Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle

Appendix 22
Shawsheen River Basin
Assessment and Listing Decision Summary

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Massachusetts Department of Environmental Protection

MassDEP's mission is to protect and enhance the Commonwealth's natural resources – air, water, and land – to provide for the health, safety, and welfare of all people, and to ensure a clean and safe environment for future generations. In carrying out this mission MassDEP commits to address and advance environmental justice and equity for all people of the Commonwealth; provide meaningful, inclusive opportunities for people to participate in agency decisions that affect their lives; and ensure a diverse workforce that reflects the communities we serve.

Watershed Planning Program

The Watershed Planning Program is a statewide program in the Division of Watershed Management, Bureau of Water Resources, at MassDEP. We are stewards of the water resources of Massachusetts. Together with other state environmental agencies, we share in the duty and responsibility to protect, enhance, and restore the quality and value of the waters of the Commonwealth. We are guided by the federal Clean Water Act and work to secure the environmental, recreational, and public health benefits of clean water for the residents of Massachusetts. The Watershed Planning Program is organized into five Sections that each have a different technical focus under the Clean Water Act: (1) Surface Water Quality Standards; (2) Surface Water Quality Monitoring; (3) Data Management and Water Quality Assessment; (4) Total Maximum Daily Load; and (5) Nonpoint Source Pollution.

Disclaimer

References to trade names, commercial products, manufacturers, or distributors in this report constituted neither endorsement nor recommendation by MassDEP.

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Notice of Availability

This report is available on the Massachusetts Department of Environmental Protection website: https://www.mass.gov/lists/integrated-lists-of-waters-related-reports.

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2022 Cycle Impairment Changes

Waterbody	AU_ID	2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Ames Pond	MA83001	5	5	Mercury in Fish Tissue		Unchanged
Bakers Meadow Pond	MA83002	3	3	None		Unchanged
Ballardvale Impoundment	MA83011	5	5	(Aquatic Plants (Macrophytes)*)		Changed
Ballardvale Impoundment	MA83011	5	5	(Fanwort*)		Added
Ballardvale Impoundment	MA83011	5	5	(Fish Passage Barrier*)		Added
Ballardvale Impoundment	MA83011	5	5	(Non-Native Aquatic Plants*)		Removed
Ballardvale Impoundment	MA83011	5	5	Mercury in Fish Tissue		Unchanged
Ballardvale Impoundment	MA83011	5	5	Nutrient/Eutrophication Biological Indicators		Added
Content Brook	MA83-09	5	5	Benthic Macroinvertebrates		Unchanged
Content Brook	MA83-09	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Elm Brook	MA83-23	2	2	None		Unchanged
Elm Brook	MA83-24	5	5	(Physical Substrate Habitat Alterations*)		Unchanged
Elm Brook	MA83-24	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Elm Brook	MA83-24	5	5	Fecal Coliform	2587	Unchanged
Elm Brook	MA83-24	5	5	Sedimentation/Siltation		Unchanged
Fawn Lake	MA83004	3	3	None		Unchanged
Fosters Pond	MA83005	5	5	(Fanwort*)		Added
Fosters Pond	MA83005	5	5	(Non-Native Aquatic Plants*)		Removed
Fosters Pond	MA83005	5	5	Dissolved Oxygen		Unchanged
Fosters Pond	MA83005	5	5	Mercury in Fish Tissue		Unchanged
Gravel Pit Pond	MA83007	4c	4c	(Non-Native Aquatic Plants*)		Unchanged
Hussey Brook Pond	MA83008	3	3	None		Unchanged
Hussey Pond	MA83009	5	5	Algae		Unchanged
Kiln Brook	MA83-10	4a	4a	Fecal Coliform	2587	Unchanged
Long Meadow Brook	MA83-11	4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
Long Meadow Brook	MA83-11	4a	4a	Fecal Coliform	2587	Unchanged
Long Pond	MA83010	5	5	(Water Chestnut*)		Added
Long Pond	MA83010	5	5	Algae		Unchanged
Long Pond	MA83010	5	5	Chlorophyll-a		Unchanged
Long Pond	MA83010	5	5	Dissolved Oxygen		Unchanged
Long Pond	MA83010	5	5	Phosphorus, Total		Unchanged
Long Pond	MA83010	5	5	Transparency / Clarity		Unchanged
Meadow Brook	MA83-12	2	2	None		Unchanged
Pomps Pond	MA83014	5	5	(Non-Native Aquatic Plants*)		Unchanged
Pomps Pond	MA83014	5	5	Mercury in Fish Tissue		Unchanged
Pond Street Pond	MA83021	3	3	None		Unchanged

Waterbody	AU_ID	2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Rabbit Pond	MA83015	5	5	Turbidity		Unchanged
Richardson Pond North	MA83020	3	3	None		Unchanged
Rogers Brook	MA83-04	4a	4a	(Physical Substrate Habitat Alterations*)		Unchanged
Rogers Brook	MA83-04	4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
Rogers Brook	MA83-04	4a	4a	Fecal Coliform	2587	Unchanged
Round Pond	MA83018	3	3	None		Unchanged
Sandy Brook	MA83-13	4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
Sandy Brook	MA83-13	4a	4a	Fecal Coliform	2587	Unchanged
Shawsheen River	MA83-01	5	5	(Physical Substrate Habitat Alterations*)		Unchanged
Shawsheen River	MA83-01	5	5	Dissolved Oxygen		Unchanged
Shawsheen River	MA83-01	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Shawsheen River	MA83-01	5	5	Fecal Coliform	2587	Unchanged
Shawsheen River	MA83-01	5	5	Sedimentation/Siltation		Unchanged
Shawsheen River	MA83-08	5	5	Dissolved Oxygen		Unchanged
Shawsheen River	MA83-08	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Shawsheen River	MA83-08	5	5	Fecal Coliform	2587	Unchanged
Shawsheen River	MA83-08	5	5	Physical Substrate Habitat Alterations		Unchanged
Shawsheen River	MA83-17	5	5	(Curly-leaf Pondweed*)		Added
Shawsheen River	MA83-17	5	5	Dissolved Oxygen		Unchanged
Shawsheen River	MA83-17	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Shawsheen River	MA83-17	5	5	Fecal Coliform	2587	Unchanged
Shawsheen River	MA83-18	5	5	(Curly-leaf Pondweed*)		Added
Shawsheen River	MA83-18	5	5	Dissolved Oxygen		Unchanged
Shawsheen River	MA83-18	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Shawsheen River	MA83-18	5	5	Fecal Coliform	2587	Unchanged
Shawsheen River	MA83-19	4a	5	(Curly-leaf Pondweed*)		Added
Shawsheen River	MA83-19	4a	5	(Fish Passage Barrier*)		Added
Shawsheen River	MA83-19	4a	5	Benthic Macroinvertebrates		Added
Shawsheen River	MA83-19	4a	5	Escherichia Coli (E. Coli)	2587	Unchanged
Shawsheen River	MA83-19	4a	5	Fecal Coliform	2587	Unchanged
Spring Brook	MA83-14	2	5	(Dewatering*)		Added
Spring Brook	MA83-14	2	5	Escherichia Coli (E. Coli)		Added
Strong Water Brook	MA83-07	4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
Strong Water Brook	MA83-07	4a	4a	Fecal Coliform	2587	Unchanged
Unnamed Tributary	MA83-15	5	5	(Dewatering*)		Unchanged
Unnamed Tributary	MA83-15	5	5	Chloride		Unchanged
Unnamed Tributary	MA83-15	5	5	Escherichia Coli (E. Coli)	2587	Unchanged
Unnamed Tributary	MA83-15	5	5	Fecal Coliform	2587	Unchanged
Unnamed Tributary	MA83-16	3	3	None		Unchanged

Waterbody	AU_ID	2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Unnamed Tributary	MA83-20	5	5	Chloride		Unchanged
Unnamed Tributary	MA83-21	4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
Vine Brook	MA83-06	5	5	(Curly-leaf Pondweed*)		Added
Vine Brook	MA83-06	5	5	Benthic Macroinvertebrates		Added
Vine Brook	MA83-06	5	5	Chloride		Added
Vine Brook	MA83-06	5	5	Dissolved Oxygen		Unchanged
Vine Brook	MA83-06	5	5	Escherichia Coli (E. Coli)		Added
Vine Brook	MA83-06	5	5	Turbidity		Unchanged
Webb Brook	MA83-22	5	5	Escherichia Coli (E. Coli)		Unchanged

Ames Pond (MA83001)

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

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Mercury in Fish Tissue		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Mercury in Fish Tissue	Atmospheric Deposition - Toxics (Y)		X			

Recommendations

2022 Recommendations
ALU: An aquatic macrophyte survey of Ames Pond should be conducted when flowering heads are present to confirm the presence of any non-native species of *Myriophyllum* (confirmation of any non-native species should be made by a qualified state agency/taxonomist).

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Assessed	YES
2022 Use Attainment Summary	
As was previously noted, MassDEP staff listed "Myriophyllum sp." on the field sheet for a September 1995 synoptic survey of Ames Pond. Although no recent data are available for Ames Pond (MA83001) and the Aquatic Life Use is Not Assessed, the Alert status should be retained until an aquatic macrophyte survey can be conducted to determine whether any of the non-native species of *Myriophyllum* are infesting the pond.	

Biological Monitoring Information

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP 1995)

Summary Statement	Assessment Recommendation
As was previously noted, MassDEP staff listed "Myriophyllum sp." on the field sheet for a September 1995 synoptic survey of Ames Pond. DEP biologists should conduct an aquatic macrophyte survey when flowering heads are present to determine whether any of the non-native species of *Myriophyllum* are infesting the pond. The Alert status should be retained in the interim.	Conduct an aquatic macrophyte survey in Ames Pond when flowering heads are present to determine if any non-native species of *Myriophyllum* are infesting the pond.

Fish Consumption

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
No recent fish toxics sampling was conducted in Ames Pond (MA83001), therefore the Fish Consumption Use will continue to be assessed as Not Supporting for Mercury in Fish Tissue. MassDPH advises that children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any largemouth bass from this water body and that the general public should limit consumption of largemouth bass to two meals per month (MassDPH 2021).	

Aesthetic

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent data were collected in Ames Pond (MA83001), therefore the Aesthetics Use is Not Assessed.	

Primary Contact Recreation

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent bacteria data were collected in Ames Pond (MA83001), therefore the Primary Contact Recreational Use is Not Assessed.	

Secondary Contact Recreation

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent bacteria data were collected in Ames Pond (MA83001), therefore the Secondary Contact Recreational Use is Not Assessed.	

Bakers Meadow Pond (MA83002)

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

No usable data were available for Bakers Meadow Pond (MA83002) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
-3	3	None		Unchanged

Ballardvale Impoundment (MA83011)

Location:	Andover (Lowell Junction Pond).
AU Type:	FRESHWATER LAKE
AU Size:	35 ACRES
Classification/Qualifier:	B: WWF

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Aquatic Plants (Macrophytes)*)		Changed
5	5	(Fanwort*)		Added
5	5	(Fish Passage Barrier*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Mercury in Fish Tissue		Unchanged
5	5	Nutrient/Eutrophication Biological Indicators		Added

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Aquatic Plants (Macrophytes)*)	Source Unknown (N)	X		X	X	X
(Fanwort*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
(Fish Passage Barrier*)	Dam or Impoundment (Y)	X				
Mercury in Fish Tissue	Source Unknown (N)		X			
Nutrient/Eutrophication Biological Indicators	Source Unknown (N)	X		X	X	X

Supporting Information for Removed Impairments

2018/20 Removed Impairment	Removal Reason	Removal Comment
Aquatic Plants (Macrophytes)	Not caused by a pollutant (4c)	As described in detail in the 2022 CALM guidance document (MassDEP 2022), the mapping of Aquatic Plants (Macrophytes) impairments as a pollutant is being reevaluated. Ballardvale Impoundment (MA83011), also known as Lowell Junction Pond, was first listed as impaired for Noxious Aquatic Plants in 1998 and this cause was remapped to Aquatic Plants (Macrophytes) during the 2010 IR cycle (MassDEP 2015). The original impairment was based on a September 1995 synoptic survey conducted by MassDEP staff in which dense plant cover was noted at multiple observation sites in the pond. Non-rooted, floating species observed included *Lemna*/*Wolffia* spp. and *Spirodela polyrhiza* (MassDEP 1995, MassDEP 1997). Subsequently, Google Earth images from August 2013 and September 2014 showed high amounts of plant coverage, over more than 25% of the impoundment's surface (Google Earth Pro Undated). The Aquatic Plants (Macrophytes) pollutant impairment is being removed and replaced with the Nutrient/Eutrophication Biological Indicators pollutant impairment (based on the presence of non-rooted, floating, aquatic macrophyte species), as well as the Aquatic Plants (Macrophytes) non-pollutant impairment (since more than 25% of the pond was covered in aquatic macrophytes in recent years).
Non-Native Aquatic Plants	Clarification of listing cause	The generic Non-Native Aquatic Plants is being removed and replaced with the specific aquatic macrophyte species, Fanwort.

Aquatic Plants (Macrophytes)

1997 WBS Coding Sheet (MassDEP 1997):

WBID: **MA83011** WATERSHED: **Shawsheen** (83) (Printed 02/03/98)
NAME: **Lowell Junction Pond** TYPE: **Lake/Pond**
CODE: **83011** SIZE: **40.00**(acres) CLASS: **B**

LATITUDE:
LONGITUDE: ()
Lake/Pond Name: Lowell Junction Pond, Andover
Ecoregion Name: ()
Description: Lowell Junction Pond (Ballardvale Pond), Andover.

Assessment Date: 9704 **Begin Sampling:** 9509 **303(d) List?:** No
Cycle: 97 **End Sampling:** 9509 **Pathogens Only?:** No

Lake Specific Information
Lake size greater than 10 acres?: Yes
Significantly Publicly Owned: xxxx
Trophic Status: Eutrophic
Trophic Trend: Unknown
Acidity/Toxics Trend: Unknown
Acidity Effects: Unknown

Uses	Support	Threat	Partial	Non-Sup	Not-Asses	Not-Attain
OVERALL USE SUPPORT				40.00		
ALUS			40.00			
FISH CONSUMPTION				40.00		
PRIMARY CONTACT				30.00	10.00	
SECONDARY CONTACT	10.00			30.00		
Aesthetics	10.00			30.00		

Nonattainment Causes

Code	Size	Magnitude
0500- Metals	40.00	M
0501- (Mercury)	40.00	M
2200- Noxious aquatic plants	30.00	M
2600- Exotic species	40.00	M

"New" Code / Size / Magnitude

Nonattainment Sources

Code	Size	Magnitude
9000- SOURCE UNKNOWN	40.00	H

"New" Code / Size / Magnitude

Assessment Type
(Assessment Category = > Monitored)
B25- Ecological/habitat surveys (Qualitative/Quantitative)
R35- Primary Producer Surveys

"New" Assessment Category = > M E NA

Media/Pollutants Assessed (Toxics Monitoring = > N)
-

"New" Toxics Monitoring = > YES or NO

Comments:
1997:
September 21, 1995 synoptic survey indicated about 75% of the pond covered by very dense floating leaf and emergent vegetation including the non-native species Cabomba caroliniana. Department of Public Health fish advisory (due to Mercury) in effect.

1995 Synoptic Survey Field Sheet (MassDEP 1995):

(Ballardville Impoundment)
Lowell Junction Pond
Page 1 of 2

Lake/Pond ~~RIVER STREET POND~~ (40 ac ~~69 ac~~.) Date 9/21/95

Town/City ANDOVER Observers HAYNES

River Basin SHAWSHEEN HALTERMAN

USGS Topo WILMINGTON 7.5' PALIS NO. ~~83019~~ 83011

Location/type of access (be specific, e.g., public boat ramp at west cove area off Simpson Street):

① River Street @ USGS Gaging Station

② River Street @ East Cove Area - About 1000 feet south of ① above

③ west side of South basin @ railroad tracks

Ownership of Location/Access (specify public or private, name of owner(s), and any use restrictions):

① unknown

② At canoe launch site, but ownership unknown

③ Boston & Maine railroad ~~(illegible)~~

Posted signs (re aquatic plants, fish advisories, access, etc.):

① NONE

② NONE

③ NONE

Water quality observations (clarity, dissolved organic staining, blooms, et cetera):

① Covered @ Wolffia sp. and Lemna minor (~70%)

Cannot judge water clarity - open water ≈ 50' from shoreline

② Very shallow water (<12"). lots of leaf litter. water ~~appears~~ to be somewhat turbid.

③ Refer to plant density notes - vantage point too far from ~~water~~ edge of water.

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Record of aquatic plant "species" observed (see note below):

① typha latifolia (dominant plant) lemna minor } Cover about 20% of
Potamogeton sp. (likely P. natans) Wolffia sp. } open water

② (*) Lythrum salicaria } dominant emergent plants
typha latifolia
Sparganium sp.
Pettandra virginica
Polygonum sp.
Dulichium arundinaceum
Nymphaea odorata (?)

lemna minor } dominant surface plants
Wolffia sp. }
Spirodella polyrhiza
Elodea sp.
(*) Cabomba caroliniana
Potamogeton sp.

③ Observed from a distance; too far to distinguish other macrophytes

(*) Lythrum salicaria
typha latifolia
Nymphaea odorata (?)

Observed aquatic plant density (at observation site and across lake or pond, if practicable):

Does not reflect coverage by submerged plants, which do not seem abundant

① 60% plus, but this is likely a dynamic (run of the river) pond subject to change in plant density (particularly re regrowth of L. minor and Wolffia sp.)

② South of Island 100% covered @ floating leaf (~25%) and emergent (~30+%) plants
North of Island is about 65% covered with emergent (mostly T. latifolia) & floating-leaf plants

Other notes (e.g., overt pollution, construction, and water uses:

③ 95% coverage @ floating-leaf plants ([redacted] Nymphaea odorata [redacted] / Lemna minor + Wolffia)

Trophic - Eutrophic
ALUS - 27 acres - Partial Support
1° Contact - 20 acres Non-Support ; 7 acres Not assessed
2° Contact 20 " " ; 7 acres Full support
Aesthetics - 20 " " ; 7 acres Full support
Causes - Exotics (MJ 27 acres ; Noxious plants (MJ 20 acres)

Note: record suspect *M. heterophyllum* plants that may require confirmation once emergent flowering stalks are evident.

Google Earth image of Ballardvale Impoundment while clear of vegetation, 4/6/2011 (Google Earth Pro Undated):

Google Earth image of Ballardvale Impoundment, 8/24/2013 (Google Earth Pro Undated):

Google Earth image of Ballardvale Impoundment, 9/27/2014 (Google Earth Pro Undated):

Non-Native Aquatic Plants

The generic Non-Native Aquatic Plants is being removed and replaced with the specific aquatic macrophyte species, Fanwort.

Recommendations

2022 Recommendations
ALU: For the next reporting cycle in which the Ballardvale Impoundment AU is assessed, update the assessment with any progress on the removal of the Ballardvale Dam.

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	

As was previously reported, MassDEP staff identified an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), in the Ballardvale Impoundment during a September 1995 synoptic survey. UMass Amherst students collected limited water quality data (Station UMassA_BVLIMP) in the impoundment 36 m upstream from the dam (in Andover). Continuous temperature data were measured over 78 days in the 2016 summer index period (during which there was a state-wide drought) and 107 days in the 2017 summer index period: there were 24 occurrences of a 7DADM >27.7 °C in 2016 but none in 2017. The maximum 24-hr rolling average temperature (28.2 °C in 2016; 26.5 °C in 2017) did not exceed the acute temperature threshold (28.3 °C) in either year. DMF biologists gave the Ballardvale Dam (marking the boundary between the impoundment and the downstream Shawsheen River AU (MA83-19) a diadromous fish passage score of "8", on a 0-10 scale, indicating that the dam poses a severe impediment to the passage of the target diadromous fish species, river herring and American eel. The population score was noted to be “3”. There is a dam removal project in its planning stages here (the design for removal was completed in 2016) as part of the large cooperative project which sought to remove this dam and the two downstream dams (which were successfully removed in 2017) on the Shawsheen River.

As described in detail in the 2022 CALM guidance document (MassDEP 2022), the mapping of Aquatic Plants (Macrophytes) impairments as a pollutant is being reevaluated. Ballardvale Impoundment, also known as Lowell Junction Pond, was first listed as impaired for Noxious Aquatic Plants in 1998 and this cause was remapped to Aquatic Plants (Macrophytes) during the 2010 IR cycle (MassDEP 2015). The original impairment was based on a September 1995 synoptic survey conducted by MassDEP staff in which dense plant cover was noted at multiple observation sites in the pond. Non-rooted, floating species observed included *Lemna*/*Wolffia* spp. and *Spirodela polyrhiza* (MassDEP 1995, MassDEP 1997). Subsequently, Google Earth images from August 2013 and September 2014 showed high amounts of plant coverage, over more than 25% of the impoundment’s surface (Google Earth Pro Undated). Nutrient/Eutrophication Biological Indicators should be added as an impairment based on the presence of non-rooted, floating, aquatic macrophyte species. Additionally, Aquatic Plants (Macrophytes) should be delisted as a pollutant and added again as a non-pollutant since more than 25% of the pond was covered in aquatic macrophytes in recent years.

The Aquatic Life Use for the Ballardvale Impoundment (MA83011) is assessed as Not Supporting. A new Fish Passage Barrier impairment will be added, based on the barrier to diadromous fish passage posed by the Ballardvale Dam. The generic Non-Native Aquatic Plants impairment is being replaced by the specific Fanwort impairment. As described according to the rationale above, the Aquatic Plants (Macrophytes) pollutant impairment is being replaced with the Nutrient/Eutrophication Biological Indicators pollutant impairment and the Aquatic Plants (Macrophytes) non-pollutant impairment.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
UMassA_BVLIMP	UMass Amherst	Water Quality	Shawsheen River	36m upstream dam	42.626883	-71.15805

Biological Monitoring Information

Habitat and Flow Data (anthropogenic alterations)

MassDMF Status of Priority Diadromous Fish Passage Barriers. (Chase 2020)

Assessment Summary
DMF biologists noted one structure causing passage limitation to diadromous fish at the downstream end of the Ballardvale Impoundment. The Ballardvale Dam (marking the boundary between the impoundment and the downstream MA83-19 Shawsheen River AU) was given a passage score of "8", on a 0-10 scale, indicating that the dam poses a severe impediment to the passage of the targeted species, river herring and American eel. The population score was noted to be “3”. There is a dam removal project in its planning stages here (the design for removal was completed in 2016) as part of the large cooperative project which sought to remove this dam and the two downstream dams (which were successfully removed in 2017) on the Shawsheen River. The Aquatic Life Use for the Ballardvale Impoundment (MA83011) is assessed as Not Supporting, based on the barrier to diadromous fish passage posed by the Ballardvale Dam.

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP 1995)

Summary Statement
As was previously reported, MassDEP staff identified an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), in the Ballardvale Impoundment during a September 1995 synoptic survey.

Physico-chemical Water Quality Information

DO, pH, Temperature (Depth Profiles)

UMass Amherst Dam Study Long-term Continuous Temperature Data (Summer Index 2014-2017). (UMass-Amherst 2018) (MassDEP Undated 4)

[Summer Index is June 1 – Sept 15; 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Index Count	Max 24hr Rolling Avg Temp (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier2 7DADA >21	Count WW 7DADM >27.7
UMassA_BVLIMP	06/30/16	12/31/16	78	28.2	30.2	29.0	27.3	72	72	24
UMassA_BVLIMP	01/01/17	11/30/17	107	26.5	28.2	26.6	25.2	96	74	0

Fish Consumption

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
No recent fish toxics sampling has been conducted in Ballardvale Impoundment (MA83011), but the Fish Consumption Use will continue to be assessed as Not Supporting for Mercury in Fish Tissue. MassDPH advises that children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat largemouth bass and black crappie from this water body and that the general public should limit consumption of largemouth bass and black crappie from the Ballardvale Impoundment to two meals per month.	

Aesthetic

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary
As described in detail in the 2022 CALM guidance document (MassDEP 2022), the mapping of Aquatic Plants (Macrophytes) impairments as a pollutant is being reevaluated. Ballardvale Impoundment, also known as Lowell Junction Pond, was first listed as impaired for Noxious Aquatic Plants in 1998 and this cause was remapped to Aquatic Plants (Macrophytes) during the 2010 IR cycle (MassDEP 2015). The original impairment was based on a September 1995 synoptic survey conducted by MassDEP staff in which dense plant cover was noted at multiple observation sites in the pond. Non-rooted, floating species observed included *Lemna*/*Wolffia* spp. and *Spirodela polyrhiza* (MassDEP 1995, MassDEP 1997). Subsequently, Google Earth images from August 2013 and September 2014 showed high amounts of plant coverage, over more than 25% of the impoundment's surface (Google Earth Pro Undated). Nutrient/Eutrophication Biological Indicators should be added as an impairment based on the presence of non-rooted, floating, aquatic macrophyte species. Additionally, Aquatic Plants (Macrophytes) should be delisted as a pollutant and added again as a non-pollutant since more than 25% of the pond was covered in aquatic macrophytes in recent years. Recent data has not been collected from the Ballardvale Impoundment (MA83011), however, its Aesthetics Use will continue to be assessed as Not Supporting. As described according to the rationale above, the Aquatic Plants (Macrophytes) pollutant impairment is being replaced with the Nutrient/Eutrophication Biological Indicators pollutant impairment and the Aquatic Plants (Macrophytes) non-pollutant impairment.

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
As described in detail in the 2022 CALM guidance document (MassDEP 2022), the mapping of Aquatic Plants (Macrophytes) impairments as a pollutant is being reevaluated. Ballardvale Impoundment, also known as Lowell Junction Pond, was first listed as impaired for Noxious Aquatic Plants in 1998 and this cause was remapped to Aquatic Plants (Macrophytes) during the 2010 IR cycle (MassDEP 2015). The original impairment was based on a September 1995 synoptic survey conducted by MassDEP staff in which dense plant cover was noted at multiple observation sites in the pond. Non-rooted, floating species observed included *Lemna*/*Wolffia* spp. and *Spirodela polyrhiza* (MassDEP 1995, MassDEP 1997). Subsequently, Google Earth images from August 2013 and September 2014 showed high amounts of plant coverage, over more than 25% of the impoundment's surface (Google Earth Pro Undated). Nutrient/Eutrophication Biological Indicators should be added as an impairment based on the presence of non-rooted, floating, aquatic macrophyte species. Additionally, Aquatic Plants (Macrophytes) should be delisted as a pollutant and added again as a non-pollutant since more than 25% of the pond was covered in aquatic macrophytes in recent years. Recent bacteria sampling has not been conducted in the Ballardvale Impoundment (MA83011), however, the Primary Contact Recreational Use will continue to be assessed as Not Supporting. As described according to the rationale above, the Aquatic Plants (Macrophytes) pollutant impairment is being replaced with the Nutrient/Eutrophication Biological Indicators pollutant impairment and the Aquatic Plants (Macrophytes) non-pollutant impairment.	

Secondary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	

As described in detail in the 2022 CALM guidance document (MassDEP 2022), the mapping of Aquatic Plants (Macrophytes) impairments as a pollutant is being reevaluated. Ballardvale Impoundment, also known as Lowell Junction Pond, was first listed as impaired for Noxious Aquatic Plants in 1998 and this cause was remapped to Aquatic Plants (Macrophytes) during the 2010 IR cycle (MassDEP 2015). The original impairment was based on a September 1995 synoptic survey conducted by MassDEP staff in which dense plant cover was noted at multiple observation sites in the pond. Non-rooted, floating species observed included *Lemna*/*Wolffia* spp. and *Spirodela polyrhiza* (MassDEP 1995, MassDEP 1997). Subsequently, Google Earth images from August 2013 and September 2014 showed high amounts of plant coverage, over more than 25% of the impoundment's surface (Google Earth Pro Undated). Nutrient/Eutrophication Biological Indicators should be added as an impairment based on the presence of non-rooted, floating, aquatic macrophyte species. Additionally, Aquatic Plants (Macrophytes) should be delisted as a pollutant and added again as a non-pollutant since more than 25% of the pond was covered in aquatic macrophytes in recent years.
Recent bacteria sampling has not been conducted in the Ballardvale Impoundment (MA83011), however, the Secondary Contact Recreational Use will continue to be assessed as Not Supporting. As described according to the rationale above, the Aquatic Plants (Macrophytes) pollutant impairment is being replaced with the Nutrient/Eutrophication Biological Indicators pollutant impairment and the Aquatic Plants (Macrophytes) non-pollutant impairment.

