Appendix 22
Quinebaug River Watershed
Assessment and Listing Decision Summary

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

CN: 505.1

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2018/20 Cycle Impairment Changes

Waterbody	AU_ID	2016 AU Category	2018/20 AU Category	Impairment	ATTAINS Action ID	Impairment Change Summary
Hatchet Brook	MA41-14	2	5	Temperature		Added
Mckinstry Brook	MA41-13	5	5	Trash		Changed
Morse Pond	MA41033	5	5	(Aquatic Plants (Macrophytes)*)		Changed
Morse Pond	MA41033	5	5	Nutrient/Eutrophication Biological Indicators		Added
Quinebaug River	MA41-01	5	5	(Non-Native Aquatic Plants*)		Added
Quinebaug River	MA41-01	5	5	Temperature		Added
Quinebaug River	MA41-02	5	5	Lack of a coldwater assemblage		Added
Quinebaug River	MA41-02	5	5	Trash		Changed
Quinebaug River	MA41-09	5	5	Trash		Changed

Alum Pond (MA41001)

Location:	Sturbridge.
AU Type:	FRESHWATER LAKE
AU Size:	198 ACRES
Classification/Qualifier:	B

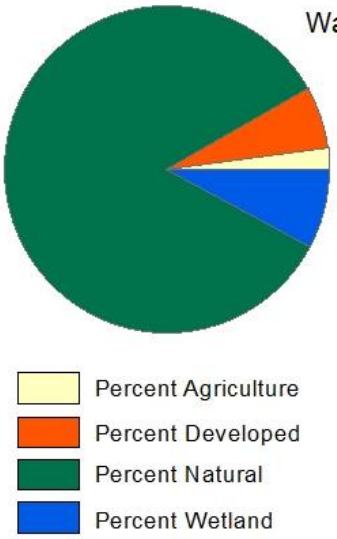
Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
In early September 2005, MassDEP DWM conducted a depth profile for dissolved oxygen at the deep hole at Alum Pond (MA41001). Total phosphorus (top and near bottom) and chlorophyll a (integrated depth sample) samples were also collected. Dissolved oxygen was plentiful from the surface to 8 meters in depth (>6.0 mg/L) after which the concentrations fell off precipitously (3.6 @ 8.5 meters, <0.2 @ 10 meters) to the bottom at ~12m. Approximately 47% of the surface area of Alum Pond is estimated to have low dissolved oxygen. Total phosphorus was low (0.005 mg/l) at the surface and slightly higher (0.062 mg/l) near the bottom. Chlorophyll *a* (5.1µg/L of a depth integrated sample) was also low. The presence of *P. crispus* and *Myriophyllum* sp. was noted in the herbicide permit applications. Field confirmation of the potential presence of non-native aquatic macrophyte species is needed. The Aquatic Life Use for Alum Pond is assessed as Not Supporting based on the area (~47% surface area of pond) experiencing low dissolved oxygen. This use is also identified with an alert status because of the potential infestation of non-native macrophyte species.

BREAKNECK BROOK (MA41-28)

Location:	Headwaters outlet Breakneck Pond, Sturbridge to mouth at confluence with Quinebaug River, Sturbridge.
AU Type:	RIVER
AU Size:	3.7 MILES
Classification/Qualifier:	B

BREAKNECK BROOK - MA41-28

Watershed Area: 4.41 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.03	2.58	1.07	0.98
Agriculture	2%	2.4%	2.7%	3%
Developed	6.2%	7.2%	5.9%	6.4%
Natural	83.8%	82.1%	77.3%	75.8%
Wetland	8%	8.3%	14.1%	14.8%
Impervious Cover	3.3%			

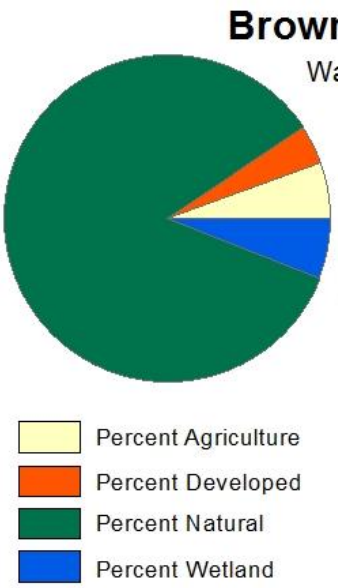
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

MassDEP biologists conducted sampling in Breakneck Brook about one mile downstream of the MA/CT state line as part of the probabilistic stream surveys in 2011 and again for benthic macroinvertebrates as part of the reference site network surveys in 2012. While the taxonomy for the benthic sample (B0707) is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Backpack electrofishing in September 2011 (SampleID: 4612) resulted in the capture of 67 individual fish representing 8 species. Three Eastern brook trout were collected including one fish less than or equal to 140 mm. The sample was dominated by fluvial specialists/dependents. Physio-chemical water quality monitoring (W2184) during the summer of 2011 documented generally good conditions (minimum DO 7.1 mg/L, maximum DO saturation 97%, good pH, low nutrients (average total phosphorus concentration 0.014 mg/L), and very low chloride (maximum 3mg/L) and ammonia-nitrogen ($\leq$0.02 mg/L). MassDFG does list Breakneck Brook as a CFR and while it is currently not a designated Cold Water stream in the SWQS it needs to be protected as a Tier 1 Cold Water since multiple age classes of Eastern brook trout were collected. A long-term thermistor was deployed from 26 May to 3 October. The long-term temperature deployment data, however, collected during the summer 2011 frequently exceeded 20°C (maximum 27.4, maximum daily average 25.1°C, and 114 exceedances above the 20°C 7DADM). While the majority of the watershed is well protected, the chronic temperature violations are of concern and likely result from Breakneck Pond. Whether or not there is a natural or man-made dam at the pond's outlet requires further investigation. MassDFG biologists also sampled the downstream section of Breakneck Brook (upstream of the River Road bridge in Sturbridge near the confluence with Quinebaug River) in October 1999 using a backpack

