Appendix 20
North Shore Coastal Drainage Area
Assessment and Listing Decision Summary

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

CN: 505.1

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Prepared by:

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

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Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Beverly Harbor	MA93-20	4a	5	Estuarine Bioassessments		Added
Cat Brook	MA93-29	5	5	Temperature		Added
Cedar Pond	MA93013	4c	3	(Non-Native Aquatic Plants*)		Removed
Chebacco Lake	MA93014	4a	4a	(Curly-leaf Pondweed*)		Added
Chebacco Lake	MA93014	4a	4a	(Fanwort*)		Added
Crane Brook	MA93-02	4a	5	Benthic Macroinvertebrates		Added
Crane River	MA93-38	5	5	(Fish Passage Barrier*)		Added
Dykes Pond	MA93020	--	4c	(Fish Passage Barrier*)		Added
Edgewater Office Park Pond	MA93094	4c	4c	(Fanwort*)		Added
Edgewater Office Park Pond	MA93094	4c	4c	(Non-Native Aquatic Plants*)		Removed
Edgewater Office Park Pond	MA93094	4c	4c	(Water Chestnut*)		Added
First Pond	MA93081	4c	4c	(Fanwort*)		Added
First Pond	MA93081	4c	4c	(Non-Native Aquatic Plants*)		Removed
Flax Pond	MA93023	5	5	(Curly-leaf Pondweed*)		Added
Griswold Pond	MA93029	4c	4c	(Fanwort*)		Added
Haskell Pond	MA93031	3	4c	(Fish Passage Barrier*)		Added
Hawkes Brook	MA93-33	4a	5	Benthic Macroinvertebrates		Added
Hawkes Brook	MA93-33	4a	5	Dissolved Oxygen		Added
Hawkes Brook	MA93-33	4a	5	Trash		Changed
Lake Quannapowitt	MA93060	5	5	(Curly-leaf Pondweed*)		Added
Lake Quannapowitt	MA93060	5	5	(Fish Passage Barrier*)		Added
Lake Quannapowitt	MA93060	5	5	(Non-Native Aquatic Plants*)		Removed
Marblehead Harbor	MA93-22	4a	5	Estuarine Bioassessments		Added
Mill River	MA93-31	5	5	Total Suspended Solids (TSS)		Removed
Proctor Brook	MA93-39	5	5	Trash		Changed
Proctor Brook	MA93-40	5	5	Trash		Changed
Salem Sound	MA93-56	4a	5	Estuarine Bioassessments		Added
Saugus River	MA93-34	5	5	Dissolved Oxygen		Added
Saugus River	MA93-34	5	5	Nitrogen, Total		Removed
Saugus River	MA93-35	4a	5	Benthic Macroinvertebrates		Added
Saugus River	MA93-35	4a	5	(Fish Passage Barrier*)		Added
Sluice Pond	MA93071	4c	5	Dissolved Oxygen		Added
Spring Pond	MA93072	4c	4c	(Fanwort*)		Added
Swains Pond	MA93095	4c	4c	(Fanwort*)		Added
Swains Pond	MA93095	4c	4c	(Non-Native Aquatic Plants*)		Removed
Unnamed Tributary	MA93-51	5	5	Trash		Changed

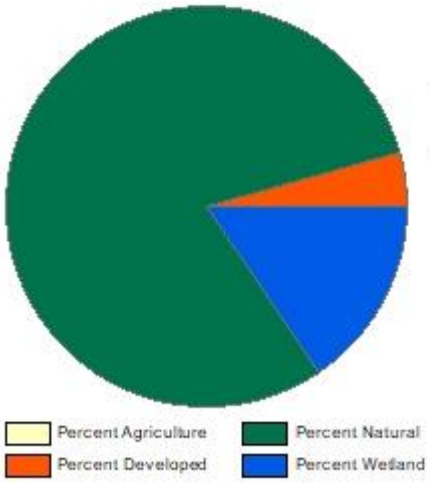
Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Unnamed Tributary	MA93-58	5	5	Benthic Macroinvertebrates		Added
Unnamed Tributary	MA93-59	5	5	Benthic Macroinvertebrates		Added
Unnamed Tributary	MA93-65	--	4c	(Fish Passage Barrier*)		Added
Walden Pond	MA93084	3	5	Mercury in Fish Tissue		Added
Walker Creek	MA93-61	--	4c	(Fish Passage Barrier*)		Added

Alewife Brook (MA93-26)

Location:	Headwaters, perennial portion just north of B&M Railroad, Rockport to mouth at inlet Babson Reservoir, Gloucester.
AU Type:	RIVER
AU Size:	1 MILES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Alewife Brook - MA93-26

Watershed Area: 0.93 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.93	0.93	0.34	0.34
Agriculture	0%	0%	0%	0%
Developed	4.4%	4.4%	5.5%	5.5%
Natural	80.1%	80.1%	67.7%	67.7%
Wetland	15.6%	15.6%	26.8%	26.8%
Impervious Cover	3.7%			

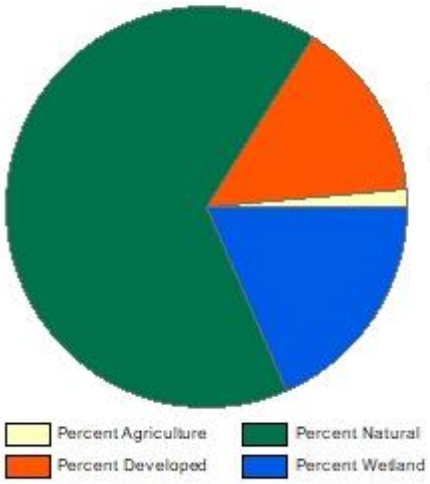
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Alewife Brook AU (MA93-26) is Not Assessed.

Alewife Brook (MA93-45)

Location:	Headwaters, outlet Chebacco Lake, Essex to Landing Road, Essex.
AU Type:	RIVER
AU Size:	1.4 MILES
Classification/Qualifier:	B

Alewife Brook - MA93-45

Watershed Area: 6.84 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.84	6.48	2.43	2.27
Agriculture	1.5%	1.6%	0.6%	0.7%
Developed	14.6%	14.8%	15.6%	16.2%
Natural	65.4%	64.9%	54.2%	52.9%
Wetland	18.5%	18.7%	29.5%	30.2%
Impervious Cover	5.4%			

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

According to DMF biologists there is a barrier to fish passage in the AU downstream of Alewife Brook MA93-45 (Alewife Brook MA93-46) in the vicinity of the Apple Street crossing, Essex where there is a change in elevation. Though passage is slightly limited (passage score 2 out of 10; 10 = no possible passage), fish do have some ability to pass the barrier and there is a good-sized existing population of river herring and American eel (population score 6 out of 10, where 0 is no run present). Water quality of Alewife Brook was surveyed by MassDEP in 2007 at station W1546 [downstream of Apple Street, Essex]. Multiprobes were deployed to record DO and temperature for one 4-day period, two 5-day periods, and one 2-day period in the months of June, July, August and September. The means of the DO daily minima were all greater than 5.25 mg/L. The DO diel shifts were all less than 2.7 mg/L and the maximum saturation was 94%. The maximum temperature was 23.6°C. Discrete attended probes measurements and grab samples were also collected at station W1546 during the sampling season. Dissolved oxygen readings were all greater than 6.0 mg/L and there were no instances of supersaturation. Temperature measurements ranged from 11.7°C to 21.5°C. There were no ammonia violations and pH ranged from 6.2 to 6.9 SU. Total phosphorus average/maximum concentrations were relatively low at 0.018/0.026 mg/L, respectively (n=5) and there were no observations of excessive filamentous algae. A benthic sample (B0619) was collected approximately 300 meters downstream/east from Apple Street, Essex on 6/27/2007. This station served as the reference location for the 2007 North Coastal benthic survey so the RBPIII status was considered “Not Impaired.”

The Aquatic Life Use for this Alewife Brook AU (MA93-45) is assessed as Fully Supporting based primarily on the benthic macroinvertebrate community (station B0619 served as the reference for the 2007 North Coastal benthic survey) and water quality data indicative of good conditions. An Alert for low DO was previously identified in the 2002 WQAR because DO reached concentrations as low as 1.7 mg/L during the 2002 water quality survey (although it was conducted during drought conditions). The Alert is being removed because the means of the daily DO minima were all greater than 5.25 mg/L during four probe deployments conducted during summer 2007. The prior Alert for elevated total phosphorus is also being removed since the 2007 maximum concentration of 0.026 mg/L is much lower than the 2002 maximum of 0.10 mg/L. The Alerts for a depauperate fish community and the poor utilization of the brook by smelt for spawning despite good habitat conditions are being retained since there is no new information available for those issues.

Alewife Brook (MA93-46)

Location:	From Landing Road, Essex to mouth at confluence with Essex River, Essex.
AU Type:	ESTUARY
AU Size:	0.01 SQUARE MILES
Classification/Qualifier:	SA: ORW, SFO (Tributary)

Fish, other Aquatic Life and Wildlife Use: Not Assessed
According to DMF biologists there is a barrier to fish passage in this downstream portion of Alewife Brook (MA93-46) in the vicinity of the Apple Street crossing, Essex where there is a change in elevation. DMF comments suggest that vegetation and beaver dams may present a challenge for fish passage. However, passage is only slightly limited (passage score 2 out of 10; 10 = no possible passage) and fish do have some ability to pass the barrier. There is a good-sized existing population of river herring and American eel (population score 6 out of 10, where 0 is no run present). As noted in the 2002 North Coastal WQAR, the NPDES permit MA0029564 for the Essex Housing Authority is no longer in effect because the facility was tied into the Essex sewer system in December 2005. Since there are no recent biotic or chemistry data available, the Aquatic Life Use for this Alewife Brook AU (MA93-46) is Not Assessed. The prior Alert for low DO in the upstream AU (MA93-45) is being removed because DO data collected in that portion of the river met standards (mean daily DO minima $\geq$ 5.25mg/L during four probe deployments conducted during summer 2007 at station W1546) and the Alert was removed for that upstream Alewife Brook AU as well. The Alert for chronic toxicity of the Essex Housing Authority effluent is also being removed since the facility tied into the sewer system in 2005.

Annisquam River (MA93-12)

Location:	The waters from the Gloucester Harbor side of the Route 127 bridge, Gloucester to Ipswich Bay at an imaginary line drawn from Bald Rocks to Wigwam Point, Gloucester.
AU Type:	ESTUARY
AU Size:	0.82 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Water from the Annisquam River at the Cape Ann Marina Dock has been collected for use as dilution water in the city of Gloucester Water Pollution Control Facility's (WPCF) whole effluent toxicity tests. Between June 2006 and December 2018, survival of *M. bahia* exposed (48 hours) to the river water ranged from 95 to 100% (n=51) and survival of *M. beryllina* during the same time period and length of exposure to the river water ranged from 90 to 100% (n=51). Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 1.94% of the Annisquam River was covered in eelgrass. Between 1995 and 2001, a 19% loss in the size of the eelgrass bed was documented. In 2007 the eelgrass bed rebounded, increasing in size by 21% since the 1995 survey. Though there was a net 4.58% increase in the size of the eelgrass bed between 1995 and 2017, there was a 13.9% decrease since size peaked in 2007. The Aquatic Life Use for the Annisquam River (MA93-12) is assessed as Fully Supporting based on good survival rates of test organisms exposed to ambient water, as well as documentation of a net increase in eelgrass bed coverage from 1995 to 2017. However, an alert is being issued because the size of the eelgrass bed decreased in the past few surveys.

Babson Reservoir (MA93001)

Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	40 ACRES
Classification/Qualifier:	A: PWS, ORW

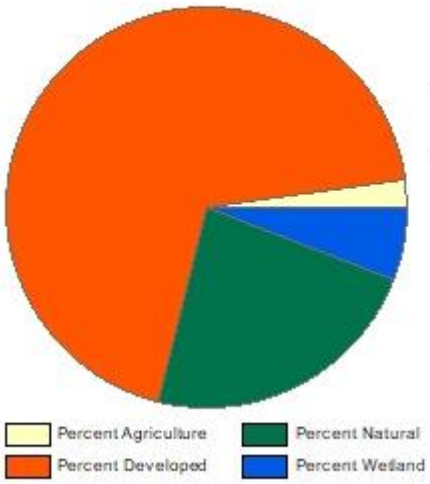
Fish, other Aquatic Life and Wildlife Use: Not Assessed
According to DMF biologists there are significant barriers to fish passage at the Babson Reservoir Dam (passage score 10, population score 0 out of 10) and at the downstream Mill Pond Dam (passage score 10, population score 0). Target species for passage would be river herring and American eel but potential is limited due to the 35-foot drop from the Babson Reservoir Dam spillway and due to saltwater intrusion in Mill Pond (MA93-60). An impairment decision is not being made at this time since there are no documented diadromous fish runs. Without any other data/information, the Aquatic Life Use for Babson Reservoir is Not Assessed.

Bass River (MA93-07)

Location:	Headwaters, perennial portion west of Wenham Lake, Beverly to the outlet of "lower Shoe Pond" north of Route 62, Beverly (through former 2006 segment: Shoe Pond MA93068) (portions culverted).
AU Type:	RIVER
AU Size:	2.1 MILES
Classification/Qualifier:	B

Bass River - MA93-07

Watershed Area: 3.09 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.09	3.09	0.67	0.67
Agriculture	2.2%	2.2%	1.9%	1.9%
Developed	68.9%	68.9%	53.1%	53.1%
Natural	23%	23%	30.6%	30.6%
Wetland	5.9%	5.9%	14.3%	14.3%
Impervious Cover	32.4%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
According to DMF biologists, there are three significant barriers to passage of river herring and American eel on the Bass River (MA93-07). From upstream to downstream, the Shoe Pond Dam permits no passage (passage score 10), the Dam above Elliot Street also prevents passage (passage score 10), and the Elliot Street culvert acts as a severe impediment to diadromous fish passage (passage score 8). Of note, the population score was 0 (no run present) for all three structures. There are no additional data for this AU. The Aquatic Life Use for this Bass River AU (MA93-07) will continue to be assessed as Not Supporting due to significant barriers to fish passage.

Bass River (MA93-08)

Location:	From outlet of "lower Shoe Pond" north of Route 62, Beverly to mouth at confluence with Danvers River and Beverly Harbor, Beverley.
AU Type:	ESTUARY
AU Size:	0.12 SQUARE MILES
Classification/Qualifier:	SA: SFO

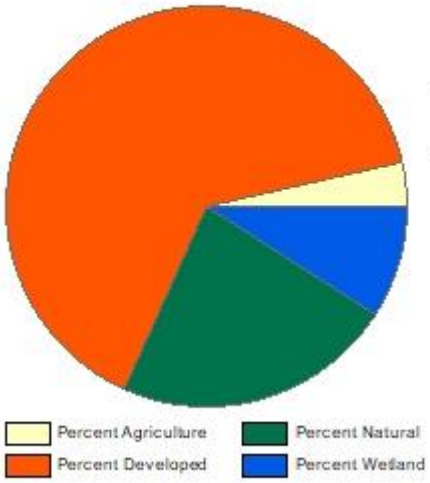
Fish, other Aquatic Life and Wildlife Use: Not Assessed
According to DMF biologists, there are three significant barriers to passage of river herring and American eel on the Bass River in the upstream AU (MA93-07) and on the border with this AU (MA93-08). From upstream to downstream, the Shoe Pond Dam permits no passage (passage score 10), the Dam above Elliot Street also prevents passage (passage score 10), and the Elliot Street culvert acts as a severe impediment to diadromous fish passage (passage score 8). Of note, the population score was 0 (no run present) for all three structures. Per 2018 CALM guidance, MassDEP does not impair estuarine AUs based on fish passage obstructions that affect upstream passage for diadromous fish. No other data or information are available. The Aquatic Life Use for this Bass River AU (MA93-08) is Not Assessed.

Beaver Brook (MA93-37)

Location:	Headwaters, perennial portion west of Route 95, Danvers to mouth at inlet Mill Pond, Danvers.
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B

Beaver Brook - MA93-37

Watershed Area: 2.28 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.28	2.28	0.49	0.49
Agriculture	3.6%	3.6%	0%	0%
Developed	64.6%	64.6%	49.4%	49.4%
Natural	22.7%	22.7%	25.1%	25.1%
Wetland	9.1%	9.1%	25.5%	25.5%
Impervious Cover	27.5%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

A benthic sample (B0618) was collected approximately 150 meters downstream/south from the Route 62 crossing of Beaver Brook near the northern end of Roosevelt Avenue, Danvers on 6/28/2007. The RBPIII status was determined to be "slightly impaired" (58% comparable) when compared to the Alewife Brook reference (B0619). The water quality of Beaver Brook was surveyed by MassDEP at the Pickering Street crossing in Danvers (Station W1541) during summer 2007. A multiprobe was deployed for three 5-day periods and one 2-day period. The data from these deployments indicated that the DO concentrations for this site remain poor, with the mean daily minimum dissolved oxygen concentrations below 5 mg/L for three of the four deployments (3.75-4.69 mg/L for the three deployments), and the deploy minimum was below 4 mg/L for two of the deployments (3.87 and 3.32 mg/L). Diel shifts in DO were greater than 3.0 mg/L for two of the four deployments (maximum shift 3.75 mg/L) and the maximum saturation was 100.6%. The sampling location about a mile downstream of a swamp/marsh area may play a role in the low dissolved oxygen concentrations. Another confounding factor may have been the pre-drought conditions occurring in early fall of 2007, as a Drought Advisory was declared on 1 October. Temperature data were also recorded throughout the deployments, with a maximum temperature of 25.9°C. Attended probe measurements and grab sample data collected at the Pickering Street crossing were generally indicative of good conditions. There were no violations of criteria for water temperature, pH, DO, ammonia, or total phosphorus. Of note, the total phosphorus average and maximum concentrations were 0.040 mg/L and 0.074 mg/L, respectively and there were no observations of

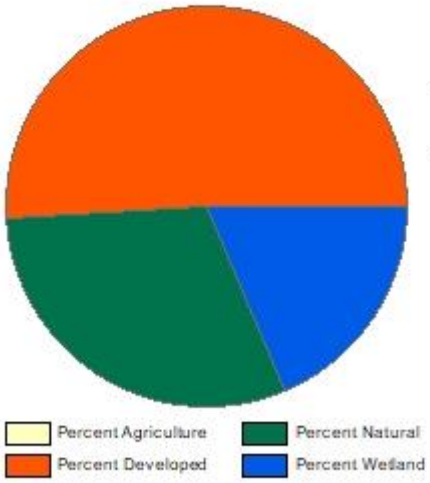
excessive filamentous algae. One 4-day average of specific conductance data (934 µs/cm) was elevated during the month of September. While this does slightly exceed the chronic criterion for estimated chloride (904 µs/cm), it was recorded at a time that the stream was noted to be stagnant. Chloride data is needed to see if the stream should be impaired for chloride toxicity.
The Aquatic Life Use of Beaver Brook will continue to be assessed as Not Supporting based on a persistent issue with periodic low dissolved oxygen concentrations (minimum of 3.32 mg/L in 2007). Although DO diel shifts were elevated above 3 mg/L for two of four probe deployments in 2007, a potential indicator of enriched conditions, there were no other such indicators (DO saturation low, pH normal range, TP seasonal average satisfactory, no observation of excessive filamentous algae).