Content Brook (MA83-09)

Location:	Headwaters, outlet Richardson Pond, Billerica, to confluence with Shawsheen River, Tewksbury.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B

No usable data were available for Content Brook (MA83-09) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Benthic Macroinvertebrates		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Benthic Macroinvertebrates	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Elm Brook (MA83-23)

Location:	Headwaters, south of Route 2A, Lincoln to beginning of channelized portion southwest of Kendall Court, Bedford (formerly part of 2014 segment: Elm Brook MA83-05).
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B

No usable data were available for Elm Brook (MA83-23) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
2	2	None		Unchanged

Elm Brook (MA83-24)

Location:	From beginning of channelized portion southwest of Kendall Court, Bedford to confluence with Shawsheen River, Bedford (formerly part of 2014 segment: Elm Brook MA83-05).
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B

No usable data were available for Elm Brook (MA83-24) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Physical Substrate Habitat Alterations*)		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged
5	5	Sedimentation/Siltation		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Physical Substrate Habitat Alterations*)	Channelization (Y)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	X
Escherichia Coli (E. Coli)	Industrial/Commercial Site Stormwater Discharge (Permitted) (N)				X	X
Escherichia Coli (E. Coli)	Source Unknown (N)				X	X
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Industrial/Commercial Site Stormwater Discharge (Permitted) (N)				X	
Fecal Coliform	Source Unknown (N)				X	
Sedimentation/Siltation	Unspecified Urban Stormwater (N)	X				

Fawn Lake (MA83004)

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

No usable data were available for Fawn Lake (MA83004) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Fosters Pond (MA83005)

Location:	Andover/Wilmington.
AU Type:	FRESHWATER LAKE
AU Size:	109 ACRES
Classification/Qualifier:	B

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Fanwort*)		Added
5	5	(Non-Native Aquatic Plants*)		Removed
5	5	Dissolved Oxygen		Unchanged
5	5	Mercury in Fish Tissue		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Fanwort*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Mercury in Fish Tissue	Atmospheric Deposition - Toxics (Y)		X			

Supporting Information for Removed Impairments

2018/20 Removed Impairment	Removal Reason	Removal Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic Non-Native Aquatic Plants impairment is being removed and replaced with the specific aquatic macrophyte, Fanwort.

Non-Native Aquatic Plants

The generic Non-Native Aquatic Plants impairment is being removed and replaced with the specific aquatic macrophyte, Fanwort.

Recommendations

2022 Recommendations
ALU: An aquatic macrophyte survey of Fosters Pond should be conducted when flowering heads are present to confirm the presence of any non-native species of *Myriophyllum* (confirmation of any non-native species should be made by a qualified state agency/taxonomist).

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	YES
2022 Use Attainment Summary	
As was previously reported, MassDEP staff identified an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), in Fosters Pond during a September 1995 synoptic survey. During a review of DEP aquatic invasive species records, it was noted that the presence of *Myriophyllum* sp. was also observed during the synoptic survey. Since no other recent data are available, the Aquatic Life Use of Fosters Pond (MA83005) will continue to be assessed as Not Supporting, with the Dissolved Oxygen impairment being carried forward. The generic Non-Native Aquatic Plants impairment will be removed and replaced with the specific Fanwort, and an Alert will be issued for a potential infestation of a non-native *Myriophyllum* species.	

Biological Monitoring Information

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP 1995)

Summary Statement	Assessment Recommendation
As was previously reported, MassDEP staff identified an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), in Fosters Pond during a September 1995 synoptic survey. A review of DEP aquatic invasive species records revealed that the presence of *Myriophyllum* sp. was also noted during the synoptic survey. An aquatic macrophyte survey should be conducted to determine whether any of the non-native species of *Myriophyllum* are present in the lake and an Alert should be issued.	Conduct an aquatic macrophyte survey in Fosters Pond when flowering heads are present to determine if any non-native species of *Myriophyllum* are infesting the pond.

Fish Consumption

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
No recent fish toxics sampling was conducted in Fosters Pond (MA83005), however the Fish Consumption Use will continue to be assessed as Not Supporting for Mercury in Fish Tissue. MassDPH advises that children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body and that the general public should limit consumption of all fish from Fosters Pond to two meals per month.	

Aesthetic

2022 Use Attainment	Alert
Insufficient Information	NO
2022 Use Attainment Summary	
There are no recent data available for Fosters Pond (MA83005). Although this use was previously identified as impaired for Non-Native Aquatic Plants, the impairment is being removed since it was determined from a review of the original field sheet (MassDEP 1995) that the impairment was applied to this use in error. There is insufficient information to assess the Aesthetics Use.	

Primary Contact Recreation

2022 Use Attainment	Alert

Not Assessed	NO
2022 Use Attainment Summary	
There are no recent bacteria data available for Fosters Pond (MA83005). Although this use was previously identified as impaired for Non-Native Aquatic Plants, the impairment is being removed since it was determined from a review of the original field sheet (MassDEP 1995) that the impairment was applied to this use in error. There is insufficient information to assess the Primary Contact Recreational Use.	

Secondary Contact Recreation

2022 Use Attainment	**Alert**
Insufficient Information	NO
2022 Use Attainment Summary	
There are no recent bacteria data available for Fosters Pond (MA83005). Although this use was previously identified as impaired for Non-Native Aquatic Plants, the impairment is being removed since it was determined from a review of the original field sheet (MassDEP 1995) that the impairment was applied to this use in error. There is insufficient information to assess the Secondary Contact Recreational Use.	

Gravel Pit Pond (MA83007)

Location:	Andover (Hussey Brook Pond East).
AU Type:	FRESHWATER LAKE
AU Size:	5 ACRES
Classification/Qualifier:	B

No usable data were available for Gravel Pit Pond (MA83007) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	4c	(Non-Native Aquatic Plants*)		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Non-Native Aquatic Plants*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				

Hussey Brook Pond (MA83008)

Location:	Andover.
AU Type:	FRESHWATER LAKE
AU Size:	0.5 ACRES
Classification/Qualifier:	B

No usable data were available for Hussey Brook Pond (MA83008) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Hussey Pond (MA83009)

Location:	Andover.
AU Type:	FRESHWATER LAKE
AU Size:	1 ACRES
Classification/Qualifier:	B

No usable data were available for Hussey Pond (MA83009) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Algae		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Algae	Source Unknown (N)			X	X	X

Kiln Brook (MA83-10)

Location:	Outlet unnamed pond (in Pine Meadows Country Club), Lexington, to confluence with Shawsheen River, Bedford.
AU Type:	RIVER
AU Size:	1.5 MILES
Classification/Qualifier:	B

No usable data were available for Kiln Brook (MA83-10) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Long Meadow Brook (MA83-11)

Location:	Wetland east of Lexington Street and north of Independence Drive, Burlington, to confluence with Vine Brook, Burlington.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B

No usable data were available for Long Meadow Brook (MA83-11) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
4a	4a	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	X
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Long Pond (MA83010)

Location:	Tewksbury.
AU Type:	FRESHWATER LAKE
AU Size:	44 ACRES
Classification/Qualifier:	B

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Water Chestnut*)		Added
5	5	Algae		Unchanged
5	5	Chlorophyll-a		Unchanged
5	5	Dissolved Oxygen		Unchanged
5	5	Phosphorus, Total		Unchanged
5	5	Transparency / Clarity		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Water Chestnut*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Algae	Source Unknown (N)	X		X	X	X
Chlorophyll-a	Source Unknown (N)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Phosphorus, Total	Source Unknown (N)	X		X	X	X
Transparency / Clarity	Source Unknown (N)	X		X	X	X

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary

The USGS Nonindigenous Aquatic Species website (which informs the MassDEP Freshwater Aquatic Invasive Species database) includes a 2016 record of the non-native aquatic macrophyte, water chestnut (*Trapa natans*), which was found in Long Pond.

The Aquatic Life Use of Long Pond (MA83010) is assessed as Not Supporting with the Algae, Chlorophyll-a, Dissolved Oxygen, 'Phophorus, Total', and Transparency/Clarity impairments related to nutrient enrichment being carried forward. A Water Chestnut impairment is being added.

Biological Monitoring Information

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP Undated 1)

Summary Statement
The USGS Nonindigenous Aquatic Species website (which informs the MassDEP Freshwater Aquatic Invasive Species database) includes a 2016 record of the non-native aquatic macrophyte, water chestnut (*Trapa natans*), which was found in Long Pond.

Fish Consumption

2022 Use Attainment	**Alert**
Not Assessed	NO
2022 Use Attainment Summary	
No recent fish toxics sampling has been conducted in Long Pond (MA83010), and since no site-specific advisory has been issued, the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	**Alert**
Not Supporting	NO
2022 Use Attainment Summary	
Sampling has not been conducted recently in Long Pond (MA83010) so the Aesthetics Use will continue to be assessed as Not Supporting with the Algae, 'Phosphorus, Total', and Transparency/Clarity impairments being carried forward.	

Primary Contact Recreation

2022 Use Attainment	**Alert**
Not Supporting	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in Long Pond (MA83010); the Primary Contact Recreational Use will continue to be assessed as Not Supporting with the Algae, 'Phosphorus, Total', and Transparency/Clarity impairments being carried forward.	

Secondary Contact Recreation

2022 Use Attainment	**Alert**
Not Supporting	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in Long Pond (MA83010); the Secondary Contact Recreational Use will continue to be assessed as Not Supporting with the Algae, 'Phosphorus, Total', and Transparency/Clarity impairments being carried forward.	

Meadow Brook (MA83-12)

Location:	Headwaters, outlet Ames Pond, Tewksbury, to confluence with Strong Water Brook, Tewksbury.
AU Type:	RIVER
AU Size:	1.7 MILES
Classification/Qualifier:	B

No usable data were available for Meadow Brook (MA83-12) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
2	2	None		Unchanged

Pomps Pond (MA83014)

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

No usable data were available for Pomps Pond (MA83014) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Non-Native Aquatic Plants*)		Unchanged
5	5	Mercury in Fish Tissue		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Non-Native Aquatic Plants*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Mercury in Fish Tissue	Atmospheric Deposition - Toxics (Y)		X			

Pond Street Pond (MA83021)

Location:	Billerica (unnamed pond west of Pond Street).
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

No usable data were available for Pond Street Pond (MA83021) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Rabbit Pond (MA83015)

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

No usable data were available for Rabbit Pond (MA83015) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Turbidity		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Turbidity	Source Unknown (N)			X	X	X

Richardson Pond North (MA83020)

Location:	Billerica/Tewksbury.
AU Type:	FRESHWATER LAKE
AU Size:	46 ACRES
Classification/Qualifier:	B

No usable data were available for Richardson Pond North (MA83020) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Rogers Brook (MA83-04)

Location:	From outlet of unnamed impoundment upstream of Morton Street, Andover (Prior to 1997 cycle listed as "Headwaters Billerica...") to confluence with Shawsheen River, Andover.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B

No usable data were available for Rogers Brook (MA83-04) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	(Physical Substrate Habitat Alterations*)		Unchanged
4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
4a	4a	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Physical Substrate Habitat Alterations*)	Channelization (Y)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Escherichia Coli (E. Coli)	Illicit Connections/Hook-ups to Storm Sewers (N)				X	
Escherichia Coli (E. Coli)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Illicit Connections/Hook-ups to Storm Sewers (N)				X	
Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems) (N)				X	

Round Pond (MA83018)

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

No usable data were available for Round Pond (MA83018) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Sandy Brook (MA83-13)

Location:	Headwaters north of Bedford Street and east of Fairfax Street, Burlington to confluence with Vine Brook, Burlington.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	B

No usable data were available for Sandy Brook (MA83-13) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
4a	4a	Fecal Coliform	2587	Unchanged

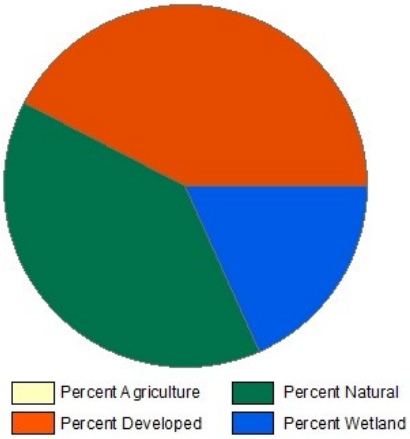
Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	X
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Shawsheen River (MA83-01)

Location:	Summer Street (historically listed as Maguire Road), Bedford to confluence with Spring Brook, Bedford.
AU Type:	RIVER
AU Size:	1.6 MILES
Classification/Qualifier:	B: TWS, WWF

Shawsheen River - MA83-01

Watershed Area: 13.79 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	13.79	11.06	2.78	2.18
Agriculture	0.8%	0%	0.3%	0%
Developed	42%	45.2%	26.8%	30.1%
Natural	39%	36.7%	31.3%	29.3%
Wetland	18.1%	18%	41.6%	40.6%
Impervious Cover	22.6%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Physical Substrate Habitat Alterations*)		Unchanged
5	5	Dissolved Oxygen		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged
5	5	Sedimentation/Siltation		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Physical Substrate Habitat Alterations*)	Source Unknown (N)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Dissolved Oxygen	Unspecified Urban Stormwater (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Sedimentation/Siltation	Source Unknown (N)	X				

Recommendations

2022 Recommendations
ALU: Fish community data collected throughout the Shawsheen River mainstem is needed to update the comparison to the Shawsheen Target Fish Community model since the Marland Place and Balmoral Dams have been removed.; REC: Collect *E. coli* samples both upstream and downstream of the Elm Brook confluence to further evaluate bacteria contamination in this Shawsheen River AU (MA83-01).

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	YES
2022 Use Attainment Summary	
Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the 5 most common species in the TFC (all fluvial species and 4 moderately tolerant), only one species (fallfish) was found in the top five among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these five most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from a downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a decision to add a Fish Bioassessments impairment will not be made at this time. The Aquatic Life Use of this Shawsheen River AU (MA83-01) will continue to be assessed as Not Supporting with Dissolved Oxygen, Physical Substrate Habitat Alterations, and Sedimentation/Siltation impairments being carried forward. An Alert for Fish Bioassessments is being identified based on the TFC analysis.	

Biological Monitoring Information

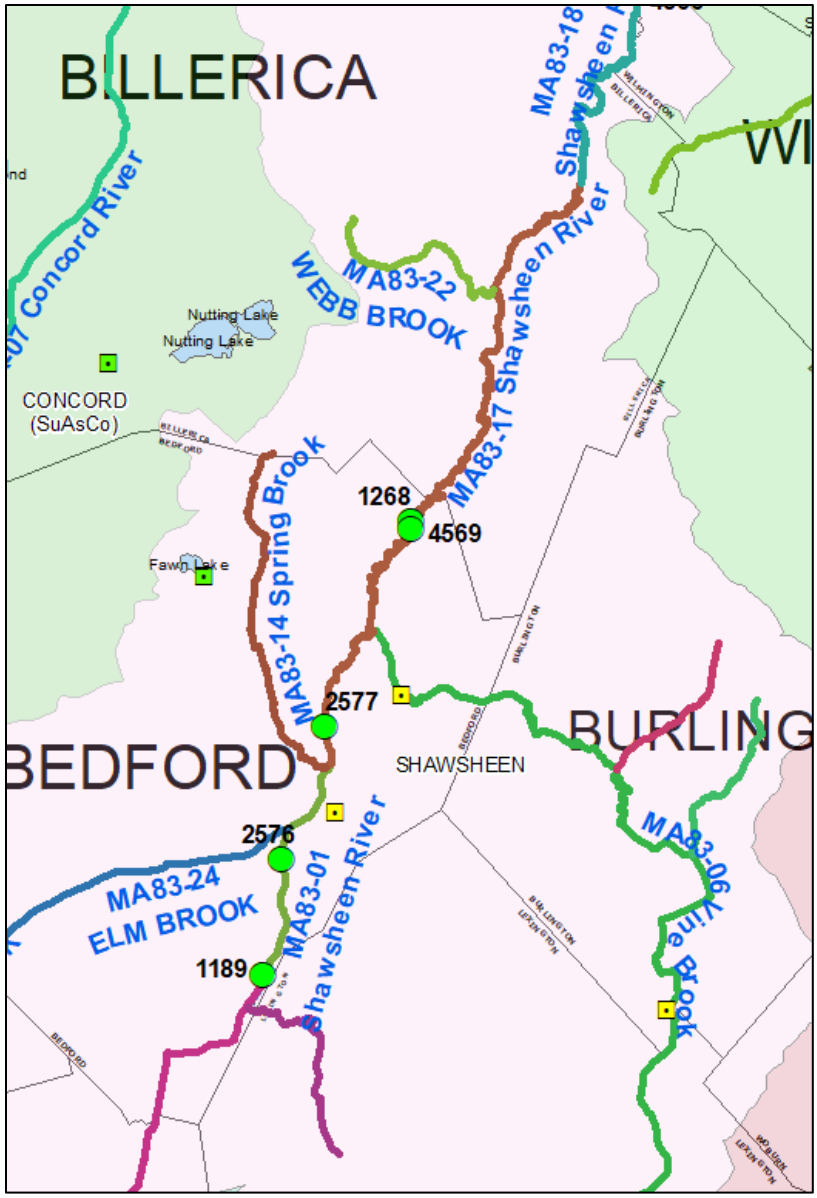
Fish Community Data and DELTS

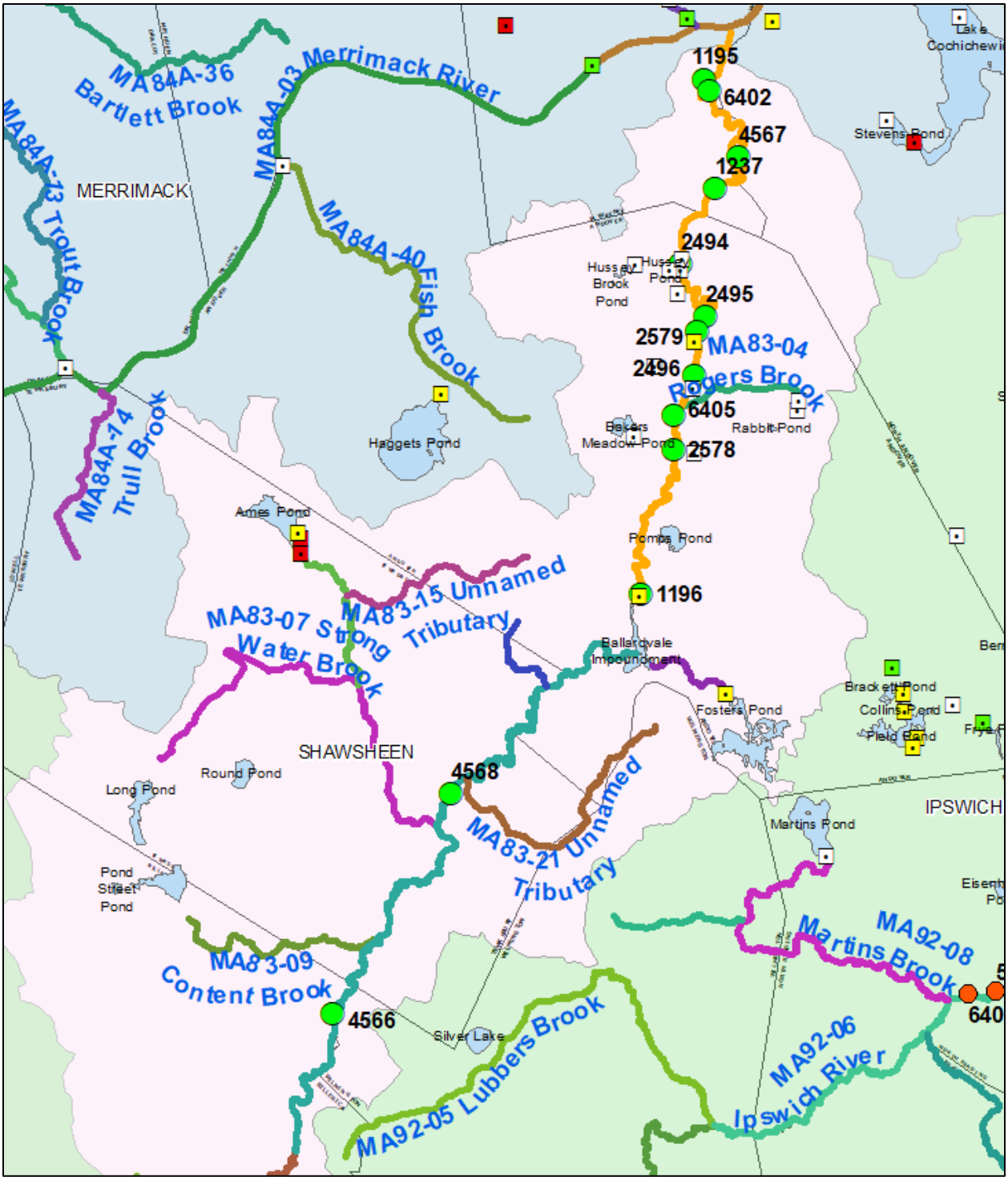
Comparison of fish community samples (2005-2017) to the Shawsheen Target Fish Community (TFC) Model. (MassDFG 2018, MassDEP Undated 2, Kashiwagi and Richards 2009)

Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community

model was 49.08%. Of the 5 most common species in the TFC (all fluvial species; 4 moderately tolerant), only one species (fallfish) was found in the top 5 among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these 5 most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from the downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a use impairment decision for these four Shawsheen River AUs (MA83-01, MA83-17, MA83-18, MA83-19) will not be made at this time. In a future IR cycle, fish community data collected after 2017 throughout the Shawsheen River mainstem should be included in a comparative analysis with the Shawsheen TFC model.

Fish Community Samples in the Shawsheen River (MA83-01, MA83-17, MA83-18, MA83-19); screen capture of 2 upstream/southern AUs, and then 2 downstream/northern AUs:


BILLERICA
Concord River
MA83-18
Shawsheen River
MA83-22
WEBB BROOK
Nutting Lake
Nutting Lake
CONCORD
(SuAsCo)
MA83-17 Shawsheen River
1268
4569
MA83-14 Spring Brook
Fawn Lake
2577
BEDFORD
SHAWSHEEN
BURLING
2576
MA83-24
ELM BROOK
MA83-01
Shawsheen River
MA83-06
Vine Brook
1189


MA84A-36
Bartlett Brook
MA84A-03 Merrimack River
MA84A-73 Trout Brook
MERRIMACK
MA84A-40 Fish Brook
MA84A-74
Trull Brook
1195
6402
4567
1237
2494
2495
2579
2496
6405
2578
1196
4568
4566
MA83-04
Rogers Brook
Stevens Pond
Hussey
Brook
Pond
Hussey
Pond
Haggets Pond
Bakers
Meadow Pond
Rabbit Pond
Ames Pond
Pomps Pond
MA83-15 Unnamed
Tributary
MA83-07 Strong
Water Brook
Ballardvale
Impoundment
Fosters Pond
Bracket Pond
Collins Pond
Field Pond
SHAWSHEEN
Round Pond
Long Pond
Pond
Street
Pond
MA83-21 Unnamed
Tributary
IPSWICH
Martins Pond
MA92-08
Martins Brook
MA83-09
Content Brook
Silver Lake
MA92-05 Lubbers Brook
MA92-06
Ipswich River

Shawsheen TFC Model:

Table A14. Species percent composition for reference rivers used to develop the Shawsheen River target fish community model. Species are ordered by mean rank. Non-native, stocked, and out-of-range species were deleted from the ranking and calculation of expected proportion in the target fish model. The ranks were converted to expected proportions (as a percent) using a rank-weighting technique as outlined by Bain and Meixler (2008).

Species	Wood River	Nissitissit River	Eightmile River	Isinglass River	SB Piscataquog River	Little River	Total	Rank	Expected Proportions
Common shiner	32.3	5.4	18.6	36.8	20.6	14.9	128.6	1	37.6
Fallfish	4.1	26.7	3.1	18.1	3.0	16.2	71.2	2	18.8
Blacknose dace	0.0	6.2	3.4	0.0	33.4	22.3	65.3		
Longnose dace	12.5	12.6	1.0	12.1	19.0	0.0	57.2		
Tessellated darter	13.6	9.7	17.3	0.0	0.0	0.0	40.7	5	7.5
Redbreast sunfish	16.1	1.0	10.9	9.2	0.0	0.0	37.1	6	6.3
American eel	5.9	2.3	8.9	10.8	0.0	4.7	32.6	7	5.4
White sucker	2.1	0.8	5.0	0.5	0.9	12.2	21.4	8	4.7
Pumpkinseed	0.3	11.0	3.3	2.7	0.5	0.0	17.9	9	4.2
Atlantic salmon	2.8	0.0	1.4	3.9	9.4	0.0	17.5		
Largemouth bass	0.2	5.4	6.0	0.9	0.7	0.0	13.2		
Yellow bullhead	0.0	10.3	0.0	0.0	1.8	0.0	12.1		
Spottail shiner	0.0	0.0	11.3	0.0	0.5	0.0	11.8		
Bluegill	4.9	3.8	0.4	0.0	0.0	0.0	9.2		
Chain pickerel	1.1	3.3	0.1	0.2	0.2	0.7	5.7	15	2.5
Smallmouth bass	0.0	0.0	1.3	0.5	3.6	0.0	5.4		
Yellow perch	0.0	0.0	4.3	0.0	0.0	0.0	4.3	17	2.2
Brown bullhead	0.8	0.0	0.1	1.4	0.0	0.0	2.3	18	2.1
Creek chubsucker	1.3	0.8	0.0	0.0	0.0	0.0	2.1	19	2.0
Brown trout	0.7	0.0	0.3	0.0	0.4	0.7	2.0		
Bridle shiner	0.0	0.0	0.0	1.8	0.0	0.0	1.8	21	1.8
Golden shiner	0.0	0.0	0.0	0.0	1.6	0.0	1.6	22	1.7
Brook trout	0.8	0.3	0.0	0.0	0.0	0.0	1.1	23	1.6
Redfin pickerel	0.0	0.0	0.9	0.0	0.0	0.0	0.9	24	1.6
Rock bass	0.0	0.5	0.0	0.0	0.0	0.0	0.5		
Rainbow trout	0.2	0.0	0.0	0.0	0.2	0.0	0.4		
Black crappie	0.2	0.0	0.0	0.0	0.0	0.0	0.2		

Fish Community Analysis:

Watershed	Common Name	Values # of Fish	% of catch	Applicable TFC	TFC Difference	% Sim to TFC
Shawsheen	American Brook Lamprey		0.00%	-	-	
Shawsheen	American Eel	490	24.23%	5.4	18.8	
Shawsheen	Atlantic Salmon	5	0.25%	-	0.2	
Shawsheen	Banded Killifish		0.00%	-	-	
Shawsheen	Banded Sunfish	10	0.49%	-	0.5	
Shawsheen	Black Crappie		0.00%	-	-	
Shawsheen	Blacknose Dace	1	0.05%	-	0.0	
Shawsheen	Bluegill	66	3.26%	-	3.3	
Shawsheen	Bluntnose Minnow		0.00%	-	-	
Shawsheen	Bridle Shiner		0.00%	1.8	1.8	
Shawsheen	Brook Trout		0.00%	1.6	1.6	
Shawsheen	Brown Bullhead	58	2.87%	2.1	0.8	
Shawsheen	Brown Trout	3	0.15%	-	0.1	
Shawsheen	Central Mudminnow		0.00%	-	-	
Shawsheen	Chain Pickerel	14	0.69%	2.5	1.8	
Shawsheen	Channel Catfish		0.00%	-	-	
Shawsheen	Common Carp	3	0.15%	-	0.1	
Shawsheen	Common Shiner	2	0.10%	37.6	37.5	
Shawsheen	Creek Chub		0.00%	-	-	
Shawsheen	Creek Chubsucker	6	0.30%	2.0	1.7	
Shawsheen	Cutlips Minnow		0.00%	-	-	
Shawsheen	Fallfish	566	27.99%	18.8	9.2	
Shawsheen	Fathead Minnow		0.00%	-	-	
Shawsheen	Golden Shiner	19	0.94%	1.7	0.8	
Shawsheen	Green Sunfish		0.00%	-	-	
Shawsheen	Lake Chub		0.00%	-	-	
Shawsheen	Largemouth Bass	23	1.14%	-	1.1	
Shawsheen	Longnose Dace		0.00%	-	-	
Shawsheen	Longnose Sucker		0.00%	-	-	
Shawsheen	Northern Pike		0.00%	-	-	
Shawsheen	Pumpkinseed	71	3.51%	4.2	0.7	
Shawsheen	Rainbow Trout		0.00%	-	-	
Shawsheen	Redbreast Sunfish	215	10.63%	6.3	4.3	
Shawsheen	Redfin Pickerel	103	5.09%	1.6	3.5	
Shawsheen	Rock Bass		0.00%	-	-	
Shawsheen	Sea Lamprey	79	3.91%	-	3.9	
Shawsheen	Slimy Sculpin		0.00%	-	-	
Shawsheen	Smallmouth Bass		0.00%	-	-	
Shawsheen	Spottail Shiner		0.00%	-	-	
Shawsheen	Swamp Darter	4	0.20%	-	0.2	
Shawsheen	Tadpole Madtom		0.00%	-	-	
Shawsheen	Tesselated Darter	82	4.06%	-	4.1	
Shawsheen	White Catfish		0.00%	-	-	
Shawsheen	White Perch		0.00%	-	-	
Shawsheen	White Sucker	145	7.17%	4.7	2.5	
Shawsheen	Yellow Bullhead	39	1.93%	-	1.9	
Shawsheen	Yellow Perch	18	0.89%	2.2	1.3	
Shawsheen	(blank)		0.00%	-	-	49.08
Grand Total		2022	#####	-	100.0	
				-	-	

Row Labels
Shawsheen
1189
1195
1196
1237
1268
2494
2495
2496
2576
2577
2578
2579
4566
4567
4568
4569
6402
6405
Grand Total

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
Fish toxics sampling has not been conducted in this Shawsheen River AU (MA83-01) so the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	

Recent sampling has not been conducted in this Shawsheen River AU (MA83-01) so the Aesthetics Use is Not Assessed.