electrofisher (SampleID 83). A total of 60 individuals were collected with 9 species being represented. The sample was a mix of fluvial specialists/dependents and macrohabitat generalists although no coldwater species were collected however the sampling location was in an area impacted by beaver activity.
The Aquatic Life Use for Breakneck Brook is assessed as Fully Supporting based on the fish, and water quality monitoring data collected during the summer of 2011 and the benthic data collected in 2012. An alert is being identified for elevated temperature which may or may not result from natural conditions.

Browns Brook (MA41-20)

Location:	From the state line Holland, MA/Union, CT to mouth at inlet of Hamilton Reservoir, Holland.
AU Type:	RIVER
AU Size:	0.8 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.90	1.90	0.64	0.64
Agriculture	5.5%	5.5%	6.7%	6.7%
Developed	3.9%	3.9%	2.7%	2.7%
Natural	84.6%	84.6%	79.7%	79.7%
Wetland	6%	6%	10.9%	10.9%
Impervious Cover	1.2%			

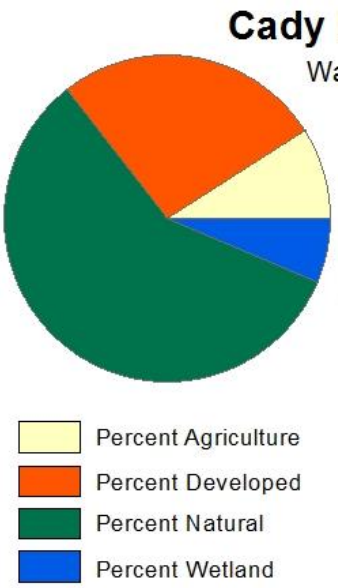
Fish, other Aquatic Life and Wildlife Use: Fully Supporting

As part of the 2011-2015 reference site network (RSN) surveys MassDEP biologists sampled Browns Brook ~0.4mi upstream of May Brook Road in Holland (BB01). Sampling included benthic macroinvertebrates (RSN-BB01), fish population samples (including SampleID 4592), and physico-chemical water quality monitoring (W2220). While the taxonomy for the benthic samples are complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Backpack electrofishing by MassDEP biologists in August 2011 documented a total of 156 individual fish with six species being represented. One brook trout (EBT) was collected which was less than or equal to 140 mm in length. The sample was composed of 97% fluvial specialists/dependents with ~15% considered intolerant/moderately tolerant to pollution. Similar fish samples were collected during the summers of 2012 through 2014 although no brook trout were collected in either the 2013 or 2014 samples. One brown trout was collected in the sample in 2013. Although Browns Brook is identified as a CFR by MassDFG, summer water temperatures are indicative of a warmwater fishery with maximum summertime temperatures between 2011 and 2015 ranging from 24.7 to 28.5°C. The temperature was above 28.3°C for 2.9 hours in 2011 was ≤27.9°C in all four subsequent sampling years. The MA portion of the watershed area is >90% natural and the impervious cover is estimated as only 1.2%. Google Earth imagery was also reviewed in the CT portion of the drainage area and no dams were visible so the temperature regime is considered to be naturally occurring. All other water quality monitoring data collected between June 2011 and October 2015 were indicative of good conditions: minimum DO 5.1mg/L, maximum saturation 99%, pH 6.9 to 7.2SU, maximum

chloride 4 mg/L, low conductivity, ammonia-nitrogen, and total phosphorus seasonal average concentrations (42 to 60 µS/cm, <0.04 mg/L excluding qualified data, and 0.012 to 0.047 mg/L, respectively),
The Aquatic Life Use of Browns Brook is assessed as Fully Supporting based on fish population and water quality monitoring data collected by MassDEP biologists from 2011-2015.

Cady Brook (MA41-05)

Location:	Headwaters, outlet of Glen Echo Lake, Charlton to Charlton WWTP outfall (NPDES: MA0101141), Charlton.
AU Type:	RIVER
AU Size:	1.5 MILES
Classification/Qualifier:	B: WWF, HQW