Beaverdam Brook (MA93-30)

Location:	Headwaters west of Main Street, Lynnfield to confluence with Saugus River (Reedy Meadow), Lynnfield.
AU Type:	RIVER
AU Size:	2.5 MILES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Beaverdam Brook - MA93-30

Watershed Area: 1.59 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.59	1.59	0.2	0.2
Agriculture	0%	0%	0%	0%
Developed	50.9%	50.9%	13.2%	13.2%
Natural	30.4%	30.4%	35.9%	35.9%
Wetland	18.7%	18.7%	50.9%	50.9%
Impervious Cover	17.9%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Beaverdam Brook has been previously listed as not supporting due to low dissolved oxygen. The Lynnfield Center Water District is authorized under the NPDES Potable Water Treatment Facilities General Permit (MAG640017 issued in March 2018) to discharge effluent from the water treatment facility to the upstream portion of Beaverdam Brook. Though there is no limit to their average monthly flow, they have a max daily limit of 1.0 MGD. The permit requires both acute whole effluent toxicity testing and chronic toxicity testing once per year. There are no LC_{50} or C-NOEC limits. The Lynnfield Center Water District collected water from Beaverdam Brook 8 to 10 feet upstream of the outfall, west of the western end of Phillips Road, Lynnfield for use as dilution water in the facility's whole effluent toxicity tests. In 2018 survival of *Ceriodaphnia dubia* exposed (48 hours) to Beaverdam Brook water in both the acute (n=1) and modified acute (n=1) tests was 100% (n=1). In the chronic toxicity test of ambient water (n=1), survival was also 100% after roughly seven days of exposure. Acute whole effluent toxicity tests were conducted on the Lynnfield Center Water District effluent in June of 2018. The LC_{50} using *Ceriodaphnia dubia* for both the acute (n=1) and modified acute (n=1) tests was ≥100%. The one chronic test was invalid. Backpack electrofishing by MassDEP biologists was conducted in Beaverdam Brook upstream of Chestnut Street, Lynnfield (SampleID 4474) in September 2007. Only 12 individuals of one moderately tolerant macrohabitat generalist species (Redfin Pickerel) were collected. MassDEP notes state that there was little to no flow, stagnant water, silt/muck in water and collection efficiencies were poor. A second species, American eel, was observed (3-4 large, ~8 small others). Water quality monitoring was also conducted by MassDEP staff

during the summer of 2007 downstream of Chestnut Street, Lynnfield (W0448). A multiprobe was deployed for three 5-day periods and one 2-day period. These data indicated that the DO levels for this site remained less than ideal, with the lowest mean daily minimum dissolved oxygen concentration at 1.58 mg/L. The highest maximum saturation was 86.5%, but the maximum diel shift for three of the four deployments exceeded 3 mg/L (4.2-5.4 mg/L); the latter is an indicator of enrichment. A temperature probe was deployed for 93 days, beginning on June 29th. The maximum 7-DADM was 23.0°C and the maximum 24-hour rolling average was 22.2°C. Attended probe and grab sample data were taken at the site as well. DO was below 5 mg/L (but >4 mg/L) for three of eight measurements. Ammonia, total phosphorus, temperature, and pH did not exceed any applicable criteria. The seasonal average total phosphorus concentration was 0.055mg/L (maximum 0.074mg/L, n=5), and there were no observations of excessive filamentous algae.

The Aquatic Life Use of Beaverdam Brook will continue to be assessed as Not Supporting based on the continuing observations of low dissolved oxygen although the 2007 fish data and much of the physicochemical data indicate adequate conditions. It should be noted that the data collected in 1997/1998, which were the basis for the initial dissolved oxygen impairment in the 2002 reporting cycle, were collected under "very low" streamflow conditions, while most of the summer 2007 data were collected just prior to a drought advisory that was issued as of October 1st. These data can be considered to have been collected under similar low flow regimes. Additionally, the stream buffer just upstream of site W0448 is wetland dominated so the low dissolved oxygen concentrations at the site are likely at least partially due to this natural influence.

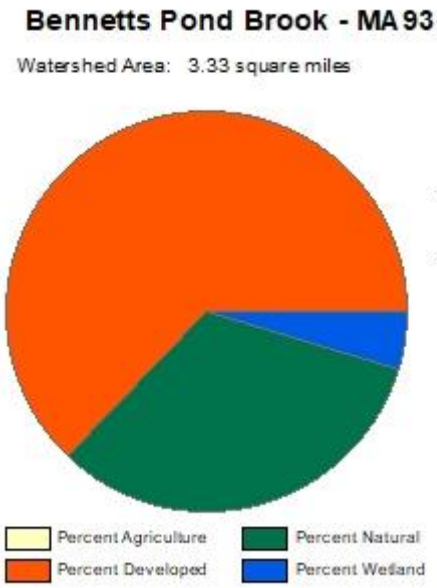
Beck Pond (MA93003)

Location:	Hamilton.
AU Type:	FRESHWATER LAKE
AU Size:	35 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
Beck Pond was sampled in September 2003 as part of a MassDEP nutrient criteria study of lakes and ponds. Temperature, pH, specific conductance, and DO were measured in a depth profile at the deep hole (W0968) of the pond. The maximum temperature was 23.7 °C near the surface and pH ranged from 6.3-6.7 SU. The maximum specific conductance was 208 µs/cm. The maximum DO saturation was 83% (dropping down to <2% near the bottom of the pond) and DO concentration ranged from 7.0 mg/L near the surface to <0.2 mg/L near the bottom. DO dropped below 5 mg/L a little below 1.0 m in depth. The area at this depth encompasses roughly 80-90% of the surface area of the pond. The depth integrated chlorophyll a concentration was 12.4 µg/L. Although the measured TP concentration was slightly elevated (0.032 mg/L) in the surface sample, there were some issues with blank contamination which could have led to a high bias. This analyte should be resampled. The Aquatic Life Use for Beck Pond is assessed as having Insufficient Information given the lack of any recent data. Low dissolved oxygen is being identified with an Alert since the area of DO depletion encompassed such a large percentage (roughly 80-90%) of the surface area of the pond in September 2003.

Bennetts Pond Brook (MA93-48)

Location:	Headwaters east of Lynn Fells Parkway (in Bellevue Golf Course), Melrose to mouth at confluence with Saugus River, Saugus.
AU Type:	RIVER
AU Size:	2.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.33	3.33	0.51	0.51
Agriculture	0.3%	0.3%	0.8%	0.8%
Developed	62.7%	62.7%	73.5%	73.5%
Natural	32.4%	32.4%	18.3%	18.3%
Wetland	4.6%	4.6%	7.3%	7.3%
Impervious Cover	29.7%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing in Bennetts Pond Brook in 2011. The upper third of the stream was sampled Lynn Fells Pkwy @ Falmouth St upstream, Saugus (SampleID 3754) in August 2011. The sample (n=33) was 82% moderately tolerant macrohabitat generalists (redfin pickerel and pumpkinseed). In the middle section of the stream, backpack electrofishing at Milan Drive upstream to Gilway Ave, Saugus (SampleID 3755) was conducted the same day. This sample (n=61) was dominated by redfin pickerel. In the downstream third of Bennetts Pond Brook, MassDEP biologists conducted backpack electrofishing near Marshalls, at mall entrance south of Lynn Falls Parkway & east of Forest St, Saugus (SampleID 4477) in October 2007. The sample (n=176) was 77% moderately tolerant redfin pickerel and also included fluvial dependent white suckers. Water quality of Bennetts Pond Brook was surveyed by MassDEP during summer 2007 in the vicinity of their fish station, approximately 0.3 miles from the confluence with the Saugus River (W0878). A multiprobe was deployed for two 5-day periods and one 2-day period. Though daily DO shifts (ranging from 1.72 to 5.03 mg/L) were indicative of enriched conditions, oxygen levels were generally good. The mean daily minimum dissolved oxygen concentrations were above 6 mg/L for all deployments. The maximum saturation was 114.2%. A thermistor recorded water temperature for 93 days, starting on June 29. The maximum temperature was 26.1 °C meeting warm water criteria. Attended probe and grab sample data were collected at the site as well. There were no violations of criteria for temperature, DO, pH, ammonia, or total phosphorus. The seasonal average total phosphorus concentration was low (0.035mg/L, maximum 0.054 mg/L). While large daily shifts in oxygen and

maximum saturations of up to 114% suggest nutrient enrichment may be a problem, the total phosphorus concentrations were acceptable and and there were no observations of dense or very dense filamentous algae. The Aquatic Life Use of Bennetts Pond Brook (MA93-48) is assessed as Fully Supporting based on the presence of moderaterly tolerant macrohabitat generalist and a few fluvial fish and the water quality data collected during the summer of 2007 indicative of good conditions. The former alert for total phosphorus (based on one elevated result (0.19 mg/L) during the 2002 survey collected during a large precipitation event is being removed since multiple samples collected during the summer of 2007 at the same location a day after large rain events (so under fairly similar conditions) had maximum concentration of only 0.054mg/L, so the Alert is being removed. A new alert is being added because of the large diel shifts in dissolved oxygen (up to 5.0 mg/L).

Beverly Harbor (MA93-20)

Location:	From the mouth of the Danvers River, Salem/Beverly to an imaginary line from Juniper Point, Salem to Hospital Point, Beverly.
AU Type:	ESTUARY
AU Size:	1.02 SQUARE MILES
Classification/Qualifier:	SB: SFR

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Estuarine Bioassessments		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 11% of Beverly Harbor was covered in eelgrass beds. In 2007 a complete loss in eelgrass beds was observed. In following years, the eelgrass beds rebounded significantly until the peak in 2013 when eelgrass beds were slightly greater in size (1.46%) than the beds documented in 1995. When observed in 2017 they had once again decreased in size with a net loss of 15.04% when compared to the 1995 eelgrass beds. The Aquatic Life Use of Beverly Harbor is assessed as Not Supporting because of the 15% loss of eelgrass bed habitat (Estuarine Bioassessments) between 1995 and 2017.

Birch Pond (MA93004)

Location:	Saugus/Lynn.
AU Type:	FRESHWATER LAKE
AU Size:	80 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Breeds Pond (MA93006)

Location:	Lynn.
AU Type:	FRESHWATER LAKE
AU Size:	195 ACRES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Fish, other Aquatic Life and Wildlife Use: Not Assessed
The Lynn Water & Sewer Commission is authorized under the Potable Water Treatment Facility (PWTF) general NPDES permit MAG640079 to discharge emergency overflows and dewatering as a result of maintenance. Although the facility is required to do whole effluent toxicity testing, because flows are so limited, there is currently no WET data available. The Aquatic Life Use for Breeds Pond is Not Assessed since no recent data/ information are available.

Browns Pond (MA93008)

Location:	Peabody.
AU Type:	FRESHWATER LAKE
AU Size:	25 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Buswell Pond (MA93009)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
Though there are significant barriers to fish passage to Buswell Pond (MA93009) there are also no documented diadromous fish runs. The Aquatic Life Use of Buswell Pond is Not Assessed.

Cape Pond (MA93011)

Location:	Rockport.
AU Type:	FRESHWATER LAKE
AU Size:	42 ACRES
Classification/Qualifier:	A: PWS, ORW

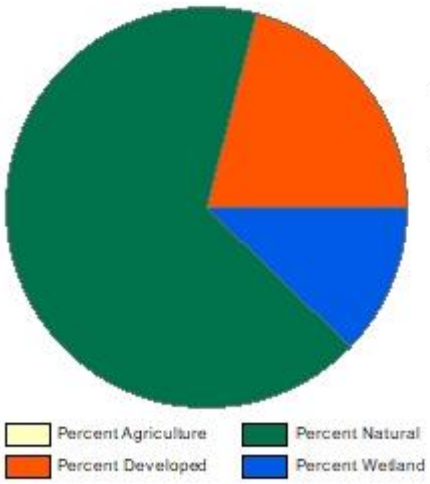
Fish, other Aquatic Life and Wildlife Use: Not Assessed
Rockport Water Treatment Plant is permitted by NPDES General Permit for Potable Water Treatment Facilities No. MAG640021 (issued October 2019) to discharge 1.0 MGD of effluent to Cape Pond. The Permit has no toxicity limits but requires LC50 (Acute WET Testing) & C-NOEC (Chronic WET Testing) reporting once a year. However, there are no data available at this time. The Aquatic Life Use for Cape Pond is Not Assessed.

Cat Brook (MA93-29)

Location:	Headwaters, perennial portion east of Route 128, Manchester to the edge of the designated shellfishing beds east of Powder House Lane, Manchester.
AU Type:	RIVER
AU Size:	1.5 MILES
Classification/Qualifier:	B

Cat Brook - MA93-29

Watershed Area: 5.07 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.07	5.07	1.62	1.62
Agriculture	0.1%	0.1%	0.4%	0.4%
Developed	20.9%	20.9%	21.1%	21.1%
Natural	66.7%	66.7%	54.8%	54.8%
Wetland	12.3%	12.3%	23.8%	23.8%
Impervious Cover	8.6%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Cat Brook is considered a coldwater fisheries resource by MADFG. DFG biologists conducted backpack electrofishing upstream of the Mill Street crossing, Manchester (SampleID 2549), in the upper portion of the brook, in July 2008. The sample contained two species (15 individuals) and was 60% young of the year Eastern brook trout (an intolerant, coldwater fluvial specialist). In the downstream portion of Cat Brook, MassDEP biologists conducted backpack electrofishing upstream of Lincoln Street, Manchester (SampleID 4472) in September 2007. This sample contained 130 individuals (5 species), including four YOY Eastern brook trout. Moderately tolerant macrohabitat generalist species (pumpkinseed, largemouth bass) made up an additional 80% of the sample. Water quality monitoring in Cat Brook was conducted by MassDEP staff during the summer of 2007 in the vicinity of the Lincoln Street fish sample, roughly 180 feet upstream of the confluence with Causeway Brook (W0889). Multiprobes were deployed for three 5-day periods and one 2-day period in the months of June, July, August and September. These data were generally indicative

of good conditions. The means of the daily DO minima were >5.6 mg/L. The maximum DO diel shift was 2.62 mg/L and the maximum saturation was 95%. A thermistor was deployed for 93 days beginning June 29th. The maximum 7DADM was 24.4 °C and the criterion for Tier 1 existing use coldwater fisheries (7DADM ≤20.0 °C; ≤11 exceedances) was exceeded 45 times. Additionally, the maximum 24-hour rolling average temperature was 22.8 °C. A small portion of Cat Brook, including in the vicinity of the W0889 water quality station, lies within a Zone II Wellhead Protection Area, but it is unknown whether this has any effect on water temperature. Discrete attended probes measurements and grab samples were taken at station W0889 during the sampling season as well. Dissolved oxygen readings were all greater than 6.0 mg/L. There were no signs of supersaturation. Discrete temperature readings were all below 21.0°C. Of the 9 pH measurements, 6 were <6.5 SU and one of these was considered a 'severe' violation at 5.7 SU. The seasonal average total phosphorus concentration was 0.027 mg/L (maximum 0.041 mg/L) (n=5). There were no observations of excessive filamentous algae. There were no ammonia violations (n=4).

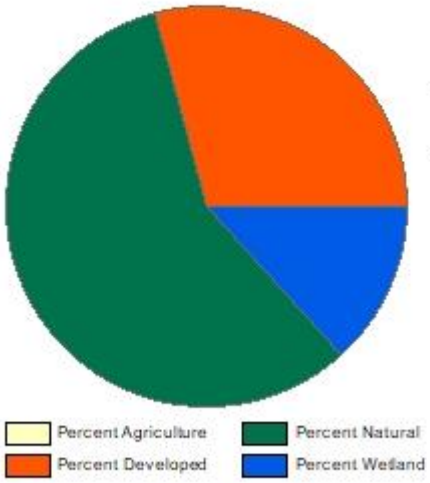
The Aquatic Life Use of Cat Brook is assessed as Not Supporting. Since young of year Eastern brook trout were present the brook is being assessed as having a Tier 1 Cold Water Existing Use and since the continuous temperature data exceeded the chronic Tier 1 7DADM criterion of 20.0 °C 45 times, a temperature impairment is being added. The low pH impairment is being carried forward since the minimum pH in 2007 was also low (5.7 SU). All other water quality data were indicative of good conditions.

Causeway Brook (MA93-47)

Location:	Headwaters, outlet Dexter Pond, Manchester to mouth at confluence with Cat Brook, Manchester.
AU Type:	RIVER
AU Size:	1.1 MILES
Classification/Qualifier:	B

Causeway Brook - MA93-47

Watershed Area: 0.77 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.77	0.77	0.24	0.24
Agriculture	0%	0%	0%	0%
Developed	29.2%	29.2%	31%	31%
Natural	57.5%	57.5%	44.4%	44.4%
Wetland	13.3%	13.3%	24.6%	24.6%
Impervious Cover	9.7%			

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

Water quality monitoring in Causeway Brook was conducted by MassDEP staff in the summer of 2007. Near the downstream end of the AU, discrete attended probes measurements and grab samples were collected at the Lincoln Street crossing, Manchester (W0888). Much like the 2002 survey (described in the 2002 North Coastal WQAR) the dissolved oxygen concentrations were poor, ranging from 2.3 to 12.1 mg/L (n=7, of which three measurements were <4.0 mg/L). Though less severe and declared later in the year (October 1st), there was also a drought advisory in 2007 which likely influenced low DO concentrations, as flow conditions were frequently described as stagnant (7 of 9 observations). Discrete temperature readings met the 28.3 °C warm water criterion (with a maximum of 22.6 °C) but three of seven measurements failed to meet the 20.0 °C coldwater criterion. Of the seven discrete pH measurements, five were less than 6.5 SU and one of these was considered a 'severe' violation at 5.8 SU. The upper half of Causeway Brook flows through shrub swamp and wooded swamp wetland areas and these landuse types likely influence the relatively low pH values documented at W0888. The total phosphorus average/maximum concentrations were 0.062/0.11 mg/L (n=4) and there were no observations of excessive filamentous algae. There were no ammonia violations (n=4).

Too limited data are available to assess the Aquatic Life Use of Causeway Brook, so it is assessed as having Insufficient Information. Given the large percentage of the brook under the influence of surrounding wetlands and the pre-drought conditions that occurred during the summer 2007 surveys in this extremely small subwatershed (<1mi^2), it is likely that natural conditions play a role in low dissolved oxygen and pH conditions

although the prior Alert for low dissolved oxygen will be carried forward and a new Alert is being added for low pH.

Cedar Pond (MA93013)

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

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

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
No current data are available for Cedar Pond. There is insufficient information to assess the Aquatic Life Use of Cedar Pond because the non-native aquatic macrophyte impairment is being delisted (see removal comment).
Primary Contact Recreation Use: Insufficient Information
No current data are available for Cedar Pond. There is insufficient information to assess the Primary Contact Recreational Use of Cedar Pond because the non-native aquatic macrophyte impairment is being delisted (see removal comment).
Secondary Contact Recreation Use: Insufficient Information
No current data are available for Cedar Pond. There is insufficient information to assess the Secondary Contact Recreational Use of Cedar Pond because the non-native aquatic macrophyte impairment is being delisted (see removal comment).
Aesthetic Use: Insufficient Information
No current data are available for Cedar Pond. There is insufficient information to assess the Aesthetic Use of Cedar Pond because the non-native aquatic macrophyte impairment is being delisted (see removal comment).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Data and/or information lacking to determine WQ status; original basis for listing was incorrect	Cedar Pond was erroneously listed as impaired in the 2002 reporting cycle based on the presence of the non-native wetland species Phragmites australis observed during the 1997 synoptic survey. This species is not an aquatic macrophyte but rather a wetland species so the Non-Native Aquatic Plants impairment is being delisted.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Data Sources:
(MassDEP 2007b) North Shore Coastal Watersheds 2002 Water Quality Assessment Report, (MassDEP 2015) Integrated Listing History 1992-2014 INTLIST_HISTORY.xlsx, 2015, and (MassDEP Undated 3) North Coastal Watershed Lake Survey Data 1997.