Primary Contact Recreation

2022 Use Attainment	**Alert**
Not Supporting	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in this Shawsheen River AU (MA83-01); the Primary Contact Recreational Use will continue to be assessed as Not Supporting, with the historical impairments for Escherichia Coli (E. Coli) and Fecal Coliform being carried forward.	

Secondary Contact Recreation

2022 Use Attainment	**Alert**
Not Assessed	YES
2022 Use Attainment Summary	
Recent bacteria sampling has not been conducted in this Shawsheen River AU (MA83-01) so the Secondary Contact Recreational Use is Not Assessed. The Alert for potential *E. coli* contamination, first identified in the 2016 reporting cycle (MassDEP Undated 7), is being carried forward.	

Shawsheen River (MA83-08)

Location:	Headwater, north of Folly Pond and North Great Road, Lincoln to Summer Street, Bedford.
AU Type:	RIVER
AU Size:	2.1 MILES
Classification/Qualifier:	B: TWS, WWF

No usable data were available for Shawsheen River (MA83-08) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Dissolved Oxygen		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged
5	5	Physical Substrate Habitat Alterations		Unchanged

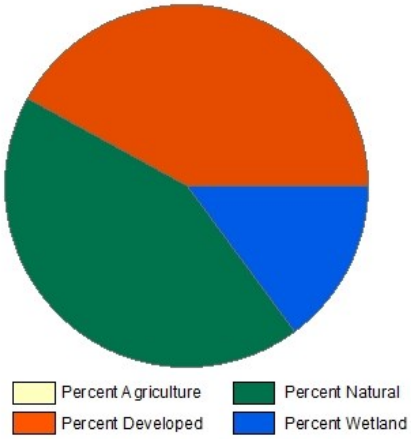
Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Dissolved Oxygen	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Escherichia Coli (E. Coli)	Industrial/Commercial Site Stormwater Discharge (Permitted) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Industrial/Commercial Site Stormwater Discharge (Permitted) (N)				X	
Physical Substrate Habitat Alterations	Channelization (Y)	X				

Shawsheen River (MA83-17)

Location:	Confluence with Spring Brook, Bedford to the Burlington Water Department's surface water intake, Billerica. (formerly part of 2002 segment: Shawsheen River MA83-02).
AU Type:	RIVER
AU Size:	5.7 MILES
Classification/Qualifier:	B: TWS, WWF

Shawsheen River - MA83-17

Watershed Area: 35.48 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	35.48	9.62	7.49	1.69
Agriculture	0.5%	0.3%	0.1%	0.1%
Developed	41.8%	42.7%	27.5%	24.3%
Natural	43.1%	46%	36.1%	43.6%
Wetland	14.7%	11%	36.3%	32%
Impervious Cover	23.4%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	Dissolved Oxygen		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Curly-leaf Pondweed*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Recommendations

2022 Recommendations
ALU: Fish community data collected throughout the Shawsheen River mainstem is needed to update the comparison to the Shawsheen Target Fish Community model since the Marland Place and Balmoral Dams have been removed.

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	YES
2022 Use Attainment Summary	
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in this Shawsheen River AU (MA83-17) in the vicinity of water quality station W2149 (approximately 350 feet upstream of Middlesex Turnpike, Bedford) in 2010. Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the five most common species in the TFC (all fluvial species and 4 moderately tolerant), only one species (fallfish) was found in the top five among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these five most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from a downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a decision to include a Fish Bioassessments impairment will not be made at this time. The Aquatic Life Use of this Shawsheen River AU (MA83-17) will continue to be assessed as Not Supporting with the Dissolved Oxygen impairment being carried forward. A new impairment is being added for the non-native aquatic macrophyte, Curly-leaf Pondweed and an Alert for Fish Bioassessments is being identified based on the TFC analysis.	

Biological Monitoring Information

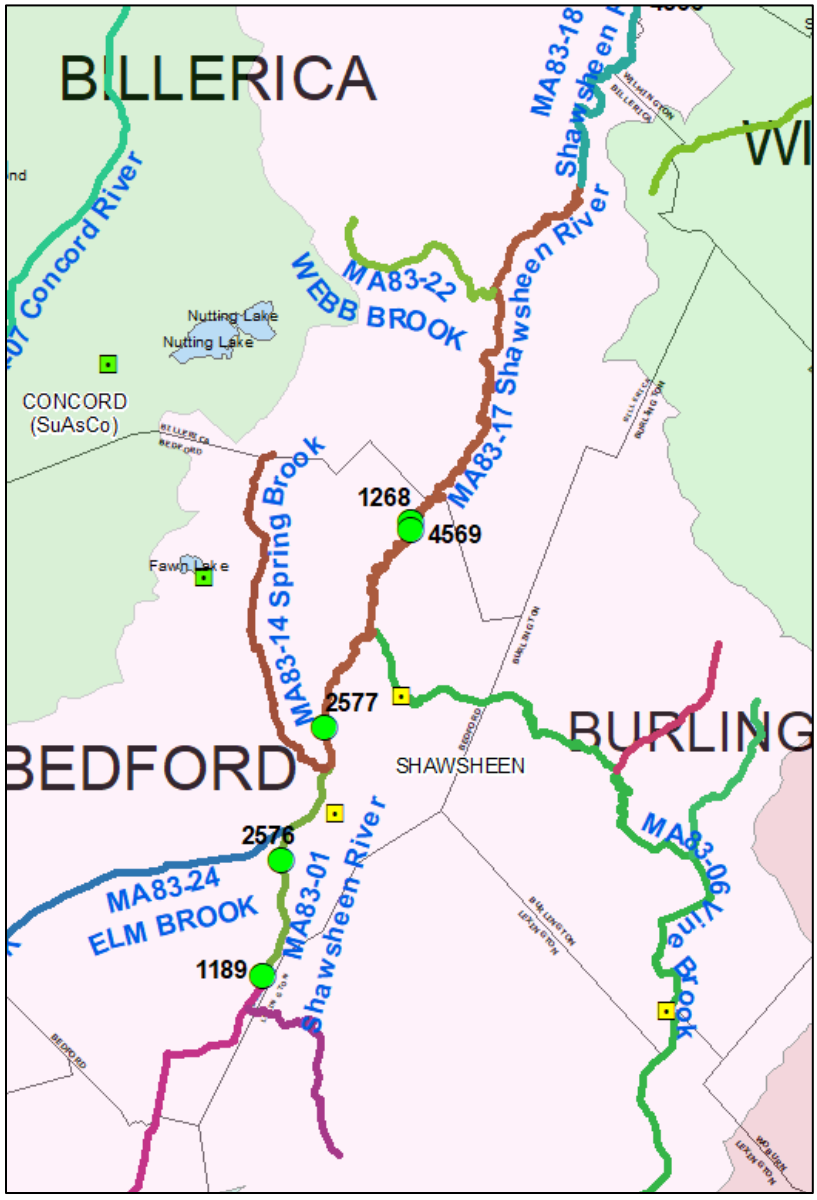
Fish Community Data and DELTS

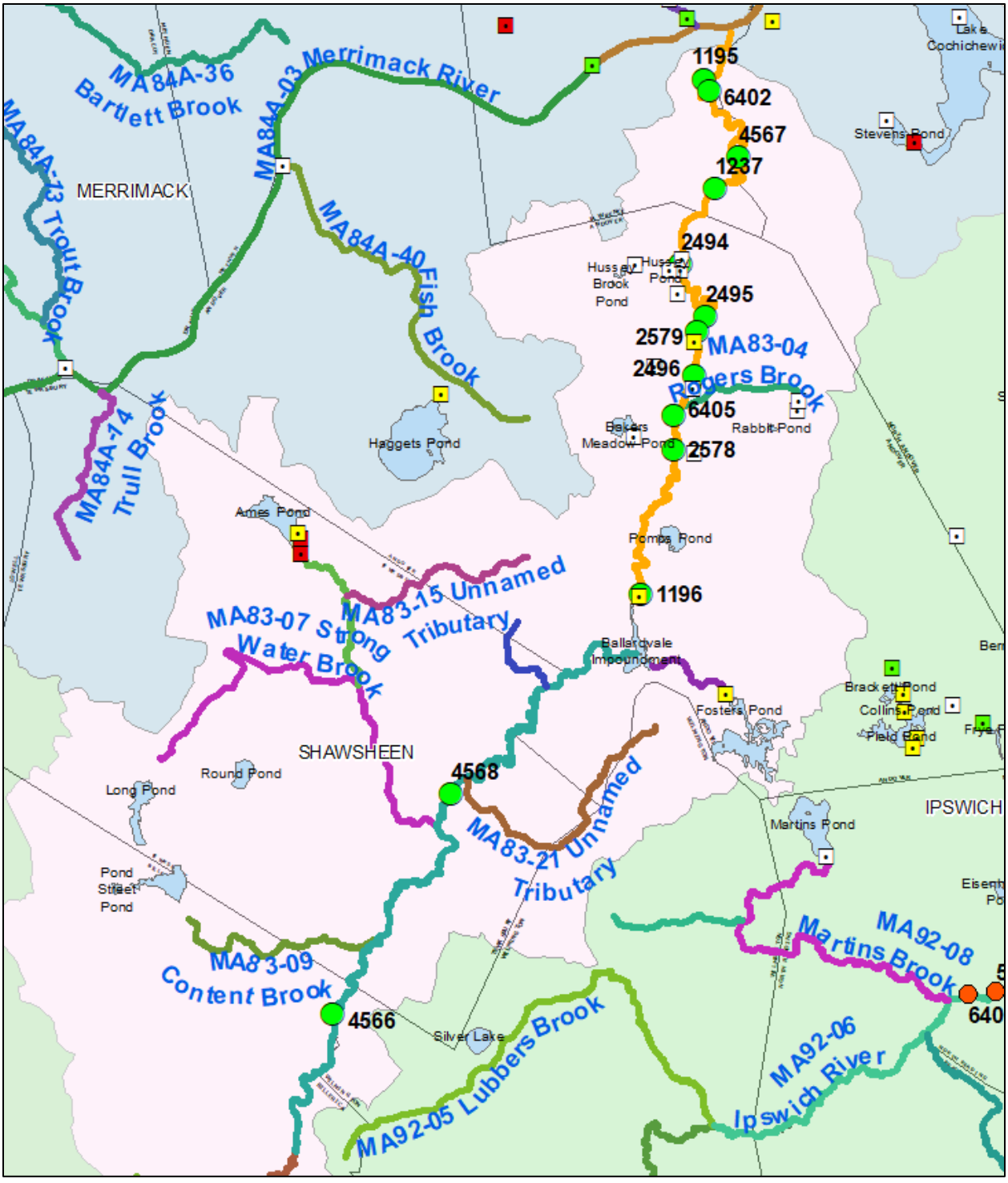
Comparison of fish community samples (2005-2017) to the Shawsheen Target Fish Community (TFC) Model. (MassDFG 2018, MassDEP Undated 2, Kashiwagi and Richards 2009)

Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the 5 most common species in the TFC (all fluvial species; 4 moderately tolerant), only one species (fallfish) was found in the top 5 among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these 5 most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from the downstream AU (MA83-

19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a use impairment decision for these four Shawsheen River AUs (MA83-01, MA83-17, MA83-18, MA83-19) will not be made at this time. In a future IR cycle, fish community data collected after 2017 throughout the Shawsheen River mainstem should be included in a comparative analysis with the Shawsheen TFC model.

Fish Community Samples in the Shawsheen River (MA83-01, MA83-17, MA83-18, MA83-19); screen capture of 2 upstream/southern AUs, and then 2 downstream/northern AUs:




MA84A-36
Bartlett Brook
MA84A-03 Merrimack River
MA84A-73 Trout Brook
MERRIMACK
MA84A-40 Fish Brook
MA84A-74
Trull Brook
1195
6402
4567
1237
2494
2495
2579
2496
6405
2578
1196
4568
4566
MA83-04
Rogers Brook
Lake
Cochichewi
Stevens Pond
Hussey
Brook
Pond
Hussey
Pond
Haggets Pond
Bakers
Meadow Pond
Rabbit Pond
Ames Pond
Pomps Pond
MA83-15 Unnamed
Tributary
MA83-07 Strong
Water Brook
Ballardvale
Impoundment
Fosters Pond
Bracket Pond
Collins Pond
Field Pond
SHAWSHEEN
Round Pond
Long Pond
Pond
Street
Pond
MA83-21 Unnamed
Tributary
IPSWICH
Martins Pond
MA92-08
Martins Brook
MA83-09
Content Brook
Silver Lake
MA92-05 Lubbers Brook
MA92-06
Ipswich River

Shawsheen TFC Model:

Table A14. Species percent composition for reference rivers used to develop the Shawsheen River target fish community model. Species are ordered by mean rank. Non-native, stocked, and out-of-range species were deleted from the ranking and calculation of expected proportion in the target fish model. The ranks were converted to expected proportions (as a percent) using a rank-weighting technique as outlined by Bain and Meixler (2008).

Species	Wood River	Nissitissit River	Eightmile River	Isinglass River	SB Piscataquog River	Little River	Total	Rank	Expected Proportions
Common shiner	32.3	5.4	18.6	36.8	20.6	14.9	128.6	1	37.6
Fallfish	4.1	26.7	3.1	18.1	3.0	16.2	71.2	2	18.8
Blacknose dace	0.0	6.2	3.4	0.0	33.4	22.3	65.3		
Longnose dace	12.5	12.6	1.0	12.1	19.0	0.0	57.2		
Tessellated darter	13.6	9.7	17.3	0.0	0.0	0.0	40.7	5	7.5
Redbreast sunfish	16.1	1.0	10.9	9.2	0.0	0.0	37.1	6	6.3
American eel	5.9	2.3	8.9	10.8	0.0	4.7	32.6	7	5.4
White sucker	2.1	0.8	5.0	0.5	0.9	12.2	21.4	8	4.7
Pumpkinseed	0.3	11.0	3.3	2.7	0.5	0.0	17.9	9	4.2
Atlantic salmon	2.8	0.0	1.4	3.9	9.4	0.0	17.5		
Largemouth bass	0.2	5.4	6.0	0.9	0.7	0.0	13.2		
Yellow bullhead	0.0	10.3	0.0	0.0	1.8	0.0	12.1		
Spottail shiner	0.0	0.0	11.3	0.0	0.5	0.0	11.8		
Bluegill	4.9	3.8	0.4	0.0	0.0	0.0	9.2		
Chain pickerel	1.1	3.3	0.1	0.2	0.2	0.7	5.7	15	2.5
Smallmouth bass	0.0	0.0	1.3	0.5	3.6	0.0	5.4		
Yellow perch	0.0	0.0	4.3	0.0	0.0	0.0	4.3	17	2.2
Brown bullhead	0.8	0.0	0.1	1.4	0.0	0.0	2.3	18	2.1
Creek chubsucker	1.3	0.8	0.0	0.0	0.0	0.0	2.1	19	2.0
Brown trout	0.7	0.0	0.3	0.0	0.4	0.7	2.0		
Bridle shiner	0.0	0.0	0.0	1.8	0.0	0.0	1.8	21	1.8
Golden shiner	0.0	0.0	0.0	0.0	1.6	0.0	1.6	22	1.7
Brook trout	0.8	0.3	0.0	0.0	0.0	0.0	1.1	23	1.6
Redfin pickerel	0.0	0.0	0.9	0.0	0.0	0.0	0.9	24	1.6
Rock bass	0.0	0.5	0.0	0.0	0.0	0.0	0.5		
Rainbow trout	0.2	0.0	0.0	0.0	0.2	0.0	0.4		
Black crappie	0.2	0.0	0.0	0.0	0.0	0.0	0.2		

Fish Community Analysis:

Watershed	Common Name	Values # of Fish	% of catch	Applicable TFC	TFC Difference	% Sim to TFC
Shawsheen	American Brook Lamprey		0.00%	-	-	
Shawsheen	American Eel	490	24.23%	5.4	18.8	
Shawsheen	Atlantic Salmon	5	0.25%	-	0.2	
Shawsheen	Banded Killifish		0.00%	-	-	
Shawsheen	Banded Sunfish	10	0.49%	-	0.5	
Shawsheen	Black Crappie		0.00%	-	-	
Shawsheen	Blacknose Dace	1	0.05%	-	0.0	
Shawsheen	Bluegill	66	3.26%	-	3.3	
Shawsheen	Bluntnose Minnow		0.00%	-	-	
Shawsheen	Bridle Shiner		0.00%	1.8	1.8	
Shawsheen	Brook Trout		0.00%	1.6	1.6	
Shawsheen	Brown Bullhead	58	2.87%	2.1	0.8	
Shawsheen	Brown Trout	3	0.15%	-	0.1	
Shawsheen	Central Mudminnow		0.00%	-	-	
Shawsheen	Chain Pickerel	14	0.69%	2.5	1.8	
Shawsheen	Channel Catfish		0.00%	-	-	
Shawsheen	Common Carp	3	0.15%	-	0.1	
Shawsheen	Common Shiner	2	0.10%	37.6	37.5	
Shawsheen	Creek Chub		0.00%	-	-	
Shawsheen	Creek Chubsucker	6	0.30%	2.0	1.7	
Shawsheen	Cutlips Minnow		0.00%	-	-	
Shawsheen	Fallfish	566	27.99%	18.8	9.2	
Shawsheen	Fathead Minnow		0.00%	-	-	
Shawsheen	Golden Shiner	19	0.94%	1.7	0.8	
Shawsheen	Green Sunfish		0.00%	-	-	
Shawsheen	Lake Chub		0.00%	-	-	
Shawsheen	Largemouth Bass	23	1.14%	-	1.1	
Shawsheen	Longnose Dace		0.00%	-	-	
Shawsheen	Longnose Sucker		0.00%	-	-	
Shawsheen	Northern Pike		0.00%	-	-	
Shawsheen	Pumpkinseed	71	3.51%	4.2	0.7	
Shawsheen	Rainbow Trout		0.00%	-	-	
Shawsheen	Redbreast Sunfish	215	10.63%	6.3	4.3	
Shawsheen	Redfin Pickerel	103	5.09%	1.6	3.5	
Shawsheen	Rock Bass		0.00%	-	-	
Shawsheen	Sea Lamprey	79	3.91%	-	3.9	
Shawsheen	Slimy Sculpin		0.00%	-	-	
Shawsheen	Smallmouth Bass		0.00%	-	-	
Shawsheen	Spottail Shiner		0.00%	-	-	
Shawsheen	Swamp Darter	4	0.20%	-	0.2	
Shawsheen	Tadpole Madtom		0.00%	-	-	
Shawsheen	Tesselated Darter	82	4.06%	-	4.1	
Shawsheen	White Catfish		0.00%	-	-	
Shawsheen	White Perch		0.00%	-	-	
Shawsheen	White Sucker	145	7.17%	4.7	2.5	
Shawsheen	Yellow Bullhead	39	1.93%	-	1.9	
Shawsheen	Yellow Perch	18	0.89%	2.2	1.3	
Shawsheen	(blank)		0.00%	-	-	49.08
Grand Total		2022	#####	-	100.0	
				-	-	

Row Labels
Shawsheen
1189
1195
1196
1237
1268
2494
2495
2496
2576
2577
2578
2579
4566
4567
4568
4569
6402
6405
Grand Total

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP Undated 1)

Summary Statement
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in the Shawsheen River (MA83-17) in the vicinity of water quality station W2149 in 2010.

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	

No fish toxics sampling has been conducted in this Shawsheen River AU (MA83-17) so the Fish Consumption Use is Not Assessed.

Aesthetic

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
Recent sampling has not been conducted in this Shawsheen River AU (MA83-17) so the Aesthetics Use is Not Assessed.	

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in this Shawsheen River AU (MA83-17) so the Primary Contact Recreational Use will continue to be assessed as Not Supporting with the Escherichia Coli (E. Coli) and Fecal Coliform impairments being carried forward.	

Secondary Contact Recreation

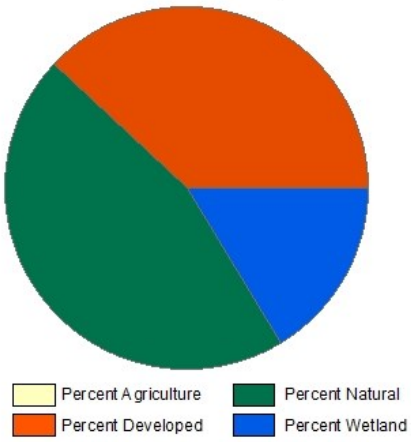
2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in this Shawsheen River AU (MA83-17) so the Secondary Contact Recreational Use is Not Assessed.	

Shawsheen River (MA83-18)

Location:	Burlington Water Department's surface water intake, Billerica to the inlet of Ballardvale Impoundment, Andover (formerly part of 2002 segment: Shawsheen River MA83-02) (since 2016 cycle: excludes Ballardvale Impoundment, pond segment MA83011).
AU Type:	RIVER
AU Size:	9.5 MILES
Classification/Qualifier:	B: WWF

Shawsheen River - MA83-18

Watershed Area: 65.5 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	65.5	13.4	14.24	3.43
Agriculture	0.9%	2.2%	0.6%	1.3%
Developed	37.6%	28.7%	24.2%	17.6%
Natural	45.3%	51.6%	39.4%	48.3%
Wetland	16.1%	17.5%	35.9%	32.7%
Impervious Cover	20.6%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	Dissolved Oxygen		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Curly-leaf Pondweed*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Recommendations

2022 Recommendations
ALU: Fish community data collected throughout the Shawsheen River mainstem is needed to update the comparison to the Shawsheen Target Fish Community model since the Marland Place and Balmoral Dams have been removed.

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	YES
2022 Use Attainment Summary	
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in this Shawsheen River AU (MA83-18) in the vicinity of water quality station W2148 (approximately 2600 feet downstream of Route 93, Andover) in 2010. Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the five most common species in the TFC (all fluvial species and 4 moderately tolerant), only one species (fallfish) was found in the top five among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these 5 most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from the downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a decision to include a Fish Bioassessments impairment will not be made at this time. UMass Amherst students collected limited water quality data (Station UMassA_BVLUS) in this Shawsheen River AU 7500 m upstream of the Ballardvale Dam (and a short way upstream of the Strong Water Brook confluence) in Tewksbury. Continuous temperature data were measured over 78 days in the 2016 summer index period (before the Balmoral Dam was demolished in 2017) and were indicative of adequate conditions for a warmwater fishery: there were <11 occurrences of a 7DADM >27.7 °C (n=8) and the maximum recorded temperature (29.0 °C) did not exceed the acute temperature threshold. The Aquatic Life Use of this Shawsheen River AU (MA83-18) will continue to be assessed as Not Supporting, with the Dissolved Oxygen impairment being carried forward. A new impairment is being added for the non-native aquatic macrophyte, Curly-leaf Pondweed and an Alert for Fish Bioassessments is being identified based on the TFC analysis.	