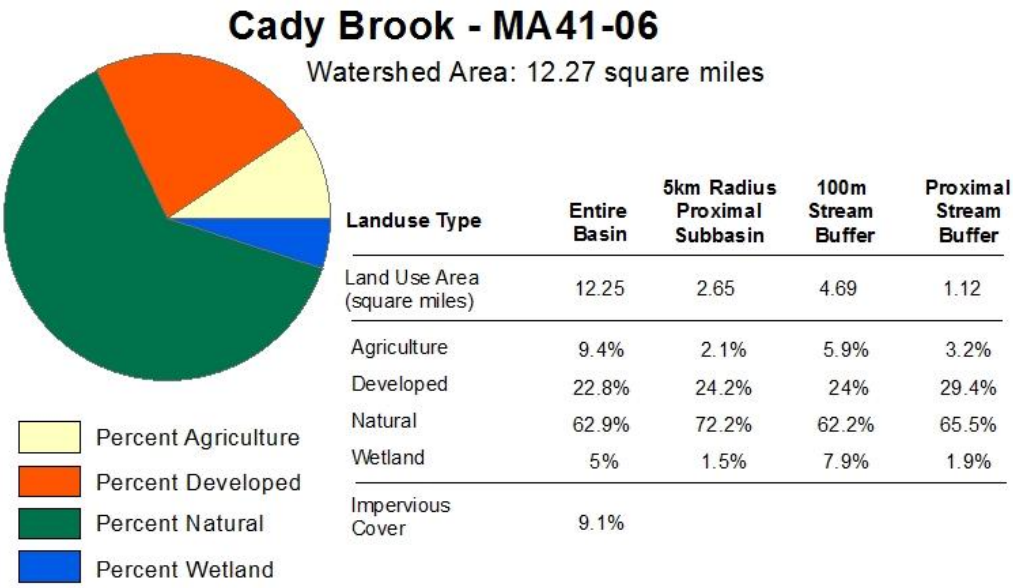
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.88	4.51	1.79	1.67
Agriculture	9%	8.7%	6.1%	5.8%
Developed	26.6%	28.3%	26.5%	28.2%
Natural	57.9%	56.5%	56.7%	55.8%
Wetland	6.5%	6.5%	10.7%	10.2%
Impervious Cover	10.2%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Water from this Cady Brook AU (MA41-05) was collected approximately 1350 feet downstream (south) from Route 20, in Charlton for use as either dilution water and/or as a site control water in the Charlton WWTP's modified acute and chronic WET tests. Survival of *C. dubia* exposed (~7 days) to the river water was >80% in all but one of 42 tests conducted between May 2009 and November 2018. Although Cady Brook has not exhibited ambient chronic toxicity in terms of poor survival of *C. dubia* test organisms over the last ~10 years, no recent *P. promelas* data have been collected (the Charlton WWTP NPDES permit has not required *P. promelas* WET tests since November 2002). Without any more recent *P. promelas* data, the Ambient Bioassays - Chronic Aquatic Toxicity (Y) will remain listed as an impairment. Survival (~7-day) of *P. promelas* in half (5 of 10) of the tests conducted between May 2001 and November 2002 was below 75% (range 38 to 70%).

Cady Brook (MA41-06)

Location:	Charlton WWTP outfall (NPDES: MA0101141), Charlton to mouth at confluence with the Quinebaug River, Southbridge.
AU Type:	RIVER
AU Size:	5.1 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	12.25	2.65	4.69	1.12
Agriculture	9.4%	2.1%	5.9%	3.2%
Developed	22.8%	24.2%	24%	29.4%
Natural	62.9%	72.2%	62.2%	65.5%
Wetland	5%	1.5%	7.9%	1.9%
Impervious Cover	9.1%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
Modified acute and chronic whole effluent toxicity tests were conducted as part of the Charlton WWTP NPDES permit (most recent permit issued in January 2011). Between May 2009 and November 2018, no acute whole effluent toxicity was detected by *C. dubia* during 40 valid modified acute tests conducted (LC50s all >100% and ANOEC=100% effluent). Of the 35 valid chronic tests CNOEC results were ≥ 93% effluent (the permit limit) in 27 tests. Some chronic toxicity was detected in 8 tests ranging from 6.25 to 50% effluent (May 2010 and 2011, November 2011, February 2013, May 2015, February 2016, November 2017, and February 2018)). Physio-chemical water quality monitoring in Cady Brook (as part of the SMART monitoring program) at northernmost Route 169 bridge in Charlton (W0615) was conducted on 43 occasions between March 2005-April 2013. Sampling included temperature, dissolved oxygen, pH, specific conductance, chloride, and nutrients including total phosphorus, total nitrogen, ammonia. Water quality data here were indicative of generally good conditions (e.g., minimum DO 8.3mg/L, maximum temperature 22.7°C, ammonia and chloride concentrations were low with ammonia ranging between <0.02- 0.13 and chloride between 25 and 280mg/L with only one individual chloride concentration exceeding the chronic four-day average criterion during the eight-year monitoring period). Nutrient concentrations were also low with total phosphorus concentrations ranging from <0.025 to 0.13mg/L. As part of the 2011 probabilistic streams survey MassDEP biologists sampled Cady Brook (MA41-06) at the confluence with the Quinebaug River in Southbridge. Sampling included fish population, benthic macroinvertebrates, and physiochemical water quality monitoring (W2189). Benthic macroinvertebrate sampling was conducted in July 2011 (B0711) and barge electrofishing (SampleID 4603) was conducted in September 2011. While the taxonomy for the benthic sample (B0711) is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. The fish sample was dominated by fluvial specialist/dependant species. With the exception of one brown trout which was deemed to be "stocked", other coldwater fish were absent. Water quality monitoring at this site (W2189) was indicative of good conditions (minimum DO 6.8mg/L, long-term temperature thermistor (26 May to 3 October 2011) maximum temperature 26.5°C, good pH, low ammonia- nitrogen concentrations, average total