Cedar Pond was listed as impaired in 2002 (MassDEP 2015) because MassDEP staff observed during a 1997 synoptic survey that the wetlands plant, *Phragmites australis*, was encroaching on 50% of the pond (MassDEP

1997). However, since this species is not an aquatic macrophyte but rather a wetland species the “Non-Native Aquatic Plants” impairment was an error and so is being delisted.

Chebacco Lake (MA93014)

Location:	Hamilton/Essex.
AU Type:	FRESHWATER LAKE
AU Size:	204 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
During the 1997 synoptic surveys, MassDEP biologists observed fanwort (*Cabomba caroliniana*) and curly-leaf pondweed (*Potamogeton crispus*) in Chebacco Lake. There are no recent data available for Chebacco Lake. The Aquatic Life Use of Chebacco Lake will continue to be assessed as Not Supporting. The generic Non-Native Aquatic Plants impairment is being removed and the species-specific non-native aquatic macrophytes Fanwort and Curly-leaf Pondweed are being added.

Chubb Creek (MA93-63)

Location:	Tidal portion south of Route 127, Beverly/Manchester to mouth at confluence with Salem Sound, Beverly/Manchester.
AU Type:	ESTUARY
AU Size:	0.01 SQUARE MILES
Classification/Qualifier:	SA: SFO

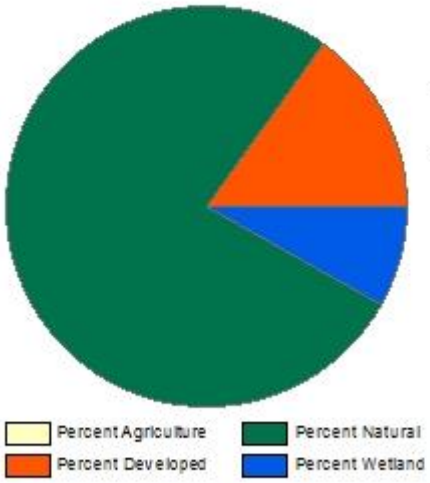
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Chubb Creek AU (MA93-63) is Not Assessed.

Chubb Creek (MA93-64)

Location:	Headwaters northwest of northern end of Leather Lane, Beverly to salt water portion south of Route 127, Beverly/Manchester.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B

Chubb Creek - MA93-64

Watershed Area: 0.81 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.81	0.81	0.31	0.31
Agriculture	0%	0%	0%	0%
Developed	15.14%	15.14%	13.43%	13.43%
Natural	76.75%	76.75%	72.93%	72.93%
Wetland	8.11%	8.11%	13.64%	13.64%
Impervious Cover	5.99%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
According to DMF biologists there is a fish passage barrier at the downstream end of this Chubb Creek AU (MA93-64) at the Rt. 133 culvert. The culvert was replaced in 2005 and minor channel improvements are still possible. The culvert is only a minor obstruction to passage of rainbow smelt and American eel, but the existing fish population is small (passage score 1 out of 10; 10 = no possible passage). Too limited data are available to assess the Aquatic Life Use for this Chubb Creek AU (MA93-64) so it is assessed as having Insufficient Information.

Coy Pond (MA93016)

Location:	Wenham.
AU Type:	FRESHWATER LAKE
AU Size:	23 ACRES
Classification/Qualifier:	B

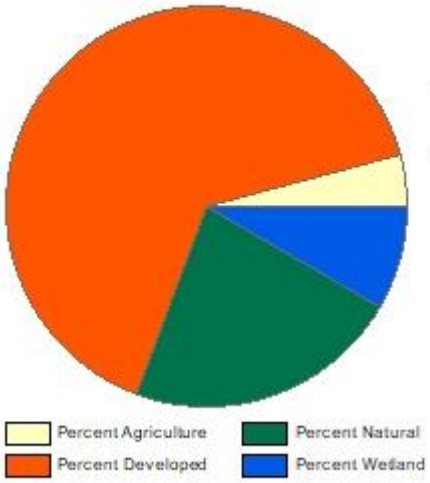
Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
There are no recent data available, so the Aquatic Life Use for Coy Pond is Not Assessed. The Alerts for low DO, elevated chlorophyll and secchi depth are being carried forward.

Crane Brook (MA93-02)

Location:	Headwaters, perennial portion east of Route 95, Danvers to mouth at inlet Mill Pond, Danvers.
AU Type:	RIVER
AU Size:	1.8 MILES
Classification/Qualifier:	B

Crane Brook - MA93-02

Watershed Area: 2.81 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.81	2.81	0.67	0.67
Agriculture	4.2%	4.2%	1.7%	1.7%
Developed	65.1%	65.1%	59.8%	59.8%
Natural	22.3%	22.3%	20.1%	20.1%
Wetland	8.4%	8.4%	18.4%	18.4%
Impervious Cover	31.1%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Benthic Macroinvertebrates		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Water quality monitoring was conducted by MassDEP staff in the downstream portion of Crane Brook during the summer of 2007 at Pine Street in Danvers (W0451). A multiprobe was deployed for two 5-day periods and one 2-day period and the data were indicative of generally good conditions (DO mean daily minima ≥4.96 mg/L, maximum DO saturation 87.6%, maximum DO diel shifts <2 mg/L, maximum temperature 24.7°C). Attended probe and grab sample measurements for DO, pH, temperature, ammonia, and total phosphorus were also indicative of good conditions with no violations of their respective criteria. The seasonal average total phosphorus concentration was 0.031 mg/L and the maximum concentration was 0.046 mg/L (n=5). There were no observations of excessive filamentous algae. A benthic sample (B0616) was collected approximately 100 meters downstream from Pine Street on 29 June 2007. The RBPIII status was determined to be “moderately impaired” (42% comparable) when compared to the Alewife Brook reference site (B0619). The site was scored poorly in the habitat assessment for sediment deposition, bank stability, and riparian zone width.

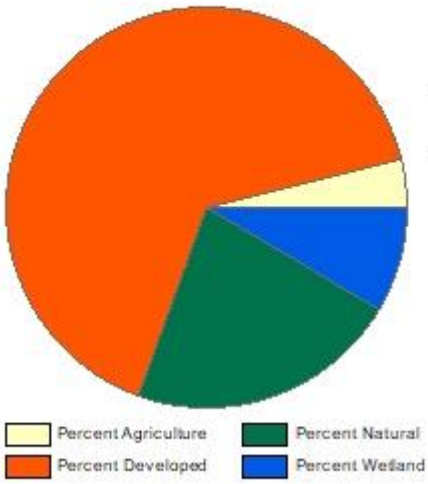
The Aquatic Life Use of Crane Brook is assessed as Not Supporting based primarily on the moderately impaired benthic macroinvertebrate sample. The Crane Brook sub-watershed is small (2.8mi^2), yet 31% impervious cover. Beside habitat limitations such as upstream channelization, local sedimentation, bank stability and small riparian zone width, nonpoint source pollution also likely plays a role in the moderately impaired benthic sample.

Crane River (MA93-38)

Location:	Headwaters, outlet Mill Pond, Danvers to outlet of the pump house sluiceway, Purchase Street, Danvers (through a portion of former 1998 segment: Crane River MA93-03).
AU Type:	RIVER
AU Size:	0.3 MILES
Classification/Qualifier:	B

Crane River - MA93-38

Watershed Area: 5.27 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.27	5.27	1.23	1.23
Agriculture	3.8%	3.8%	0.9%	0.9%
Developed	65.7%	65.7%	56.2%	56.2%
Natural	22.1%	22.1%	22.4%	22.4%
Wetland	8.5%	8.5%	20.5%	20.5%
Impervious Cover	29.9%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
According to DMF biologists, the Mill Pond Dam at the upstream end of Crane River MA93-38 permits no passage of diadromous fish (passage score 10). Target species for passage are river herring and American eel. A benthic sample (B0002) was collected by MassDEP biologists 10 meters upstream/west from Ash Street, Danvers on 6/28/2007. The RBPIII status was determined to be “slightly impaired” (68% comparable) when compared to the Alewife Brook reference (UniqueID: B0619). The habitat assessment indicated that poor bank stability remains a problem, similar to conditions noted in a 2002 habitat assessment. Water quality of this Crane River AU (MA93-38) was surveyed by MassDEP during summer 2007 at the Ash Street crossing (W0452). A multiprobe was deployed for two 5-day periods and one 2-day period. The data from these three deployments were indicative of good conditions. The lowest mean daily minimum dissolved oxygen concentration for all three deployments was 5.99 mg/L. The maximum DO diel shift was 1.45 mg/L for all deployments and the maximum saturation was 85.8%. Temperatures were also recorded throughout the

deployments. The maximum temperature was 23.7°C. Attended probe measurements and grab sample data were also collected during the sampling season. Dissolved oxygen was >6.0 mg/L (n=9), discrete temperature measurments did not fail warmwater criteria and there were no ammonia or pH violations. The seasonal average total phosphorus concentration was 0.042 mg/L and the maximum concentration was 0.059 mg/L. The Aquatic Life Use of this Crane River AU (MA93-38) is assessed as Not Supporting based on the barrier to diadromous fish passage posed by Mill Pond Dam. The benthic and water quality data were otherwise indicative of good conditions although the Alert for habitat quality degradation (poor bank stability) is being carried forward.

Crane River (MA93-41)

Location:	From outlet pump house sluiceway, Purchase Street, Danvers to mouth at confluence with Danvers River, Danvers (through a portion of former 1998 segment: Crane River MA93-03; portion formerly reported as 2002 lake segment: Crane River Pond MA93017).
AU Type:	ESTUARY
AU Size:	0.07 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Crane River AU (MA93-41) is Not Assessed.

Crystal Lake (MA93018)

Location:	Wakefield/Stoneham.
AU Type:	FRESHWATER LAKE
AU Size:	79 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Crystal Lake is Not Assessed.

Danvers River (MA93-09)

Location:	From confluence of Porter, Crane and Waters rivers, Danvers to mouth at confluence with Bass and North rivers and Beverly Harbor, Beverly/Salem.
AU Type:	ESTUARY
AU Size:	0.53 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Danvers River is Not Assessed.

Days Pond (MA93092)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no recent data available so the Aquatic Life Use of Days Pond will continue to be assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte *Egeria densa*.

Dykes Pond (MA93020)

Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	107 ACRES
Classification/Qualifier:	A: PWS, ORW

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
--	4c	(Fish Passage Barrier*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
According to DMF biologists the Dykes Pond Dam prevents all passage of river herring and American eel into Dykes Pond (passage score 10, population score 2 out of 10 with 0 meaning no run is present). The Aquatic Life Use for Dykes Pond is assessed as Not Supporting based on the presence of a fish passage barrier.

Edgewater Office Park Pond (MA93094)

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

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Edgewater Office Park Pond was previously assessed as impaired due to an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), which was reported on herbicide permit applications. This non-native continued to be listed on herbicide permit applications submitted nearly every year from 2003-2016. Additionally, *Trapa natans* (water chestnut) was noted on the 2011 and 2012 applications. The Aquatic Life Use of Edgewater Office Park Pond MA93094 will continue to be assessed as Not Supporting due to infestations of non-native aquatic macrophytes. However, the generic Non-Native Aquatic Plants impairment is being delisted and replaced with the specific cause, Fanwort (*Cabomba caroliniana*), and a new impairment for Water Chestnut (*Trapa natans*) is being added.

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Data Sources:
(MassDEP 2007b) North Shore Coastal Watersheds 2002 Water Quality Assessment Report and
(MassDEP 2017) Herbicide Database, as of January 2017

Edgewater Office Park Pond was previously assessed as impaired in the 2002 North Coastal Water Quality Assessment Report due to an infestation of the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), reported on herbicide permit applications. This non-native continued to be listed on herbicide permit applications submitted nearly every year from 2003-2016. Additionally, *Trapa natans* (water chestnut) was noted on the 2011 and 2012 applications. The generic “Non-Native Aquatic Plants” impairment is not needed since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Essex Bay (MA93-16)

Location:	The waters landward of Ipswich Bay contained within an imaginary line drawn from the northwestern tip of Gloucester near Coffins Beach to the southern tip of Castle Neck, Ipswich to the eastern most point of Dilly Island, Essex (mouth of Castle Neck River) and then from Cross Island, Essex to Conomo Point, Essex (mouth of Essex River) excluding Walker, Lanes, and Farm creeks.
AU Type:	ESTUARY
AU Size:	0.97 SQUARE MILES
Classification/Qualifier:	SA: ORW, SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Essex Bay is Not Assessed.

Essex River (MA93-11)

Location:	From salt water portion west of Southern Avenue, Essex to mouth at Essex Bay, Essex.
AU Type:	ESTUARY
AU Size:	0.51 SQUARE MILES
Classification/Qualifier:	SA: ORW, SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Essex River is Not Assessed.

Fernwood Lake (MA93022)

Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	25 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Fernwood Lake is Not Assessed.

First Pond (MA93081)

Location:	Saugus (also known as Upper Griswold Pond).
AU Type:	FRESHWATER LAKE
AU Size:	4 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The non-native aquatic macrophytes, fanwort (*Cabomba caroliniana*) and variable milfoil (*Myriophyllum heterophyllum*) were reported on (2001-2003) herbicide permit applications for First Pond. A recent review of Lycott Environmental's 2000 report on macrophyte surveys found that the consulting firm noted the presence of fanwort, variable milfoil, as well as *Marsilea quadrifolia* in First Pond. MassDEP staff should confirm the presence of *Myriophyllum heterophyllum* and *Marsilea quadrifolia* in First Pond. The Aquatic Life Use of First Pond will continue to be assessed as Not Supporting because of the non-native aquatic macrophyte infestations. The generic Non-Native Aquatic Plants cause is being delisted and replaced with the specific Fanwort (*Cabomba caroliniana*) code (see removal comment). Alerts are being added for variable milfoil (*Myriophyllum heterophyllum*) and *Marsilea quadrifolia* which need confirmation.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The Non-Native Aquatic Plants cause is being delisted and replaced with the specific Fanwort (Cabomba caroliniana) code.

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Data Sources:
(MassDEP 2007b) North Shore Coastal Watersheds 2002 Water Quality Assessment Report, (MassDEP 2017) Herbicide Database, as of January 2017, and (Lyman 2000) Aquatic Plant Management Griswold Pond, Environmental Impact Report EOEA #12291.

As was previously reported in the 2002 North Coastal Water Quality Assessment Report, the non-native aquatic macrophytes, fanwort (*Cabomba caroliniana*) and variable milfoil (*Myriophyllum heterophyllum*) were noted on herbicide permit applications for First Pond (MassDEP 2017). A recent review of Lycott Environmental's 2000 report on macrophyte surveys found that the consulting firm noted the presence of fanwort, variable milfoil, as well as *Marsilea quadrifolia* in First Pond (Lyman 2000). MassDEP staff should confirm the presence of *Myriophyllum heterophyllum* and *Marsilea quadrifolia* in First Pond. The "Non-Native Aquatic Plants" impairment is being delisted and replaced with the specific Fanwort (*Cabomba caroliniana*) impairment.

Flax Pond (MA93023)

Location:	Lynn.
AU Type:	FRESHWATER LAKE
AU Size:	55 ACRES
Classification/Qualifier:	B

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The non-native aquatic macrophyte, curly-leaf pondweed (*Potamogeton crispus*), was identified by MassDEP staff during a 1997 synoptic survey of Flax Pond. The Aquatic Life Use of Flax Pond will continue to be assessed as Not Supporting. The Non-Native Aquatic Plants impairment is being removed and replaced with the specific code, Curly-leaf Pondweed (*Potamogeton crispus*).

Floating Bridge Pond (MA93024)

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

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

Forest River (MA93-10)

Location:	From saltwater wetlands upstream of Loring Avenue, Salem to mouth at confluence with Salem Harbor, Salem.
AU Type:	ESTUARY
AU Size:	0.03 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no recent data available, so the Aquatic Life Use for Forest River will continue to be assessed as Not Supporting with the dissolved oxygen supersaturation impairment being carried forward.

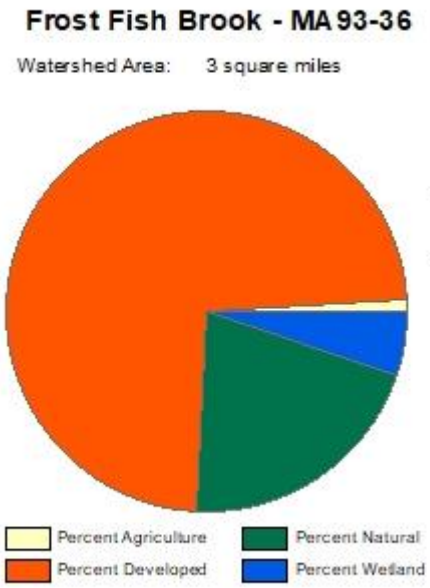
Foster Pond (MA93026)

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

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
Bardon Trimount, Inc., now Aggregate Industries – Northeast Region, Inc. in Swampscott is authorized, NPDES permit MA0001830, to discharge treated process water and stormwater to Foster Pond via outfall 001. The facility is required to report the acute LC_{50} and CNOEC of one annual Whole Effluent Toxicity test. Between March 2009 and April 2018, ambient Foster Pond water was collected at the Webster Rd dam, Swampscott for use as a diluent/control in Aggregate Industries WET tests. Survival of *C. dubia* exposed (one 48-hour and eight chronic ~7-day periods) to the pond water was excellent, ranging from 90-100% of test organisms. Survival of *P. promelas* exposed (one 48 hour and 10 chronic ~7-day periods) to Foster Pond water ranged from 25 to 100% with survival less than 75% once (the March 2011 test). Although the LC_{50} of test organisms exposed to effluent was >100% effluent in all tests, there were historically some issues with chronic toxicity, but not since April 2014. Too limited data are available to assess the Aquatic Life Use of Foster Pond, so it is assessed as having Insufficient Information.

Frost Fish Brook (MA93-36)

Location:	From Cabot Road, Danvers to mouth at confluence with Porter River, Route 62, Danvers.
AU Type:	RIVER
AU Size:	1 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3	3	0.64	0.64
Agriculture	1%	1%	0.8%	0.8%
Developed	73.1%	73.1%	70.7%	70.7%
Natural	20.7%	20.7%	21.4%	21.4%
Wetland	5.1%	5.1%	7.2%	7.2%
Impervious Cover	27.4%			

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

DFG biologists conducted backpack electrofishing in Frost Fish Brook in the reach upstream of the Coolidge Rd crossing, Danvers in July 2011 (roughly in the middle of this AU). The sample was comprised of 45% moderately tolerant pumpkinseed and redfin pickerel. In the vicinity of the fish sample, the water quality of Frost Fish Brook was surveyed by MassDEP during the summer of 2007 (W1540). Multiprobes were deployed for one 4-day period and two 5-day periods, recording data indicative of good conditions (mean of the daily minimum DO >7 mg/L, maximum DO diel shift <2.0 mg/L, maximum DO saturation 92%; maximum temperature 22.6 °C). Attended probes measurements and grab samples were collected at station W1540 as well. There were no violations of criteria for DO, pH, temperature, ammonia or total phosphorus with a seasonal average of 0.032mg/L (maximum 0.049mg/L) (n of 5), and there were no observations of excessive filamentous algae. Close to the downstream boundary of the AU, MassDEP biologists collected a benthic sample (B0003) ~150 meters upstream/north from Route 62, Danvers on 6/28/2007. The RBPIII analysis indicated “slightly impaired” (58% comparable) conditions when compared to the Alewife Brook reference (UniqueID: B0619). The site scored poorly for bank stability, vegetative protection and riparian vegetative zone width.

The Aquatic Life Use of Frost Fish Brook is assessed as Fully Supporting based on benthic macroinvertebrate and fish bioassessment and good water quality data. The Alert for sedimentation/siltation and poor utilization of smelt spawning habitat identified by MassDEP and DMF biologists is being carried forward.