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
8593	MassDFG	Fish Community	Shawsheen River	mill st ds, Tewksbury	42.60061	-71.19296

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
UMassA_BVLUS	UMass Amherst	Water Quality	Shawsheen River	7500m upstream dam	42.595117	-71.195383

Biological Monitoring Information

Fish Community Data and DELTS

Fish Community Data (2012-2019) Provided by MassDFG. (MassDFG 2020) (MassDEP Undated 3)

[Sample Type: TP= Total Pickup, SP= Selective Pickup, Method: BT=Boat Shocking, BP= Backpack Shocking, BG= Barge Shocking, SE= Seine, SL= Snorkel, NS= Not Stated, MT= Minnow Trap, GN= Gillnet, FY= Fyke Net, Gradient: H = High, L = Low; I/MT MG= Intolerant/Moderately Tolerant Macrohabitat Generalist]

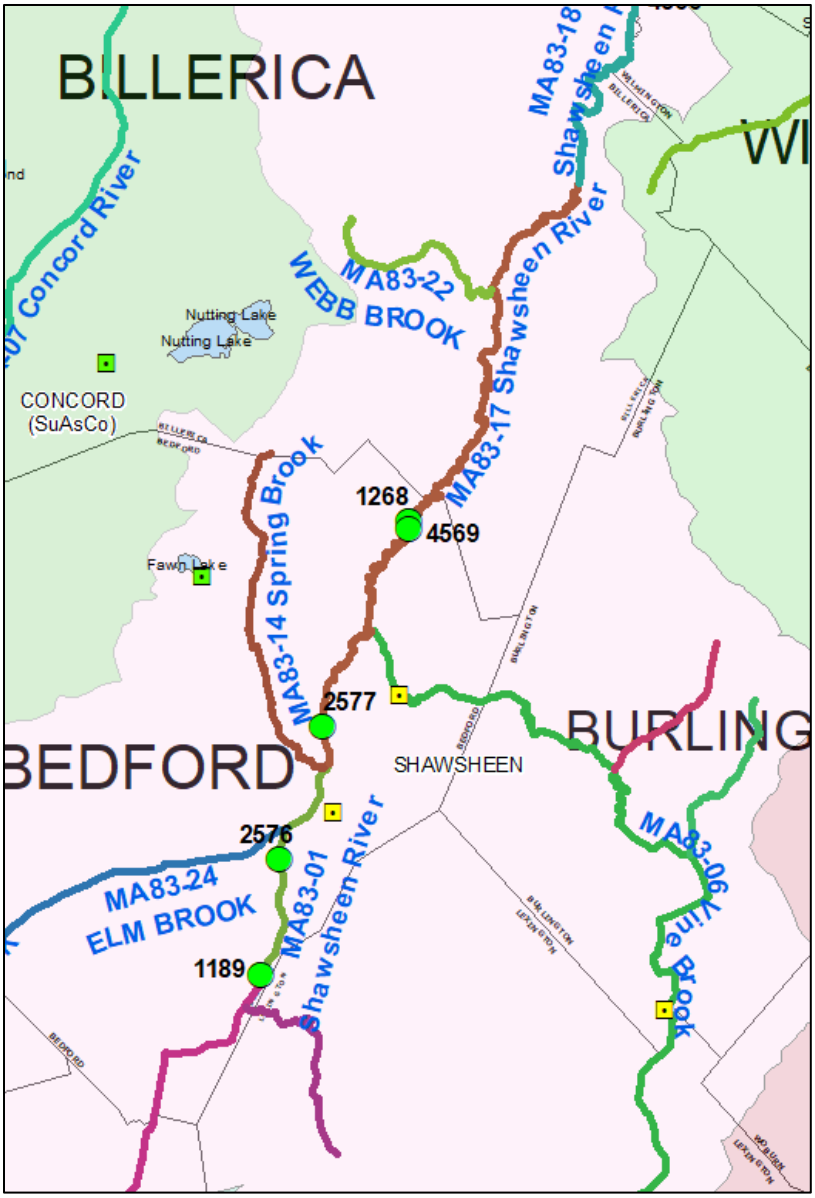
[Species List: AE = American Eel, B = Bluegill, F = Fallfish, LMB = Largemouth Bass, P = Pumpkinseed, RBS = Redbreast Sunfish, RP = Redfin Pickerel, YP = Yellow Perch]

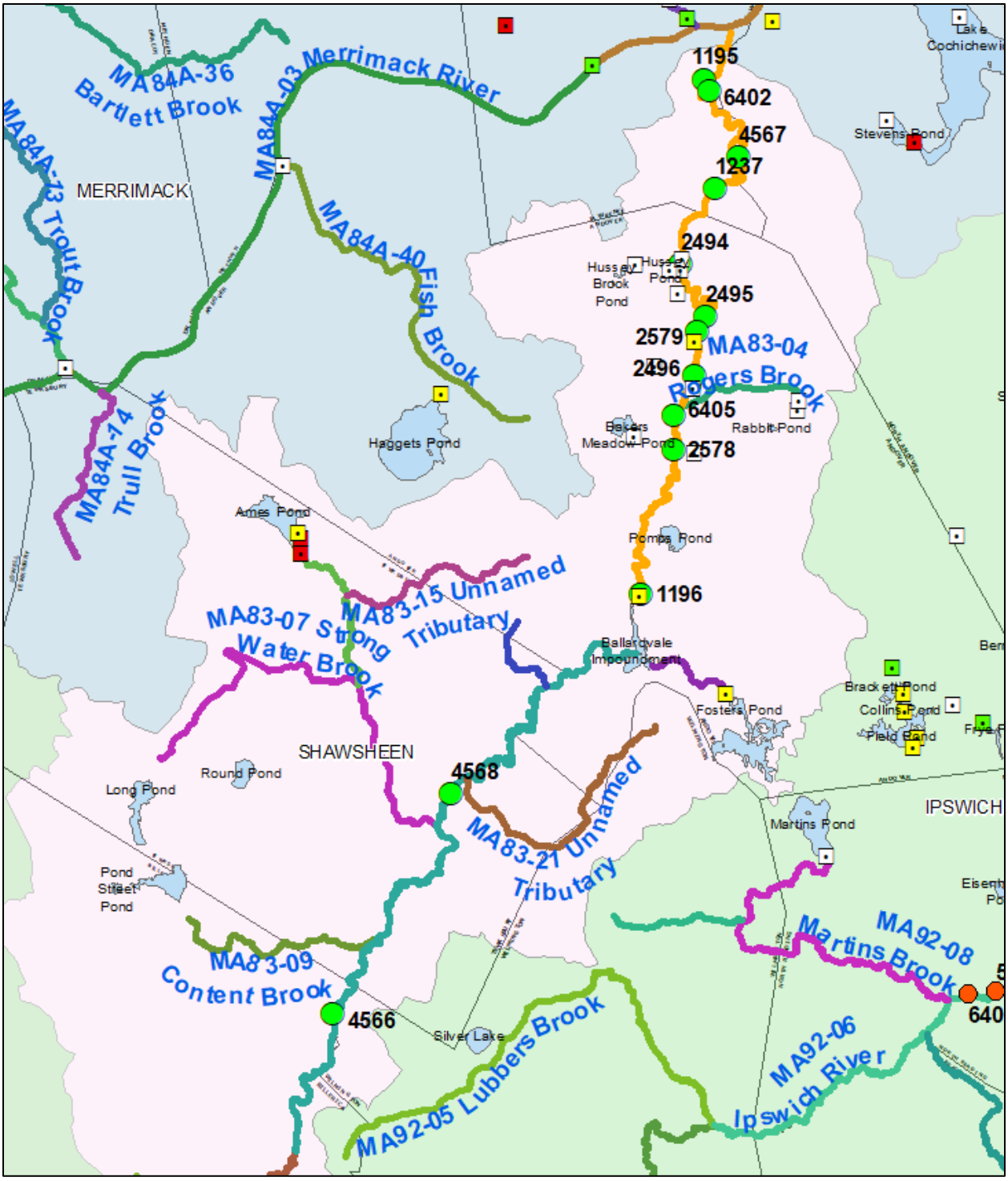
Sample ID	Sample Date	Method	Sample Type	Gradient	Total Taxa	Total Ind	Cold Ind %	Fluvial Taxa	Fluvial Ind %	Intol Ind %	I/MT MG Taxa	I/MT MG Ind %	Notables	CFR	Species List
8593	08/15/19	BP	TP		8	120	0%	1	11%	0%	5	39%	No	No	AE, B, F, LMB, P, RBS, RP, YP,

Comparison of fish community samples (2005-2017) to the Shawsheen Target Fish Community (TFC) Model. (MassDFG 2018, MassDEP Undated 2, Kashiwagi and Richards 2009)

Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the 5 most common species in the TFC (all fluvial species; 4 moderately tolerant), only one species (fallfish) was found in the top 5 among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these 5 most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from the downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a use impairment decision for these four Shawsheen River AUs (MA83-01, MA83-17, MA83-18, MA83-19) will not be made at this time. In a future IR cycle, fish community data collected after 2017 throughout the Shawsheen River mainstem should be included in a comparative analysis with the Shawsheen TFC model.

Fish Community Samples in the Shawsheen River (MA83-01, MA83-17, MA83-18, MA83-19); screen capture of 2 upstream/southern AUs, and then 2 downstream/northern AUs:


BILLERICA
MA83-18
Shawsheen R
Concord River
MA83-22
WEBB BROOK
MA83-17 Shawsheen River
Nutting Lake
Nutting Lake
CONCORD
(SuAsCo)
1268
4569
MA83-14 Spring Brook
Fawn Lake
2577
BEDFORD
SHAWSHEEN
BURLING
2576
MA83-24
ELM BROOK
MA83-01
Shawsheen River
1189
MA83-06
Vine Brook


MA84A-36
Bartlett Brook
MA84A-03 Merrimack River
MA84A-73 Trout Brook
MERRIMACK
MA84A-40 Fish Brook
MA84A-74
Trull Brook
1195
6402
4567
1237
2494
2495
2579
2496
6405
2578
1196
4568
4566
MA83-04
Rogers Brook
Stevens Pond
Hussey
Brook
Pond
Hussey
Pond
Haggets Pond
Bakers
Meadow Pond
Rabbit Pond
Ames Pond
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Shawsheen TFC Model:

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Blacknose dace	0.0	6.2	3.4	0.0	33.4	22.3	65.3		
Longnose dace	12.5	12.6	1.0	12.1	19.0	0.0	57.2		
Tessellated darter	13.6	9.7	17.3	0.0	0.0	0.0	40.7	5	7.5
Redbreast sunfish	16.1	1.0	10.9	9.2	0.0	0.0	37.1	6	6.3
American eel	5.9	2.3	8.9	10.8	0.0	4.7	32.6	7	5.4
White sucker	2.1	0.8	5.0	0.5	0.9	12.2	21.4	8	4.7
Pumpkinseed	0.3	11.0	3.3	2.7	0.5	0.0	17.9	9	4.2
Atlantic salmon	2.8	0.0	1.4	3.9	9.4	0.0	17.5		
Largemouth bass	0.2	5.4	6.0	0.9	0.7	0.0	13.2		
Yellow bullhead	0.0	10.3	0.0	0.0	1.8	0.0	12.1		
Spottail shiner	0.0	0.0	11.3	0.0	0.5	0.0	11.8		
Bluegill	4.9	3.8	0.4	0.0	0.0	0.0	9.2		
Chain pickerel	1.1	3.3	0.1	0.2	0.2	0.7	5.7	15	2.5
Smallmouth bass	0.0	0.0	1.3	0.5	3.6	0.0	5.4		
Yellow perch	0.0	0.0	4.3	0.0	0.0	0.0	4.3	17	2.2
Brown bullhead	0.8	0.0	0.1	1.4	0.0	0.0	2.3	18	2.1
Creek chubsucker	1.3	0.8	0.0	0.0	0.0	0.0	2.1	19	2.0
Brown trout	0.7	0.0	0.3	0.0	0.4	0.7	2.0		
Bridle shiner	0.0	0.0	0.0	1.8	0.0	0.0	1.8	21	1.8
Golden shiner	0.0	0.0	0.0	0.0	1.6	0.0	1.6	22	1.7
Brook trout	0.8	0.3	0.0	0.0	0.0	0.0	1.1	23	1.6
Redfin pickerel	0.0	0.0	0.9	0.0	0.0	0.0	0.9	24	1.6
Rock bass	0.0	0.5	0.0	0.0	0.0	0.0	0.5		
Rainbow trout	0.2	0.0	0.0	0.0	0.2	0.0	0.4		
Black crappie	0.2	0.0	0.0	0.0	0.0	0.0	0.2		

Fish Community Analysis:

Watershed	Common Name	Values # of Fish	% of catch	Applicable TFC	TFC Difference	% Sim to TFC
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Shawsheen	Banded Killifish		0.00%	-	-	
Shawsheen	Banded Sunfish	10	0.49%	-	0.5	
Shawsheen	Black Crappie		0.00%	-	-	
Shawsheen	Blacknose Dace	1	0.05%	-	0.0	
Shawsheen	Bluegill	66	3.26%	-	3.3	
Shawsheen	Bluntnose Minnow		0.00%	-	-	
Shawsheen	Bridle Shiner		0.00%	1.8	1.8	
Shawsheen	Brook Trout		0.00%	1.6	1.6	
Shawsheen	Brown Bullhead	58	2.87%	2.1	0.8	
Shawsheen	Brown Trout	3	0.15%	-	0.1	
Shawsheen	Central Mudminnow		0.00%	-	-	
Shawsheen	Chain Pickerel	14	0.69%	2.5	1.8	
Shawsheen	Channel Catfish		0.00%	-	-	
Shawsheen	Common Carp	3	0.15%	-	0.1	
Shawsheen	Common Shiner	2	0.10%	37.6	37.5	
Shawsheen	Creek Chub		0.00%	-	-	
Shawsheen	Creek Chubsucker	6	0.30%	2.0	1.7	
Shawsheen	Cutlips Minnow		0.00%	-	-	
Shawsheen	Fallfish	566	27.99%	18.8	9.2	
Shawsheen	Fathead Minnow		0.00%	-	-	
Shawsheen	Golden Shiner	19	0.94%	1.7	0.8	
Shawsheen	Green Sunfish		0.00%	-	-	
Shawsheen	Lake Chub		0.00%	-	-	
Shawsheen	Largemouth Bass	23	1.14%	-	1.1	
Shawsheen	Longnose Dace		0.00%	-	-	
Shawsheen	Longnose Sucker		0.00%	-	-	
Shawsheen	Northern Pike		0.00%	-	-	
Shawsheen	Pumpkinseed	71	3.51%	4.2	0.7	
Shawsheen	Rainbow Trout		0.00%	-	-	
Shawsheen	Redbreast Sunfish	215	10.63%	6.3	4.3	
Shawsheen	Redfin Pickerel	103	5.09%	1.6	3.5	
Shawsheen	Rock Bass		0.00%	-	-	
Shawsheen	Sea Lamprey	79	3.91%	-	3.9	
Shawsheen	Slimy Sculpin		0.00%	-	-	
Shawsheen	Smallmouth Bass		0.00%	-	-	
Shawsheen	Spottail Shiner		0.00%	-	-	
Shawsheen	Swamp Darter	4	0.20%	-	0.2	
Shawsheen	Tadpole Madtom		0.00%	-	-	
Shawsheen	Tesselated Darter	82	4.06%	-	4.1	
Shawsheen	White Catfish		0.00%	-	-	
Shawsheen	White Perch		0.00%	-	-	
Shawsheen	White Sucker	145	7.17%	4.7	2.5	
Shawsheen	Yellow Bullhead	39	1.93%	-	1.9	
Shawsheen	Yellow Perch	18	0.89%	2.2	1.3	
Shawsheen	(blank)		0.00%	-	-	49.08
Grand Total		2022	#####	-	100.0	
				-	-	

Row Labels
Shawsheen
1189
1195
1196
1237
1268
2494
2495
2496
2576
2577
2578
2579
4566
4567
4568
4569
6402
6405
Grand Total

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP Undated 1)

Summary Statement
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in the Shawsheen River (MA83-18) in the vicinity of water quality station W2148 in 2010.

Physico-chemical Water Quality Information

DO, pH, Temperature

UMass Amherst Dam Study Long-term Continuous Temperature Data (Summer Index 2014-2017). (UMass-Amherst 2018) (MassDEP Undated 4)

[Summer Index is June 1 – Sept 15; 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Index Count	Max 24hr Rolling Avg Temp (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier2 7DADA >21	Count WW 7DADM >27.7
UMassA_BVLUS	06/30/16	12/31/16	78	27.5	29.0	28.4	26.9	72	70	8
UMassA_BVLUS	01/01/17	05/18/17	0	23.4	23.8	NA	NA	NA	NA	NA

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
Fish toxics sampling has not been conducted in this Shawsheen River AU (MA83-18) so the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent sampling has been conducted in this Shawsheen River AU (MA83-18) so the Aesthetics Use is Not Assessed.	

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in this Shawsheen River AU (MA83-18) so the Primary Contact Recreational Use will continue to be assessed as Not Supporting, with the Escherichia Coli (E. Coli) and Fecal Coliform impairments being carried forward.	

Secondary Contact Recreation

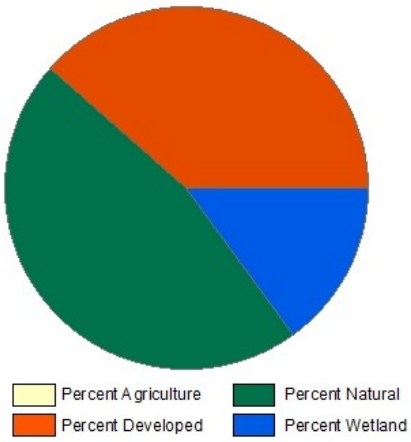
2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No recent bacteria sampling has been conducted in this Shawsheen River AU (MA83-18) so the Secondary Contact Recreational Use is Not Assessed.	

Shawsheen River (MA83-19)

Location:	Outlet of Ballardvale Impoundment, Andover to the confluence with the Merrimack River, Lawrence. (formerly part of 2002 segment: Shawsheen River MA83-02 and all of 2002 segment: Shawsheen River MA83-03).
AU Type:	RIVER
AU Size:	8.2 MILES
Classification/Qualifier:	B: WWF

Shawsheen River - MA83-19

Watershed Area: 77.75 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	77.75	6.56	17.13	1.39
Agriculture	0.9%	1.4%	0.6%	0%
Developed	38.2%	47.7%	25.1%	33.1%
Natural	46%	43.3%	40.9%	41.8%
Wetland	14.8%	7.6%	33.4%	25.1%
Impervious Cover	21.1%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	(Curly-leaf Pondweed*)		Added
4a	5	(Fish Passage Barrier*)		Added
4a	5	Benthic Macroinvertebrates		Added
4a	5	Escherichia Coli (E. Coli)	2587	Unchanged
4a	5	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Curly-leaf Pondweed*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
(Fish Passage Barrier*)	Dam or Impoundment (Y)	X				
Benthic Macroinvertebrates	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Illicit Connections/Hook-ups to Storm Sewers (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Illicit Connections/Hook-ups to Storm Sewers (N)				X	

Recommendations

2022 Recommendations
ALU: Fish community data collected throughout the Shawsheen River mainstem is needed to update the comparison to the Shawsheen Target Fish Community model since the Marland Place and Balmoral Dams were removed in March 2017. Additionally, progress should be tracked on the project to remove the Ballardvale Dam.

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	

The Ballardvale Dam, at the upstream end of this Shawsheen River AU (MA83-19), represents the upstream extent of passage of diadromous fish species (river herring, American eel, American shad), according to DMF biologists. They gave this structure a passage score of "8", on a 0-10 scale, meaning the dam poses a severe impediment to fish passage. A dam removal project is in the planning stages with design completed in 2016, while the downstr. Marland Place Dam (aka Stevens St Dam) & Balmoral/Rt.133 Dam were successfully removed in 2017 (passage scores = 0), opening ~4 miles of river.

Data available for this AU includes benthic community (MassDEP), fish community (MassDFG/MassDEP), and water quality (WQ) data (MassDEP, UMass). Eighteen fish community samples (Samples 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The % similarity with the Shawsheen Target Fish Community model was 49.08%, approaching the 50% target. Although Kashiwagi & Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin, this TFC analysis is not necessarily representative of current conditions since 2 dams were removed in 2017; therefore, a use impairment decision is not warranted at this time. Additional fish samples were collected in 2018 & 2019, but comparable sampling is needed in all mainstem AUs so that the TFC analysis can be updated.

UMass Amherst students collected limited WQ data at 3 locations downstream of the Ballardvale Dam. Among continuous temp. data collected in the 2016 (n=78 days) & 2017 (n=107 days) summer index periods, there were no violations of chronic/acute temp. thresholds (MassDEP 2022). MassDEP field crews conducted benthic/WQ sampling during summer 2015 at 2 locations in this AU: ~1900 ft upstr. of Central St, Andover (B0937/W2538) & ~1300 ft downstr. of the Rt 495 crossing nearest the Mass Ave ramp to Rt 495 S, Lawrence (B0922/W2523). Benthic sample index scores (47/32) were indicative of moderately degraded conditions at the high gradient upstr. location & severely degraded conditions at the low gradient downstr. site. The non-native aquatic macrophyte, curly-leaf pondweed (*P. crispus*) was observed at the upstr. site. Among continuous DO data (n= 79 days/location), no 7DADMins were <5.0mg/L & only two 1day mins were <4.0mg/L at the downstr. location. Continuous temp. was measured over a similar period & the max temp. for either location was 27.4°C, good for a WWF. Other WQ indicators are summarized as follows ("n" listed per station) & were generally indicative of good conditions: pH 7.0-7.3 S.U. (n=3), no indication of nutrient enrichment (seasonal TP avg 0.041/0.038mg/L with n=5, max DO diel shift 3.0mg/L both stations, max DO saturation 86%/97%, no observations of excessive filamentous algae), no exceedances among 3 clean metals samples or 3 aluminum samples, max Total Ammonia-N was 0.2/0.19mg/L (n=3), and max chloride was 180/210mg/L (n=3/station) with similar indications in the SC data. UMass Amherst students collected WQ data at multiple stations upstr. & downstr. of the Marland Place & Balmoral Dams in 2015, 2016, and after dam removal in 2017. Continuous DO (5-7 day deploys) had no 1-day mins <5.0mg/L in the early life stages period or <4.0mg/L the rest of the season. Among continuous temp. data (n= 69-107/summer index) there were no exceedances of acute/chronic thresholds. All pH data ranged from 6.5-8.0S.U. (n= 1-6/depth/station). SC data (n= 1-6/depth/station) did not exceed estimated chloride criteria.

The Aquatic Life Use of this Shawsheen River AU (MA83-19) is assessed as Not Supporting based on all the described data above, with Fish Passage Barriers (barrier posed by the Ballardvale Impoundment), Benthic Macroinvertebrates, and Curly-leaf Pondweed impairments all being added.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
6402	MassDEP	Fish Community	Shawsheen River	, Lawrence, North Andover	42.69712	-71.14400
6405	MassDEP	Fish Community	Shawsheen River	approximately 1900 feet upstream/north of Central Street, Andover, Andover	42.65220	-71.15097
7459	MassDFG	Fish Community	Shawsheen River	Riverina Rd., Andover	42.67295	-71.14970
7460	MassDFG	Fish Community	Shawsheen River	Washington Park Dr., Andover	42.66749	-71.14566
7461	MassDFG	Fish Community	Shawsheen River	Stevens St. downstream, Andover	42.66404	-71.14643

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
7462	MassDFG	Fish Community	Shawsheen River	Essex St. downstream, Andover	42.65840	-71.14703
7463	MassDFG	Fish Community	Shawsheen River	"off" Lupine rd. behind cemetary, Andover	42.65198	-71.15077
7464	MassDFG	Fish Community	Shawsheen River	Dale St. "end of dirt road", Andover	42.63031	-71.15786
8591	MassDFG	Fish Community	Shawsheen River	Dale ST, Andover	42.63024	-71.15786
8592	MassDFG	Fish Community	Shawsheen River	Dale ST, Andover	42.62908	-71.15725
B0922	MassDEP	Benthic	Shawsheen River/	[approximately 400 meters downstream/west of Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence, MA]	42.697117	-71.143995
B0937	MassDEP	Benthic	Shawsheen River/	[approximately 580 meters upstream/north of Central Street, Andover, MA]	42.652195	-71.150971
W2523	MassDEP	Water Quality	Shawsheen River	[approximately 1300 feet downstream/west of Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence]	42.697117	-71.143995
W2538	MassDEP	Water Quality	Shawsheen River	[approximately 1900 feet upstream/north of Central Street, Andover]	42.652195	-71.150971

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
UMassA_BALDS1	UMass Amherst	Water Quality	Shawsheen River	60m downstream dam	42.672617	-71.149567
UMassA_BALDS2	UMass Amherst	Water Quality	Shawsheen River	160m downstream dam	42.673552	-71.149397
UMassA_BALDS3	UMass Amherst	Water Quality	Shawsheen River	450m downstream dam	42.676033	-71.149667
UMassA_BALDS4	UMass Amherst	Water Quality	Shawsheen River	600m downstream dam	42.677458	-71.14953
UMassA_BALIMP	UMass Amherst	Water Quality	Shawsheen River	30m upstream dam	42.671867	-71.149417
UMassA_BALUS	UMass Amherst	Water Quality	Shawsheen River	1500m upstream dam	42.66495	-71.1458
UMassA_BVLDS1	UMass Amherst	Water Quality	Shawsheen River	49m downstream dam	42.627478	-71.157397
UMassA_BVLDS2	UMass Amherst	Water Quality	Shawsheen River	245m downstream dam	42.629133	-71.157383
UMassA_BVLDS3	UMass Amherst	Water Quality	Shawsheen River	460m downstream dam	42.631017	-71.15815
UMassA_MARDS1	UMass Amherst	Water Quality	Shawsheen River	44m downstream dam	42.662717	-71.146733
UMassA_MARDS2	UMass Amherst	Water Quality	Shawsheen River	100m downstream dam	42.663229	-71.146659
UMassA_MARDS3	UMass Amherst	Water Quality	Shawsheen River	205m downstream dam	42.664183	-71.1465
UMassA_MARIMP	UMass Amherst	Water Quality	Shawsheen River	27m upstream dam	42.66205	-71.146683

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
UMassA_MARUS	UMass Amherst	Water Quality	Shawsheen River	669m upstream dam	42.657103	-71.14675

Biological Monitoring Information

Benthic Macroinvertebrate Data

MassDEP Benthic Macroinvertebrate Data (2011-2017). (MassDEP Undated 5)

[Index Biological Condition Class: E= Exceptional, S= Satisfactory, MD= Moderately Degraded, SD= Severely Degraded; High Gradient IBI Thresholds: E= 100-75, S= 74-55, MD= 54-35, SD= 34-0; Low Gradient IBI Thresholds: E= 100-81, S= 80-62, MD= 61-38, SD= 37-0; R qualifier = Rarefaction (100ct) <55]

Station Code	Collection Date	Collection Method	Index Type	Organism Count	Index Score	Index Biological Condition Class
B0922	07/07/15	RBP multihab	Statewide_Low_Gradient	314	32	SD
B0937	07/09/15	RBP kicknet	Central_Hills_300ct	311	47	MD

Fish Community Data and DELTS

Fish Community Data (2012-2019) Provided by MassDFG. (MassDFG 2020) (MassDEP Undated 3)

[Sample Type: TP= Total Pickup, SP= Selective Pickup, Method: BT=Boat Shocking, BP= Backpack Shocking, BG= Barge Shocking, SE= Seine, SL= Snorkel, NS= Not Stated, MT= Minnow Trap, GN= Gillnet, FY= Fyke Net, Gradient: H = High, L = Low; I/MT MG= Intolerant/Moderately Tolerant Macrohabitat Generalist]

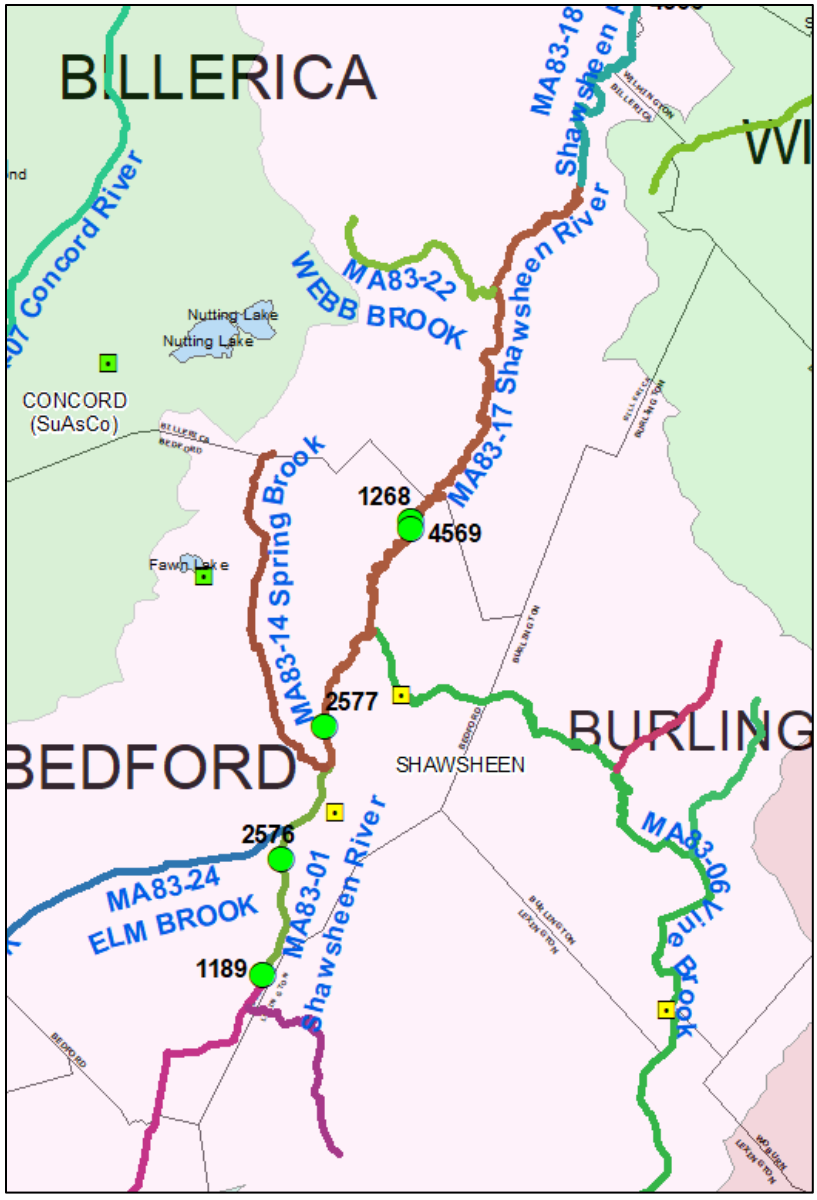
[Species List: AE = American Eel, B = Bluegill, BB = Brown Bullhead, CP = Chain Pickerel, F = Fallfish, GS = Golden Shiner, GSF = Green Sunfish, LMB = Largemouth Bass, P = Pumpkinseed, RBS = Redbreast Sunfish, SL = Sea Lamprey, TD = Tesselated Darter, WS = White Sucker, YB = Yellow Bullhead, YP = Yellow Perch]