phosphorus concentration 0.022mg/L, and no exceedances of any acute or chronic metals criteria during any of the three sampling events). Lastly a statistically significant decreasing trend of total phosphorus, both annually and seasonally, was calculated between 1994 and 2012/2013 for sites in this Cady Brook AU. The original impairments for both Nutrient/Eutrophication Biological Indicators and Dewatering were based on data collected during the MassDEP 1999 survey and these issues were associated with conditions in the upper 0.3 mile reach of this Cady Brook AU. Although all of the data collected during the 2011 survey near the mouth of Cady Brook were indicative of good conditions, the historical impairments will remain listed until newer data are collected in the brook nearer to the WWTP discharge so the Aquatic Life Use will remain assessed as Not Supporting. This use is also being identified with an Alert Status because of occasional chronic WET in the Charlton WWTP discharge. It should be noted here however that the Charlton WWTP (MA0101141) was upgraded to include a CoMag treatment system to provide improved removal of pollutants, most notably phosphorus. The treatment was on-line in 2010.

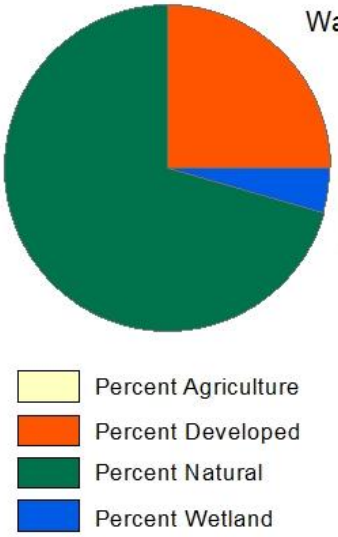
Cedar Pond (MA41008)

Location:	Sturbridge.
AU Type:	FRESHWATER LAKE
AU Size:	149 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
A MassDEP 1994 synoptic survey identified an infestation of *Myriophyllum heterophyllum* in Cedar Pond (MA41008). Based upon the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum* in Cedar Pond the Aquatic Life Use is assessed as Not Supporting.

Cohasse Brook (MA41-12)

Location:	From the outlet of Cohasse Brook Reservoir, Southbridge to mouth at confluence with the Quinebaug River, Southbridge (through former 2008 segment: Wells Pond MA41053).
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	2.75	2.23	0.92	0.81
Agriculture	0.8%	1%	1.4%	1.6%
Developed	24.7%	30.3%	23.6%	26.5%
Natural	70%	64.7%	68.7%	65.7%
Wetland	4.5%	4%	6.3%	6.2%
Impervious Cover	8.8%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no new data so the Aquatic Life Use for Cohasse Brook (MA41-12) will remain assessed as Not Supporting.

East Brimfield Reservoir (MA41014)

Location:	Brimfield/Sturbridge.
AU Type:	FRESHWATER LAKE
AU Size:	313 ACRES
Classification/Qualifier:	B: HQW

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
A MassDEP 1994 synoptic survey identified an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in East Brimfield Reservoir (MA41014). Based upon the documented presence of *Myriophyllum heterophyllum* the Aquatic Life Use is assessed as not supporting. DCR and the Natural Heritage & Endangered Species Program have also noted Asian clam, *Corbicula fluminea*, in the reservoir, however this infestation needs confirmation of live specimens so is being identified as an Alert issue.

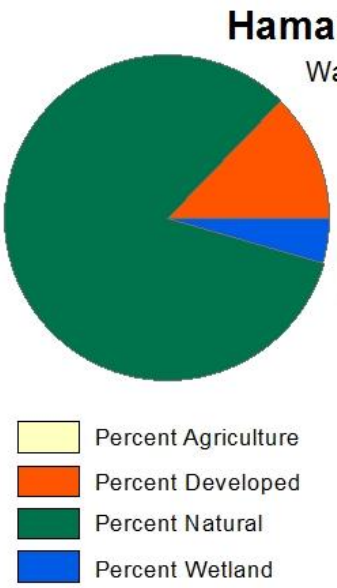
Glen Echo Lake (MA41017)

Location:	Charlton.
AU Type:	FRESHWATER LAKE
AU Size:	115 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No recent data have been collected for Glen Echo Lake (MA41017) so the Aquatic Life Use will remain assessed as Not Supporting (low dissolved oxygen).

Hamant Brook (MA41-15)

Location:	Headwaters, outlet unnamed pond, Sturbridge to mouth at confluence with the Quinebaug River, Sturbridge.
AU Type:	RIVER
AU Size:	3.1 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.69	2.44	1.36	0.88
Agriculture	0.6%	0.9%	0.8%	1.2%
Developed	12.6%	11.4%	11.9%	10.3%
Natural	82.2%	84.5%	78.8%	82%
Wetland	4.5%	3.2%	8.5%	6.4%
Impervious Cover	5%			

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

MassDFG and MassDEP biologists conducted backpack electrofishing at three locations within Hamant Brook (MA41-15) and one site by the angling method. The MassDEP survey which was conducted in 2004 (SampleID 2928) and one of the MassDFG surveys from 2010 (SampleID 3308) were conducted in very close proximity to one another just upstream of two impoundments in Sturbridge. Both samples were dominated by fluvial fishes and included reproducing brook trout populations. The two remaining MassDFG stations were located downstream of the lowermost impoundment on the river near the confluence with the Quinebaug River and although samples were dominated by fluvial fishes, coldwater species were absent. Three dams located between the lowermost section of Hamant Brook and the upper section which supports reproducing brook trout have been removed (late 2017). This provides continuity throughout the brook and MassDFG biologists expect that brook trout will soon inhabit the lowermost section of Hamant Brook.