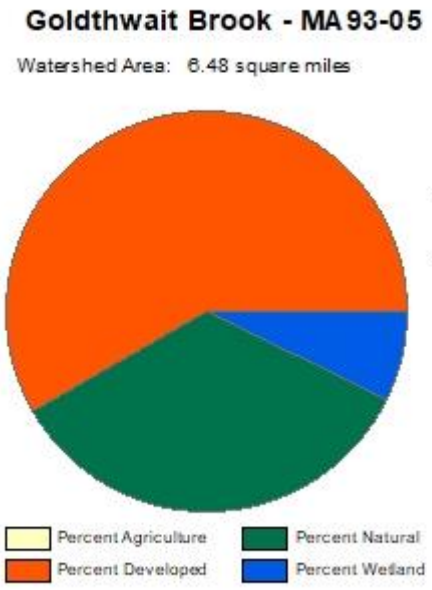
Gloucester Harbor (MA93-18)

Location:	The waters landward of an imaginary line drawn between Mussel Point, Gloucester and the tip of the Dog Bar Breakwater, Gloucester excluding the Annisquam River.
AU Type:	ESTUARY
AU Size:	2.32 SQUARE MILES
Classification/Qualifier:	SB: SFR, CSO

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The City of Gloucester primary wastewater treatment facility discharges (under a 301(h) waiver) outside of Gloucester Harbor proper. Five CSO discharges and a pump station bypass outfall also discharge directly into Gloucester Harbor. Whole effluent toxicity tests were conducted on the Gloucester WPCF effluent between June 2006 and December 2018 utilizing *Mysidopsis bahia* and *Menidia beryllina* test organisms. The effluent exhibited acute toxicity to both species. The LC_{50}s for *M. bahia* ranged from 38.3% to 100% effluent (25 of 51 tests met the permit limit LC_{50}>100%). The LC_{50}s for *M. beryllina* ranged from 16.1% to 100% effluent (only 6 of 51 tests met the limit) and it was almost always the more sensitive test organism. Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 3.09% of Gloucester Harbor was covered in eelgrass beds. Although the pattern of eelgrass increases or decreases varied over the years, there was a net increase in eelgrass coverage of 21.89% between 1995 and 2017. The Aquatic Life Use for Gloucester Harbor will continue to be assessed as Not Supporting. Despite evidence of increasing eelgrass bed coverage the previous impairments for poor combined biota/habitat bioassessments and low dissolved oxygen will be carried forward (the inner portion of Gloucester Harbor has degraded habitat quality conditions (i.e., anoxic sediments) and the evidence of a stressed benthic community).

Goldthwait Brook (MA93-05)

Location:	Headwaters, outlet Cedar Pond, Peabody to mouth at confluence with Proctor Brook, Peabody (portions culverted).
AU Type:	RIVER
AU Size:	3.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.48	5.73	1.95	1.86
Agriculture	0.4%	0.4%	0.4%	0.5%
Developed	58.1%	56.4%	45.6%	46.2%
Natural	34.3%	35.9%	39.8%	40.5%
Wetland	7.2%	7.2%	14.1%	12.8%
Impervious Cover	27.9%			

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

DFG biologiststs conducted backpack electrofishing in the upper portion of Goldthwait Brook in June 2008 downstream of the Robin Rd crossing in Peabody (Sample 2574). The sample consisted of largemouth bass and chain pickerel, two moderately tolerant macrohabitat generalist species. The sampling crew noted the channelization of the stream. Downstream of several impoundments in the lower portion of the sub-watershed, Eastman Gelatine Corporation is authorized (NPDES permit MA0003956) to discharge non-contact cooling water and storm water runoff from outfall 001 and storm water runoff from 18 other outfalls into Goldthwait Brook. The permit requires toxicity testing twice a year but has no permit limits. Eastman Gelatine staff collected water from Goldthwait Brook, approximately 800 feet upstream from outfall 001, just upstream of Allens Lane, Peabody for use as a diluent/control in their whole effluent toxicity tests. Between June 2007 and September 2018, survival of *Ceriodaphnia dubia* exposed (~ 7 days) to river water (n = 21 tests) ranged from 80-100% except for one test in June 2013 when there was 0% survival. Survival of *Pimephales promelas* exposed (~ 7 days) to river water ranged from 75-100%, except for 4 tests (n = 21 test events). These tests occurred in Sept. 2008, Sept. 2011, June 2012, and June 2013 (38%, 13%, 38%, and 65% survival, respectively). Of note, there was no issue with toxicity in the ambient controls in more recent years. WET tests on the effluent (n=24) did not exhibit any acute toxicity (LC_{50}s were all >100% effluent). Of 23 tests with valid CNOEC results, concentrations ranged from 50-100% effluent for *C. dubia* and 25-100% effluent for *P. promelas*. Water quality of Goldthwait Brook was surveyed a short way downstream by MassDEP in 2007 at Foster Street, Peabody (W0454). A

multiprobe was deployed for three 5-day periods and one 2-day period. The lowest mean daily minimum among the 1st 3 deployments was 5.49 mg/L, but for the Sept. deploy it was 2.86 mg/L. Diel shifts were all ≤2.1 mg/L, and max saturations were ≤117%. It is unclear whether DO concentrations are regularly poor in late summer or if they were exacerbated by low flows due to water withdrawals, or by the near drought conditions at the time of sampling (a drought advisory was declared as of Oct 1st). A thermistor was deployed for 89 days beginning on June 29. The max 7DADM was 27.1 °C and the max 24-hour rolling avg was 26.4 °C. Attended probe and grab sample measurements for temperature, DO, pH, ammonia, and TP did not violate their respective criteria. The seasonal average total phosphorus concentration was 0.038 mg/L (maximum 0.054 mg/L). There were no observations of excessive filamentous algae. The stream is still channelized in some areas and there are no new data on the state of stream side littoral vegetative cover or changes in water withdrawals.

The Aquatic Life Use of Goldthwait Brook will continue to be assessed as Not Supporting due to Alterations in stream-side or littoral vegetative covers, Dewatering, Dissolved Oxygen, and Total Phosphorus. An Alert is being identified because of infrequently low *P. promelas* survival in ambient river water samples collected from Goldthwait Brook in tests conducted between 2008 and 2013 although survival was good (above 75%) in more recent years.

Goose Cove Reservoir (MA93093)

Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	58 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
According to DMF biologists there is a barrier to fish passage at Goose Cove Reservoir and two more barriers to passage downstream. At the Reservoir Dam there is no passage, but there is also no existing fish run (passage score 10, population score 0). Downstream of the duck pond (not an AU), the two other barriers to fish passage occur at the Denniston Street Falls and the duck pond culvert, where passage was ranked 5 of 10, but there is no existing fish run. The target species for passage at all three sites is river herring. The Aquatic Life Use for Goose Cove Reservoir is Not Assessed. It is noted that there are significant barriers to fish passage at the Goose Cove Reservoir Dam and downstream of the reservoir, but since there is no documented diadromous fish run an impairment decision is not being made at this time.

Gravelly Pond (MA93028)

Location:	Hamilton.
AU Type:	FRESHWATER LAKE
AU Size:	50 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
The Manchester Water Department holds a general NPDES permit for Discharges from Potable Water Treatment Facilities that allows discharge to Gravelly Pond. According to the general permit, chronic (and modified acute) toxicity test(s) shall be performed by the permittee upon request by EPA and/or MassDEP. There is currently no toxicity data for this facility. There are no other recent data available. The Aquatic Life Use for Gravelly Pond is Not Assessed.

Griswold Pond (MA93029)

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

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
A synoptic survey of Griswold Pond conducted by MassDEP staff in 1997 identifed the presence of the non-native fanwort (Cabomba caroliniana), as well as an unidentified species of Myriophyllum sp. Lycott Environmental subsequently surveyed the pond in 2000 and confirmed the presence of the non-native variable milfoil (Myriophyllum heterophyllum). The Aquatic Life Use of Griswold Pond continues to be assessed as not supporting due to the presence of non-native aquatic macrophytes. The Non-Native Aquatic Plants cause is being retained to cover the variable milfoil (Myriophyllum heterophyllum) impairment (no species specific code is available) and Fanwort (Cabomba caroliniana) is being added.

Haskell Pond (MA93031)

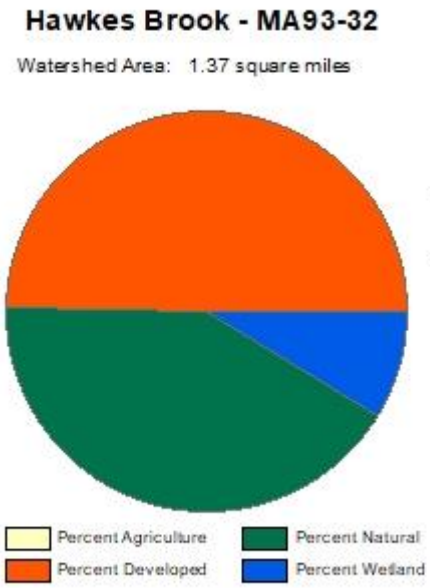
Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	58 ACRES
Classification/Qualifier:	A: PWS, ORW

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
3	4c	(Fish Passage Barrier*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
According to DMF biologists there is a significant barrier to diadromous fish passage at the Haskell Pond Dam in Gloucester. It does not allow any passage (passage score 10), but there is also no existing fish run (population score 0 out of 10). A dam downsteam on Walker Creek (MA93-61) at Forest Lane also does not permit any passage (passage score 10), and there is again no existing fish run (population score 0 out of 10). The targeted diadromous species for passage at these two locations are river herring and American eel. A short way downstream, the Route 133 culvert also blocks fish passage, in effect serving as the upstream extent of fish migration (passage score 10) although here there is a small run present (population score 1 out of 10) of rainbow smelt and American eel. The Aquatic Life Use for Haskell Pond is assessed as Not Supporting based on the presence of fish passage barriers for diadromous fish.

Hawkes Brook (MA93-32)

Location:	Headwaters near the Lynn/Lynnfield border to the inlet of Hawkes Pond, Lynnfield.
AU Type:	RIVER
AU Size:	2.6 MILES
Classification/Qualifier:	A: PWS, ORW (Tributary)



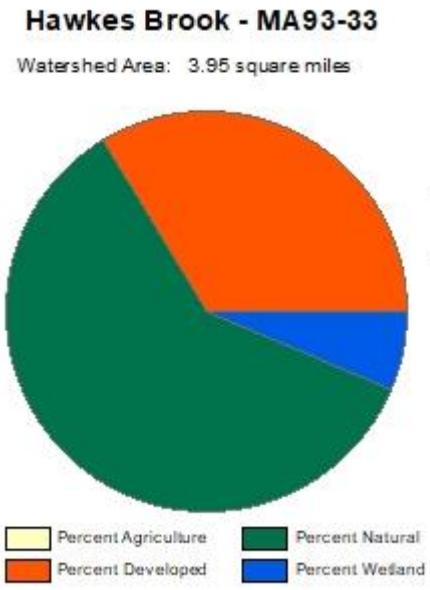
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.37	1.37	0.55	0.55
Agriculture	0%	0%	0%	0%
Developed	49.7%	49.7%	42.3%	42.3%
Natural	41.6%	41.6%	43.3%	43.3%
Wetland	8.7%	8.7%	14.4%	14.4%
Impervious Cover	21.7%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
DFG biologists conducted backpack electrofishing End of Timberhill Terrace, off Timberhill Lane, Lynnfield) (SampleID 4021) which is near the middle portion of this Hawkes Brook AU (MA93-32) in July 2012. The sample was dominated by the moderately tolerant redfin pickerel. Near the downstream end of the AU, MassDEP biologists also conducted backpack electrofishing (Sample P0125, north of Hawkes Pond, upstream from Salem St./Rt. 129, Lynnfield) in September 2007. This sample was dominated by young of the year yellow perch (a moderately tolerant species), but also included a number of redfin pickerel. MassDEP staff also conducted water quality monitoring in the brook north of Hawkes Pond, Salem Street/Route 129, Lynnfield (W0436) during the summer of 2007. A multiprobe was deployed for two 5-day periods, one 4-day period and one 2-day period. Dissolved oxygen levels were good with daily mean minimum for the four deployments ranging from 6.72 to 8.69 mg/L. Daily shifts in DO were all below 2 mg/L and saturations were not elevated (max saturation 88%). The maximum temperature recorded by the multiprobes was 21.9°C and there was no violation of warm water fishery criteria. Attended probe data and grab samples were taken at the site as well. DO was above 6.0 mg/L for all attended samples. Temperatures did not exceed warm water criteria. There were no ammonia violations, and no excursions in pH (range of 7.0 - 7.3SU). Total phosphorous was slightly elevated (seasonal average 0.062mg/L) for a flowing water entering a reservoir (guidance 0.05 mg/L). The maximum total phosphorus concentration was 0.11 mg/L, however, there were no observations of any excessive filamentous algae.

The Aquatic Life Use of this Hawkes Brook AU (MA93-32) is assessed as Fully Supporting based on fish population and water quality data. An Alert Status is being added for elevated total phosphorus.

Hawkes Brook (MA93-33)

Location:	From outlet of Hawkes Pond, Saugus to mouth at confluence with Saugus River, Saugus.
AU Type:	RIVER
AU Size:	1.1 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.95	3.95	1.65	1.65
Agriculture	0.1%	0.1%	0.1%	0.1%
Developed	33.6%	33.6%	26.8%	26.8%
Natural	59.9%	59.9%	62.4%	62.4%
Wetland	6.4%	6.4%	10.7%	10.7%
Impervious Cover	16.5%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Benthic Macroinvertebrates		Added
4a	5	Dissolved Oxygen		Added
4a	5	Trash		Changed

Fish, other Aquatic Life and Wildlife Use: Not Supporting

MassDEP surveyed water quality of Hawkes Brook at station W0435 [south of Hawkes Pond, Spring Street, Saugus] during summer 2007. A multiprobe was deployed for two 5-day periods. The DO concentrations from these two deployments were low (the means of the daily minimum concentrations were 4.7 mg/L in June and 4.8 mg/L in August, with minimum concentrations of 3.5 and 4.0 mg/L, respectively). Diel shifts in DO were less than 2.6 mg/L for both deployments and the maximum saturation was 75.3%. Low oxygen levels may also have been influenced by pre-drought conditions, as a Drought Advisory was issued October 1st, 2007. Temperatures were also recorded throughout the deployments and did not violate warm water criteria; the maximum temperature was 21.4°C. Attended probes measurements and grab samples were collected at station W0435 during the sampling season as well. Dissolved oxygen readings were obtained on 8 occasions with 2

measurements <5.0 mg/L but greater than 4.0 mg/L. Discrete temperature readings did not fail warm water criteria. There were no ammonia or pH violations. The average total phosphorus was 0.044 mg/L and the maximum total phosphorus was 0.066 mg/L. There were no observations of excessive filamentous algae. A benthic sample was collected a short way downstream (B0617, approximately 50 meters downstream/west of Walnut Street, Saugus) in June 2007. The RBPIII status was determined to be "Moderately Impaired" or 42% comparable when compared to the Alewife Brook reference. The sample was lacking in sensitive EPT taxa, had low affinity with the reference, and had an elevated percent dominance by the amphipod, *Gammarus* sp.
The Aquatic Life Use of Hawkes Brook is assessed as Not Supporting based on the moderately impaired benthic community and low DO documented during the summer of 2007.

Hawkes Pond (MA93032)

Location:	Lynnfield/Saugus.
AU Type:	FRESHWATER LAKE
AU Size:	65 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Lake Quannapowitt (MA93060)

Location:	Wakefield.
AU Type:	FRESHWATER LAKE
AU Size:	246 ACRES
Classification/Qualifier:	A: PWS, ORW (Tributary)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

The Aquatic Life Use of Lake Quannapowitt was previously listed as Not Supporting due to Harmful Algal Blooms, Non-Native Aquatic Plants, and Turbidity. Since the last assessment, the lake continued to have severe problems with Harmful Algal Blooms, and was posted for 138 days in 2009, 65 days in 2010, and 70 days in 2013. The basis for the non-native impairment was reviewed. The fieldsheet from the 1997 synoptic survey of Lake Quannapowitt conducted by MassDEP staff includes the following: "*Potamogeton crispus* noted in past surveys." According to DMF biologists, the Lake Quannapowitt Dam permits no passage of river herring and American eel from the Saugus River MA93-34 (passage score 10, population score 1). Their notes indicate that "major watershed alterations limit potential to get herring close to dam." There are no recent water quality data with which to provide an update on the status of turbidity in the lake.
The Aquatic Life Use for Lake Quannapowitt will continue to be assessed as Not Supporting with the Turbidity and Harmful Algal Blooms impairments being carried forward. The Non-Native Aquatic Plants impairment is being delisted and replaced with the species specific impairment, Curly-leaf Pondweed (*Potamogeton crispus*). A new impairment for Fish Passage Barrier is being added since the Lake Quannapowitt Dam does not permit passage of diadromous fish.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Non-Native Aquatic Plants	Clarification of listing cause	The generic "Non-Native Aquatic Plants" is being delisted and replaced with the specific macrophyte Potamogeton crispus (curly-leaf pondweed).

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Data Sources:
(MassDEP 2007b) North Shore Coastal Watersheds 2002 Water Quality Assessment Report
(MassDEP 1997) North Coastal Watershed Lake Survey Data, 1997

The fieldsheet from the 1997 synoptic survey of Lake Quannapowitt conducted by MassDEP staff includes the following: "Potamogeton crispus noted in past surveys" (MassDEP 1997). The generic "Non-Native Aquatic Plants" impairment is being delisted and replaced with the specific macrophyte *Potamogeton crispus* (curly-leaf pondweed).

Lily Pond (MA93039)

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

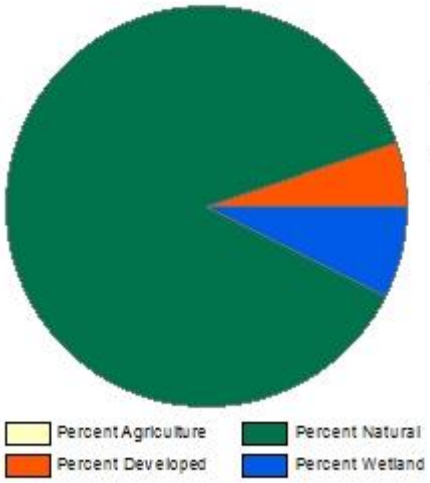
Fish, other Aquatic Life and Wildlife Use: Insufficient Information
At the Lily Pond Dam, the wooden Denil ladder was replaced with an Alaska steeppass fishway in 2017. According to DMF biologists, the dam still acts as a minor obstruction to river herring and American eel (passage score 3 out of 10 with 10 indicating no possible passage) with flow the limiting factor (population score 4 out of 10 with 0 indicating no run is present). Too limited data are available to assess the Aquatic Life Use for Lily Pond, so it is assessed as having Insufficient Information.

Little River (MA93-66)

Location:	Headwaters outlet Lily Pond, Gloucester to salt water portion north at Route 133, Gloucester.
AU Type:	RIVER
AU Size:	0.5 MILES
Classification/Qualifier:	B

Little River - MA93-66

Watershed Area: 1.64 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.64	1.64	0.74	0.74
Agriculture	0%	0%	0%	0%
Developed	5.14%	5.14%	6.74%	6.74%
Natural	87.47%	87.47%	84.86%	84.86%
Wetland	7.39%	7.39%	8.41%	8.41%
Impervious Cover	2.79%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information
At the upstream end of this Little River AU (MA93-66), the wooden Denil ladder at the Lily Pond Dam was replaced with an Alaska steeppass fishway in 2017. According to DMF biologists, the dam still acts as a minor obstruction to river herring and American eel (passage score 3 of 10) with flow the limiting factor (population score 4 out of 10). The fishway at the Water Treatment Plant at the downstream end of the AU was removed in 2016 but there was no change to the passage score (passage score 2 out of 10) due to the limited flow. There are too limited data/information available to assess the Aquatic Life Use of this Little River AU (MA93-66) so it is assessed as having Insufficient Information).

