.019	0.023	10	0	NA	NA

OARS NH3 and TP Data for Site ABT-311 (OARS 2018)

Station	Year	Count NH3	Count Acute NH3 Violations	Count Chronic NH3 Violations	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l
ABT-311	2009	6	0	0	6	4	0	0.01	0.08	0.037
ABT-311	2010	7	0	0	7	5	0	0.01	0.05	0.031
ABT-311	2011	7	0	0						
ABT-311	2012	1	0	0						

USGS Total Phosphorus Data Source: (USGS 2014, Zimmerman, Qian and Yong Q 2011) [Note: These data are from a sediment flux study and do not well 17represent typical water quality monitoring (DeSimone October 2, 2019); therefore are not used in the assessment decision.]

Monitoring Location	Analyte	Year	Start Date	Stop Date	Count	Min	Max	Avg	Collection Method
USGS-421646071381701	TP mg/l	2007	07/12/07	11/09/07	14	0.014	0.137	0.043	USGS
USGS-421646071381701	TP mg/l	2008	06/09/08	06/13/08	10	0.032	0.148	0.061	USGS

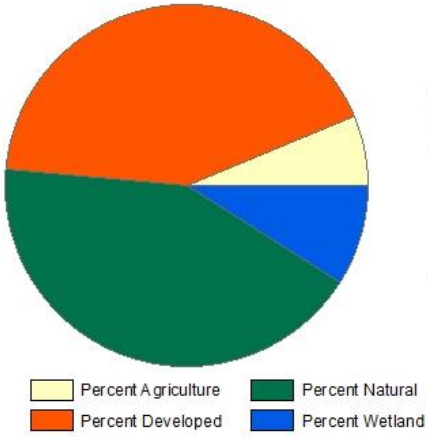
Based on these more recent data which document seasonal average TP concentrations in an acceptable range in this Assabet River AU (MA82B-01), the Total Phosphorus cause of impairment warrants being delisted.

Assabet River (MA82B-02)

Location:	From the Westborough WWTP discharge (NPDES: MA0100412), Westborough to the dam (NATID: MA02843) Route 20, Northborough.
AU Type:	RIVER
AU Size:	3.8 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-02

Watershed Area: 19.96 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	19.75	7.63	5.91	2.86
Agriculture	6.3%	5.1%	5.6%	5.8%
Developed	42.3%	43.5%	30.5%	28%
Natural	42.5%	39.2%	46.7%	42.9%
Wetland	9%	12.3%	17.2%	23.4%
Impervious Cover	14.4%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	Dissolved Oxygen	35104	Removed
5	5	Phosphorus, Total	35104	Removed

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

Water quality data were collected by multiple organizations at sites along this Assabet River AU (MA82B-02) between 2005 and 2017. Because the upgrade of the Westborough WWTP for enhanced nutrient treatment was completed in March 2012, total phosphorus (TP) data collected after this time are discussed below. Between June 2004 and June 2017, 52 valid WET tests were conducted on Westborough WWTP's effluent using *C. dubia*. No acute toxicity was detected (LC_{50}s and ANOECs all >100 and 100% effluent, respectively). Of the 51 tests with valid CNOEC data, most met the permit limit (100% effluent), while 7 tests (14%) did not. CNOEC results after the WWTP upgrade were as low as 25% effluent. Roughly 500-600m downstream of the Westborough WWTP, monitoring was conducted by DEP staff during summer 2006 (W1469), OARS volunteers between 2009-2017 (site ABT-301), and USEPA staff (only TP samples) in 2012 (site ABT-301). WQ data were indicative of good conditions (minimum DO 5.36 mg/L, good temperature, pH, and low TSS and ammonia-nitrogen concentrations). The OARS seasonal average TP concentrations ranged from 0.02 to 0.044 mg/L between 2013 and 2017. Further downstream near School Street in Northborough DEP biologists conducted benthic macroinvertebrate sampling in

the Assabet River (B0359) in July 2006. The RBP III analysis indicated slightly impaired conditions in comparison with upstream reference site (B0358), however the reference itself was compromised (see discussion for AU MA82B-01). WQ monitoring was also conducted in summer of 2006 (W0695), DEP staff between 2005 and 2013 and OARS volunteers (site ABT-280) collected data only in 2009. DEP staff noted the presence of the non-native aquatic macrophyte, *Potamogeton crispus*, at this location. Most data were indicative of good conditions (min DO 5.2mg/L during probe deployments in summer 2006, good temperature, pH, and low TSS and ammonia-nitrogen concentrations). Chloride concentrations were above 230 mg/L (the chronic criterion) several times: in 2011 (n = 1 of 6), 2012 (n = 2 of 5), and 2013 (n = 1 of 5 using specific conductivity as a surrogate for a censored chloride result). Dense/very dense filamentous algae were typically noted once per year and 3 times during the 2012 sampling period but none were noted here in 2013. The seasonal average for DEP TP concentration data were 0.044 and 0.042mg/L in 2012 and 2013, respectively. In the downstream end ofthis AU just above the dam at Route 20 Bridge in Northborough (W1470) DEP staff conducted monitoring in summer 2006. Except for one low DO (3.7mg/L collected after a 2" storm when river flows were extremely high – 2.9% exceedance) data were indicative of good conditions. A long-term trend analysis (2000-2013) of TP concentrations at three DEP stations showed a statistically significant downward trend (p = 3.56e-09) for year-round data, as well as for seasonal (May-Sept) data (p = 2.75e-03). USGS bulk TP concentrations in surficial sediment of Aluminum City impoundment ranged from 0.13 to 0.23% (median 0.17 and mean 0.17%) in summer 2003.

The *Aquatic Life Use* of this Assabet River AU (MA82B-02) is assessed as Not Supporting due to an infestation by the non-native aquatic macrophyte *Potamogeton crispus* (Curly-leaf pondweed). Because the reference site for the 2006 benthic survey was compromised, the Benthic Macroinvertebrate impairment remains. Too limited data available to justify delisting Nutrient/Eutrophication Biological Indicators. Elevated chloride data near School Street in Northborough are noted with an alert because individual samples exceeded the chronic chloride criterion in successive years. DO and TP are being delisted as a result of documented improvements.

2018/20 Delisted Impairment	**Delisting Reason**	**Delisting Comment**
Dissolved Oxygen	Applicable WQS attained, due to restoration activities	The Assabet River MA82B-02 was originally listed as impaired for "Organic Enrichment/DO" in 1992 due to low instream dissolved oxygen measurements documented prior to when the upgraded Westborough Regional WWTP came online in the late spring of 1987. Recent DO data collected in this AU of the Assabet River can be summarized as follows: during the summer of 2006, prior to the Westborough WWTP upgrade for enhanced nutrient removal, MassDEP deployed DO probes at one station (W0695) located in the middle of the AU for four 3-day periods. All measurements met water quality standards during these deployment periods (minimum DO 5.2 mg/L). Additional attended DO measurements were taken multiple times per season at several stations within this AU and from upstream to downstream these stations include the following: DEP site W1469 (upper AU) in 2006, OARS site ABT-301 (upper AU) from 2009-2017, DEP SMART site W0695 (middle AU) from 2005-2013, OARS site ABT-280 (middle AU) in 2009, and DEP site W1470 (lower AU) in 2006. With the exception of one single measurement (representing <1% of all attended measurements) at one site (W1470) in July 2006, all DO measurements collected

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		between 2005 and 2017 by MassDEP and OARS in this Assabet River AU have met water quality standards. This measurement was also taken after a very heavy precipitation event when the river flow was extremely high (2.9% exceedance). Additionally, DO data collected by MassDEP in the next downstream Assabet River AU at one station (W1471) for three 2-3 day periods in summer 2006 (roughly 1 mile downstream from the Route 20 bridge in Northborough) were all indicative of good conditions (minimum DO 6.6 mg/L). Phosphorus removal at the Westborough WWTP was also online ~ March 2012. Similar land use patterns in 2005 and 2015 satellite imagery were observed and therefore data collected within this timeframe are considered usable for water quality assessment, listing, and delisting decisions. Based on all of these data and information "Oxygen, Dissolved" is being removed as a cause of impairment for this Assabet River AU (MA82B-02).
Phosphorus, Total	Applicable WQS attained, due to restoration activities	This Assabet River AU (MA82B-02) was first listed as impaired for "Nutrients" in the 1992 303d List of Impaired Waters based on the 1987 DEQE Assabet River Basin water quality survey data. During that survey, the seasonal average (May to September) of total phosphorus concentrations at four sites (AS04 Route 9, ASO5, Route 135 Westborough/Northborough, AS06 School Street in Northborough, and AS07A above the dam at Route 20 in Northborough) in this Assabet River AU ranged from 0.54 to 2.6mg/L. After the Westborough WWTP enhanced nutrient treatment was completed in March 2012, OARS volunteers collected TP samples from 2013-2017 at site ABT-301 (Route 9) and MassDEP collected data at School Street in 2012 and 2013 (same locations as sites AS04 and AS06 in 1987). The seasonal average TP concentrations of OARS and MassDEP data in this Assabet River AU averaged ≤0.044 mg/L each year. Based on these more recent data which document seasonal average TP concentrations in an acceptable range, the Total Phosphorus cause of impairment warrants being delisted.

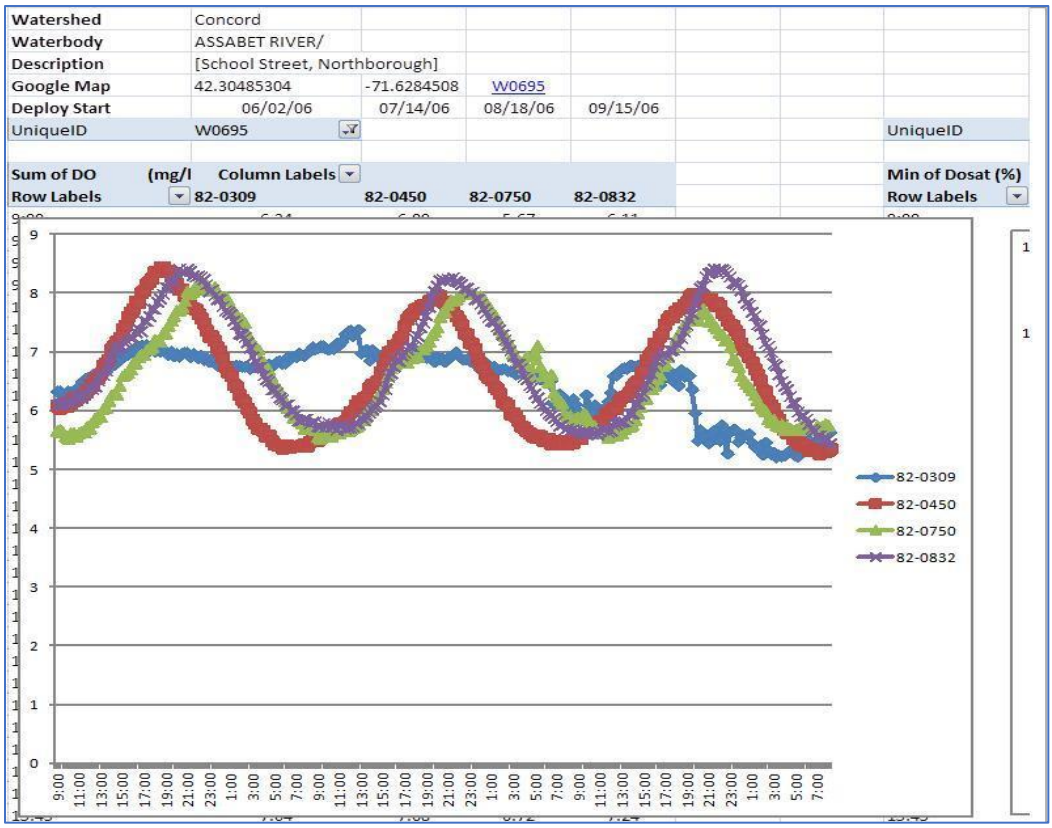
Supporting Information for Delisted Impairments

Dissolved Oxygen

DO probe data – Assabet River School Street, Northborough (W0695) Data Source (MassDEP Undated 6)

Unique ID	Waterbody	Class	Qualifier	Start Date	Days	OWMID Minimum DO	Daily Mean Minimum DO	Maximum Daily DO Shift	OWMID Mean DO	OWMID Maximum Saturation
W0695	ASSABET RIVER	B	WWF	06/02/06	3	5.22	5.73	1.57	6.53	79.5
W0695	ASSABET RIVER	B	WWF	07/14/06	3	5.28	5.36	2.61	6.62	102.7
W0695	ASSABET RIVER	B	WWF	08/18/06	3	5.54	5.59	2.48	6.64	95.5
W0695	ASSABET RIVER	B	WWF	09/15/06	3	5.45	5.58	2.82	6.86	95.4

DO probe deployment graph – Data Source (MassDEP Undated 6)



Attended probes measurements were conducted in the Assabet River upstream of Rt 9 bridge, Westborough W1469 during the 2006 sampling season. Dissolved oxygen readings were obtained on 5 occasions with 0 recordings < 5mg/L. Data Source (MassDEP Undated 6)

Attended Data					
Unique ID	Waterbody	Count	Count DO	Count DO CWF <5.0	DOSAT max
W1469	ASSABET RIVER	5	5	0	90

OARS data from the Assabet River at Rt 9, eastbound side, Westborough (Site ABT-301) (OARS 2018)

Station	**Year**	**Count DO mg/L**	**Count DO <4.0**	**Count DO <5.0**	**Max of DO%**
ABT-301	2009		0	0	83.6
ABT-301	2010	6	0	0	88.8
ABT-301	2011	7	0	0	90.5
ABT-301	2012	7	0	1	
ABT-301	2013	7	0	0	103.5
ABT-301	2014	7	0	0	85.4
ABT-301	2015	7	0	0	95.5
ABT-301	2016	8	0	0	143.1
ABT-301	2017	7	0	0	100.6

MassDEP attended probes measurements Assabet River at School Street, Northborough (W0695) (MassDEP Undated 6)

Attended Data				
Unique ID	**Year**	**Count DO**	**Count DO CWF LT5.0**	**DO SAT max**
W0695	2005	6	0	97
W0695	2006	18	0	92
W0695	2007	6	0	91
W0695	2008	4	0	91
W0695	2009	6	0	90
W0695	2010	3	0	87

* The raw data for these years appear in the table below.

MassDEP SMART Data 2005-2010, Station AS04*. *In Situ* Multiprobe Data. Data Source (Beaudoin 2016a) * Station AS04 is the same as W0695; this data is summarized in the relate table above.

Date	Time	Depth	Temp	pH	Cond @ 25C	TDS	DO	SAT
	(24hr)	(m)	(C)	(SU)	(us/cm)	(mg/l)	(mg/l)	(%)
1/19/2005	8:53	0.8	1.6	6.6	468	304	12.9	92
3/16/2005	9:22	0.6	2.6	6.7	623	405	13.2	97
5/18/2005	8:58	0.4	14.4	6.7	612	398	8.6	84
7/20/2005	9:09	0.2	22.5	6.8	879	571	5.7	66
9/21/2005	8:51	0.3	19.1	6.8 i	769	500	6.5	71
11/8/2005	9:11	0.6	10.2	6.6	457	297	9.2	82
2/15/2006	9:08	0.4	2.2	6.6	325	211	12.6	92
4/12/2006	9:05	0.4	10.0	6.6	589	383	9.3	83
6/14/2006	9:03	0.3	18.8	6.6	438	285	7.8	84
8/9/2006	8:49	0.3	20.2	6.8	1114 c	724 c	5.5	61
10/11/2006	9:09	0.5	15.1	6.6	649	415	6.6 i	66 i
1/17/2007	8:38	0.3	0.8 u	6.6 u	459 u	298 u	13.0 u	91 u
3/14/2007	8:59	0.6	3.7	6.4	374	243	12.0	91
5/16/2007	8:46	0.4	16.0	6.6	698	454	7.2	73
7/18/2007	8:22	0.2	20.6	6.7	1024 c	666 c	6.2	69
9/12/2007	8:48	0.3	18.0	6.9	693	450	6.6	70
11/7/2007	8:53	0.4	7.5	6.6	565	367	10.1	84
2/27/2008	8:25	0.5	2.4	6.4	569	370	12.4	91
4/23/2008	8:55	0.2	14.2	6.6	569	370	8.1	79
6/18/2008	8:47	0.2	17.3	6.7	666	433	## i	## i
8/20/2008	8:30	0.3	18.7	6.8	547	355	7.2	77
10/22/2008	8:45	0.4	11.7	6.5	806 c	524 c	7.3	67
1/21/2009	9:14	0.4	0.3	6.5	626	407	12.3 i	85 i
3/18/2009	8:46	0.5	5.3	6.5	557	362	11.3	90
5/20/2009	8:35	0.1	14.5	6.7	812 c	528 c	7.8	76
7/22/2009	8:40	0.3	18.8	6.7	476	310	7.0	75
9/29/2009	8:41	0.3	16.1	6.8	611	397	7.1	72
11/17/2009	8:33	0.3	8.6	6.7	342	222	10.4	89
2/18/2010	8:38	0.3	2.9	6.6	854 c	555 c	11.7	87
8/25/2010	8:28	0.3	18.8	6.9	903 c	587 c	7.5	81
10/20/2010	8:05	0.3	11.6	6.4	795	517	8.0	74

MassDEP SMART Data 2011-2013, Station AS04*. *In Situ* Multiprobe Data. Data Source (Beaudoin 2016b) * Station AS04 is the same as W0695.

Date	Time	Depth	Temp	pH	Cond @ 25C	TDS	DO	SAT
	(24hr)	(m)	(C)	(SU)	(us/cm)	(mg/l)	(mg/l)	(%)
1/19/2011	8:50 AM	0.3	3.1	6.6	777	505	11.9	89
3/15/2011	8:14 AM	0.7	3.1	6.5	458	298	12.1	90
5/17/2011	8:26 AM	0.3	12.6	6.7	436	283	##i	##i
7/20/2011	8:27 AM	0.2	21.4	7.0	1110	721	6.1	69
9/21/2011	8:15 AM	0.4	15.9	7.0	679	441	7.8	79
11/16/2011	8:07 AM	0.7	10.7	6.9	370	240	10.0	90
2/22/2012	8:12 AM	0.6	4.7	7.0	606	394	11.0	86
4/11/2012	8:04 AM	##i	10.8	7.0	894	581	8.7i	79i
6/20/2012	8:02 AM	##i	19.0	7.0	810	527	6.5	70
8/22/2012	8:22 AM	##i	20.5	7.1	1246	810	5.6i	63i
10/24/2012	7:58 AM	##i	14.5	7.1	1050	682	5.9	58
1/28/2013	8:43 AM	0.0i	2.1	6.9	795	517	11.3i	82i
3/20/2013	8:11 AM	0.0i	1.9	6.8	655	426	12.8i	92i
5/20/2013	8:10 AM	##i	16.1	7.3	902	586	8.1	82
8/28/2013	8:22 AM	0.0i	20.8	7.3	1047	681	6.8	76
9/25/2013	8:11 AM	0.0i	15.0	7.1	999	649	8.0	80

OARS data Assabet River at School St, Northborough (ABT-280) (OARS 2018)

Station	Year	Count DO mg/L	Count DO <5.0	Max of DO%
ABT-280	2009		0	73.9

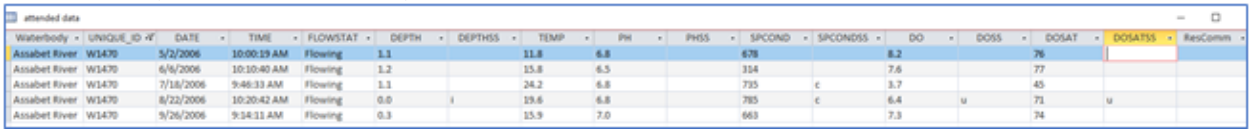
Attended probes measurements were taken by MassDEP staff in the Assabet River at Route 20, upstream of dam, Northborough (W1470) during the 2006 sampling season. Dissolved oxygen readings were obtained on 5 occasions with 1 measurement <4 mg/L.

Data Source (MassDEP Undated 6)

Attended Data						
Unique ID	Waterbody	Count	Count DO	Count DO CWF LT5.0	Count DO WWF LT4.0	DOSAT max

W1470	ASSABET RIVER	5	5	1	1	77

Data Source (MassDEP Undated 8)



Waterbody	UNIQUE_ID	DATE	TIME	FLOWSTAT	DEPTH	DEPTHSS	TEMP	PH	PHSS	SPCOND	SPCONDSS	DO	DOSS	DOSAT	DOSATSS	ResComm
Assabet River	W1470	5/2/2006	10:00:19 AM	Flowing	1.1		11.8	6.8		678		8.2		76		
Assabet River	W1470	6/6/2006	10:10:40 AM	Flowing	1.2		15.8	6.5		314		7.6		77		
Assabet River	W1470	7/18/2006	9:46:33 AM	Flowing	1.1		24.2	6.8		735	c	3.7		45		
Assabet River	W1470	8/22/2006	10:20:42 AM	Flowing	0.0	i	19.6	6.8		785	c	6.4	u	71	u	
Assabet River	W1470	9/26/2006	9:14:11 AM	Flowing	0.3		15.9	7.0		663		7.3		74		

The lowest DO (3.7mg/L) collected after 2" storm event when river flow very high (2.9% exceedance).

Phosphorus, Total

OARS seasonal TP data from Assabet River at Rt 9, eastbound side, Westborough (ABT-301) (OARS 2018)

Station ID	Year	Count	Sum of GT_0.025	Sum of GT_0.1	TP Min mg/L	TP Max mg/L	TP Avg mg/L
ABT-301	2013	5	3	0	0.02	0.07	0.044
ABT-301	2014	5	3	0	0.01	0.05	0.030
ABT-301	2015	5	2	0	0.01	0.04	0.020
ABT-301	2016	5	3	0	0.01	0.05	0.028
ABT-301	2017	5	2	0	0.01	0.05	0.022

MassDEP SMART Data 2012-2013, Station AS04*. Chemistry Data. Data Source (Beaudoin 2016b)

* Station AS04 is the same as W0695 (Assabet River, School Street, Northborough)

Date	Alkalinity	Hardness	Chloride	Ssolids	Turb	TN	NH3-N	NO3-NO2-N	TPhos
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
6/20/2012	67	150	180	3.5	2.2b	5.1	0.05	4.6	0.048
8/22/2012	70	260	250	##h	1.4	6.6	<0.02	5.5	0.040
5/20/2013	73	160	200	6.0	2.7	5.3	0.12	4.4	0.070
8/28/2013*	80	180b	##h	1.8d	1.1d	5.5	##h	##h	0.034
9/25/2013	75	180	210	<1.0	0.8	8.0	0.02	8.1	0.022

* See specific conductance data for this date.

W0695 summer seasonal average TP (May to September) after Westborough WWTP upgrade:

2012: 0.044 mg/L

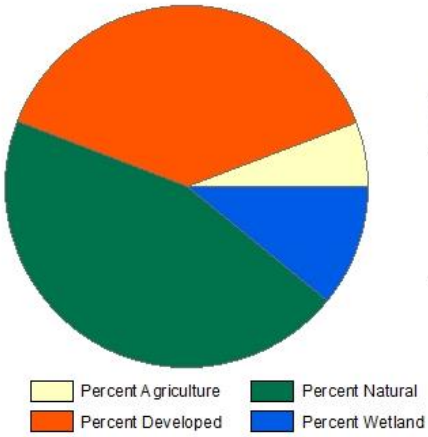
2013: 0.042 mg/L

Assabet River (MA82B-03)

Location:	From the dam (NATID: MA02843) Route 20, Northborough to the Marlborough West WWTP discharge (NPDES: MA0100480), Marlborough.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-03

Watershed Area: 35.33 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	35.11	9.56	11.07	3.22
Agriculture	5.7%	3.9%	5.1%	4.5%
Developed	38.5%	39.6%	29%	29%
Natural	44.9%	42.4%	44.9%	37.8%
Wetland	10.9%	14%	21%	28.6%
Impervious Cover	13.8%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The non-native aquatic macrophyte, *Potamogeton crispus*, infests this Assabet River AU (MA82B-03). Because the upgrade of the Westborough WWTP for enhanced nutrient treatment was completed in March 2012, total phosphorus data collected after this time is discussed below. Water quality data were collected by multiple entities at multiple sites. At the most upstream end of this Assabet River AU just above the dam upstream of the Route 20 Bridge in Northborough (W1470) MassDEP staff conducted water quality monitoring during the summer of 2006. With the exception of one low DO measurement (3.7mg/L collected after a 2" storm when river flows were extremely high – 2.9% exceedance) water quality data were indicative of good conditions. The total phosphorus sample

collected by EPA just upstream from River Street (ABT-259) in July 2012 was 0.059mg/L. MassDEP and EPA also sampled the river upstream of the Allen Street bridge (W1471 and ABT-252). During the summer of 2006 water quality conditions documented by MassDEP was good (minimum DO during the three probe deployments 6.6mg/L, maximum diel shift 2.4mg/L, maximum saturation 104%), good pH, max temperature 25.4°C, and low ammonia-nitrogen concentrations (<0.06 mg/L). The total phosphorus sample collected by EPA in July 2012 was 0.079mg/L. Monitoring of the Allen Street impoundment as part of the Long-term Duckweed Monitoring Study (2007-2014) found a measurable, though not statistically significant decrease in mean duckweed biomass after the upgrade of the Westborough Wastewater Treatment Plant (completed in March 2012), as compared to before the upgrade however, macrophytes and filamentous algae were frequently present. USGS reported total bulk phosphorus concentrations in the Allen Street impoundment surficial sediment ranged from 0.05 to 0.21% (median 0.21 and mean 0.17%) in the summer of 2003. Further downstream near Boundary Street River water has been collected upstream of the bridge in Northborough for use as a site control in the Marlborough Westerly WWTP WET tests. Survival of *C. dubia* exposed (~7-day) to the river has been good (≥75%) in all but one test when survival was 70% during the tests conducted between June 2004 and December 2017 (n = 55 tests). Survival of *P. promelas*, however, has ranged from 3 to 100% and frequently been <75% among seasons and across years (n= 32 tests of 54 tests) with very poor survival (≤50%) in 20 tests. MassDEP conducted water quality monitoring here as well (W1472) during the summer of 2006. Water quality data were indicative of good conditions (i.e., minimum DO 6.4mg/L, maximum saturation 101%, pH between 6.7 and 7.2SU, maximum temperature 25.5°C. and low ammonia-nitrogen--≤0.05mg/L). OARS volunteers sampled the river here (site ABT-242) in 2009 and their data also indicated good conditions. The total phosphorus sample collected by EPA (ABT-242)) in July 2012 was 0.067mg/L.

Given the non-statistically significant decrease in duckweed biomass and the limited amount of total phosphorus data collected after the Westborough WWTP upgraded as well as the infestation of the non-native aquatic macrophyte, *Potamogeton crispus*, the Aquatic Life Use for this Assabet River AU (MA82B-03) is assessed as Not Supporting, New for this cycle, Ambient Bioassays- Chronic Aquatic Toxicity is being added based on the frequently poor survival of *P. promelas* exposed (~7-day) to river water collected near the Boundary Street Bridge in Northborough used as a site control in the Marlborough Westerly WWTP WET tests.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Curly-leaf Pondweed" (Potamogeton crispus)

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

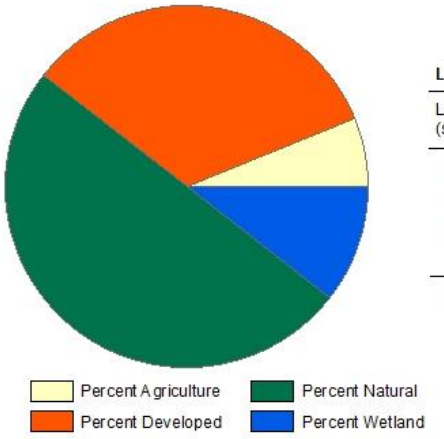
The non-native aquatic macrophyte, *Potamogeton crispus*, continues to infest this segment of the Assabet River with WPP staff noting observations in 2006 and 2017 (MassDEP Undated 8, MassDEP Undated 2). The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Curly-leaf Pondweed" (*Potamogeton crispus*).

Assabet River (MA82B-04)

Location:	From the Marlborough West WWTP discharge (NPDES: MA0100480), Marlborough to the Hudson WWTP discharge (NPDES: MA0101788), Hudson.
AU Type:	RIVER
AU Size:	8 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-04

Watershed Area: 74 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	73.77	9.2	25.81	3.08
Agriculture	6.1%	1.8%	5.3%	1.4%
Developed	33.4%	43%	26%	34.4%
Natural	50%	46.9%	49%	47.1%
Wetland	10.5%	8.3%	19.7%	17.1%
Impervious Cover	13.2%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Aquatic Plants (Macrophytes)	35106	Removed
5	5	Nutrient/Eutrophication Biological Indicators		Added
5	5	(Water Chestnut*)		Added

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

Occasional acute and/or chronic toxicity in the Marlborough Westerly WWTP to both *C. dubia* and *P. promelas* between June 2004 and Dec. 2017, but all tests after the January 2012 plant upgrade met permit limits. WPP staff recorded the presence of *Potamogeton* sp. in this river reach during two surveys in 2006. Since upgrades to Westborough and Marlborough WWTPs (enhanced nutrient treatment) were completed in March and Jan. 2012, respectively, TP data collected after this time is discussed below. Monitoring was conducted at several sites along this Assabet River AU (MA82B-04) from upstream to downstream as follows: upper reach near Robin Hill Street Bridge in Marlborough (DEP site W1473, OARS site ABT-237, EPA site ABT-237, and USGS site 5401), middle reach near Chapin Road Bridge in Hudson (DEP site W1474, EPA site ABT-196), EPA sites HUD1M and HUD2M in Hudson Impoundment, just downstream from Route 85 in Hudson (USGS site 01096840) and EPA site ABT-185, and downstream reach at Cox

Street Bridge in Hudson (DEP site W1475, OARS site ABT-162, EPA site ABT-162). Although pH, temperature, and NH3-N concentrations were all good, there were symptoms of enriched conditions near Robin Hill Street bridge in Marlborough during the summer of 2006 (i.e., min DO 4.79mg/L, max saturation 122%, max diel DO shift 4.75mg/L). OARS data between 2009-2017 (water temperature, pH, DO, TSS, NH3, and TP) were generally indicative of good WQ, with TP concentrations after the WWTP upgrades ≤0.05 mg/L. Further downstream near Chapin Road bridge in Hudson similar conditions were documented by DEP during summer 2006 with min DO 5.04mg/L, max saturation 136%, and max diel DO shift 3.23mg/L. EPA TP was 0.063mg/L in July 2012 and USGS data downstream Route 85 in Hudson (site 01096840) after plant upgrades max TPs ranged 0.05 to 0.1 mg/L. In Hudson Impoundment, statistically significant decrease of duckweed after the Westborough and Marlborough WWTPs upgrades for enhanced nutrient treatment completed (March and January 2012, respectively) was found while floating and rooted macrophytes and filamentous algae frequently filled the water column. EPA's TP samples at 4 riverine sites and 6 impounded sites (2 depths) in 2012 all had TP concentrations 0.05-0.1 mg/L (with several instances of elevated DO saturation). Many samples at greater depths also had elevated TP. USGS bulk Hudson impoundment surficial sediment TP ranged 0.04 to 0.32% (median 0.11 and mean 0.13%) in summer 2003. *Trapa natans* first observed in Hudson Impoundment during OARS 2012 survey sponsored by SuAsCo CISMA. Further downstream, data at Cox Street during summer 2006 was indicative of enriched conditions (min. DO 4.75mg/L, max. saturation 163%, max. diel shift 8.72mg/L). OARS TP concentrations after WWTP ugrades were ≤0.05 mg/L and at EPA Site ABT-162 was 0.055mg/L in July 2012. *C. dubia* survival (~7-day exposure) to Assabet River water collected at the Cox Street Bridge in Hudson (site control in the Town of Hudson's WWTP WET tests) was good ≥80% (n=26 tests Dec 2010 to Dec 2017).

Although TP has declined since the Westborough and Marlborough Westerly WWTP upgrades, the health of Assabet River AU (MA82B-04) needs more time to improve as evidenced by nutrient enrichment (high DO saturation, large diel DO swings). The current impairments for Benthic Macroinvertebrates, Algae, Fish Bioassessments, DO, and TP remain for this reporting cycle. Aquatic Plants (Macrophytes) is being removed and replaced with Nutrient/Eutrophication Biological Indicators. An impairment is being added for the non-native *Trapa natans*. An Alert is identified for potential infestation of *Potamogeton crispus* (present in both upstream (MA82B-03) and downstream (MA82B-05) AUs).

Primary Contact Recreation Use: Not Supporting (Alert)

The Primary Contact Recreational Use for this Assabet River AU (MA82B-04) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae, E. Coli, and Fecal coliform impairments are being retained. The alert for total phosphorus is being carried forward.

Secondary Contact Recreation Use: Not Supporting (Alert)

The Secondary Contact Recreational Use for this Assabet River AU (MA82B-04) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae impairment is being retained. The alert for total phosphorus is being carried forward.

Aesthetic Use: Not Supporting (Alert)

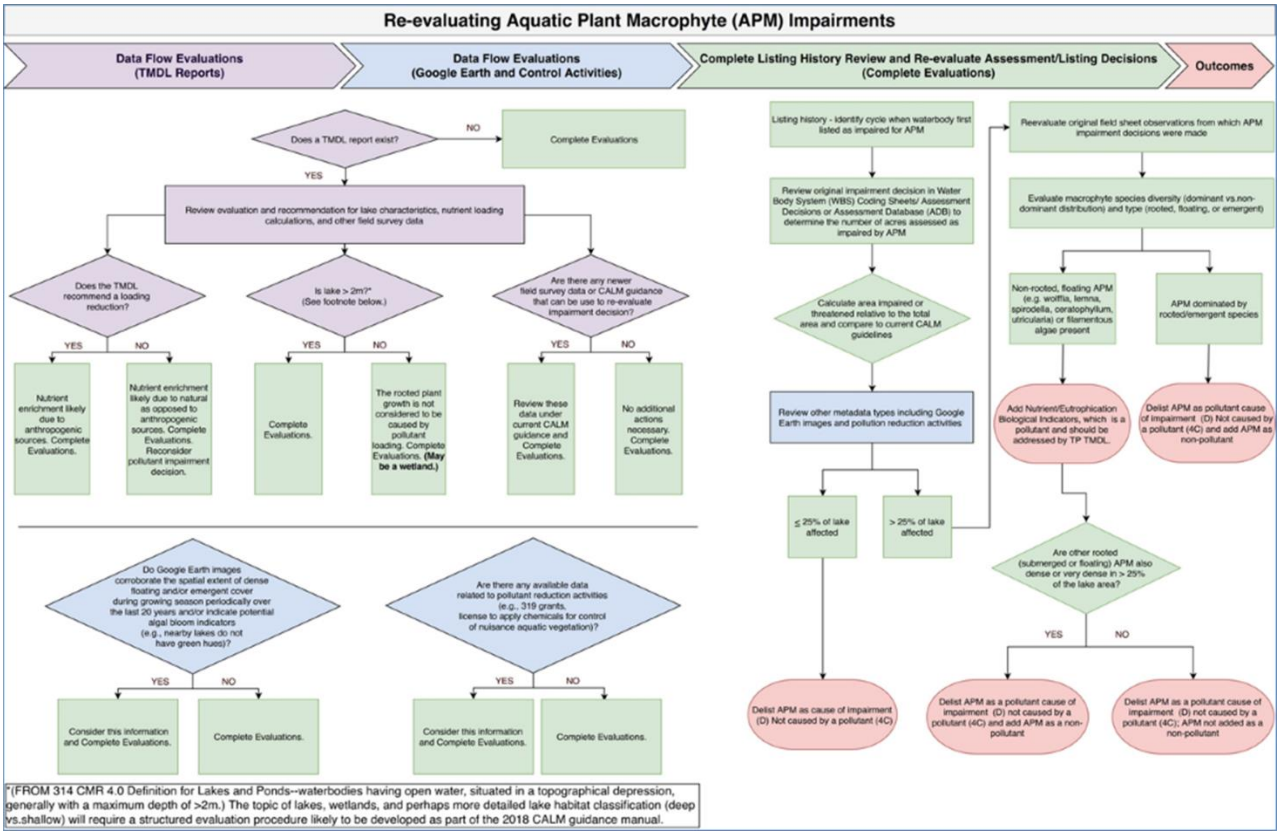
The Aesthetics Use for this Assabet River AU (MA82B-04) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae impairment is being retained. The alert for total phosphorus is being carried forward.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Clarification of listing cause	The Assabet River MA82B-04 was originally listed as impaired for "Noxious Aquatic Plants" in 2006 based on notes indicating the presence of duckweed and Wolffia sp., as well as filamentous and thin-film algae, documented during the 2001 biomonitoring survey at one station. While rooted aquatic macrophytes were present in this AU, they were recorded in the impounded portions, which represent a small percentage of the segment. With the conversion of EPA's WBS to ADB database, the Noxious Aquatic Plants code was converted to Aquatic Plants (Macrophytes) and mapped as a pollutant. Therefore, this cause of impairment is being removed. The presence of non-rooted macrophytes (Lemna sp. and Wolffia sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment.

Supporting Information for Delisted Impairments

Aquatic Plants (Macrophytes)

MassDEP analysts conducted a stepwise review process for the Aquatic Plant (Macrophytes) impairments. This reevaluation (see below) was developed by DWM analysts to consider multiple sources of information, including but not limited to Google Earth satellite imagery (often available for various months/years ranging from the mid-1990s through current time), herbicide application records, historical information on maximum lake depth, DEP water quality monitoring data, and 319 grant activities, leading to an outcome of 1) APM being delisted as a pollutant and relisted as a non-pollutant, 2) APM being delisted due to historical errors in the original listing or reapplication of current assessment methodology on whatever data are available (including original data utilized for an impairment listing if they are the only data available), or 3) APM being delisted as a pollutant to be replaced with a listing of impaired due to Nutrient/Eutrophication Biological Indicators (a pollutant). As part of the reevaluation process, those lakes experiencing dense/very dense plant coverage >25% of the lake area by filamentous algae, algal blooms, or aquatic macrophyte species that utilize nutrients directly from the water column (e.g,. non-rooted floating species including *Lemna*, *Wolfia*, *Spirodella*, *Ceratophyllum*, *Utricularia*) should be reassessed as impaired using the pollutant code "Nutrient/Eutrophication Biological Indicators".



In the case of this Assabet River AU (MA82B-04), a clarification of the listing cause is being made with the delisting of the "Aquatic Plant (Macrophytes)" The presence of non-rooted macrophytes (Lemna sp. and Wolffia sp.) and filamentous algae is reflected in the addition of "Nutrient/Eutrophication Biological Indicators" as a cause of impairment.

Long-term Duckweed Monitoring (2007-2014) on the Assabet River (Beaudoin March 15, 2016)

MA82B-04: The duckweed biomass at the Hudson Dam impoundment, like Allen Street, decreased measurably over the course of the project. However, the water column and some of the surface areas were also frequently filled in with floating and rooted macrophytes and filamentous algae.

Hudson Dam at Park Street: Upstream 8/4/2014 (left) and closeup of riparian biomass 7/21/2014 (right)

Hudson impoundment above the dam 8/4/2014

Long-term Duckweed Monitoring on the Assabet River Final Report (Beaudoin 2017)

Table 1 Wastewater treatment plants on the Assabet River and nearest downstream impoundments

Wastewater Treatment Plant*	Upgrade Completion (approximate)	Closest Downstream Impoundment(s)	Monitoring Period Before Upgrade Completion	Monitoring Period After Upgrade Completion
Westborough	March 2012	Allen Street	2007-2011	2012-2016
Marlborough	January 2012	Hudson	2007-2011	2012-2016
Hudson	Late 2009	Gleasondale, Ben Smith	2007-2009	2010-2016
Maynard	March 2011	Powdermill	2007-2010	2011-2016
*In order from upstream to downstream.				

Table 4 Mean annual duckweed biomass in Assabet River impoundments before and after WWTF upgrades[1]

Impoundment	Mean biomass before upgrade[2]	Mean biomass after upgrade	Mean biomass after upgrade minus extreme drought year
Allen Street	91.71	88.59	80.84
Hudson/Park Street	46.49	25.61	20.39
Hudson/Dam	114.20	84.43	82.66
Gleasondale	38.43	22.85	22.99
Ben Smith Upstream	159.62	106.64	104.43
Ben Smith Downstream	81.94	59.54	58.35
Ben Smith Dam	209.35	143.52	143.81
Powdermill	75.27	77.31	74.88

[1]See for the dates of the WWTP upgrades relative to each impoundment.
[2]Biomass expressed as kg.

Table 5 Summary of t-tests comparing Assabet River duckweed biomass before and after WWTF upgrades

Impoundment	Entire dataset (2007 - 2016)	Without 2016 extreme drought data (2007 - 2015)
Allen St	Cannot reject null hypothesis	Cannot reject null hypothesis
Hudson Park	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Hudson Dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Gleasondale	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road upstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road downstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Powdermill	Cannot reject null hypothesis	Cannot reject null hypothesis

Information from the Assabet River Total Phosphorus TMDL (MassDEP Undated 1): This AU, MA82B-04, receives the Marlborough Westerly treatment plant's discharge Pg. 42

TMDL Comparison Summary

The following provides a summary of the existing loadings (July, 1999 conditions) and the specified TMDL total phosphorus loadings for the Assabet River:

TMDL Allocation

	TMDL lbs/day Total P	1999 lbs/day Total P
Background (BG) based on forested watershed	3.6	3.6
Load Allocation		
Watershed NPS	1.0	1.0
Sediment P Flux	2.8	28.0
Wasteload Allocation	(@ Permitted Flows)	(@ existing July 1999 Flows)
Major Dischargers		
Westborough	6.4	46.1
Marlborough West	2.4	11.3
Hudson	2.5	32.2
Maynard	1.2	3.1
Minor Dischargers		
Powdermill Plaza	0.008[1]	0.34[1]
Middlesex School	0.22[2]	0.22[2]
MCI Concord	1.25[2]	1.25[2]
Margin of Safety	6.1	-
Total	**27.5**	**127.1**

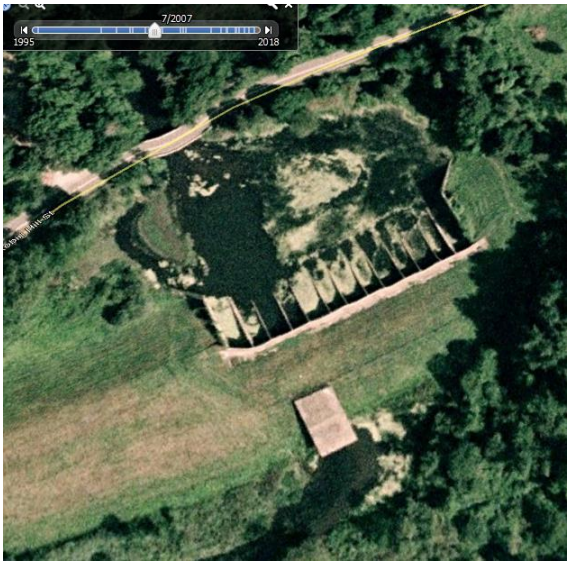
[1] connecting to Acton POTW therefore no load anticipated; used estimated average flow @ 5.0 mg/l total phosphorus

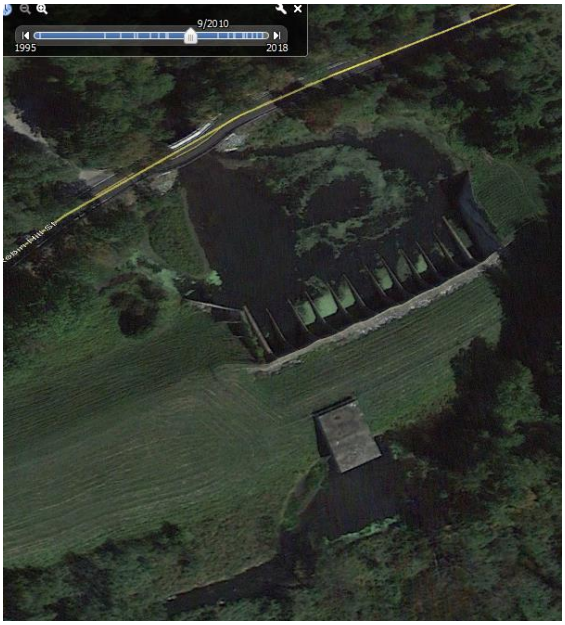
[2] estimated using design flows and 0.5 mg/l total phosphorus

Notes from the MassDEP; Assabet River approximately 50 meters downstream/east of Broad Street, Hudson (benthic site B0465); July 2001 survey (Nuzzo 2004)

sp. (willow), *Pinus strobus* (white pine), *Rhus typhina* (sumac), and *Vitis* sp. (grape). The stream bottom was about 70% covered with aquatic vegetation, most of it rooted submergent forms such as *Potamogeton* sp. (pondweed), *Elodea* sp. (waterweed), *Myriophyllum* sp. (water milfoil), and *Callitriche* sp. (water starwort). Mosses and rooted emergent aquatic plants were also present, as were the free-floating *Lemna* sp. (duckweed) and *Wolffia* sp. (watermeal). Filamentous and thin-film green algal growth covered about half the area of the reach.