Based on fish population information and the habitat restoration efforts (three dam removals) Aquatic Life Use for Hamant Brook (MA41-15) is assessed as Fully Supporting. The perched box culvert near the confluence with the Quinebaug River is being identified as an Alert issue.

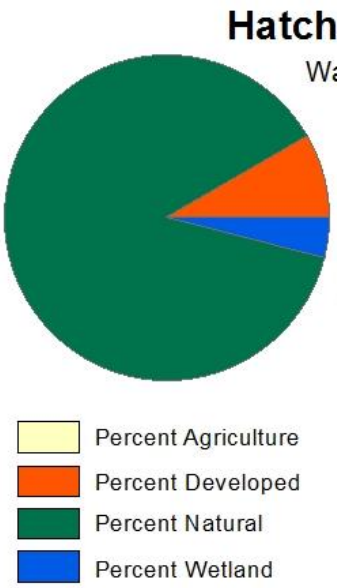
Hamilton Reservoir (MA41019)

Location:	Holland (size indicates portion in Massachusetts).
AU Type:	FRESHWATER LAKE
AU Size:	386 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
The MassDEP Herbicide Database indicates the Town of Holland has treated Hamilton Reservoir (MA41019) for the non-native aquatic macrophyte *Myriophyllum heterophyllum* every year between 2004-2013 and possibly through 2016. The Pioneer Valley Planning Commission (PVPC) received a 319 grant to implement BMPs to reduce the input of sediments to the reservoir in 2007. The BMPs were implemented and the Town of Holland continues to implement their aquatic plant management program. Based on the ongoing aquatic plant management program the Aquatic Life Use assessment for Hamilton Reservoir remains Not Supporting due to the infestation of the non-native aquatic macrophyte *Myriophyllum heterophyllum.*

Hatchet Brook (MA41-14)

Location:	From the outlet of No. 3 Reservoir, Southbridge to mouth at confluence with the Quinebaug River, Southbridge.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.51	3.39	1.43	1.40
Agriculture	0.8%	0.8%	0.6%	0.6%
Developed	8.4%	8.7%	5.2%	5.3%
Natural	86.9%	86.4%	87.4%	87.1%
Wetland	3.9%	4%	6.8%	7%
Impervious Cover	2.7%			

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

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

As part of the 2011 probabilistic streams survey MassDEP biologists sampled Hatchet Brook (MA41-14) near Dennison Cross Road in Southbridge. Sampling included benthic macroinvertebrates, fish population, and physiochemical water quality monitoring (W2214). Benthic macroinvertebrate sampling was conducted in July 2011 (B0734) and backpack electrofishing (SampleID 4597) was conducted in September 2011. While the taxonomy for the benthic sample (B0734) is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. The fish sample was dominated by fluvial specialist/dependant species and included multiple age classes of Eastern brook trout. Water quality monitoring at this site (W2214) with the exception of temperature was indicative of good conditions (minimum DO 6.4 mg/L, maximum saturation 97%, maximum DO diel shift 1.6 mg/L, good pH, low chloride and ammonia- nitrogen concentrations, average total phosphorus concentration 0.016 mg/L, and with the exception of copper no exceedances of any acute or chronic metals criteria during any of the three sampling events. Copper slightly exceeded the acute criterion once and the chronic criterion twice. These excursions do not warrant an impairment decision but will be identified with an Alert. MassDFG does list Hatchet Brook as a CFR and while it is currently not a designated Cold Water stream in

the SWQS it needs to be protected as a Tier 1 Cold Water since multiple age classes of Eastern brook trout were collected. The long-term temperature deployment data, however, collected during the summer 2011 frequently exceeded 20°C (maximum 24.2, maximum daily average 22.5°C, and 73 exceedances above the 20°C 7DADM). While the majority of the watershed is well protected, the chronic temperature violations are not considered natural since there are at least three public water supply reservoir dams in the upper watershed. The Aquatic Life Use for Hatchet Brook is assessed as Not Supporting because of elevated water temperatures resulting from the water supply dams/impoundments.

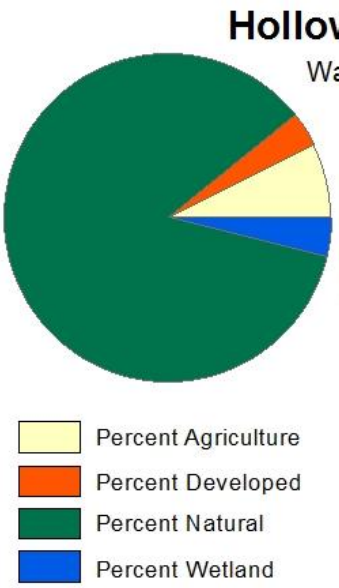
Holland Pond (MA41022)

Location:	Holland.
AU Type:	FRESHWATER LAKE
AU Size:	66 ACRES
Classification/Qualifier:	B: HQW