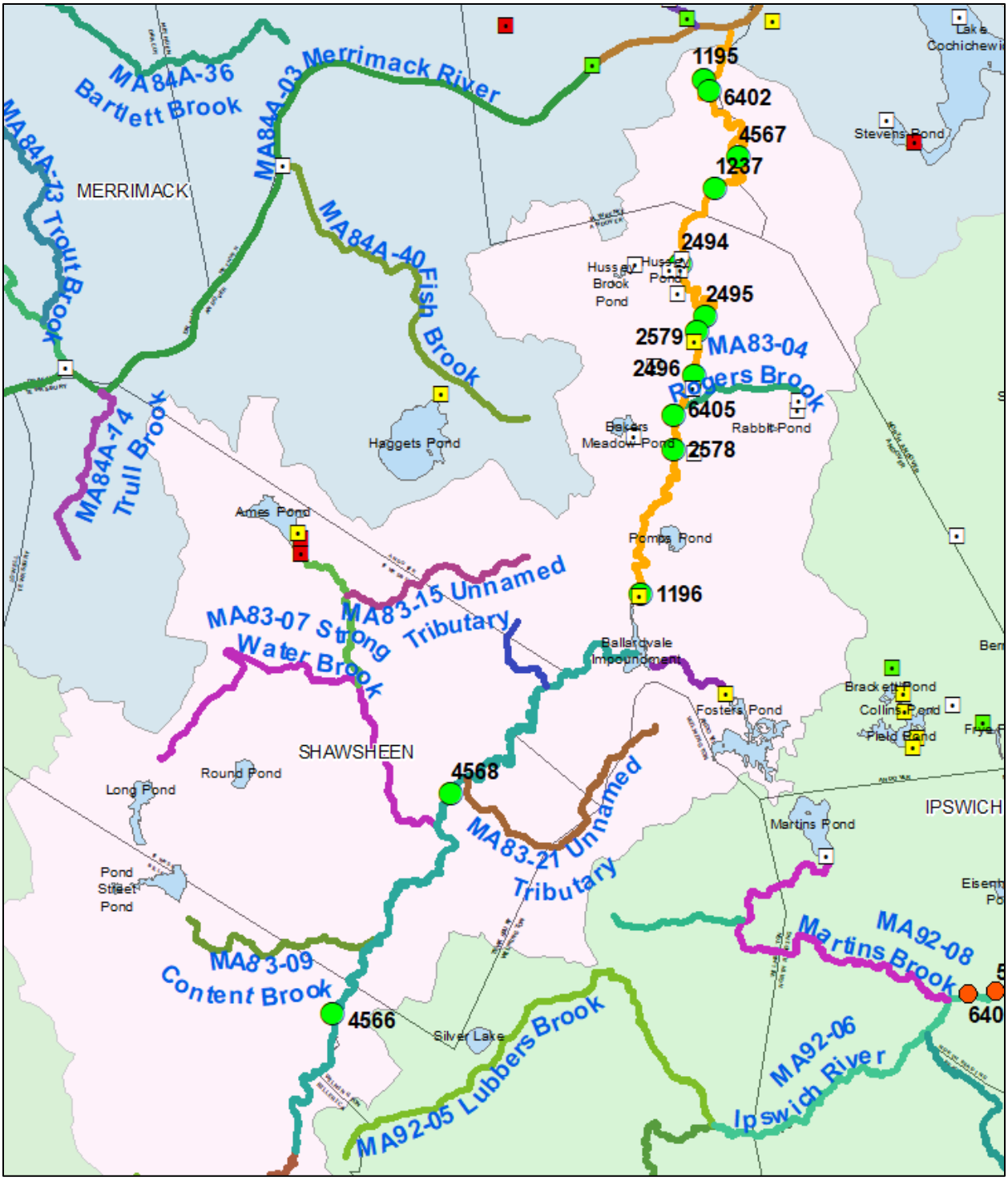
Sample ID	Sample Date	Method	Sample Type	Gradient	Total Taxa	Total Ind	Cold Ind %	Fluvial Taxa	Fluvial Ind %	Intol Ind %	I/MT MG Taxa	I/MT MG Ind %	Notables	CFR	Species List
6402	09/22/15	BG	TP		9	150	0%	3	31%	0%	2	5%	Yes	No	AE, B, F, GS, P, RBS, SL, TD, WS,
6405	09/25/15	BP	TP		9	454	0%	2	92%	0%	3	2%	No	No	AE, BB, CP, F, LMB, RBS, SL, WS, YB,
7459	07/10/18	BP	TP	L	10	64	0%	3	59%	0%	2	6%	No	No	AE, B, F, GSF, LMB, P, SL, TD, WS, YB,
7460	07/10/18	BP	TP	L	7	26	0%	2	46%	0%	3	19%	No	No	AE, F, GSF, LMB, P, RBS, TD,
7461	07/10/18	BP	TP	L	9	126	0%	2	83%	0%	3	6%	No	No	AE, CP, F, GSF, LMB, RBS, SL, TD, YB,
7462	07/11/18	BP	TP	L	7	34	0%	2	18%	0%	3	44%	No	No	AE, CP, F, P, RBS, WS, YB,
7463	07/11/18	BP	TP	L	6	69	0%	1	7%	0%	3	12%	No	No	AE, CP, F, LMB, RBS, SL,
7464	07/11/18	BP	TP	L	6	23	0%	1	13%	0%	3	39%	No	No	AE, P, RBS, WS, YB, YP,
8591	08/15/19	BP	TP		10	92	0%	2	9%	0%	5	34%	No	No	AE, B, CP, F, LMB, P, RBS, WS, YB, YP,
8592	08/15/19	BP	TP		9	100	0%	2	12%	0%	4	16%	No	No	AE, B, F, LMB, P, RBS, WS, YB, YP,

Comparison of fish community samples (2005-2017) to the Shawsheen Target Fish Community (TFC) Model. (MassDFG 2018, MassDEP Undated 2, Kashiwagi and Richards 2009)

Eighteen fish community samples (Sample IDs: 1189, 1195, 1196, 1237, 1268, 2494, 2495, 2496, 2576, 2577, 2578, 2579, 4566, 4567, 4568, 4569, 6402, 6405) were collected in the Shawsheen River (AUs MA83-01, MA83-17, MA83-18, MA83-19) from 2005-2015. The percent similarity with the Shawsheen Target Fish Community model was 49.08%. Of the 5 most common species in the TFC (all fluvial species; 4 moderately tolerant), only one species (fallfish) was found in the top 5 among the study samples (fallfish, American eel, redbreast sunfish, white sucker, redfin pickerel). There were fewer fluvial species and more tolerant species among these 5 most common species in the study samples. Kashiwagi and Richards (2009) noted issues with channelization, as well as potentially erosion, sedimentation, and stormwater discharges in this basin. However, the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam were removed from the downstream AU (MA83-19) in 2017, resulting in increased connectivity of riverine habitat (USFWS 2016). Since the comparison of fish community data with the Shawsheen TFC model was so close to the 50% target and the fish community data collected before 2017 (when major restoration activities occurred) were not necessarily representative of current conditions, a use impairment decision for these four Shawsheen River AUs (MA83-01, MA83-17, MA83-18, MA83-19) will not be made at this time. In a future IR cycle, fish community data collected after 2017 throughout the Shawsheen River mainstem should be included in a comparative analysis with the Shawsheen TFC model.

Fish Community Samples in the Shawsheen River (MA83-01, MA83-17, MA83-18, MA83-19); screen capture of 2 upstream/southern AUs, and then 2 downstream/northern AUs:


BILLERICA
MA83-18
Shawsheen River
Concord River
MA83-22
WEBB BROOK
Nutting Lake
Nutting Lake
CONCORD
(SuAsCo)
MA83-17 Shawsheen River
1268
4569
MA83-14 Spring Brook
Fawn Lake
2577
BURLING
BEDFORD
SHAWSHEEN
2576
MA83-24
ELM BROOK
MA83-01
Shawsheen River
MA83-06
Vine Brook
1189


MA84A-36
Bartlett Brook
MA84A-03 Merrimack River
MA84A-73 Trout Brook
MERRIMACK
MA84A-40 Fish Brook
MA84A-74
Trull Brook
1195
6402
4567
1237
2494
2495
2579
2496
MA83-04
Rogers Brook
6405
2578
1196
4568
4566
Stevens Pond
Hussey Brook Pond
Haggets Pond
Bakers Meadow Pond
Rabbit Pond
Ames Pond
Pomps Pond
MA83-15 Unnamed Tributary
MA83-07 Strong Water Brook
Ballardvale Impoundment
Fosters Pond
Bracket Pond
Collins Pond
Field Pond
SHAWSHEEN
Round Pond
Long Pond
Pond Street Pond
MA83-21 Unnamed Tributary
IPSWICH
Martins Pond
MA92-08
Martins Brook
MA83-09
Content Brook
Silver Lake
MA92-05 Lubbers Brook
MA92-06
Ipswich River

Shawsheen TFC Model:

Table A14. Species percent composition for reference rivers used to develop the Shawsheen River target fish community model. Species are ordered by mean rank. Non-native, stocked, and out-of-range species were deleted from the ranking and calculation of expected proportion in the target fish model. The ranks were converted to expected proportions (as a percent) using a rank-weighting technique as outlined by Bain and Meixler (2008).

Species	Wood River	Nissitissit River	Eightmile River	Isinglass River	SB Piscataquog River	Little River	Total	Rank	Expected Proportions
Common shiner	32.3	5.4	18.6	36.8	20.6	14.9	128.6	1	37.6
Fallfish	4.1	26.7	3.1	18.1	3.0	16.2	71.2	2	18.8
Blacknose dace	0.0	6.2	3.4	0.0	33.4	22.3	65.3		
Longnose dace	12.5	12.6	1.0	12.1	19.0	0.0	57.2		
Tessellated darter	13.6	9.7	17.3	0.0	0.0	0.0	40.7	5	7.5
Redbreast sunfish	16.1	1.0	10.9	9.2	0.0	0.0	37.1	6	6.3
American eel	5.9	2.3	8.9	10.8	0.0	4.7	32.6	7	5.4
White sucker	2.1	0.8	5.0	0.5	0.9	12.2	21.4	8	4.7
Pumpkinseed	0.3	11.0	3.3	2.7	0.5	0.0	17.9	9	4.2
Atlantic salmon	2.8	0.0	1.4	3.9	9.4	0.0	17.5		
Largemouth bass	0.2	5.4	6.0	0.9	0.7	0.0	13.2		
Yellow bullhead	0.0	10.3	0.0	0.0	1.8	0.0	12.1		
Spottail shiner	0.0	0.0	11.3	0.0	0.5	0.0	11.8		
Bluegill	4.9	3.8	0.4	0.0	0.0	0.0	9.2		
Chain pickerel	1.1	3.3	0.1	0.2	0.2	0.7	5.7	15	2.5
Smallmouth bass	0.0	0.0	1.3	0.5	3.6	0.0	5.4		
Yellow perch	0.0	0.0	4.3	0.0	0.0	0.0	4.3	17	2.2
Brown bullhead	0.8	0.0	0.1	1.4	0.0	0.0	2.3	18	2.1
Creek chubsucker	1.3	0.8	0.0	0.0	0.0	0.0	2.1	19	2.0
Brown trout	0.7	0.0	0.3	0.0	0.4	0.7	2.0		
Bridle shiner	0.0	0.0	0.0	1.8	0.0	0.0	1.8	21	1.8
Golden shiner	0.0	0.0	0.0	0.0	1.6	0.0	1.6	22	1.7
Brook trout	0.8	0.3	0.0	0.0	0.0	0.0	1.1	23	1.6
Redfin pickerel	0.0	0.0	0.9	0.0	0.0	0.0	0.9	24	1.6
Rock bass	0.0	0.5	0.0	0.0	0.0	0.0	0.5		
Rainbow trout	0.2	0.0	0.0	0.0	0.2	0.0	0.4		
Black crappie	0.2	0.0	0.0	0.0	0.0	0.0	0.2		

Fish Community Analysis:

Watershed	Common Name	Values # of Fish	% of catch	Applicable TFC	TFC Difference	% Sim to TFC
Shawsheen	American Brook Lamprey		0.00%	-	-	
Shawsheen	American Eel	490	24.23%	5.4	18.8	
Shawsheen	Atlantic Salmon	5	0.25%	-	0.2	
Shawsheen	Banded Killifish		0.00%	-	-	
Shawsheen	Banded Sunfish	10	0.49%	-	0.5	
Shawsheen	Black Crappie		0.00%	-	-	
Shawsheen	Blacknose Dace	1	0.05%	-	0.0	
Shawsheen	Bluegill	66	3.26%	-	3.3	
Shawsheen	Bluntnose Minnow		0.00%	-	-	
Shawsheen	Bridle Shiner		0.00%	1.8	1.8	
Shawsheen	Brook Trout		0.00%	1.6	1.6	
Shawsheen	Brown Bullhead	58	2.87%	2.1	0.8	
Shawsheen	Brown Trout	3	0.15%	-	0.1	
Shawsheen	Central Mudminnow		0.00%	-	-	
Shawsheen	Chain Pickerel	14	0.69%	2.5	1.8	
Shawsheen	Channel Catfish		0.00%	-	-	
Shawsheen	Common Carp	3	0.15%	-	0.1	
Shawsheen	Common Shiner	2	0.10%	37.6	37.5	
Shawsheen	Creek Chub		0.00%	-	-	
Shawsheen	Creek Chubsucker	6	0.30%	2.0	1.7	
Shawsheen	Cutlips Minnow		0.00%	-	-	
Shawsheen	Fallfish	566	27.99%	18.8	9.2	
Shawsheen	Fathead Minnow		0.00%	-	-	
Shawsheen	Golden Shiner	19	0.94%	1.7	0.8	
Shawsheen	Green Sunfish		0.00%	-	-	
Shawsheen	Lake Chub		0.00%	-	-	
Shawsheen	Largemouth Bass	23	1.14%	-	1.1	
Shawsheen	Longnose Dace		0.00%	-	-	
Shawsheen	Longnose Sucker		0.00%	-	-	
Shawsheen	Northern Pike		0.00%	-	-	
Shawsheen	Pumpkinseed	71	3.51%	4.2	0.7	
Shawsheen	Rainbow Trout		0.00%	-	-	
Shawsheen	Redbreast Sunfish	215	10.63%	6.3	4.3	
Shawsheen	Redfin Pickerel	103	5.09%	1.6	3.5	
Shawsheen	Rock Bass		0.00%	-	-	
Shawsheen	Sea Lamprey	79	3.91%	-	3.9	
Shawsheen	Slimy Sculpin		0.00%	-	-	
Shawsheen	Smallmouth Bass		0.00%	-	-	
Shawsheen	Spottail Shiner		0.00%	-	-	
Shawsheen	Swamp Darter	4	0.20%	-	0.2	
Shawsheen	Tadpole Madtom		0.00%	-	-	
Shawsheen	Tesselated Darter	82	4.06%	-	4.1	
Shawsheen	White Catfish		0.00%	-	-	
Shawsheen	White Perch		0.00%	-	-	
Shawsheen	White Sucker	145	7.17%	4.7	2.5	
Shawsheen	Yellow Bullhead	39	1.93%	-	1.9	
Shawsheen	Yellow Perch	18	0.89%	2.2	1.3	
Shawsheen	(blank)		0.00%	-	-	49.08
Grand Total		2022	#####	-	100.0	
				-	-	

Row Labels
Shawsheen
1189
1195
1196
1237
1268
2494
2495
2496
2576
2577
2578
2579
4566
4567
4568
4569
6402
6405
Grand Total

Habitat and Flow Data (anthropogenic alterations)

Status of MassDER habitat restoration priority projects as of 2021 (Wildman April 15, 2021)

Marland Place Dam (aka Stevens Street Dam) and Balmoral Dam

The Town of Andover worked with the Massachusetts Division of Ecological Restoration, USFWS, NOAA, and the Center for Ecosystem Restoration to complete the removal of the Marland Place Dam (also known as the Stevens Street Dam) and the Balmoral Dam (also known as the Rt. 133 Dam) on the Shawsheen River in spring 2017. The combined removal of both dams has reconnected approximately 4 miles of the Shawsheen River, restored access to 16 acres of habitat for migratory fish species (alewife, blueback herring, American shad, and sea lamprey), and reduced the risk of flooding in downtown Andover (USFWS 2016). Studies on the environmental effects of both the Balmoral and Marland Place Dams on the

Shawsheen River were conducted by UMass students between July 2015 and September 2017. Investigators used data loggers to monitor continuous and discrete temperature, as well as dissolved oxygen levels (UMass-Amherst 2018).

MassDMF Status of Priority Diadromous Fish Passage Barriers. (Chase 2020)

Assessment Summary
DMF biologists note three structures pertaining to the passage of diadromous fish throughout the Shawsheen River AU. From upstream to downstream: The Ballardvale Dam (marking the boundary between this Shawsheen River AU and the upstream Ballardvale Impoundment (MA83011) was given a passage score of "8", on a 0-10 scale, indicating that the dam poses a severe impediment to the passage of the targeted species, river herring and American eel. The population score was noted to be “3”. It was noted that there is a dam removal project in its planning stages here, as part of the large cooperative project which sought to remove all 3 dams on the Shawsheen. The design for removal of the Ballardvale dam was completed in 2016. In the middle of the AU, the remnants of the Marland Place Dam (just downstream of Stevens Street in Andover), which was successfully removed in 2017, were given a passage score of "0", indicating that the dam remnants pose no obstruction to the passage of the targeted species, river herring and American shad. The population score was noted to be “3”. A little further downstream, the Balmoral/Rt.133 Dam (NATID# MA00179), also removed in 2017, was given a passage score of "0", on a 0-10 scale, indicating that the remnants of the dam also no longer pose an impediment to the passage of the targeted species, river herring and American shad. The population score was noted to be “3”. The Aquatic Life Use for Shawsheen River (Assessment Unit MA83-19) is assessed as Not Supporting, based on the barrier to diadromous fish passage at the Ballardvale Dam.

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP Undated 1)

Summary Statement
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in the Shawsheen River (MA83-19) in the vicinity of water quality station W2538 in 2015.

Physico-chemical Water Quality Information

DO, pH, Temperature

MassDEP Long-term Continuous Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[7DADMin= 7-Day Average of the Daily Minima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Day Count	7day Count	30day Count	DO Min (mg/L)	Min 7DADMin (mg/L)	Min 7DADA (mg/L)	Delta DO Max (mg/L)	Count CW 7DADMin <6.0	Count CW 1Day Min <5.0	Count WW Early Life Stages 7DADA <6.5	Count WW Early Life Stages 1Day Min <5.0	Count WW Other Life Stages 7DADMin <5.0	Count WW Other Life Stages 1Day Min <4.0	Count CW 30DADA <8.0	Count WW Other Life Stages 30DADA <6.0
W2523	07/01/15	09/23/15	85	79	56	3.5	5.1	6.2	3	10	4	0	0	0	2	56	0
W2538	07/01/15	09/23/15	85	79	56	5.7	6.2	7.2	3	0	0	0	0	0	0	56	0

MassDEP Discrete Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	DO Count	DO Min (mg/L)	DO Avg (mg/L)	Count CW <5.0	Count WW Early Life Stages <5.0	Count WW Other Life Stages <4.0
W2523	08/04/15	09/24/15	3	7.7	8.3	0	0	0
W2538	08/04/15	09/24/15	3	6.4	7.2	0	0	0

MassDEP Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; Max Daily Mean= Maximum 24-Hour Average, 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Index Count	7day Count	Max Daily Mean (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier1 Daily Mean >23.5	Count CWTier2 7DADA >21	Count CWTier2 Daily Mean >24.1	Count WW 7DADM >27.7	Count WW Daily Mean >28.3
W2523	07/01/15	09/15/15	77	74	25.4	26.7	25.8	24.9	74	26	71	17	0	0
W2538	07/01/15	09/15/15	77	74	26.1	27.4	26.6	25.5	74	34	71	24	0	0

24-hour Rolling Average Calculations for MassDEP Short- and Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Count Days Deployed	24hr Rolling Count	Max 24hr Avg Rolling Temp (°C)	Count CWTier1 24hr Avg Rolling >23.5 °C	Count CWTier2 24hr Avg Rolling >24.1 °C	Count WW 24hr Avg Rolling >28.3°C
W2523	06/30/15	09/15/15	77	3665	25.5	1300	867	0
W2538	06/30/15	09/15/15	78	3677	26.2	1687	1162	0

MassDEP Discrete Temperature Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Temp Count	Index Count	Temp Max (°C)	Temp Avg (°C)	Count CW >20	Count CW >22	Count WW >28.3	Count WW >30.3
W2523	08/04/15	09/24/15	3	2	24.7	21.8	2	2	0	0
W2538	08/04/15	09/24/15	3	2	24.1	21.2	2	2	0	0

MassDEP Discrete pH Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	pH Count	pH Min (SU)	pH Max (SU)	pH Count <6.5 & >8.3	pH Count <6.0 & >8.8
W2523	08/04/15	09/24/15	3	7.2	7.3	0	0
W2538	08/04/15	09/24/15	3	7	7.1	0	0

UMass Amherst Dam Study Short-term Continuous Dissolved Oxygen Data (2015-2017). (UMass-Amherst 2018) (MassDEP Undated 4)

[Note: X= 7 (or # of deploy days if less than seven days); XDADMin= XDay Average of the Daily Minima, XDADA= XDay Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Day Count	DO Min (mg/L)	Min XDADMin (mg/L)	Min XDADA (mg/L)	Delta DO Max (mg/L)	Count CW XDADMin <6.0	Count CW 1Day Min <5.0	Count WW Early Life Stages XDADA <6.5	Count WW Early Life Stages 1Day Min <5.0	Count WW Other Life Stages XDADMin <5.0	Count WW Other Life Stages 1Day Min <4.0
UMassA_BALDS1	08/26/15	09/01/15	7	7.2	7.5	8.1	1.4	0	0	0	0	0	0
UMassA_BALDS1	07/20/16	07/24/16	5	5.9	6.5	6.9	0.9	0	0	0	0	0	0
UMassA_BALDS1	08/17/16	08/21/16	5	6.6	6.8	7.1	1.2	0	0	0	0	0	0
UMassA_BALDS1	09/08/16	09/13/16	6	6.7	7	7.4	1	0	0	0	0	0	0
UMassA_BALDS1	07/28/17	08/01/17	5	7.3	7.9	8.3	1.4	0	0	0	0	0	0
UMassA_BALDS1	08/19/17	08/24/17	6	5.6	6.5	7.5	2.9	0	0	0	0	0	0
UMassA_BALDS1	09/11/17	09/16/17	6	6.7	7.7	8.4	2	0	0	0	0	0	0
UMassA_BALIMP	08/26/15	09/01/15	7	6	6.6	7.8	3.3	0	0	0	0	0	0
UMassA_BALIMP	07/20/16	07/24/16	5	5	5.4	6.3	1.8	1	0	1	0	0	0
UMassA_BALIMP	08/17/16	08/21/16	5	5.2	5.4	6.2	2	1	0	0	0	0	0
UMassA_BALIMP	09/08/16	09/13/16	6	4.7	5.6	6.1	1.8	1	2	0	0	0	0
UMassA_BALIMP	07/28/17	08/01/17	5	7.3	7.9	8.4	1.4	0	0	0	0	0	0
UMassA_BALIMP	08/19/17	08/24/17	6	5.6	6.6	7.6	3	0	0	0	0	0	0
UMassA_BALIMP	09/11/17	09/16/17	6	6.7	7.7	8.4	2.2	0	0	0	0	0	0
UMassA_BALUS	08/26/15	09/01/15	7	7.7	7.9	8.4	1.7	0	0	0	0	0	0
UMassA_BALUS	07/20/16	07/24/16	5	6.5	6.9	7.5	1.5	0	0	0	0	0	0
UMassA_BALUS	08/17/16	08/21/16	5	6.8	7.2	7.6	1.5	0	0	0	0	0	0
UMassA_BALUS	09/08/16	09/13/16	6	7.5	7.7	8.1	1.3	0	0	0	0	0	0
UMassA_BALUS	07/28/17	08/01/17	5	7.7	8.1	8.5	1.0	0	0	0	0	0	0
UMassA_BALUS	08/19/17	08/24/17	6	6.5	7.2	7.9	1.7	0	0	0	0	0	0
UMassA_BALUS	09/11/17	09/16/17	6	7.7	8.3	8.8	1.5	0	0	0	0	0	0
UMassA_MARDS1	08/26/15	09/01/15	7	7.7	8	8.5	1.6	0	0	0	0	0	0
UMassA_MARDS1	07/20/16	07/24/16	5	6.6	7	7.4	1.2	0	0	0	0	0	0
UMassA_MARDS1	08/17/16	08/21/16	5	7	7.3	7.8	1.3	0	0	0	0	0	0
UMassA_MARDS1	09/08/16	09/13/16	6	7.7	8	8.3	0.9	0	0	0	0	0	0
UMassA_MARDS1	07/28/17	08/01/17	5	7.8	8.1	8.6	1.1	0	0	0	0	0	0
UMassA_MARDS1	08/19/17	08/24/17	6	6.4	7.2	7.9	1.8	0	0	0	0	0	0
UMassA_MARDS1	09/11/17	09/16/17	6	7.5	8	8.4	1.4	0	0	0	0	0	0
UMassA_MARIMP	08/26/15	09/01/15	7	6.4	6.7	7.8	3.6	0	0	0	0	0	0
UMassA_MARIMP	07/20/16	07/24/16	5	5	5.7	7.2	3.5	1	0	0	0	0	0
UMassA_MARIMP	08/17/16	08/21/16	5	5.3	5.7	7	3.4	1	0	0	0	0	0
UMassA_MARIMP	09/08/16	09/13/16	6	5.4	5.8	7.2	3.1	1	0	0	0	0	0
UMassA_MARIMP	08/19/17	08/24/17	6	6.1	6.8	7.7	2.6	0	0	0	0	0	0
UMassA_MARIMP	09/11/17	09/16/17	6	6.7	7.3	7.8	1.5	0	0	0	0	0	0
UMassA_MARUS	08/26/15	09/01/15	7	7.4	7.7	8.9	4	0	0	0	0	0	0
UMassA_MARUS	07/20/16	07/24/16	5	6.4	6.7	7.6	2.6	0	0	0	0	0	0
UMassA_MARUS	08/17/16	08/21/16	5	6.5	6.6	7.6	3.4	0	0	0	0	0	0
UMassA_MARUS	09/08/16	09/13/16	6	6.9	7.1	8.4	4	0	0	0	0	0	0
UMassA_MARUS	07/28/17	08/01/17	5	7.5	7.8	8.3	1.7	0	0	0	0	0	0

Station Code	Start Date	End Date	Day Count	DO Min (mg/L)	Min XDADMin (mg/L)	Min XDADA (mg/L)	Delta DO Max (mg/L)	Count CW XDADMin <6.0	Count CW 1Day Min <5.0	Count WW Early Life Stages XDADA <6.5	Count WW Early Life Stages 1Day Min <5.0	Count WW Other Life Stages XDADMin <5.0	Count WW Other Life Stages 1Day Min <4.0
UMassA_MARUS	08/19/17	08/24/17	6	6.5	7	7.9	2.6	0	0	0	0	0	0
UMassA_MARUS	09/11/17	09/16/17	6	7.5	8.1	8.6	1.7	0	0	0	0	0	0

UMass Amherst Dam Study Discrete Dissolved Oxygen Data (2016-2017). (UMass-Amherst 2018) (MassDEP Undated 4)
[CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Sample Depth	DO Count	DO Min (mg/L)	DO Avg (mg/L)	Count CW <5.0	Count WW Early Life Stages <5.0	Count WW Other Life Stages <4.0
UMassA_BALIMP	07/25/16	09/14/16	surface	3	4.6	5.5	1	1	0
UMassA_BALIMP	07/25/16	09/14/16	0.5m	3	4.6	5.6	1	1	0
UMassA_BALIMP	07/25/16	09/14/16	1.0m	3	4.3	5.3	2	2	0
UMassA_BALIMP	08/22/16	09/14/16	1.3m	2	4.4	5.5	1	1	0
UMassA_BALIMP	07/25/16	07/25/16	1.4m	1	2.2	2.2	1	1	1
UMassA_MARIMP	07/25/16	09/14/16	surface	3	4.4	5.8	1	1	0
UMassA_MARIMP	07/25/16	09/14/16	0.5m	3	4.5	5.7	1	1	0
UMassA_MARIMP	07/25/16	09/14/16	1.0m	3	4.8	5.8	1	1	0
UMassA_MARIMP	07/25/16	09/14/16	1.5m	3	4.6	5.6	1	1	0
UMassA_MARIMP	07/25/16	09/14/16	2.0m	3	4.5	5.2	2	2	0
UMassA_MARIMP	09/14/16	09/14/16	2.5m	1	4.5	4.5	1	1	0