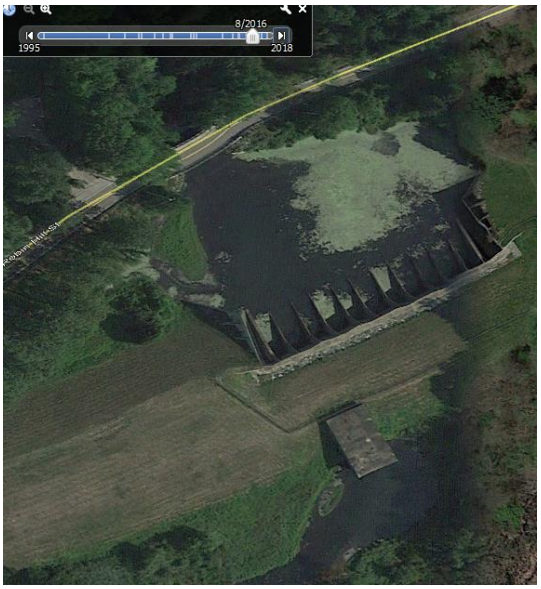
Google Earth Images (July 2007, September 2010, August 2013, September 2014, August 2016) From Run-of-river Impoundment Downstream of Tyler Dam (NATID #MA01195), Data Source (Google Earth Pro Undated):



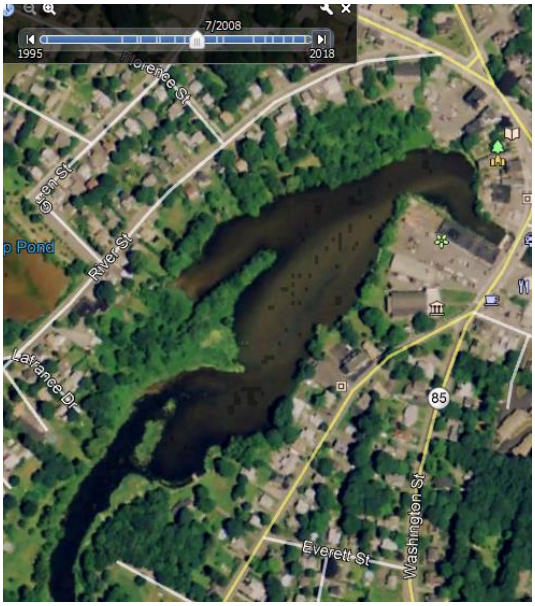


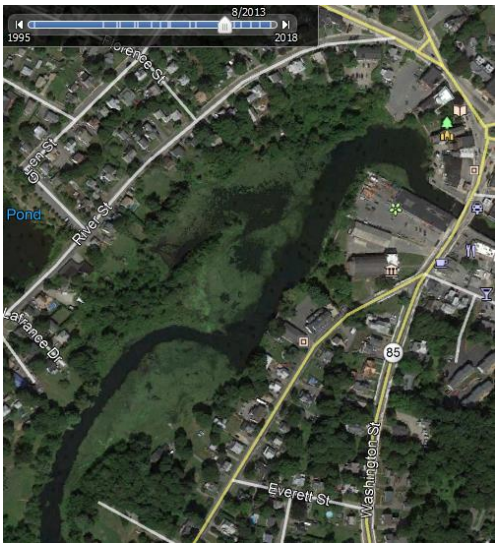

8/2013
1995
2018


9/2014
1995
2018



Google Earth Images (July 2008, August 2013, September 2014, June 2015) From Run-of-river Impoundment (Hudson Reservoir) Upstream of Washington Street Dam (NATID # MA00447), Data Source (Google Earth Pro Undated):




8/2013
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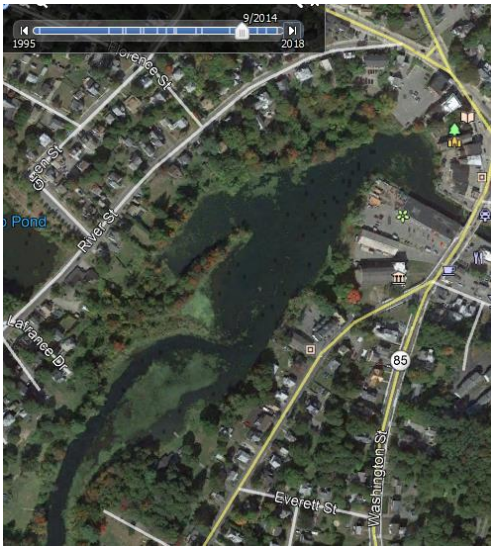
Florence St
Green St
River St
Pond
Lafrance Dr
85
Everett St
Washington St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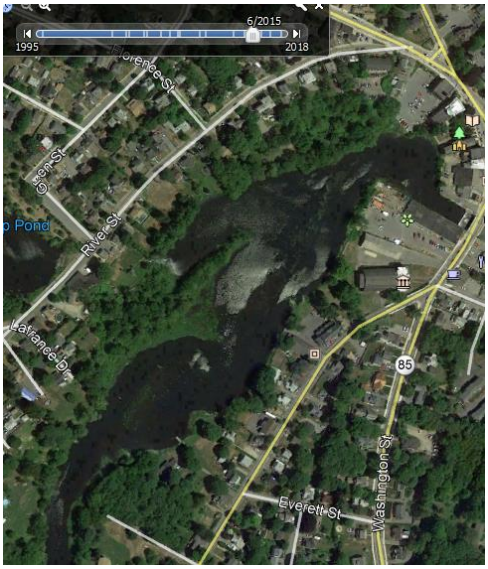
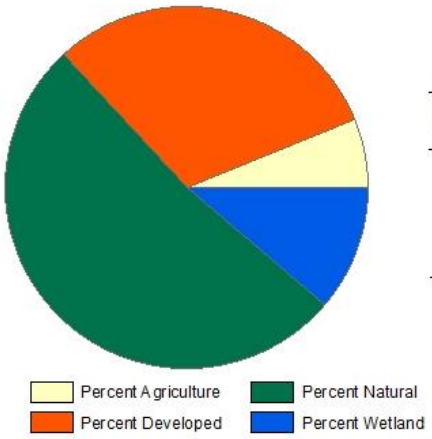

6/2015
1995
2018
Florence St
Green St
River St
Pond
Lafrance Dr
85
Everett St
Washington St

Assabet River (MA82B-05)

Location:	From the Hudson WWTP discharge (NPDES: MA0101788), Hudson to the USGS gage (#01097000) at Routes 27/62, Maynard.
AU Type:	RIVER
AU Size:	8.2 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-05

Watershed Area: 115.69 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	115.38	10.12	38.41	2.72
Agriculture	6.1%	3.8%	5.6%	5.1%
Developed	30.7%	25.7%	23.8%	18.3%
Natural	52%	53.6%	49.4%	45.7%
Wetland	11.2%	16.9%	21.2%	30.9%
Impervious Cover	11.8%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Aquatic Plants (Macrophytes)	35107	Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
5	5	(Fanwort*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Trash		Changed
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Hudson WWTF exhibited occasional chronic toxicity to *C. dubia* during tests between June 2004 and December 2017, but only one test after the 2009 plant upgrade. Multiple non-native aquatic macrophytes in different reaches of this Assabet River AU (MA82B-05) documented by ENSR and/or MassDEP staff (*Potamogeton crispus*, *Trapa natans*, *Cabomba caroliniana*, and *Myriophyllum spicatum*). Since upgrades to Westborough, Marlborough, and Hudson WWTPs for enhanced nutrient treatment were completed in March 2012, January 2012, and late in 2009 respectively, TP data collected after presented below. Monitoring upstream to downstream as follows: upper reach through

Gleasondale Impoundment (EPA GLE1M and GLE2M), MassDEP benthic sampling upstream Route 62 in Stow (B0389), Route 62 Bridge in Stow (MassDEP W1476), Rockbottom Road Bridge (OARS ABT-144,) and (EPA ABT-237), middle reach near Sudbury Road Bridge in Stow (MassDEP W1477, OARS and EPA ABT-134), EPA sites near Crow Island CR01M and CR02M, and near White Pond Road bridge in Stow/Maynard (MassDEP W1478, OARS ABT-095 and EPA sampling in Ben Smith Impoundment BEN1M, BEN3m, ABT-088), upstream Route 117 bridge in Maynard (EPA ABT-086) and at downstream end of this AU near Route 27/62 bridge in Maynard (MassDEP W0697), OARS ABT-077, EPA ABT-077, and USGS 01097000). In Gleasondale Impoundment TP concentrations at surface were 0.056mg/L in July 2012 but elevated in deeper samples (0.22mg/L). USGS total bulk TP in Gleasondale impoundment surficial sediment 0.02 to 0.71% (median 0.07 and mean 0.17%) in summer 2003. The RPBIII analysis of benthic sample collected in July 2006 63% comparable (slightly impacted) to the Assabet River reference site however reference itself was compromised (see MA82B-01). DEP data (including deployed dissolved oxygen probes) at sites W1476 (upper AU), W1477 (middle AU), and W1478 (middle AU) in summer 2006 generally indicative of good water quality, but some evidence of nutrient enriched conditions (diel DO shifts exceeding 3 mg/L (W1477, W1478) and DO maximum saturation exceeding 125% (W1478). MassDEP SMART data at W0697 (downstream border of AU) from 2005-2013 generally indicative of good water quality, with TP concentrations between 0.05-0.1 mg/L after the Hudson WWTF plant upgrade (2010-2012) and ≤0.05 mg/L during 2013 sampling, one ammonia exceeding acute criteria in January 2013, and three observations of dense/very dense filamentous algae in both 2009 and 2012. OARS data generally indicative of good water quality (annual average TP concentations (2009-2017; only for ABT-144 and ABT-077) were <0.05 mg/L after Hudson WWTF upgrade in late 2009 (except ABT-144 in 2010). Composite TP samples at USGS-01096885 (near W1477) and USGS-01097000 (near W0697) annual averages post Hudson WWTF upgrade <0.1 mg/L. EPA TP data at 3 river sites and Gleasondale, Crow Island, and Ben Smith impoundments in July 2012 generally between 0.05-0.1 mg/L, with instances of elevated DO sat in later two impoundments. Statistically significant duckweed decrease in Gleasondale and Ben Smith Impoundments after upstream WWTPs upgrades for enhanced nutrient treatment found as well as 2000-2013 downward trend (p = 5.87e-10) year-round and seasonal (May-September) TP data (p = 3.76e-03) TP data at 4 DEP sites). USGS bulk TP surficial sediment in Ben Smith impoundment 0.02 to 0.86% (median 0.12 and mean 0.17%) in summer 2003.

Although still signs of enrichment, water quality in this Assabet River AU (MA82B-05) has substantially improved since upstream WWTPs upgraded for enhanced nutrient treatment. The Aquatic Life Use is assessed as Not Supporting despite statistically significant improvements in duckweed biomass and TP because of non-native aquatic macrophytes (*Potamogeton crispus*, *Trapa natans*, *Cabomba caroliniana*, and *Myriophyllum spicatum*). Most impairment causes remain but Aquatic Plants (Macrophytes) is being delisted (see Removal Comment for rationale).

Primary Contact Recreation Use: Not Supporting

The Primary Contact Recreational Use for this Assabet River AU (MA82B-05) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae, E. Coli, Fecal coliform, debris, odor, and trash impairments are being retained.

Secondary Contact Recreation Use: Not Supporting

The Secondary Contact Recreational Use for this Assabet River AU (MA82B-05) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae, E. Coli, debris, odor, and trash impairments are being retained.

Aesthetic Use: Not Supporting

The Aesthetics Use for this Assabet River AU (MA82B-05) will continue to be assessed as Not Supporting. The presence of non-rooted macrophytes (*Lemna* sp. and *Wolffia* sp.) and filamentous algae is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted (see justification in removal comment). The Algae, debris, odor, and trash impairments are being retained.

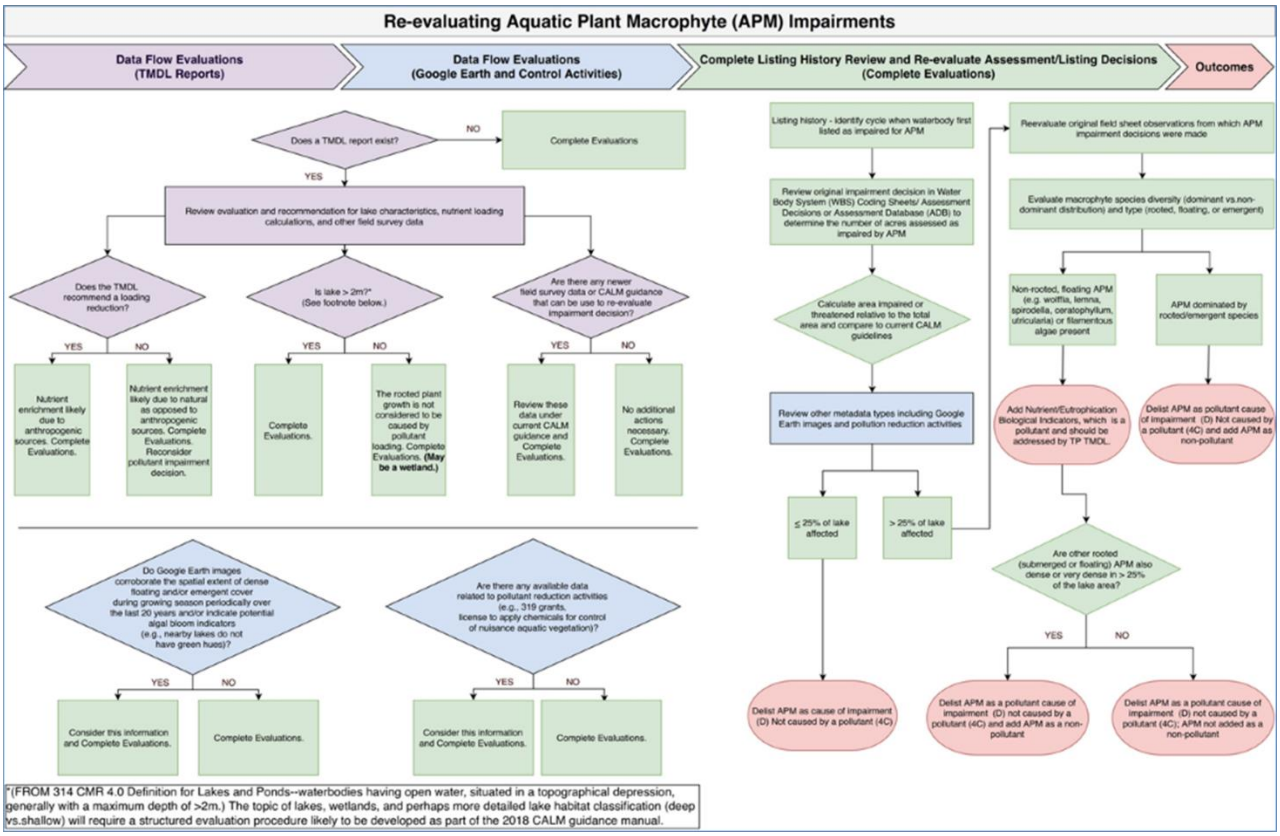
2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Applicable WQS attained, due to restoration activities	The Assabet River MA82B-05 was originally listed as impaired for "Noxious Aquatic Plants" in 2006 due to an abundance of green algal mats, and the presence of duckweed and Wolffia sp. in two of the impounded portions of this AU. With the conversion of EPA's WBS to ADB database, the Noxious Aquatic Plants code was converted to Aquatic Plants (Macrophytes) and mapped as a pollutant. Rooted aquatic macrophytes are not problematic in this AU. Therefore, this cause of impairment is being removed. The non-rooted macrophytes (Lemna sp. and Wolffia sp.) and filamentous algae impairments are reflected in the Nutrient/Eutrophication Biological Indicators cause of impairment.
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes "Eurasian water milfoil (Myriophyllum spicatum), Fanwort (Cabomba caroliniana), Curly-leaf pondweed (Potamogeton crispus), and Water chestnut (Trapa natans) have been utilized.

Supporting Information for Delisted Impairments

Aquatic Plants (Macrophytes)

MassDEP analysts conducted a stepwise review process for the Aquatic Plant (Macrophytes) impairments. This reevaluation (see below) was developed by DWM analysts to consider multiple sources of information, including but not limited to Google Earth satellite imagery (often available for various months/years ranging from the mid-1990s through current time), herbicide application records, historical information on maximum lake depth, DEP water quality monitoring data, and 319 grant activities, leading to an outcome of 1) APM being delisted as a pollutant and relisted as a non-pollutant, 2) APM being delisted due to historical errors in the original listing or reapplication of current assessment methodology on whatever data are available (including original data utilized for an impairment listing if they are the only data available), or 3) APM being delisted as a pollutant to be replaced with a listing of impaired due to Nutrient/Eutrophication Biological Indicators (a pollutant). As part of the reevaluation process, those lakes experiencing dense/very dense plant coverage >25% of the

lake area by filamentous algae, algal blooms, or aquatic macrophyte species that utilize nutrients directly from the water column (e.g,. non-rooted floating species including *Lemna*, *Wolfia*, *Spirodella*, *Ceratophyllum*, *Utricularia*) should be reassessed as impaired using the pollutant code "Nutrient/Eutrophication Biological Indicators".



In the case of this Assabet River AU (MA82B-05), the delisting of the "Aquatic Plant (Macrophytes)" impairment is appropriate given the restoration activities resulting in decreased duckweed biomass in the Gleasondale and Ben Smith impoundments and since the non-rooted macrophytes (Lemna sp. and Wolffia sp.) and filamentous algae impairments are reflected in the "Nutrient/Eutrophication Biological Indicators" cause of impairment.

Summary of MassDEP Field Observation Data (2005-2013). Data Source (MassDEP Undated 6, Beaudoin 2016b):

AU_ID	UniqueID	Year	Fieldsheets	Filamentous Dense or Very Dense
MA82B-05	W1476	2006	10	1
MA82B-05	W1477	2006	10	0

MA82B-05	W1478	2006	10	0
MA82B-05	W0697	2005	6	2
MA82B-05	W0697	2006	5	1
MA82B-05	W0697	2007	6	0
MA82B-05	W0697	2008	5	0
MA82B-05	W0697	2009	6	3
MA82B-05	W0697	2010	3	0
MA82B-05	W0697	2011	6	0
MA82B-05	W0697	2012	5	3
MA82B-05	W0697	2013	5	0

Long-term Duckweed Monitoring (2007-2014) on the Assabet River (Beaudoin March 15, 2016)

MA82B-05: Gleasondale: The Gleasondale impoundment was generally free of nuisance aquatic vegetation, including floating and rooted macrophytes and filamentous algae, from 2013-2014. Although a minor algal bloom was observed on 8/4/2014, this was not a typical condition, and impacted only a small area, not the entire impoundment.

Gleasondale impoundment 8/4/2014

Ben Smith: The open water areas of the Ben Smith impoundment near White Pond Road (the upstream part of the impoundment) were consistently clear, with sparse communities of macrophytes and filamentous algae. Although often present, these were located in narrow fringes along the shoreline in areas outside of the main river current. The downstream areas of the impoundment were similar.

Ben Smith near White Pond Road 7/21/2014: Upstream (left) and downstream (right)

Ben Smith near dam 7/21/2014: Upstream (left) and downstream (right)

However, the macrophytes and filamentous algae would sometimes build up in front of the safety barrels above the dam and among the rocks below. The area covered was limited to the northeastern end of the impoundment, above the dam.

Ben Smith near dam 8/1/2013: Upstream (left) and close-up (right)

Long-term Duckweed Monitoring on the Assabet River Final Report (Beaudoin 2017)

Table 1 Wastewater treatment plants on the Assabet River and nearest downstream impoundments

Wastewater Treatment Plant*	Upgrade Completion (approximate)	Closest Downstream Impoundment(s)	Monitoring Period Before Upgrade Completion	Monitoring Period After Upgrade Completion
Westborough	March 2012	Allen Street	2007-2011	2012-2016
Marlborough	January 2012	Hudson	2007-2011	2012-2016
Hudson	Late 2009	Gleasondale, Ben Smith	2007-2009	2010-2016
Maynard	March 2011	Powdermill	2007-2010	2011-2016
*In order from upstream to downstream.				

Table 4 Mean annual duckweed biomass in Assabet River impoundments before and after WWTF upgrades[1]

Impoundment	Mean biomass before upgrade[2]	Mean biomass after upgrade	Mean biomass after upgrade minus extreme drought year
Allen Street	91.71	88.59	80.84
Hudson/Park Street	46.49	25.61	20.39
Hudson/Dam	114.20	84.43	82.66
Gleasondale	38.43	22.85	22.99
Ben Smith Upstream	159.62	106.64	104.43
Ben Smith Downstream	81.94	59.54	58.35
Ben Smith Dam	209.35	143.52	143.81
Powdermill	75.27	77.31	74.88

[1]See
for the dates of the WWTP upgrades relative to each impoundment.
[2]Biomass expressed as kg.

Table 5 Summary of t-tests comparing Assabet River duckweed biomass before and after WWTF upgrades

Impoundment	Entire dataset (2007 - 2016)	Without 2016 extreme drought data (2007 - 2015)
Allen St	Cannot reject null hypothesis	Cannot reject null hypothesis
Hudson Park	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Hudson Dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Gleasondale	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road upstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road downstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Powdermill	Cannot reject null hypothesis	Cannot reject null hypothesis

Information from the Assabet River Total Phosphorus TMDL **(MassDEP Undated 1)**
MA82B-05 receives the Hudson treatment plant discharge Pg. 42

TMDL Comparison Summary

The following provides a summary of the existing loadings (July, 1999 conditions) and the specified TMDL total phosphorus loadings for the Assabet River:

TMDL Allocation

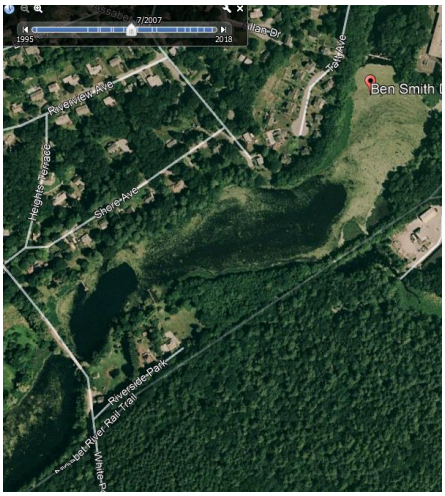
	TMDL lbs/day Total P	1999 lbs/day Total P
Background (BG) based on forested watershed	3.6	3.6
Load Allocation		
Watershed NPS	1.0	1.0
Sediment P Flux	2.8	28.0
Wasteload Allocation	(@ Permitted Flows)	(@ existing July 1999 Flows)
Major Dischargers		
Westborough	6.4	46.1
Marlborough West	2.4	11.3
Hudson	2.5	32.2
Maynard	1.2	3.1
Minor Dischargers		
Powdermill Plaza	0.008[1]	0.34[1]
Middlesex School	0.22[2]	0.22[2]
MCI Concord	1.25[2]	1.25[2]
Margin of Safety	6.1	-
Total	**27.5**	**127.1**

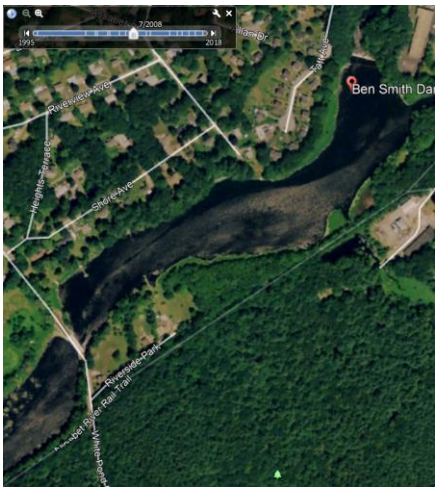
[1] connecting to Acton POTW therefore no load anticipated; used estimated average flow @ 5.0 mg/l total phosphorus
[2] estimated using design flows and 0.5 mg/l total phosphorus

Google Earth Images (September 2006, April 2008, July 2008, September 2014) From Run-of-river Impoundment Upstream of Assabet River Dam (NATID # MA00820), Data Source (Google Earth Pro Undated):

For river boundary reference:

Google Earth Images (July 2007, July 2008, August 2013, September 2014, June 2015) From Run-of-river Impoundment Upstream of Ben Smith Dam (NATID #MA00752)…. Of the images available, they seem to corroborate the findings in the Longterm Duckweed project that duckweed biomass was lower 2010-2016 (after WWTP upgrades) than 2007-2009; Data Source (Google Earth Pro Undated):


7/2007
1995
2018
Ben Smith
Riverside Ave
Heights Terrace
Shore Ave
Riverside Park
Rail Trail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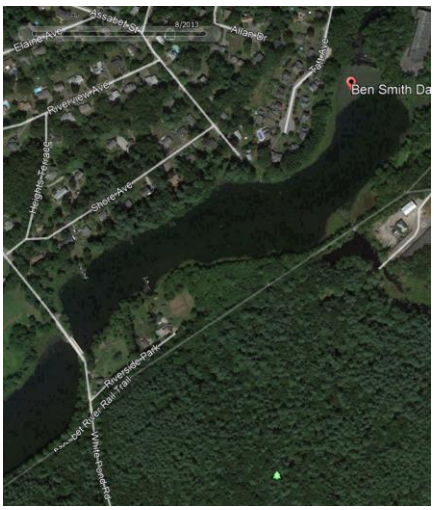
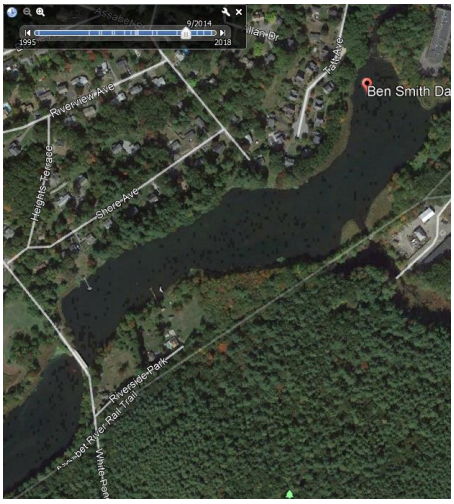
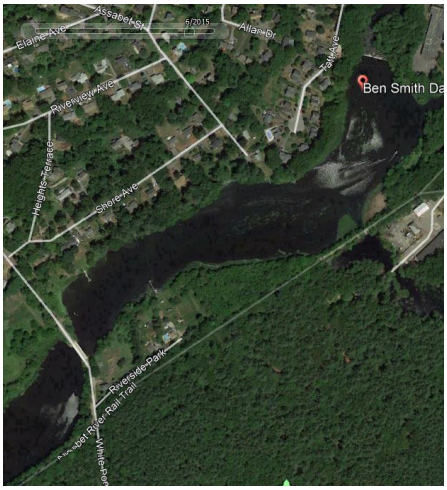
2018
Ben Smith Da
Riverside Ave
Heights Terrace
Shore Ave
Riverside Park
Rail Trail


8/2013
Ben Smith Da
Riverside Ave
Heights Terrace
Shore Ave
Riverside Park
Rail Trail





Non-Native Aquatic Plants

Several non-native aquatic macrophytes have been observed in the Gleasondale and Ben Smith Impoundments of this segment of the Assabet River. As part of the ENSR TMDL Study of the Assabet River, field surveys were conducted in 1999 and 2000 (ENSR International 2001). *Cabomba caroliniana* was documented in the Gleasondale Impoundment, while *Potamogeton crispus*, *Trapa natans*, and *Cabomba caroliniana* were documented in the Ben Smith Impoundment (ENSR International 2001).

More recently, WPP staff documented *Myriophyllum spicatum* during field surveys in 2008, 2011, 2013, and 2017 (MassDEP Undated 8, MassDEP Undated 2). *Trapa natans* and *Cabomba caroliniana* were reported in 2015 by a member of the public (MassDEP Undated 2).

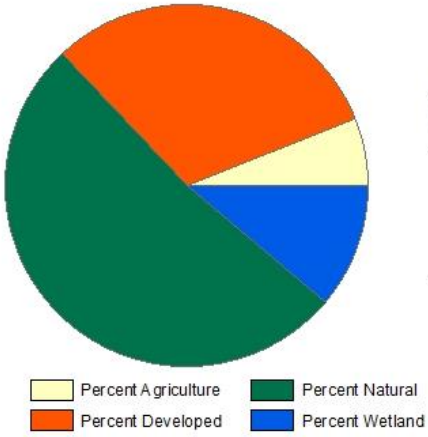
The generic "Non-Native Aquatic Plants" is not needed since the specific macrophytes "Eurasian water milfoil (Myriophyllum spicatum), Fanwort (*Cabomba caroliniana*), Curly-leaf pondweed (*Potamogeton crispus*), and Water chestnut (*Trapa natans*) have been utilized.

Assabet River (MA82B-06)

Location:	From the USGS gage (#01097000) at Routes 27/62, Maynard to the Powdermill Dam (NATID: MA00128), Acton.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-06

Watershed Area: 117.03 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	116.71	7.71	38.75	1.98
Agriculture	6%	1.7%	5.6%	1.8%
Developed	31.1%	38.8%	24%	26.4%
Natural	51.8%	45.7%	49.4%	47.3%
Wetland	11.1%	13.8%	21%	24.5%
Impervious Cover	11.9%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Algae	35108	Removed
5	5	Aquatic Plants (Macrophytes)	35108	Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Fanwort*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Phosphorus, Total	35108	Removed
5	5	Temperature		Removed
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are infestations of the non-native aquatic macrophytes, *Potamogeton crispus*, *Trapa natans*, and *Cabomba caroliniana*, in the Powdermill impoundment located within this AU. Water from the Assabet River was collected at the Waltham Street bridge in Maynard for use as dilution water in the Maynard WPCF WET tests. Survival of *C. dubia* exposed (~7 days) to Assabet River water was good ranging from 80-100% in all but one test (December 2014 when survival was 70%). The Maynard WPCF conducted 56 modified acute and chronic WET tests between December 2004 and December 2017. With the exception of one test exhibiting acute toxicity (June 2006 with LC_{50} = 70.7%effluent) and one test exhibiting chronic toxicity (CNOEC = 6.25% effluent in May 2007), the facility has met their WET test limits. The Maynard WPCF upgrade for enhanced nutrient removal was completed in March 2011. The long-term duckweed monitoring study of the Assabet (2007-2014) did not find a statistically significant decrease of duckweed in the Powdermill Impoundment of this Assabet River AU after the Westborough, Marlborough, Hudson, and Maynard WWTPs upgrades for enhanced nutrient treatment were completed however there were no notes of any objectionable growths of rooted and floating plants or filamentous algae present in the impoundment. The maximum instream temperature measured by MassDEP staff and OARS volunteers just upstream of this AU near the Route 27/62 bridge in Maynard (MassDEP site W0697/OARS site ABT-077) between 2005 and 2017 was 27.8°C while just downstream of this AU at the Route 62 bridge crossing below the Powdermill Dam in Acton (MassDEP site W1479/OARS site ABT-062) was 28.95°C (one of 42 measurments was above 28.3°C). The Aquatic Life Use of this Assabet River AU (MA82B-06) remains assessed as Not Supporting based on the infestation of Non-Native Aquatic Plants including *Potamogeton crispus*, *Trapa natans*, and *Cabomba caroliniana* in the Powdermill impoundment. The temperature impairment is being delisted based on data collected at the upstream end of the is AU as well as slightly downstream from this AU by MassDEP and OARs between 2005 and 2017. The impairments for Aquatic Plants (Macrophytes), Algae, and Phosphorus (Total) are also being removed based primarily on MassDEP duckweed monitoring project data and OARS water quality data (see Removal Comment for justification). The Dissolved Oxygen and Unspecified Metals in Sediment causes of impairment will remain. A recommendation will be made for monitoring to further assess the extent of the dissolved oxygen impairments.

2018/20 Delisted Impairment	**Delisting Reason**	**Delisting Comment**
Algae	Applicable WQS attained, due to restoration activities	The Assabet River MA82B-06 was originally listed as impaired for “Noxious Aquatic Plants” in 1998 due to mats of duckweed and algal blooms. The segment was listed as impaired for Nutrients in 1992 and for “Excess Algal Growth” in 2010 and now “Algae”. As part of the 2007-2014 MassDEP long-term duckweed monitoring project assessing the effects of Assabet WWTP nutrient treatment upgrades, it was documented that the Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae (Beaudoin March 15, 2016). Furthermore, the average summer total phosphorus concentrations at OARS sites ABT-077 (at the upstream end of this AU) and ABT-062 (in the upstream portion of MA82B-07, slightly downstream of this AU) were <0.05 mg/L from 2013-2017 (after the

		upgrades of the upstream WWTPs were completed). Therefore, the impairment causes Aquatic Plants (Macrophytes), Algae, and Phosphorus (Total) are being removed.
Aquatic Plants (Macrophytes)	Applicable WQS attained, due to restoration activities	The Assabet River MA82B-06 was originally listed as impaired for "Noxious Aquatic Plants" in 1998 due to mats of duckweed and algal blooms. The segment was listed as impaired for Nutrients in 1992 and for "Excess Algal Growth" in 2010 and now "Algae". As part of the 2007-2014 MassDEP long-term duckweed monitoring project assessing the effects of Assabet WWTP nutrient treatment upgrades, it was documented that the Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae. Furthermore, the average summer total phosphorus concentrations at OARS sites ABT-077 (at the upstream end of this AU) and ABT-062 (in the upstream portion of MA82B-07, slightly downstream of this AU) were <0.05 mg/L from 2013-2017 (after the upgrades of the upstream WWTPs were completed). Therefore, the impairment causes Aquatic Plants (Macrophytes), Algae, and Phosphorus (Total) are being removed.
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus), Fanwort (Cabomba caroliniana), and Water chestnut (Trapa natans).
Phosphorus, Total	Applicable WQS attained, due to restoration activities	The Assabet River MA82B-06 was originally listed as impaired for "Noxious Aquatic Plants" in 1998 due to mats of duckweed and algal blooms. The segment was listed as impaired for Nutrients in 1992 and for "Excess Algal Growth" in 2010 and now "Algae". As part of the 2007-2014 MassDEP long-term duckweed monitoring project assessing the effects of Assabet WWTP nutrient treatment upgrades, it was documented that the Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae (Beaudoin March 15, 2016). Furthermore, the average summer total phosphorus concentrations at OARS sites ABT-077 (at the upstream end of this AU) and ABT-062 (in the upstream portion of MA82B-07, slightly downstream of this AU) were <0.05 mg/L from 2013-2017 (after the upgrades of the upstream WWTPs were completed). Therefore, the impairment causes Aquatic Plants (Macrophytes), Algae, and Phosphorus (Total) are being removed.

Temperature	Applicable WQS attained; original basis for listing was incorrect	The Assabet River MA82B-06 was originally listed as impaired for "Thermal modifications" in 1992 and remapped to "Temperature" during the 2010 reporting cycle. The original listing appears to be in error since none of the temperatures measured at the station AS21 above the Powdermill Dam during the 1987 survey exceeded 83°F (28.3°C). Furthermore, the maximum instream temperature measured by MassDEP staff and OARS volunteers just upstream of this AU near the Route 27/62 bridge in Maynard (MassDEP site W0697/OARS site ABT-077) between 2005 and 2017 was 27.8°C while just downstream of this AU at the Route 62 bridge crossing below the Powdermill Dam in Acton (MassDEP site W1479/OARS site ABT-062) was 28.95°C with only one of 42 measurments above 28.3°C). This infrequent excursion would not be considered an impairment according to the CALM guidance so the temperature impairment is being removed.

Supporting Information for Delisted Impairments

Algae

Long-term Duckweed Monitoring (2007-2014) on the Assabet River (Beaudoin March 15, 2016)

"*The Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae."*

Powdermill Impoundment, July 21, 2014

Long-term Duckweed Monitoring on the Assabet River- Information from the Final Report (Beaudoin 2017)

Table 1 Wastewater treatment plants on the Assabet River and nearest downstream impoundments

Wastewater Treatment Plant*	Upgrade Completion (approximate)	Closest Downstream Impoundment(s)	Monitoring Period Before Upgrade Completion	Monitoring Period After Upgrade Completion
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Marlborough	January 2012	Hudson	2007-2011	2012-2016
Hudson	Late 2009	Gleasondale, Ben Smith	2007-2009	2010-2016
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*In order from upstream to downstream.				

Table 4 Mean annual duckweed biomass in Assabet River impoundments before and after WWTF upgrades[1]

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[1]See for the dates of the WWTP upgrades relative to each impoundment.
[2]Biomass expressed as kg.

Table 5 Summary of t-tests comparing Assabet River duckweed biomass before and after WWTF upgrades

Impoundment	Entire dataset (2007 - 2016)	Without 2016 extreme drought data (2007 - 2015)
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Hudson Dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Gleasondale	Duckweed biomass significantly lower	Duckweed biomass significantly lower
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Ben Smith White Pond Road downstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Powdermill	Cannot reject null hypothesis	Cannot reject null hypothesis

OARS Seasonal (May-Sept) TP Data from the Rt 27/62 bridge, Maynard, Site ABT-077 (OARS 2018)

Station ID	Year	Count	Sum of GT_0.025	Sum of GT_0.1	TP Min mg/L	TP Max mg/L	TP Avg mg/L
ABT-077	2009	3	3	2	0.07	0.2	0.130
ABT-077	2010	5	5	0	0.03	0.07	0.052
ABT-077	2013	5	1	0	0.01	0.06	0.024
ABT-077	2014	5	3	0	0.01	0.05	0.030
ABT-077	2015	5	2	0	0.01	0.03	0.018
ABT-077	2016	5	1	0	0.01	0.05	0.020
ABT-077	2017	5	3	0	0.01	0.06	0.036

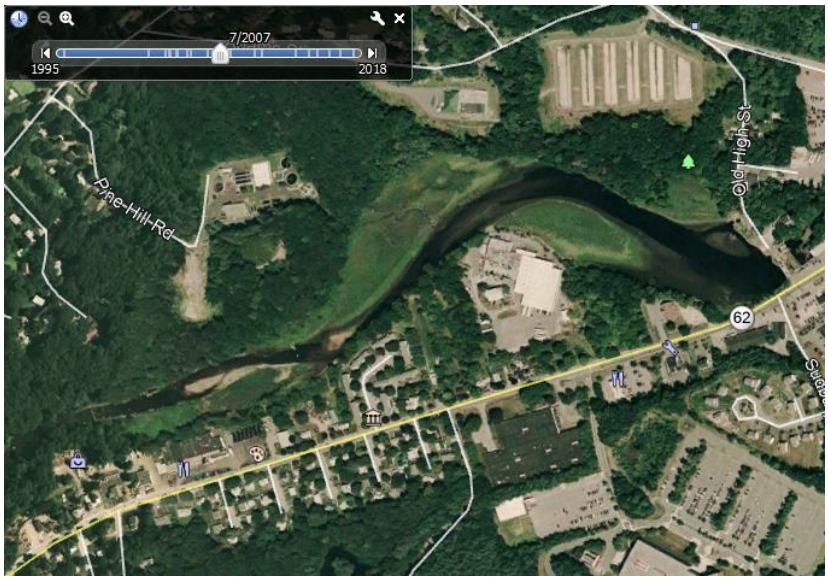
OARS TP Data for Site ABT-062 (Rt 62, Acton, in the upstream portion of MA82B-07, slightly downstream of this AU) (OARS 2018)

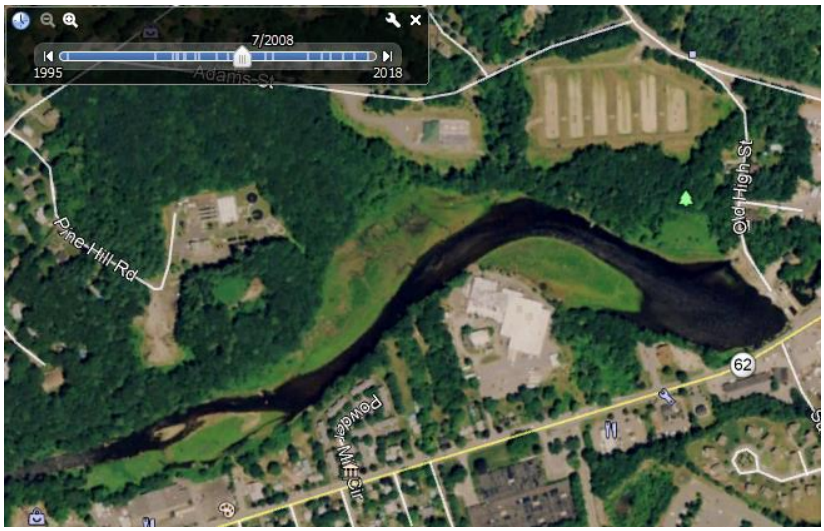
StationID	Year	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l	Seasonal* TP Avg mg/L
ABT-062	2009	3	3	2	0.1	0.15	0.120	0.120
ABT-062	2010	3	3	2	0.04	0.2	0.120	0.120
ABT-062	2013	3	2	0	0.01	0.07	0.043	0.043
ABT-062	2014	3	1	0	0.02	0.05	0.030	0.030
ABT-062	2015	3	0	0	0.01	0.01	0.010	0.010
ABT-062	2016	3	0	0	0.01	0.02	0.017	0.017
ABT-062	2017	3	2	0	0.02	0.06	0.043	0.043

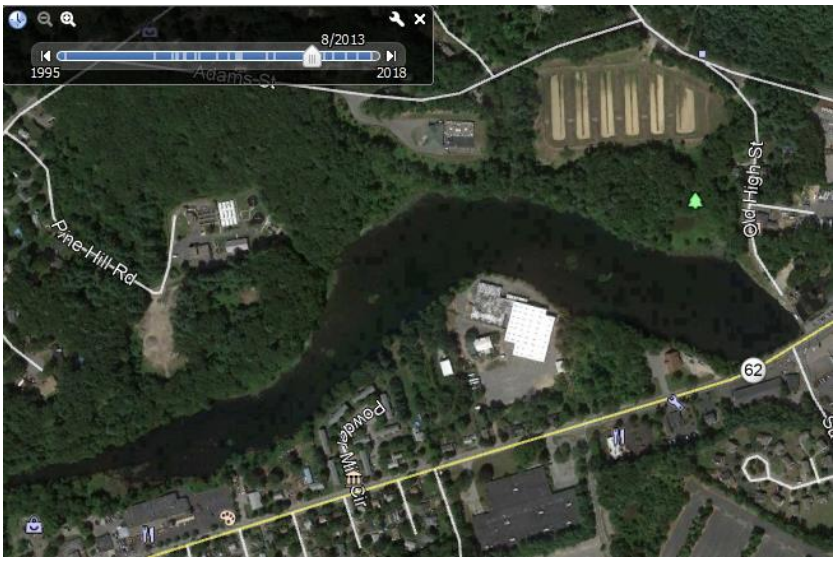
*May to September (only seasonal data were available so the TP averages and seasonal averages were the same)

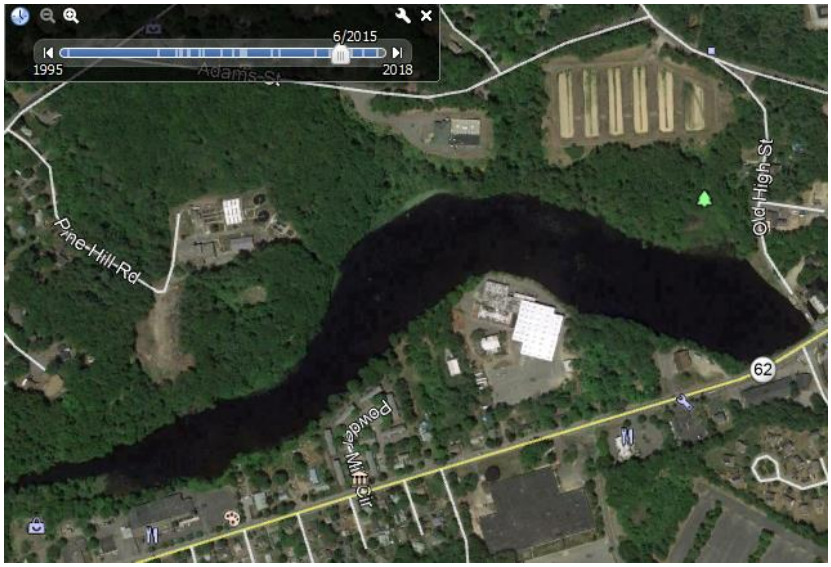
Google Earth Images (September 2006, July 2007, July 2008, August 2013, June 2015) From Run-of-river Impoundment (also known as Powdermill Impoundment) upstream of the Assabet River Dam at High Street, Acton (NATID # MA00128 Data Source (Google Earth Pro Undated). Some of the green areas in the 2006-2008 pictures may be sandbars covered in grass. (The Assabet Duckweed Final Report indicates the water level was drawn down for dam repairs 2004 to 2013-2014). This indicates fairly consistent clear water over years (when pictures are available).