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
A MassDEP 1994 synoptic survey notes “potential” infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Holland Pond (MA41022). Due to the fact that this potential infestation has not been confirmed the Aquatic Life Use status remains Insufficient Information (alert)

Hollow Brook (MA41-24)

Location:	Headwaters, west of Hollow Road, Wales to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	2.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.26	3.16	1.05	0.98
Agriculture	7.3%	7.6%	9.7%	10.4%
Developed	3.5%	2.8%	4.7%	3%
Natural	85.3%	85.8%	74.5%	75.1%
Wetland	3.8%	3.8%	11.1%	11.5%
Impervious Cover	1.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

Backpack electrofishing was conducted by DFG biologists in Hollow Brook near the Hollow Road crossing in Wales (SampleID 1222) in August 2005. The sample included multiple age classes of brook trout. Hollow Brook is currently listed by MassWildlife as a CFR.

The Aquatic Life Use for Hollow Brook is assessed as fully supporting based on the presence of multiple age classes of Eastern brook trout which is indicative of good water quality conditions.

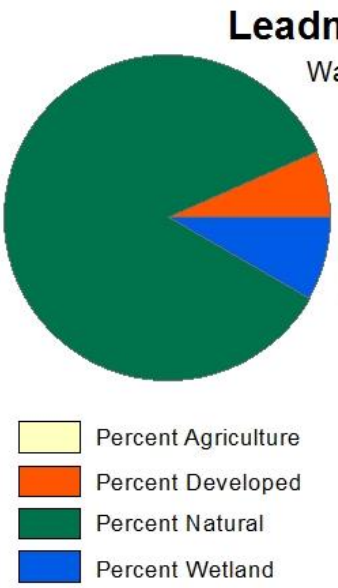
Lake George (MA41016)

Location:	Wales.
AU Type:	FRESHWATER LAKE
AU Size:	93 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
The Town of Wales noted the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum* (variable milfoil), in Lake George on herbicide permit applications for most years from 2004-2016. The presence of this non-native species should be confirmed by DEP staff. There is currently Insufficient Information to assess the Aquatic Life Use of Lake George since the identity of *Myriophyllum heterophyllum* has not yet been confirmed. The "Alert Status" due to the possible presence of a non-native macrophyte species is being maintained.

Leadmine Brook (MA41-21)

Location:	Headwaters, outlet Leadmine Pond, Sturbridge to the state line, Sturbridge, MA/Union, CT.
AU Type:	RIVER
AU Size:	2.5 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.00	2.70	1.09	1.04
Agriculture	0.3%	0.4%	0.5%	0.5%
Developed	6.6%	6.8%	9.2%	9.6%
Natural	84.8%	83.9%	79.2%	78.6%
Wetland	8.2%	8.9%	11.1%	11.3%
Impervious Cover	2.8%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

MassWildlife biologists attempted to sample fish from Leadmine Brook (MA41-21) just downstream from the Vinton Road crossing in Sturbridge on 9/14/2007. They were unable to sample, noting that the stream was dry. Not only did the sampling coincide with the issuance of a drought advisory in Central Massachusetts, but Google Earth photos from 2007 suggest what appears to be beaver activity upstream from the sampled reach. Due to the presence of what appears to be beaver activity and the beginning of a drought advisory, no fish sampling was conducted. There is Insufficient Information to assess the Aquatic Life Use for Leadmine Brook.

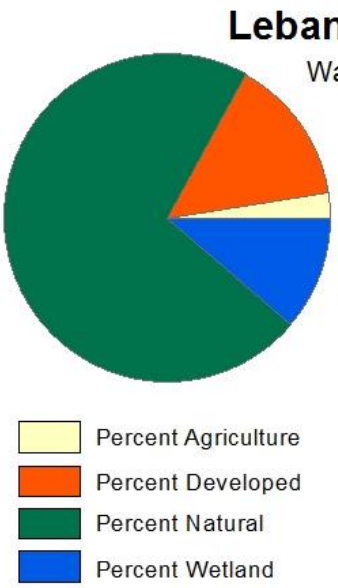
Leadmine Pond (MA41027)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data available for Leadmine Pond (MA41027) therefore the Aquatic Life Use is Not Assessed.

Lebanon Brook (MA41-11)

Location:	From the state line, Southbridge, MA/Woodstock, CT, to mouth at confluence with the Quinebaug River, Southbridge.
AU Type:	RIVER
AU Size:	4.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.41	2.99	1.34	1.14
Agriculture	2.4%	2.4%	3%	2.8%
Developed	14.6%	16.2%	9.3%	10.3%
Natural	71.7%	72.1%	71%	73.1%
Wetland	11.4%	9.3%	16.6%	13.7%
Impervious Cover	4.9%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no new data to evaluate so the Aquatic Life Use for Lebanon Brook (MA41-11) is Not Assessed.

Little Alum Pond (MA41029)

Location:	Brimfield.
AU Type:	FRESHWATER LAKE
AU Size:	73 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
The presence of a potential non-native aquatic macrophyte in Little Alum Pond (MA41029) was detailed in an old herbicide permit application however field confirmation of the *Myriophyllum* sp. has not been made. Due to a lack of any other data there is Insufficient Information to assess the Aquatic Life Use. The "Alert" for the potential non-native aquatic macrophyte infestation is being carried forward.