UMass Amherst Dam Study Long-term Continuous Temperature Data (Summer Index 2014-2017). (UMass-Amherst 2018) (MassDEP Undated 4)
[Summer Index is June 1 – Sept 15; 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Index Count	Max 24hr Rolling Avg Temp (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier2 7DADA >21	Count WW 7DADM >27.7
UMassA_BALDS1	07/07/15	12/31/15	71	25.8	26.6	25.7	24.8	65	65	0
UMassA_BALDS1	01/01/16	12/31/16	107	27.2	27.8	26.8	25.8	107	94	0
UMassA_BALDS1	01/01/17	05/18/17	0	21.9	23.4	NA	NA	NA	NA	NA
UMassA_BALDS2	07/07/15	12/31/15	71	26.0	26.7	25.9	25.4	65	65	0
UMassA_BALDS2	01/01/16	12/31/16	107	26.7	27.1	26.2	25.5	107	93	0
UMassA_BALDS2	01/01/17	05/18/17	0	23.0	23.5	NA	NA	NA	NA	NA
UMassA_BALDS3	07/07/15	12/31/15	71	26.1	26.9	26.0	25.4	65	65	0
UMassA_BALDS3	01/01/16	12/31/16	107	26.9	27.4	26.5	25.5	107	90	0
UMassA_BALDS3	01/01/17	05/18/17	0	22.9	23.4	NA	NA	NA	NA	NA
UMassA_BALDS4	07/07/15	12/31/15	71	26.0	27.1	26.0	25.3	65	65	0
UMassA_BALDS4	01/01/16	12/31/16	107	26.9	27.7	27.1	25.5	107	91	0
UMassA_BALDS4	01/01/17	05/18/17	0	23.0	23.5	NA	NA	NA	NA	NA
UMassA_BALIMP	07/07/15	12/31/15	71	26.5	26.9	26.4	25.7	65	65	0
UMassA_BALIMP	01/01/16	11/05/16	107	27.4	27.9	27.2	26.0	107	94	0

Station Code	Start Date	End Date	Index Count	Max 24hr Rolling Avg Temp (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier2 7DADA >21	Count WW 7DADM >27.7
UMassA_BALUS	07/07/15	12/31/15	71	26.0	27.4	26.7	25.4	65	65	0
UMassA_BALUS	01/01/16	12/31/16	107	27.2	28.9	27.5	25.9	107	93	0
UMassA_BALUS	01/01/17	05/18/17	0	22.1	23.6	NA	NA	NA	NA	NA
UMassA_BVLDS1	06/30/16	12/31/16	78	27.8	29.4	28.4	27.0	72	72	8
UMassA_BVLDS1	01/01/17	11/30/17	107	26.2	27.4	26.3	25.1	87	74	0
UMassA_BVLDS2	06/30/16	12/31/16	78	27.3	28.7	27.9	26.2	72	71	3
UMassA_BVLDS2	01/01/17	11/30/17	106	26.1	27.4	26.2	25.0	84	73	0
UMassA_BVLDS3	06/30/16	12/31/16	78	27.2	28.5	27.6	26.2	72	71	0
UMassA_BVLDS3	01/01/17	11/30/17	107	26.1	27.4	26.3	25.1	83	73	0
UMassA_MARDS1	07/09/15	12/31/15	69	25.8	28.0	26.3	26.2	63	63	0
UMassA_MARDS1	01/01/16	11/05/16	107	27.2	29.1	27.1	26.7	107	101	0
UMassA_MARDS2	07/09/15	12/31/15	69	26.3	27.8	26.5	26.3	63	63	0
UMassA_MARDS2	01/01/16	11/05/16	107	27.1	29.0	27.0	26.6	107	96	0
UMassA_MARDS3	07/09/15	12/31/15	69	26.3	27.8	26.5	26.4	63	63	0
UMassA_MARDS3	01/01/16	11/05/16	107	27.2	28.9	27.0	26.6	107	99	0
UMassA_MARIMP	07/09/15	12/31/15	69	26.5	28.3	26.7	26.6	63	63	0
UMassA_MARIMP	01/01/16	11/05/16	107	27.3	29.1	27.2	26.8	107	101	0
UMassA_MARUS	07/09/15	12/31/15	69	25.5	27.9	26.1	26.1	63	63	0
UMassA_MARUS	01/01/16	11/05/16	106	27.1	30.7	28.0	27.9	107	101	4

UMass Amherst Dam Study Discrete Temperature Data (2016-2017). (UMass-Amherst 2018) (MassDEP Undated 4)
[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Sample Depth	Temp Count	Index Count	Temp Max (°C)	Temp Avg (°C)	Count CW >20	Count CW >22	Count WW >28.3	Count WW >30.3
UMassA_BALIMP	07/25/16	09/14/16	surface	3	3	25	23	3	2	0	0
UMassA_BALIMP	07/25/16	09/14/16	0.5m	3	3	24	22	3	2	0	0
UMassA_BALIMP	07/25/16	09/14/16	1.0m	3	3	24	22	2	2	0	0
UMassA_BALIMP	08/22/16	09/14/16	1.3m	2	2	22	21	1	1	0	0
UMassA_BALIMP	07/25/16	07/25/16	1.4m	1	1	24	24	1	1	0	0
UMassA_MARIMP	07/25/16	09/14/16	surface	3	3	24	23	3	3	0	0
UMassA_MARIMP	07/25/16	09/14/16	0.5m	3	3	24	22	3	2	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.0m	3	3	24	22.0	2	2	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.5m	3	3	23	22	2	2	0	0
UMassA_MARIMP	07/25/16	09/14/16	2.0m	3	3	23	22	2	2	0	0
UMassA_MARIMP	09/14/16	09/14/16	2.5m	1	1	19	19	0	0	0	0

UMass Amherst Dam Study Discrete pH Data (2016-2017). (UMass-Amherst 2018) (MassDEP Undated 4)

Station Code	Start Date	End Date	Sample Depth	pH Count	pH Min (SU)	pH Max (SU)	pH Count <6.5 & >8.3	pH Count <6.0 & >8.8
UMassA_BALDS1	07/19/16	09/14/16	Surface	6	6.7	7.2	0	0
UMassA_BALDS1	07/27/17	09/17/17	Surface	5	6.9	7.7	0	0

Station Code	Start Date	End Date	Sample Depth	pH Count	pH Min (SU)	pH Max (SU)	pH Count <6.5 & >8.3	pH Count <6.0 & >8.8
UMassA_BALIMP	07/19/16	09/14/16	Surface	6	6.7	7.0	0	0
UMassA_BALIMP	07/25/16	09/14/16	0.5m	3	6.6	7.0	0	0
UMassA_BALIMP	07/25/16	09/14/16	1.0m	3	6.6	6.9	0	0
UMassA_BALIMP	08/22/16	09/14/16	1.3m	2	6.5	6.8	0	0
UMassA_BALIMP	07/25/16	07/25/16	1.4m	1	6.7	6.7	0	0
UMassA_BALIMP	07/27/17	09/17/17	Surface	5	6.9	7.7	0	0
UMassA_BALUS	07/19/16	09/14/16	Surface	6	6.9	7.4	0	0
UMassA_BALUS	07/27/17	09/17/17	Surface	5	6.9	7.7	0	0
UMassA_MARDS1	07/19/16	09/14/16	Surface	6	7.0	7.3	0	0
UMassA_MARDS1	07/27/17	09/17/17	Surface	5	6.9	7.9	0	0
UMassA_MARIMP	07/19/16	09/14/16	Surface	6	6.7	7.0	0	0
UMassA_MARIMP	07/25/16	09/14/16	0.5m	3	6.7	7.0	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.0m	3	6.6	7.0	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.5m	3	6.6	6.9	0	0
UMassA_MARIMP	07/25/16	09/14/16	2.0m	3	6.6	6.9	0	0
UMassA_MARIMP	09/14/16	09/14/16	2.5m	1	6.7	6.7	0	0
UMassA_MARIMP	08/18/17	09/17/17	Surface	4	6.9	7.6	0	0
UMassA_MARUS	07/19/16	09/14/16	Surface	6	6.8	8.0	0	0
UMassA_MARUS	07/27/17	09/17/17	Surface	5	6.9	7.5	0	0

Nutrients (Primary Producer Screening, Physico-chemical Screening)

MassDEP Nutrient Enrichment Indicator Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer seasonal total phosphorus data collected May-Sept]

Station Code	Data Year	Seasonal TP Count	Seasonal TP Min (mg/L)	Seasonal TP Max (mg/L)	Seasonal TP Avg (mg/L)	Delta DO Max (mg/L)	Delta DO Avg (mg/L)	DO Sat Max (%)	pH Max (SU)	Count Algal Obsv.	Dense/V. Dense Film/Fila. Algae
W2523	2015	5	0.012	0.088	0.038	3.0	1.4	97.2	7.3	4	0
W2538	2015	5	0.019	0.091	0.041	3.0	1.9	86.2	7.1	4	0

Toxics and other pollutants (metals, ammonia, chloride, chlorine)

MassDEP Clean Metals Water Column Data (2011-2018), Acute Criteria Violations. (MassDEP Undated 8) (MassDEP Undated 6)

[CMC= Criterion Maximum Concentration, TU= Toxic Unit]

Station Code	Data Year	Metals Count	As CMC TU >1	Cd CMC TU >1	Cr III CMC TU >1	Cu CMC TU >1	Pb CMC TU >1	Ni CMC TU >1	Ag CMC TU >1	Zn CMC TU >1
W2523	2015	3	0	0	0	0	0	0	0	0
W2538	2015	3	0	0	0	0	0	0	0	0

MassDEP Clean Metals Water Column Data (2011-2018), Chronic Criteria Violations. (MassDEP Undated 8) (MassDEP Undated 6)

[CCC= Criterion Continuous Concentration, TU= Toxic Unit]

Station Code	Data Year	Metals Count	As CCC TU >1	Cd CCC TU >1	Cr III CCC TU >1	Cu CCC TU >1	Pb CCC TU >1	Ni CCC TU >1	Se CCC TU >1	Zn CCC TU >1
W2523	2015	3	0	0	0	0	0	0	0	0

Station Code	Data Year	Metals Count	As CCC TU >1	Cd CCC TU >1	Cr III CCC TU >1	Cu CCC TU >1	Pb CCC TU >1	Ni CCC TU >1	Se CCC TU >1	Zn CCC TU >1
W2538	2015	3	0	0	0	0	0	0	0	0

MassDEP Dissolved Aluminum Water Column Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)
[Since only dissolved aluminum data were available, these data were compared to the default freshwater criteria for total recoverable aluminum (TRA), presented in Appendix E of MassDEP's 2022 CALM. As dissolved Al is a fraction of TRA, an exceedance count of 0 does not rule out violations of the TRA criteria. CMC= Criterion Maximum Concentration, CCC= Criterion Continuous Concentration, TU= Toxic Unit]

Station Code	Data Year	Dissolved Al Count	Al Min (mg/L)	Al Max (mg/L)	Al Avg (mg/L)	Al CMC TU Max	Al CCC TU Max	Al CMC TU >1	Al CCC TU >1
W2523	2015	3	0.051	0.051	0.051	0.1	0.2	0	0
W2538	2015	3	0.051	0.051	0.051	0.1	0.2	0	0

MassDEP Total Ammonia Nitrogen (TAN) Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)
[TAN= NH3 + NH4+]

Station Code	Data Year	TAN Count	TAN Min (mg/L)	TAN Max (mg/L)	TAN Avg (mg/L)	Count TAN >Chronic	Count TAN >Acute
W2523	2015	5	0.040	0.190	0.073	0	0
W2538	2015	5	0.035	0.200	0.073	0	0

MassDEP Chloride Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Chloride Count	Chloride Min (mg/L)	Chloride Max (mg/L)	Chloride Avg (mg/L)	Count Chloride >230	Count Chloride >860
W2523	2015	5	140	210	182	0	0
W2538	2015	5	130	180	160	0	0

MassDEP Discrete Specific Conductance Data (2011-2018) Compared to Estimated Chloride Criteria. (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	SpCond Count	SpCond Min (µs/cm)	SpCond Max (µs/cm)	Count SpCond >904	Count SpCond >994	Count SpCond >3193	Count SpCond >3512	Consecutive sets >904	Consecutive sets >994
W2523	08/04/15	09/24/15	3	724	796	0	0	0	0	0	0
W2538	08/04/15	09/24/15	3	654	714	0	0	0	0	0	0

UMass Amherst Dam Study Discrete Specific Conductance Data (2016-2017) Compared to Estimated Chloride Criteria. (UMass-Amherst 2018) (MassDEP Undated 4)

Station Code	Start Date	End Date	Sample Depth	SpCond Count	SpCond Min (µs/cm)	SpCond Max (µs/cm)	Count SpCond >904	Count SpCond >994	Count SpCond >3193	Count SpCond >3512	Consecutive sets >904	Consecutive sets >994
UMassA_BALDS1	07/19/16	09/14/16	surface	6	245	762	0	0	0	0	0	0
UMassA_BALDS1	07/27/17	09/17/17	surface	5	540	688	0	0	0	0	0	0
UMassA_BALIMP	07/19/16	09/14/16	surface	6	246	761	0	0	0	0	0	0
UMassA_BALIMP	07/25/16	09/14/16	0.5m	3	247	764	0	0	0	0	0	0
UMassA_BALIMP	07/25/16	09/14/16	1.0m	3	238	753	0	0	0	0	0	0

Station Code	Start Date	End Date	Sample Depth	SpCond Count	SpCond Min (µs/cm)	SpCond Max (µs/cm)	Count SpCond >904	Count SpCond >994	Count SpCond >3193	Count SpCond >3512	Consecutive sets >904	Consecutive sets >994
UMassA_BALIMP	07/25/16	07/25/16	1.4m	1	737	737	0	0	0	0	0	0
UMassA_BALIMP	08/22/16	09/14/16	1.3m	2	237	696	0	0	0	0	0	0
UMassA_BALIMP	07/27/17	09/17/17	surface	5	538	707	0	0	0	0	0	0
UMassA_BALUS	07/19/16	09/14/16	surface	6	472	766	0	0	0	0	0	0
UMassA_BALUS	07/27/17	09/17/17	surface	5	535	702	0	0	0	0	0	0
UMassA_MARDS1	07/19/16	09/14/16	surface	6	472	763	0	0	0	0	0	0
UMassA_MARDS1	07/27/17	09/17/17	surface	5	537	702	0	0	0	0	0	0
UMassA_MARIMP	07/19/16	09/14/16	surface	6	449	765	0	0	0	0	0	0
UMassA_MARIMP	07/25/16	09/14/16	0.5m	3	442	762	0	0	0	0	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.0m	3	448	762	0	0	0	0	0	0
UMassA_MARIMP	07/25/16	09/14/16	1.5m	3	455	762	0	0	0	0	0	0
UMassA_MARIMP	07/25/16	09/14/16	2.0m	3	459	762	0	0	0	0	0	0
UMassA_MARIMP	09/14/16	09/14/16	2.5m	1	690	690	0	0	0	0	0	0
UMassA_MARIMP	08/18/17	09/17/17	surface	4	560	712	0	0	0	0	0	0
UMassA_MARUS	07/19/16	09/14/16	surface	6	548	720	0	0	0	0	0	0
UMassA_MARUS	07/27/17	09/17/17	surface	5	532	707	0	0	0	0	0	0

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No fish toxics sampling has been conducted in this Shawsheen River AU (MA83-19) so the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	Alert
Fully Supporting	NO
2022 Use Attainment Summary	
MassDEP field crews conducted water quality sampling during summer 2015 at two locations in this Shawsheen River AU (MA83-19): ~1900 ft upstream/north of Central Street, Andover (W2538) and ~1300 ft downstream/west of the Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence (W2523). There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded during five site visits to each location. The Aesthetics Use of this Shawsheen River AU (MA83-19) is assessed as Fully Supporting based on DEP field crew observations from summer 2015.	

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2523	MassDEP	Water Quality	Shawsheen River	[approximately 1300 feet downstream/west of Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence]	42.697117	-71.143995
W2538	MassDEP	Water Quality	Shawsheen River	[approximately 1900 feet upstream/north of Central Street, Andover]	42.652195	-71.150971

Aesthetic Observations

Aesthetics Summary Statements for MassDEP Stations (2011-2018) (MassDEP Undated 6)

Station Code	Waterbody	Data Year	Field Sheet Count	Aesthetics Summary Statement
W2523	Shawsheen River	2015	5	MassDEP aesthetics observations for station W2523/MAP2-685 on Shawsheen River can be summarized as follows: there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DEP field sampling crews during summer 2015.
W2538	Shawsheen River	2015	5	MassDEP aesthetics observations for station W2538/MAP2-717 on Shawsheen River can be summarized as follows: there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DEP field sampling crews during summer 2015.

Observations of Filamentous/Film Algae at MassDEP Stations (2011-2018) (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Field Sheet Count	Field Sheet Count w/ Film & Filamentous Algae Observations	Dense/ Very Dense Film/ Filamentous Algae
W2523	2015	5	4	0
W2538	2015	5	4	0

MassDEP Aesthetics Observations (2011-2018) (MassDEP Undated 8)

Station Code	Waterbody	Data Year	Parameter	Result	Result Count	Total Field Sheet Count
W2523	Shawsheen River	2015	Color	Light Yellow/Tan	4	5
W2523	Shawsheen River	2015	Color	None	1	5
W2523	Shawsheen River	2015	Objectionable Deposits	No	2	5
W2523	Shawsheen River	2015	Objectionable Deposits	Yes	3	5
W2523	Shawsheen River	2015	Odor	None	5	5
W2523	Shawsheen River	2015	Scum	No	4	5
W2523	Shawsheen River	2015	Scum	Yes	1	5
W2523	Shawsheen River	2015	Turbidity	Slightly Turbid	5	5
W2538	Shawsheen River	2015	Color	Light Yellow/Tan	3	5
W2538	Shawsheen River	2015	Color	None	2	5
W2538	Shawsheen River	2015	Objectionable Deposits	No	4	5
W2538	Shawsheen River	2015	Objectionable Deposits	Unobservable	1	5
W2538	Shawsheen River	2015	Odor	None	5	5
W2538	Shawsheen River	2015	Scum	No	4	5
W2538	Shawsheen River	2015	Scum	Yes	1	5
W2538	Shawsheen River	2015	Turbidity	Moderately Turbid	1	5
W2538	Shawsheen River	2015	Turbidity	None	4	5

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	

MassDEP field crews conducted water quality sampling during summer 2015 at two locations in this Shawsheen River AU (MA83-19): ~1900 ft upstream/north of Central Street, Andover (W2538) and ~1300 ft downstream/west of the Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence (W2523). There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded during five site visits to each location. Analysis of limited frequency *E. coli* data (n=5) collected during these summer site visits indicated that 100% of intervals for the upstream station (W2538) had GMs >126 cfu/100mL, one sample exceeded the 410 cfu/100mL STV, and the seasonal GM was 279 cfu/100mL. For the downstream location (W2523), 100% of intervals again exceeded the GM criterion, one sample exceeded the STV, and the seasonal GM was 381 cfu/100mL.
Although aesthetics observations by DEP staff at two locations on this Shawsheen River AU (MA83-19) were good, the Primary Contact Recreational Use will continue to be assessed as Not Supporting. *E. coli* bacteria data from the same two locations support the retention of the Escherichia Coli (E. Coli) and Fecal Coliform impairments for this AU.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2523	MassDEP	Water Quality	Shawsheen River	[approximately 1300 feet downstream/west of Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence]	42.697117	-71.143995
W2538	MassDEP	Water Quality	Shawsheen River	[approximately 1900 feet upstream/north of Central Street, Andover]	42.652195	-71.150971

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

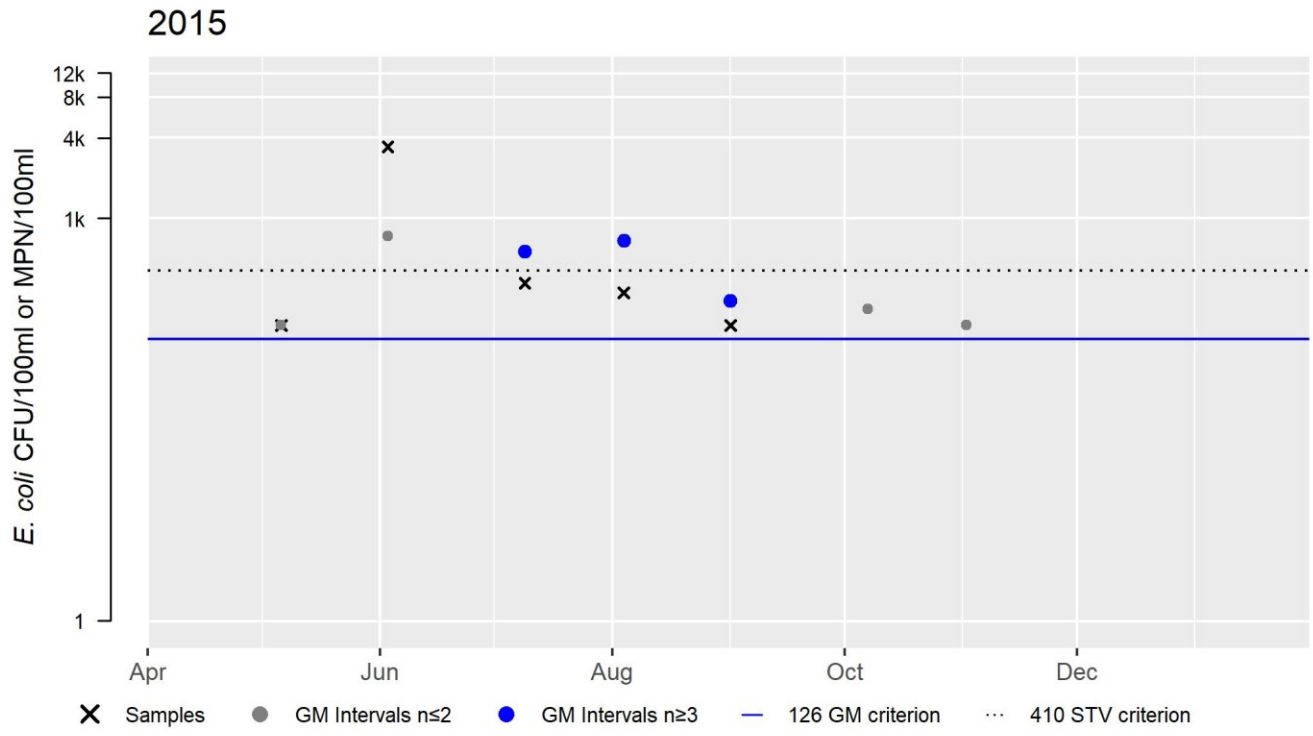
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result	Maximum Sample Result	Seasonal Geometric Mean
W2523	MassDEP	E. coli	05/06/15	09/01/15	5	160	3400	381
W2538	MassDEP	E. coli	05/06/15	09/01/15	5	95	2600	279

W2523 *E. coli* (90-day Interval), Primary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	381
#GMI	3
#GMI Ex	3
%GMI Ex	100
n>STV	1
%n>STV	20

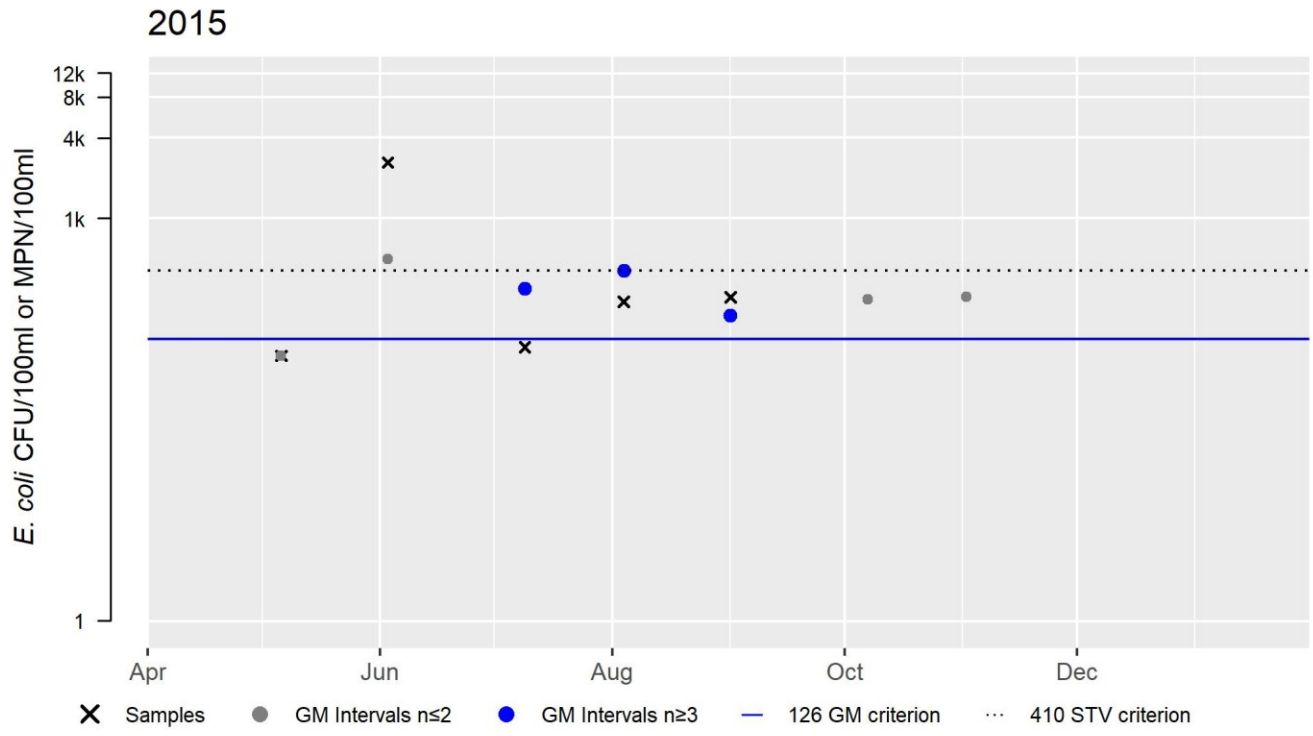
Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



W2538 *E. coli* (90-day Interval), Primary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	279
#GMI	3
#GMI Ex	3
%GMI Ex	100
n>STV	1
%n>STV	20

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



Secondary Contact Recreation

2022 Use Attainment	Alert
Fully Supporting	NO

2022 Use Attainment Summary

MassDEP field crews conducted water quality sampling during summer 2015 at two locations in this Shawsheen River AU (MA83-19): ~1900 ft upstream/north of Central Street, Andover (W2538) and ~1300 ft downstream/west of the Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence (W2523). There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded during five site visits to each location. Analysis of limited frequency *E. coli* data (n=5) collected during these summer site visits indicated that none of the intervals for the upstream station (W2538) had GMs >630 cfu/100mL, one sample exceeded the 1260 cfu/100mL STV, and the seasonal GM was 279 cfu/100mL. For the downstream location (W2523), 33% of intervals exceeded the GM criterion, one sample exceeded the STV, and the seasonal GM was 381 cfu/100mL.
E. coli bacteria data and aesthetics observations by DEP staff at two locations on this Shawsheen River AU (MA83-19) were indicative of good conditions, so the Secondary Contact Recreational Use is assessed as Fully Supporting.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2523	MassDEP	Water Quality	Shawsheen River	[approximately 1300 feet downstream/west of Route 495 crossing nearest the Massachusetts Avenue ramp to Route 495 southbound, Lawrence]	42.697117	-71.143995
W2538	MassDEP	Water Quality	Shawsheen River	[approximately 1900 feet upstream/north of Central Street, Andover]	42.652195	-71.150971