Little River (MA93-67)

Location:	From salt water portion north at Route 133, Gloucester to mouth at confluence with Annisquam River, Gloucester.
AU Type:	ESTUARY
AU Size:	0.19 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Little River AU (MA93-67) is Not Assessed.

Lower Pond (MA93044)

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

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

Lynn Harbor (MA93-52)

Location:	The "inner" portion of Lynn Harbor; the waters landward of an imaginary line drawn from Black Rock Point, Nahant to the eastern edge of Point of Pines, Revere excluding the Saugus River (formerly part of 2006 segment: Lynn Harbor MA93-23).
AU Type:	ESTUARY
AU Size:	1.62 SQUARE MILES
Classification/Qualifier:	SB: SFR, CSO

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 20.6% of the inner portion of Lynn Harbor was covered in eelgrass beds (with two main beds spanning the border between the inner and outer portions of the harbor which are separate AUs). Between 1995 and 2013 there was no clear pattern in the growth or decline in the size of eelgrass beds. A 10% decrease in the size of the beds in 2007 was more than made up for by an 8.9% increase (compared to the 1995 coverage) in 2013. By 2017, eelgrass beds had decreased by roughly 56.1% of their coverage documented in 1995. However, the part of the beds in the outer portion of Lynn Harbor (MA93-53) appeared to increase in size over the same period. The Lynn Water and Sewer Commission is authorized under NPDES permit MA0100552 (issued 30 March 2007) to regularly discharge effluent from the Lynn Regional Wastewater Treatment Facility via outfall 001 to Lynn Outer Harbor (MA93-53). When effluent flows exceed the hydraulic capacity of outfall 001 (at least 60 MGD), the permittee is authorized to discharge effluent from outfall 002 to the Lynn Inner Harbor (MA93-52). No Whole Effluent Toxicity testing is required on the discharge from outfall 002. While the part of the eelgrass beds in the inner portion of Lynn Harbor (MA93-52) decreased in size between 1995 and 2017, the part in the contiguous AU increased in size over the same period so there is insufficient information to assess the Aquatic Life Use of Lynn Harbor (MA93-52). An alert is being issued due to the significant decrease in size of the eelgrass beds.

Lynn Harbor (MA93-53)

Location:	The "outer" portion of Lynn Harbor into Broad Sound; the waters landward of an imaginary line drawn from Baileys Hill, Nahant to the eastern point of Winthrop Highlands, Winthrop to the seaward edge of the "inner" portion of Lynn Harbor (at an imaginary line drawn from Black Rock Point, Nahant to the eastern edge of Point of Pines, Revere) (formerly part of 2006 segment: Lynn Harbor MA93-23).
AU Type:	ESTUARY
AU Size:	6.57 SQUARE MILES
Classification/Qualifier:	SB: SFR, CSO

Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 12.25% of the outer portion of Lynn Harbor was covered in eelgrass beds. From 1995 to 2001 there was a decrease in the size of eelgrass beds of 16.34%. Eelgrass beds increased in size through 2017 with a net gain of 4.06% in comparison with the 1995 baseline. Note, however, that the contiguous eelgrass beds in the inner Lynn Harbor AU (MA93-52) decreased by roughly 56.1% over the same period. The Lynn Water and Sewer Commission is authorized under NPDES permit MA0100552 (issued 30 March 2007) to regularly discharge effluent from the Lynn Regional Wastewater Treatment Facility via outfall 001 to Lynn Outer Harbor (MA93-53). When effluent flows exceed the hydraulic capacity of outfall 001 (at least 60 MGD), the permittee is authorized to discharge effluent from outfall 002 to the Lynn Inner Harbor (MA93-52). The average monthly flow limit for 001 is 25.8 MGD. The permit requires both acute and chronic whole effluent toxicity testing 4 times per year. The LC_{50} limit is ≥100% and the chronic C-NOEC limit is ≥5.26%. Whole effluent toxicity tests were conducted on the Lynn Regional Wastewater Treatment Facility effluent between March 2005 and December 2018. The LC_{50}s of definitive acute WET tests using *Mysidopsis bahia* were generally ≥100% effluent (n=10) with only one exception (97.9% effluent). Chronic (and modified acute) tests utilizing *Menidia beryllina* had LC_{50}s ranging from 62.5% to ≥100% effluent, with 7 of 54 tests below the permit limit of 100% effluent. Three of these tests occurred recently, in December 2017 (62.5% effluent), June 2018 (75.4% effluent), and September 2018 (91.2% effluent). The C-NOECs for *Menidia beryllina* ranged from <3.12% to ≥100% effluent with only one test below the limit of ≥5.26% effluent. The Aquatic Life Use for the outer portion of Lynn Harbor (MA93-53) is assessed as Fully Supporting based on the presence of eelgrass beds that slightly increased in size between 1995 and 2017. Since the contiguous beds in the inner Lynn Harbor AU (MA93-52) decreased over the same period, the Alert is being carried forward as well as for the presence of occasional acute toxicity in the Lynn Regional Wastewater Treatment Facility effluent.

Manchester Harbor (MA93-19)

Location:	The waters landward of an imaginary line drawn between Gales Point, Manchester and Chubb Point, Manchester excluding Cat Brook.
AU Type:	ESTUARY
AU Size:	0.33 SQUARE MILES
Classification/Qualifier:	SB: SFR

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 43% of Manchester Harbor had eelgrass. In 2007 a complete loss in eelgrass beds was observed. In following years, the eelgrass beds rebounded significantly. Between 1995 and 2017 there was a net loss in the total coverage of eelgrass beds of 7.12%. The Aquatic Life Use of Manchester Harbor is assessed as Fully Supporting based on the fairly stable presence of eelgrass bed habitat between 1995 and 2017 (loss only 7%).

Marblehead Harbor (MA93-22)

Location:	The waters landward of an imaginary line drawn northwesterly from the northern tip of Marblehead Neck, Marblehead to Fort Sewall, Marblehead.
AU Type:	ESTUARY
AU Size:	0.57 SQUARE MILES
Classification/Qualifier:	SA: SFO

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Estuarine Bioassessments		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 7.1% of Marblehead harbor had eelgrass. In 2007 a total loss of eelgrass beds was observed. Though there was some recovery in subsequent years, by 2017 the percent coverage had increased to 5.7% coverage of the harbor, a decrease of 20.4% from the 1995 baseline condition. The Aquatic Life Use of Marblehead Harbor is assessed as Not Supporting based on the loss of eelgrass bed habitat between 1995 and 2017 (~20%) so an Estuarine Bioassessments impairment is being added and the former alert is being removed.

Mill Pond (MA93-60)

Location:	East of Route 127, Gloucester (formerly reported as 2014 lake segment: Mill Pond MA93050).
AU Type:	ESTUARY
AU Size:	0.03 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
According to DMF biologists there is a significant barrier to fish passage at the Mill Pond Dam (passage score 10 indicating no possible passage) but there is limited potential due to saltwater intrusion. Target species for passage would be river herring and American eel but the present population score is 0 out of 10). The Aquatic Life Use for Mill Pond (MA93-60) is Not Assessed.

Mill River (MA93-28)

Location:	Headwaters, outlet Mill Pond, Gloucester to mouth at confluence with Annisquam River, Gloucester.
AU Type:	ESTUARY
AU Size:	0.1 SQUARE MILES
Classification/Qualifier:	SA: SFO

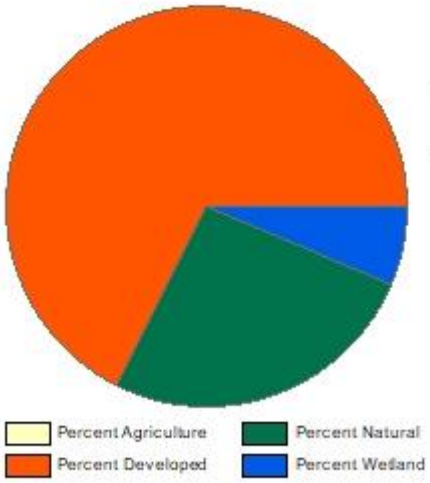
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Mill River AU (MA93-28) is Not Assessed.

Mill River (MA93-31)

Location:	Headwaters in wetlands north of Salem Street, Wakefield to mouth at confluence with Saugus River, Wakefield.
AU Type:	RIVER
AU Size:	2 MILES
Classification/Qualifier:	B

Mill River - MA93-31

Watershed Area: 3.44 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.44	3.44	0.65	0.65
Agriculture	0%	0%	0%	0%
Developed	67.7%	67.7%	54.6%	54.6%
Natural	26%	26%	30%	30%
Wetland	6.4%	6.4%	15.4%	15.4%
Impervious Cover	34.5%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Total Suspended Solids (TSS)		Removed

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
The Town of Wakefield New Broadway Water Treatment Plant has an NPDES general permit which requires Whole Effluent Toxicity testing at the request of USEPA or MassDEP although no WET testing data are available currently. The Wakefield Corporation and Spirit, Inc. previously held NPDES permits to discharge non-contact cooling water to the Wakefield Brook tributary (not an AU) and this Mill River AU (MA93-31), respectively, but both permits have been terminated. Water quality monitoring was conducted in the Mill River at Farm Street (south off of Route 129), Wakefield (W0437) by MassDEP staff during summer of 2007. A multiprobe was deployed for one 3-day period and two 5-day periods. These data indicated that DO concentrations remain poor, with daily mean minimum concentrations below 5 mg/L for all deployments (3.17-4.43 mg/L) and diel DO shifts ranging from 3.70 to 4.62 mg/L, which may indicate enrichment although the maximum DO saturation was only 100%. Temperatures were also recorded throughout the probe deployment with a maximum temperature of 26.1° and there were no exceedances of warm water criteria. Attended probe data and grab samples were taken at the site as well. DO was below 5 mg/L for 3 of the eight attended measurements, ranging

from 3.4 mg/L to 9.4 mg/L. None of the temperature readings failed warm water criteria. There were no ammonia, pH or total phosphorus violations. Of note, the seasonal average total phosphorous was 0.065mg/L (maximum 0.11mg/L) (n=5). During the 2007 sampling season, one 4-day average specific conductance measurement of 995 µs/cm (1.10 TU) exceeded the chronic criterion for estimated chloride plus the 10% margin of error needed to account for the cumulative uncertainty in the model (994 µs/cm). Two of seven additional independent measurements exceeded 1.0 TU but were within the 10% margin or error. Chloride data are needed to assess whether the stream should be impaired. The Aquatic Life Use for the Mill River (MA93-31) will continue to be assessed as Not Supporting because of low dissolved oxygen. An Alert for elevated chloride is being identified. This Mill River AU (MA93-31) was also previously listed impaired for turbidity but this impairment should be identified for the Aesthetics and Primary and Secondary Contact Recreational uses not the Aquatic Life Use. The total suspended solids impairment is an error and should be removed.
Primary Contact Recreation Use: Not Supporting
Turbidity was initially identified as an Aesthetic and Recreational Use impairment in the 1998 WQAR based on visual turbidity and gray appearance of water column noted on two occasions in the summer of 1997. Turbidity was erroneously applied to the Aquatic Life Use so is being corrected/applied as an impairment for the Primary Contact Recreational Use. The former alert for turbidity is being removed.
Secondary Contact Recreation Use: Not Supporting
Turbidity was initially identified as an Aesthetic and Recreational Use impairment in the 1998 WQAR based on visual turbidity and gray appearance of water column noted on two occasions in the summer of 1997. Turbidity was erroneously applied to the Aquatic Life Use so is being corrected/applied as an impairment for the Secondary Contact Recreational Use. The former alert for turbidity is being removed.
Aesthetic Use: Not Supporting (Alert)
Turbidity was initially identified as an Aesthetic and Recreational Use impairment in the 1998 WQAR based on visual turbidity and gray appearance of water column noted on two occasions in the summer of 1997. Turbidity was erroneously applied to the Aquatic Life Use so is being corrected/applied as an impairment for the Aesthetics Use. The former alert for turbidity is being removed.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Total Suspended Solids (TSS)	Applicable WQS attained; original basis for listing was incorrect	Total suspended solids (TSS) was incorrectly identified as an impairment for this Mill River AU (MA93-31) during the 2002 reporting cycle. TSS sampling in the river during the six surveys conducted between June 1997 and January 1998 ranged from 1.2 to 29mg/L with only one measurement >3.8mg/L at that time. It was erroneously identified as an impairment for the Aquatic Life Use (similar to turbidity at that time) but this was an error. No TSS data were collected in the summer of 2002. During the summer of 2007 TSS ranged from 2.5 mg/L to 19 mg/L with two measurements above 10 mg/L after wet weather conditions but these data do not exceed impairment decision guidelines either so the TSS impairment should be removed.

Supporting Information for Delisted Impairments

Total Suspended Solids (TSS)

MassDEP staff conducted water quality surveys of the Mill River at Farm Street (south off of Route 129), Wakefield (W0437). Results of the turbidity and TSS data from the Tech Memo on the 2007 North Coastal Water Quality monitoring are as follows: (MassDEP 2012)

Water Body	Unique ID	Sample OWMID	Sample Date	Sample Time	Flow Condition	Analyte	Units	Result	Result Qualifiers
MILL RIVER	W0437	93-0601	5/1/2007	9:38:00 AM	Flowing	Turbidity	NTU	2.2	
MILL RIVER	W0437	93-0708	6/5/2007	9:25:00 AM	Flowing	Turbidity	NTU	8.6	
MILL RIVER	W0437	93-0812	7/10/2007	9:50:00 AM	Flowing	Turbidity	NTU	15.0	
MILL RIVER	W0437	93-0898	8/14/2007	9:00:00 AM	Flowing	Turbidity	NTU	7.4	
MILL RIVER	W0437	93-1006	9/18/2007	9:39:00 AM	Flowing	Turbidity	NTU	8.2	b

Water Body	Unique ID	Sample OWMID	Sample Date	Sample Time	Flow Condition	Analyte	Units	Result	Result Qualifiers
MILL RIVER	W0437	93-0601	5/1/2007	9:38:00 AM	Flowing	Suspended Solids	mg/L	2.5	
MILL RIVER	W0437	93-0708	6/5/2007	9:25:00 AM	Flowing	Suspended Solids	mg/L	13	
MILL RIVER	W0437	93-0812	7/10/2007	9:50:00 AM	Flowing	Suspended Solids	mg/L	19	
MILL RIVER	W0437	93-0898	8/14/2007	9:00:00 AM	Flowing	Suspended Solids	mg/L	4.3	
MILL RIVER	W0437	93-1006	9/18/2007	9:39:00 AM	Flowing	Suspended Solids	mg/L	3.0	

Survey conditions on July 10th 2007 were collected shortly after several days of rain so considered representative of wet weather conditions. (MassDEP 2012)

Table 3. The precipitation totals (inches) and daily average discharge (cubic feet per second) for five days prior to and each DWM 2007 North Shore Coastal Watersheds survey date (USGS 2012a) (NOAA 2012).

Note: The percent of time that the daily average discharge was equaled or exceeded over the entire period of record at each stream gage are also provided (percent exceeded). Shaded dates indicate the deployment of multiprobes and large bold dates indicate collection of water samples.

	Precipitation		Discharge (Percent Exceeded)
Date	Reading, MA	Beverly, MA Municipal Airport	01102345 Saugus River at Saugus Ironworks at Saugus, MA
05/29/07	0.00	0.00	36 (32.0)
05/30/07	0.00	0.00	34 (34.1)
05/31/07	0.00	0.00	32 (36.0)
06/01/07	0.00	0.00	27 (42.3)
06/02/07	0.03	0.00	23 (46.9)
06/03/07	0.05	0.04	22 (48.3)
06/04/07	2.04	2.07	69 (12.4)
06/05/07	0.00	0.00	99 (6.0)
06/06/07	0.00	0.00	64 (13.9)
07/01/07	0.22	0.16	7.5 (76.9)
07/02/07	0.00	0.00	4.7 (85.2)
07/03/07	0.00	0.00	4.0 (87.7)
07/04/07	0.14	0.16	3.6 (89.1)
07/05/07	0.83	0.82	12 (66.6)
07/06/07	0.23	0.02	9.9 (70.8)
07/07/07	0.00	0.00	6.1 (80.4)
07/08/07	0.07	0.16	5.1 (83.6)
07/09/07	0.12	0.39	8.8 (73.3)
07/10/07	0.00	0.00	7.9 (75.4)
07/11/07	0.00	0.03	5.5 (82.3)

The total suspended solids impairment is being delisting to correct the original listing error.

Nahant Bay (MA93-24)

Location:	The waters landward of an imaginary line drawn between Galloupes Point, Swampscott and East Point, Nahant.
AU Type:	ESTUARY
AU Size:	5.12 SQUARE MILES
Classification/Qualifier:	SA: SFO, CSO

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
Eelgrass is considered a sentinel species for embayment health. Between 1995 and 2007 the MassDEP Eelgrass Mapping Project documented a hundred percent loss of the eelgrass bed in Nahant Bay. However, in subsequent years an increase in size of the eelgrass bed was documented. Between 1995 and 2013 there was a 104.44% increase in the size of the eelgrass bed and between 1995 and 2017 there was a 391.53% increase in size of the eelgrass bed. The Lynn Water and Sewer Commission is authorized under NPDES permit MA0100552 (issued 30 March 2007) to discharge via CSO 006 directly to Nahant Bay, while the main outfall 001 for the Lynn Regional Wastewater Treatment Facility discharges treated effluent to Lynn Outer Harbor. No Whole Effluent Toxicity testing is required on the discharge from CSO 006. The Lynn Regional Wastewater Treatment Facility staff collected water from Nahant Bay, off the pier at Fishermans Beach, Swampscott for use as dilution water in the facility's whole effluent toxicity tests. Between March 2005 and December 2018 survival of *Mysidopsis bahia* in definitive acute toxicity tests (48 hours) was ≥90% (n=10). In modified acute toxicity tests survival of *Menidia beryllina* was also ≥88% (n=55). For chronic tests (~7 days) *Menidia beryllina* survival at the end of test was ≥78% (n=55). The Aquatic Life Use for Nahant Bay is assessed as Fully Supporting based on the presence of stable/increasing eelgrass bed habitat between 1995 and 2017 and the good survival of test organisms exposed to water from Nahant Bay.

Niles Pond (MA93052)

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

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

North River (MA93-42)

Location:	Downstream of Route 114 bridge (Proctor Brook becomes North River at this bridge), Salem to mouth at confluence with Danvers River and Beverly Harbor, Salem (formerly part of 1998 segment: North River MA93-06).
AU Type:	ESTUARY
AU Size:	0.15 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No recent data are available, so the Aquatic Life Use of the North River will continue to be assessed as Not Supporting with the unionized ammonia and dissolved oxygen supersaturation impairments being carried forward.

Pillings Pond (MA93056)

Location:	Lynnfield.
AU Type:	FRESHWATER LAKE
AU Size:	90 ACRES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No recent data are available for Pillings Pond so the Aquatic Life Use will continue to be assessed as Not Supporting with the algae, chlorophyll- a, dissolved oxygen, dissolved oxygen supersaturation, and total phosphorus impairments being carried forward.