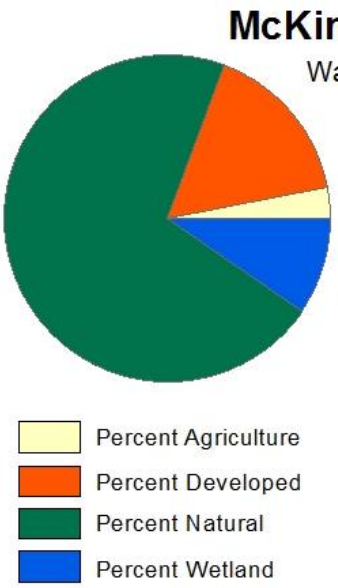
McIntyre Pond (MA41031)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data for McIntyre Pond (MA41031) therefore the Aquatic Life Use is Not Assessed.

McKinstry Brook (MA41-13)

Location:	Headwaters, east of Brookfield Road, Charlton (excluding intermittent portion) to mouth at confluence with the Quinebaug River, Southbridge.
AU Type:	RIVER
AU Size:	7.3 MILES
Classification/Qualifier:	B



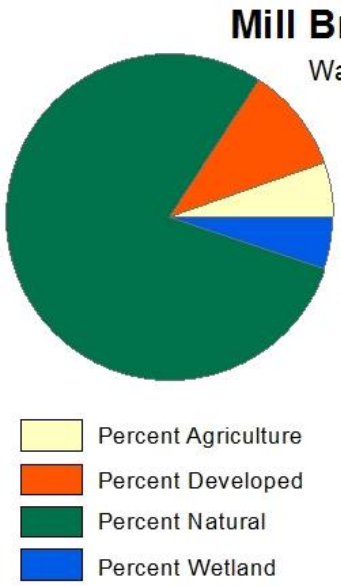
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	8.01	4.39	2.71	1.46
Agriculture	3%	2.4%	0.7%	0.6%
Developed	16.4%	20.5%	10.7%	11.4%
Natural	71%	69.4%	72.1%	76.2%
Wetland	9.6%	7.7%	16.5%	11.8%
Impervious Cover	5.9%			

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 (Alert)
There are no new data to evaluate so the Aquatic Life Use for McKinstry Brook (MA41-13) is Not Assessed. The former Alert because of hyperdominance of filter feeders in the summer 2004 benthic sample is being carried forward.

Mill Brook (MA41-07)

Location:	From inlet of Mill Road Pond, Brimfield to mouth at confluence with Quinebaug River, Brimfield (through former 2008 segment: Mill Road Pond MA41032).
AU Type:	RIVER
AU Size:	4.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	25.29	12.32	8.61	4.46
Agriculture	5.4%	5.6%	6.2%	6.2%
Developed	10.4%	11.4%	11.6%	12.9%
Natural	79%	75.6%	70.2%	64.5%
Wetland	5.2%	7.5%	12%	16.5%
Impervious Cover	3.2%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

An infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, has been documented in the Mill Road Pond impoundment of Mill Brook. DFG biologists conducted backpack electrofishing in Mill Brook downstream from the Mill Road Pond dam in July 2013. The sampling resulted in the collection of 104 fish representing 10 species, three of which are classified as fluvial. Based on the presence of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in the Mill Pond impoundment, the Aquatic Life Use for Mill Brook (MA41-07) is assessed as Not Supporting.

Monson Road Pond (MA41059)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data for Monson Road Pond (MA41059) therefore the Aquatic Life Use is Not Assessed

Morse Pond (MA41033)

Location:	Southbridge.
AU Type:	FRESHWATER LAKE
AU Size:	41 ACRES
Classification/Qualifier:	B

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

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

Morse Pond (MA41033) was first listed as impaired for Noxious Aquatic Plants in the 1996 reporting cycle. This impairment was remapped to Aquatic Plants (Macrophytes) in the 2010 cycle. Google Earth images in July 2003, September 2006, and August 2016 show high amount of floating cover. Non-rooted, floating aquatic macrophytes including Wolffia, Lemna, and Utricularia were all present in the pond during the 1994 and 1999 surveys. During the 1999 water quality survey dissolved oxygen was low in late September (4.4 mg/L at the surface and 3.1 mg/L at 1.3 meters) and extremely low in August and early September (1 and 2 mg/l at the surface and 0.4 and 1.8 mg/L at approximately 1m respectively). The maximum depth of Morse Pond measured at station W0713 (deep hole near outlet at southern end, Southbridge) in 1999 was 1.8 m. There is also a report of an infestation with the non-native aquatic macrophyte *M. heterophyllum* however this needs confirmation. The Aquatic Life Use for Morse Pond will remain assessed as Not Supporting based on older data indicating low DO at depth. Nutrient/Eutrophication Biological Indicators is being added as an impairment based on the presence of non-rooted, floating aquatic macrophytes. The Aquatic Plant Macrophytes will also remain listed as a non-pollutant because the entire lake is covered/filled in. An Alert is being identified for the potential infestation of *M. heterophyllum*. Note: Morse Pond will remain an impaired lake segment for the 2018 cycle, however it is very shallow (1.8 m at deep hole) and likely should not be represented as a lake segment (FROM 314 CMR 4.0 Definition for Lakes and Ponds --waterbodies having open water, situated in a topographical depression, generally with a maximum depth of greater than two meters). The topic of lake vs. wetland will require a structured evaluation procedure likely to be developed as part of a future CALM guidance manual. This waterbody is filled in with macrophytes during the growing season, has little oxygen, and should likely more appropriately be described as a wetland rather than a lake.