9/2006
1995
2018
Pine Hill Rd
Old High St
62


7/2007
1995
2018
Pine Hill Rd
Old High St
62


7/2008
1995
2018
Adams St
Pine Hill Rd
Old High St
62





"*OARS' observations concur that the Powdermill impoundment was drawn down for dam repairs from 2004 to about 2013/2014. The green patches clearly visible in the 2006-2008 Google Earth Imagery are indeed dewatered areas with grassy vegetation, with the main channel of the river visible as dark*" (Flint July 10, 2019).

Aquatic Plants (Macrophytes)

Long-term Duckweed Monitoring (2007-2014) on the Assabet River (Beaudoin March 15, 2016)

"*The Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae."*

Powdermill Impoundment, July 21, 2014

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OARS Seasonal (May-Sept) TP Data from the Rt 27/62 bridge, Maynard, Site ABT-077 (OARS 2018)

Station ID	Year	Count	Sum of GT_0.025	Sum of GT_0.1	TP Min mg/L	TP Max mg/L	TP Avg mg/L
ABT-077	2009	3	3	2	0.07	0.2	0.130
ABT-077	2010	5	5	0	0.03	0.07	0.052
ABT-077	2013	5	1	0	0.01	0.06	0.024
ABT-077	2014	5	3	0	0.01	0.05	0.030
ABT-077	2015	5	2	0	0.01	0.03	0.018
ABT-077	2016	5	1	0	0.01	0.05	0.020
ABT-077	2017	5	3	0	0.01	0.06	0.036

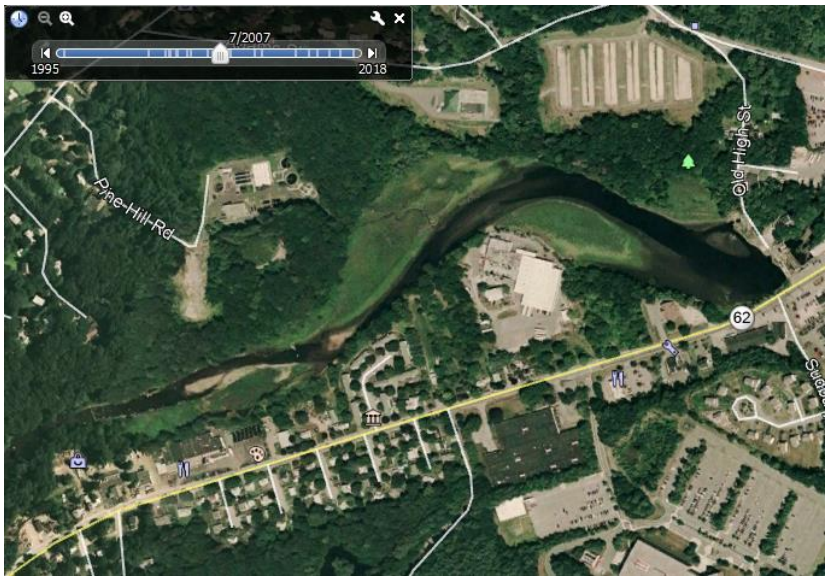
OARS TP Data for Site ABT-062 (Rt 62, Acton, in the upstream portion of MA82B-07, slightly downstream of this AU) (OARS 2018)

StationID	Year	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l	Seasonal* TP Avg mg/L
ABT-062	2009	3	3	2	0.1	0.15	0.120	0.120
ABT-062	2010	3	3	2	0.04	0.2	0.120	0.120
ABT-062	2013	3	2	0	0.01	0.07	0.043	0.043
ABT-062	2014	3	1	0	0.02	0.05	0.030	0.030
ABT-062	2015	3	0	0	0.01	0.01	0.010	0.010
ABT-062	2016	3	0	0	0.01	0.02	0.017	0.017
ABT-062	2017	3	2	0	0.02	0.06	0.043	0.043

*May to September (only seasonal data were available so the TP averages and seasonal averages were the same)

Google Earth Images (September 2006, July 2007, July 2008, August 2013, June 2015) From Run-of-river Impoundment (also known as Powdermill Impoundment) upstream of the Assabet River Dam at High Street, Acton (NATID # MA00128 Data Source (Google Earth Pro Undated). Some of the green areas in the 2006-2008 pictures may be sandbars covered in grass. (The Assabet Duckweed Final Report indicates the water level was drawn down for dam repairs 2004 to 2013-2014). This indicates fairly consistent clear water over years (when pictures are available).


9/2006
1995
2018
Pine Hill Rd
Old High St
62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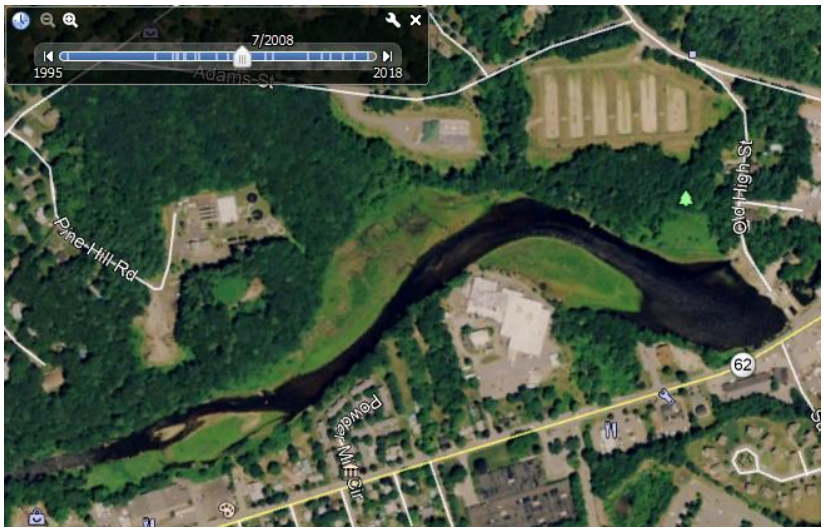
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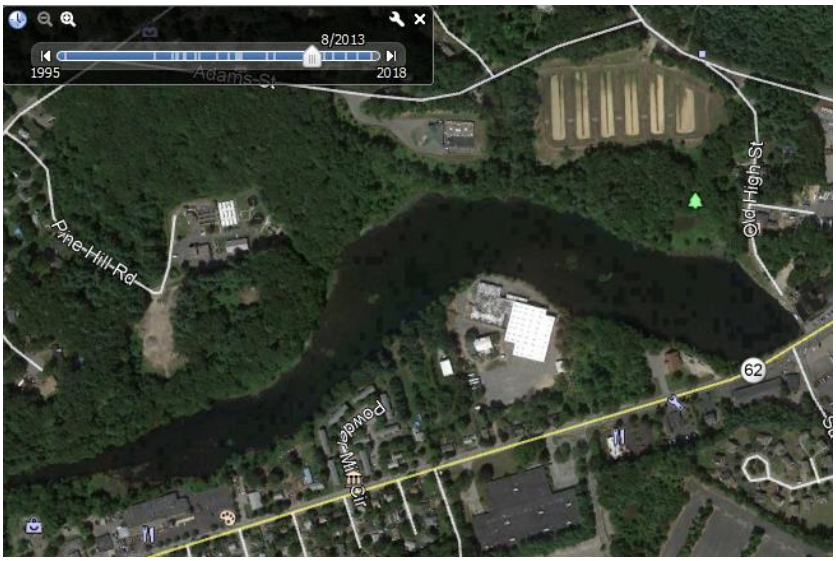

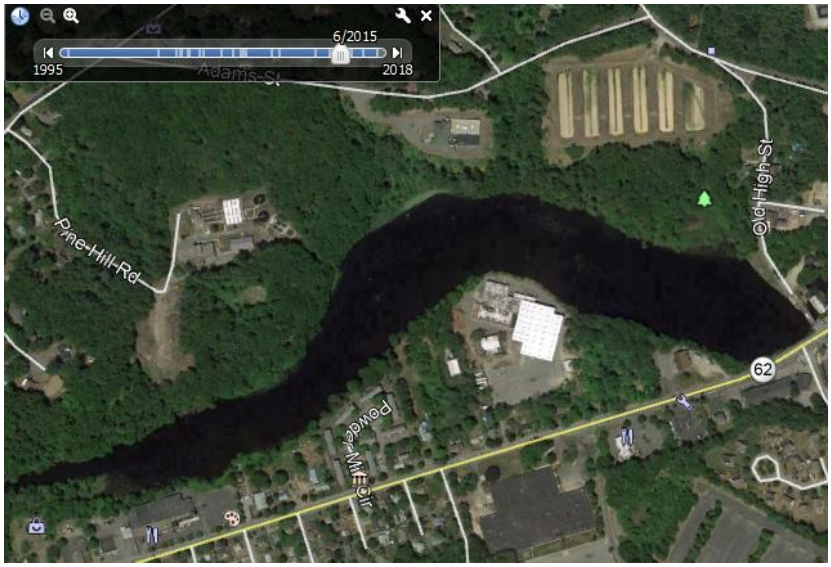

"*OARS' observations concur that the Powdermill impoundment was drawn down for dam repairs from 2004 to about 2013/2014. The green patches clearly visible in the 2006-2008 Google Earth Imagery are indeed dewatered areas with grassy vegetation, with the main channel of the river visible as dark*" (Flint July 10, 2019).

Non-Native Aquatic Plants

Several non-native aquatic macrophytes have been observed in the Gleasondale and Ben Smith Impoundments of this segment of the Assabet River. As part of the ENSR TMDL Study of the Assabet River, field surveys were conducted in 1999 and 2000 (ENSR International 2001). *Cabomba caroliniana* was documented in the Gleasondale Impoundment, while *Potamogeton crispus*, *Trapa natans*, and *Cabomba caroliniana* were documented in the Ben Smith Impoundment (ENSR International 2001).

More recently, WPP staff documented *Myriophyllum spicatum* during field surveys in 2008, 2011, 2013, and 2017 (MassDEP Undated 8, MassDEP Undated 2). *Trapa natans* and *Cabomba caroliniana* were reported in 2015 by a member of the public (MassDEP Undated 2).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (*Potamogeton crispus*), Fanwort (*Cabomba caroliniana*), and Water chestnut (*Trapa natans*).

Phosphorus, Total

Long-term Duckweed Monitoring (2007-2014) on the Assabet River (Beaudoin March 15, 2016)

"*The Powdermill impoundment was characteristically low in rooted and floating plants and filamentous algae."*

Powdermill Impoundment, July 21, 2014

Long-term Duckweed Monitoring on the Assabet River- Information from the Final Report (Beaudoin 2017)

Table 1 Wastewater treatment plants on the Assabet River and nearest downstream impoundments

Wastewater Treatment Plant*	Upgrade Completion (approximate)	Closest Downstream Impoundment(s)	Monitoring Period Before Upgrade Completion	Monitoring Period After Upgrade Completion
Westborough	March 2012	Allen Street	2007-2011	2012-2016
Marlborough	January 2012	Hudson	2007-2011	2012-2016
Hudson	Late 2009	Gleasondale, Ben Smith	2007-2009	2010-2016
Maynard	March 2011	Powdermill	2007-2010	2011-2016
*In order from upstream to downstream.				

Table 4 Mean annual duckweed biomass in Assabet River impoundments before and after WWTF upgrades[1]

Impoundment	Mean biomass before upgrade[2]	Mean biomass after upgrade	Mean biomass after upgrade minus extreme drought year
Allen Street	91.71	88.59	80.84
Hudson/Park Street	46.49	25.61	20.39
Hudson/Dam	114.20	84.43	82.66
Gleasondale	38.43	22.85	22.99
Ben Smith Upstream	159.62	106.64	104.43
Ben Smith Downstream	81.94	59.54	58.35
Ben Smith Dam	209.35	143.52	143.81
Powdermill	75.27	77.31	74.88

[1]See
for the dates of the WWTP upgrades relative to each impoundment.
[2]Biomass expressed as kg.

Table 5 Summary of t-tests comparing Assabet River duckweed biomass before and after WWTF upgrades

Impoundment	Entire dataset (2007 - 2016)	Without 2016 extreme drought data (2007 - 2015)
Allen St	Cannot reject null hypothesis	Cannot reject null hypothesis
Hudson Park	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Hudson Dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Gleasondale	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road upstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith White Pond Road downstream	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Ben Smith dam	Duckweed biomass significantly lower	Duckweed biomass significantly lower
Powdermill	Cannot reject null hypothesis	Cannot reject null hypothesis

OARS Seasonal (May-Sept) TP Data from the Rt 27/62 bridge, Maynard, Site ABT-077 (OARS 2018)

Station ID	Year	Count	Sum of GT_0.025	Sum of GT_0.1	TP Min mg/L	TP Max mg/L	TP Avg mg/L
ABT-077	2009	3	3	2	0.07	0.2	0.130
ABT-077	2010	5	5	0	0.03	0.07	0.052
ABT-077	2013	5	1	0	0.01	0.06	0.024
ABT-077	2014	5	3	0	0.01	0.05	0.030
ABT-077	2015	5	2	0	0.01	0.03	0.018
ABT-077	2016	5	1	0	0.01	0.05	0.020
ABT-077	2017	5	3	0	0.01	0.06	0.036

OARS TP Data for Site ABT-062 (Rt 62, Acton, in the upstream portion of MA82B-07, slightly downstream of this AU) (OARS 2018)

StationID	Year	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l	Seasonal* TP Avg mg/L
ABT-062	2009	3	3	2	0.1	0.15	0.120	0.120
ABT-062	2010	3	3	2	0.04	0.2	0.120	0.120
ABT-062	2013	3	2	0	0.01	0.07	0.043	0.043
ABT-062	2014	3	1	0	0.02	0.05	0.030	0.030
ABT-062	2015	3	0	0	0.01	0.01	0.010	0.010
ABT-062	2016	3	0	0	0.01	0.02	0.017	0.017
ABT-062	2017	3	2	0	0.02	0.06	0.043	0.043

*May to September (only seasonal data were available so the TP averages and seasonal averages were the same)

Google Earth Images (September 2006, July 2007, July 2008, August 2013, June 2015) From Run-of-river Impoundment (also known as Powdermill Impoundment) upstream of the Assabet River Dam at High Street, Acton (NATID # MA00128 Data Source (Google Earth Pro Undated). Some of the green areas in the 2006-2008 pictures may be sandbars covered in grass. (The Assabet Duckweed Final Report indicates the water level was drawn down for dam repairs 2004 to 2013-2014). This indicates fairly consistent clear water over years (when pictures are available).


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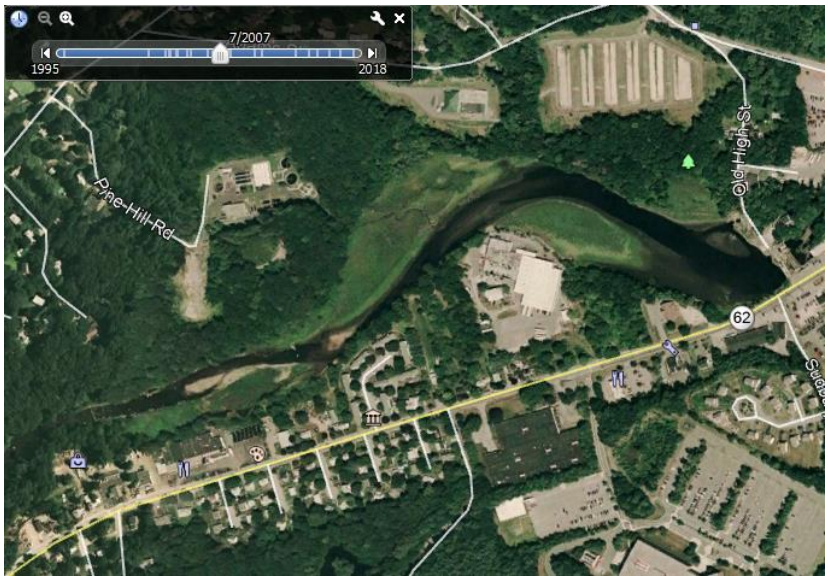
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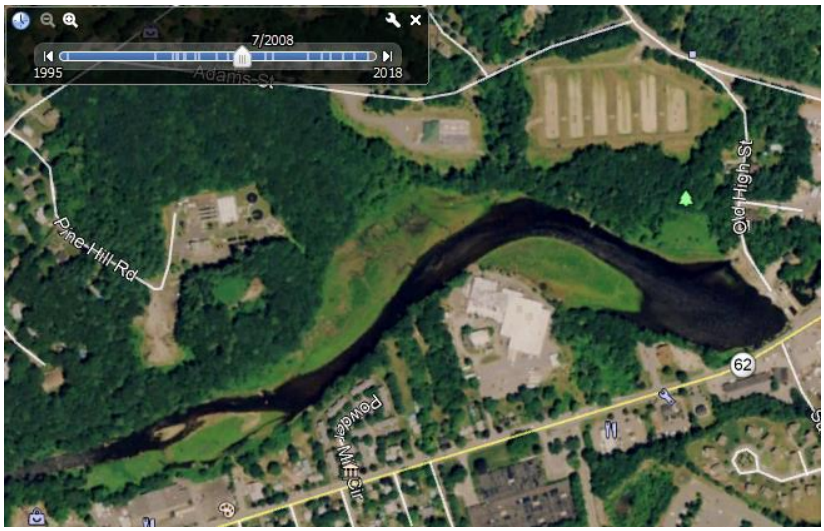
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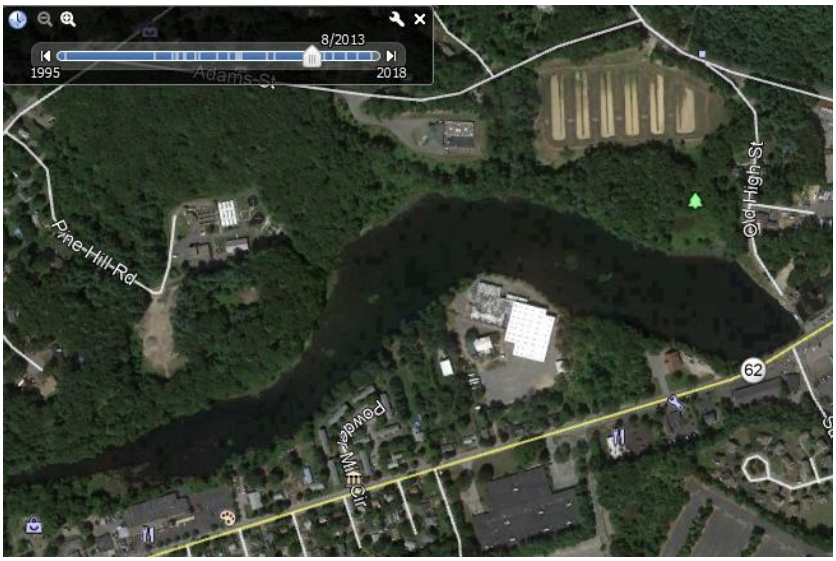
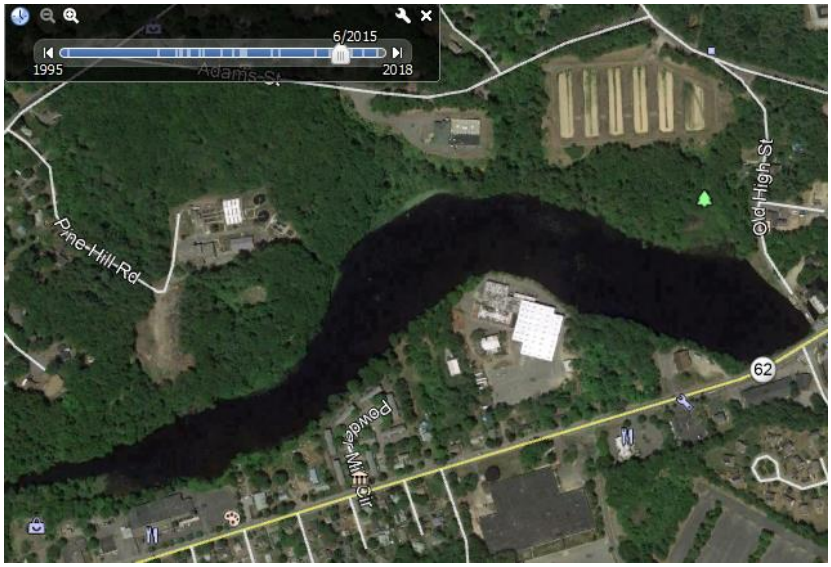




"OARS' observations concur that the Powdermill impoundment was drawn down for dam repairs from 2004 to about 2013/2014. The green patches clearly visible in the 2006-2008 Google Earth Imagery are indeed dewatered areas with grassy vegetation, with the main channel of the river visible as dark" (Flint July 10, 2019).

Temperature

MassDEP discrete temperature data from the Route 27/62 bridge in Maynard, Station W0697 (MassDEP Undated 6)

Attended Data							
Unique ID	**Year**	**Count Temp**	**Count Temp CWF >20**	**Count Temp CWF >22 (Severe)**	**Count Temp WWF >28.3**	**Count Temp WWF >30.3 (Severe)**	**Count PH**

W0697	2005	6	2	1	0	0	6
W0697	2006	5	2	1	0	0	5
W0697	2007	6	1	1	0	0	6
W0697	2008	5	2	0	0	0	5
W0697	2009	6	1	0	0	0	6
W0697	2010	3	0	0	0	0	3

Raw W0697 data in two tables below:

MassDEP SMART Data 2005-2010, Station AS18*. *In Situ* Multiprobe Data. Data Source (Beaudoin 2016a) * Station AS18 is the same as W0697

Date	**Time**	**Depth**	**Temp**
	(24hr)	**(m)**	**(C)**
1/19/2005	10:29	0.8	0.0
3/16/2005	11:11	0.6	3.0
5/18/2005	10:43	0.4	15.6
7/20/2005	10:47	0.3	27.1
9/21/2005	10:42	0.3	20.7
11/8/2005	11:03	0.5	10.1
2/15/2006	11:00	0.6	0.8
4/12/2006	10:46	0.3	11.8
6/14/2006	10:43	0.7	20.3
8/9/2006	10:42	0.3	25.2
10/11/2006	11:03	0.6	15.2
1/17/2007	10:31	0.5	0.6 u
3/14/2007	10:45	0.5	3.2
5/16/2007	10:36	0.3	18.4
7/18/2007	10:19	0.1	24.8
9/12/2007	10:36	0.3	19.6

11/7/2007	10:27	0.3	7.6
2/27/2008	10:26	0.4	1.3
4/23/2008	10:46	0.3	17.3
6/18/2008	10:37	0.3	21.2
8/20/2008	10:17	0.3	20.8
10/22/2008	10:31	0.2	10.0
1/21/2009	11:19	0.3	-0.3
3/18/2009	10:22	1.1	5.8
5/20/2009	10:29	0.2	17.1
7/22/2009	10:24	0.4	21.2
9/29/2009	10:25	0.4	17.2
11/17/2009	10:18	0.5	9.3
2/18/2010	10:30	0.3	1.0
8/25/2010	10:15	0.2	19.8
10/20/2010	9:57	0.3	10.4

MassDEP SMART Data 2011-2013, Station AS18*. *In Situ* Multiprobe Data. Data Source (Beaudoin 2016b) * Station AS18 is the same as W0697

Date	**Time**	**Depth**	**Temp**
	(24hr)	**(m)**	**(C)**
1/19/2011	10:51 AM	0.3	0.3
3/15/2011	10:21 AM	0.6	3.2
5/17/2011	10:45 AM	0.3	13.1
7/20/2011	10:13 AM	0.2	25.6
9/21/2011	10:04 AM	0.3	16.4
11/16/2011	10:03 AM	0.5	10.6
2/22/2012	10:15 AM	0.3	4.3
4/11/2012	10:01 AM	##i	11.1

6/20/2012	9:46 AM	##i	22.3
8/22/2012	10:10 AM	##i	23.6
10/24/2012	9:52 AM	##i	12.9
1/28/2013	10:29 AM	0.0i	0.6
3/20/2013	10:21 AM	0.0i	1.4
5/20/2013	10:02 AM	##i	18.8
8/28/2013	10:12 AM	##i	23.5
9/25/2013	9:58 AM	0.0i	16.5

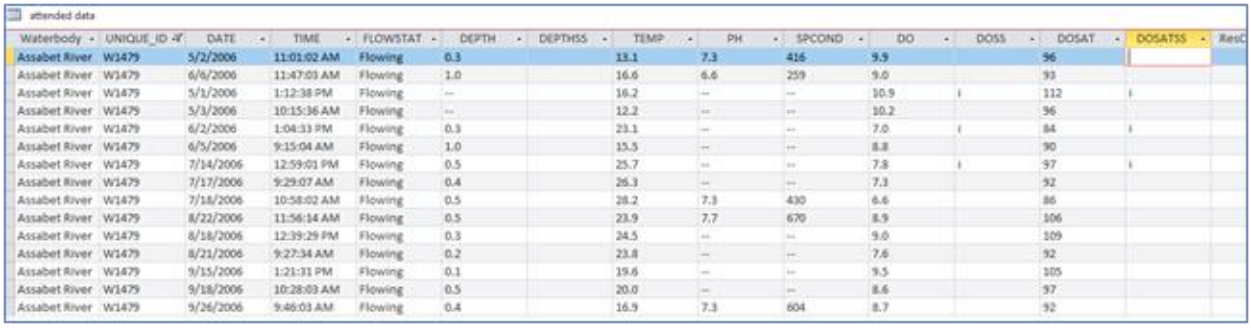
OARS data from the Rt 27/62 bridge, Maynard, Site ABT-077 (OARS 2018)

Station	**Year**	**Count Temp**	**Count Temp >20.0**	**Count Temp >22.0**	**Count Temp >28.3**	**Count Temp >30.3**
ABT-077	2009	5	3	2	0	0
ABT-077	2010	7	2	2	0	0
ABT-077	2011	7	3	2	0	0
ABT-077	2012	7	3	2	0	0
ABT-077	2013	7	2	1	0	0
ABT-077	2014	7	2	1	0	0
ABT-077	2015	7	4	3	0	0
ABT-077	2016	8	5	3	0	0
ABT-077	2017	7	4	1	0	0

Attended probes measurements were collected by MassDEP staff in the Assabet River at first Route 62 bridge crossing below the "Powdermill Dam", Acton (W1479) during the 2006 sampling season. Of the 15 discrete temperature measurements, none failed warmwater criteria. Data Source (MassDEP Undated 6)

Attended Data					
Unique ID	Water Body	Count	Count CWF >20	Count CWF >22 Severe	Count WWF >28.3
W1479	ASSABET RIVER	15	7	7	0

Data Source (MassDEP Undated 8)



attended data

Waterbody	UNIQUE_ID	DATE	TIME	FLOWSTAT	DEPTH	DEPTHSS	TEMP	PH	SPCOND	DO	DOSS	DOSAT	DOSATSS	ResC
Assabet River	W1479	5/2/2006	11:01:02 AM	Flowing	0.3		13.1	7.3	416	9.9		96		
Assabet River	W1479	6/6/2006	11:47:03 AM	Flowing	1.0		16.6	6.6	259	9.0		93		
Assabet River	W1479	5/1/2006	1:12:38 PM	Flowing	--		16.2	--	--	10.9		112		
Assabet River	W1479	5/3/2006	10:15:36 AM	Flowing	--		12.2	--	--	10.2		96		
Assabet River	W1479	6/2/2006	1:04:33 PM	Flowing	0.3		23.1	--	--	7.0		84		
Assabet River	W1479	6/5/2006	9:15:04 AM	Flowing	1.0		15.5	--	--	8.8		90		
Assabet River	W1479	7/14/2006	12:59:01 PM	Flowing	0.5		25.7	--	--	7.8		97		
Assabet River	W1479	7/17/2006	9:29:07 AM	Flowing	0.4		26.3	--	--	7.3		92		
Assabet River	W1479	7/18/2006	10:58:02 AM	Flowing	0.5		28.2	7.3	430	6.6		86		
Assabet River	W1479	8/22/2006	11:56:14 AM	Flowing	0.5		23.9	7.7	670	8.9		106		
Assabet River	W1479	8/18/2006	12:39:29 PM	Flowing	0.3		24.5	--	--	9.0		109		
Assabet River	W1479	8/21/2006	9:27:34 AM	Flowing	0.2		23.8	--	--	7.6		92		
Assabet River	W1479	9/15/2006	1:21:31 PM	Flowing	0.1		19.6	--	--	9.5		105		
Assabet River	W1479	9/18/2006	10:28:03 AM	Flowing	0.5		20.0	--	--	8.6		97		
Assabet River	W1479	9/26/2006	9:46:03 AM	Flowing	0.4		16.9	7.3	604	8.7		92		

OARS Data from Route 62, Acton (in the upstream portion of MA82B-07, slightly downstream of this AU), Site ABT-062 (OARS 2018)

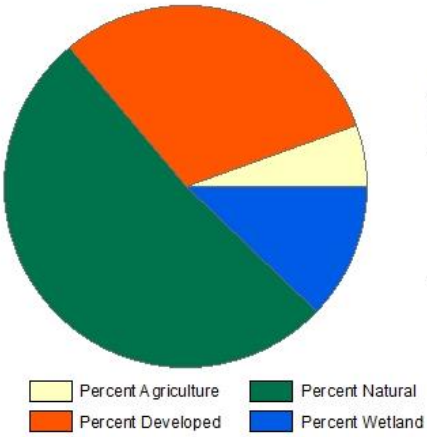
Station ID	Year	Count Temp	Count Temp >20.0	Count Temp >22.0	Count Temp >T28.3	Count Temp >30.3
ABT-062	2009	3	3	2	0	0
ABT-062	2010	3	2	2	0	0
ABT-062	2011	3	3	3	0	0
ABT-062	2012	3	3	2	0	0
ABT-062	2013	3	2	2	1	0
ABT-062	2014	3	2	1	0	0
ABT-062	2015	3	3	2	0	0
ABT-062	2016	3	3	3	0	0
ABT-062	2017	3	3	2	0	0

Assabet River (MA82B-07)

Location:	From the Powdermill Dam (NATID: MA00128), Acton to mouth at confluence with the Sudbury River (forming headwaters Concord River), Concord.
AU Type:	RIVER
AU Size:	6.4 MILES
Classification/Qualifier:	B: WWF

Assabet River - MA82B-07

Watershed Area: 177.82 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	177.49	10.91	57.58	3.4
Agriculture	5.5%	8.2%	5.1%	6.7%
Developed	30.6%	29.2%	22.9%	21.1%
Natural	51.8%	47.9%	48.8%	45.8%
Wetland	12.2%	14.6%	23.2%	26.4%
Impervious Cover	11.4%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Phosphorus, Total	35109	Removed

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Because the upgrades of the Westborough, Marlborough, Hudson, and Maynard WWTPs for enhanced nutrient treatment were completed in March 2012, January 2012, late 2009, and March 2011 respectively, total phosphorus data collected after this time is discussed below. Water quality monitoring was conducted at several sites along this Assabet River AU (MA82B-07) from upstream to downstream as follows: downstream from first Route 62 bridge crossing in Acton (MassDEP benthic site B0586, water quality monitoring site W1479/OARS site ABT-062/EPA site ABT-062), Route 62 (Main Street) in Concord (OARS site ABT-033), the Assabet River ~300' upstream from the MCI Concord WWTP discharge, the Route 2/2A bridge in Concord (MassDEP site W0843/OARS site ABT-026), and 477 Lowell Road in Concord (OARS site ABT-010). The RBPIII analysis of the benthic macroinvertebrate sample collected in July 2006 in the river at the Route 62 bridge in Acton (B0586) was 68% comparable (slightly impacted) compared to the upstream Assabet River sampling site, however the reference itself was compromised (see MA82B-01). Water quality data collected here by MassDEP

staff during the summer of 2006 were indicative of generally good conditions (min DO 6.58mg/L although during the August deployment the max diel shift was 3.13mg/L, max saturation 124%, max temperature 28.2°C, pH 6.6 to 7.7SU, and ammonia-nitrogen concentrations <0.09mg/L). OARS data collected here between 2009-2017 (water temperature, pH, DO, total suspended solids, ammonia, and total phosphorus) were generally indicative of good water quality, with total phosphorus concentrations after the WWTP upgrades ≤0.07 mg/L. In July 2012 EPA measured 0.057mg/L of total phosphorus here and 0.051mg/L further downstream near Main Street in Concord. Survival of *Ceriodaphnia dubia* (n = 31 tests) and *Pimephales promelas* (n = 32 tests) exposed (~48 hours) to Assabet River water collected upstream from the MCI Concord discharge was good ranging from 90-100% in the tests conducted between June 2006 and June 2018. With the exception of one test (*P. promelas* test in June 2009 with LC50>100% and ANOEC =6.25% effluent), no acute whole effluent toxicity has been detected in the MCI Concord WWTP effluent during the tests conducted between March 2006 and June 2018 by either *C. dubia* (n=39 tests) or *P. promelas* (n= 42 tests) with LC_{50}s >100 and ANOECs =100% effluent. Further downstream near the Rt. 2/2A bridge in Concord water quality during the summer of 2006 was indicative of generally good conditions (min DO 5.9mg/L although during the August deployment the max diel shift was 5.5mg/L and max saturation 140%, max temperature 27.5°C, pH 6.5 to 7.5SU, and ammonia-nitrogen concentrations <0.05mg/L). OARS volunteer data collected here between 2009-2017 (water temperature, pH, DO, total suspended solids, ammonia, and total phosphorus) were generally indicative of good water quality, with total phosphorus concentrations after the WWTP upgrades ≤0.08 mg/L and the maximum seasonal average 0.029mg/L. There is a potential infestation of the non-native aquatic macrophyte *Potamogeton crispus* at the mouth of the Assabet River (where it joins the Sudbury River to form the Concord River), but this should be confirmed.

Based primarily on the excellent survival of *C. dubia* and *P. promelas* exposed (48-hour) to water collected from the Assabet River upstream from the MCI Concord WWTP discharge and the OARS/EPA water quality data collected at the Route 62 bridge in Acton and the Route 2/2A bridge in Concord, the Aquatic Life Use of this Assabet River AU (MA82B-07) is assessed as Fully Supporting. An Alert is issued for a potential infestation of the non-native aquatic macrophyte *Potamogeton crispus*. Total phosphorus is being delisted as a cause of impairment since the concentrations have been reduced following completion of the four Assabet River municipal WWTP upgrades for enhanced nutrient removal (see Removal Comment for justification).

2018/20 Delisted Impairment	**Delisting Reason**	**Delisting Comment**
Phosphorus, Total	Applicable WQS attained, due to restoration activities	MA82B-07 was first listed as impaired for "Nutrients" in the 1992 I.R. The impairment listing was triggered because the segment had been listed as "Threatened" in the 1990 I.R. This was based on the 1987 Assabet River Basin water quality survey data, with TP concentrations amongst several sites in this AU ranging from 0.52-1.0 mg/L. Since 2012 (when the upgrades of the four upstream Assabet municipal WWTPs for enhanced nutrient removal were completed), OARS reported total phosphorus data from two sites in this AU which document improved conditions. In particular, annual averages of the TP data from site ABT-026, located downstream of the MCI-Concord wastewater treatment facility, were all <0.03 mg/L (with data ranging from 0.01-0.08 mg/L) between 2013 and 2017 and seasonal TP averages were all ≤0.05mg/L. Given the improvement in

		TP concentrations to an acceptable range, this cause of impairment has been removed.

Supporting Information for Delisted Impairments

Phosphorus, Total

Water quality sampling was conducted by MassDEP staff in the Assabet River downstream of the first Route 62 bridge crossing below the "Powdermill Dam", Acton (W1479) on 5 occasions during the 2006 sampling season. The average total phosphorus was 0.09 mg/L while the maximum total phosphorus was 0.11 mg/L. No observations of dense or very dense filamentous algae were noted.

Data Source (MassDEP Undated 6)

Nutrient Relate Data

Unique ID	Waterbody	Year	Count	TP Avg	TP Max	Fieldsheets	Filamentous Dense or Very Dense	Max Daily DO Shift	Max Saturation
W1479	ASSABET RIVER	2006	5	0.09	0.11	10	0	3.1	124

OARS TP Data Assabet River downstream of the first Rt 62 bridge crossing in Acton (Site ABT-062) (OARS 2018)

StationID	**Year**	**Count TP**	**Count TP GT0.025 mg/l**	**Count TP GT_0.1 mg/l**	**TP Min mg/l**	**TP Max mg/l**	**TP Avg mg/l**	**Seasonal* TP Avg mg/L**
ABT-062	2009	3	3	2	0.1	0.15	0.120	0.120
ABT-062	2010	3	3	2	0.04	0.2	0.120	0.120
ABT-062	2011							
ABT-062	2012							
ABT-062	2013	3	2	0	0.01	0.07	0.043	0.043
ABT-062	2014	3	1	0	0.02	0.05	0.030	0.030
ABT-062	2015	3	0	0	0.01	0.01	0.010	0.010
ABT-062	2016	3	0	0	0.01	0.02	0.017	0.017
ABT-062	2017	3	2	0	0.02	0.06	0.043	0.043

*May to September

EPA Assabet River Study Data Assabet River downstream of the first Rt 62 bridge crossing in Acton (Site ABT-062), Collected July 11, 2012 (Faber 2013)

Site ID	Description	Town	Team	Location		Time	TP
				Latitude	Longitude		(ug/L)
ABT-062	Rte 62 (Powdermill Rd.) by put-in	Acton	B	N 42.44066	W -71.42908	13:40	57

OARS TP Data Assabet River Rt 62 (Main Street) in Concord (Site ABT-033) (OARS 2018)

StationID	Year	Count NH3	Count Acute NH3 Violations	Count Chronic NH3 Violations	Count TP	Count TP GT0.025 mg/l	Count TP GT_0.1 mg/l	TP Min mg/l	TP Max mg/l	TP Avg mg/l
ABT-033	2009	3	0	0	3	3	0	0.09	0.1	0.097

EPA Assabet River Study Data Assabet River from Rt 62 (Main Street) in Concord (Site ABT-033), Collected July 11, 2012 (Faber 2013)

Site ID	Description	Town	Team	Location		Time	TP
				Latitude	Longitude		(ug/L)
ABT-033	Rte 62 (Main St.) by pump station	West Concord	B	N 42.45620	W -71.38982	13:15	51

Water quality sampling was conducted in the Assabet River at the Route 2/2A bridge, Concord (W0843) on 5 occasions during the 2006 sampling season. The average total phosphorus was 0.074 mg/L while the maximum total phosphorus was 0.087 mg/L. No observations of dense or very dense filamentous algae were noted. The maximum daily DO shift was 5.5 and the maximum DO saturation was 141%.

Data Source (MassDEP Undated 6)

Nutrient Relate Data

Unique ID	Waterbody	Year	Count	TP Avg	TP Max	Fieldsheets	Filamentous Dense or Very Dense	Max Daily DO Shift	Max Saturation
W0843	ASSABET RIVER	2006	5	0.074	0.087	10	0	5.5	141

OARS TP Data for Assabet River at the Route 2/2A bridge, Concord (Site ABT-026) (OARS 2018)

StationID	**Year**	**Count TP**	**Count TP GT0.025 mg/l**	**Count TP GT_0.1 mg/l**	**TP Min mg/l**	**TP Max mg/l**	**Annual TP Avg mg/l**	**Seasonal*TP Avg mg/L**
ABT-026	2009	3	3	1	0.08	0.17	0.110	0.110
ABT-026	2010	7	7	2	0.03	0.13	0.071	0.086
ABT-026	2011							
ABT-026	2012							
ABT-026	2013	7	1	0	0.01	0.05	0.019	0.022
ABT-026	2014	7	3	0	0.01	0.05	0.021	0.022
ABT-026	2015	7	2	0	0.01	0.08	0.024	0.028
ABT-026	2016	7	2	0	0.01	0.04	0.019	0.018
ABT-026	2017	7	3	0	0.01	0.06	0.029	0.030

*May to September

OARS TP Data Assabet River at 477 Lowell Road in Concord, (Site ABT-010) (OARS 2018)

StationID	**Year**	**Count TP**	**Count TP GT0.025 mg/l**	**Count TP GT_0.1 mg/l**	**TP Min mg/l**	**TP Max mg/l**	**TP Avg mg/l**	**Seasonal* TP Avg mg/L**
ABT-010	2009	3	3	0	0.08	0.1	0.090	0.090
ABT-010	2010	3	3	0	0.06	0.09	0.070	0.070
ABT-010	2011							
ABT-010	2012							

*May to September

Assabet River Reservoir (MA82004)

Location:	Westborough.
AU Type:	FRESHWATER LAKE
AU Size:	355 ACRES
Classification/Qualifier:	B

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

An infestation of the non-native aquatic macrophyte, *Myriophyllum spicatum*, was identified during the WPP 1996 synoptic survey.

Trapa natans was first observed in the Assabet River Reservoir during a 2014 survey of the Concord basin sponsored by SuAsCo CISMA (and conducted by OARS). Limited MassDEP dissolved oxygen and water temperature data from a two-day probe deployment in July 2004 were indicative of good water quality. However, because the data are so limited in nature, the Aquatic Life Use continues to be assessed as Not Supporting, with impairments maintained for turbidity, dissolved oxygen, dissolved oxygen supersaturation, and algae. The impairment due to infestations of non-native aquatic macrophytes is also maintained (with *Trapa natans* added as a new species).

Bartlett Pond (MA82007)

Location:	Northborough.
AU Type:	FRESHWATER LAKE
AU Size:	52 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Bartlett Pond has infestations of multiple non-native aquatic macrophytes- *Myriophyllum spicatum*, *Potamogeton crispus*, *Cabomba caroliniana*, *Trapa natans*. The Aquatic Life Use of Bartlett Pond remains Not Supporting because of these infestations.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus), Fanwort (Cabomba caroliniana), and Water chestnut (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Bartlett Pond has infestations of the non-native species, *Myriophyllum spicatum* and *Potamogeton crispus* (MassDEP 1996). Additionally, the 1986 Bartlett Pond Diagnostic/Feasibility study (IEP, Inc. 1986) documented *Cabomba caroliniana* and there are reports in the DEP Freshwater Aquatic Invasive Species Database of *Trapa natans* (MassDEP Undated 2).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus), Fanwort (*Cabomba caroliniana*), and Water chestnut (*Trapa natans*).

Batemans Pond (MA82008)

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

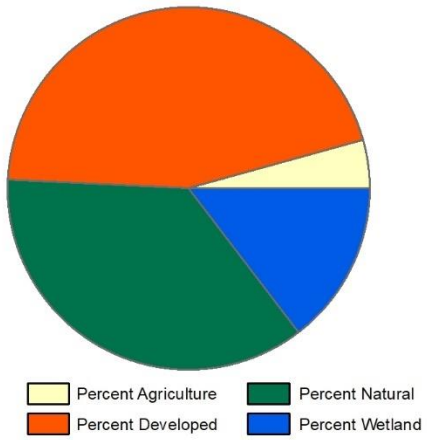
Fish, other Aquatic Life and Wildlife Use: Not Supporting
Due to the presence of a non-native aquatic macrophyte, *Marsilea quadrifolia*, the Aquatic Life Use of Batemans Pond is assessed as Not Supporting.