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

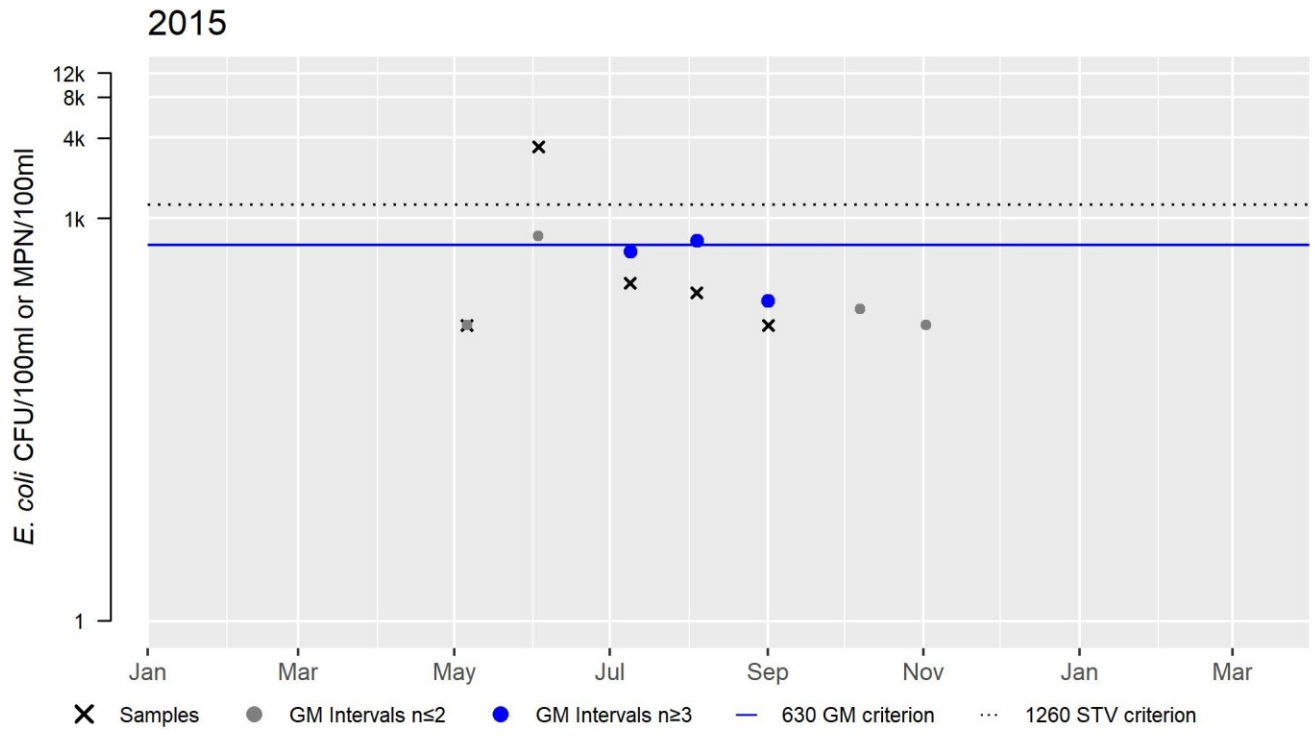
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result (CFU/100ml or MPN/100ml)	Maximum Sample Result (CFU/100ml or MPN/100ml)	Seasonal Geometric Mean (CFU/100ml or MPN/100ml)
W2523	MassDEP	E. coli	05/06/15	09/01/15	5	160	3400	381
W2538	MassDEP	E. coli	05/06/15	09/01/15	5	95	2600	279

W2523 *E. coli* (90-day Interval), Secondary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	381
#GMI	3
#GMI Ex	1
%GMI Ex	33
n>STV	1
%n>STV	20

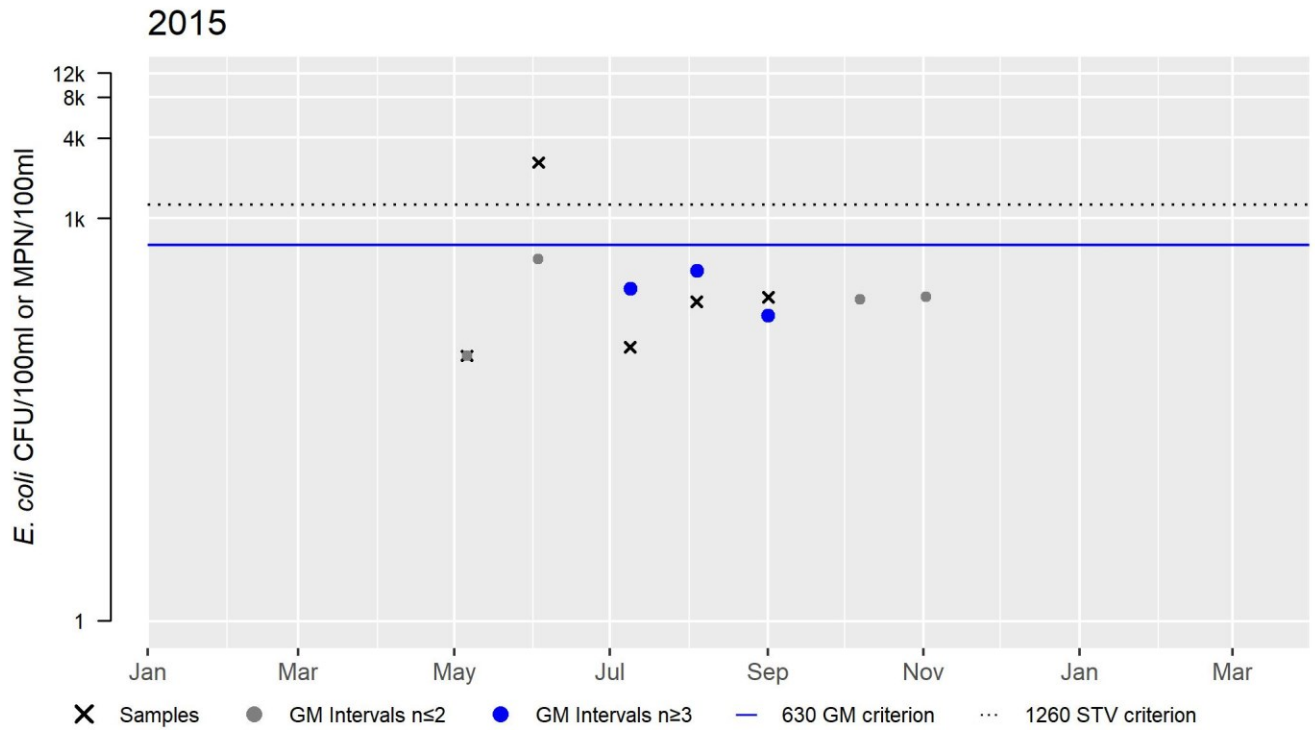
Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



W2538 *E. coli* (90-day Interval), Secondary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	279
#GMI	3
#GMI Ex	0
%GMI Ex	0
n>STV	1
%n>STV	20

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV

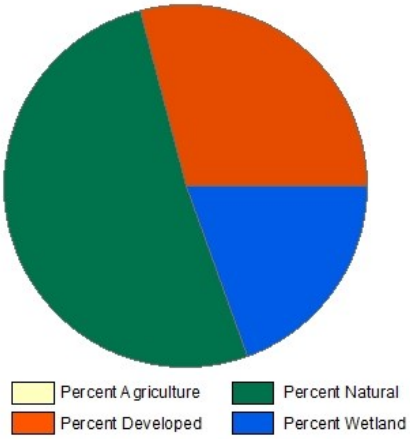


Spring Brook (MA83-14)

Location:	Headwaters, wetland northeast of Route 3 Billerica, to confluence with Shawsheen River, Bedford.
AU Type:	RIVER
AU Size:	2.6 MILES
Classification/Qualifier:	B

Spring Brook - MA83-14

Watershed Area: 2.31 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.31	2.31	0.52	0.52
Agriculture	0.1%	0.1%	0%	0%
Developed	29%	29%	12.3%	12.3%
Natural	51.5%	51.5%	44.5%	44.5%
Wetland	19.5%	19.5%	43.1%	43.1%
Impervious Cover	15%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
2	5	(Dewatering*)		Added
2	5	Escherichia Coli (E. Coli)		Added

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Dewatering*)	Baseflow Depletion from Groundwater Withdrawals (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Escherichia Coli (E. Coli)	Source Unknown (N)				X	

Recommendations

2022 Recommendations
ALU: Additional chloride data and continuous specific conductance data should be collected in Spring Brook (MA83-14) to track chloride trends (in the vicinity of DEP Station W2535). Given the regional trend of increasing chloride, the use of de-icing products containing chloride should be minimized by all parties (i.e., highways/roads, municipalities, businesses, residences) in the Spring Brook sub-watershed.

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary

MassDEP staff conducted fish (Sample ID 6356), benthic (Sample ID B0934), and water quality (Sample ID W2535) surveys in Spring Brook approximately 250 feet upstream of the mouth of the brook (and the confluence with the Shawsheen River) in Bedford during summer 2015. The 22 June fish sample (n=36) included several intolerant individuals (banded sunfish, swamp darter), with 44% of the entire sample comprised of intolerant/moderately tolerant macrohabitat generalists, a good indicator in this warmwater fishery. However, the 5 August benthic sample IBI score was only 29, indicating that conditions were severely degraded for a low gradient location. Field sheet comments stated "*Very low flow in stream. Sand and bottom exposed. Isolated pools a couple weeks ago with river going underground in cobble past probe, but underwater now*" (MassDEP Undated 8). A deployed probe recorded continuous DO data for 16 days in late June and early July. All 10 7DADMins were <5.0 mg/L and most of the daily minima were <4.0 mg/L with a minimum DO of 2.7 mg/L (note that these data were qualified and that the probe was actually deployed until the end of August but most data were censored due to low flow conditions (MassDEP Undated 8)). Continuous temperature data were measured over the same 16 days with a maximum of 25.1 °C (good for a WWF). Other water quality indicators are summarized as follows and were generally indicative of good conditions: pH was 7.1 S.U. (n=1), there was no indication of nutrient enrichment (seasonal TP average was 0.083 mg/L with n=4, maximum DO diel shift was 2.2 mg/L, maximum DO saturation was 82.0%, no observations of excessive filamentous algae), there were no exceedances among 2 aluminum samples (because dissolved Al data were compared to the total recoverable Al criteria, exceedances cannot be ruled out, however), and the maximum Total Ammonia Nitrogen was 0.072 mg/L. Among 4 chloride samples, none had concentrations greater than 230 mg/L (the criterion for chronic toxicity), but the maximum concentration was 230 mg/L and the average was 200 mg/L. The one specific conductance measurement was 1009 µs/cm (>994 µs/cm, the estimated chloride chronic criterion plus a 10% margin of error).

The Aquatic Life Use of Spring Brook (MA83-14) is assessed as Not Supporting, with a new impairment being added for Dewatering. Although dissolved oxygen data and analysis of the benthic macroinvertebrate community provided a picture of the poor condition of Spring Brook, it is the BPJ of MassDEP analysts that these were by-products of the low flow state observed during most of the summer, which was likely influenced by the location of the monitoring station in the downstream portion of the brook that is within a Zone II Wellhead Protection Area for the Town of Bedford.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
6356	MassDEP	Fish Community	Spring Brook	Approximately 250 ft US of mouth at confluence with Shawsheen River., Bedford	42.49406	-71.25598
B0934	MassDEP	Benthic	Spring Brook/	[approximately 75 meters upstream of mouth at confluence with Shawsheen River, Bedford, MA]	42.494062	-71.255983
W2535	MassDEP	Water Quality	Spring Brook	[approximately 250 feet upstream of mouth at confluence with Shawsheen River, Bedford]	42.494062	-71.255983

Biological Monitoring Information

Benthic Macroinvertebrate Data

MassDEP Benthic Macroinvertebrate Data (2011-2017). (MassDEP Undated 5)

[Index Biological Condition Class: E= Exceptional, S= Satisfactory, MD= Moderately Degraded, SD= Severely Degraded; High Gradient IBI Thresholds: E= 100-75, S= 74-55, MD= 54-35, SD= 34-0; Low Gradient IBI Thresholds: E= 100-81, S= 80-62, MD= 61-38, SD= 37-0; R qualifier = Rarefaction (100ct) <55]

Station Code	Collection Date	Collection Method	Index Type	Organism Count	Index Score	Index Biological Condition Class
B0934	08/05/15	RBP multihab	Statewide_Low_Gradient	341	29	SD

Fish Community Data and DELTS

Fish Community Data (2012-2019) Provided by MassDFG. (MassDFG 2020) (MassDEP Undated 3)

[Sample Type: TP= Total Pickup, SP= Selective Pickup, Method: BT=Boat Shocking, BP= Backpack Shocking, BG= Barge Shocking, SE= Seine, SL= Snorkel, NS= Not Stated, MT= Minnow Trap, GN= Gillnet, FY= Fyke Net, Gradient: H = High, L = Low; I/MT MG= Intolerant/Moderately Tolerant Macrohabitat Generalist]

[Species List: AE = American Eel, BB = Brown Bullhead, BS = Banded Sunfish, GS = Golden Shiner, P = Pumpkinseed, RP = Redfin Pickerel, SD = Swamp Darter, YB = Yellow Bullhead]

Sample ID	Sample Date	Method	Sample Type	Gradient	Total Taxa	Total Ind	Cold Ind %	Fluvial Taxa	Fluvial Ind %	Intol Ind %	I/MT MG Taxa	I/MT MG Ind %	Notables	CFR	Species List
6356	06/22/15	NS	TP		8	36	0%	0	0%	8%	4	44%	Yes	No	AE, BB, BS, GS, P, RP, SD, YB,

Physico-chemical Water Quality Information

DO, pH, Temperature

MassDEP Long-term Continuous Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[7DADMin= 7-Day Average of the Daily Minima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Day Count	7day Count	30day Count	DO Min (mg/L)	Min 7DADMin (mg/L)	Min 7DADA (mg/L)	Delta DO Max (mg/L)	Count CW 7DADMin <6.0	Count CW 1Day Min <5.0	Count WW Early Life Stages 7DADA <6.5	Count WW Early Life Stages 1Day Min <5.0	Count WW Other Life Stages 7DADMin <5.0	Count WW Other Life Stages 1Day Min <4.0	Count CW 30DADA <8.0	Count WW Other Life Stages 30DADA <6.0
W2535	06/26/15	07/11/15	16	10	0	2.7	3.7	4.2	2.2	10	14	10	14	10	8	0	0

MassDEP Discrete Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	DO Count	DO Min (mg/L)	DO Avg (mg/L)	Count CW <5.0	Count WW Early Life Stages <5.0	Count WW Other Life Stages <4.0
W2535	07/30/15	09/23/15	1	6.8	6.8	0	0	0

MassDEP Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; Max Daily Mean= Maximum 24-Hour Average, 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Index Count	7day Count	Max Daily Mean (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier1 Daily Mean >23.5	Count CWTier2 7DADA >21	Count CWTier2 Daily Mean >24.1	Count WW 7DADM >27.7	Count WW Daily Mean >28.3
W2535	06/26/15	07/11/15	16	10	23.0	25.1	23.7	21.5	10	0	3	0	0	0

24-hour Rolling Average Calculations for MassDEP Short- and Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Count Days Deployed	24hr Rolling Count	Max 24hr Avg Rolling Temp (°C)	Count CWTier1 24hr Avg Rolling >23.5 °C	Count CWTier2 24hr Avg Rolling >24.1 °C	Count WW 24hr Avg Rolling >28.3°C
W2535	06/25/15	07/11/15	16	740	23.0	0	0	0

MassDEP Discrete Temperature Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Temp Count	Index Count	Temp Max (°C)	Temp Avg (°C)	Count CW >20	Count CW >22	Count WW >28.3	Count WW >30.3
W2535	07/30/15	09/23/15	1	1	23.6	23.6	1	1	0	0

MassDEP Discrete pH Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	pH Count	pH Min (SU)	pH Max (SU)	pH Count <6.5 & >8.3	pH Count <6.0 & >8.8
W2535	07/30/15	09/23/15	1	7.1	7.1	0	0

Nutrients (Primary Producer Screening, Physico-chemical Screening)

MassDEP Nutrient Enrichment Indicator Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer seasonal total phosphorus data collected May-Sept]

Station Code	Data Year	Seasonal TP Count	Seasonal TP Min (mg/L)	Seasonal TP Max (mg/L)	Seasonal TP Avg (mg/L)	Delta DO Max (mg/L)	Delta DO Avg (mg/L)	DO Sat Max (%)	pH Max (SU)	Count Algal Obsv.	Dense/V. Dense Film/Fila. Algae
W2535	2015	4	0.036	0.140	0.083	2.2	1.1	82.0	7.1	4	0

Toxics and other pollutants (metals, ammonia, chloride, chlorine)

MassDEP Dissolved Aluminum Water Column Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Since only dissolved aluminum data were available, these data were compared to the default freshwater criteria for total recoverable aluminum (TRA), presented in Appendix E of MassDEP's 2022 CALM. As dissolved Al is a fraction of TRA, an exceedance count of 0 does not rule out violations of the TRA criteria. CMC= Criterion Maximum Concentration, CCC= Criterion Continuous Concentration, TU= Toxic Unit]

Station Code	Data Year	Dissolved Al Count	Al Min (mg/L)	Al Max (mg/L)	Al Avg (mg/L)	Al CMC TU Max	Al CCC TU Max	Al CMC TU >1	Al CCC TU >1
W2535	2015	3	0.051	0.071	0.060	0.2	0.3	0	0

MassDEP Total Ammonia Nitrogen (TAN) Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[TAN= NH3 + NH4+]

Station Code	Data Year	TAN Count	TAN Min (mg/L)	TAN Max (mg/L)	TAN Avg (mg/L)	Count TAN >Chronic	Count TAN >Acute
W2535	2015	4	0.040	0.072	0.051	0	0

MassDEP Chloride Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Chloride Count	Chloride Min (mg/L)	Chloride Max (mg/L)	Chloride Avg (mg/L)	Count Chloride >230	Count Chloride >860
W2535	2015	4	140	230	200	0	0

MassDEP Discrete Specific Conductance Data (2011-2018) Compared to Estimated Chloride Criteria. (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	SpCond Count	SpCond Min (µs/cm)	SpCond Max (µs/cm)	Count SpCond >904	Count SpCond >994	Count SpCond >3193	Count SpCond >3512	Consecutive sets >904	Consecutive sets >994
W2535	07/30/15	09/23/15	1	1009	1009	1	1	0	0	0	0

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No fish toxics sampling has been conducted in Spring Brook (MA83-14), so the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	Alert

Fully Supporting	NO

2022 Use Attainment Summary

MassDEP field crews conducted surveys of Spring Brook approximately 250 feet upstream of the mouth of the brook (and the confluence with the Shawsheen River) in Bedford (W2535) during summer 2015. On four site visits, there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded.
The Aesthetics Use of Spring Brook (MA83-14) is assessed as Fully Supporting based on the observations of MassDEP field sampling staff during summer 2015.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2535	MassDEP	Water Quality	Spring Brook	[approximately 250 feet upstream of mouth at confluence with Shawsheen River, Bedford]	42.494062	-71.255983

Aesthetic Observations

Aesthetics Summary Statements for MassDEP Stations (2011-2018) (MassDEP Undated 6)

Station Code	Waterbody	Data Year	Field Sheet Count	Aesthetics Summary Statement
W2535	Spring Brook	2015	4	MassDEP aesthetics observations for station W2535 on Spring Brook can be summarized as follows: there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DEP field sampling crews during summer 2015.

Observations of Filamentous/Film Algae at MassDEP Stations (2011-2018) (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Field Sheet Count	Field Sheet Count w/ Film & Filamentous Algae Observations	Dense/ Very Dense Film/ Filamentous Algae
W2535	2015	4	4	0

MassDEP Aesthetics Observations (2011-2018) (MassDEP Undated 8)

Station Code	Waterbody	Data Year	Parameter	Result	Result Count	Total Field Sheet Count
W2535	Spring Brook	2015	Color	Light Yellow/Tan	2	4
W2535	Spring Brook	2015	Color	None	1	4
W2535	Spring Brook	2015	Color	Reddish	1	4
W2535	Spring Brook	2015	Objectionable Deposits	No	4	4
W2535	Spring Brook	2015	Odor	None	4	4
W2535	Spring Brook	2015	Scum	No	3	4
W2535	Spring Brook	2015	Scum	Yes	1	4
W2535	Spring Brook	2015	Turbidity	None	3	4
W2535	Spring Brook	2015	Turbidity	Slightly Turbid	1	4

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary

MassDEP field crews collected *E. coli* bacteria data (n=4) in Spring Brook approximately 250 feet upstream of the mouth of the brook (and the confluence with the Shawsheen River) in Bedford (W2535) during summer 2015. Analysis of this limited frequency dataset indicated that 100% of intervals had GMs exceeding 126 cfu/100mL, two samples exceeded the 410 cfu/100mL STV, and that the seasonal GM was 532 cfu/100mL. During these site visits, there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded.
The Primary Contact Recreational Use of Spring Brook (MA83-14) is assessed as Not Supporting with a new impairment for Escherichia Coli (E. Coli).

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2535	MassDEP	Water Quality	Spring Brook	[approximately 250 feet upstream of mouth at confluence with Shawsheen River, Bedford]	42.494062	-71.255983

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

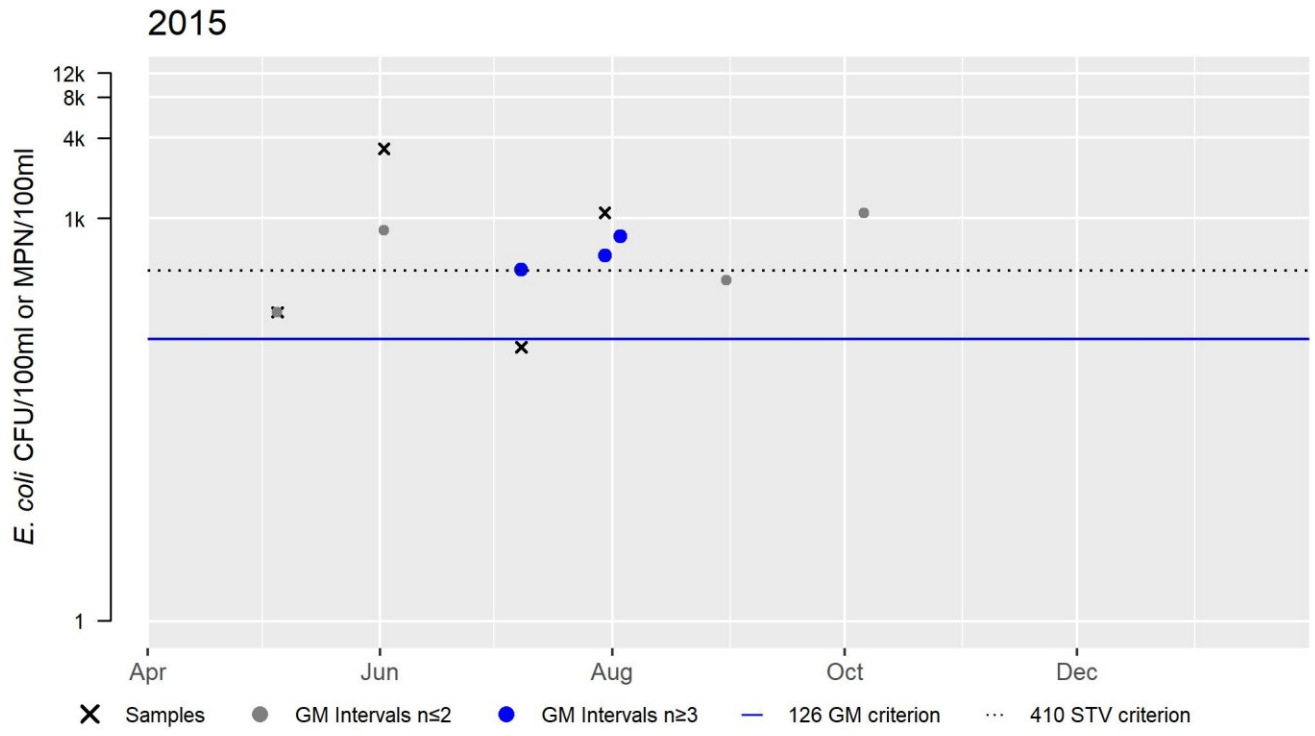
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result	Maximum Sample Result	Seasonal Geometric Mean
W2535	MassDEP	E. coli	05/05/15	07/30/15	4	110	3300	532

W2535 *E. coli* (90-day Interval), Primary Contact Recreational Use Season

Var	Res
Samples	4
SeasGM	532
#GMI	3
#GMI Ex	3
%GMI Ex	100
n>STV	2
%n>STV	50

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



Secondary Contact Recreation

2022 Use Attainment	**Alert**
Fully Supporting	NO
2022 Use Attainment Summary	
MassDEP field crews collected *E. coli* bacteria data (n=4) in Spring Brook approximately 250 feet upstream of the mouth of the brook (and the confluence with the Shawsheen River) in Bedford (W2535) during summer 2015. Analysis of this limited frequency dataset indicated that 33% of intervals had GMs exceeding 630 cfu/100mL, one sample exceeded the 1260 cfu/100mL STV, and that the seasonal GM was 532 cfu/100mL. During these site visits, there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded. The Secondary Contact Recreational Use of Spring Brook (MA83-14) is assessed as Fully Supporting.	