Pines River (MA93-15)

Location:	Headwaters east of Route 1, Revere/Saugus to mouth at confluence with the Saugus River and Lynn Harbor, Saugus/Revere (portion formerly reported as 2002 lake segment: Seaplane Basin MA93067).
AU Type:	ESTUARY
AU Size:	0.58 SQUARE MILES
Classification/Qualifier:	SB: ORW, SFR

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Pines River is Not Assessed.

Porter River (MA93-04)

Location:	Headwaters, confluence with Frost Fish Brook, Route 62, Danvers to mouth at confluence with Danvers River, Danvers (through former 2002 segment: Porters Pond MA93058).
AU Type:	ESTUARY
AU Size:	0.13 SQUARE MILES
Classification/Qualifier:	SA: SFO

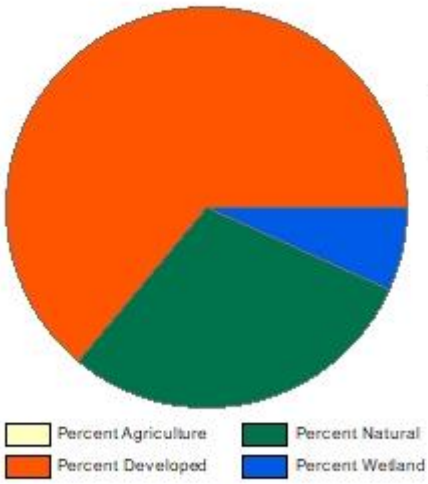
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Porter River is Not Assessed.

Proctor Brook (MA93-39)

Location:	Headwaters, outlet small pond in wetland north of Downing Road, Peabody to Grove/Goodhue Street bridge, Salem (formerly part of 1998 segment: North River MA93-06) (interrupted urban).
AU Type:	RIVER
AU Size:	2.9 MILES
Classification/Qualifier:	B

Proctor Brook - MA 93-39

Watershed Area: 10.91 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	10.91	7.44	2.83	2.23
Agriculture	0.7%	0.7%	0.4%	0.5%
Developed	63.6%	66.7%	49.6%	51.8%
Natural	29.1%	27.1%	35.1%	36%
Wetland	6.6%	5.4%	15%	11.7%
Impervious Cover	31.1%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
DFG biologists conducted backpack electrofishing in this Proctor Brook AU (MA93-39) upstream of Endicot St, Peabody (SampleID 2573) in June 2008. The sample contained mainly American eel and only tolerant macrohabitat generalist species. On the same date but further downstream, upstream of the Caller St crossing, Peabody (2575), DFG biologists also collected mainly American eel, as well as one moderately tolerant pumpkinseed. About 60 m downstream of Caller St, MassDEP biologists conducted benthic sampling in July 2010 (B0681) as well as backpack electrofishing in August 2010 (SampleID 4558). The RBPIII analysis indicated "moderately impaired" (30% comparable) conditions when compared to the Johnson Creek reference (Station B0688 in the Merrimack basin). This fish sample was comprised primaily by American eel and golden shiner, with an individual pumpkinseed. As noted during prior surveys, sedimentation/siltation remained a problem. Water quality sampling by MassDEP staff during the summer os 2010 (W2151) included deployment of multiprobes for one 3-day period and two 5-day periods. The mean of the daily DO minimum was ≥6.25 mg/L,

maximum DO diel shift ≤3.23 mg/L, maximum DO saturation 116%, maximum temperature 24.4 °C). A thermistor was deployed for 118 days beginning on May 28th and there were no violations of warm water criteria (maximum temperature 26.6 °C). Attended probe and grab sample data for temperature, pH, DO, ammonia, total phosphorus, and metals did not violate any of their applicable criteria (seasonal average total phosphorus concentration 0.03mg/L (maximum 0.039 mg/L) (n=4) and there were no exceedances of any acute or chronic metals criteria or observations of excessive filamentous algae. Total Nitrogen concentrations ranged from 0.70 to 1.7 mg/L (n=4). A short way downstream at the Howley Street crossing (W0453), MassDEP staff conducted a water quality survey during summer 2007. A multiprobe was deployed for two 5-day periods and one 2-day period, recording data generally indicative of good conditions in this location as well (mean of the daily DO minimum ≥5.93 mg/L, maximum DO diel shift ≤3.37 mg/L, maximum DO saturation 104%, maximum temperature 24.1 °C). Attended probe and grab sample data for temperature, pH, DO, ammonia, and total phosphorus did not violate any of their applicable criteria. Of note, the seasonal TP average/maximum concentrations were 0036/0.052 mg/L (n=5) and there were no observations of excessive filamentous algae. Total nitrogen ranged from 1.16 to 1.6 mg/L (n=5). Downstream of Howley St, MassDEP staff conducted a fish population survey in October 2007). Among hundreds of tolerant mummichog either collected or observed, two moderately tolerant ninespine stickleback were captured. There are no longer active NPDES discharges to Proctor brook, but the Eastman Gelatin Corporation is permitted to discharge to Goldthwait Brook which flows into Proctor Brook.

The Aquatic Life Use of this Proctor Brook AU (MA93-39) will continue to be assessed as Not Supporting with the benthic macroinvertebrate bioassessment, sedimentation/siltation, total nitrogen, and total phosphorus impairments being carried forward. An Alert is being identified since there was only a low proportion of moderately tolerant fish species in the four samples collected in this low gradient brook.

Proctor Brook (MA93-40)

Location:	From Grove/Goodhue Street bridge, Salem to mouth at Route 114 culvert, Salem (formerly part of 1998 segment: North River MA93-06).
AU Type:	ESTUARY
AU Size:	0.01 SQUARE MILES
Classification/Qualifier:	SA: SFO

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Proctor Brook AU (MA93-40) is Not Assessed.

Quarry Reservoir (MA93053)

Location:	Rockport.
AU Type:	FRESHWATER LAKE
AU Size:	7 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Rockport Harbor (MA93-57)

Location:	Waters landward of an imaginary line from Gully Point, Rockport to Granite Pier, Rockport (including Back Harbor and a portion of Sandy Bay) (area includes former 2010 segment: Rockport Harbor MA93-17).
AU Type:	ESTUARY
AU Size:	0.35 SQUARE MILES
Classification/Qualifier:	SB: SFR

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project documented approximately 1.06% eelgrass coverage in Rockport Harbor. Between 1995 and 2001, there was roughly a 14.05% loss in the size of the eelgrass bed. By 2013 the bed had recovered a small amount, but in 2017 the mapping again documented a decrease. The net loss between 1995 and 2017 was 7.8% of the eelgrass bed. The Rockport Wastewater Treatment Facility currently has an NPDES permit (MA0100145) issued in May of 2020 which authorizes the facility to discharge 0.8 MGD (rolling average) of treated effluent through Outfall Serial Number 001 to Rockport Harbor, locally known as Sandy Bay. The facility is required to conduct acute whole effluent toxicity testing twice a year with an LC_{50} limit of ≥100% effluent. Surface water from Rockport Harbor was usually collected (sampling off of a boat) above the Rockport WWTF discharge for use as dilution water. In the case of inclement weather, water was collected outside of the Harbor, on the south side of Granite Pier in Sandy Bay. Between September 2005 and February 2018, survival of *M. beryllina* exposed (48 hours) to these ambient water samples ranged from 85 to 100% (n=25). The Rockport WWTF also met the LC_{50} limit of 100% effluent in all the WET tests conducted during this time (n=23 valid tests). The Aquatic Life Use for Rockport Harbor is assessed as Fully Supporting based on the good survival of test organisms exposed to water collected from the harbor as well as the farily stable presence of eelgrass bed habitat (net loss between 1995 and 2017 <10%).

Round Pond (MA93063)

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

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

Rum Rock Lake (MA93064)

Location:	Rockport.
AU Type:	FRESHWATER LAKE
AU Size:	10 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Rum Rock Lake is Not Assessed.

Salem Harbor (MA93-54)

Location:	Waters landward of an imaginary line from Naugus Head, Marblehead to the northwest point of Bakers Island, Salem to Hospital Point, Beverly to Juniper Point, Salem (excluding Forest River) (area includes former 2010 segment: Salem Harbor MA93-21 and part of former 2010 segment: Salem Sound MA93-25 [waterbody code 93907]).
AU Type:	ESTUARY
AU Size:	4.91 SQUARE MILES
Classification/Qualifier:	SB: SFR

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 3.69% of Salem Harbor was covered in eelgrass beds. The Aquatic Life Use has been previously assessed as impaired for Salem Harbor based on significant loss of eelgrass bed habitat since 1995. Between 1995 and 2017 there was a net 65.7% loss in eelgrass beds. Though there is a large overall loss between 1995 and 2017, there does appear to have been some growth in the size of the eelgrass bed since 2007, with coverage rising from 0.91% of the AU to 1.27% of the AU in 2017. The South Essex Sewerage District is authorized (NPDES Permit MA0100501 issued in May 2016 and modified in April 2017) to discharge an average monthly flow of 29.7 MGD of treated effluent from the SESD (WWTP) via outfall #001 to Salem Sound. The facility is a secondary wastewater treatment plant which discharges via a multiport diffuser approximately 1.4 miles offshore into Salem Sound. The prior permit required acute whole effluent toxicity testing (LC_{50}>100% limit) using *Mysidopsis bahia* and *Menidia beryllina* four times per year while the most recent permit additionally required chronic toxicity tests be conducted with *M. beryllina* and *Arbacia punculata* (CNOEC monitor only). The SESD staff collected water from Salem Harbor off the harbormaster's dock on Winter Island in Salem for use as dilution water in the facility's whole effluent toxicity tests. Between June 2006 and August 2018, survival of *M. bahia* and *M. beryllina* exposed (48 hours) to Salem Harbor water was ≥85% with the exception of the June 2013 test when *M. beryllina* survival was 43% (n=42 mysid tests and 53 menidia tests). Acute whole effluent toxicity tests were conducted on the SESD effluent between June 2006 and August 2018. The LC_{50}s using *M. bahia* were all ≥100% effluent (n=48 valid tests). The LC_{50}s using *M. beryllina* ranged from 57.3 to ≥100% effluent with LC_{50}s <100% in 12 of the 58 valid tests. The Aquatic Life Use of Salem Harbor will continue to be assessed as Not Supporting due to the loss of eelgrass bed habitat with the Estuarine Bioassessment impairment being carried forward (~66% loss between 1995 and 2017).

Salem Sound (MA93-55)

Location:	Northern portion of Salem Sound, waters landward of and within imaginary lines from Chubb Point, Manchester to Gales Point, Manchester to the northwest point of Bakers Island, Salem to Hospital Point, Beverly (formerly part of 2010 segment: Salem Sound MA93-25).
AU Type:	ESTUARY
AU Size:	3.46 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Fully Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project found that approximately 16.7% of the Salem Sound AU (MA93-55) had eelgrass bed habitat. In 2007 a complete loss of eelgrass beds was documented. By 2013 the eelgrass beds had rebounded substantially to 15.2% coverage and a bit more growth occurred by the time of the 2017 survey, with coverage estimated at 15.5%. Between 1995 and 2017 there was a net loss of 6.98% of the total coverage of eelgrass beds. The Manchester by the Sea Wastewater Treatment Plant is authorized by NPDES permit MA0100871 issued in June of 2011 to discharge treated effluent from outfall 001 to (Manchester Bay) Salem Sound MA93-55. The facility has a monthly flow limit from June to November of 0.67 MGD and a monthly limit from December through May of 1.2 MGD. The permit requires whole effluent toxicity testing twice a year with an LC50 limit of ≥50% effluent. The Manchester WWTP staff collected water from Salem Sound near Sauli Rock in the vicinity of the outfall pipe for use as dilution water in the facility's whole effluent toxicity tests. Between June 2006 and September 2018, survival of *M. beryllina* exposed (48 hours) to Salem Sound water ranged from 93 to 100% (n=26). Additionally, no acute toxicity was detected in *M. beryllina* in the 26 tests conducted between June 2006 and September 2018 on effluent from the Manchester WWTP (all LC50s and ANOECs were >100 and 100% effluent, respectively). All met the LC50>50% permit limit. The Aquatic Life Use of this Salem Sound AU (MA93-55) is assessed as Fully Supporting due to the presence of stable eelgrass bed habitat and the good survival of organisms exposed to Salem Sound water.

Salem Sound (MA93-56)

Location:	Southern portion of Salem Sound, waters landward of and within imaginary lines from Fort Sewall, Marblehead to the Marblehead Lighthouse on Marblehead Neck, Marblehead to the northwest point of Bakers Island, Salem to Naugus Head, Marblehead (formerly part of 2010 segment: Salem Sound MA93-25).
AU Type:	ESTUARY
AU Size:	2.55 SQUARE MILES
Classification/Qualifier:	SA: SFO

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Estuarine Bioassessments		Added

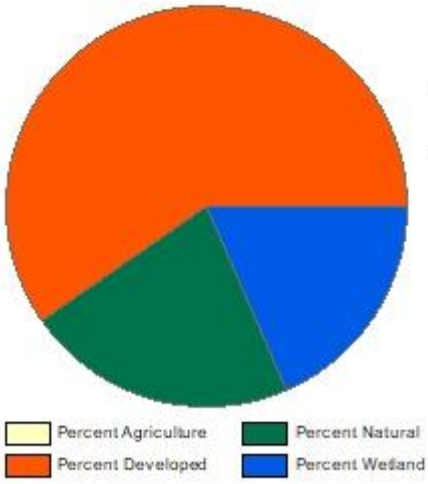
Fish, other Aquatic Life and Wildlife Use: Not Supporting
Eelgrass is considered a sentinel species for embayment health. In 1995 MassDEP's Eelgrass Mapping Project documented approximately 0.85% of the southern section of this Salem Sound AU (MA93-56) had eelgrass bed habitat. From 1995 to 2007 a 47.52% loss in the size of eelgrass beds was observed. By 2013 the beds had rebounded slightly, and percent coverage rose to 0.75%, holding fairly steady through 2017 when the size of the beds was measured at 0.74% coverage. The Aquatic Life Use of this Salem Sound AU (MA93-56) is assessed as Not Supporting based on the ~12.5% loss of eelgrass bed habitat (Estuarine Bioassessment impairment) between 1995 and 2017.

Saugus River (MA93-34)

Location:	Headwaters, outlet Lake Quannapowitt, Wakefield (thru Reedy Meadow) to Lynn Water & Sewer Commission diversion canal impoundment dam (Saugus River Dam, NAT ID: MA02276), Wakefield/Lynnfield (canal diverts to Hawkes Pond) (formerly part of 1998 segment: Saugus River MA93-13).
AU Type:	RIVER
AU Size:	3.1 MILES
Classification/Qualifier:	B: TWS

Saugus River - MA 93-34

Watershed Area: 10.99 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	10.99	9.13	1.84	1.69
Agriculture	0%	0.1%	0.1%	0.2%
Developed	59.7%	55.6%	42.3%	42.9%
Natural	21.9%	23.8%	19.7%	19.6%
Wetland	18.4%	20.5%	37.8%	37.3%
Impervious Cover	23.5%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
According to DMF biologists, the Lake Quannapowitt Dam permits no passage of river herring and American eel from the Saugus River (MA93-34) up into the lake (passage score 10, population score 1). Their notes indicate that "major watershed alterations limit potential to get herring close to dam." Under an individual NPDES permit (#MA0026247, issued 6 August 2019), New England Detroit Diesel – Allison, Incorporated, discharges stormwater runoff and non-contact cooling water via a surface drainage channel that drains to the Saugus River. A number of effluent characteristics must be monitored quarterly, but there is no requirement for whole effluent toxicity testing. Further downstream water quality monitoring was conducted in the Saugus River by MassDEP staff at Vernon Street/Main Street, Wakefield/Lynnfield (W0882) during the summer 2007. A

multiprobe was deployed for three 5-day periods and one 2-day period. Dissolved oxygen concentrations were poor here during all the deployments, with mean daily minima ranging from 3.58 to 4.44 mg/L, excluding the August deploy which had anomalous data). The maximum saturation was 70.1% and the diel shifts were below 3 mg/L, excluding the August deploy. The DO concentrations were a little worse later in the season as conditions approached those that would lead to a Drought Advisory being declared on October 1st. The maximum temperature recorded by the deployed probes was 22.8°C so no violations of warm water criteria. Attended probe and grab sample data (temperature, pH, ammonia) were generally indicative of good water quality. There were no ammonia violations and only very slight pH excursions (6.3-6.7 SU; n=9) that are considered natural (downstream of wooded swamp). While the seasonal average total phosphorus concentration was slightly elevated (0.078mg/L) exceeding the 0.05 mg/L criterion for a river entering an impoundment (maximum concentrations 0.11 mg/L) (n=5), there were no observations of excessive filamentous algae. Dissolved oxygen measurements were consistent with the continuous probe data (3.7-8.6 mg/L; n=8). At the downstream end of the AU, DMF biologists noted that improvements have been made to the Colonial Golf and Country Club Dam, including installation of a bottom opening sluice and an eel ramp in 2007. However, they indicated that the dam "is otherwise still impassable" and recently gave it a passage score of 7 out of 10 (severe impediment to passage of diadromous fish).

The Aquatic Life Use for this Saugus River AU (MA93-34) will continue to be assessed as Not Supporting with the physical substrate habitat alterations, total phosphorous, and the presence of fish passage barriers being carried forward. Although low DO concentrations at the Vernon Street crossing (W0882) may have been partially influenced by the upstream wetland and natural low-flow conditions occurring later in summer 2007, because the low concentrations were also measured early in the summer and the surrounding area is classified as urban, a new impairment for Dissolved Oxygen is being added. Upon review of historical data, it is apparent that the Total Nitrogen impairment was applied to this AU in error and is being delisted (see Removal Comment for rationale).

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Nitrogen, Total	Applicable WQS attained; original basis for listing was incorrect	"Nutrients" was originally listed as an impairment for Saugus River MA93-34 in 2002 based on ammonia-nitrogen and total phosphorus data collected at one site at the upstream end of the assessment unit (SR04, outlet Lake Quannapowitt – downstream/east at Main St, Wakefield (approx. 15 ft from road)) in 1997. Ammonia concentrations were measured at 0.66 mg/L and 0.93 mg/L on June 25th and July 29th, respectively. Subsequently, in 2008 the "Nutrients" code was converted to "Phosphorus (Total)" and "Nitrogen (Total)." It appears that the conversion to "Nitrogen (Total)" was an error since total nitrogen data were not collected as part of the original listing data set. Additionally, an evaluation of the 1997 data under 2018 CALM guidance concluded that the 1997 data were not in violation of the chronic or acute calculated site-specific ammonia criteria (the lower chronic ammonia criterion = 1.89 mg/L). More recently, MassDEP collected water quality data during summer 2007 roughly 0.6 miles downstream at station W0882 (Vernon Street/Main Street, Wakefield/Lynnfield). There were no violations of the ammonia-nitrogen site specific criteria (n=5; max = 0.17 mg/L). The 1997 data were collected during dry weather conditions with streamflow that was less than the mean

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
		monthly discharge of the prior five years at the Saugus Iron Works USGS gage. Discharge at the gage during the July/August/September 2007 sampling dates (3 of 5 dates) was exceeded by well over 50% of measurements. Most of the 2007 data can therefore be considered to have been collected under a similar flow regime to the original 1997 data. Because the original 1997 ammonia data which contributed to the "Nutrients" listing are not considered elevated under the 2018 CALM guidance and because the "Nutrients" cause was erroneously converted to "Nitrogen (Total)" (now called "Nitrogen, Total"), the "Nitrogen, Total" cause of impairment is being delisted for the Saugus River MA93-34 assessment unit.