BEAVER BROOK (MA82A-34)

Location:	Headwaters south at Rack Road, Chelmsford to mouth at confluence with River Meadow Brook, Chelmsford.
AU Type:	RIVER
AU Size:	6.3 MILES
Classification/Qualifier:	B

Beaver Brook - MA82A-34

Watershed Area: 5.59 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.58	4.47	1.59	1.33
Agriculture	4.3%	4.6%	6.6%	7.9%
Developed	44.9%	48.9%	34.3%	35.7%
Natural	36.2%	36.7%	36.2%	36.7%
Wetland	14.6%	9.8%	23%	19.7%
Impervious Cover	15.8%			

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

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

DFG biologists conducted backpack electrofishing at two sites along Beaver Brook in Chelmsford in August 2010: the most upstream location was upstream from Hunt Road (Sample ID 3327) and the next site was upstream of High Street (Sample ID 3341). Further downstream MassDEP biologists conducted both benthic macroinvertebrate (B0673) as well as backpack electrofishing (Sample ID 4561) in the brook upstream of Summer Street in July and August 2010, respectively. Although few fish were collected at the two upstream sites, all samples contained at least one moderately tolerant macrohabitat generalist, and the two downstream samples also contained fluvial specialist and/or dependant species. The RBP III analysis indicated the benthic sample was 62% comparable or "slightly impaired" when compared to the Elizabeth Brook reference site. MassDEP staff also conducted water quality monitoring in Beaver Brook during the summer of 2010 near Summer Street (W2130). Two of three DO deployments documented very low DO (minimum 1.81mg/L and large diel shifts –as high as 10 mg/L) as well as high saturation (maximum 159%) although there were no records of any filamentous algae and the average and maximum total phosphorus concentrations were fairly low (0.03 and 0.048 mg/L, respectively). The maximum temperature was 28.4°C with a maximum 7-DADM of 26.6°C. There were no exceedances of acute or chronic metals criteria (n=3 sampling events) and the ammonia nitrogen concentrations were also low ≤0.11mg/L. Two out of five chloride samples contained elevated chloride concentrations (320 and 310 mg/L, measured in August and September, respectively).

Although the fish and benthic invertebrate community samples were indicative of generally good conditions, because of the severity of the low DO and large diel shifts the Aquatic Life Use of Beaver Brook MA82A-34 is assessed as Not Supporting. An Alert is being issued for elevated chloride at station W2130.

Boons Pond (MA82011)

Location:	Stow/Hudson.
AU Type:	FRESHWATER LAKE
AU Size:	174 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

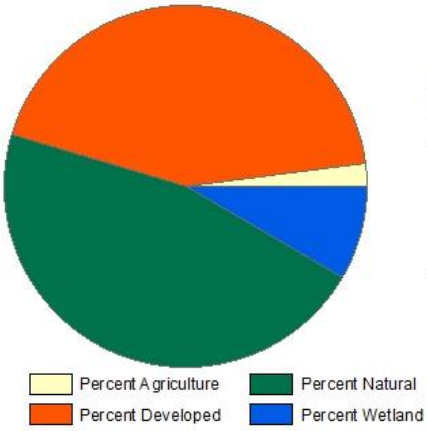
Boons Pond has infestations of the non-native aquatic macrophytes *Myriophyllum heterophyllum* and *Cabomba caroliniana*. Therefore, the Aquatic Life Use is assessed as not supporting. With no additional data this period, the impairment for Algae is maintained.

BROAD MEADOW BROOK (MA82A-39)

Location:	Headwaters east of Concord Road, Marlborough to mouth at inlet Sudbury Reservoir, Marlborough.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	A: PWS, ORW

BROAD MEADOW BROOK - MA82A-39

Watershed Area: 0.94 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.94	0.94	0.29	0.29
Agriculture	2%	2%	5.2%	5.2%
Developed	43.4%	43.4%	32.9%	32.9%
Natural	46.2%	46.2%	47.2%	47.2%
Wetland	8.4%	8.4%	14.7%	14.7%
Impervious Cover	19.9%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available at this time, the Aquatic Life Use of Broad Meadow Brook MA82A-39 is Not Assessed.

Carding Mill Pond (MA82015)

Location:	Sudbury.
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
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	(Water Chestnut*)		Added
5	5	Nutrient/Eutrophication Biological Indicators		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Infestations of the non-natives *Potamogeton crispus* and *Trapa natans* were identified in Carding Mill Pond as part of the (ENSR International 2000) study evaluating the impact of elevated nutrients in Hop Brook. The Aquatic Life Use is assessed as not supporting due to infestations of non-native aquatic macrophytes. Furthermore, since there are no recent water quality data available, the impairments for dissolved oxygen supersaturation and total phosphorus are maintained. Additionally Nutrient/Eutrophication Biological Indicators is being added for consistency with changes being made in this reporting cycle for both the upstream and downstream AUs (Grist Mill Pond and Hop Brook)

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic “Non-Native Aquatic Plants” to the specific macrophytes “Curly-leaf Pondweed” (Potamogeton crispus) and Water chestnut (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Infestations of the non-natives *Potamogeton crispus* and *Trapa natans* were identified in Carding Mill Pond as part of the ENSR study evaluating the impact of elevated nutrients in Hop Brook (ENSR International 2000).

The impairment changed from the generic “Non-Native Aquatic Plants” to the specific macrophytes “Curly-leaf Pondweed” (*Potamogeton crispus*) and Water chestnut (*Trapa natans*).

Cedar Swamp Pond (MA82016)

Location:	Westborough.
AU Type:	FRESHWATER LAKE
AU Size:	17 ACRES
Classification/Qualifier:	B: ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use for Cedar Swamp Pond is not assessed.

Chauncy Lake (MA82017)

Location:	Westborough.
AU Type:	FRESHWATER LAKE
AU Size:	173 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
An infestation of the non-native aquatic macrophyte *Myriophyllum spicatum* was identified in Chauncy Lake in the WPP 1996 synoptic survey. MA DPH posted the lake for algal blooms for 15 days in 2011. The Aquatic Life Use of Chauncy Lake is assessed as Not Supporting due to the presence of a non-native aquatic macrophyte.

Clamshell Pond (MA82018)

Location:	Clinton.
AU Type:	FRESHWATER LAKE
AU Size:	24 ACRES
Classification/Qualifier:	B

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

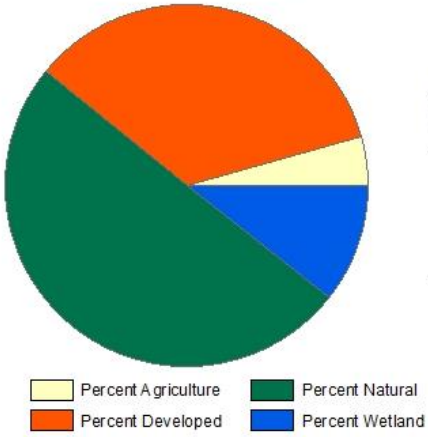
Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Because of an infestation of the non-native aquatic macrophyte, *Trapa natans*, the Aquatic Life Use for Clamshell Pond is assessed as not supporting. There is also a report of an infestation of the non-native aquatic macrophyte *Egeria densa* however this will require further confirmation so is being identified as an Alert issue.

Cold Harbor Brook (MA82B-18)

Location:	Headwaters, outlet Rocky Pond, Boylston to mouth at confluence with Howard Brook, Northborough.
AU Type:	RIVER
AU Size:	6.1 MILES
Classification/Qualifier:	B

Cold Harbor Brook - MA82B-18

Watershed Area: 6.91 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.91	4.56	2.43	1.69
Agriculture	4.3%	6.5%	4.6%	6.5%
Developed	34.9%	31.4%	28.5%	28.4%
Natural	50.3%	51.2%	45.7%	44%
Wetland	10.6%	10.9%	21.3%	21%
Impervious Cover	12.8%			

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

Water quality monitoring was conducted in Cold Harbor Brook by MassDEP biologists at two sites in Northborough during the summer of 2010 (W2139/B0697 upstream from Route 290 and W2129/B0672 near Crawford Street, Northborough). The RBPIII analyses of the benthic community indicated it was Non-impaired for the upstream station and Non/Slightly Impaired for the downstream station compared to the Johnson Creek reference station (B0688, located in the Merrimack basin). Backpack electrofishing was conducted by MassDEP biologists at these two sites (Sample #4551 & 4550) in August 2010, and an additional site further upstream near Central Street in Boylston was sampled by DFG biologists (Sample #4192) in August 2012. All three sites were dominated by a fluvial specialist species (blacknose dace). MassDEP staff deployed dissolved oxygen probes for three 5-day periods in 2010 at sites W2139 and W2129 and a thermistor for the summer at the downstream site. The minimum DO during these deploys was 6.99mg/L and the maximum temperature was 27.7°C. In situ and grab sample data (water temperature, pH, dissolved oxygen, ammonia, and total phosphorus, metals) collected at both sites in 2010, were also indicative of good water quality conditions (maximum total phosphorus 0.034mg/L). However, two out of five chloride measurements exceeded the chronic chloride toxicity criterion at each site (with August and September exceedances ranging from 280-340 mg/L). OARS collected data (water temperature, pH, dissolved oxygen, total suspended solids, ammonia) 6 times per year in 2009 further downstream near Cherry Street Bridge in Northborough (site CLD-030) and their data were also indicative of good water quality (maximum total phosphorus concentration 0.05 mg/L).

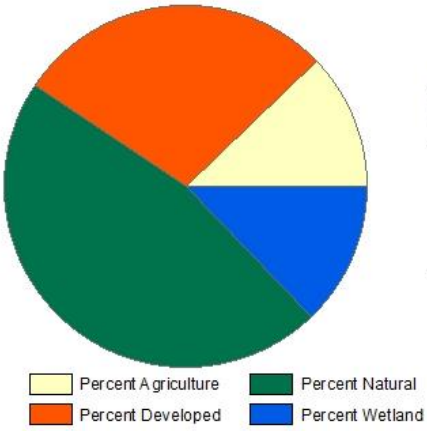
Based on the fish/invertebrate community samples and water quality data generally indicative of good conditions, the Aquatic Life Use of Cold Harbor Brook MA82B-18 is assessed as fully supporting. The former alerts for low dissolved oxygen, pH and lack of intolerant fishes are being removed but a new alert is being added for elevated chloride.

COLD SPRING BROOK (MA82A-18)

Location:	Headwaters outlet Bloods Pond, Hopkinton to inlet Ashland Reservoir, Ashland.
AU Type:	RIVER
AU Size:	1.8 MILES
Classification/Qualifier:	B

COLD SPRING BROOK - MA82A-18

Watershed Area: 5.47 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.45	5.45	1.67	1.67
Agriculture	12.2%	12.2%	12.3%	12.3%
Developed	28.4%	28.4%	16.9%	16.9%
Natural	46.6%	46.6%	44.1%	44.1%
Wetland	12.8%	12.8%	26.7%	26.7%
Impervious Cover	11.1%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

DFG biologists conducted backpack electrofishing at two sites along Cold Spring Brook in July 2006: the upstream reach was downstream from North Mill Street in Hopkinton (Sample ID 1668) and the downstream reach was upstream of Spring Street just upstream from Ashland Reservoir in Ashland (Sample ID1619). Both samples contained a decent number of fish with several moderately tolerant macrohabitat generalist species however tolerant macrohabitat generalist species dominated both samples.

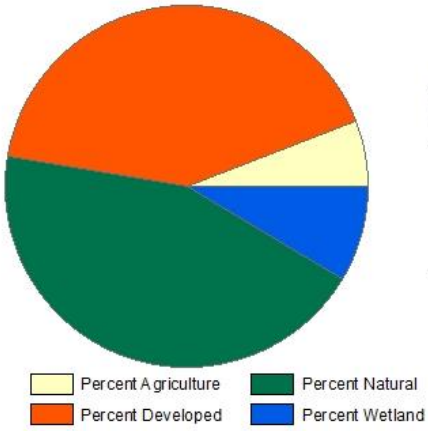
Given the age of the samples, fairly new development in the watershed, and the presence of two Town of Hopkinton Zone II Wellhead Protection Areas encompassing a large percentage of the subwatershed area, there is insufficient information to assess the Aquatic Life Use of Cold Spring Brook.

Coles Brook (MA82B-22)

Location:	Headwaters, east of Francine Road, Acton to mouth at confluence with Fort Pond Brook, Acton.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B

COLES BROOK - MA82B-22

Watershed Area: 1.99 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.99	1.99	0.53	0.53
Agriculture	5.9%	5.9%	2%	2%
Developed	41.5%	41.5%	31%	31%
Natural	44.1%	44.1%	45.3%	45.3%
Wetland	8.5%	8.5%	21.7%	21.7%
Impervious Cover	17.8%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

DFG biologists conducted backpack electrofishing at two locations along Coles Brook in July 2012. The most upstream sampling location was downstream from Taylor Road in Acton (Sample ID 4025) and the second site was near Sandalwood Road (Sample ID 4014). MassDEP biologists also conducted backpack electrofishing in Coles Brook upstream of Robinwood Road in Acton (Sample ID 4552) in August 2010. All three samples were dominated by moderately tolerant macrohabitat generalists, and fallfish, a fluvial specialist species was also abundant in the two downstream samples (4552 and 4014). Benthic macroinvertebrates were also sampled by MassDEP biologists in the brook upstream from Robinwood Road in Acton (B0692) in July 2010. The RBP III analysis indicated the sample was non-impaired (85% comparability) in comparison with the Johnson Creek reference site (B0688 located in the Merrimack basin). Water quality data collected from the brook near Robinwood Road by MassDEP staff during the summer of 2010 (W2137) were also generally indicative of good conditions (i.e., minimum dissolved oxygen 5.5 mg/L, maximum saturation 85%, maximum diel DO shift 1.4 mg/L, maximum temperature 24.8 ˚C, average/maximum total phosphorus concentrations 0.021/0.042 mg/L, and no acute or chronic criteria exceedances of any metals). However, four of five chloride samples exceeded the chronic chloride criterion (230 mg/L), with exceedances ranging from 240-480 mg/L. USGS collected two total phosphorus samples in August 2010 near the confluence with Fort Pond Brook- the maximum concentration was low (0.016 mg/L).

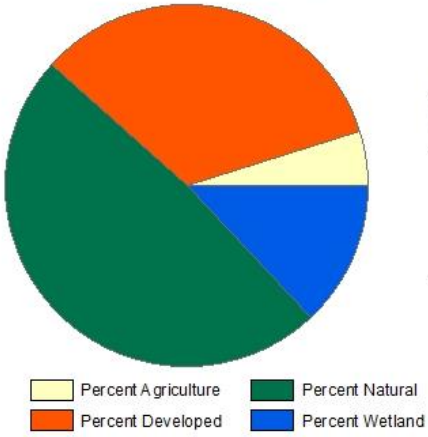
Although biotic data and most water quality data were indicative of good conditions, chronic chloride exceedances (for four out of five samples) warrant assessing the Aquatic Life Use of Coles Brook MA82B-22 as Not Supporting.

Concord River (MA82A-07)

Location:	Headwaters, confluence Assabet and Sudbury rivers, Concord to Billerica Water Supply intake, Billerica.
AU Type:	RIVER
AU Size:	10.4 MILES
Classification/Qualifier:	B: TWS, WWF

Concord River - MA82A-07

Watershed Area: 366.75 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	366.25	7.97	111.42	1.7
Agriculture	4.8%	2.1%	4.7%	3.6%
Developed	33.6%	50.3%	23.8%	35.9%
Natural	48.7%	36.9%	47.1%	40.7%
Wetland	12.9%	10.7%	24.4%	19.8%
Impervious Cover	12.8%			

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 Fish/Shellfish/Zooplankton*)		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Infestations of non-native aquatic macrophytes (*T. natans*, *C. caroliana*, *M. spicatum*, *P. crispus*, and *M. quadrifolia*) were found in this Concord River AU (MA82A-07) as well as the Asian clam, *Corbicula fluminea* (reported by USFWS). Monitoring by MassDEP staff and OARS volunteers conducted from upstream to downstream as follows: Lowell Road Bridge in Concord (OARS CND-161 and ambient sampling for Concord WWTP WET tests), Monument Street Bridge in Concord (MassDEP W1482), near Route 225 Bridge in Carlisle/Bedford (DFG biologists conducted boat electrofishing Sample IDs 3713, 3714, and 3711, MassDEP W1483, and OARS site CND-110), Route 4 Bridge (Riverside) in Billerica (MassDEP W1484) and River Street Bridge in Billerica (DFG electrofishing Sample ID 3712 and MassDEP W1485). Water quality data collected by MassDEP in summer 2006 (upstream of Concord WWTP discharge) were indicative of generally good conditions (maximum diel shift was 2.7mg/L, saturation 125%, temperature 27.1°C, good pH, and ammonia-nitrogen concentrations ≤0.06mg/L, and seasonal average and maximum total phosphorus 0.071 and 0.076mg/L, respectively) and while the minimum DO slightly low (4.84mg/L) the daily mean minimum DOs during the probe deploys were all above 5mg/L. OARS data collected here between 2009-2017 (water temperature, pH, DO, total suspended solids, ammonia, and total phosphorus) were similar, with seasonal average total phosphorus concentrations after the Assabet River WWTP upgrades ≤0.05mg/L. TSS was above 25mg/L a few times in 2017 but was low during all other surveys. Survival of *C. dubia* exposed (~7-day) to the river water collected at Lowell Road Bridge in Concord was good (≥80%) in the tests conducted between June 2004 and September 2017 (n=45) and except for two tests (March 2008 and 2013 with LC_{50} = 60.2 and 75.8%, respectively) no acute whole effluent toxicity was detected in the Concord WWTP effluent (LC_{50}'s and ANOEC >100 and 100% effluent, respectively). The CNOECs generally ranged from 25 to 100% effluent (n=44 valid tests) although four tests prior to September 2013 had CNOEC results that were lower. In the middle reach of this Concord River AU near Route 225 bridge DFG biologists conducted boat electrofishing in July 2011. The samples were comprised of macohabitat generalists roughly half of which were moderately tolerant to pollution. Water quality was generally good (minimum DO 6.07mg/L, good pH, ammonia-nitrogen concentrations ≤0.08mg/L, season average total phosphorus concentrations after the Assabet River WWTP upgrades ≤0.05mg/L) although there were some indications of nutrient enrichment during the summer of 2006 (maximum diel DO shift 3.8mg/L, and maximum saturation 132%). The maximum temperature was 29.4°C although the daily mean was okay (27.9°C). Similar conditions during the summer of 2006 were also documented further downstream near River Street Bridge in Billerica (minimum DO 5.78mg/L, maximum diel shift 3.1mg/L, maximum saturation 146%, maximum temperature 29.2°C, ammonia-nitrogen concentrations ≤0.09mg/L, and maximum total phosphorus concentration 0.1mg/L) although one fluvial dependant species was documented by DFG biologists during the July 2011 boat electrofishing survey.

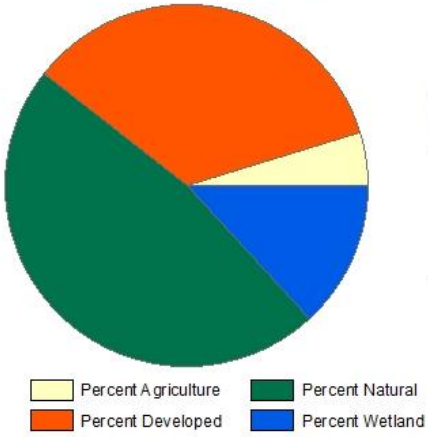
The Aquatic Life Use for this Concord River AU (MA82A-07) continues to be assessed as Not Supporting because of non-native aquatic macrophytes *T. natans*, *C. caroliana*, *M. spicatum*, *P. crispus*, and *M. quadrifolia* as well as the new impairment for the non-native Asian clam, *Corbicula fluminea*. While there were indications of nutrient enriched conditions during the summer of 2006 survey (diel DO shifts ≥3.0mg/L and saturation ≥125%) more recent data collected by OARS volunteers indicate improved conditions (maximum saturation ≤ 113%). Based on these more recent data collected after enhanced nutrient treatment implementation at the Assabet River WWTPS upstream from this Concord River AU no nutrient enrichment impairments are being listed.

Concord River (MA82A-08)

Location:	From Billerica Water Supply intake, Billerica to Rogers Street bridge, Lowell.
AU Type:	RIVER
AU Size:	5.1 MILES
Classification/Qualifier:	B: WWF

Concord River - MA82A-08

Watershed Area: 399.61 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	399.07	9.69	119.65	2.58
Agriculture	4.7%	0.2%	4.7%	0.5%
Developed	34.7%	65.8%	24.5%	43.8%
Natural	47.5%	19.9%	46.2%	27.9%
Wetland	13.1%	14.1%	24.6%	27.8%
Impervious Cover	13.4%			

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

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

Infestations of multiple non-native aquatic macrophytes--*Trapa natans*, *Cabomba caroliana*, *Myriophyllum spicatum*, and *Marsilea quadrifolia*- were reported in this Concord River AU (MA82A-08) in the 2003 ENSR report. According to DMF biologists, the downstream Centennial Island dam serves as only a minor obstruction to diadromous fish, but the upstream Talbot Mills Dam allows no possible passage of migratory river herring and American shad. Water quality monitoring by MassDEP staff and OARS volunteers has also been conducted at multiple locations in this Concord River AU (MA82A-08) from upstream to downstream as follows: Pollard Street Bridge in Billerica (MassDEP W1486 sampled summer 2006 and ambient sampling for Billerica WWTP WET tests), behind the fire station on Lowell Street in Billerica (OARS site CND-045 sampled 2009-2017), Rogers Street Bridge in Lowell (MassDEP SMART site W2227 sampled 2011-2013, OARS site CND-009 sampled 2009-2017). Sampling was also conducted just downstream of this AU at the Route 110 Bridge in Lowell (MassDEP SMART site W0679 sampled 2005-2007). Survival of *C. dubia* exposed (~7-days) to water collected from the Concord River at the Pollard Street bridge between June 2004 and March 2018 was ≥ 70% (n = 52) and was less than 75% in only the September 2014 test. Survival of *P. promelas* exposed (~7-day) to the river water ranged from 15 to 100% (n=27) and was less than 75% in five tests with the lowest survival occurring in the December 2007 and 2009 tests (43 and 15%, respectively). Water quality data collected by MassDEP during the summer of 2006 in the upper reach of this Concord River AU (upstream of the Billerica WWTP discharge) was generally good (minimum DO 5.45mg/L, maximum temperature 28.2°C, pH 6.4 to 7.2SU, ammonia-nitrogen concentrations ≤0.1mg/L) although there were some indications of nutrient enrichment (maximum diel DO shift 3.3mg/L, and maximum saturation 151%). OARS data in this reach of the river were similar with notes that after 2012 the maximum saturation was 102% and the maximum total phosphorus concentration was 0.053mg/L. The Billerica WWTP did not exhibit acute or chronic whole effluent toxicity to *P. promelas* in the tests conducted between June 2004 and September 2010 and with one exception (June 2006) no acute toxicity to *C. dubia* (n=52). Chronic whole effluent toxicity to *C. dubia* (n=50 valid tests conducted between June 2004 and March 2018) was occasionally detected and was below the permit limit in two tests (March 2016 and 2017) with CNOECs of 12.5 and 25% effluent, respectively. In the downstream reach of this Concord River AU, water quality monitoring data were generally indicative of good conditions (minimum DO 7.7mg/L, maximum saturation 114%, maximum temperature 26.8°C, good pH 6.5 to 7.5SU, ammonia-nitrogen concentrations ≤0.09mg/L, and a maximum total phosphorus concentration after 2012 of 0.072mg/L). However, chloride concentrations measured at W2227 (2011-2013 & 2015-2016) appeared to increase over time (with annual averages of 107 mg/L in 2011 and 203 mg/L in 2016; n= 5 or 6 respectively). Long term trend analysis (2005-2017) of total phosphorus concentrations at five DEP/OARS stations showed a statistically significant downward trend (p = 3.65e-11) for year-round data, as well as for seasonal (May-September) data (p = 7.15e-11).

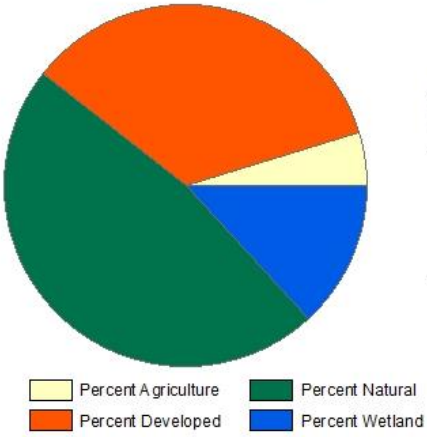
The Aquatic Life Use for this Concord River AU (MA82A-08) continues to be assessed as Not Supporting because of the infestations of several non-native aquatic macrophytes *Trapa natans*, *Cabomba caroliana*, *Myriophyllum spicatum*, and *Marsilea quadrifolia* as well as the lack of diadromous fish passage at the Talbot Mills Dam. An Alert is being issued due to a potential increasing trend in chloride concentrations at downstream station W2227.

Concord River (MA82A-09)

Location:	From Rogers Street bridge, Lowell to mouth at confluence with the Merrimack River, Lowell.
AU Type:	RIVER
AU Size:	0.9 MILES
Classification/Qualifier:	B: WWF, CSO

Concord River - MA82A-09

Watershed Area: 400.25 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	399.2	7.08	119.66	1.65
Agriculture	4.7%	0.3%	4.7%	0.7%
Developed	34.7%	72.1%	24.5%	51.3%
Natural	47.5%	16.6%	46.2%	27.6%
Wetland	13.1%	11%	24.6%	20.3%
Impervious Cover	13.4%			

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

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

Water quality monitoring was conducted in this Concord River AU (MA82A-09) by MassDEP staff and OARS volunteers from upstream to downstream as follows: Rogers Street Bridge in Lowell (MassDEP SMART site W2227 sampled 2011-2013, OARS site CND-009 sampled 2009-2017), at the Route 110 Bridge in Lowell (MassDEP SMART site W0679 sampled 2005-2007), and at the Route 110 Bridge in Lowell (MassDEP W1487 during the summer of 2006). In the upstream reach of this Concord River AU, water quality monitoring data were indicative of good conditions (minimum DO 7.7mg/L, maximum saturation 114%, maximum temperature 26.8°C, good pH 6.5 to 7.5SU, ammonia-nitrogen concentrations ≤0.09mg/L, and the maximum total phosphorus concentration after 2012 of 0.072mg/L). Further downstream at the Route 110 bridge water quality conditions were also generally good (minimum DO 7.3mg/L, maximum saturation 116%, maximum temperature 29.2°C with daily mean 28.1°C, good ph 6.6 to 7.6SU, ammonia-nitrogen concentrations ≤0.15m/L and a long term trend analysis (2000-2013) of total phosphorus concentrations at three stations showed a statistically significant downward trend (p = 1.04e-08) for year-round data, as well as for seasonal (May-September) data (p = 2.35e-05).

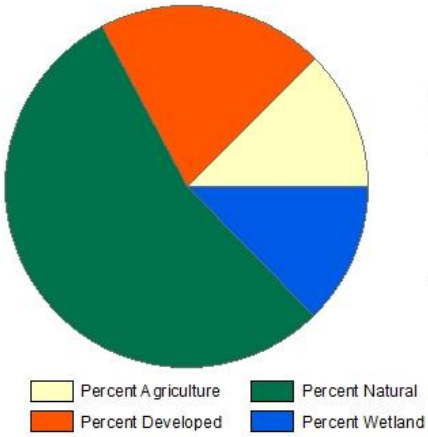
The Aquatic Life Use of this Concord River AU (MA82A-09) is assessed as Fully Supporting based on the MassDEP and OARS water quality monitoring data collected between 2006 and 2017 that were indicative of generally good conditions.

Danforth Brook (MA82B-19)

Location:	Headwaters, confluence of Mill Brook and an unnamed tributary draining from Little Pond, Bolton to mouth at inlet of Bruces Pond, Hudson.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B

Danforth Brook - MA82B-19

Watershed Area: 6.8 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.8	4.8	2.44	1.83
Agriculture	12.5%	7.1%	7.5%	5.1%
Developed	20.3%	23.2%	20%	22.6%
Natural	54.5%	54.7%	48.3%	45.6%
Wetland	12.7%	15%	24.2%	26.7%
Impervious Cover	7.4%			

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

DFG biologists conducted backpack electrofishing in a low gradient portion of Danforth Brook in August 2011 (Sample ID 3819). The sample contained a fluvial specialist species (tessellated darter) as well as fish that were either intoralerant or moderately tolerant to pollution. OARS staff collected water quality data further downstream in Danforth Brook at DAN-013 (near Route 85, Hudson) from 2009-2017 in a higher gradient reach. Most of their water quality data (pH, dissolved oxygen, total suspended solids, ammonia) were generally indicative of good conditions. Total phosphorus was infrequently above 0.05 mg/L (maximum concentration 0.23 mg/L in 2013) but ≤ 0.08 mg/L amongst all other years. The maximum water temperature was 24.03°C in July 2013 but most years slightly exceeded 20°C during either July or August. It should be noted that several wild brown trout had been collected from the brook near the OARS site DAN-013 (Sample ID 369) in July 2001.The Aquatic Life Use is assessed as Fully Supporting based on the presence of both fluvial fish and those intolerant/moderately tolerant to pollution as well as the generally good water quality conditions documented by OARS staff in the brook near Route 85 in Hudson. This use is identified with an Alert status because of slightly elevated temperatures where the presence of wild brown trout had previously been documented. The prior Alerts (low dissolved oxygen, low numbers of fish collected in fish samples, and low flows) are also being maintained.

Dean Park Pond (MA82026)

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

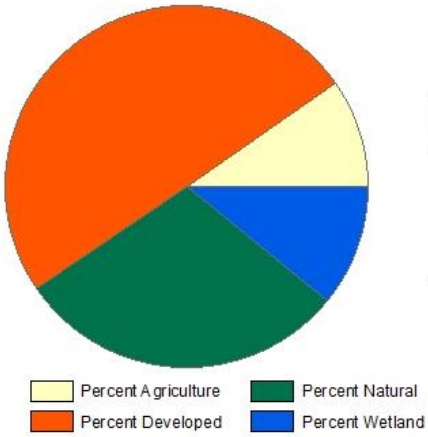
Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
Dean Park Pond was posted for harmful algal blooms for 69 days in 2012 and 22 days in 2014. Since no other water quality data are available, there is insufficient information to assess the Aquatic Life Use. However, Harmful Algal Blooms is being identified as an Alert issue.

Denny Brook (MA82A-27)

Location:	Headwaters, perennial portion, outlet unnamed pond west of South Street, Westborough to mouth at confluence with Jackstraw Brook, Westborough.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B: ORW

Denny Brook - MA82A-27

Watershed Area: 1.1 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.1	1.1	0.42	0.42
Agriculture	9.7%	9.7%	9.6%	9.6%
Developed	49.9%	49.9%	48.1%	48.1%
Natural	29.7%	29.7%	22%	22%
Wetland	10.8%	10.8%	20.3%	20.3%
Impervious Cover	17.5%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use is not assessed for Denny Brook.

Dudley Pond (MA82029)

Location:	Wayland.
AU Type:	FRESHWATER LAKE
AU Size:	83 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	(Non-Native Aquatic Plants*)		Removed
5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Dudley Pond is assessed as Not Supporting due to infestations of the non-native aquatic macrophytes, *Myriophyllum spicatum* and *Potamogeton crispus*, as well as the non-native Asian clam (*Corbicula fluminea*). The pond was posted for a harmful algal bloom for 13 days in 2012. With no new water quality data, the impairment for dissolved oxygen is carried forward.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Curly-leaf Pondweed" (Potamogeton crispus).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Dudley Pond has an infestation of the two non-native aquatic macrophytes, *Myriophyllum spicatum* and *Potamogeton crispus* (MassDEP 1996). According to MassDEP records, the Town of Wayland Surface Water Quality Committee continued to utilize herbicide treatments to control these species in 2008, 2010, 2013, and 2016 (MassDEP 2017). In 2016, a member of the Wayland Surface Water Quality Committee reported the presence of the Asian clam, *Corbicula fluminea*, and this was verified by MassDEP staff (MassDEP Undated 2).

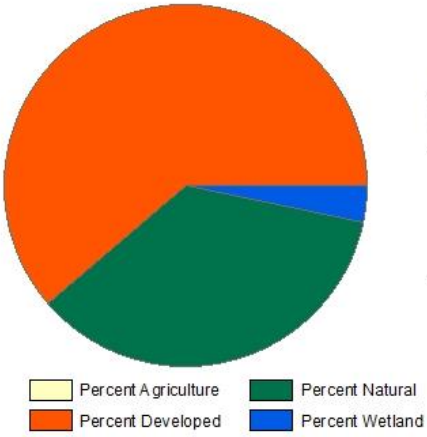
The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Curly-leaf Pondweed" (*Potamogeton crispus*).

Eames Brook (MA82A-13)

Location:	Headwaters, outlet Farm Pond, Framingham to mouth at confluence with the Sudbury River, Framingham.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B

Eames Brook - MA82A-13

Watershed Area: 1.2 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.2	1.2	0.15	0.15
Agriculture	0%	0%	0%	0%
Developed	61.3%	61.3%	40.3%	40.3%
Natural	35.4%	35.4%	49.1%	49.1%
Wetland	3.3%	3.3%	10.6%	10.6%
Impervious Cover	34.5%			

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

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

No recent data have been collected in Eames Brook. Inspection of the 1996 synoptic survey data sheet and a MassDEP staff field notebook revealed that further confirmation of an infestation of *Potamogeton crispus* in Eames Brook was needed. Therefore, the impairment of the Aquatic Life Use due to non-native aquatic plants was not confirmed so this impairment is being removed and changed to an alert. The Benthic Macroinvertebrates impairment is being maintained.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Data and/or information lacking to determine WQ status; original basis for listing was incorrect	Inspection of the 1996 synoptic survey data sheet and a MassDEP staff field notebook revealed that further confirmation of an infestation of Potamogeton crispus in Eames Brook was needed. The original notes indicated Potamogeton sp. was present but not whether it was a native or non-native species. Therefore, the non-native aquatic plants impairment is being removed and a recommendation is being made to conduct a macrophyte survey.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

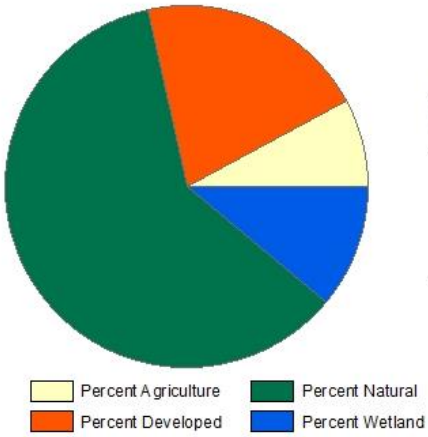
The 2001 Assessment Report notes an infestation of *Potamogeton crispus* documented in a 1996 DWM habitat assessment of Eames Brook (O'Brien-Clayton 2005). Upon examination of field sheets and a staff field notebook (Nuzzo 1996), it is apparent that *Potamogeton* sp. was observed during a May 22, 1996 reconnaissance survey, but species identification was not made. Therefore, the impairment is removed, but the segment will remain under alert status until a species confirmation can be made.

Elizabeth Brook (MA82B-12)

Location:	From the outlet of an unnamed pond (Delaney Project on Stow/Harvard border) west of Harvard Road, Stow to mouth at inlet of Fletchers Pond, Stow.
AU Type:	RIVER
AU Size:	3.7 MILES
Classification/Qualifier:	B

Elizabeth Brook - MA82B-12

Watershed Area: 17.87 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	17.78	5.6	5.83	1.79
Agriculture	7.9%	6.6%	8%	7.8%
Developed	20.5%	26.9%	15.9%	21.1%
Natural	60.6%	50.3%	54%	42.5%
Wetland	11%	16.2%	22.1%	28.7%
Impervious Cover	6.3%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Benthic Macroinvertebrates		Removed

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

MassDEP biologisits conducted benthic macroinvertebrate and fish sampling in two reaches of Elizabeth Brook during the summer of 2010. The downstream station (B0686) was used as the reference site for the low gradient 2010 Concord River Watershed benthic survey sites. The upstream location near Delaney Street in Stow (B0695) was surveyed in July 2010 and the RBP III analysis was determined to be 90% comparable (Non-impaired) in comparison to the Elizabeth Brook reference site located further downstream near Wheeler Road in Stow (B0686). MassDEP biologists conducted backpack and barge electrofishing in Elizabeth Brook downstream from Delaney Street (Sample ID 4549) in September 2010 and backpack electrofishing further downstream near Wheeler Road (SampleID 4548) in August 2010. Both samples contained a fluvial species as well as multiple moderately tolerant macrohabitat generalist species. DEP staff also deployed dissolved oxygen probes for three 5-day periods in 2010 at both the upstream (W2138) and downstream (W2134) biological sampling site locations. These data were generally satisfactory, except two of the deployments at W2138 had daily mean minima <5.0 mg/L. Water temperature probes were deployed for 115 days apiece at each site. The probe at the downstream site (W2134) exceeded the 7-DADM ≥27.7°C 17 times. In-situ attended and grab sample data for pH, ammonia and total phosphorus collected at both sites in 2010 were generally indicative of good water quality. Three metals samples collected at these sites did not exceeded any chronic/acute criteria. One likely ephemeral filamentous algal bloom was observed during the benthic algae survey in July 2010 at the downstream sampling location but there were no other observations of filamentous algae during any of the other site visits.

Based primarily on the biological (benthic macroinvertebrate and fish) sample data, the Aquatic Life Use of Elizabeth Brook is assessed as Fully Supporting. However, an Alert is issued because of slightly low dissolved oxygen at the upstream sampling location and elevated water temperature at the downstream sampling location. The Aquatic Life Use of Elizabeth Brook was historically listed as impaired for Aquatic Macrioinvertebrate Bioassessments based on one benthic sample collected in the summer of 1996 with an RBP II analysis indicating moderate impairment. Since the more recent benthic data collected from the brook in the summer of 2010 do not indicate impairment (one site was used as a reference and the other was not impacted), the Benthic Macroinvertebrates Bioassessments impairment is being delisted from Elizabeth Brook AU. The newer data have greater resolution (RBPIII analysis) and are indicative of very good biological condition.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Benthic Macroinvertebrates	Applicable WQS attained, according to new assessment method	The Aquatic Life Use of Elizabeth Brook was historically listed as impaired for Aquatic Macroinvertebrate Bioassessments based on one benthic sample collected in the summer of 1996 with an RBP II analysis indicating moderate impairment. Since then, more recent benthic data were collected from two sites along the brook in the summer of 2010. Neither of these two sites were found to be impacted. The upstream site (B0695) RBPIII analysis compared to the low gradient reference (B0686) scores 38/42 = was non impaired (90% comparability). The second site was the low gradient reference site so by default was not impaired (score 42/42 = 100% comparability). The newer data have greater resolution (RBPIII analysis) and are indicative of very good biological condition. Therefore, the Aquatic Macroinvertebrate

		impairment for Elizabeth Brook (MA82B-12) is being delisted as the newer data with greater resolution (RBPIII over the RBP II analysis) is indicative of full support for the Aquatic Life Use.

Supporting Information for Delisted Impairments

Benthic Macroinvertebrates

Benthic sampling was conducted by MassDEP biologists in Elizabeth Brook- approximately 80 meters downstream of Delaney Street, Stow, MA (Station B0695) on 7/12/2010. The RBP III analysis indicated the sample was 90% comparable or "Non-impaired" when compared to the reference (Unique ID: B0686) Data Source (MassDEP Undated 5).

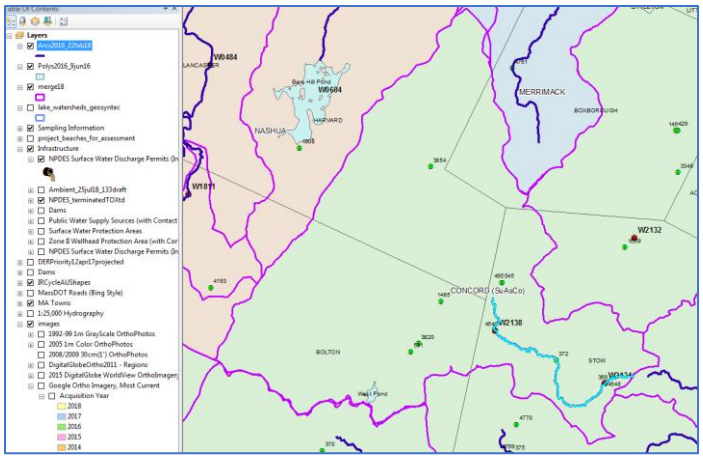
A	F
FieldID	MA09A-180
Unique_ID	B0695
BenSampID	2010009
TotInd	97
Richness	33
HBI	5.48
EPTIndex	11
EPT/CHIR	2.06
SC/FC	0.31
FC/Total	0.30
%DomTaxon	12%
TotHabSc	148.00
% of "R"	
BenSampID	2010009
Richness	106%
HBI	99%
EPTIndex	100%
EPT/CHIR	149%
SC/FC	21%
RefAffinity	77%
%DomTaxon	12%
RBP Scoring	
BenSampID	2010009
Richness	6
HBI	6
EPTIndex	6
EPT/CHIR	6
SC/FC	2
RefAffinity	6
%DomTaxon	6
Total	38
RBP % Comparability to Reference	90%
RBP Status	NI
Hab. Ref.%	90%
Hab. Comp.	Comparable

Benthic sampling was conducted by MassDEP biologists in Elizabeth Brook- Wheeler Road, Stow, MA (Station B0686) on 7/12/2010. As this station was the reference site (total score 42) amongst the Concord low gradient sites in the 2010 benthic survey, the RBP III status and habitat were considered "Non-impaired." Data Source (MassDEP Undated 5).

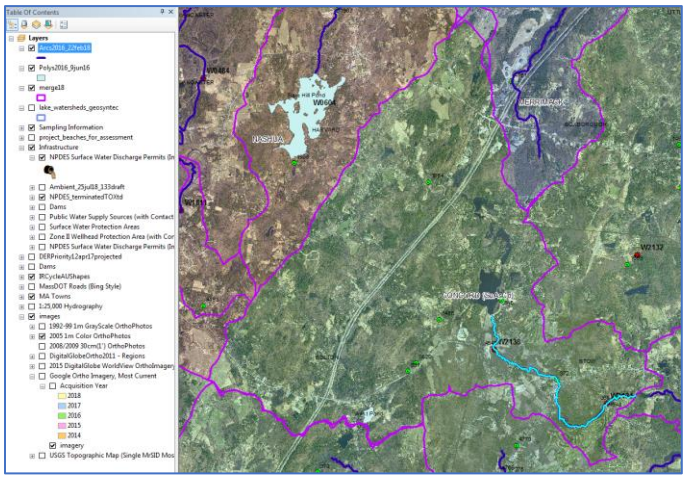
A	E
FieldID	MA09A-152
Unique_ID	B0686
BenSampID	2010008 "R"
TotInd	96
Richness	31
HBI	5.44
EPTIndex	11
EPT/CHIR	1.38
SC/FC	1.45
FC/Total	0.21
%DomTaxon	13%
TotHabSc	164.00
% of "R"	
BenSampID	2010008 "R"
Richness	100%
HBI	100%
EPTIndex	100%
EPT/CHIR	100%
SC/FC	100%
RefAffinity	100%
%DomTaxon	13%
RBP Scoring	
BenSampID	2010008 "R"
Richness	6
HBI	6
EPTIndex	6
EPT/CHIR	6
SC/FC	6
RefAffinity	6
%DomTaxon	6
Total	42
RBP % Comparability to Reference	100%
RBP Status	NI
Hab. Ref.%	100%
Hab. Comp.	Comparable

The newer data have greater resolution (RBPIII analysis) and are indicative of very good biological condition. Except for the retrofit of the Center School in Stow, similar land use patterns are observed in 2005 and 2015. Therefore, data collected within this timeframe are considered usable for water quality assessment, listing, and delisting decisions. Data Source (MassDEP Undated 8). Therefore, the Aquatic Macroinvertebrate impairment for Elizabeth Brook (MA82B-12) is being delisted.