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2535	MassDEP	Water Quality	Spring Brook	[approximately 250 feet upstream of mouth at confluence with Shawsheen River, Bedford]	42.494062	-71.255983

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

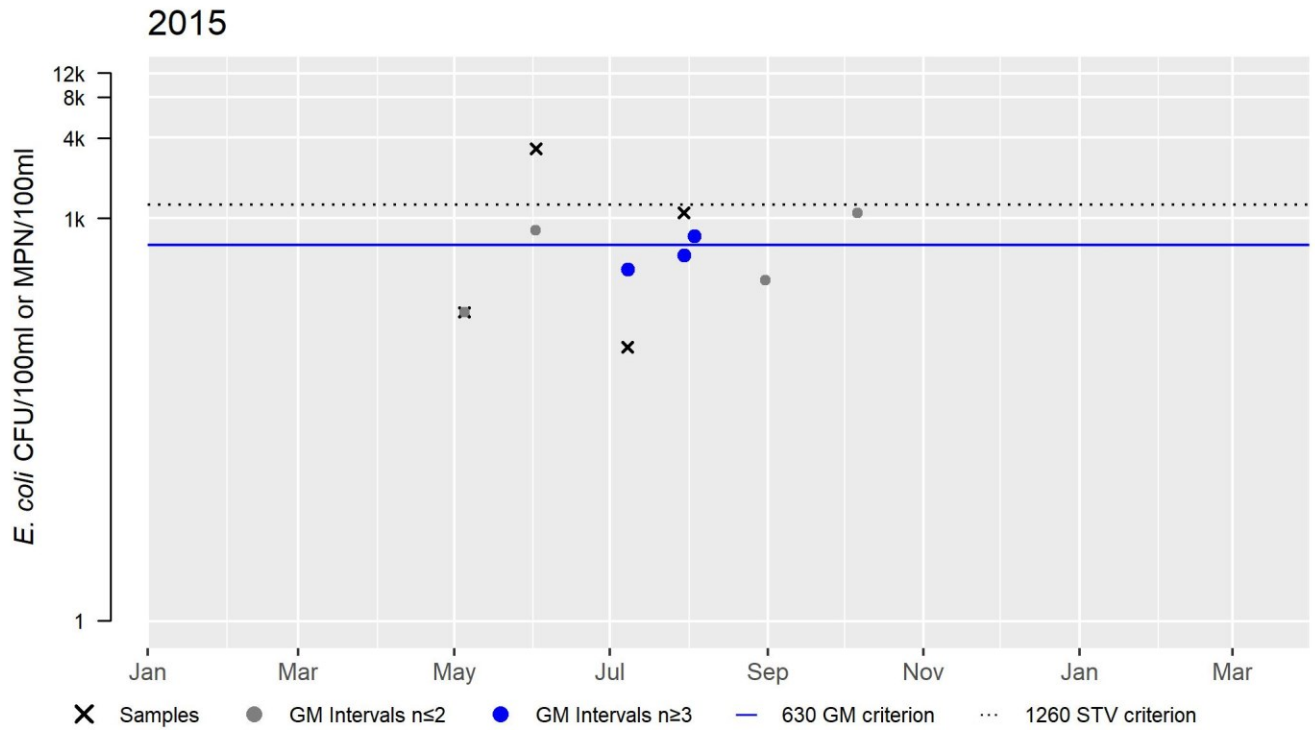
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result (CFU/100ml or MPN/100ml)	Maximum Sample Result (CFU/100ml or MPN/100ml)	Seasonal Geometric Mean (CFU/100ml or MPN/100ml)
W2535	MassDEP	E. coli	05/05/15	07/30/15	4	110	3300	532

W2535 *E. coli* (90-day Interval), Secondary Contact Recreational Use Season

Var	Res
Samples	4
SeasGM	532
#GMI	3
#GMI Ex	1
%GMI Ex	33
n>STV	1
%n>STV	25

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



Strong Water Brook (MA83-07)

Location:	Headwaters northeast of Long Pond, Tewksbury to confluence with Shawsheen River, Tewksbury.
AU Type:	RIVER
AU Size:	4.9 MILES
Classification/Qualifier:	B

No usable data were available for Strong Water Brook (MA83-07) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged
4a	4a	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Fecal Coliform	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Unnamed Tributary (MA83-15)

Location:	Unnamed tributary to Meadow Brook, also known as "Pinnacle Brook" - from small wetland east of Route 93, Andover, to confluence with Meadow Brook, Tewksbury (includes intermittent portion).
AU Type:	RIVER
AU Size:	2.1 MILES
Classification/Qualifier:	B

No usable data were available for Unnamed Tributary (MA83-15) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Dewatering*)		Unchanged
5	5	Chloride		Unchanged
5	5	Escherichia Coli (E. Coli)	2587	Unchanged
5	5	Fecal Coliform	2587	Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Dewatering*)	Baseflow Depletion from Groundwater Withdrawals (N)	X				
Chloride	Highway/Road/Bridge Runoff (Non-construction Related) (Y)	X				
Escherichia Coli (E. Coli)	Animal Feeding Operations (NPS) (N)				X	
Fecal Coliform	Animal Feeding Operations (NPS) (N)				X	

Unnamed Tributary (MA83-16)

Location:	Unnamed tributary to Shawsheen River also known as "Fosters Brook" - outlet Fosters Pond, Andover through River Street Pond to confluence with Shawsheen River at Lowell Junction Pond, Andover.
AU Type:	RIVER
AU Size:	1 MILES
Classification/Qualifier:	B

No usable data were available for Unnamed Tributary (MA83-16) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	3	None		Unchanged

Unnamed Tributary (MA83-20)

Location:	Unnamed intermittent tributary to the Shawsheen River, from Dascomb Road, Andover to confluence with Shawsheen River, Tewksbury.
AU Type:	RIVER
AU Size:	0.9 MILES
Classification/Qualifier:	B

No usable data were available for Unnamed Tributary (MA83-20) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Chloride		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Chloride	Highway/Road/Bridge Runoff (Non-construction Related) (Y)	X				

Unnamed Tributary (MA83-21)

Location:	Unnamed intermittent tributary to the Shawsheen River locally known as 'Sutton Brook', from headwaters north of Research Drive, Wilmington to confluence with the Shawsheen River, Tewksbury.
AU Type:	RIVER
AU Size:	3 MILES
Classification/Qualifier:	B

No usable data were available for Unnamed Tributary (MA83-21) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	4a	Escherichia Coli (E. Coli)	2587	Unchanged

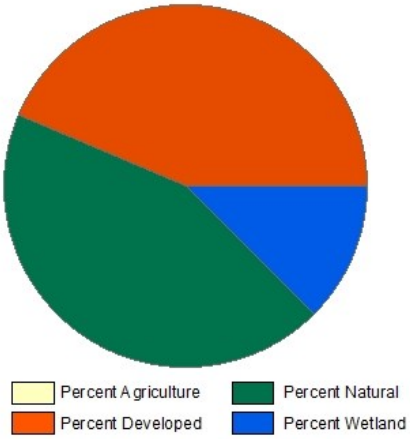
Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	

Vine Brook (MA83-06)

Location:	Headwaters (southeast of Granny Hill) near Grant Street, Lexington to confluence with Shawsheen River, Bedford (through former 2014 segment: Butterfield Pond MA83003).
AU Type:	RIVER
AU Size:	6.8 MILES
Classification/Qualifier:	B

Vine Brook - MA83-06

Watershed Area: 10.13 square miles including areas outside Massachusetts



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	10.13	6.07	2.49	1.39
Agriculture	0.2%	0%	0%	0%
Developed	43.6%	47.2%	32.8%	36.7%
Natural	43.7%	40.1%	35.2%	28.1%
Wetland	12.5%	12.7%	32%	35.2%
Impervious Cover	27.5%			

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	(Curly-leaf Pondweed*)		Added
5	5	Benthic Macroinvertebrates		Added
5	5	Chloride		Added
5	5	Dissolved Oxygen		Unchanged
5	5	Escherichia Coli (E. Coli)		Added
5	5	Turbidity		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
(Curly-leaf Pondweed*)	Introduction of Non-native Organisms (Accidental or Intentional) (Y)	X				
Benthic Macroinvertebrates	Source Unknown (N)	X				
Chloride	Highway/Road/Bridge Runoff (Non-construction Related) (Y)	X				
Chloride	Impervious Surface/Parking Lot Runoff (Y)	X				

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Dissolved Oxygen	Baseflow Depletion from Groundwater Withdrawals (N)	X				
Dissolved Oxygen	Source Unknown (N)	X				
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	
Escherichia Coli (E. Coli)	Source Unknown (N)				X	
Turbidity	Sand/Gravel/Rock Mining or Quarries (N)			X	X	X

Designated Use Attainment Decisions

Fish, other Aquatic Life and Wildlife

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary

MassDEP staff conducted benthic (B0921) and water quality (W2522) surveys in Vine Brook just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford during the summer of 2015. The July benthic sample IBI score was 18, indicating that conditions were severely degraded for a low gradient location. A probe was deployed to measure DO for 17 days in late June and early July. All 11 7DADMins were <5.0 and about half the daily minima were <4.0 mg/L. Continuous temperature data were measured over 82 days in the summer index period with a maximum of 26.5 °C (good for a WWF). Other water quality indicators were generally indicative of good conditions and are summarized as follows: pH ranged from 6.4-6.5 S.U. (n=3), there was no indication of nutrient enrichment (seasonal TP average was 0.039 mg/L with n=5, maximum DO diel shift was 2.7 mg/L, no observations of excessive filamentous algae), there were no exceedances among 2 clean metals samples or 2 aluminum samples (because dissolved Al data were compared to the total recoverable Al criteria, exceedances cannot be ruled out, however), and the maximum Total Ammonia Nitrogen was 0.088 mg/L. Among 5 chloride samples, 3 had concentrations greater than 230 mg/L (the criterion for chronic toxicity), with a maximum of 280 mg/L. Similarly, 2 of 3 specific conductance measurements were >994 µs/cm (the estimated chloride chronic criterion plus a 10% margin of error), with a maximum of 1265 µs/cm. Additionally, an infestation of curly-leaf pondweed (*Potamogeton crispus*) was previously observed in Vine Brook (but not yet reported on) by MassDEP staff conducting a field survey at the Terrace Hall Ave crossing in Burlington (W0357) in 2005.
The Aquatic Life Use of Vine Brook (MA83-06) is assessed as Not Supporting with the DO impairment being carried forward. New for this cycle, Benthic Macroinvertebrates, Curly-leaf Pondweed, and Chloride impairments are being added. Besides major roadways near the site, there are significant parking lots and residential areas in this subwatershed (27.5% impervious cover), and I-95 crosses the brook roughly mid-way through the AU. Given the regional trend of increasing chloride concentrations, the use of de-icing products containing chloride should be minimized by all parties (i.e., highways/roads, municipalities, businesses, residences) in the Vine Brook sub-watershed.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
B0921	MassDEP	Benthic	Vine Brook/	[just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford, MA]	42.501785	-71.240716

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2522	MassDEP	Water Quality	Vine Brook	[just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford]	42.501785	-71.240716

Biological Monitoring Information

Benthic Macroinvertebrate Data

MassDEP Benthic Macroinvertebrate Data (2011-2017). (MassDEP Undated 5)

[Index Biological Condition Class: E= Exceptional, S= Satisfactory, MD= Moderately Degraded, SD= Severely Degraded; High Gradient IBI Thresholds: E= 100-75, S= 74-55, MD= 54-35, SD= 34-0; Low Gradient IBI Thresholds: E= 100-81, S= 80-62, MD= 61-38, SD= 37-0; R qualifier = Rarefaction (100ct) <55]

Station Code	Collection Date	Collection Method	Index Type	Organism Count	Index Score	Index Biological Condition Class
B0921	07/23/15	RBP multihab	Statewide_Low_Gradient	331	18	SD

Non-native Aquatic Species Presence

MassDEP Non-Native Aquatic Invasive Species Records as of May 2021. (MassDEP Undated 1)

Summary Statement
MassDEP staff identified an infestation of the non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), in Vine Brook (MA83-06) in the vicinity of water quality station W0357 in 2005.

Physico-chemical Water Quality Information

DO, pH, Temperature

MassDEP Long-term Continuous Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[7DADMin= 7-Day Average of the Daily Minima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Day Count	7day Count	30day Count	DO Min (mg/L)	Min 7DADMin (mg/L)	Min 7DADA (mg/L)	Delta DO Max (mg/L)	Count CW 7DADMin <6.0	Count CW 1Day Min <5.0	Count WW Early Life Stages 7DADA <6.5	Count WW Early Life Stages 1Day Min <5.0	Count WW Other Life Stages 7DADMin <5.0	Count WW Other Life Stages 1Day Min <4.0	Count CW 30DADA <8.0	Count WW Other Life Stages 30DADA <6.0
W2522	06/26/15	07/12/15	17	11	0	3.5	3.8	4.7	2.7	11	17	11	17	11	8	0	0

MassDEP Discrete Dissolved Oxygen Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	DO Count	DO Min (mg/L)	DO Avg (mg/L)	Count CW <5.0	Count WW Early Life Stages <5.0	Count WW Other Life Stages <4.0
W2522	07/30/15	09/23/15	3	0.4	0.7	3	3	3

MassDEP Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; Max Daily Mean= Maximum 24-Hour Average, 7DADM= 7-Day Average of the Daily Maxima, 7DADA= 7-Day Average of the Daily Average, CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Index Count	7day Count	Max Daily Mean (°C)	Max Temp (°C)	Max 7DADM (°C)	Max 7DADA (°C)	Count CWTier1 7DADM >20	Count CWTier1 Daily Mean >23.5	Count CWTier2 7DADA >21	Count CWTier2 Daily Mean >24.1	Count WW 7DADM >27.7	Count WW Daily Mean >28.3
W2522	06/26/15	09/15/15	82	79	24.7	26.5	24.7	23.6	67	9	45	6	0	0

24-hour Rolling Average Calculations for MassDEP Short- and Long-term Continuous Temperature Data (Summer Index 2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater; NOTE: In the case of more than one row of data in the same year for a site, different types of temperature probes were deployed.]

Station Code	Start Date	End Date	Count Days Deployed	24hr Rolling Count	Max 24hr Avg Rolling Temp (°C)	Count CWTier1 24hr Avg Rolling >23.5 °C	Count CWTier2 24hr Avg Rolling >24.1 °C	Count WW 24hr Avg Rolling >28.3°C
W2522	06/25/15	09/15/15	82	3909	25.0	448	222	0

MassDEP Discrete Temperature Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer Index is June 1 – Sept 15; CW= Coldwater, WW= Warmwater]

Station Code	Start Date	End Date	Temp Count	Index Count	Temp Max (°C)	Temp Avg (°C)	Count CW >20	Count CW >22	Count WW >28.3	Count WW >30.3
W2522	07/30/15	09/23/15	3	2	22.3	20.4	2	1	0	0

MassDEP Discrete pH Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	pH Count	pH Min (SU)	pH Max (SU)	pH Count <6.5 & >8.3	pH Count <6.0 & >8.8
W2522	07/30/15	09/23/15	3	6.4	6.5	1	0

Nutrients (Primary Producer Screening, Physico-chemical Screening)

MassDEP Nutrient Enrichment Indicator Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Summer seasonal total phosphorus data collected May-Sept]

Station Code	Data Year	Seasonal TP Count	Seasonal TP Min (mg/L)	Seasonal TP Max (mg/L)	Seasonal TP Avg (mg/L)	Delta DO Max (mg/L)	Delta DO Avg (mg/L)	DO Sat Max (%)	pH Max (SU)	Count Algal Obsv.	Dense/V. Dense Film/Fila. Algae
W2522	2015	5	0.015	0.061	0.039	2.7	1.5	9.7	6.5	3	0

Toxics and other pollutants (metals, ammonia, chloride, chlorine)

MassDEP Clean Metals Water Column Data (2011-2018), Acute Criteria Violations. (MassDEP Undated 8) (MassDEP Undated 6)

[CMC= Criterion Maximum Concentration, TU= Toxic Unit]

Station Code	Data Year	Metals Count	As CMC TU >1	Cd CMC TU >1	Cr III CMC TU >1	Cu CMC TU >1	Pb CMC TU >1	Ni CMC TU >1	Ag CMC TU >1	Zn CMC TU >1
W2522	2015	2	0	0	0	0	0	0	0	0

MassDEP Clean Metals Water Column Data (2011-2018), Chronic Criteria Violations. (MassDEP Undated 8) (MassDEP Undated 6)

[CCC= Criterion Continuous Concentration, TU= Toxic Unit]

Station Code	Data Year	Metals Count	As CCC TU >1	Cd CCC TU >1	Cr III CCC TU >1	Cu CCC TU >1	Pb CCC TU >1	Ni CCC TU >1	Se CCC TU >1	Zn CCC TU >1
W2522	2015	2	0	0	0	0	0	0	0	0

MassDEP Dissolved Aluminum Water Column Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[Since only dissolved aluminum data were available, these data were compared to the default freshwater criteria for total recoverable aluminum (TRA), presented in Appendix E of MassDEP's 2022 CALM. As dissolved Al is a fraction of TRA, an exceedance count of 0 does not rule out violations of the TRA criteria. CMC= Criterion Maximum Concentration, CCC= Criterion Continuous Concentration, TU= Toxic Unit]

Station Code	Data Year	Dissolved Al Count	Al Min (mg/L)	Al Max (mg/L)	Al Avg (mg/L)	Al CMC TU Max	Al CCC TU Max	Al CMC TU >1	Al CCC TU >1
W2522	2015	2	0.051	0.051	0.051	0.1	0.2	0	0

MassDEP Total Ammonia Nitrogen (TAN) Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

[TAN= NH3 + NH4+]

Station Code	Data Year	TAN Count	TAN Min (mg/L)	TAN Max (mg/L)	TAN Avg (mg/L)	Count TAN >Chronic	Count TAN >Acute
W2522	2015	5	0.040	0.088	0.054	0	0

MassDEP Chloride Data (2011-2018). (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Chloride Count	Chloride Min (mg/L)	Chloride Max (mg/L)	Chloride Avg (mg/L)	Count Chloride >230	Count Chloride >860
W2522	2015	5	160	280	226	3	0

MassDEP Discrete Specific Conductance Data (2011-2018) Compared to Estimated Chloride Criteria. (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Start Date	End Date	SpCond Count	SpCond Min (µs/cm)	SpCond Max (µs/cm)	Count SpCond >904	Count SpCond >994	Count SpCond >3193	Count SpCond >3512	Consecutive sets >904	Consecutive sets >994
W2522	07/30/15	09/23/15	3	736	1265	2	2	0	0	0	0

Fish Consumption

2022 Use Attainment	Alert
Not Assessed	NO
2022 Use Attainment Summary	
No fish toxics sampling has been conducted in Vine Brook (MA83-06) so the Fish Consumption Use is Not Assessed.	

Aesthetic

2022 Use Attainment	Alert
Not Supporting	NO
2022 Use Attainment Summary	
MassDEP field crews conducted surveys in Vine Brook just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford (W2522) on five occasions during summer 2015. There were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded. According to information compiled in the 2016 reporting cycle, MassDEP sampling in 1995 found issues with turbidity in Butterfield Pond (in the upstream third of the AU) due to adjacent sand and gravel operations (MassDEP Undated 7). Since recent sampling was not conducted in that area of the brook, there is insufficient information to delist this impairment so Turbidity will be carried forward. The Aesthetics Use for Vine Brook (MA83-06) is therefore assessed as Not Supporting.	

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2522	MassDEP	Water Quality	Vine Brook	[just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford]	42.501785	-71.240716

Aesthetic Observations

Aesthetics Summary Statements for MassDEP Stations (2011-2018) (MassDEP Undated 6)

Station Code	Waterbody	Data Year	Field Sheet Count	Aesthetics Summary Statement
W2522	Vine Brook	2015	5	MassDEP aesthetics observations for station W2522/MAP2-682 on Vine Brook can be summarized as follows: there were generally no noted objectionable conditions (odors, deposits, growths, or turbidity) recorded by DEP field sampling crews during summer 2015.

Observations of Filamentous/Film Algae at MassDEP Stations (2011-2018) (MassDEP Undated 8) (MassDEP Undated 6)

Station Code	Data Year	Field Sheet Count	Field Sheet Count w/ Film & Filamentous Algae Observations	Dense/ Very Dense Film/ Filamentous Algae
W2522	2015	5	3	0

MassDEP Aesthetics Observations (2011-2018) (MassDEP Undated 8)

Station Code	Waterbody	Data Year	Parameter	Result	Result Count	Total Field Sheet Count
W2522	Vine Brook	2015	Color	Light Yellow/Tan	5	5
W2522	Vine Brook	2015	Objectionable Deposits	No	2	5
W2522	Vine Brook	2015	Objectionable Deposits	Yes	3	5

Station Code	Waterbody	Data Year	Parameter	Result	Result Count	Total Field Sheet Count
W2522	Vine Brook	2015	Odor	None	5	5
W2522	Vine Brook	2015	Scum	No	5	5
W2522	Vine Brook	2015	Turbidity	None	2	5
W2522	Vine Brook	2015	Turbidity	Slightly Turbid	3	5

Primary Contact Recreation

2022 Use Attainment	Alert
Not Supporting	NO

2022 Use Attainment Summary

MassDEP staff collected *E. coli* bacteria samples in Vine Brook just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford (W2522) on five occasions during summer 2015. Analysis of this limited frequency dataset indicated that 80% of intervals had GMs exceeding 126 cfu/100mL, one sample exceeded the 410 cfu/100mL STV, and that the seasonal GM was 159 cfu/100mL. During these site visits, field crews generally did not note any objectionable conditions (odors, deposits, growths, or turbidity).

The Primary Contact Recreational Use for Vine Brook (MA83-06) is assessed as Not Supporting with a new impairment for Escherichia Coli (E. Coli). The Turbidity impairment will also be carried forward. According to information compiled in the 2016 reporting cycle, MassDEP sampling in 1995 found issues with turbidity in Butterfield Pond (in the upstream third of the AU) due to adjacent sand and gravel operations (MassDEP Undated 7); since recent sampling was not conducted nearby, there is insufficient information to delist this impairment.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2522	MassDEP	Water Quality	Vine Brook	[just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford]	42.501785	-71.240716

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

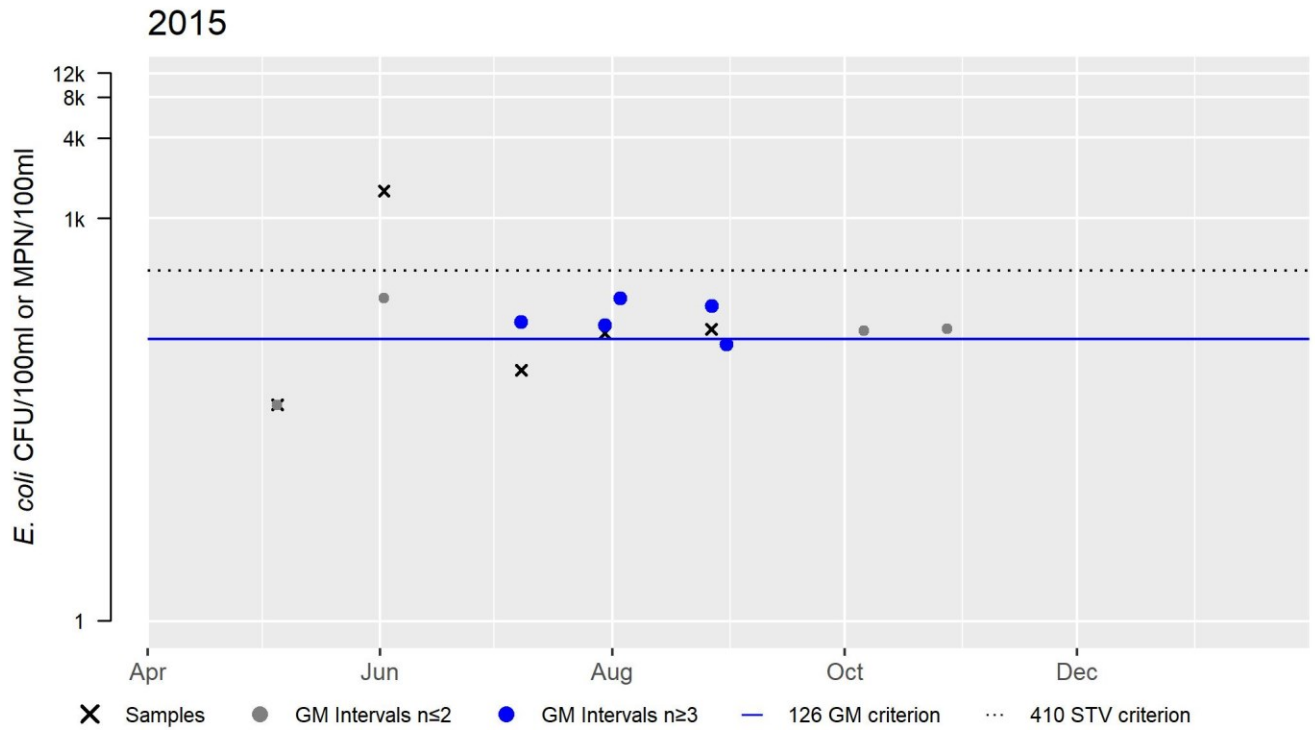
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result	Maximum Sample Result	Seasonal Geometric Mean
W2522	MassDEP	E. coli	05/05/15	08/27/15	5	41	1600	159

W2522 *E. coli* (90-day Interval), Primary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	159
#GMI	5
#GMI Ex	4
%GMI Ex	80
n>STV	1
%n>STV	20

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



Secondary Contact Recreation

2022 Use Attainment	**Alert**
Not Supporting	NO
2022 Use Attainment Summary	

MassDEP staff collected *E. coli* bacteria samples in Vine Brook just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford (W2522) on five occasions during summer 2015. Analysis of this limited frequency dataset indicated that no intervals had GMs exceeding 630 cfu/100mL, but one sample exceeded the 1260 cfu/100mL STV. During these site visits, field crews generally did not note any objectionable conditions (odors, deposits, growths, or turbidity).
Although bacteria data were generally indicative of good conditions, the Secondary Contact Recreational Use for Vine Brook (MA83-06) will continue to be assessed as Not Supporting with the Turbidity impairment being carried forward. According to information compiled in the 2016 reporting cycle, MassDEP sampling in 1995 found issues with turbidity in Butterfield Pond (in the upstream third of the AU) due to adjacent sand and gravel operations (MassDEP Undated 7); since recent sampling was not conducted in that area of the brook, there is insufficient information to delist this impairment.

Monitoring Stations

Station Code	Organization	Type	Water Body	Station Description	Latitude	Longitude
W2522	MassDEP	Water Quality	Vine Brook	[just downstream/west of the Route 62 eastbound ramp to Route 3 northbound, Bedford]	42.501785	-71.240716

Bacteria Data

Bacteria Data Collected by MassDEP and External Data Providers 2011-2020 (90-day Interval Analysis) (MassDEP Undated 8) (MassDEP Undated 6)

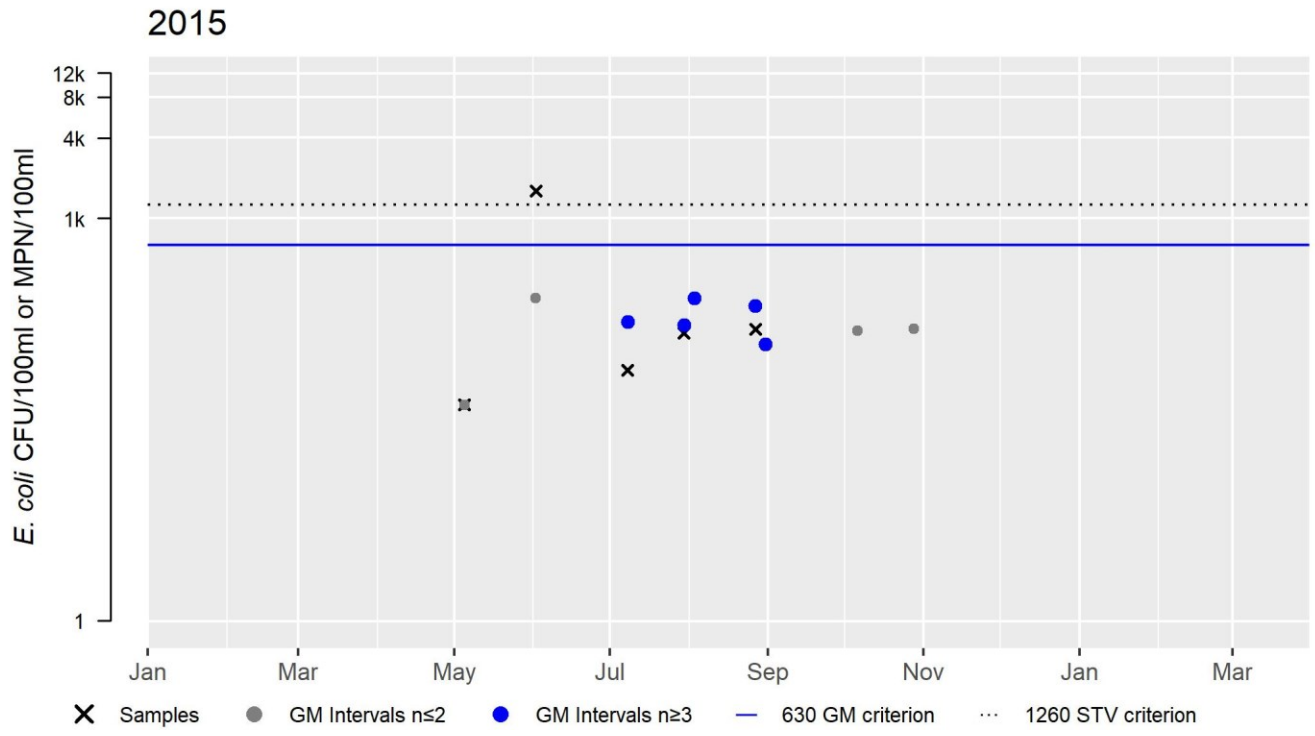
[Result units are CFU/100ml or MPN/100ml]

Station Code	Organization	Indicator	Start Date	End Date	Sample Count	Minimum Sample Result (CFU/100ml or MPN/100ml)	Maximum Sample Result (CFU/100ml or MPN/100ml)	Seasonal Geometric Mean (CFU/100ml or MPN/100ml)
W2522	MassDEP	E. coli	05/05/15	08/27/15	5	41	1600	159

W2522 *E. coli* (90-day Interval), Secondary Contact Recreational Use Season

Var	Res
Samples	5
SeasGM	159
#GMI	5
#GMI Ex	0
%GMI Ex	0
n>STV	1
%n>STV	20

Abbreviations: Samples = #samples; SeasGM = Seasonal Geometric Mean (GM); #GMI = number GM Intervals; #GMI Ex = number GMI Exeedances; %GMI Ex = percent GMI Exeedances; n>STV = #samples>Statistical Threshold Value (STV); %n>STV = percent samples>STV



Webb Brook (MA83-22)

Location:	Headwaters north of Webb Brook Road, Billerica to confluence with Shawsheen River, Billerica.
AU Type:	RIVER
AU Size:	1.6 MILES
Classification/Qualifier:	B

No usable data were available for Webb Brook (MA83-22) for the 2022 Integrated Reporting cycle, therefore its category, use attainments, impairments, associated actions, and sources remain unchanged from the previous cycle.

2018/20 AU Category	2022 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Escherichia Coli (E. Coli)		Unchanged

Impairment	Source (Confirmed Y/N)	Fish, other Aquatic Life and Wildlife	Fish Consumption	Aesthetic	Primary Contact Recreation	Secondary Contact Recreation
Escherichia Coli (E. Coli)	Discharges from Municipal Separate Storm Sewer Systems (MS4) (N)				X	X

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