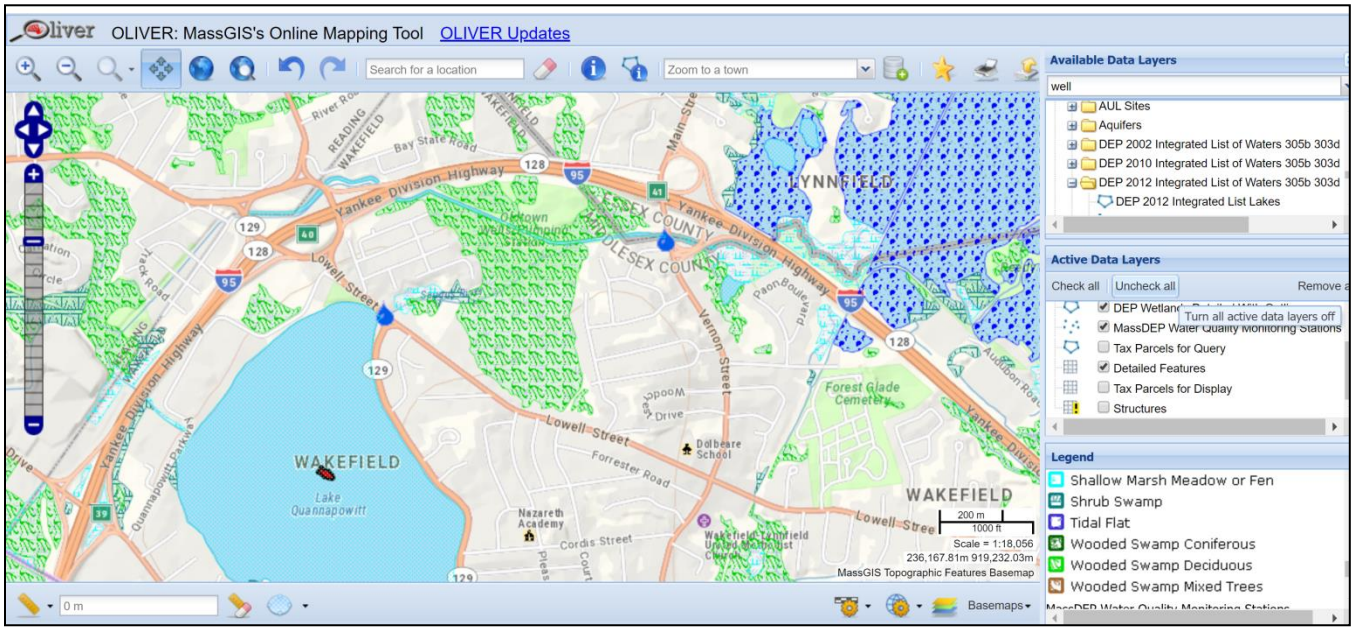
Supporting Information for Delisted Impairments

Nitrogen, Total

Data Source: (MassDEP Undated 3) Evaluation of 1997 ammonia-nitrogen data following guidance from the 2018 CALM

Site	Date	NH3-N	Temp	pH	Acute	Acute	Chronic	Acute Violation	Chronic Violation
		(mg/l)	(C)	(SU)	O. pres.	O. absent			
SR04	6/25/1997	0.66	21.4	6.6	19.4	19.4	1.91	no	no
SR04	7/29/1997	0.93	21.6	6.6	19.1	19.1	1.89	no	no

Data Source: (MassGIS Undated) Map depicting SR04 (1997 site), the water drop icon located immediately downstream of Lake Quannapowitt, and W0882 (2007 site), the water drop icon located at the Vernon Street crossing of the Saugus River



Data Sources:
(MassDEP 2012) Tech Memo North Shore Coastal Watersheds 2007 DWM Water Quality Monitoring Data and (MassDEP Undated 3) Open file analysis of DWM WPP water quality data collected between 2000 and 2014 using CALM guidance.

Nutrient sampling was conducted by MassDEP staff in the Saugus River at Vernon Street/Main Street, Wakefield/Lynnfield (W0882) on 5 occasions during the 2007 sampling season.

SR04A	W0882	93-0600	05/01/07	9:07	Ammonia-N	mg/L	0.13
SR04A	W0882	93-0706	06/05/07	8:50	Ammonia-N	mg/L	0.10
SR04A	W0882	93-0810	07/10/07	9:16	Ammonia-N	mg/L	0.13
SR04A	W0882	93-0896	08/14/07	8:28	Ammonia-N	mg/L	0.09
SR04A	W0882	93-1004	09/18/07	9:06	Ammonia-N	mg/L	0.17
SR04A	W0882	93-0600	05/01/07	9:07	Total Nitrogen	mg/L	1.5
SR04A	W0882	93-0706	06/05/07	8:50	Total Nitrogen	mg/L	1.3
SR04A	W0882	93-0810	07/10/07	9:16	Total Nitrogen	mg/L	1.1
SR04A	W0882	93-0896	08/14/07	8:28	Total Nitrogen	mg/L	0.94
SR04A	W0882	93-1004	09/18/07	9:06	Total Nitrogen	mg/L	1.1
SR04A	W0882	93-0600	05/01/07	9:07	Total Phosphorus	mg/L	0.034
SR04A	W0882	93-0706	06/05/07	8:50	Total Phosphorus	mg/L	0.11
SR04A	W0882	93-0810	07/10/07	9:16	Total Phosphorus	mg/L	0.081
SR04A	W0882	93-0896	08/14/07	8:28	Total Phosphorus	mg/L	0.10
SR04A	W0882	93-1004	09/18/07	9:06	Total Phosphorus	mg/L	0.067

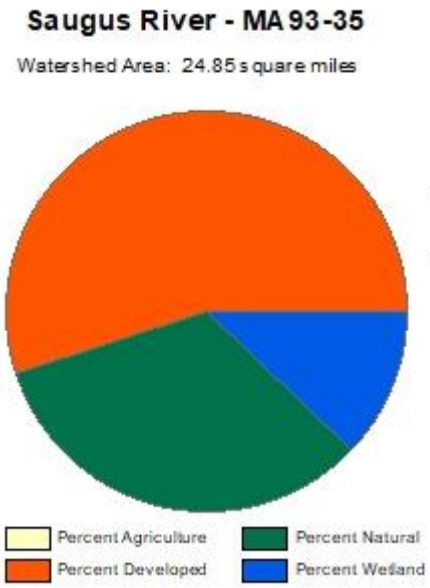
Data Source: (MassDCR 2017) Summer 2007 data were collected just prior to a Drought Advisory that was issued as of October 1st.

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

Most of the 2007 data can be considered to have been collected under a similar flow regime to the original 1997 data. Because the original 1997 ammonia data which contributed to the “Nutrients” listing are not considered elevated under the 2018 CALM guidance and because the “Nutrients” cause was erroneously converted to “Nitrogen (Total)” (now called “Nitrogen, Total”), the “Nitrogen, Total” impairment is being delisted for the Saugus River MA93-34 assessment unit to correct the original listing error.

Saugus River (MA93-35)

Location:	From the Lynn Water & Sewer Commission diversion canal impoundment dam (Saugus River Dam, NAT ID: MA02276), Wakefield/Lynnfield to Saugus Iron Works, Bridge Street, Saugus (formerly part of 1998 segment: Saugus River MA93-13).
AU Type:	RIVER
AU Size:	5.4 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	24.85	9.54	5.44	2.65
Agriculture	0.1%	0.1%	0.2%	0.2%
Developed	54.9%	43.6%	41.3%	35.7%
Natural	32.9%	49.4%	36.7%	51%
Wetland	12.1%	6.8%	21.8%	13.1%
Impervious Cover	24.1%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4a	5	Benthic Macroinvertebrates		Added
4a	5	(Fish Passage Barrier*)		Added

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

Lynn Water & Sewer Commission (LWSC) registration/permit (31816302/9P31816302) authorizes withdrawals from the Saugus River at the diversion canal. In 2004 the withdrawal volume in the LWSC permit was lowered from 10.21MGD to 8.93MGD. In summer 2007 flows were very low (~1.5cfs in late summer with 7Q10 at Saugus Ironworks USGS gage 1.4cfs). A drought advisory was issued Oct 1. Per DMF biologists an eel ramp was installed at the Colonial Golf & Country Club Dam in 2007 although the dam "is otherwise still impassable" (passage score 7 of 10 - severe impediment for diadromous fish passage). Benthic sampling was conducted ~300m downstream Salem St, Lynnfield/Wakefield (B0689) in July 2010. The RBPIII analysis indicated moderately impaired conditions (48% comparable) compared to the Elizabeth Brook reference site (B0686, Concord watershed). MassDEP biologists conducted backpack electrofishing here in Aug 2010 (SampleID4563). The sample was

dominated by moderately tolerant and tolerant macrohabitat generalist species although the fluvial dependent white sucker was present. MassDEP staff also conducted sampling at 3 sites during the summers of 2007/2010 (up to downstream) as follows: ~970 ft downstream Salem St, Lynnfield/Wakefield (W2150 in 2010), Cedar Glen Golf Course footbridge west from club house, Saugus (W1545 in 2007) and Elm St, Saugus (W0883 in 2007). At the most upstream location downstream from a large deep marsh habitat (W2150) continuous 3 5-day probe deployments documented low DO (mean daily min 3.65 to 4.11mg/L), max diel DO shift <1.6mg/L, max DO sat 64.5%.The maximum temperature recorded by the thermistor deployed 28 May for 188 days was 29.1°C (maximum 7DADM 25.7°C and 24-hr rolling average 27.4°C). The pH ranged from 6.7 to 7.1SU (n=6). The seasonal avg TP concentration was 0.039mg/L (max 0.053mg/L) (n=4) and there were no observations of any excessive filamentous algae. Two of 6 SC measurements (both ~1050µs/cm) exceeded estimated chloride chronic criterion plus 10% needed to account for model uncertainty (994µs/cm) although 5 chloride samples collected on different dates in 2010 did not exceed 230mg/L (max was 230mg/L). There were no exceedances of either acute or chronic metals criteria. Discrete data collected further downstream (W1545) were generally indicative of good conditions (min DO 5.7mg/L, seasonal average total phosphorus 0.05mg/L (n=5) with no notes of excessive algae, only 1 of 9 SC measurements slightly elevated (954µs/cm). Further downstream off Lake Circle at the trail crossing, DFG biologists conducted backpack electrofishing in July 2012 (SampleID 4020). Not many fish were collected but the sample did include white sucker. Further downstream backpack electrofishing by DFG biologists in July 2012 in the river near Elm St (SampleID 4019) resulted in the capture of only a few white sucker and American eel but notes were made that the water was dirty and flows were high. MassDEP conducted water quality monitoring here (W0883) during the summer of 2007. Multiprobes were deployed (3/5/5/2 days) in June, July, Aug, and Sept. The minimum mean DO was 5.55mg/L, max diel DO shift 1.44mg/L, max DOsat 94%, and max temperature was 22.4°C. The pH ranged from 7.1 to 7.4SU (n= 9). The seasonal avg TP concentration was 0.048mg/L (max 0.08mg/L) (n=5) with no notes of excessive algae.
The Aquatic Life Use for this Saugus River AU (MA93-35) is assessed as Not Supporting. Prior impairments for Dewatering and Alteration in Stream-side or Littoral Vegetative Covers are being carried forward. Impairments are being added for Fish Passage Barrier and Benthic Macroinvertebrates. Alerts are being added for elevated estimated chloride and low DO in the river downstream of Salem St (W2150).

Saugus River (MA93-43)

Location:	From Saugus Iron Works, Bridge Street, Saugus to Lincoln Avenue/Boston Street, Saugus/Lynn (formerly part of 2006 segment: Saugus River MA93-14).
AU Type:	ESTUARY
AU Size:	0.04 SQUARE MILES
Classification/Qualifier:	SB: SFR

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No recent data are available for this Saugus River AU (MA93-43). It was initially listed for thermal modifications in the 2002 reporting cycle when it was a part of the larger AU (MA93-14). The NPDES discharges responsible for the increased temperature are in the downstream AU (MA93-44), but their impacts to river are likely still an issue. The Aquatic Life Use for this Saugus River AU (MA93-43) will continue to be assessed as Not Supporting with the flow regime modifications, oil and grease, and increased temperature impairments being carried forward.

Saugus River (MA93-44)

Location:	From Lincoln Avenue/Boston Street, Saugus/Lynn to mouth (east of Route 1A) at Lynn Harbor, Lynn/Revere (formerly part of 2006 segment: Saugus River MA93-14).
AU Type:	ESTUARY
AU Size:	0.37 SQUARE MILES
Classification/Qualifier:	SB: ORW, SFR, CSO

Fish, other Aquatic Life and Wildlife Use: Not Supporting

General Electric Aviation is authorized (NPDES permit MA0003905, modified June 2017), to discharge stormwater commingled with dry weather flows during wet weather from drainage outfalls 001, 007, 010, 019, and 027B to this Saugus River AU (MA93-44). Acute Whole Effluent Toxicity testing is required twice per year on the discharge from these outfalls, with only a reporting requirement. The permit authorizes discharge of treated effluent from the Consolidated Drains Treatment System through Outfall 027A to the Saugus River. Two modified acute and chronic WET tests are required each year with only a reporting requirement. The permit also authorizes discharge of non-contact cooling water through Outfall 018A. Two modified acute and chronic WET tests are required each year with only a reporting requirement. General Electric Aviation has four water intakes along the Saugus River.

Water was collected from the ocean side of the bridge on Route 1A, Lynn for use as dilution water in the whole effluent toxicity tests performed on the discharge from General Electric Aviations's outfalls. Between November 2015 and September 2018, survival of *Mysidopsis bahia* in definitive acute ambient controls (48 hours) was ≥90% (n=35). In 34 definitive acute ambient controls (48 hours), survival of *Menidia beryllina* was ≥90%, while in 14 chronic tests (~7 days), survival was generally ≥90% (with one exception at 73% survival). Definitive acute (48 hours) and chronic (~7 days) whole effluent toxicity tests were conducted on the discharge from General Electric Aviation outfalls between November 2015 and September 2018. The LC_{50}s for definitive acute tests were >100% effluent for both *Mysidopsis bahia* (n=35) and *Menidia beryllina* tests (n=34). The LC_{50}s were also >100% effluent for 12 7-day tests utilizing *Menidia beryllina*, while the C-NOECs ranged from 50% to 100% effluent. Wheelabrator Saugus, Inc. is authorized by NPDES permit MA0028193 issued February 2010 to discharge non-contact cooling water from outfall number 001 to the Saugus River. Whole Effluent Toxicity testing is not required. Wheelabrator has one water intake along the Saugus River. Though survival of organisms exposed to ambient river water in GE Aviation WET tests was good, no recent data were available with which to reevaluate the status of prior impairments.

The Aquatic Life Use for this Saugus River AU (MA93-44) will continue to be assessed as Not Supporting with the flow regime modifications, oil and grease, and temperature impairments being carried forward.

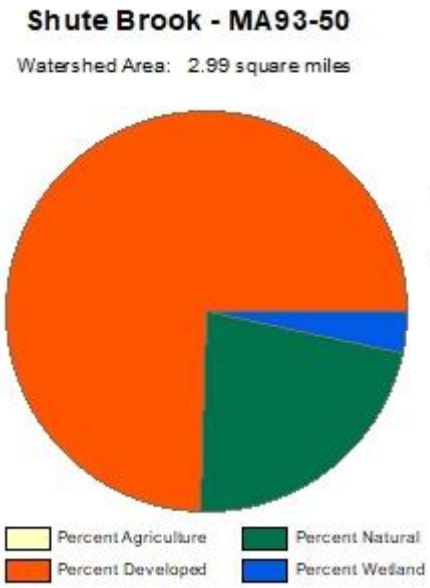
Shute Brook (MA93-49)

Location:	From saltwater wetland downstream of Central Street, Saugus to mouth at confluence with the Saugus River, Saugus.
AU Type:	ESTUARY
AU Size:	0.01 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
There are no recent data available, so the Aquatic Life Use for this Shute Brook AU (MA93-49) is Not Assessed. The Alert for elevated chromium levels in sediment is being carried forward.

Shute Brook (MA93-50)

Location:	From the confluence of Fiske Brook, Saugus to approximately 350 feet downstream from Central Street, Saugus.
AU Type:	RIVER
AU Size:	0.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.99	2.99	0.7	0.7
Agriculture	0.1%	0.1%	0.4%	0.4%
Developed	74.5%	74.5%	64.7%	64.7%
Natural	22%	22%	27.2%	27.2%
Wetland	3.4%	3.4%	7.7%	7.7%
Impervious Cover	41.4%			

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

DFG biologists conducted backpack electrofishing in this Shute Brook AU (MA93-50) upstream of Vine St. at Highland Ave, Saugus (SampleID 3750) in July 2011. The sample contained only 14 American eel, a macrohabitat generalist considered tolerant to pollution. Moving downstream, MassDEP biologists conducted backpack electrofishing in the brook upstream of Central Street, Saugus (Sample 4476) in October 2007. Many (n=345) fish were collected but only tolerant species- banded killifish and American eel. The survey notes mentioned that the stream was channelized in this area. Water quality monitoring was also conducted at this site (W0877) during the summer of 2007. Multiprobes were deployed for a 5-day period in July, a 3-day period in August and a 2-day period in September. The dissolved oxygen data from these deployments were generally indicative of good conditions. The lowest mean of the daily minimum from all three deployments was 5.9 mg/L. Although the maximum diel shift was slightly elevated at 3.16 mg/L, the maximum DO saturations were satisfactory (maximum 99%). A thermistor was deployed for 93 days, beginning on June 29. The maximum 7-DADM was 23.0 °C and the maximum 24-hour rolling average temperature was 22.4 °C indicative of conditions meeting warm water criteria. Attended probes measurements and grab sample data (temperature, pH, DO, ammonia, total phosphorus) were also indicative of good conditions. The seasonal average total phosphorus concentration was 0.039 (maximum 0.065 mg/L) and there were no observations of excessive filamentous algae. According to DMF biologists, as part of a 2007 MassDOT flood control project for Shute Brook, the Central Street culvert floor was improved with smelt spawning substrate (with American eel as a secondary target species). The passage score

improved slightly to 2 out of 10. Two DFG fish surveys were conducted at Riverside cemetery upstream to Central Street in July (SampleID 3753) and August (SampleID 3764) 2011 the purpose of the second visit was to collect voucher stickleback specimens but it was still a total pickup). The July sample (n=55; 4 species) contained 31% moderately tolerant species (threespine stickleback, pumpkinseed). The August sample (n=136; 6 species) also included 31% moderately tolerant species (ninespine, threespine, and fourspine stickback, plus 1 pumpkinseed).

The Aquatic Life Use of this Shute Brook AU (MA93-50) is assessed as Fully Supporting based primarily on fish population samples that included moderately tolerant species, as well as the water quality data that were indicative of good conditions. **T**he former alert for total phosphorus is being removed but alerts for sedimentation and excessive periphyton growth are being carried forward.

Sluice Pond (MA93071)

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

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
4c	5	Dissolved Oxygen		Added

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

As was previously reported, DCR Lakes and Ponds staff documented an infestation of Eurasian water milfoil (*Myriophyllum spicatum*) in Sluice Pond in 2005. Additionally, herbicide permit applications for most years from 2007-2016 listed fanwort (*Cabomba caroliniana*) and *Najas*/naiad as present in Sluice Pond for most years from 2006-2016. The presence of fanwort and species identity of *Najas* need to be comfirmed by MassDEP biologists. Water quality monitoring in Sluice Pond was conducted by MassDEP staff at the deep hole (W1304) in August 2005 as part of a lakes nutrient criteria study. On that date, aquatic macrophyte plant cover and algal density were sparse. A depth profile documented dissolved oxygen concentrations ranging from 1.1 mg/L near the bottom, to 9.0 mg/L near the surface. DO dropped below 5 mg/L between 4.5 and 5.5 meters in depth (15-18 feet). The area of Sluice Pond between 15-18 feet in depth encompasses roughly 41% of the area at the surface of the pond. The maximum DO saturation was 113%, temperature was 26.6 °C, and pH ranged from 8.1 at the surface down to 6.1 SU in the hypolimnion. Total phosphorus at the surface was <0.01 mg/L, and 0.24 mg/L at the bottom indicative of phosphorus release from anoxic sediment. Secchi depth was 4.8 meters and the depth integrated chlorophyll *a* sample was low (3 µg/L). Specific conductance was elevated ranging from 902 µs/cm in the epilimnion to 1,200 µs/cm in the hypolimnion. Most of the measurements exceeded the chronic criterion for estimated chloride (904 µs/cm).