Entire drainage area:



2005 image entire drainage area:



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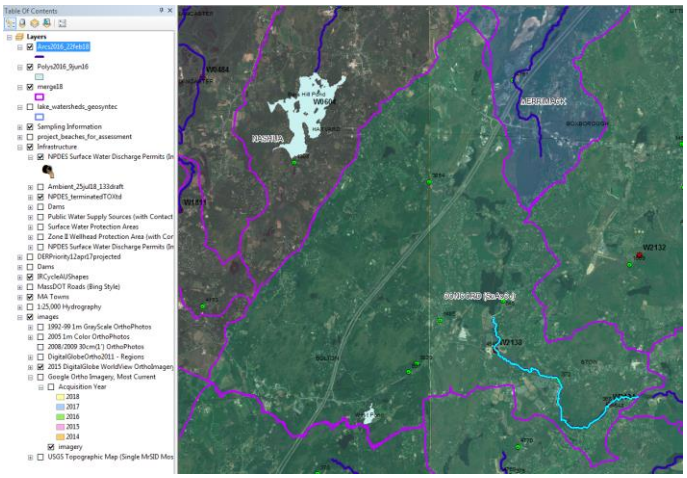

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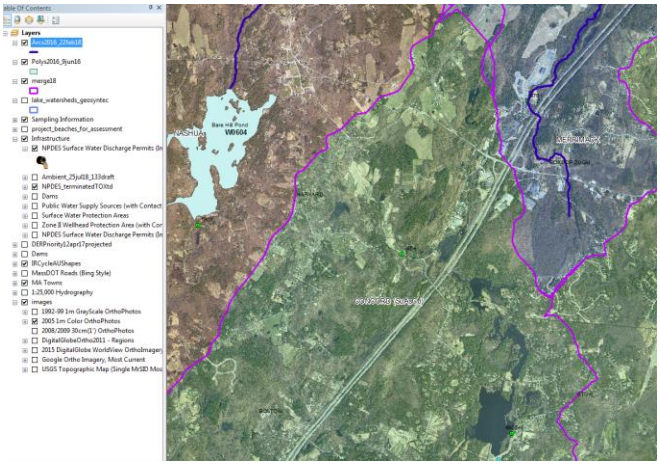

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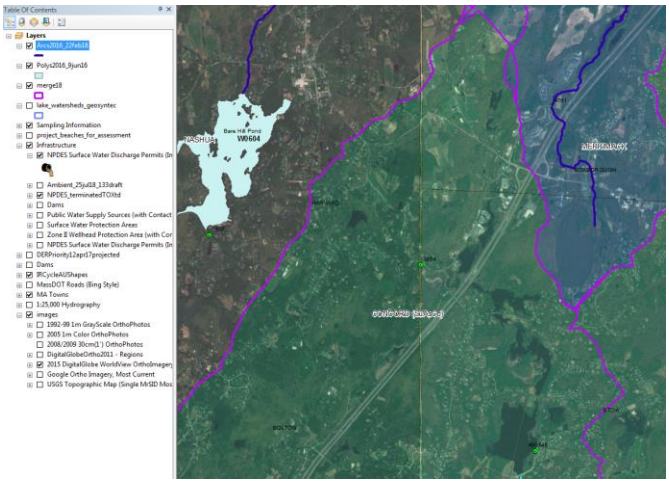

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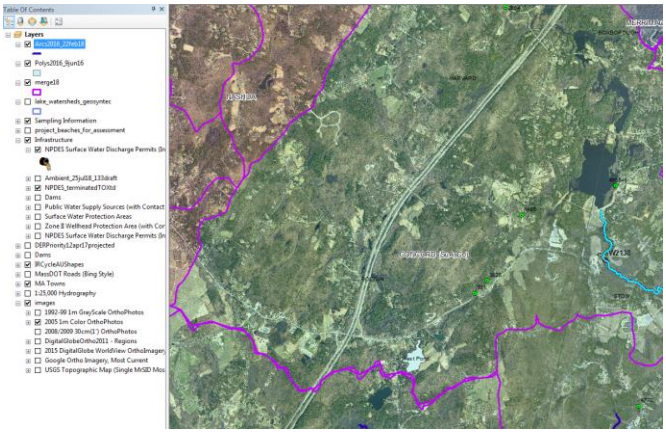

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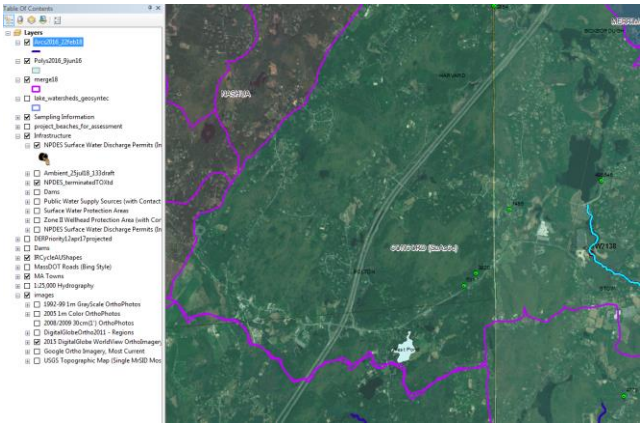
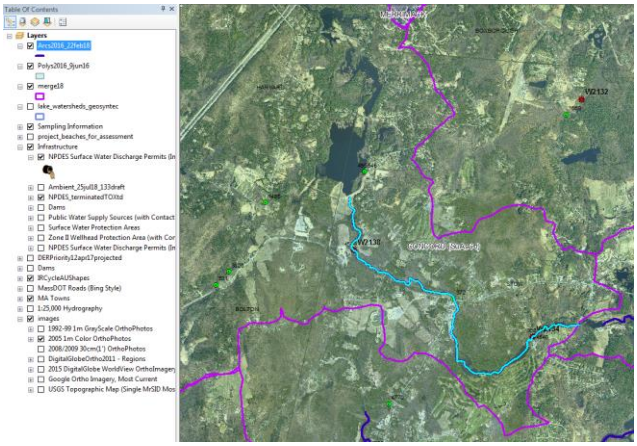


2005 Image Lower Watershed:



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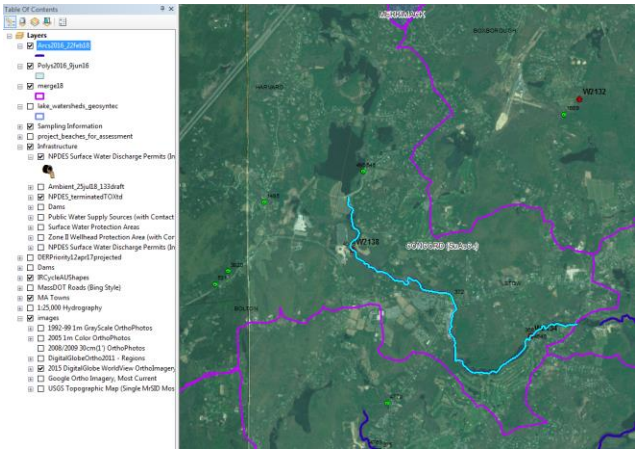


Elm Street Pond (MA82032)

Location:	Chelmsford/Carlisle.
AU Type:	FRESHWATER LAKE
AU Size:	65 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
With no data available for this reporting cycle, the Aquatic Life Use of Elm Street Pond is Not Assessed. The prior Alert Status, due to water level manipulation associated with cranberry bog dam operation and maintenance, is maintained

Farm Pond (MA82035)

Location:	Framingham.
AU Type:	FRESHWATER LAKE
AU Size:	139 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)

Non-native aquatic macrophyte species *Potamogeton crispus*, *Myriophyllum spicatum*, and *Cabomba caroliniana* have been reported in Farm Pond. During the 1996 synoptic survey, specimens from the genus *Myriophyllum* were described as "possibly *heterophyllum*" (MassDEP 1996), but confirmation of a *M. heterophyllum* infestation is still required. In July 2003, MassDEP staff conducted water quality monitoring at the deep hole (W0946). Two depth-integrated samples for chlorophyll *a* were collected, one was >16 µg/L and the other was <16 µg/L, but these samples were outside the precision threshold for duplicates. On the same survey, most of the pond was covered with a monoculture of *Potamogeton robbinsii*, but this may be natural for this system. Additionally, a depth profile was conducted in which dissolved oxygen dropped below 5 mg/L at 3.5 m in depth. With no bathymetry data available, an Alert will be issued for low dissolved oxygen and a recommendation made for future collection of that data.

The Aquatic Life Use of Farm Pond remains Not Supporting due to infestations of multiple non-native aquatic macrophytes, in particular, *Myriophyllum spicatum*.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus) and Fanwort (Cabomba caroliniana).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Non-native aquatic macrophyte species *Potamogeton crispus* (MassDEP Undated 8), as well as *Myriophyllum spicatum* and *Cabomba caroliniana* (MassDEP Undated 2) have been reported in Farm Pond. During the 1996 synoptic survey, specimens from the genus *Myriophyllum* were described as

"possibly *heterophyllum*" (MassDEP 1996), but confirmation of a *M. heterophyllum* infestation is still required.

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (*Potamogeton crispus*) and Fanwort (*Cabomba caroliniana*).

Farrar Pond (MA82036)

Location:	Lincoln.
AU Type:	FRESHWATER LAKE
AU Size:	83 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

With no available data for this reporting cycle, the Aquatic Life Use for Farrar Pond is not assessed.

Fish Consumption Use: Not Supporting

Following a public request, MassDEP biologists conducted fish toxics sampling at Farrar Pond in June 2015. Because of elevated mercury measured in black crappie, chain pickerel, and largemouth bass fillets, MassDPH issued the following fish consumption advisories:

"Children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any of the affected fish species (black crappie, chain pickerel, largemouth bass) from this water body"

"The general public should limit consumption of affected fish species (black crappie, chain pickerel, largemouth bass) to two meals per month."

Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Farrar Pond (MA82036) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition. Data Source: (MassDPH 2019)

Fisk Pond (MA82038)

Location:	Natick.
AU Type:	FRESHWATER LAKE
AU Size:	62 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 (Alert)
The Aquatic Life Use for Fisk Pond is assessed as not supporting based on the presence of the non-native aquatic macrophytes *Myriophyllum heterophyllum* and *Trapa natans*. A potential infestation of *Potamogeton crispus* needs species confirmation, so an Alert is being issued.

Fiske Street Pond (MA82037)

Location:	Carlisle/Chelmsford.
AU Type:	FRESHWATER LAKE
AU Size:	38 ACRES
Classification/Qualifier:	B

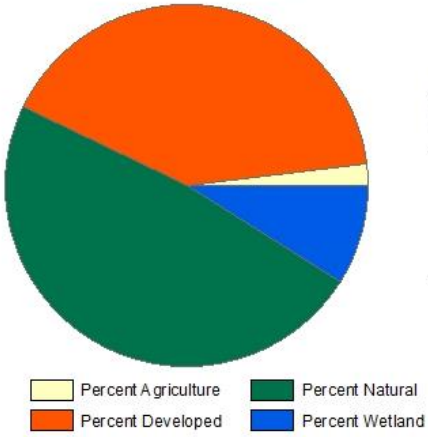
Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
With no data available for this reporting cycle, the Aquatic Life Use of Fiske Street Pond is Not Assessed. The prior Alert Status, due to water level manipulation associated with cranberry bog dam operation and maintenance, is maintained.

Fort Meadow Brook (MA82B-11)

Location:	Headwaters, outlet Fort Meadow Reservoir, Marlborough/Hudson to mouth at confluence with Assabet River, Hudson.
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B

Fort Meadow Brook - MA82B-11

Watershed Area: 6.31 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.31	4.54	1.63	1.29
Agriculture	1.9%	2.6%	1.7%	2.2%
Developed	41%	38.9%	27.8%	25.7%
Natural	48.3%	49.4%	52.5%	53.2%
Wetland	8.9%	9.2%	18%	19%
Impervious Cover	16.1%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
With no new data available during this reporting cycle, the Aquatic Life Use of Fort Meadow Brook is Not Assessed. The Alert Status is maintained for habitat degradation and riparian zone disturbances.

Fort Meadow Reservoir (MA82042)

Location:	Marlborough/Hudson.
AU Type:	FRESHWATER LAKE
AU Size:	254 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*)		Added

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

Fort Meadow Reservoir has infestations of multiple non-native aquatic macrophytes- *Myriophyllum spicatum*, *Myriophyllum heterophyllum*, and *Cabomba caroliniana*. The presence of the non-native Asiatic clam, *Corbicula fluminea* has also been reported however confirmation of live specimens (not just shells) is needed. The reservoir was posted for harmful algal blooms for 16 days in 2014.

The Aquatic Life Use of Fort Meadow Reservoir is assessed as impaired due to infestations of non-native aquatic macrophytes (including *Myriophyllum spicatum, Myriophyllum heterophyllum*, and *Cabomba caroliniana*). With no new water quality data in this reporting cycle, the impairment for Total Phosphorus is maintained and an Alert is being added for the non-native Asiatic clam.

Fort Pond (MA82043)

Location:	Littleton.
AU Type:	FRESHWATER LAKE
AU Size:	102 ACRES
Classification/Qualifier:	B

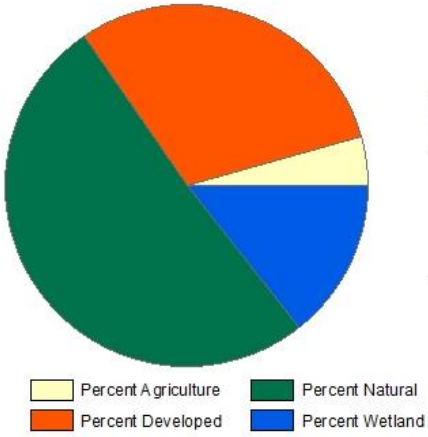
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of Fort Pond is Not Assessed.

Fort Pond Brook (MA82B-13)

Location:	From source in a wetland just west of Fort Pond, Littleton to mouth at inlet Warners Pond, Concord.
AU Type:	RIVER
AU Size:	10.2 MILES
Classification/Qualifier:	B

Fort Pond Brook - MA82B-13

Watershed Area: 46.14 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	46.13	11.84	14.21	3.59
Agriculture	4.3%	4.1%	4.1%	3.3%
Developed	30.3%	37.6%	20.7%	26%
Natural	51%	46.8%	46.6%	47%
Wetland	14.3%	11.6%	28.6%	23.7%
Impervious Cover	10.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing at three sites along Fort Pond Brook – the most upstream site was downstream from Newtown Road in Littleton (Sample ID 1671) in July 2006, the middle site was downstream from Arlington Street in Acton (Sample ID 2155) in July 2007 and the most downstream site was near Heritage Road in Acton (Sample ID 2157) in July 2007. All three samples along this low gradient stream contained one or more moderately tolerant macrohabitat generalist species, and the downstream sample was dominated by fallfish (a fluvial specialist) (42% of the sample). USGS detected phenol in one sample collected from Fort Pond Brook near Central Street, Acton in August 2010.

The Aquatic Life Use of Fort Pond Brook is assessed as Fully Supporting based on the DFG fish survey data which primarily documented the presence of moderately tolerant macrohabitat generalist fishes. Two fluvial species were also present at the most downstream sampling location in this low gradient stream.

Framingham Reservoir #1 (MA82044)

Location:	Framingham.
AU Type:	FRESHWATER LAKE
AU Size:	117 ACRES
Classification/Qualifier:	B

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

The Aquatic Life Use of Framingham Reservoir #1 continues to be assessed as not supporting based on the presence of the non-native aquatic macrophytes, *Myriophyllum spicatum* and *Myriophyllum heterophyllum*. Furthermore, *Trapa natans* was observed in the reservoir during a 2016 survey sponsored by SuAsCo CISMA (and conducted by OARS).

Framingham Reservoir #2 (MA82045)

Location:	Framingham/Ashland.
AU Type:	FRESHWATER LAKE
AU Size:	114 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data available for this AU Therefore, the Aquatic Life Use of Framingham Reservoir #2 is not assessed.

Framingham Reservoir #3 (MA82046)

Location:	Framingham.
AU Type:	FRESHWATER LAKE
AU Size:	222 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use of Framingham Reservoir #3 continues to be assessed as not supporting based on the presence of the non-native aquatic macrophyte *Myriophyllum spicatum*.

Gates Pond (MA82047)

Location:	Berlin.
AU Type:	FRESHWATER LAKE
AU Size:	73 ACRES
Classification/Qualifier:	A: PWS, ORW

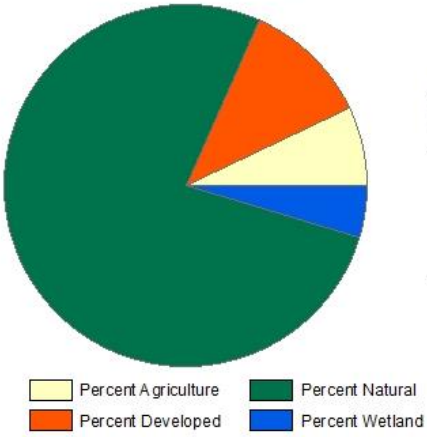
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting period, the Aquatic Life Use of Gates Pond is Not Assessed.

Gates Pond Brook (MA82B-10)

Location:	Headwaters, outlet Gates Pond, Berlin to mouth at confluence with the Assabet River, Berlin.
AU Type:	RIVER
AU Size:	1 MILES
Classification/Qualifier:	B

Gates Pond Brook - MA82B-10

Watershed Area: 0.98 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.98	0.98	0.49	0.49
Agriculture	7%	7%	8.3%	8.3%
Developed	11.3%	11.3%	10.9%	10.9%
Natural	77.1%	77.1%	73.3%	73.3%
Wetland	4.6%	4.6%	7.4%	7.4%
Impervious Cover	4.8%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
With no data available for this reporting cycle, the Aquatic Life Use of Gates Pond Brook is Not Assessed. However, the Alert Status due to the 1996 benthic assessment (O'Brien-Clayton 2005) is maintained.

Gleasons Pond (MA82048)

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

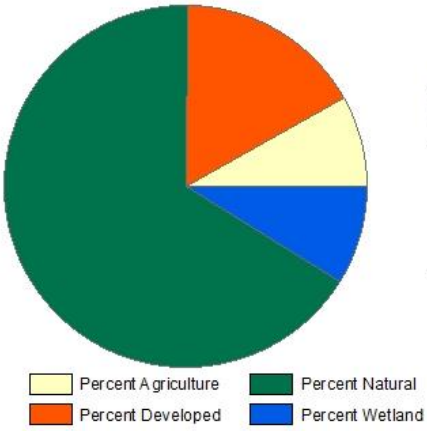
Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use for Gleasons Pond is not assessed.

GREAT BROOK (MA82B-29)

Location:	Headwaters, perennial portion east of Harvard Road, Bolton to mouth at inlet Delaney Pond (impoundment of Elizabeth Brook), Stow.
AU Type:	RIVER
AU Size:	5.7 MILES
Classification/Qualifier:	B

GREAT BROOK - MA82B-29

Watershed Area: 8.00 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.99	6.20	2.77	2.19
Agriculture	8.1%	6.7%	6.9%	6.8%
Developed	16.8%	16.2%	14.6%	13.2%
Natural	66.4%	67.9%	59.8%	60.5%
Wetland	8.8%	9.2%	18.7%	19.5%
Impervious Cover	5.9%			

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

DFG biologists conducted backpack electrofising in Great Brook along Route 117 in Bolton (Sample ID 3820) in August 2011. The sample was dominated by fluvial specialist/dependant species but no cold-water species were collected. Prior sampling by DFG biologists slightly further upstream in Great Brook in June 2001 (SampleID 531) had documented the presence of multiple age classes of Eastern brook trout.

The Aquatic Life Use of Great Brook is assessed as Fully Supporting based on the fish sample that was dominated by fluvial specials/dependant species. Since no cold-water species were collected however, and DFG considers Great Brook a Coldwater Fisheries Resource, an Alert issue is being identified due to the lack of cold-water fish species in the August 2011 survey.

Great Meadows Pond #3 (MA82053)

Location:	Concord.
AU Type:	FRESHWATER LAKE
AU Size:	53 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
4c	4c	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Due to an infestation of a non-native aquatic macrophyte, *Trapa natans*, the Aquatic Life Use of Great Meadows Pond #3 is assessed as Not Supporting.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

An infestation of *Trapa natans* was identified in the WPP 1996 synoptic survey (MassDEP 1996).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water chestnut" (*Trapa natans*).

Grist Mill Pond (MA82055)

Location:	Sudbury/Marlborough.
AU Type:	FRESHWATER LAKE
AU Size:	17 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Aquatic Plants (Macrophytes)		Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Nutrient/Eutrophication Biological Indicators		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Grist Mill Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans*. Review of Google Earth images indicates that nearly the entire pond was covered with plant growth as recently as summer 2015. The Aquatic Life Use of Grist Mill Pond is assessed as Not Supporting. Most of the impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Primary Contact Recreation Use: Not Supporting

The Primary Contact Recreational Use for Grist Mill Pond will continue to be assessed as Not Supporting. Grist Mill Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans*. Review of Google Earth images indicates that nearly the entire pond was covered with plant growth as recently as summer 2015. The fecal coliform and algae impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Secondary Contact Recreation Use: Not Supporting

The Secondary Contact Recreational Use for Grist Mill Pond will continue to be assessed as Not Supporting. Grist Mill Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans*. Review of Google Earth images indicates that nearly the entire pond was covered with plant growth as recently as summer 2015. The fecal coliform and algae impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Aesthetic Use: Not Supporting

The Aesthetics Use for Grist Mill Pond will continue to be assessed as Not Supporting. Grist Mill Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans*. Review of Google Earth images indicates that nearly the entire pond was covered with plant growth as recently as summer 2015. The algae impairment cause remains, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

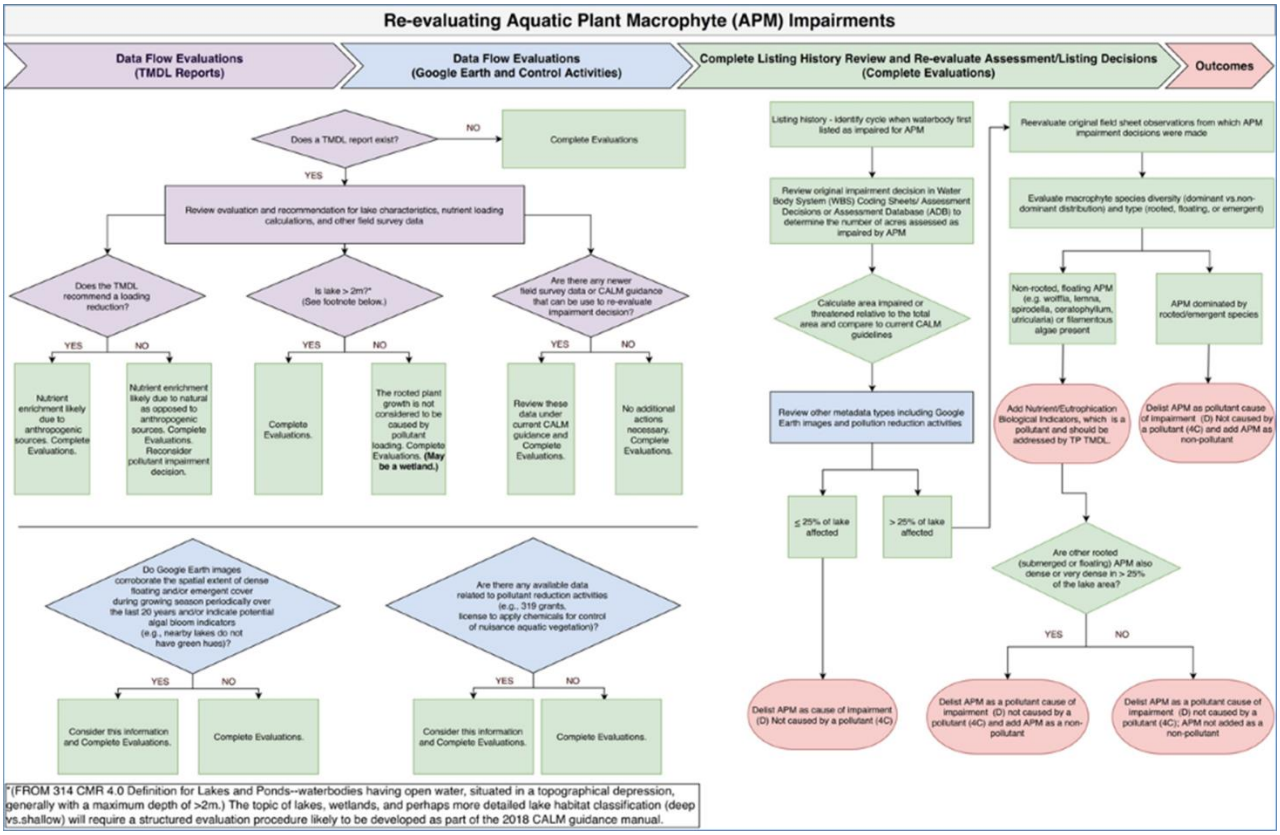
2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Applicable WQS attained, according to new assessment method	Grist Mill Pond was originally listed as impaired for "Noxious Aquatic Plants" in 1992 because 75% of the pond was covered in an algal and duckweed mat. Total phosphorus was also high at that time. Subsequent review of Google Earth images indicates that nearly the entire pond was covered with plant growth as recently as summer 2015. Therefore, the impaired status remains, but the Aquatic Plants (Macrophytes) cause is being delisted and replaced with the Nutrient/Eutrophication Biological Indicators cause. Please note that while the maximum depth of Grist Mill Pond is recorded as roughly 1.8 meters, most of the pond is less than 5 feet deep (~1.5 m), according to bathymetry records. The status of this pond may be revisited when a more detailed lake habitat classification (deep vs. shallow) is developed as part of a future CALM guidance manual.
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus) and "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Aquatic Plants (Macrophytes)

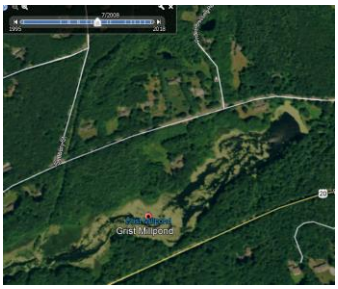
MassDEP analysts conducted a stepwise review process for the Aquatic Plant (Macrophytes) impairments. This reevaluation (see below) was developed by DWM analysts to consider multiple sources of information, including but not limited to Google Earth satellite imagery (often available for various months/years ranging from the mid-1990s through current time), herbicide application records, historical information on maximum lake depth, DEP water quality monitoring data, and 319 grant activities, leading to an outcome of 1) APM being delisted as a pollutant and relisted as a non-pollutant, 2) APM being delisted due to historical errors in the original listing or reapplication of current assessment methodology on whatever data are available (including original data utilized for an impairment listing if they are the only data available), or 3) APM being delisted as a pollutant to be replaced with a listing of impaired due to Nutrient/Eutrophication Biological Indicators (a pollutant). As part of the reevaluation process, those lakes experiencing dense/very dense plant coverage >25% of the lake area by filamentous algae, algal blooms, or aquatic macrophyte species that utilize nutrients

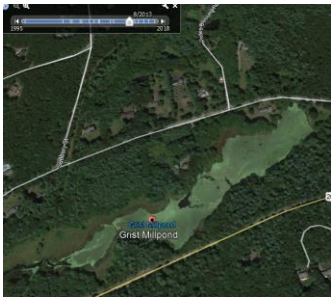
directly from the water column (e.g,. non-rooted floating species including *Lemna*, *Wolfia*, *Spirodella*, *Ceratophyllum*, *Utricularia*) should be reassessed as impaired using the pollutant code "Nutrient/Eutrophication Biological Indicators". This reclassification would place these lakes in Category 5 until a Total Phosphorus TMDL is developed and allow MassDEP to better prioritize TMDL development for lakes where nutrient reduction efforts should result in restoration, as opposed to requiring TMDLs for waterbodies where naturally occurring shallow areas are conducive to aquatic macrophyte growth.

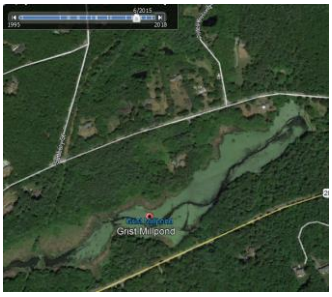


Therefore, the impaired status of Grist Mill Pond remains, but the "Aquatic Plants (Macrophytes)" impairment is being delisted and replaced with the "Nutrient/Eutrophication Biological Indicators" impairment.

Google Earth Images (September 2006, July 2008, August 2013, June 2015) For Grist Mill Pond (Google Earth Pro Undated)







Non-Native Aquatic Plants

Infestations of the non-native *Potamogeton crispus* and *Trapa natans* were identified in the ENSR impact evaluation of elevated nutrients in Hop Brook (ENSR International 2000).

The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophytes “Curly-leaf Pondweed” (*Potamogeton crispus*) and “Water chestnut” (*Trapa natans*).

Hager Pond (MA82056)

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

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Aquatic Plants (Macrophytes)		Removed
5	5	(Curly-leaf Pondweed*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Nutrient/Eutrophication Biological Indicators		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Hager Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans* (the latter was recently reported in 2014). Review of Google Earth images indicates that roughly 40-50% of the pond was covered with plant growth as recently as summer 2014.
The Aquatic Life Use of Hager Pond is assessed as Not Supporting. Most of the impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Primary Contact Recreation Use: Not Supporting

The Primary Contact Recreational Use for Hager Pond will continue to be assessed as Not Supporting. Hager Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans* (the latter was recently reported in 2014). Review of Google Earth images indicates that roughly 40-50% of the pond was covered with plant growth as recently as summer 2014. The fecal coliform, algae, and turbidity impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Secondary Contact Recreation Use: Not Supporting

The Secondary Contact Recreational Use for Hager Pond will continue to be assessed as Not Supporting. Hager Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans* (the latter was recently reported in 2014). Review of Google Earth images indicates that roughly 40-50% of the pond was covered with plant growth as recently as summer 2014. The fecal coliform, algae, and turbidity impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

Aesthetic Use: Not Supporting

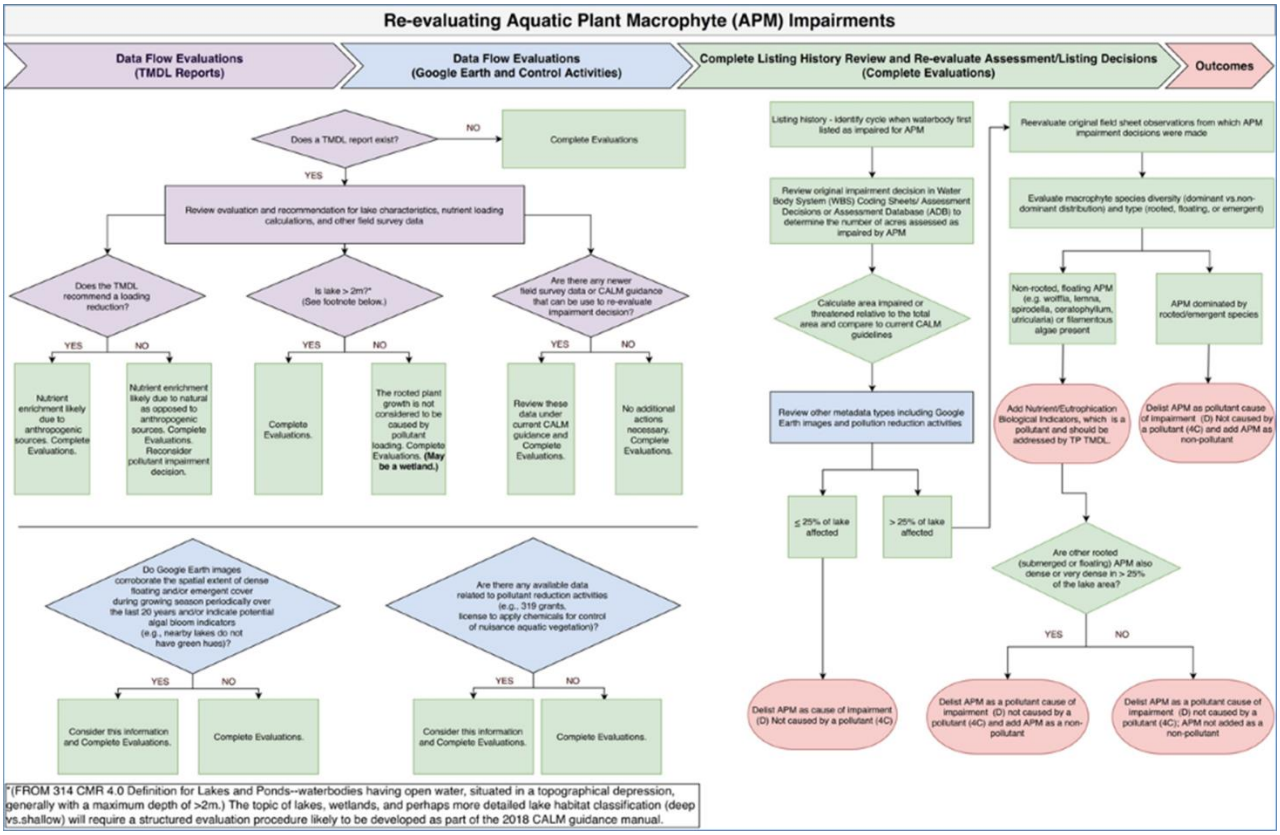
The Aesthetics Use for Hager Pond will continue to be assessed as Not Supporting. Hager Pond has infestations of the non-native aquatic macrophytes, *Potamogeton crispus* and *Trapa natans* (the latter was recently reported in 2014). Review of Google Earth images indicates that roughly 40-50% of the pond was covered with plant growth as recently as summer 2014. The algae and turbidity impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators (see Removal Comment section for rationale).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Applicable WQS attained, according to new assessment method	Hager Pond was originally listed as impaired for "Noxious Aquatic Plants" in 1992 because half of the pond was covered in an algal and duckweed mat (Wolffia sp. was also present). Total phosphorus was also historically elevated. Subsequent review of Google Earth images indicates that roughly 40-50% of the pond was covered with plant growth as recently as summer 2014. Therefore, the impaired status remains, but the Aquatic Plants (Macrophytes) cause is being delisted and replaced with the Nutrient/Eutrophication Biological Indicators cause. Please note that while the maximum depth of Hager Pond is recorded as 6 feet (~1.8 m), the average depth is 2.5 feet (~0.8 m), according to bathymetry records. The status of this pond may be revisited when a more detailed lake habitat classification (deep vs. shallow) is developed as part of a future CALM guidance manual.
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus) and "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Aquatic Plants (Macrophytes)

MassDEP analysts conducted a stepwise review process for the Aquatic Plant (Macrophytes) impairments. This reevaluation (see below) was developed by DWM analysts to consider multiple sources of information, including but not limited to Google Earth satellite imagery (often available for various months/years ranging from the mid-1990s through current time), herbicide application records, historical information on maximum lake depth, DEP water quality monitoring data, and 319 grant activities, leading to an outcome of 1) APM being delisted as a pollutant and relisted as a non-pollutant, 2) APM being delisted due to historical errors in the original listing or reapplication of current assessment methodology on whatever data are available (including original data utilized for an impairment listing if they are the only data available), or 3) APM being delisted as a pollutant to be replaced with a listing of impaired due to Nutrient/Eutrophication Biological Indicators (a pollutant). As part of the reevaluation process, those lakes experiencing dense/very dense plant coverage >25% of the lake area by filamentous algae, algal blooms, or aquatic macrophyte species that utilize nutrients directly from the water column (e.g,. non-rooted floating species including *Lemna*, *Wolfia*, *Spirodella*, *Ceratophyllum*, *Utricularia*) should be reassessed as impaired using the pollutant code "Nutrient/Eutrophication Biological Indicators". This reclassification would place these lakes in Category 5 until a Total Phosphorus TMDL is developed and allow MassDEP to better prioritize TMDL development for lakes where nutrient reduction efforts should result in restoration, as opposed to requiring TMDLs for waterbodies where naturally occurring shallow areas are conducive to aquatic macrophyte growth.



Therefore, the impaired status of Hager Pond remains, but the “Aquatic Plants (Macrophytes)” impairment is being delisted and replaced with the “Nutrient/Eutrophication Biological Indicators” impairment.

Google Earth Images (July 2007, July 2008, August 2013, September 2014) for Hager Pond (Google Earth Pro Undated)

Non-Native Aquatic Plants

An infestation of the non-native *Potamogeton crispus* was identified in the ENSR impact evaluation of elevated nutrients in Hop Brook (ENSR International 2000).

Trapa natans was observed in Hager Pond during a 2014 survey of the Concord basin sponsored by SuAsCo CISMA (and conducted by OARS) (SuAsCo CISMA 2016, OARS 2017).

The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophytes “Curly-leaf Pondweed” (*Potamogeton crispus*) and “Water chestnut” (*Trapa natans*).

Heard Pond (MA82058)

Location:	Wayland.
AU Type:	FRESHWATER LAKE
AU Size:	76 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Eurasian Water Milfoil, Myriophyllum Spicatum*)		Added
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
The Aquatic Life Use for Heard Pond is assessed as Not Supporting due to infestations of the non-native aquatic macrophytes, *Myriophyllum spicatum, Trapa natans,* and *Cabomba caroliniana*. Without any new data the impairment for Algae is being carried forward.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (Potamogeton crispus) and "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophytes *Myriophyllum spicatum* and *Trapa natans* were identified in Heard Pond during the WPP 1996 synoptic survey (MassDEP 1996). Additionally, an infestation of *Cabomba caroliniana* was found during the 2001 Baseline Lakes Survey (Mattson, PhD and Haque 2004).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophytes "Curly-leaf Pondweed" (*Potamogeton crispus*) and "Water chestnut" (*Trapa natans*).

Heart Pond (MA82059)

Location:	Chelmsford/Westford.
AU Type:	FRESHWATER LAKE
AU Size:	94 ACRES
Classification/Qualifier:	B

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Mercury in Fish Tissue		Added
5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

In 2017, WPP staff identified the non-natives *Trapa natans* (water chestnut) and *Corbicula fluminea* (Asian clam) in Heart Pond.

The Aquatic Life Use of Heart Pond is assessed as Not Supporting because of the presence of the non-native species *Trapa natans* and *Corbicula fluminea*.

Fish Consumption Use: Not Supporting

MassDEP biologists conducted fish toxics sampling at Heart Pond in May 2017 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in largemouth bass fillets, MassDPH issued the following fish consumption advisories:

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

Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Heart Pond (MA82059) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition. Data Source: (MassDPH 2019)

Hocomonco Pond (MA82060)

Location:	Westborough.
AU Type:	FRESHWATER LAKE
AU Size:	27 ACRES
Classification/Qualifier:	B

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

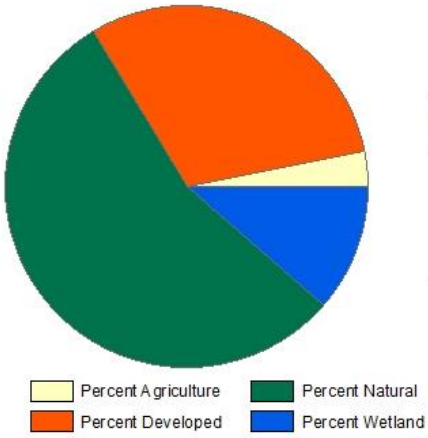
Fish, other Aquatic Life and Wildlife Use: Not Supporting
Because of the presence of the non-native aquatic macrophyte, *Myriophyllum spicatum*, the *Aquatic Life Use* is assessed as not supporting for Hocomonco Pond.

Hop Brook (MA82A-05)

Location:	Headwaters, outlet Carding Mill Pond, Sudbury to confluence with Allowance Brook, Sudbury (through former 2014 segment: Stearns Mill Pond MA82104) (prior to 1987, USGS topographic quadrangles depicted Allowance Brook as Landham Brook) (prior to 1998 this segment included waters between Marlborough East WWTP and Carding Mill Pond outlet).
AU Type:	RIVER
AU Size:	6.7 MILES
Classification/Qualifier:	B: WWF

Hop Brook - MA82A-05

Watershed Area: 15.58 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	15.58	7.69	3.9	2.12
Agriculture	3.1%	4.4%	4.1%	6.3%
Developed	30.5%	36.7%	22.9%	24.2%
Natural	55.1%	48.3%	51.7%	48.5%
Wetland	11.4%	10.6%	21.3%	21%
Impervious Cover	11.6%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Aquatic Plants (Macrophytes)		Removed
5	5	Benthic Macroinvertebrates		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Nutrient/Eutrophication Biological Indicators		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

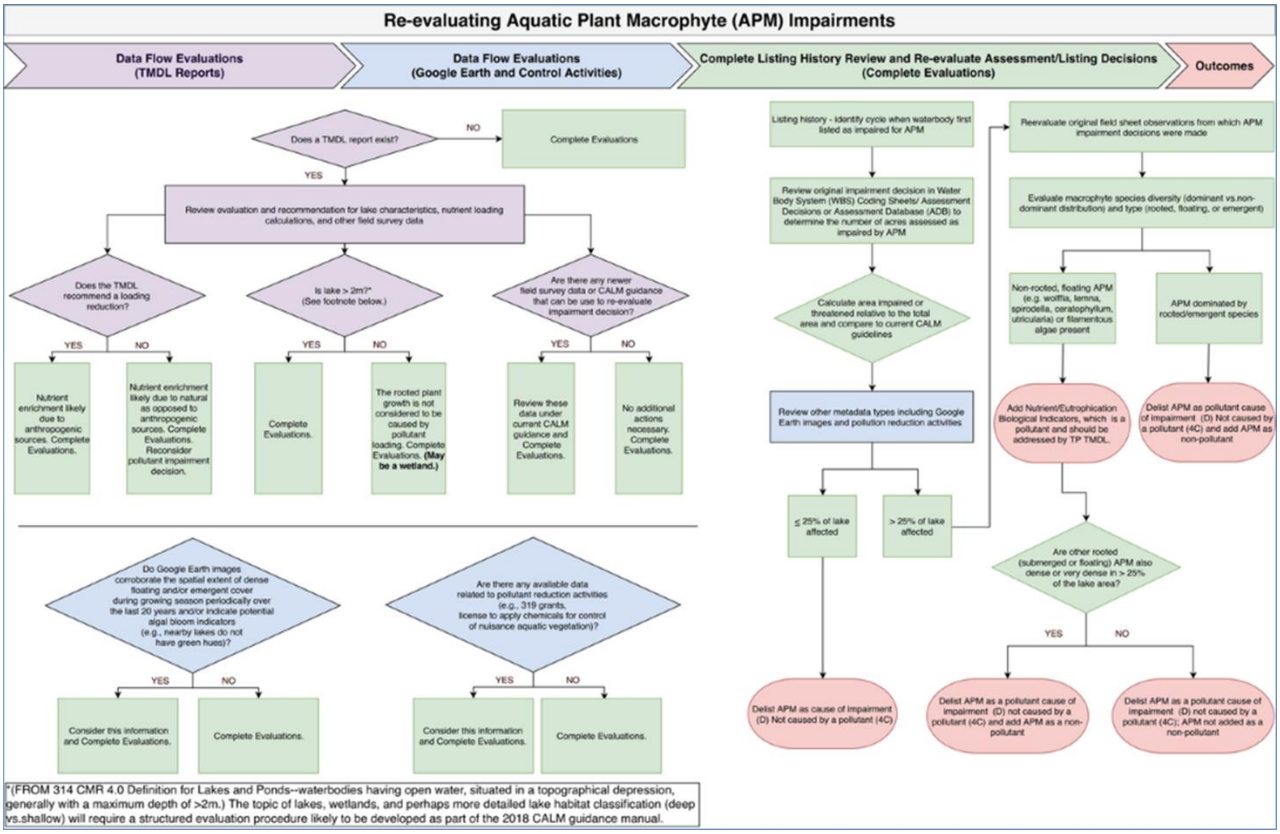
There is an infestation of the non-native aquatic macrophyte, *Trapa natans*, in the Stearns Mill Pond impoundment of this Hop Brook AU (MA82A-05). DFG and MassDEP biologists conducted fish population surveys at 5 different sites along the brook in Sudbury between 2006 and 2011: near Oak Hill Road (2156), East of Blueberry Hill Lane off Peakham Rd (1665), 0.5 mi downstream from Peakham Rd (4570), near Station Rd (2160), and downstream from Rt 20 @ Mill Villages (3649). Although not all the surveys had satisfactory sampling efficiency, at least one fluvial species was present in all of the samples and moderately tolerant species comprised the majority of the samples. OARS volunteers collected water quality data several times in 2012 and 2013 at site HBS-065 (in the riverine portion of Hop Brook between Carding Mill Pond and Stearns Mill Pond). With the exception of one of two samples with a slightly elevation total phosphorus concentration (>0.1 mg/L), their data for water temperature, pH, dissolved oxygen, total suspended solids, and ammonia were indicative of good water quality. Benthic macroinvertebrate sampling was conducted downstream of Peakham Road in Sudbury (B0691) in July 2010. The RBPIII analysis determined the site was moderately impaired (48% comparability) in comparison with the Elizabeth Brook reference location. DEP staff also conducted water quality monitoring at this location (W2136) in the summer of 2010. With the exception of elevated total phosphorus (average TP concentration 0.11 mg/L, n=5) water quality data were also indicative of good conditions (max water temperature 28.2°C, min DO 5.81mg/L, maximum diel DO shift 2.5 mg/L, good pH, no exceedances of acute criteria for ammonia or acute/chronic criteria for metals).
The Aquatic Life Use of this Hop Brook AU (MA82A-05) is assessed as Not Supporting. New for this reporting cycle, the AU is considered Not Supporting for Benthic-Macroinvertebrate Bioassessments. Many of the historical impairment causes remain, but Aquatic Plants (Macrophytes) is being delisted and replaced with Nutrient/Eutrophication Biological Indicators and the generic Non-Native Aquatic Plants is being replaced with the specific macrophyte "Water chestnut" (*Trapa natans*) (see Removal Comment section for rationale). Although data collected in 2010 at DEP site W2136 indicate improved conditions, Dissolved oxygen supersaturation and dissolved oxygen are being carried forward until more recent data are collected to confirm the appropriateness of delisting.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Applicable WQS attained, according to new assessment method	Hop Brook MA82A-05 was originally listed as impaired for "Noxious Aquatic Plants" in the 1992 reporting cycle. There are no details in the 1992 303(d) coding sheet regarding the presence of aquatic macrophytes, but the upstream assessment units (Carding Mill Pond MA82015, Unnamed Tributary MA82A-17, Grist Mill Pond MA82055) have had problems with excessive algae. Total phosphorus data described in the 1992 coding sheet were quite elevated (0.2-0.55 mg/L), and although it has decreased substantially over time, MassDEP data from 2010 (site W2136) indicates that it still remains somewhat elevated (with a seasonal average of 0.11 mg/L). Considering all this information, the impaired status remains, but the Aquatic Plants (Macrophytes) cause is being delisted and replaced with the more appropriate Nutrient/Eutrophication Biological Indicators impairment cause.
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

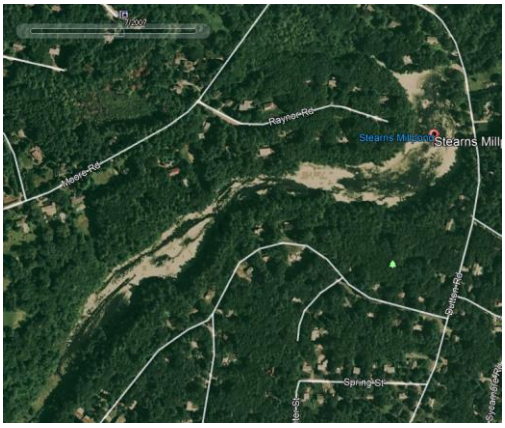
Aquatic Plants (Macrophytes)

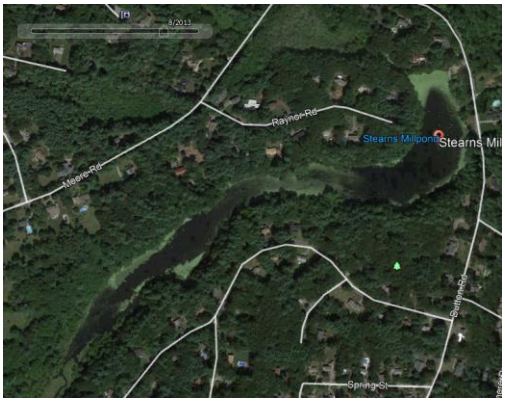
The impaired status of this Hop Brook AU (MA82A-05) remains, but the "Aquatic Plants (Macrophytes)" impairment is being delisted and replaced with the more appropriate "Nutrient/Eutrophication Biological Indicators" based on similar conditions in upstream assessment units (Carding Mill Pond MA82015, Unnamed Tributary MA82A-17, Grist Mill Pond MA82055). This is part of the MassDEP analysts stepwise review process for the Aquatic Plant (Macrophytes) impairments. This reevaluation (see below) was developed by DWM analysts to consider multiple sources of information, including but not limited to Google Earth satellite imagery (often available for various months/years ranging from the mid-1990s through current time), herbicide application records, historical information on maximum lake depth, DEP water quality monitoring data, and 319 grant activities, leading to an outcome of 1) APM being delisted as a pollutant and relisted as a non-pollutant, 2) APM being delisted due to historical errors in the original listing or reapplication of current assessment methodology on whatever data are available (including original data utilized for an impairment listing if they are the only data available), or 3) APM being delisted as a pollutant to be replaced with a listing of impaired due to Nutrient/Eutrophication Biological Indicators (a pollutant).