The Aquatic Life Use for Sluice Pond will continue to be assessed as Not Supporting due to the presence of the non-native Eurasian Water Milfoil (*Myriophyllum spicatum*). An impairment for Dissolved Oxygen is being added because ~41% of the surface area of the pond was below 5 mg/L. Alerts are being added for potential infestations of the non-native *Cabomba caroliniana* and a non-native *Najas* sp., as well as elevated estimated chloride concentrations (using specific conductance as a surrogate).

Spring Pond (MA93072)

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

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
As was previously reported, MassDEP staff observed the non-native aquatic macrophyte, fanwort (*Cabomba caroliniana*), as well as *Myriophyllum* sp. in this Spring Pond AU (MA93072) during a 1997 synoptic survey. In 2006, DCR Lakes and Ponds staff confirmed the presence of variable milfoil (*Myriophyllum heterophyllum*). The Aquatic Life Use of this Spring Pond AU (MA93072) is assessed as Not Supporting due to the presence of non-native aquatic macrophyte species. The generic Non-Native Aquatic Plants will be retained to cover the variable milfoil (*Myriophyllum heterophyllum*) species and Fanwort (*Cabomba caroliniana*) is being added.

Spring Pond (MA93073)

Location:	[South Basin] Peabody/Lynn/Salem.
AU Type:	FRESHWATER LAKE
AU Size:	67 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Spring Pond AU (MA93073) is Not Assessed.

Spring Pond (MA93074)

Location:	[North Basin] Peabody.
AU Type:	FRESHWATER LAKE
AU Size:	17 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed (Alert)
There is no recent data, so the Aquatic Life Use of this Spring Pond AU (MA93074) will continue to be Not Assessed. The former alert because of the area affected by sedimentation from the Coolidge Avenue Water Treatment Facility discharge is being carried forward.

Strangman Pond (MA93076)

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

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

Swains Pond (MA93095)

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

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The Aquatic Life Use for Swains Pond will continue to be assessed as Not Supporting because of the infestation of the non-native aquatic macrophyte fanwort (*Cabomba caroliniana*). Herbicide permit application records list this species in most years from 2000 to 2016. The generic non-native aquatic plant impairment is being removed (see removal comment) and Fanwort is being added.

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

Supporting Information for Delisted Impairments

Non-Native Aquatic Plants

Data Sources:
(MassDEP 2007b) North Shore Coastal Watersheds 2002 Water Quality Assessment Report and
(MassDEP 2017) Herbicide Database, as of January 2017

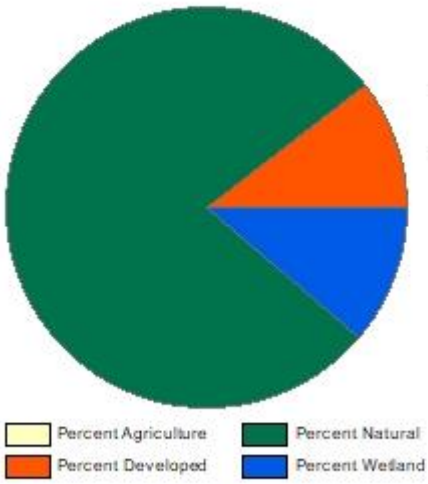
According to the 2002 North Coastal WQAR, Swains Pond was listed as impaired for fanwort (*Cabomba caroliniana*) because of records from the Herbicide Permit Application database. The generic "Non-Native Aquatic Plants" impairment is being delisted since the specific macrophyte *Cabomba caroliniana* (fanwort) has been utilized.

Unnamed Tributary (MA93-27)

Location:	Headwaters, outlet Babson Reservoir, Gloucester to culvert outlet into saltwater wetland northwest of Bertoni Road, Gloucester (portion culverted).
AU Type:	RIVER
AU Size:	0.4 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA93-27

Watershed Area: 1.5 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.5	1.5	0.57	0.57
Agriculture	0%	0%	0%	0%
Developed	10.5%	10.5%	12.8%	12.8%
Natural	78.3%	78.3%	69.6%	69.6%
Wetland	11.2%	11.2%	17.5%	17.5%
Impervious Cover	6.4%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed

The Babson Filtration Plant in Gloucester is authorized under the NPDES Potable Water Treatment Facilities General Permit (MAG640012) to discharge treated effluent via one outfall to this Unnamed Tributary AU (MA93-27). No whole effluent toxicity testing has been required. According to DMF biologists there are significant barriers to fish passage both upstream and downstream of this Unnamed Tributary at Babson Reservoir Dam (passage score 10, population score 0 out of 10) and Mill Pond Dam (passage score 10, population score 0). Target species for passage would be river herring and American eel but potential is limited due to the 35-foot drop from the Babson Reservoir Dam spillway and due to saltwater intrusion in Mill Pond (MA93-60).

The Aquatic Life Use for the Unnamed Tributary (MA93-27) is Not Assessed. An impairment decision is not being made at this time since there are no documented diadromous fish runs (population scores 0).

Unnamed Tributary (MA93-51)

Location:	Unnamed tributary locally known as "Town Line Brook", from Route 99, Malden to mouth at confluence with Pines River, Revere.
AU Type:	ESTUARY
AU Size:	0.02 SQUARE MILES
Classification/Qualifier:	SA: SFO

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

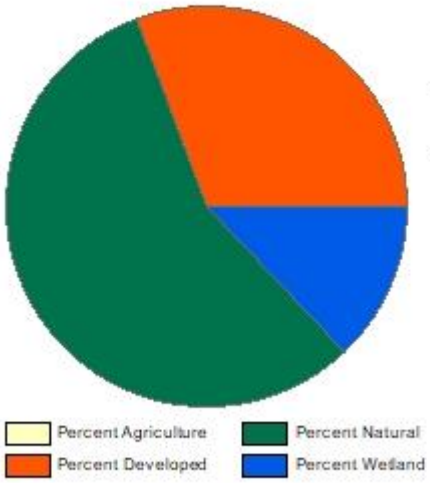
Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no recent data available for Unnamed Tributary MA93-51 (locally known as “Town Line Brook”) so the Aquatic Life Use will continue to be assessed as Not Supporting with the Alteration in stream-side or littoral vegetative covers, Flow Regime Modification, and Physical substrate habitat alterations impairments being carried forward.

Unnamed Tributary (MA93-58)

Location:	Unnamed tributary to Beverly Cove, perennial portion, Route 22, Beverly to saltwater wetlands south of Route 127, Beverly.
AU Type:	RIVER
AU Size:	2.1 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA93-58

Watershed Area: 1.54 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.54	1.54	0.66	0.66
Agriculture	0.9%	0.9%	0.5%	0.5%
Developed	30.4%	30.4%	32.9%	32.9%
Natural	55.8%	55.8%	47.7%	47.7%
Wetland	12.8%	12.8%	18.9%	18.9%
Impervious Cover	11.9%			

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

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

Water quality monitoring of this Unnamed Tributary MA93-58 (locally known as "Curtis Brook") to Beverly Cove was conducted by MassDEP staff at Tall Tree Drive, Beverly (W1543) during the summer of 2007. A multiprobe was deployed for one 5-day period in July to measure DO and temperature. The mean daily minimum DO was 4.91 mg/L. The DO maximum diel shift and maximum saturation were good at 1.01 mg/L and 81%, respectively. The maximum temperature was 20.4°C. Discrete probe measurements and grab samples were also collected. Dissolved oxygen ranged from 10.2 mg/L at the beginning of the season to 3.7 mg/L in September (n=7). No sampling was conducted in August because the stream was dry. The station in this very small stream (drainage area only 1.54mi^2) was located within a wooded swamp wetland. A drought advisory was declared on October 1st so low DO was likely influenced by these conditions. The maximum temperature was 18.3°C (n=6) and pH ranged from 6.3 to 6.7 SU (n=7). There were no ammonia violations (n=5). The seasonal average total phosphorus concentration was low 0.030mg/L (maximum 0.078 mg/L, n=5) and there were no observations of excessive filamentous algae. A benthic sample (B0621) was collected approximately 200 meters downstream

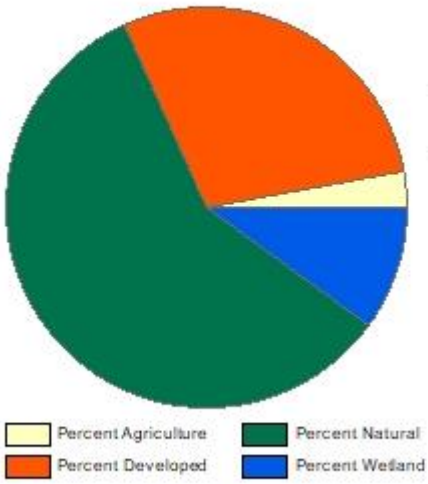
from Tall Tree Drive in June 2007. The RBPIII analysis indicated “moderately impaired” (42% comparable) conditions when compared to the Alewife Brook reference station (B0619). The main factors contributing to the relatively low score were the small number of sensitive EPT taxa represented in the sample, a lack of scraper taxa, and poor affinity with the reference. This station had a habitat score of 130 considered to be “Supporting” when compared to the reference.
The Aquatic Life Use of this Unnamed Tributary AU (MA93-58) is being assessed as Not Supporting based on the moderately impaired benthic sample. An Alert for low dissolved oxygen is also being identified.

Unnamed Tributary (MA93-59)

Location:	Unnamed tributary to Chubb Creek, headwaters west of Hale Street, Beverly to mouth at confluence with Chubb Creek east of Route 127, Beverly.
AU Type:	RIVER
AU Size:	0.8 MILES
Classification/Qualifier:	B

Unnamed Tributary\ - MA93-59

Watershed Area: 1.74 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.74	1.74	0.66	0.66
Agriculture	2.9%	2.9%	6%	6%
Developed	28.8%	28.8%	33.1%	33.1%
Natural	58.3%	58.3%	46.7%	46.7%
Wetland	10%	10%	14.2%	14.2%
Impervious Cover	10.2%			

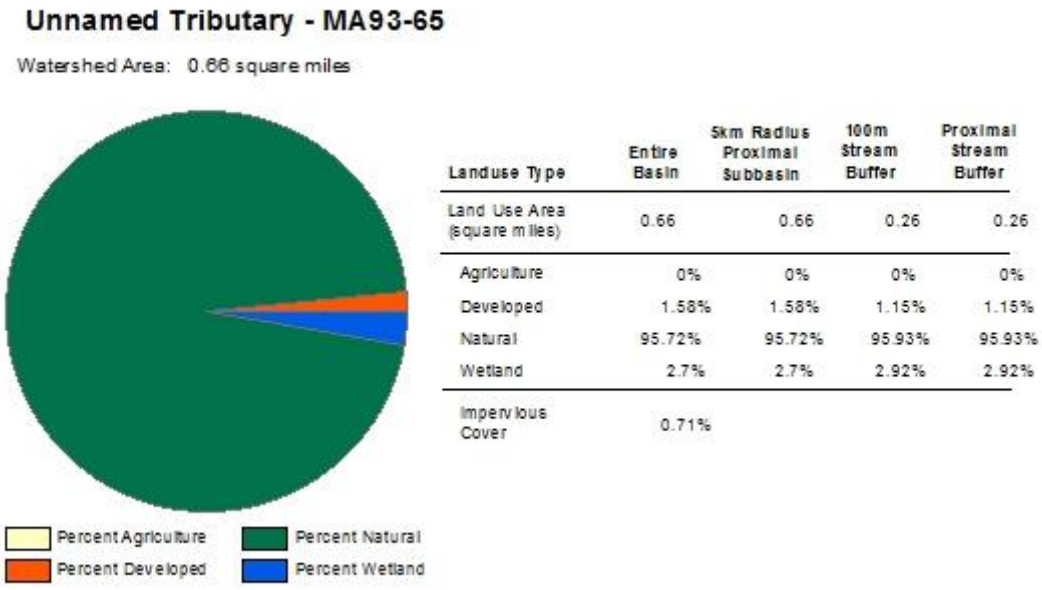
2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
5	5	Benthic Macroinvertebrates		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
A benthic sample was collected by MassDEP biologists from this Unnamed Tributary AU (MA93-59) to Chubb Creek, ~5 meters upstream Oak Street, Beverly (B0620) in June 2007. The RBPIII analysis indicated "moderately impaired" (32% comparable) conditions when compared to the Alewife Brook reference (Station B0619). The low score was mainly due to a small number of sensitive EPT taxa in the sample, low affinity with the reference, and hyperdominance (65%) by one taxon, the gammarid amphipods. The habitat assessment determined the habitat was 74% comparable (partially supporting) when compared with the habitat at the reference location, due mainly to a small riparian zone and a lack of vegetative protection of one of the banks. Water quality sampling was conducted by MassDEP staff in the vicinity of the benthic sample at Oak Street, Beverly (W1542) during the summer of 2007. Multiprobes were deployed for three 5-day periods and one 2-day period in June, July, August and September. The data from these deployments were indicatve of good conditions with mean daily DO minima all above 7.0 mg/L. The DO diel shifts were $\leq$2.3 mg/L and the maximum saturation was 93%.

The maximum temperature was 21.8°C. Discrete attended probes measurements and grab samples were collected during the sampling season as well. Data for temperature, DO, ammonia, and total phosphorus were indicative of good conditions (no violations of water quality criteria). The seasonal average total phosphorus concentration was 0.029mg/L (maximum 0.044 mg/L, n=5) and there were no observations of excessive filamentous algae. pH ranged from 6.4 to 6.8 SU with only one measurement less than 6.5 SU.
The Aquatic Life Use of this Unnamed Tributary (MA93-59) is assessed as Not Supporting because of the moderately impaired benthic macroinvertebrate community although the other water quality data collected during the summer of 2007 were indicative of good conditions.

Unnamed Tributary (MA93-65)

Location:	Unnamed Tributary to Lily Pond, headwaters outlet Dykes Pond, Gloucester to mouth at inlet Lily Pond, Gloucester.
AU Type:	RIVER
AU Size:	0.2 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	0.66	0.66	0.26	0.26
Agriculture	0%	0%	0%	0%
Developed	1.58%	1.58%	1.15%	1.15%
Natural	95.72%	95.72%	95.93%	95.93%
Wetland	2.7%	2.7%	2.92%	2.92%
Impervious Cover	0.71%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
--	4c	(Fish Passage Barrier*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting

According to DMF biologists there are significant barriers to fish passage on this Unnamed Tributary AU (MA93-65). The first barrier is at the headwaters at the Dykes Pond Dam, which permits no passage of river herring and American eel (passage score 10, population score 2). Downstream at the Lily Pond Dam, the wooden Denil ladder was replaced with an Alaska steeppass fishway in 2017. The dam still acts as a minor obstruction (passage score 3) with flow the limiting factor but the population of river herring and American eel is a little larger (population score 4). There are no other data available.

The Aquatic Life Use for this Unnamed Tributary AU (MA93-65) is assessed as Not Supporting based on the presence of a fish passage barrier at Dykes Pond Dam.

Upper Banjo Pond (MA93080)

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

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

Upper Pond (MA93083)

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

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

Walden Pond (MA93084)

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

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed

There are no recent data available, so the Aquatic Life Use for Walden Pond is Not Assessed.

Fish Consumption Use: Not Supporting

MassDEP biologists conducted fish toxics sampling at Walden Pond (in Lynn/Lynnfield/Saugus) in June 2017 as part of the probabilistic lake surveys (MAP2). Because of elevated mercury measured in largemouth bass filets, MassDPH issued the following fish consumption advisories:

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

Since there is a site specific DPH advisory for elevated mercury in fish tissue, the Fish Consumption Use for Walden Pond (MA93084) is assessed as Not Supporting. The likely source, although not confirmed, is atmospheric deposition.

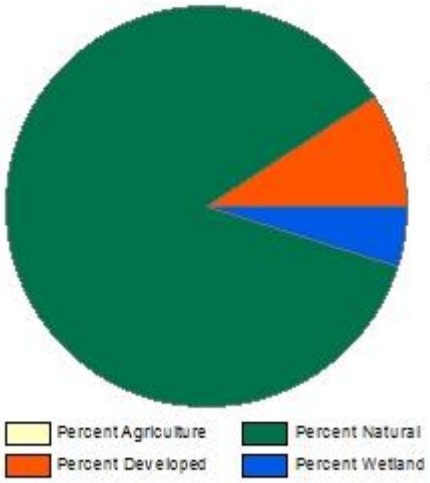
Data Source: (MassDPH 2019)

Walker Creek (MA93-61)

Location:	Headwaters outlet Haskell Pond, Gloucester to tidal portion approximately 460 feet north of Route 133, Gloucester.
AU Type:	RIVER
AU Size:	0.7 MILES
Classification/Qualifier:	B

Walker Creek - MA93-61

Watershed Area: 1.33 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.33	1.33	0.48	0.48
Agriculture	0%	0%	0%	0%
Developed	9.2%	9.2%	10.98%	10.98%
Natural	85.87%	85.87%	82.24%	82.24%
Wetland	4.93%	4.93%	6.78%	6.78%
Impervious Cover	4.96%			

2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
--	4c	(Fish Passage Barrier*)		Added

Fish, other Aquatic Life and Wildlife Use: Not Supporting
According to DMF biologists there are three significant barriers to fish passage on Walker Creek (MA93-61). The Haskell Pond Dam in Gloucester does not allow any passage (passage score 10), but there is also no existing fish run (population score 0). Further downstream the dam at Forest Lane also does not permit any passage (passage score 10), and there is again no existing fish run (population score 0). The targeted diadromous species for passage at these two locations are river herring and American eel. A short way downstream, the Route 133 culvert also blocks fish passage, in effect serving as the upstream extent of fish migration (passage score 10) but there is a small run present (population score 1) of rainbow smelt and American eel at this location. The Aquatic Life Use for this Walker Creek AU (MA93-61) is assessed as Not Supporting based on the presence of fish passage barriers.

Walker Creek (MA93-62)

Location:	From tidal portion approximately 460 feet north of Route 133, Gloucester to mouth at confluence with Essex Bay, Essex.
AU Type:	ESTUARY
AU Size:	0.09 SQUARE MILES
Classification/Qualifier:	SA: ORW, SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for this Walker Creek AU (MA93-62) is Not Assessed.

Wallace Pond (MA93085)

Location:	Gloucester.
AU Type:	FRESHWATER LAKE
AU Size:	22 ACRES
Classification/Qualifier:	A: PWS, ORW

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

Waters River (MA93-01)

Location:	From west of Route 128, Peabody/Danvers to mouth at confluence with Danvers River and Beverly Harbor, Danvers (formerly reported as 2002 lake segment: Waters River Pond MA93088).
AU Type:	ESTUARY
AU Size:	0.09 SQUARE MILES
Classification/Qualifier:	SA: SFO

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no recent data available, so the Aquatic Life Use for Waters River is Not Assessed.

West Pond (MA93089)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no recent data available so the Aquatic Life Use of West Pond will continue to be assessed as Not Supporting with the algae, chlorophyll *a*, total phosphorous and transparency/clarity impairments being carried forward.

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