Google Earth images (August 2013, September 2014, June 2015) from Hop Brook about a ¼ mile (as the crow flies, not river miles) downstream of Carding Mill Pond, Sudbury (Google Earth Pro Undated)

Google Earth Images (July 2007, August 2013, September 2014, June 2015) from Run-of-river Impoundment of Hop Brook Called Stearns Mill Pond (Google Earth Pro Undated):


Rayner Rd
Stearns Millpond
Meade Rd
Spring St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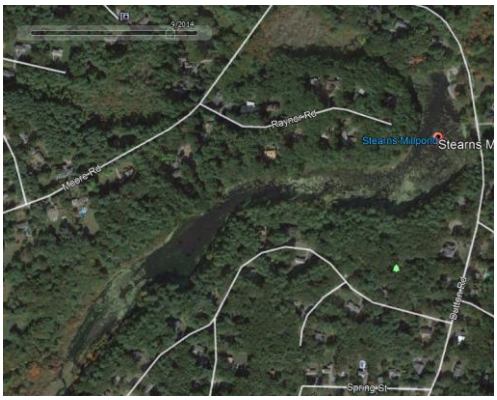
Stearns Millpond
Meade Rd
Spring St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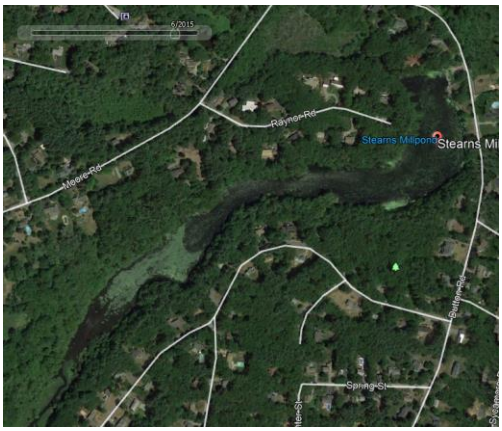
Meade Rd
Spring St


Rayner Rd
Stearns Millpond
Meade Rd
Spring St

Non-Native Aquatic Plants

An infestation of the non-native, *Trapa natans*, was identified in Stearns Mill Pond (now part of Hop Brook MA82A-05) in the ENSR impact evaluation of elevated nutrients in Hop Brook (ENSR International 2000).

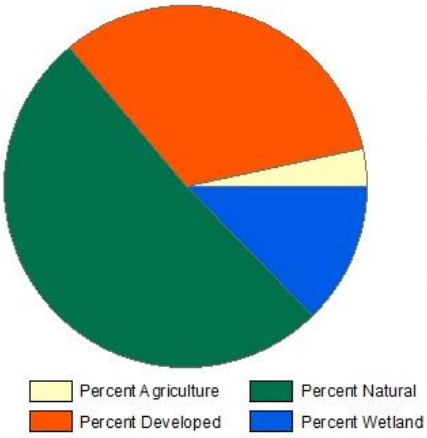
The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “Water chestnut” (*Trapa natans*).

Hop Brook (MA82A-06)

Location:	From the confluence of Allowance Brook, Sudbury to mouth at confluence with the Sudbury River, Wayland (MA82A-06 changed from Wash Brook to Hop Brook in 2006: prior to 1987 USGS topographic quadrangles depicted this stretch of river as Wash Brook and Allowance Brook as Landham Brook).
AU Type:	RIVER
AU Size:	3 MILES
Classification/Qualifier:	B: WWF

Hop Brook - MA82A-06

Watershed Area: 22.03 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	22.03	5.44	5.61	1.61
Agriculture	3.4%	6.4%	4.8%	8%
Developed	32.7%	41.8%	22.6%	19.3%
Natural	51.4%	33.4%	46.7%	32.4%
Wetland	12.6%	18.4%	25.9%	40.4%
Impervious Cover	11.9%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
DEP staff conducted water quality monitoring in Hop Brook at the Landham Road bridge in Sudbury (W0849) during the summer 2006. Three of four 2-day dissolved oxygen probe deploys recorded maximum diel shifts >3 mg/L and the daily mean minimum D.O. concentrations were well under 4 mg/L for all deploys but the maximum saturation was only 82%. This is a low gradient reach of the brook heavily influenced by wetlands and potentially beaver activity. Attended probes measurements for water temperature and pH were indicative of good water quality, but 5 of 13 D.O. measurements were <4 mg/L. Ammonia and total phosphorus sample data were also indicative of good conditions (maximum ammonia-nitrogen 0.07mg/L and average total phosphorus 0.065 mg/L). The presence of *Potamogeton* sp. during two of the surveys in 2006 was noted but species confirmation is needed. OARS volunteers also collected water quality data at this same location (their station HBS-016) generally 5 times per year from 2009-2017. OARS data (temperature, pH, TSS, ammonia) were generally indicative of good water quality. However, the majority of dissolved oxygen measurements were <4 mg/L each year and there were usually 1-2 instances per year of total phosphorus exceeding 0.1 mg/L. OARS also collected chlorophyll *a* data several times a year, in 2010 and 2013-2017and while the maximum chlorophyll *a* concentration was high (28.4µg/L) most were <10µg/L. Although this Hop Brook AU (MA82A-06) is a low gradient stream surrounded by wetlands and low dissolved oxygen concentrations may result in part from natural conditions, because of the presence of the Marlborough Easterly WWTP discharge upstream of this Hop Brook AU, human influences cannot be ruled out. Therefore,

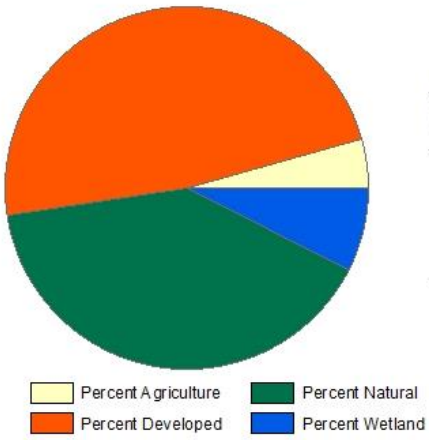
the Aquatic Life Use will continue to be assessed as Not Supporting due to low dissolved oxygen and total phosphorus impairments.

Hop Brook (MA82B-20)

Location:	Outlet Smith Pond, Northborough to mouth at confluence with the Assabet River, Northborough.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B

Hop Brook - MA82B-20

Watershed Area: 7.85 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.85	6.61	2.6	2.35
Agriculture	4.4%	5%	6%	6.7%
Developed	48%	42.7%	34.6%	31.9%
Natural	40.2%	43.8%	45.9%	47.5%
Wetland	7.5%	8.4%	13.5%	14%
Impervious Cover	17.1%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
OARS collected water quality data (temperature, pH, dissolved oxygen, ammonia) at site HOP-011 6-8 times per year from 2009-2017. These data were generally indicative of good water quality. Total Phosphorus data were also collected 6-7 times per year from 2009-2017. There were a number of instances of total phosphorus data exceeding 0.1 mg/L; however, there were none after 2014, and the average phosphorus appeared to decrease over the sampling period. Although the OARS site is located at the upstream end of the AU, the Aquatic Life Use for Hop Brook (MA82B-20) is assessed as fully supporting based on OARS water quality data collected over nine years. The Alert Status for low dissolved oxygen is removed, as 56 of 57 OARS measurements were >4 mg/L (and the great majority were >5 mg/L). With no new benthic macroinvertebrate data available the prior alert, due to "some indications of water quality degradation" (O'Brien-Clayton 2005) in the 2001 benthic survey, is maintained.

Hopkinton Reservoir (MA82061)

Location:	Hopkinton/Ashland.
AU Type:	FRESHWATER LAKE
AU Size:	161 ACRES
Classification/Qualifier:	B

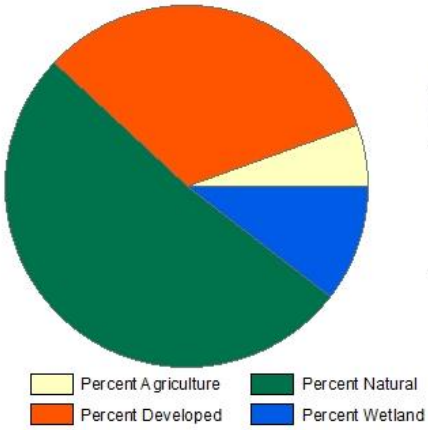
Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
There have been multiple reports of the non-native aquatic macrophyte *Myriophyllum heterophyllum* in Hopkinton Reservoir. A depth profile was taken at the deep hole (W1300) in August 2005. Chlorophyll *a* (2.5µg/L) and total phosphorus (≤0.013mg/L) data were low and indicative of good water quality. Although the dissolved oxygen and pH data were all qualified, the data do support the prior impairment decision due to low dissolved oxygen. Dissolved oxygen fell below 5 mg/L between 2.5 and 3.5 m in depth. Bathymetry data indicate that the area of the reservoir at 3 m in depth encompasses roughly 81% of the area at the surface. sLow pH was documented at depths below 2.5m (5.6 to 5.8SU) however these data were all qualified so an Alert is being identified. The Aquatic Life Use of Hopkinton Reservoir is assessed as Not Supporting due to the presence of the non-native aquatic macrophyte species *Myriophyllum heterophyllum* and low dissolved oxygen.

HOWARD BROOK (MA82B-26)

Location:	Headwaters, perennial portion east of Green Street, Northborough to mouth at confluence with Assabet River, Northborough.
AU Type:	RIVER
AU Size:	3.5 MILES
Classification/Qualifier:	B

HOWARD BROOK - MA82B-26

Watershed Area: 9.70 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	9.70	9.70	3.25	3.25
Agriculture	5.5%	5.5%	5.4%	5.4%
Developed	32.5%	32.5%	26.4%	26.4%
Natural	51.6%	51.6%	46.3%	46.3%
Wetland	10.4%	10.4%	21.9%	21.9%
Impervious Cover	11.9%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

DFG biologists conducted backpack electrofishing in the upper part of Howard Brook upstream from Green Street in Northborough (Sample ID 4955) in August 2013. Sampling duration was limited (142 seconds schocked) but they were able to locate 2 wild Eastern brook trout.

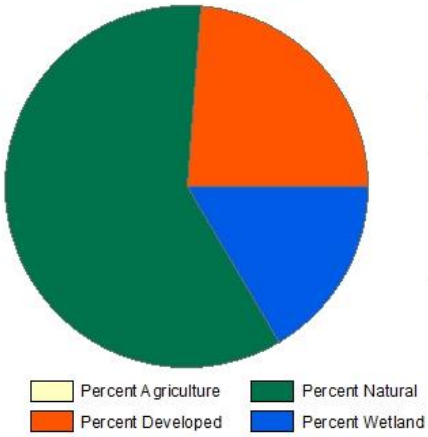
There is Insufficient Information to assess the Aquatic Life Use for Howard Brook due to the limited nature of the DFG fish survey and the location of the site in the upper part of the watershed. A recommendation for further sampling will be made.

Indian Brook (MA82A-23)

Location:	Headwaters, outlet Icehouse Pond, Hopkinton to the inlet of Hopkinton Reservoir, Hopkinton (formerly part of 2004 segment: Indian Brook MA82A-12).
AU Type:	RIVER
AU Size:	2.3 MILES
Classification/Qualifier:	B

Indian Brook - MA82A-23

Watershed Area: 5.23 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.23	4.99	2	1.84
Agriculture	0.3%	0.3%	0.1%	0.1%
Developed	23.7%	22.8%	16.4%	15.1%
Natural	59.6%	60%	57.9%	57.9%
Wetland	16.4%	16.9%	25.6%	26.9%
Impervious Cover	10.1%			

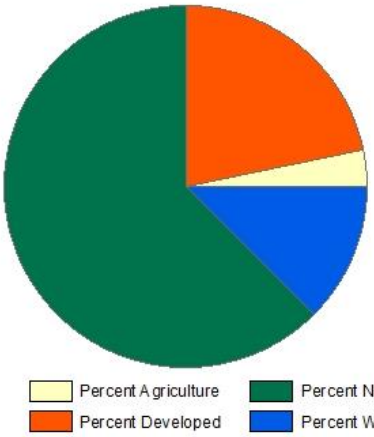
Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in Indian Brook near the Duck Pond Trail Crossing behind Hopkinton State Park in Hopkinton (Sample ID 1014) in August 2004. The sample in this low gradient reach was comprised of macrohabitat generalist species and dominated by species moderately tolerant to pollution. The Aquatic Life Use for this Indian Brook AU (MA82A-23) is assessed as fully supporting based on the fish sampling data.

Indian Brook (MA82A-24)

Location:	Outlet of Hopkinton Reservoir, Ashland to mouth at confluence with the Sudbury River, Ashland (formerly part of 2004 segment: Indian Brook MA82A-12).
AU Type:	RIVER
AU Size:	1.7 MILES
Classification/Qualifier:	B

Indian Brook - MA82A-24

Watershed Area: 7.84 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.84	4.62	2.72	1.17
Agriculture	3.2%	5.2%	0.3%	0.5%
Developed	21.8%	17.5%	16.6%	11.5%
Natural	62.6%	65.5%	61.9%	64.1%
Wetland	12.5%	11.8%	21.2%	23.9%
Impervious Cover	9.6%			

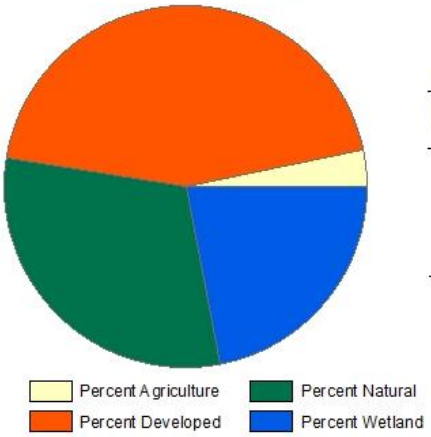
Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing at two sites along this Indian Brook AU (MA82A-24) in August 2004; downstream from Howe Street (SampleID 1015) and ~one quarter mile downstream from Cross Street in Ashland (SampleID 1108). The samples both contained at least one fluvial dependant species as well as multiple moderately tolerant macrohabitat generalists. The downstream site was also dominated by a fluvial specialist species. The Aquatic Life Use of this Indian Brook AU (MA82A-24) is assessed as fully supporting based on the fish sampling data.

Jackstraw Brook (MA82A-28)

Location:	From the most downstream crossing of Upton Road (first crossing south of Hopkinton Road), Westborough to mouth at inlet of Cedar Swamp Pond, Westborough.
AU Type:	RIVER
AU Size:	1.5 MILES
Classification/Qualifier:	B: ORW

Jackstraw Brook - MA82A-28

Watershed Area: 6.62 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.61	6.42	2.49	2.41
Agriculture	3.2%	3.1%	3.1%	3%
Developed	44.3%	44.7%	37.1%	37.7%
Natural	30.6%	29.9%	30.5%	29.5%
Wetland	21.9%	22.2%	29.3%	29.7%
Impervious Cover	18.9%			

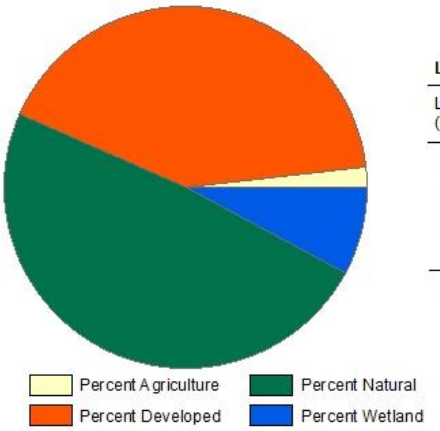
Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
DFG biologists conducted backpack electrofishing in the upper portion of this Jackstraw Brook AU downstream from Upton Road in Westborough (Sample ID 125) in July 2000. The sampling documented the presence of a reproducing Eastern brook trout population as well as other macrohabitat generalist species that were either intolerant or moderately tolerant to pollution. Given the elapsed time since the fish community sample and the fact that the Zone II Wellhead Protection Area for two Town of Westborough drinking water wells includes a large portion of the watershed, there is currently insufficient information to assess the Aquatic Life Use for this Jackstraw Brook AU (MA82A-28). This use is being identified with an Alert Status because of the potential for withdrawal impacts on streamflow as noted in the upstream Jackstraw Brook AU.

JACKSTRAW BROOK (MA82A-32)

Location:	Headwaters, perennial portion west of Upton Road, Westborough to the most downstream crossing of Upton Road (first crossing south of Hopkinton Road), Westborough.
AU Type:	RIVER
AU Size:	0.4 MILES
Classification/Qualifier:	B: ORW, CWF

JACKSTRAW BROOK - MA82A-32

Watershed Area: 1.41 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.41	1.41	0.63	0.63
Agriculture	1.8%	1.8%	1.5%	1.5%
Developed	41.6%	41.6%	33.8%	33.8%
Natural	48.8%	48.8%	51.5%	51.5%
Wetland	7.8%	7.8%	13.2%	13.2%
Impervious Cover	13.1%			

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

DFG biologists conducted backpack electrofishing in Jackstraw Brook upstream of Upton Road (Sample ID 1013) and further downstream near the second Upton Road crossing in Westborough (Sample ID 1019) in August 2004. Both samples were found to contain Eastern brook trout –only upstream site had young of year and notes were made that stream was dry for ~40m downstream from a pumphouse. The sampling location slightly further downstream also contained wild eastern brook trout as well as intolerant and moderately tolerant macrohabitat generalist species.

The Aquatic Life Use for this Jackstraw Brook AU (MA82A-32) is assessed as Fully Supporting based on the presence of a reproducing Eastern brook trout population documented by DFG biologisits in August 2004. This use is being identified with an Alert because of the notes made of a dry streambed below a water supply pumphouse.

Lake Cochituate (MA82020)

Location:	[North Basin] Natick/Framingham/Wayland.
AU Type:	FRESHWATER LAKE
AU Size:	196 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The North Basin of Lake Cochituate has an infestation of the non-native aquatic macrophyte *Myriophyllum spicatum* and a potential infestation of *Potamogeton crispus*. With no water quality data available for this reporting cycle, the Aquatic Life Use remains Not Supporting due to dissolved oxygen, and also due to the presence of the non-native *Myriophyllum spicatum*. An Alert will be issued for a potential infestation of *Potamogeton crispus*.

Lake Cochituate (MA82125)

Location:	[Middle Basin] Natick/Wayland.
AU Type:	FRESHWATER LAKE
AU Size:	134 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	(Non-Native Fish/Shellfish/Zooplankton*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Middle Basin of Lake Cochituate has infestations of the non-native aquatic macrophytes, *Myriophyllum spicatum*, *Potamogeton crispus*, and *Myriophyllum heterophyllum*. Additionally, the Asian clam (*Corbicula fluminea*) has been documented. Several chlorophyll *a* samples were collected by MassDEP staff at the deep hole (site W1090) in 2003 and 2005 which were all <16 µg/L. A depth profile was conducted at site W1090 in September 2005. Water temperature measurements were all less than 25°C. pH ranged from 6.2-8.3SU. Dissolved oxygen dropped below 5 mg/L between 5.6-6.5 m in depth. Bathymetry data indicates that the area of the Middle Basin at 6.1 meters in depth encompasses roughly 63% of the surface area of the lake. Two total phosphorus samples were collected at the surface of the lake and one near the bottom during the September 2005 survey. The surface samples were both less than or equal to 0.01 mg/L, while the near bottom sample was 1.9 mg/L. For this sample, it is possible that the collection device disturbed the sediments, and there is also evidence that phosphorus can be released from anoxic sediments. The Aquatic Life Use for the Middle Basin of Lake Cochituate is assessed as not supporting due to non-native aquatic macrophytes *Myriophyllum spicatum*, *Potamogeton crispus*, and *Myriophyllum heterophyllum*, with a new impairment added for non-native invertebrates. Dissolved oxygen continues to be assessed as Not Supporting since the depth at which D.O. drops below 5.0 mg/L encompasses roughly 63% of the surface area.

Lake Cochituate (MA82126)

Location:	[Carling Basin] Natick.
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	5	(Curly-leaf Pondweed*)		Added
5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
5	5	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Aquatic Life Use of the Carling Basin of Lake Cochituate is assessed as Not Support based on the presence or presumed presence of multiple non-native aquatic macrophyte species (*Trapa natans, Myriophyllum spicatum*, *Myriophyllum heterophyllum*, and *Potamogeton crispus*), as well as the non-native Asian clam *Corbicula fluminea.*

Lake Cochituate (MA82127)

Location:	[South Basin] Natick.
AU Type:	FRESHWATER LAKE
AU Size:	239 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	(Water Chestnut*)		Added

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

The Aquatic Life Use of the South Basin of Lake Cochituate is assessed as Not Supporting due to the continuing presence of the non-native aquatic macrophytes, *Myriophyllum spicatum*, *Myriophyllum heterophyllum*, *Potamogeton crispus*, and *Trapa natans*. An alert is issued for a potential infestation of the non-native aquatic macrophyte, *Egeria densa*, which needs to be confirmed. With no new water quality data this period, the impairment due to dissolved oxygen is being also being maintained. It should also be noted that the Natick Laboratory Army Research, Development, and Engineering Center is currently on the EPA National Priority List (Superfund Site) and is undergoing remediation. The site, located on a peninsula on the eastern shore of the South Basin of Lake Cochituate, has VOC, heavy metal, petroleum, organic compound, and chlorinated solvent contamination in soil and groundwater… the ecological risks due to contaminated sediments associated with the facility are "negligible for bird and mammal species" (U.S. Army Corps of Engineers 2012). However, there is "a probability of risk to the benthic community and a potential for aquatic food chain exposures to occur in the sediments, but no unacceptable risk for exposures to the surface water. Concentrations of chemicals of ecological concern in fish and in the sediment-based aquatic food chain do not pose unacceptable risk to wildlife" (EPA 2018).

Learned Pond (MA82069)

Location:	Framingham.
AU Type:	FRESHWATER LAKE
AU Size:	34 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use for Learned Pond is not assessed.

Little Chauncy Pond (MA82070)

Location:	Northborough.
AU Type:	FRESHWATER LAKE
AU Size:	43 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

During the WPP 1996 synoptic survey, the non-native aquatic macrophytes *Myriophyllum heterophyllum* and *Potamogeton crispus* were found in Little Chauncy Pond. Therefore, the Aquatic Life Use for Little Chauncy Pond is assessed as Not Supporting due to the presence of non-native species.

Fish Consumption Use: Not Supporting

MassDEP biologists conducted fish toxics sampling at Little Chauncy Pond in May 2017 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in black crappie and largemouth bass fillets, MassDPH (2019) issued the following fish consumption advisories:

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

Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Little Chauncy Pond (MA82070) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition. Data Source: (MassDPH 2019)

Long Pond (MA82072)

Location:	Littleton.
AU Type:	FRESHWATER LAKE
AU Size:	102 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
According to the MassDEP Herbicide Database (MassDEP 2017), the Town of Littleton has applied treatments to Long Pond every year from 2005-2016 to treat various aquatic macrophytes, including the non-natives *Myriophyllum heterophyllum*, *Potamogeton crispus*, and *Cabomba caroliniana*. The presence of these species needs confirmation, so an alert is being assigned. With no other data available during this reporting cycle, the Aquatic Life Use for Long Pond remains Not Supporting due to historical impairments.

Meadow Pond (MA82129)

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

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	3	(Non-Native Aquatic Plants*)		Removed

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
Meadow Pond was erroneously listed in 2002 as Not Supporting due to the presence of the non-native aquatic macrophyte Trapa natans. MassDCR has recently indicated that there is no record of T. natans in Meadow Pond. Therefore, the impairment for Non-Native Aquatic Plants is being removed. There is insufficient information to assess the Aquatic Life Use of Meadow Pond.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Data and/or information lacking to determine WQ status; original basis for listing was incorrect	Meadow Pond was erroneously listed in 2002 as Not Supporting due to the presence of the non-native aquatic macrophyte Trapa natans. MassDCR has recently indicated that there is no record of T. natans in Meadow Pond. Therefore, the impairment listing of Meadow Pond for Non-Native Aquatic Plants is removed.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The last Water Quality Assessment Report (O'Brien-Clayton 2005) indicated MassDCR had documented the non-native aquatic macrophyte, *Trapa natans*, in Meadow Pond. Upon an attempt to confirm this, MassDCR actually has no such record (Straub October 10, 2018).

Since MassDCR has recently indicated that there is no record of *T. natans* in Meadow Pond the "Non-Native Aquatic Plants" impairment is being removed since the original basis for listing was an error.

Milham Reservoir (MA82077)

Location:	Marlborough.
AU Type:	FRESHWATER LAKE
AU Size:	67 ACRES
Classification/Qualifier:	A: PWS, ORW

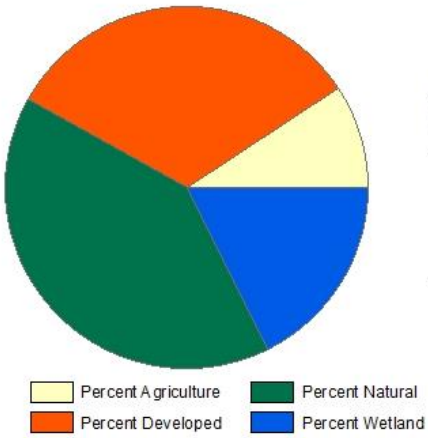
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of Milham Reservoir is Not Assessed.

Mill Brook (MA82A-20)

Location:	Headwaters, outlet Crosby Pond, Concord to mouth at confluence with the Concord River, Concord.
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B

Mill Brook - MA82A-20

Watershed Area: 3.37 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.27	3.27	0.81	0.81
Agriculture	9.2%	9.2%	10.1%	10.1%
Developed	32.7%	32.7%	21.6%	21.6%
Natural	40.5%	40.5%	30.3%	30.3%
Wetland	17.6%	17.6%	37.9%	37.9%
Impervious Cover	10.8%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
DFG biologists conducted backpack electrofishing at two sites along Mill Brook in Concord in July 2008. The upstream sampling site was downstream from Hawthorne Lane (Sample ID 2507) and the downstream location was near Heywood Street (Sample ID 2508). Although both sites in this low gradient brook were dominated by moderately tolerant macrohabitat generalist species, the total number of individuals collected was small for both samples. It is best professional judgement that there is Insufficient Information to assess the Aquatic Life Use of Mill Brook so the habitat impairment is being carried forward as are the former alert status issues due to the low numbers of fish and the presence of water withdrawals in this small drainage area.

Nagog Pond (MA82082)

Location:	Littleton/Acton.
AU Type:	FRESHWATER LAKE
AU Size:	278 ACRES
Classification/Qualifier:	A: PWS, ORW

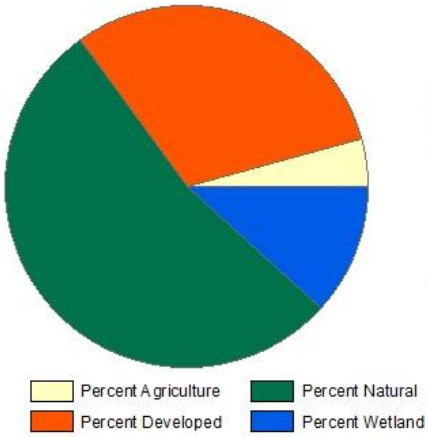
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of Nagog Pond is Not Assessed.

Nashoba Brook (MA82B-14)

Location:	From source just south of Route 110, Westford to mouth at confluence with Fort Pond Brook, Concord (through former 2014 segment: Ice House Pond MA82066).
AU Type:	RIVER
AU Size:	9.4 MILES
Classification/Qualifier:	B

Nashoba Brook - MA82B-14

Watershed Area: 21.11 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	21.1	6.97	6.66	2.18
Agriculture	4.2%	2.6%	4.6%	2.6%
Developed	30.8%	34.4%	21.3%	25.1%
Natural	53.3%	52.2%	50.5%	50.8%
Wetland	11.7%	10.8%	23.6%	21.5%
Impervious Cover	11.8%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Water quality monitoring has been conducted in Nashoba Brook at several stations from upstream to downstream as follows: near the footbridge at the USGS staff gage #01097300 near Wheeler Lane in Acton (OARS site NSH-047 and MassDEP SMART monitoring site W0698), upstream of the Rte 2A/199 bridge in Acton (MassDEP B0682, fish Sample ID 4562 and W2133) and upstream from Brook Street in Acton (DFG fish sampleID 1672). At the most upstream sampling site both the OARS (6-7 times per year from 2009-2017), and the MassDEP SMART (3-6 times per year from 2005-2013) data were generally indicative of good water quality (water temperature, pH, dissolved oxygen, total suspended solids, ammonia, phosphorus). Further downstream between the railroad crossing and Rt 2A/119 bridge, MassDEP biologists conducted benthic macroinvertebrate (B0682) and backpack electrofishing (Sample ID 4562) in July and August 2010, respectively. The RBP III analysis of the benthic macroinvertebrate community was determined to be Slightly Impaired (57% comparability) in comparison to the Elizabeth Brook reference site. The fish sample in this low gradient stream was dominated by two fluvial species and was well represented by intolerant and moderately tolerant species. Water quality data were also collected here during the summer of 2010 (W2133). Field sheets indicate that the stream was braided in this reach. The short-term temperature/DO probe was deployed in the larger braid in July, but inadvertently deployed in the smaller braid (which nearly dried up over the course of the summer) in August so the August deploy data will be excluded from the assessment decision. Elevated temperatures, however, were documented during both July and August 2010 from a thermistor deployed in the brook from May to September 2010 with exceedances of the 7DADM occurring 27 times during that period. Even excluding elevated temperatures in August (the Drought Management Taskforce issued a Drought Advisory during that period of time) elevated temperatures exceeded the 7DADM 13 times in July. The maximum temperature recorded was 32.1°C. The other water quality data however were generally indicative of good conditions (minimum DO 4.9mg/L, maximum diel shift 2.23mg/L, maximum saturation 92%, ammonia-nitrogen concentrations ≤0.08mg/L, seasonal average total phosphorus = 0.051mg/L, and with the exception of one chronic lead exceedance no violations of any acute or chronic metals criteria). Long term trend analysis (2000-2013) of total phosphorus concentrations at the two MassDEP monitoring station data showed a statistically significant downward trend ($p = 0.02$) for year-round data, but no statistically significant trend for seasonal data (May – September) analyzed over the same period. DFG biologists conducted backpack electrofishing at one site upstream from Brook Street in Acton in (Sample ID 1672) in July 2006. An intolerant fluvial specialist species was well represented in this sample. It should be noted that Concord and Acton WMA water withdrawals in this AU continue, with the Acton Zone II Wellhead Protection Areas located along the brook. The Aquatic Life Use of Nashoba Brook is assessed as Not Supporting due to elevated water temperature documented during the summer of 2010. The Dewaterering impairment is being carried forward. The Fish Bioassessments impairment is being removed since the fish samples in this low gradient stream were well represented by intolerant or moderately tolerant fluvial species (see additional information in delisting). An Alert is being added for the slightly low dissolved.

2018/20 Delisted Impairment	**Delisting Reason**	**Delisting Comment**
Fish Bioassessments	Applicable WQS attained, according to new assessment method	Nashoba Brook MA82B-14 was first listed as impaired for Fishes Bioassessments in 2010. Under the current (2018) CALM guidance, the original impairment decision would not have been made. Although DFG sample #155 (collected in 2000) recorded overall lower abundance, the sample included a fluvial species (creek chubsucker), as well as a large proportion of a moderately tolerant macrohabitat generalist (chain pickerel) Furthermore, DEP sample 4562 (collected in August 2010) recorded much greater abundances of fish and was dominated by two fluvial species and a second site sampled by DFG

		biologists in July 2006 in this low gradient stream also contained an intolerant fluvial species. Land use imagery from 2005 and 2015 were compared and found to be similar and so data collected within this timeframe are considered usable for water quality assessment, listing, and delisting decisions. The impairment for Fish Bioassessments is therefore being removed.

Supporting Information for Delisted Impairments

Fish Bioassessments

The Nashoba Brook was sampled (<0.5MI us OF Rt 2A/119. DEP station MA09A-144) on 8/26/2010 (SampleID: 4562), using the DEP Backpack Shocking method. A total of 113 individuals were collected with 5 species represented. No coldwater species were found. The sample was composed of 65% fluvial specialists/dependents and 77% intolerant/moderately intolerant, while 23% were considered tolerant to pollution. Data Source (MassDFG 2014)

Concord Fish Population Data from DFG Database

Station Description	Nashoba Brook -- <0.5MI us OF Rt 2A/119. DEP station MA09A-144, Acton (42.50413,		
Habitat Comments	DEP survey. Great efficiency early, poor late. High water, deep pool at end of reach.		
Efficiency	Reach width between 2.5-7m(Seconds Shocked - 1769)		
Sample Date	**Species**	5	
08/26/10	**Total Ind**	113	
Method	**% Dom**	61%	
DEP Backpack Shockir	**Habitat**	**Species**	**% Ind**
Saris/Palis	FS	1	61%
8246875	FD	1	4%
	MG	3	35%
	Tolerant	**Species**	**% Ind**
	I	1	61%
	M	1	16%
	T	3	23%
	SampleID	4562	

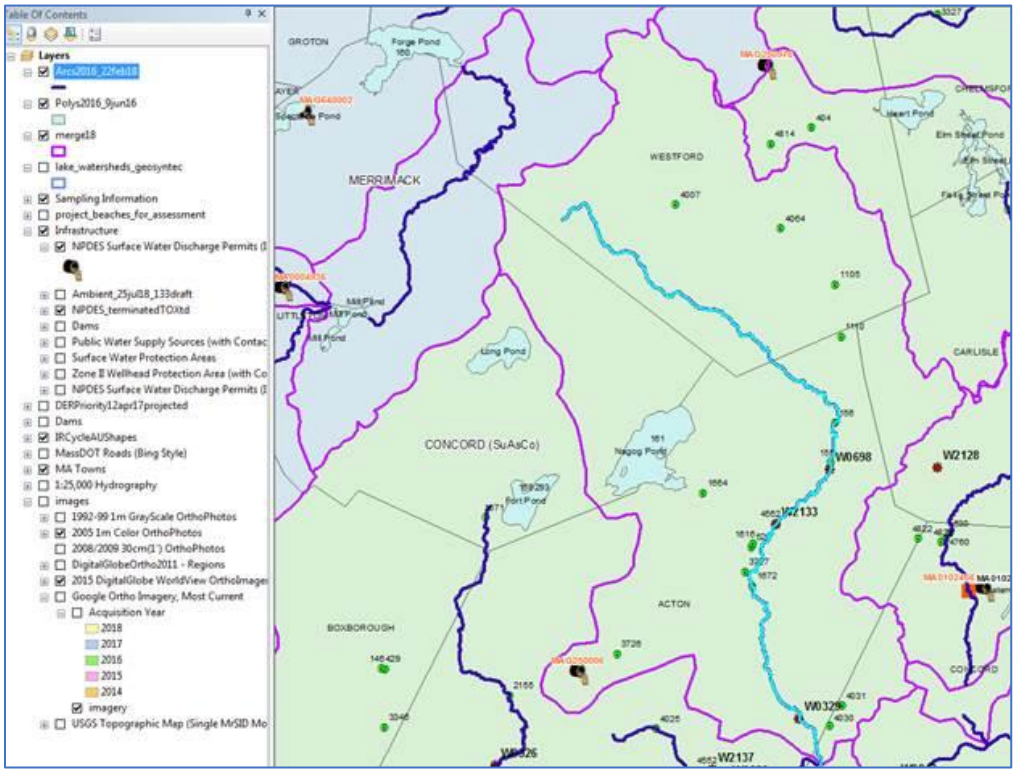
Common Name	Fish Code	Count	Min Length	Max Length	Temp	FG	PT	Function
Brown bullhead	BB	1	135	135	W	MG	T	Generalist Feeder
Golden shiner	GS	20	44	150	W	MG	T	Generalist Feeder
White sucker	WS	5	60	72	CW	FD	T	Generalist Feeder
Creek chubsucker	CCS	69	41	190	W	FS	I	Generalist Feeder
Redfin pickerel	RP	18	100	240	WB	MG	M	Top Carnivore

The Nashoba Brook was sampled (Brook St xing upstream 0.2mi E of Rt 27) on 7/25/2006 (SampleID: 1672), using the Backpack Shocking method. A total of 6 individuals were collected with 3 species represented. No coldwater species were found. The sample was composed of 33% fluvial specialists/dependents and 50% intolerant/moderately intolerant, while 50% were considered tolerant to pollution. Data Source (MassDFG 2014)

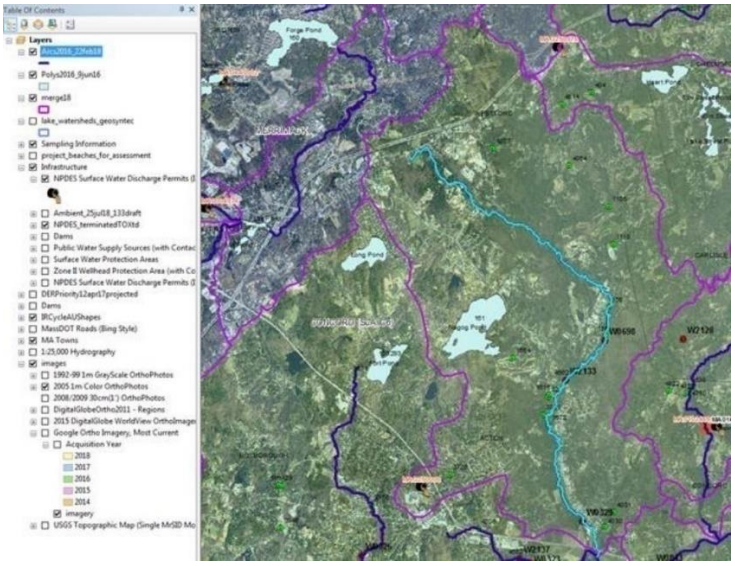
Concord Fish Population Data from DFG Database								
Station Description	Nashoba Brook -- Brook St xing upstream 0.2mi E of Rt 27, Acton (42.49493, 71.42033)							
Habitat Comments	Dark, stained water, deep, only spot on brook that we could wade							
Efficiency	(Seconds Shocked - 545)							
Sample Date	Species	3						
07/25/06	Total Ind	6						
Method	% Dom	50%						
Backpack Shocking	Habitat	Species	% Ind					
Saris/Palis	FS	1	33%					
8246875	FD	0	0%					
	MG	2	67%					
	Tolerant	Species	% Ind					
	I	1	33%					
	M	1	17%					
	T	1	50%					
	SampleID	1672						
Common Name	Fish Code	Count	Min Length	Max Length	Temp	FG	PT	Function
Pumpkinseed	P	1	53	53	W	MG	M	Generalist Feeder
Golden shiner	GS	3	25	71	W	MG	T	Generalist Feeder
Creek chubsucker	CCS	2	31	31	W	FS	I	Generalist Feeder

Similar land use patterns are observed in 2005 and 2015. Therefore, data collected within this timeframe are considered usable for water quality assessment, listing, and delisting decisions.

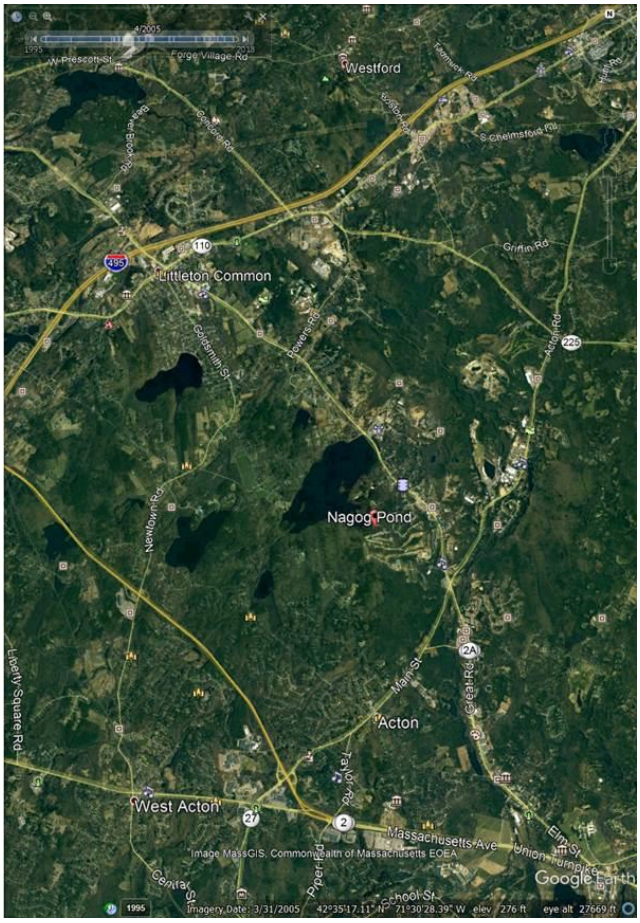
Entire drainage area (MassDEP Undated 8):



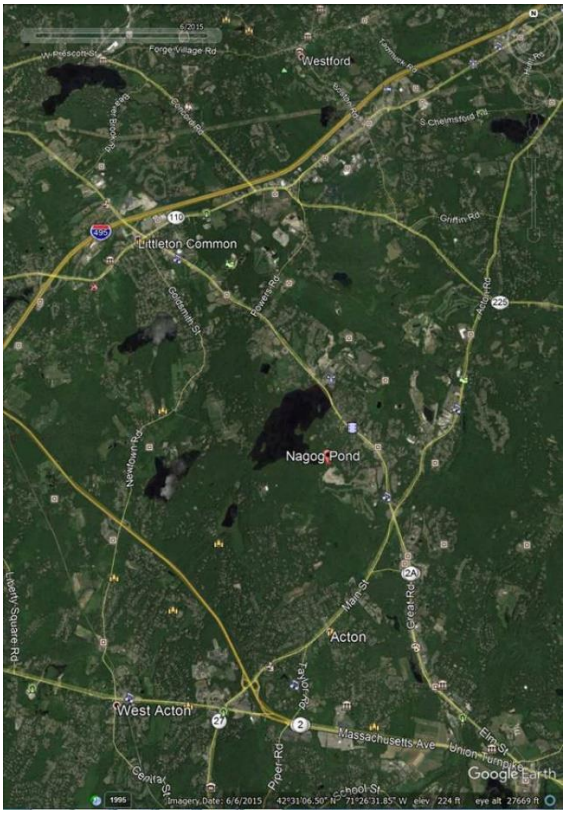
2005 GIS project landuse image provided for perspective on sub-watershed boundary; Google Earth images are presented below because the 2015 image in the DEP GIS database was of poor quality (MassDEP Undated 8):



2005 Landuse Image (Google Earth Pro Undated):



2015 Landuse Image (Google Earth Pro Undated):

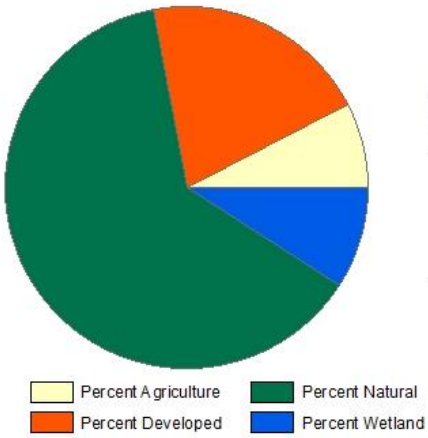


North Brook (MA82B-21)

Location:	Headwaters, east of Ballville Road and north of Wataquadock Hill Road, Bolton to mouth at confluence with the Assabet River, Berlin (excluding the approximately 0.1 mile through Wataquatic Pond (locally 'Fyfeshire Pond'), Bolton).
AU Type:	RIVER
AU Size:	7.6 MILES
Classification/Qualifier:	B

North Brook - MA82B-21

Watershed Area: 16.87 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	16.86	9.7	6.29	3.48
Agriculture	7.6%	8.8%	7.8%	8.9%
Developed	20.3%	24%	17.1%	22.5%
Natural	63%	59%	57%	51.5%
Wetland	9.1%	8.3%	18.1%	17.1%
Impervious Cover	8.4%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
2	5	(Curly-leaf Pondweed*)		Added
2	5	Temperature		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Water quality monitoring was conducted by MassDEP staff at one site downstream from Collins Road in Berlin (W2131) during the summer of 2010. This sampling location is ~400m downstream of the Fyfeshire Pond Dam, a small impoundment. Dissolved oxygen probes were deployed twice and although the daily mean minimum dissolved oxygen concentrations and maximum daily shifts were indicative of poor water quality, notes from field sheets (MassDEP Undated 8) indicate the site was stagnant during the July 2010 probe deploy (when the worst data was recorded). The maximum instream temperature was 28.4°C, the 7-DADM exceeded 20.0°C 58 times, and the maximum 24-hour rolling average was 25°C. The non-native aquatic macrophyte *Potamogeton crispus* was also found at this sampling location. Further downstream DFG biologists sampled the fish community at four locations along North Brook in Berlin, from upstream to downstream along Lancaster Road (SampleIDs 3817 and 3818) in August 2011, and further downstream below the Lester G. Ross Dam flood control project near Jones Road (SampleID 4970) and near Pleasant Street (SampleID 4969) in September 2013. Samples 3817 and 4970 contained multiple age classes of Eastern brook trout, while all samples contained one or more fluvial species in moderate abundance. OARS staff collected data 6-7 times per year from 2009-2017 in the lower portion of North Brook at Pleasant Street in Berlin (site NTH-009). Water quality data (pH, dissolved oxygen, total suspended solids, ammonia, total phosphorus) from this site were generally indicative of good conditions. The maximum water temperature was 26.03°C. However, it is important to note that these data were collected at the outlet of an impoundment known locally as Wheeler Pond. Although North Brook is not a designated cold water stream it does support multiple age classes of Eastern brook trout so has an Existing Tier I Cold Water use. Given the evidence of elevated temperatures in the brook downstream from the Fyfeshire Pond Dam as well as the Wheeler Pond impoundment, the Aquatic Life Use is assessed as Not Supporting. This use is also assessed as impaired because of an infestation of a non-native aquatic macrophyte (*Potamogeton crispus*). An alert for low flows and DO is being identified.

North Great Meadows (MA82084)

Location:	Concord.
AU Type:	FRESHWATER LAKE
AU Size:	73 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
4c	4c	(Water Chestnut*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Due to an infestation of the non-native aquatic macrophyte, *Trapa natans*, the Aquatic Life Use of North Great Meadows is assessed as Not Supporting.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “Water chestnut” (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

There is an infestation of the non-native *Trapa natans* in North Great Meadows (MassDEP Undated 2).

The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “Water chestnut” (*Trapa natans*).

Nutting Lake (MA82088)

Location:	[East Basin] Billerica.
AU Type:	FRESHWATER LAKE
AU Size:	30 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Due to an infestation of the non-native aquatic macrophyte, *Trapa natans*, the Aquatic Life Use of the East Basin of Nutting Lake is assessed as Not Supporting.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte species, *Trapa natans*, was identified by the WPP during the 1996 synoptic survey (MassDEP 1996).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water chestnut" (*Trapa natans*).

Nutting Lake (MA82124)

Location:	[West Basin] Billerica.
AU Type:	FRESHWATER LAKE
AU Size:	51 ACRES
Classification/Qualifier:	B

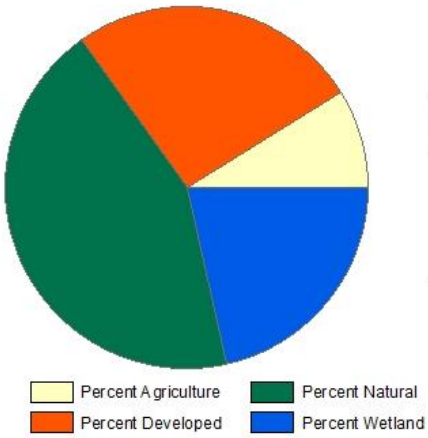
Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
With no data available for this reporting cycle, there is Insufficient Information to assess the Aquatic Life Use of the West Basin of Nutting Lake. The Alert Status is maintained due to the potential for a non-native aquatic macrophyte present in the East Basin to disperse downstream to the West Basin.

Pantry Brook (MA82A-19)

Location:	From source west of Haynes Road, Sudbury to mouth at confluence with the Sudbury River, Sudbury.
AU Type:	RIVER
AU Size:	3.1 MILES
Classification/Qualifier:	B

Pantry Brook - MA82A-19

Watershed Area: 6.01 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.01	6.01	1.83	1.83
Agriculture	8.8%	8.8%	7.3%	7.3%
Developed	26%	26%	13.8%	13.8%
Natural	43.7%	43.7%	39.2%	39.2%
Wetland	21.5%	21.5%	39.7%	39.7%
Impervious Cover	8.8%			

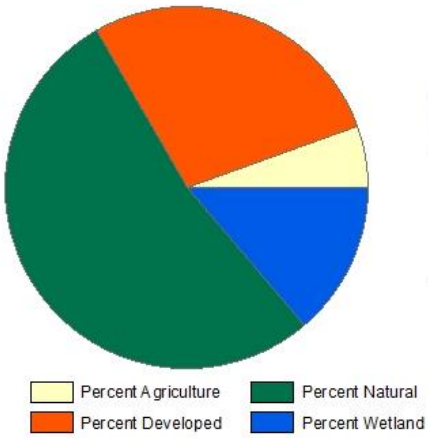
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no available data so the Aquatic Life Use of Pantry Brook is not assessed.

Piccadilly Brook (MA82A-30)

Location:	Headwaters, outlet Westboro Reservoir, Westborough to mouth at inlet to Cedar Swamp Pond, Westborough.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B: ORW

Piccadilly Brook - MA82A-30

Watershed Area: 2.47 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.47	2.34	1.28	1.21
Agriculture	5.5%	5.8%	5.1%	5.4%
Developed	27.8%	29.2%	21.9%	23%
Natural	53%	50.6%	56.4%	54.1%
Wetland	13.7%	14.3%	16.5%	17.5%
Impervious Cover	11.8%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

DFG biologists conducted backpack electrofishing at two locations along Piccadilly Brook in Westborough in July 2001: the upstream location was north of Belknap Street (SampleID 529) and the downstream location was at the Route 135 crossing (SampleID 474). Multiple age classes of Eastern brook trout were documented at the upstream site and one larger Eastern brook trout was in the downstream sample. Both sampling locations also contained macrohabitat generalist species moderately tolerant and tolerant to pollution.

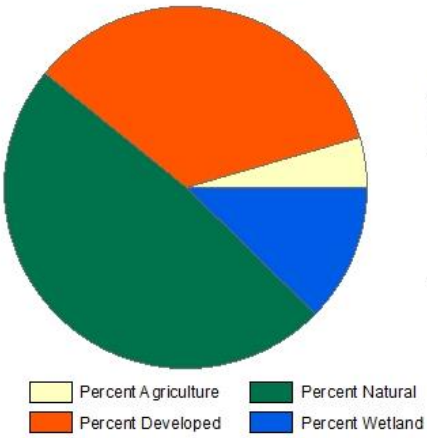
Although multiple age classes of Eastern brook trout have been documented in Piccadilly Brook, because of the age of the data there is insufficient information available to assess the Aquatic Life Use.

Pine Brook (MA82A-14)

Location:	Headwaters, south of Route 20, just east of the Weston/Wayland border to mouth at confluence with the Sudbury River, Wayland.
AU Type:	RIVER
AU Size:	2.5 MILES
Classification/Qualifier:	B

Pine Brook - MA82A-14

Watershed Area: 5.81 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.81	5.8	1.87	1.87
Agriculture	4.5%	4.5%	2.2%	2.2%
Developed	34.7%	34.8%	24%	24.1%
Natural	48.5%	48.4%	47.8%	47.8%
Wetland	12.3%	12.3%	26%	25.9%
Impervious Cover	10.3%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
The Aquatic Life Use of Pine Brook is assessed as fully supporting based on the presence of a reproducing Eastern brook trout population documented in two DFG fish community samples collected in August 2013both up and downstream from the Old Connecticut Path crossing in Wayland (Sample IDs 4777 & 4778). With any more recent benthic macroinvertebrate community data available, the Alert Status is retained from the earlier benthic surveys conducted in 1996 and 2001 (RPBIII analysis indicating slightly impacted conditions with notes that samples were dominated by taxa thriving on organic particulates as a food resource.

Puffers Pond (MA82092)

Location:	Maynard/Sudbury.
AU Type:	FRESHWATER LAKE
AU Size:	28 ACRES
Classification/Qualifier:	B

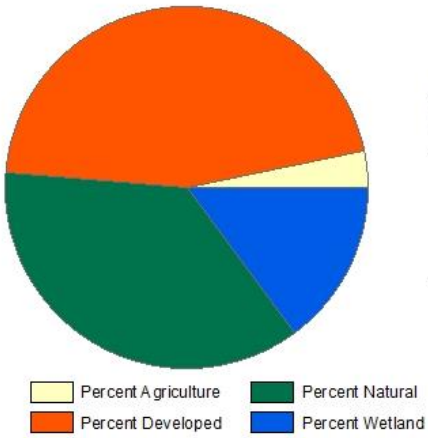
Fish, other Aquatic Life and Wildlife Use: Not Assessed
As there are no available data, the Aquatic Life Use for Puffers Pond is not assessed.

River Meadow Brook (MA82A-10)

Location:	Headwaters, outlet Russell Mill Pond, Chelmsford to mouth at confluence with the Concord River, Lowell.
AU Type:	RIVER
AU Size:	6.4 MILES
Classification/Qualifier:	B

River Meadow Brook - MA82A-10

Watershed Area: 26.87 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	26.86	5.83	6.58	1.38
Agriculture	3.2%	0.2%	5.1%	0.3%
Developed	45.5%	71.9%	31.9%	49.8%
Natural	36.4%	16.2%	35.5%	25.3%
Wetland	14.9%	11.7%	27.5%	24.6%
Impervious Cover	19.1%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
An infestation of the non-native aquatic macrophyte, *Trapa natans*, has spread downstream from Russell Mill Pond throughout River Meadow Brook. Water quality data were collected at multiple locations from the brook from upstream to downstream as follows: downstream from the outlet of Russell Mill Pond at Mill Road bridge in Chelmsford (MassDEP site W1488 during the summer of 2006), Route 129 in Chelmsford (OARS site RVM-038 in 2009 and 2010), at Thorndike Street in Lowell (OARS site RVM-005 between 2009 and 2017), just upstream from Lawrence Street bridge in Lowell (MassDEP benthic site B0587 in July 2006) and near the mouth of the brook in Lowell (MassDEP site W1489 during the summer of 2006). In general water quality data collected at these locations were indicative of generally good conditions (minimum DO 6.64mg/L exluding "stagnant" conditions, maximum diel DO shift 0.75mg/L, maximum saturation 97%, pH range 6.5 to 7.1SU, ammonia-nitrogen concentrations ≤0.14mg/L, total phosphorus concentrations and seasonal average total phosphorus concentrations reported by OARS ≤0.097mg/L and lower in more recent years). Temperature in the brook, however, just downstream from the Russell Mill Pond dam was very high during the July 17-19, 2006 probe deployment (maximum temperature 32.4°C and the 24-hour rolling maximum 28.5°C). Temperatures near the mouth of the brook, however, were good (maximum 26.7°C). The RBP III status of the benthic community just upstream of Lawrence Street in Lowell (B0587) at the downstream end of the assessment unit was slightly impacted (63%) in comparison with the reference site on the Assabet River (B0358) however the reference itself was compromised (see MA82B-01). The Aquatic Life Use of River Meadow Brook is assessed as Not Supporting due to an infestation of a non-native aquatic macrophyte *Trapa natans* and elevated temperature in the brook downstream from the Russell Mill Pond dam.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water Chestnut" (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

WPP staff identified the non-native aquatic macrophyte *Trapa natans* (water chestnut) in Russell Millpond during the 1996 synoptic survey (MassDEP 1996). The River Meadow Brook Association has documented that the infestation has spread downstream throughout the brook (Wilson 2004).

The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water Chestnut" (*Trapa natans*).

Rocky Pond (MA82095)

Location:	Boylston.
AU Type:	FRESHWATER LAKE
AU Size:	62 ACRES
Classification/Qualifier:	B

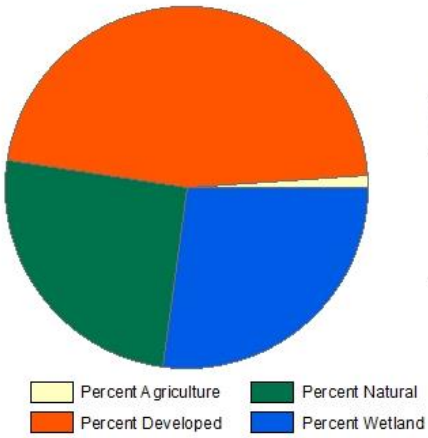
Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use of Rocky Pond is assessed as Not Supporting due to an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, documented during the summer of 1996.

Rutters Brook (MA82A-29)

Location:	From headwaters near Robin Road, Westborough to mouth at confluence with Jackstraw Brook, Westborough.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B: ORW

Rutters Brook - MA82A-29

Watershed Area: 3.73 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.73	3.73	1.27	1.27
Agriculture	1.1%	1.1%	0.7%	0.7%
Developed	46.5%	46.5%	39.6%	39.6%
Natural	25.3%	25.3%	25.9%	25.9%
Wetland	27.1%	27.1%	33.8%	33.8%
Impervious Cover	23%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
DFG biologists conducted limited backpack electrofishing at two locations in Rutters Brook: downstream from Robins Road in Westborough (Sample ID4957) at the upper end of this AU in August 2013 and further downstream west of Route 30 in Westborough in July 2001. Both samples contained one moderately tolerant macrohabitat generalist species. The upstream site of this very low gradient brook was culverted underground near Robins Road and the downstream site was very mucky which hampered the sampling effort. Insufficient information is available to assess the Aquatic Life Use for Rutters Brook.

Saxonville Pond (MA82097)

Location:	Framingham.
AU Type:	FRESHWATER LAKE
AU Size:	59 ACRES
Classification/Qualifier:	B

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

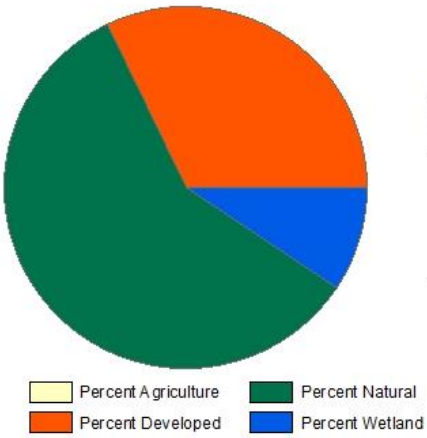
Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use of Saxonville Pond is assessed as Not Supporting due to infestations of the non-native aquatic macrophytes *Cabomba caroliniana*, *Marsilea quadrifolia,* and *Trapa natans*.

Second Division Brook (MA82B-09)

Location:	Headwaters, outlet small unnamed pond north of Waltham Street, Maynard to mouth at confluence with the Assabet River, Concord.
AU Type:	RIVER
AU Size:	2.9 MILES
Classification/Qualifier:	B

Second Division Brook - MA82B-09

Watershed Area: 2 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2	2	0.73	0.73
Agriculture	0.1%	0.1%	0.2%	0.2%
Developed	32.1%	32.1%	23.1%	23.1%
Natural	58.5%	58.5%	62.1%	62.1%
Wetland	9.3%	9.3%	14.6%	14.6%
Impervious Cover	9.1%			

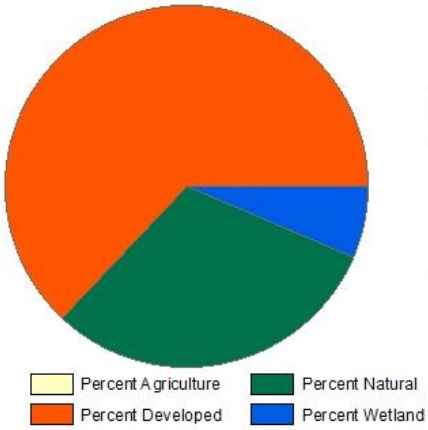
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists sampled the fish community in two locations in Second Division Brook (near the end of Cranberry Cirlce in Sudbury/Concord Sample ID 4035 in August 2012 and near Border Road in Concord Sample ID 3719 in October 2011). Based on the presence of multiple age classes of Eastern brook trout in both samples, the Aquatic Life Use of Second Division Brook is assessed as Fully Supporting. The Alert Status related to the Town of Concord water supply wells in this small subwatershed is maintained.

SHEEP FALL BROOK (MA82B-25)

Location:	Headwaters, perennial portion north of Ash Street, Marlborough to mouth at confluence with Flagg Brook, Marlborough.
AU Type:	RIVER
AU Size:	0.5 MILES
Classification/Qualifier:	B

SHEEP FALL BROOK - MA82B-25

Watershed Area: 0.55 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.55	0.55	0.13	0.13
Agriculture	0%	0%	0%	0%
Developed	63%	63%	35%	35%
Natural	30.6%	30.6%	43.5%	43.5%
Wetland	6.4%	6.4%	21.5%	21.5%
Impervious Cover	26.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing at three sites along Sheep Fall Brook in Marlborough (upstream to downstream): upstream of culvert at Russell Street in July 2012 (Sample ID 4010), off Pleasant Street near West Hill Road (Sample ID 4011) in July 2010, and behind the VFW at Pleasant Street upstream from the confluence with Flagg Brook (Sample ID 3744) in July 2011. All three samples included one or more Eastern brook trout <140 cm in size.

The Aquatic Life Use of Sheep Fall Brook is assessed as Fully Supporting based on the presence of a reproducing Eastern brook trout population.

Smith Pond (MA82099)

Location:	Northborough.
AU Type:	FRESHWATER LAKE
AU Size:	16 ACRES
Classification/Qualifier:	B

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

Solomon Pond (MA82100)

Location:	Northborough.
AU Type:	FRESHWATER LAKE
AU Size:	21 ACRES
Classification/Qualifier:	B

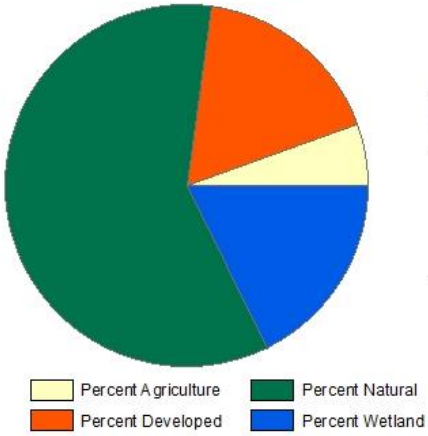
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no available data for this reporting cycle, Solomon Pond is Not Assessed for the Aquatic Life Use.

Spencer Brook (MA82B-15)

Location:	From the outlet of an unnamed pond north of Bellows Hill, Carlisle to mouth at inlet Angiers Pond, Concord.
AU Type:	RIVER
AU Size:	3.8 MILES
Classification/Qualifier:	B

Spencer Brook - MA82B-15

Watershed Area: 6.88 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.88	6.13	2.01	1.9
Agriculture	5.5%	5.1%	5%	3.8%
Developed	17.3%	17.2%	15.8%	16.3%
Natural	59.5%	59.7%	49%	49.4%
Wetland	17.7%	18.1%	30.2%	30.5%
Impervious Cover	5.7%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing in Spencer Brook downstream from Spencer Brook Road in Concord (Sample ID 4760) in July 2013. The sample was dominated by moderately tolerant macrohabitat generalist species although one intolerant species was also present. Survival of *C. dubia* exposed (~7 days) to water collected from Spencer Brook off Wetford Road in Concord upstream from the Middlesex School Wastewater Treatment Plant discharge was generally good (>80%) with the exception of two tests (September 2005 with survival of 60% and March 2016 with 40%), (n=51). The Middlesex School WWTP has conducted 52 modified acute and chronic WET tests using *C. dubia* as test organisms between June 2005 and April 2018. Of the 49 valid tests, no acute toxicity was detected (LC_{50}s ≥100 and ANOEC =100% effluent) and the CNOECs were all ≥42% effluent.

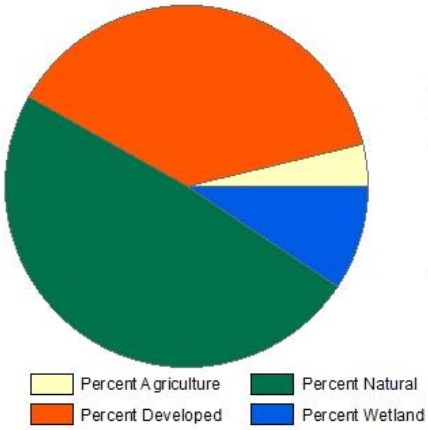
The Aquatic Life Use of Spencer Brook is assessed as Fully Supporting based on the DFG fish data, the good survival of *C. dubia* exposed (~7-day) to water collected from Spencer Brook, and the results of the Middlesex School WET test results indicating the facility is in compliance with the WET limits. The former alert status identified for the fish community (low number of fish and lack of fluvial species) is being removed based on the newer data.

STONY BROOK (MA82A-33)

Location:	Headwaters, outlet Sudbury Reservoir, Southborough to mouth at inlet Framingham Reservoir #3, Framingham.
AU Type:	RIVER
AU Size:	0.4 MILES
Classification/Qualifier:	A: PWS, ORW

STONY BROOK - MA82A-33

Watershed Area: 22.87 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	22.87	9.51	6.76	2.71
Agriculture	3.7%	3.2%	3.8%	3.5%
Developed	38.1%	28.1%	27%	20.8%
Natural	48.9%	63.1%	53.3%	66.1%
Wetland	9.3%	5.7%	15.9%	9.6%
Impervious Cover	16.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDEP biologists sampled the benthic and fish community of Stony Brook upstream from Pleasant Street (Route 30) Framingham in 2010 (B0698 and fish Sample ID 4547) and DFG biologists sampled the brook slightly further downstream in August 2012 (Sample ID 4042). Both fish samples contained multiple moderately tolerant macrohabitat generalist species. The RBPIII status of the benthic sample was determined to be 65% comparable (slightly impaired) in comparison with the Johnson Creek reference (Station B0688 in the Merrimack basin). Water quality surveys were also conducted upstream from Pleasant Street (Site W2140) in 2010, and data (for long term water temperature, pH, long and short-term dissolved oxygen, ammonia, total phosphorus) were indicative of good water quality. Two metals samples collected at W2140 in 2010 did not exceed the acute or chronic criteria.

The Aquatic Life Use for Stony Brook is assessed as fully supporting based on the slightly impaired benthic sample, presence of multiple moderately tolerant macrohabitat generalist fish species and good water quality.

Sudbury Reservoir (MA82106)

Location:	Southborough/Marlborough.
AU Type:	FRESHWATER LAKE
AU Size:	1181 ACRES
Classification/Qualifier:	A: PWS, ORW

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

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

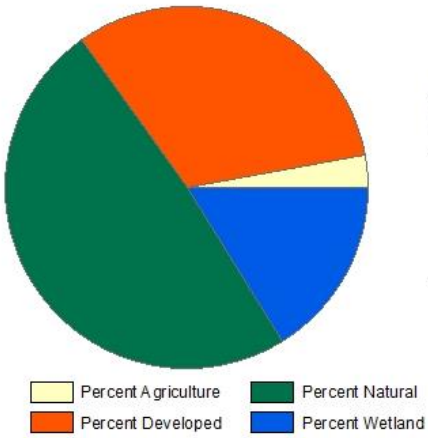
Sudbury Reservoir has infestations of the non-native aquatic macrophytes, *Trapa natans* and *Myriophyllum spicatum*. Additionally, reports of *Myriophyllum heterophyllum* and *Potamogeton crispus* require confirmation. Because of the presence of non-native species, the Aquatic Life Use of Sudbury Reservoir is designated as not supporting. An alert is issued for the potential infestation of the non-natives Myriophyllum heterophyllum and Potamogeton crispus.

Sudbury River (MA82A-01)

Location:	Headwaters, outlet Cedar Swamp Pond, Westborough to the Fruit Street bridge, Hopkinton/Westborough.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B: ORW, WWF

Sudbury River - MA82A-01

Watershed Area: 18.92 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	18.91	11.84	7.31	4.39
Agriculture	2.9%	3%	3.1%	3.3%
Developed	31.9%	31.2%	27.6%	26.8%
Natural	49%	45.5%	44.8%	39.2%
Wetland	16.2%	20.3%	24.5%	30.7%
Impervious Cover	13.1%			

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

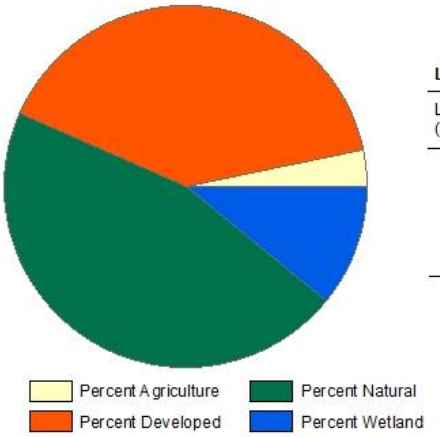
DFG biologists conducted backpack electrofishing in the Sudbury River near Fruit Street in Hopkinton/Westborough (Sample ID 4808) in September 2013. This portion of the river has flowed through a large, very low gradient wetland complex system. The sample was dominated by macrohabitat generalist species however one fluvial dependant species was present. MassDEP conducted water quality monitoring in the Sudbury River at the Fruit Street bridge (W0832) during the summer of 2006. Dissolved oxygen was low (range 1.57 to 5.4mg/L) with a maximum saturation of only 59% and maximum diel shift of 1.82mg/L. Daily mean DO minima ranged from 1.62-4.16 mg/L. The pH was slightly low (6.2-6.6), while the data for water temperature, ammonia, and total phosphorus were indicative of good conditions (maximum temperature 27.2°C, ammonia-nitrogen ranging from <0.02 to 0.16 mg/L, and average and maximum total phosphorus concentrations 0.054 and 0.085mg/L, respectively). Based primarily on the fish sample data documenting the presence of a fluvial dependent species as well as a moderately tolerant macrohabitat generalists in this low gradient portion of the Sudbury River (MA82A-01), it is BPJ that water quality data are indicative generally good conditions and that the low DO/slightly low pH are naturally occuring. Therefore, the Aquatic Life Use is assessed as fully supporting based on the fish sample. The Alert Status for low DO will be maintained while the former alerts for fish community structure, total phosphorus, and flow are being removed.

Sudbury River (MA82A-03)

Location:	Outlet Saxonville Pond, Framingham to confluence with Hop Brook (the lower portion of Hop Brook was identified as Wash Brook on USGS quads prior to 1987), Wayland.
AU Type:	RIVER
AU Size:	5.5 MILES
Classification/Qualifier:	B: AQL, HQW

Sudbury River - MA82A-03

Watershed Area: 116.67 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	116.62	14.19	34.46	4.19
Agriculture	3.3%	3.3%	3.4%	1.9%
Developed	40.1%	39.4%	29%	24.2%
Natural	45.8%	44.8%	47.1%	44.5%
Wetland	10.8%	12.6%	20.5%	29.4%
Impervious Cover	5%			

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	Fish Bioassessments		Added
5	5	(Non-Native Fish/Shellfish/Zooplankton*)		Added
5	5	(Water Chestnut*)		Added

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

There are infestations of the non-native aquatic macrophytes, *Myriophyllum spicatum*, *Potamogeton crispus,* and *Trapa natans*, as well as the Asian clam (*Corbicula fluminea*) that have been documented in this Sudbury River AU (MA82A-03). In August 2014, DFG biologists conducted electrofishing at two sites (Sample IDs 5125 & 5124) were found to be 20.59% similar to the Target Fish Community model for the Concord. This AU has been sampled by the MassDEP WPP and SMART monitoring program, and by OARS at multiple sites between 2005-2017. DEP site W0696 (which was also a SMART site, sampled 2005-2013) and OARS site SUD-144 (sampled 2009-2017) were in the vicinity of each other at the upper part of the AU DEP site W1480 (sampled in 2006) was located in the middle of the AU Finally, DEP site W0850 (sampled in 2006) and OARS site SUD-098 (sampled 2009-2012) were in the vicinity of each other in the lower part of the AU Data for water temperature, pH, dissolved oxygen, total suspended solids, chloride, chlorophyll *a*, ammonia, and total phosphorus were all generally indicative of good water quality. Although there were some observations of dense or very dense periphyton recorded during the SMART monitoring program, there were not multiple lines of evidence indicative of nutrient enrichment problems (i.e. chlorophyll *a* concentrations were ≤12.2µg/L, minimum DO concentration 5.94 mg/L and diel shifts <2.4mg/L, and maximum total phosphorus concentrations almost all ≤0.05mg/L). Long term trend analysis (2000-2013) of total phosphorus concentrations at three DEP stations showed a statistically significant downward trend (p = 9.29e-03) for year-round data, but not for seasonal (May-September) data (p = 0.06011). The non-signficance of the seasonal data is not surprising, however, given how low the TP values typically are. Additionally, survival of *P. promelas* and *C. dubia* exposed (48-hours) to water collected from the Sudbury River upstream of the confluence with Hop Brook (at the Pelham Island Road bridge, Wayland for use as dilution water during the Town of Waylands WET tests (n = 17 tests for each species between 2009 and 2017) was also good, ≥93%.

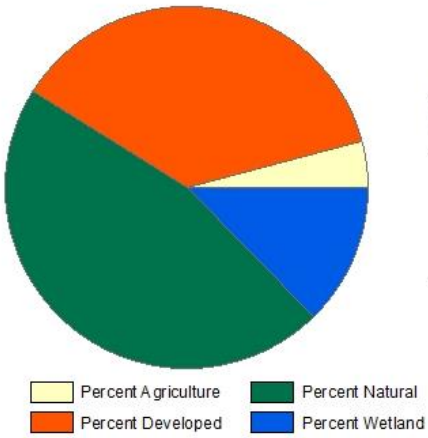
The *Aquatic Life Use* is assessed as not supporting due to the presence of non-native aquatic macrophytes *Myriophyllum spicatum*, *Potamogeton crispus,* and *Trapa natans*, as well as the non-native invertebrate Asian clam (*Corbicula fluminea*) in this Sudbury River AU (MA82A-03). Additionally, this segment is Not Supporting because the fish community did not compare favorably to the Concord Target Fish Community (Fishes Bioassessments) (only 20.59% similar). The former alert status for mercury contamination from the Nyanza Superfund Site is being maintained.

Sudbury River (MA82A-04)

Location:	Confluence with Hop Brook (the lower portion of Hop Brook was identified as Wash Brook on USGS topographic quadrangles prior to 1987), Wayland to confluence with Assabet River (forming headwaters Concord River), Concord.
AU Type:	RIVER
AU Size:	11.7 MILES
Classification/Qualifier:	B: AQL

Sudbury River - MA82A-04

Watershed Area: 162.52 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	162.46	7.85	47.13	2.01
Agriculture	4.1%	8.3%	4.1%	7.9%
Developed	37%	26.7%	25.7%	13.8%
Natural	46.3%	51.4%	45.9%	43%
Wetland	12.6%	13.6%	24.2%	35.3%
Impervious Cover	14.6%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
There is an infestation of the non-native aquatic macrophyte, *Trapa natans*, in this segment of the Sudbury River. Additionally, there are reports of *Potamogeton crispus*, *Cabomba caroliniana*, and *Marsilea quadrifolia*, but species confirmations are required. This Sudbury River AU has been sampled in multiple locations by MassDEP staff and OARS volunteers. from upstream to downstream these sites are as follows: Sudbury River Route 20 boat ramp in Wayland (OARS site SUD-096 and ambient sampling for Wayland WWTP WET tests), River Road in Wayland (OARS site SUD-086), Sherman Bridge Road in Waylnad (OARS site SUD-064 and MassDEP W0847), Sudbury Road Bridge in Concord (MassDEP W1481), South Bridge boat house in Concord (OARS site SUD-005), and Nashawtuc Road Bridge in Concord (MassDEP W0844). Sudbury River water was collected, from October 2005 to October 2008, upstream of the Wayland WWTP but downstream of the confluence with Hop Brook for use as dilution water in the town of Waylands WWTP WET tests. Survival of *C. dubia* and *P. promelas* exposed (~48 hours) to the river water was excellent, 100% in all four tests. OARS volunteers collected water temperature, pH, dissolved oxygen, ammonia, and total phosphorus data generally 5 times per year from 2012-2017 at site SUD-096, and from 2009-2017 at sites SUD-086, SUD-064, and SUD-005. TSS data was collected generally 5 times per year in 3 years at site SUD-096, in 5 years at sites SUD-086 and SUD-064, and 4-7 times per year in 5 years at site SUD-005. OARS also collected chlorophyll *a* data generally 3 times per year at SUD-096 (2013-2017), SUD-086, SUD-064, and SUD-005 (2010, 2013-2017 for these last three sites). MassDEP deployed dissolved oxygen probes 4-5 times in 2006, at the Sudbury Road bridge in Concord (W1481) and further downstream at the at the Nashawtuck Road bridge in Concord (W0844), for 1-3 days each deployment. MassDEP collected attended probe data in 2006 at site W0847 (n=4), at W1481 (D.O. & water temperature n=13; pH n=5), and at W0844 (D.O. & water temperature n=15; pH n=5). MassDEP also collected ammonia and total phosphorus data at these sites in 2006 (n=5 for each site). Data for most water quality parameters (temperature, pH, TSS, ammonia, total phosphorus) were generally indicative of good water quality. Dissolved oxygen data were also generally good, but in a few instances showed signs of nutrient enrichment in the lower reaches of this Sudbury River AU (MA82A-04). The maximum dissolved oxygen saturation was elevated (131%) in August 2006 during the probe deploy at the most downstream DEP sampling site (W0844) near Nashawtuc Road bridge in Concord. Additionally, there were several instances of dissolved oxgen dropping below 3 mg/L at OARS sites SUD-064 and SUD-005 (June 2010, September 2011, June 2017). OARS chlorophyll *a* data were generally indicative of good water quality but were slightly elevated a number of times many of which were in 2016, when this part of Massachusetts was under a Drought Warning most of the summer. In summary, the Aquatic Life Use of this Sudbury River AU (MA82A-04) is assessed as not supporting due to an infestation of the non-native aquatic macrophyte *Trapa natans*. An alert is issued for potential infestations of the non-natives *Potamogeton crispus*, *Cabomba caroliniana*, *Marsilea quadrifolia*, and *Myriophyllum spicatum* is being identified as well as for some evidence of nutrient enrichment (low dissolved oxygen, chlorophyll a) in the lower reaches of this AU.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “water chestnut” (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

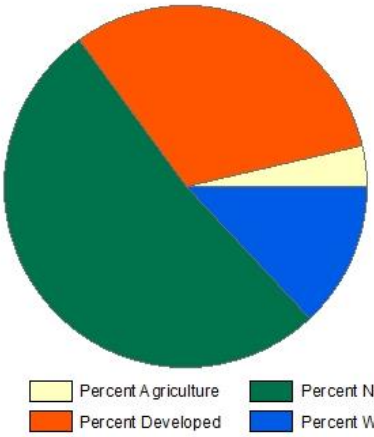
There is an infestation of the non-native aquatic macrophyte, *Trapa natans* (MassDEP Undated 8), in this segment of the Sudbury River. Additionally, there are reports of *Potamogeton crispus*, *Cabomba caroliniana*, and *Marsilea quadrifolia* (MassDEP Undated 2), but species confirmations are required. The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “water chestnut” (*Trapa natans*).

Sudbury River (MA82A-25)

Location:	From the Fruit Street bridge Hopkinton/Westborough to the inlet of Framingham Reservoir #2, Ashland (formerly part of 2004 segment: Sudbury River MA82A-02).
AU Type:	RIVER
AU Size:	6.3 MILES
Classification/Qualifier:	B: WWF, HQW

Sudbury River - MA82A-25

Watershed Area: 43.35 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	43.32	10.57	15.14	3.36
Agriculture	3.6%	6.4%	3%	6.2%
Developed	31.4%	32.9%	25.2%	25.1%
Natural	52%	52.9%	49.3%	53.3%
Wetland	13%	7.8%	22.4%	15.3%
Impervious Cover	12.4%			

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)

The non-native aquatic macrophyte, *Trapa natans*, was observed in the Sudbury River AU MA82A-25 (in the Mill Pond impoundment upstream of Pinehill Road/Myrtle Street, Ashland) during a 2016 survey of the Concord basin sponsored by SuAsCo CISMA (and conducted by OARS). DFG fish community samples were collected in September 2013 at Fruit Street (Sample ID 4808 on the border with AU MA82A-01), at Howe Street (SampleID 4807), and upstream of Concord Street (SampleID 4806). The two downstream samples (4807 & 4806) were found to be 51.67% similar to the Target Fish Community model for the Concord. Note, sample 4808 was excluded from this analysis because it was located in a low-gradient wetland habitat reach. Water quality data were collected by MassDEP staff in 2006 in the vicinity of Fruit Street (Site W0832 and those data were evaluated in the Sudbury River AU MA82A-01) and at Route 135 downstream of most of Ashland town center (Site W0838). With the exception of slightly elevated water temperature (maximum 29.7°C), water quality data collected at W0838 were all indicative of good conditions (minimum DO 6.3mg/L, pH 6.7 – 7.0SU, ammonia-nitrogen concentrations all ≤0.05 mg/L, and average and maximum total phosphorus concentrations 0.03 and 0.041mg/L, respectively).

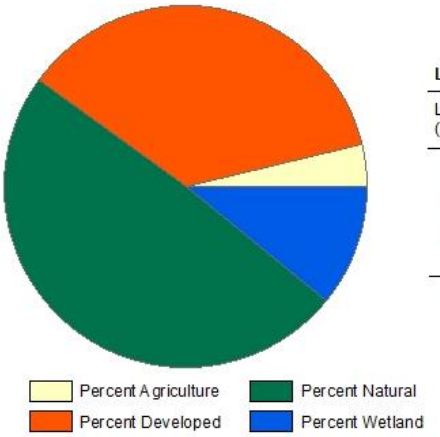
Although the fish community was >50% comparable to the Target Fish Community and water quality collected from the Sudbury River near Route 135 in Ashland (W0838) were indicative of generally good conditions, the Aquatic Life Use for this Sudbury River AU (MA82A-25) is assessed as Not Supporting due to an infestation of the non-native aquatic macrophyte *Trapa natans* in the Mill Pond impoundment upstream from Pinehill Road/Myrtle Street in Ashland. The Alert Status for mercury in the sediments (due to the Nyanza Superfund site) is being maintained and a new alert for elevated water temperature downstream from the mill pond impoundment in Ashland is being identified.

Sudbury River (MA82A-26)

Location:	Outlet Framingham Reservoir #1, Framingham to inlet of Saxonville Pond, Framingham (formerly part of 2004 segment: Sudbury River MA82A-02).
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B: WWF, HQW

Sudbury River - MA82A-26

Watershed Area: 82.03 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	82	11.08	25.84	2.91
Agriculture	3.7%	3.7%	3.7%	5.8%
Developed	36.3%	51.6%	27.2%	38.6%
Natural	49.2%	38.7%	49.7%	43.3%
Wetland	10.8%	6%	19.3%	12.3%
Impervious Cover	14.8%			

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

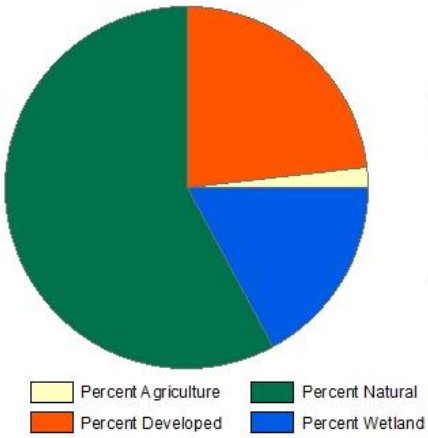
The non-native aquatic macrophyte, *Trapa natans*, was observed in the Sudbury River AU MA82A-26 just downstream of Framingham Reservoir #1 during a 2016 survey sponsored by SuAsCo CISMA (and conducted by OARS). The Aquatic Life Use is being assessed as Not Supporting due to this new infestation of a non-native species and due to the historical impairment for Benthic Macroinvertebrates.

Taylor Brook (MA82B-08)

Location:	Headwaters, outlet Puffer Pond, Maynard to mouth at confluence with the Assabet River, Maynard.
AU Type:	RIVER
AU Size:	1.8 MILES
Classification/Qualifier:	B

Taylor Brook - MA82B-08

Watershed Area: 4.63 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.63	4.63	1.04	1.04
Agriculture	1.8%	1.8%	2.6%	2.6%
Developed	23.2%	23.2%	8.2%	8.2%
Natural	57.9%	57.9%	52.9%	52.9%
Wetland	17.1%	17.1%	36.2%	36.2%
Impervious Cover	8.7%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
With no data available for this reporting cycle, the Aquatic Life Use of Taylor Brook is Not Assessed. The Alert Status related to the Town of Maynard water supply wells in this small subwatershed is maintained.

Tripp Pond (MA82107)

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

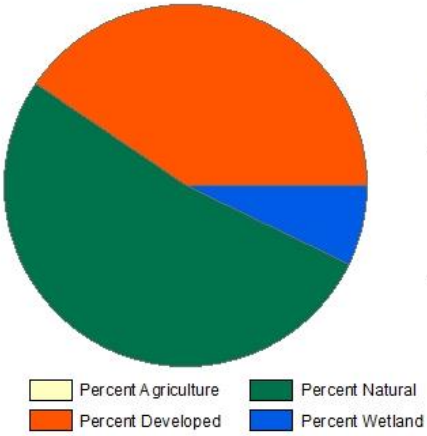
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of Tripp Pond is Not Assessed.

Unnamed Tributary (MA82A-15)

Location:	Headwaters, northeast of Indian Head Hill (near Route 20), Marlborough to mouth at inlet of Hager Pond, Marlborough (formerly part of 1996 segment: Hop Brook MA82A-05).
AU Type:	RIVER
AU Size:	1.1 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA82A-15

Watershed Area: 1.06 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.06	1.06	0.21	0.21
Agriculture	0.5%	0.5%	1.3%	1.3%
Developed	40.3%	40.3%	45.9%	45.9%
Natural	52.1%	52.1%	36.2%	36.2%
Wetland	7.1%	7.1%	16.5%	16.5%
Impervious Cover	22%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Ambient Bioassays - Chronic Aquatic Toxicity		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Water from the Unnamed Tributary was collected for use as a diluent/control in Marlborough Easterly WWTF WET tests. Survival of *C. dubia* (n = 51 tests) exposed (~7 days) to the stream water was good, ranging from 80-100% of the test organisms in all but one test (December 2012). Survival of *P. promelas* (n = 53 tests), however, was often poor, with only 32 of the 53 tests (60%) yielding survival rates ≥75%. Of the 21 tests where end of test survival was poor (ranging from 0-73% survival, occurring among seasons and across years), all but two tests had good survival (≥90%) of *P. promelas* at 48 hours. The cause of instream toxicity to *P. promelas* is unknown and warrants further investigation. The Marlborough Easterly Wastewater Treatment Facility was upgraded for improved nutrient treatment online as of June 2016. Between December 2004 and September 2017, the discharge has not exhibited acute toxicity to either *C. dubia* or *P. promelas* or with the exception of one test any chronic toxicity to *C. dubia*. While the facility had occasionally exhibited chronic whole effluent toxicity to *P. promelas*, the facility has been meeting its WET limits since 2012.

The Aquatic Life Use of the unnamed tributary (MA82A-15) is assessed as Not Supporting due to the frequently poor survival of *P. promelas* exposed to the river water (Ambient Bioassays – chronic aquatic toxicity). Without

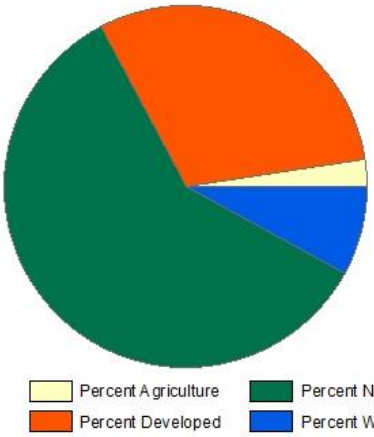
any other new data the impairments for dissolved oxygen, total phosphorus, and total suspended solids are being maintained.

Unnamed Tributary (MA82A-16)

Location:	Headwaters, outlet Hager Pond, Marlborough to mouth at inlet of Grist Mill Pond, Marlborough (formerly part of 1996 segment: Hop Brook MA82A-05).
AU Type:	RIVER
AU Size:	0.2 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA82A-16

Watershed Area: 1.87 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.87	1.87	0.43	0.43
Agriculture	2.4%	2.4%	1.6%	1.6%
Developed	30.3%	30.3%	31.7%	31.7%
Natural	59.3%	59.3%	51.7%	51.7%
Wetland	7.9%	7.9%	15%	15%
Impervious Cover	17%			

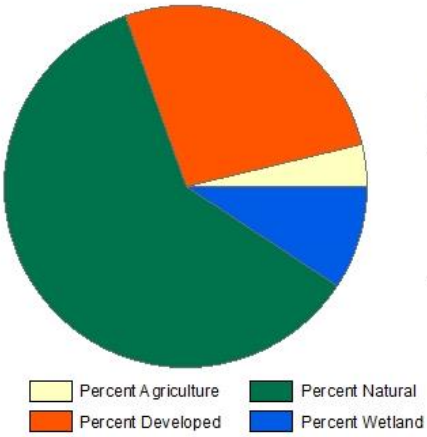
Fish, other Aquatic Life and Wildlife Use: Not Supporting
With no new data collected during this period, the impairments from the last assessment will be maintained and the Aquatic Life Use of this unnamed tributary (MA82A-16) will continue to be assessed as Not Supporting.

Unnamed Tributary (MA82A-17)

Location:	Headwaters, outlet Grist Mill Pond, Sudbury to mouth at inlet of Carding Mill Pond, Sudbury (formerly part of 1996 segment: Hop Brook MA82A-05).
AU Type:	RIVER
AU Size:	0.5 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA82A-17

Watershed Area: 3.14 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.14	3.14	0.83	0.83
Agriculture	3.7%	3.7%	4.6%	4.6%
Developed	26.7%	26.7%	24.8%	24.8%
Natural	60.4%	60.4%	53.6%	53.6%
Wetland	9.3%	9.3%	17%	17%
Impervious Cover	13.1%			

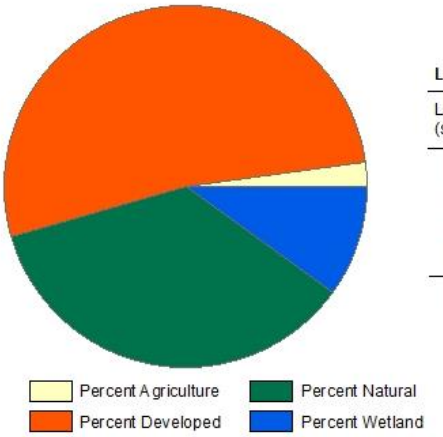
Fish, other Aquatic Life and Wildlife Use: Not Supporting
With no new data collected during this period, the impairments from the last assessment will be maintained and the Aquatic Life Use of this unnamed tributary (MA82A-17) will continue to be assessed as Not Supporting.

Unnamed Tributary (MA82A-22)

Location:	Unnamed tributary to the Sudbury River locally known as Cochituate Brook, headwaters, outlet north basin of Lake Cochituate, Framingham to mouth at confluence with Sudbury River, Framingham.
AU Type:	RIVER
AU Size:	1.4 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA82A-22

Watershed Area: 20.36 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	20.35	9.62	4.66	2.3
Agriculture	2.1%	0.1%	3.1%	0%
Developed	52.4%	61.2%	38.9%	43.2%
Natural	35.6%	33.6%	37.9%	43%
Wetland	9.9%	5.1%	20.1%	13.8%
Impervious Cover	25%			

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

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

The non-native aquatic macrophyte *Potamogeton crispus* was identified in this unnamed tributary (Cochituate Brook) during a MassDEP 2010 survey. Two fish community surveys in August 2010 upstream from School Street Framingham (Sample IDs 4559 & 4560), resulted in the collection of two fluvial specialist/dependent species at each site, and multiple moderately tolerant macrohabitat generalist species in sample 4559. The RBP III analysis of the benthic macroinvertebrate sample (B0687), collected in this reach by DEP staff in July 2010, was moderately impaired (score 18, 55% comparability Elizabeth Brook reference site score 42). DEP staff also conducted water quality monitoring in this reach during the summer of 2010 (W2135, upstream from School Street, Framingham). A DO probe was deployed for three five-day periods. DO dropped below 5 mg/L during two of the deploys, and the maximum daily D.O. shift for the same two deploys was greater than 3 mg/L, which is indicative of nutrient enrichment, but the maximum saturation was only 109%. A deployed probe measured water temperature for 122 days with a maximum temperature of 26.9 °C. Attended probes measurements were also made with the water temperature (n=8), pH (n=6), and dissolved oxygen (n=6) data all indicative of

good water quality. Ammonia and total phosphorus concentrations were also low (max NH3-N = 0.26 mg/L and max TP = 0.03 mg/L). There was one observation of dense filamentous algae during the surveys. Three metals samples did not exceed acute or chronic criteria. Three of five chloride samples exceeded the chronic chloride toxicity criterion (230 mg/L), with exceedances ranging from 250-290 mg/L. No chloride exceedances, however, were documented by MassDEP in the brook ~800 ft upstream of School St (Rt 126), Framingham (W2536) during the summer of 2015.

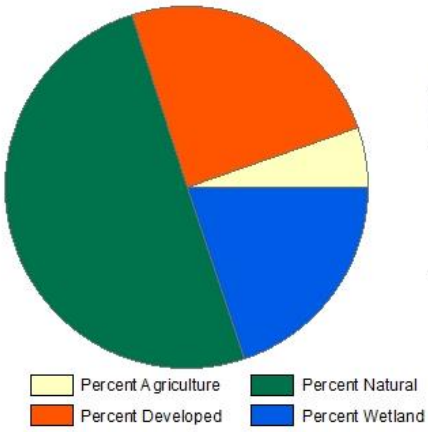
The Aquatic Life Use for this unnamed tributary (Cochituate Brook AU MA82A-22) remains not supporting for Nutrient/Eutrophication Biological Indicators and Benthic Macroinvertebrates. A new impairment is being added in this reporting cycle for the non-native aquatic macrophyte Curly-leaf Pondweed (*Potamogeton crispus*) and an Alert is being identified for chloride.

Unnamed Tributary (MA82A-31)

Location:	Unnamed tributary to River Meadow Brook, outlet Elm Street Pond, Carlisle to mouth at confluence with River Meadow Brook, Chelmsford (through former 2014 segment: Russell Millpond MA82096 and excluding approximately 0.4 mile through existing segment: Meadow Pond MA82129) (formerly part of 2014 segment: Unnamed Tributary MA82A-21).
AU Type:	RIVER
AU Size:	3.7 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82A-31

Watershed Area: 9.98 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	9.98	6.30	2.49	1.54
Agriculture	5.3%	5.8%	7.1%	7.6%
Developed	24.6%	23.2%	17.6%	16.5%
Natural	50.3%	51.5%	42.8%	45.2%
Wetland	19.8%	19.5%	32.6%	30.7%
Impervious Cover	8.5%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Aquatic Life Use of this unnamed tributary AU (MA82A-31) is assessed as Not Supporting based on the presence of the non-native aquatic macrophyte *Trapa natans* in the Russell Millpond impoundment. The prior impairment related to flow alteration (originally identified for the Russell Millpond AU in the 1998 reporting cycle) has now been transferred to this AU as the flow regime modification impairment. Water level manipulation associated with cranberry bog dam operations, the small diameter of culverts, and maintenance of Elm Street Pond (MA82032) and Fiske Street Pond (MA82037) all affect flows in this brook so the former alert associated with the former AU MA82A-21 related to these issues is now identified as an impaimment.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water Chestnut" (Trapa natans)

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

The non-native aquatic macrophyte, *Trapa natans*, was identified in Russell Millpond, now part of Unnamed Tributary MA82A-31, by WPP staff during the 1996 synoptic survey (MassDEP 1996).

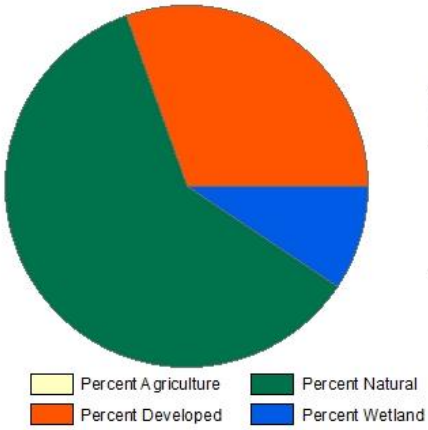
The impairment was changed from the generic "Non-Native Aquatic Plants" to the specific macrophyte "Water Chestnut" (*Trapa natans*).

Unnamed Tributary (MA82A-35)

Location:	Unnamed tributary to Hop Brook, headwaters south of Graham Path, Marlborough to mouth at confluence with Hop Brook, Sudbury.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82A-35

Watershed Area: 1.36 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.36	1.36	0.37	0.37
Agriculture	0.2%	0.2%	0%	0%
Developed	30.4%	30.4%	21.1%	21.1%
Natural	60.1%	60.1%	56.2%	56.2%
Wetland	9.3%	9.3%	22.7%	22.7%
Impervious Cover	11.1%			

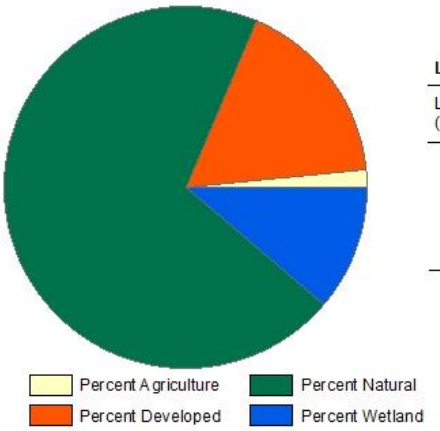
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing at three locations along this unnamed tributary: downstream from Sudbury Street in Marlboro (site #2515) in August 2008, upstream and downstream of the pipeline in Sudbury (sites #3636 and #3637, respectivey) in July 2011. Eastern brook trout were collected at all three sites with multiple age classes at the most downstream sampling location. OARS staff collected limited water quality data at site TRT-006 (which is near DFG sites 3636 & 3637)- one set of samples in 2012 and two in 2013. Of these, all the pH, dissolved oxygen, total suspended solids, ammonia, and total phosphorus data were indicative of good water quality. Of the limited water temperature data, only one data point (at 20.18°C) was measured in the summer months (but no QC data were submitted for this date). The Aquatic Life Use for this unnamed tributary (AU MA82A-35) is assessed as fully supporting based on the presence of a reproducing population of Eastern brook trout. An alert is issued for water temperature and a recommendation for additional temperature monitoring will be made.

Unnamed Tributary (MA82A-36)

Location:	Unnamed tributary to Hop Brook, headwaters outlet unnamed pond west of Vega Road, Marlborough to mouth at confluence with Hop Brook, Sudbury.
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82A-36

Watershed Area: 1.80 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.80	1.80	0.40	0.40
Agriculture	1.6%	1.6%	0.7%	0.7%
Developed	17%	17%	15.5%	15.5%
Natural	70.2%	70.2%	61.9%	61.9%
Wetland	11.2%	11.2%	21.9%	21.9%
Impervious Cover	7.2%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing at two locations along this unnamed tributary (locally referred to as Cranberry Brook upstream of the pipeline in the Sudbury Valley Trustees property in Marlborough and downstream of the pipeline in the SVT property in Sudbury (sites #3633 and #3634, respectively) in July 2011. Sample #3633 was dominated by moderately tolerant macrohabitat generalists and sample #3634 was dominated by Eastern brook trout of multiple age classes. OARS staff collected limited water quality data at site CRN-002 (roughly 450 meters downstream of DFG site 3634)- one set of samples in 2012 and two in 2013. All of these data (water temperature, pH, dissolved oxygen, total suspended solids, ammonia, and total phosphorus) were indicative of good water quality.

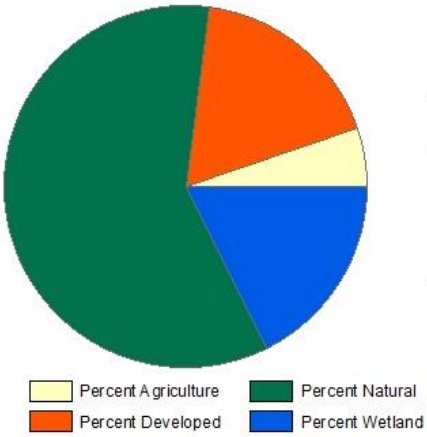
The Aquatic Life Use for this unnamed tributary locally referred to as Cranberry Brook (AU MA82A-36) is assessed as fully supporting based on the presence of a reproducing population of Eastern brook trout and the limited water quality data indicative of good conditions.

Unnamed Tributary (MA82B-16)

Location:	Unnamed tributary to Assabet River (locally considered part of Spencer Brook), outlet Angiers Pond, Concord to mouth at confluence with the Assabet River, Concord.
AU Type:	RIVER
AU Size:	0.5 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA82B-16

Watershed Area: 7.51 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.51	5.52	2.34	1.79
Agriculture	5.2%	5.5%	4.8%	4.3%
Developed	17.7%	18.5%	16.3%	17.4%
Natural	59.5%	57.6%	50%	48.6%
Wetland	17.6%	18.3%	28.9%	29.8%
Impervious Cover	5.8%			

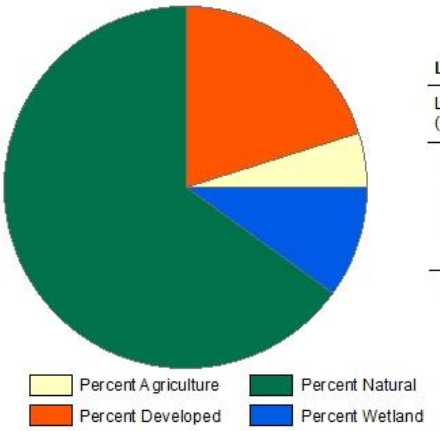
Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of this Unnamed Tributary AU (MA82B-16) is Not Assessed. The former alert issues, low flow and slightly elevated total phosphorus concentrations, are being maintained.

Unnamed Tributary (MA82B-23)

Location:	Unnamed tributary to the Assabet River; headwaters, outlet small pond south of Athens Street, Stow to mouth at confluence with Assabet River (backwater area), Stow.
AU Type:	RIVER
AU Size:	1.1 MILES
Classification/Qualifier:	B: CWF

UNNAMED TRIBUTARY - MA82B-23

Watershed Area: 1.75 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.75	1.75	0.56	0.56
Agriculture	4.8%	4.8%	2.6%	2.6%
Developed	20.1%	20.1%	15.2%	15.2%
Natural	65.1%	65.1%	59%	59%
Wetland	9.9%	9.9%	23.2%	23.2%
Impervious Cover	6.4%			

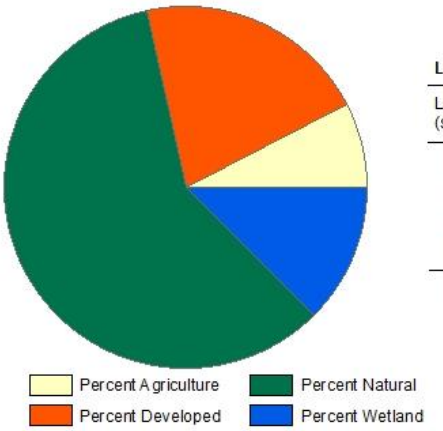
Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG biologists conducted backpack electrofishing in this unnamed tributary locally known as Sandy Brook parallel to Walcott Street in Stow (Sample ID 4769) in July 2013. Multiple age classes of Eastern brook trout were collected in the sample which was also contained other macrohabitat generalist species both moderately tolerant and tolerant to pollution. Notes were made that lots of EBTs were also observed ahead of the probe but were not collected. Backpack electrofishing was also conducted in August 2001 (Sample ID 375) when many multiple age classes of Eastern brook trout were also collected. The Aquatic Life Use of this Unnamed Tributary (MA82B-23) locally known as Sandy Brook is assessed as Fully Supporting based on the presence of a reproducing Eastern brook trout population.

Unnamed Tributary (MA82B-24)

Location:	Unnamed tributary to Nashoba Brook, headwaters outlet unnamed pond east of Pope Road, Acton to mouth at confluence with Nashoba Brook, Acton.
AU Type:	RIVER
AU Size:	1.4 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82B-24

Watershed Area: 1.00 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.00	1.00	0.37	0.37
Agriculture	7.5%	7.5%	7%	7%
Developed	20.9%	20.9%	13.1%	13.1%
Natural	59%	59%	61.3%	61.3%
Wetland	12.5%	12.5%	18.7%	18.7%
Impervious Cover	7.9%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

DFG biologists conducted backpack electrofishing at two locations along this unnamed tributary (MA82B-24) in August 2012. The most upstream sampling reach was near the end of Commerford Road in Concord (Sample ID 4031) and the reach further downstream was slightly upstream of Route 2A/Route 119 in Acton/Concord (Sample ID 4030). The upstream sample was comprised primarily by multiple age classes of Eastern brook trout. Few fish were collected at the downstream site and both were tolerant macrohabitat generalist species. Notes were made that this reach was shallow and muddy.

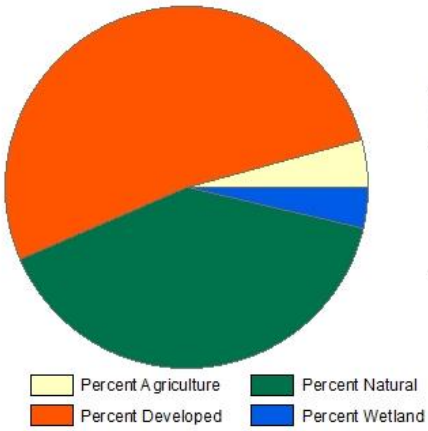
The Aquatic Life Use for this Unnamed Tributary AU (MA82B-24) is assessed as Full Supporting based on the presence of a reproducing Eastern brook trout population.

Unnamed Tributary (MA82B-27)

Location:	Unnamed tributary to Assabet River Reservoir, headwaters, perennial portion south of Route 30 (Nourse Street), Westborough to mouth at inlet of Assabet River Reservoir, Westborough.
AU Type:	RIVER
AU Size:	0.7 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82B-27

Watershed Area: 1.30 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.30	1.30	0.36	0.36
Agriculture	4.2%	4.2%	0.7%	0.7%
Developed	52.3%	52.3%	40.7%	40.7%
Natural	39.9%	39.9%	53.7%	53.7%
Wetland	3.6%	3.6%	5%	5%
Impervious Cover	12.9%			

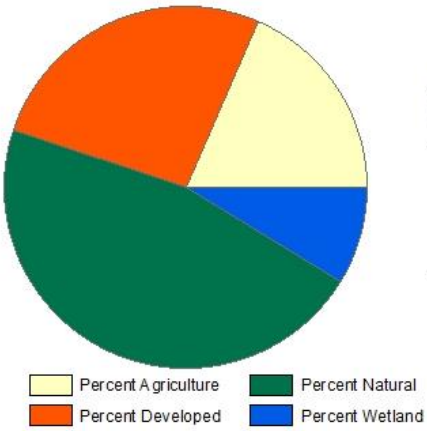
Fish, other Aquatic Life and Wildlife Use: Fully Supporting
DFG conducted fish community surveys in roughly the same section of this Unnamed Tributary MA82B-27 in June 2001 (Sample ID 488) and again in July 2013 (Sample ID 4954). The Aquatic Life Use is assessed as Fully Supporting based on the presence of a reproducing population of Eastern brook trout present in 2001 and 2013.

Unnamed Tributary (MA82B-28)

Location:	Unnamed tributary to Assabet River Reservoir, headwaters, perennial portion north of Nourse Street (Route 30), Westborough to mouth at inlet of Assabet River Reservoir, Westborough.
AU Type:	RIVER
AU Size:	0.3 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82B-28

Watershed Area: 2.39 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.18	2.18	0.50	0.50
Agriculture	18.4%	18.4%	15%	15%
Developed	26.5%	26.5%	16.3%	16.3%
Natural	46.5%	46.5%	53.7%	53.7%
Wetland	8.7%	8.7%	14.9%	14.9%
Impervious Cover	7.5%			

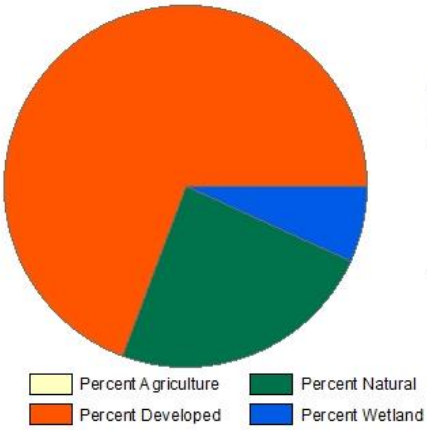
Fish, other Aquatic Life and Wildlife Use: Not Assessed
Backpack electrofishing was conducted by DFG biologists at two sites (SampleIDs 1593 and 1594) upstream from the perennial portion of this Unnamed Tributary in July 2006. Multiple ages of eastern brook trout were collected at both sites. DFG identifies this Unnamed tributary as a Coldwater Fishery Resource. No data, however, are currently available in this new AU, so the Aquatic Life Use for MA82B-28 is Not Assessed.

Unnamed Tributary (MA82B-31)

Location:	Unnamed tributary to Hop Brook, headwaters west of Tennis Drive, Shrewsbury to inlet Eaton Pond, Shrewsbury.
AU Type:	RIVER
AU Size:	1 MILES
Classification/Qualifier:	B

UNNAMED TRIBUTARY - MA82B-31

Watershed Area: 1.23 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.23	1.23	0.36	0.36
Agriculture	0%	0%	0%	0%
Developed	69.3%	69.3%	52.8%	52.8%
Natural	23.9%	23.9%	31%	31%
Wetland	6.7%	6.7%	16.1%	16.1%
Impervious Cover	22.3%			

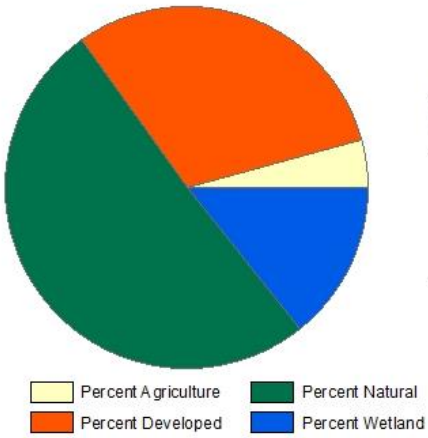
Fish, other Aquatic Life and Wildlife Use: Not Assessed
Water quality monitoring was conducted in this Unnamed Tributary (MA82B-31) during the summer of 2015 (W2528 and B0927). Data validation is not yet complete so the Aquatic Life Use for this Unnamed Tributary (MA82B-31) is Not Assessed.

Unnamed Tributary (MA82B-32)

Location:	Unnamed tributary to Assabet River, headwaters outlet Warner Pond, Concord to mouth at confluence with Assabet River, Concord.
AU Type:	RIVER
AU Size:	0.2 MILES
Classification/Qualifier:	B

UnNamed Tributary - MA82B-32

Watershed Area: 47.5 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	47.5	8.7	14.3	2.6
Agriculture	4.2%	4.8%	4.1%	4.2%
Developed	30%	38.3%	20.9%	25.5%
Natural	50%	46%	47%	48.5%
Wetland	14%	10.3%	28.7%	21.9%
Impervious Cover	10%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

Between March 2012 and June 2014, water was collected from this unnamed tributrary at the Commonwealth Avenue bridge in Concord for use as dilution water in the MCI Concord facility's WET tests. Survival of both *C. dubia* and *P. promelas* exposed (48-hours) to the river water was excellent (≥98%) (n=9 tests). OARS volunteers also conducted water quality sampling at this location as well (temperature, pH, dissolved oxygen, total suspended solids, ammonia, total phosphorus) 6-7 times per year from 2009-2017 (site NSH-002). With few exceptions (data collected under stagnant conditions) OARS data were indicative of generally good water quality.

The Aquatic Life Use for this Unnamed Tributary (AU MA82B-32) is assessed as Fully Supporting based on the excellent survival of *C. dubia* and *P. promelas* exposed (48-hours) to the river and the water quality data collected by OARS volunteers.

Walden Pond (MA82109)

Location:	Concord.
AU Type:	FRESHWATER LAKE
AU Size:	63 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
Because water quality data was last collected in 1999, the Aquatic Life Use of Walden Pond is considered Not Assessed. However, the alert for organic enrichment/low DO is being maintained.

Warners Pond (MA82110)

Location:	Concord.
AU Type:	FRESHWATER LAKE
AU Size:	59 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The Town of Concord has noted the presence of *Trapa natans* in Warners Pond. The DEP Herbicide Database indicates the Town made several treatments for *Myriophyllum heterophyllum* and *Cabomba caroliniana* in 2011 but the presence of these species needs to be confirmed. The Aquatic Life Use for Warners Pond is assessed as Not Supporting due to an infestation of the non-native aquatic macrophyte *Trapa natans*. An alert is issued due to the potential presence of *Myriophyllum heterophyllum* and *Cabomba caroliniana*.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	Impairment changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “Water chestnut” (Trapa natans).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

On the 1996 synoptic survey field sheet, a personal communication by Town of Concord staff was noted indicating that *Trapa natans* had been present for several years and the Town was engaged in harvesting (MassDEP 1996). The DEP Herbicide Database also indicates that the Town made several treatments for *Myriophyllum heterophyllum* and *Cabomba caroliniana* in 2011 (MassDEP 2017) but the presence of these species needs to be confirmed.

The impairment was changed from the generic “Non-Native Aquatic Plants” to the specific macrophyte “Water chestnut” (*Trapa natans*).

Waushakum Pond (MA82112)

Location:	Framingham/Ashland.
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
5	5	Aquatic Plants (Macrophytes)		Removed
5	5	Chlorophyll-a		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There is an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Waushakum Pond. MassDEP surveyed the pond at the deep hole (site W1301) in 2005. Water temperature and pH data were acceptable. Two integrated chlorophyll *a* samples were >30 µg/L. Total phosphorus concentrations reported near the surface were acceptable but were quite elevated near the bottom where conditions were anoxic. Dissolved oxygen dropped below 5 mg/L between 2.7-3.5 m in depth. Bathymetry data indicate that the area of Waushakum Pond at 10 ft (3.05 m) in depth encompasses roughly 46% of the surface area of the pond. The 2005 MassDEP lakes nutrient criteria survey documented sparse plant cover in August 2005. Review of Google Earth imagery for summer seasonal months indicates plant coverage remains limited to the northwest and southwest coves, with roughly <10% coverage of the pond in August 2013, for example. Therefore, Aquatic Plants (Macrophytes) is being removed as a cause of impairment for the Aquatic Life Use of Waushakum Pond. The other historical impairments will remain. New for this reporting cycle, an impairment is being added for Chlorophyll-a.
Primary Contact Recreation Use: Not Supporting
The Primary Contact Recreational Use for Waushakum Pond will continue to be assessed as Not Supporting. The 2005 MassDEP lakes nutrient criteria survey documented sparse plant cover in August 2005. Review of Google Earth imagery for summer seasonal months indicates plant coverage remains limited to the coves, with roughly <10% coverage of the pond in August 2013, for example. While the turbidity impairment will be carried forward, the Aquatic Plants (Macrophytes) is being removed as a cause of impairment (see additional information in removal comments).
Secondary Contact Recreation Use: Not Supporting
The Secondary Contact Recreational Use for Waushakum Pond will continue to be assessed as Not Supporting. The 2005 MassDEP lakes nutrient criteria survey documented sparse plant cover in August 2005. Review of Google Earth imagery for summer seasonal months indicates plant coverage remains limited to the coves, with roughly <10% coverage of the pond in August 2013, for example. While the turbidity impairment will be carried forward, the Aquatic Plants (Macrophytes) is being removed as a cause of impairment (see additional information in removal comments).
Aesthetic Use: Not Supporting
The Aesthetics Use for Waushakum Pond will continue to be assessed as Not Supporting. The 2005 MassDEP lakes nutrient criteria survey documented sparse plant cover in August 2005. Review of Google Earth imagery for summer seasonal months indicates plant coverage remains limited to the coves, with roughly <10% coverage of the pond in August 2013, for example. While the turbidity impairment will be carried forward, the Aquatic Plants (Macrophytes) is being removed as a cause of impairment (see additional information in removal comments).

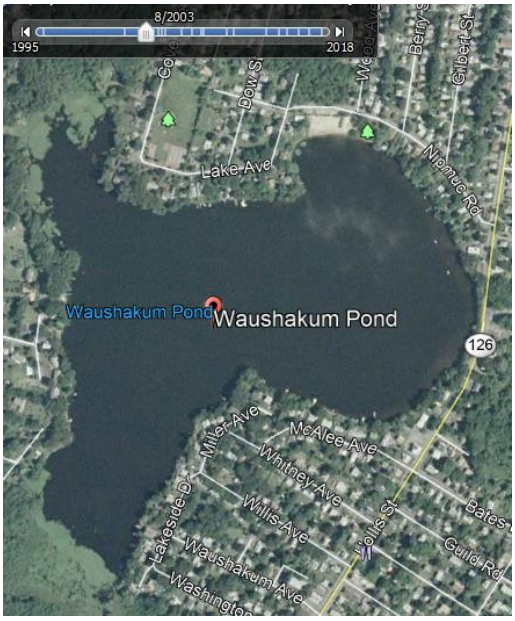
2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Applicable WQS attained; original basis for listing was incorrect	Waushakum Pond was originally listed as impaired for "Noxious Aquatic Plants" in 1992-1998 and then from 2006 and on. The 2001 Water Quality Assessment Report indicates that ESS conducted aquatic plant mapping in the pond in October 2001. Plant coverage was largely restricted to the northwest and southwest coves, and included mainly various species of aquatic macrophytes. The 2005 MassDEP lakes nutrient criteria survey documented plant cover as sparse on one occasion in August 2005. Review of Google Earth imagery for summer seasonal months indicates plant coverage remains limited to the coves, with roughly <10% coverage of the pond in August 2013, for example. Therefore, Aquatic Plants (Macrophytes) is being removed as a cause of impairment.

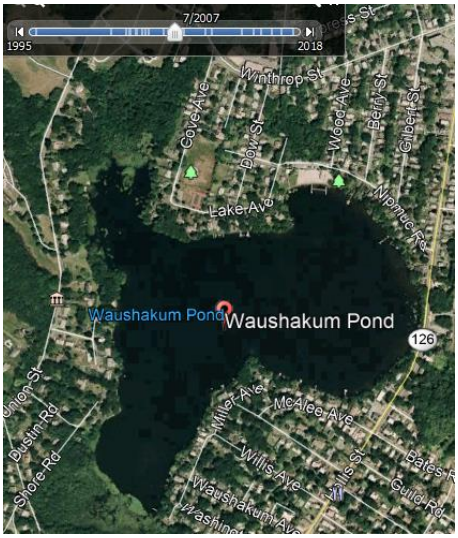
Supporting Information for Delisted Impairments

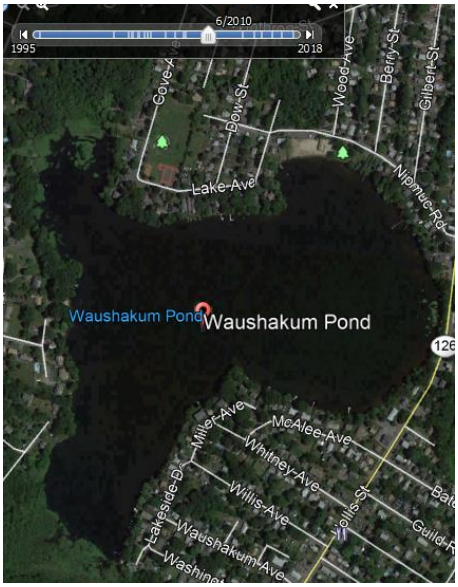
Aquatic Plants (Macrophytes)

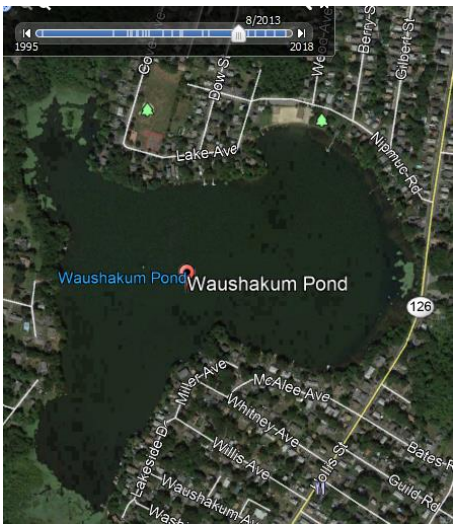
During MassDEP DWM's 2005 lakes nutrient criteria survey, overall lake plant cover was documented as sparse on 8/17/2005 (MassDEP 2013).

Google Earth Images (August 2003, July 2007, June 2010, August 2013) for Waushakum Pond (Google Earth Pro Undated)




7/2007
1995
2018
Winthrop St
Cove Ave
Bow St
Wood Ave
Berry St
Gilbert St
Lake Ave
Nipmuc Rd
Waushakum Pond
Waushakum Pond
126
Union St
Dustin Rd
Shore Rd
Miller Ave
McAlee Ave
Willis Ave
Bates Rd
Guild Rd


6/2010
1995
2018
Bow St
Wood Ave
Berry St
Gilbert St
Lake Ave
Nipmuc Rd
Waushakum Pond
Waushakum Pond
126
Miller Ave
McAlee Ave
Whitney Ave
Willis Ave
Guild Rd


8/2013
1995
2018
Bow St
Berry St
Gilbert St
Lake Ave
Nipmuc Rd
Waushakum Pond
Waushakum Pond
126
Miller Ave
McAlee Ave
Whitney Ave
Willis Ave
Guild Rd

Section 319 Grant Program Indicative Project Summary for Project #08-02/319 Conducted on Waushakum Pond (Harper 2014). The project was completed in June 2011 (Harper March 11, 2019).

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

SECTION 319 NPS PROJECT 08-02/319

PROJECT TITLE: Lake Waushakum LID BMP Implementation Project
NPS CATEGORY: Urban runoff
INVESTIGATOR: Town of Ashland
LOCATION: Concord (SuAsCo) Basin

DESCRIPTION:

Waushakum Pond is located on the border of the towns of Ashland and Framingham. The pond is located in the headwaters of the Concord River Watershed (Major Basin SuAsCo – Concord) and is tributary to the Sudbury River. It is also one of Massachusetts' *Great Ponds*. The area around the pond is highly developed and receives stormwater discharge from a roadway collection system that currently provides little or no treatment. Waushakum Pond is currently listed on Massachusetts Department of Environmental Protection (MassDEP) Proposed Year 2006 Integrated Lists of Waters as Category 4c for "Impairment not Caused by a Pollutant." Two pond assessments and MassDEPs *SuAsCo Watershed 2001 Water Quality Assessment Report* have identified non-point source pollutants (TSS and phosphorous) as the major causes of impairment.

This project will utilize the information developed in these previous assessments, and will implement three priority Best Management Practices (BMPs) in the Pond's watershed. The Low Impact Development (LID) BMPs include several tree bioretention facilities (raingardens), and the installation of permeable paving with the major project goals of reducing phosphorous, suspended solids and other non-point source pollutants, promoting recharge through infiltration, and replicating the area's natural hydrology. This project is the first phase of a multi phase project.

A decision matrix was used to evaluate potential BMP locations. Ten locations were evaluated and the three most promising sites were chosen. Once locations were determined, a second matrix was used to identify the best BMP per site. The selected BMPs are:

1. Site #1 - Installation of permeable paving at the boat launching area in Ashland to prevent significant sedimentation of the pond from ongoing erosion and untreated discharge of stormwater, and promotes stormwater recharge.
2. Site #2 and Site #10 - Installation of bioretention cells to capture, treat and infiltrate storm water. Bioretention has been shown to be extremely effective in reducing nutrient levels and sediment loading associated nonpoint source pollution. The bioretention cells will take the form of tree filters/rain gardens located near catch basins. Street trees will be planted in the tree filter along with perennials. Street trees will also help reduce thermal pollution associated with hot summer weather.

PROJECT COST: $163,890

FUNDING: $ 98,500 by the U.S. EPA
$ 38,990 by the Town of Ashland
$ 20,000 by the Town of Framingham
$ 6,400 by volunteers

DURATION: 2007 – 2010

West Pond (MA82115)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use of West Pond is Not Assessed.

Westborough Reservoir (MA82114)

Location:	Westborough.
AU Type:	FRESHWATER LAKE
AU Size:	41 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No data are available so the Aquatic Life Use for Westborough Resevoir is not assessed.

White Pond (MA82118)

Location:	Concord.
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
3	5	Dissolved Oxygen		Added
3	5	Harmful Algal Blooms		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

MassDEP staff conducted a depth profile and collected some water samples from White Pond at site W1302 in September 2005. The water temperature, chlorophyll *a*, and specific conductivity data were indicative of good water quality. The pH ranged from 5.5-7.6 (with lower measurements primarily in the anoxic zone). Dissolved oxygen dropped below 5 mg/L between 9.4-10.1 m in depth. Bathymetry data indicate that the area of White Pond at 30 ft (9.144 m) in depth encompasses roughly 58% of the surface area of the lake. The total phosphorus concentration at the surface was <0.005 mg/L, while the near bottom concentration was 0.067 mg/L. White Pond was posted because of algal blooms for 65 days in 2015.

The Aquatic Life Use for White Pond MA82118 is assessed as Not Supporting due to low dissolved oxygen and the prolonged Harmful Algal Bloom.

White Pond (MA82119)

Location:	Hudson/Stow.
AU Type:	FRESHWATER LAKE
AU Size:	49 ACRES
Classification/Qualifier:	A: PWS, ORW

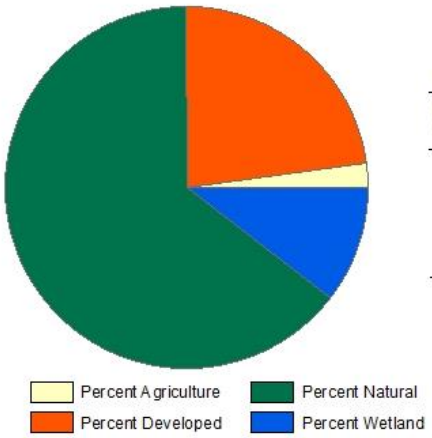
Fish, other Aquatic Life and Wildlife Use: Not Assessed
As there are no available data, the Aquatic Life Use for this White Pond AU (MA82119) is not assessed.

Whitehall Brook (MA82A-11)

Location:	Headwaters, outlet Whitehall Reservoir, Hopkinton to mouth at confluence with the Sudbury River, Westborough.
AU Type:	RIVER
AU Size:	3.5 MILES
Classification/Qualifier:	B: ORW

Whitehall Brook - MA82A-11

Watershed Area: 7.6 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	7.6	5.59	2.7	2.15
Agriculture	2.1%	2.8%	2.7%	3.4%
Developed	23%	24.6%	21.6%	21.9%
Natural	64.5%	62.1%	55.7%	55%
Wetland	10.4%	10.6%	20%	19.7%
Impervious Cover	7.5%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Whitehall Brook near Fruit Street in Hopkinton (Sample ID4773) in July 2013. The sample was comprised entirely of seven macrohabitat generalist species three of which were either intolerant or moderately tolerant to pollution although sampling efficiency was noted as being compromised by dark water/difficulty seeing fish. The Aquatic Life Use for Whitehall Brook is assessed as fully supporting based on the DFG fish sample collected in July 2013. The former alert issues are being maintained (low DO/pH influence of wetlands in this low gradient stream).

Whitehall Reservoir (MA82120)

Location:	Hopkinton.
AU Type:	FRESHWATER LAKE
AU Size:	560 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

Infestations of the non-native aquatic macrophytes *Myriophyllum heterophyllum*, *Cabomba caroliniana*, and *Utricularia inflata* have been identified in Whitehall Reservoir. In July 2003 MassDEP conducted a water quality survey at the deep hole of the reservoir (W0942) as part of the 2003 Nutrient Criteria Survey. Dissolved oxygen dropped below 5 mg/L between 2.5-3.0 m in depth, similar to the conditions documented in the 2001 survey. Bathymetry data indicates that the area of the reservoir at 3.0 m in depth encompasses roughly 9% of the surface area, so it is likely that the depth at which dissolved oxygen declined was ~10% of the lake's surface area. Chlorophyll *a*, temperature, and specific conductivity data, were indicative of good water quality conditions (chlor *a* ≤7.1µg/L, maximum temperature 27.2°C, and conductivity ≤138µS/cm). The pH was as low as 5.7SU at greater depths (in the anoxic zone). Total phosphorus data were censored.

The Aquatic Life Use of Whitehall Reservoir remains assessed as Not Supporting based on the presence of the non-native aquatic macrophytes *Myriophyllum heterophyllum*, *Cabomba caroliniana*, and *Utricularia inflata* and low dissolved oxygen. Without any more recent data total phosphorus will also remain listed as an impairment.

Williams Lake (MA82121)

Location:	Marlborough.
AU Type:	FRESHWATER LAKE
AU Size:	69 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
With no data available for this reporting cycle, the Aquatic Life Use of Williams Lake is Not Assessed.

Willis Pond (MA82122)

Location:	Sudbury.
AU Type:	FRESHWATER LAKE
AU Size:	67 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
Willis Pond was posted for harmful algal blooms for 21 days in 2015 so an Alert is issued. Without any other data available for this reporting cycle, there is insufficient information to assess the Aquatic Life Use for Willis Pond.

Winning Pond (MA82123)

Location:	Billerica.
AU Type:	FRESHWATER LAKE
AU Size:	22 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Three non-native aquatic macrophyte species, *Myriophyllum spicatum*, *Trapa natans*, and *Eichornia crassipes*, have been identified in Winning Pond. Therefore, the Aquatic Life Use is assessed as Not Supporting.

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