Primary Contact Recreation Use: Not Supporting

The Primary Contact Recreational Use for Morse Pond (MA41033) will continue to be assessed as Not Supporting. Google Earth images in July 2003, September 2006, and August 2016 all show high amount of floating cover. Non-rooted, floating aquatic macrophytes including Wolffia, Lemna, and Utricularia were all present in the pond during the 1994 and 1999 surveys. The presence of these free-floating species in this system is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted as a pollutant (see additional information in the removal comment. An Aquatic Plant Macrophyte impairment is also being added back in as a non-pollutant. Note: Morse Pond will remain an impaired lake segment for the 2018 cycle, however it is very shallow (1.8 m at deep hole) and likely should not be represented as a lake segment (FROM 314 CMR 4.0 Definition for Lakes and Ponds --waterbodies having open water, situated in a topographical depression, generally with a maximum depth of greater than two meters). The topic of lake vs. wetland will require a structured evaluation procedure likely to be developed as part of a future CALM guidance manual. This waterbody is filled in with macrophytes

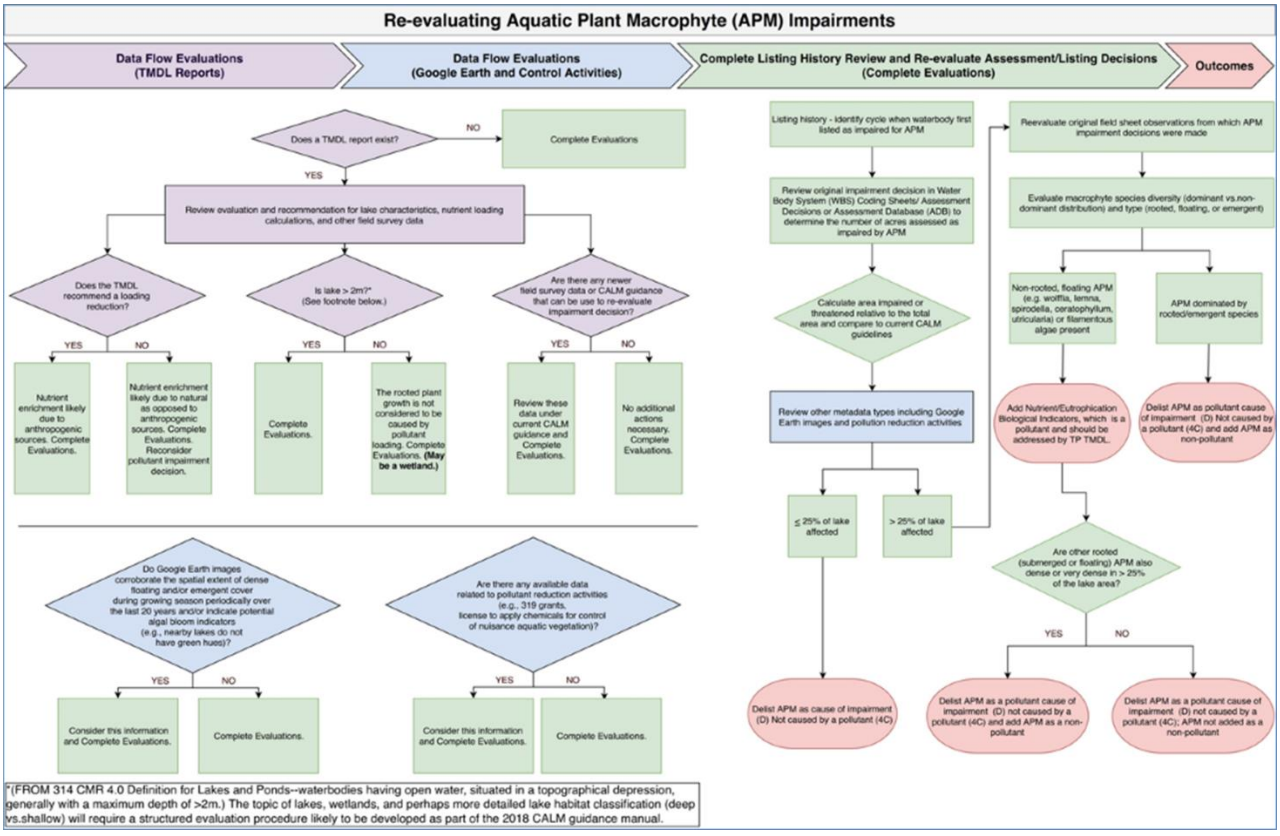
during the growing season, has little oxygen, and should likely more appropriately be described as a wetland rather than a lake.
Secondary Contact Recreation Use: Not Supporting
The Secondary Contact Recreational Use for Morse Pond (MA41033) will continue to be assessed as Not Supporting. Google Earth images in July 2003, September 2006, and August 2016 all show high amount of floating cover. Non-rooted, floating aquatic macrophytes including Wolffia, Lemna, and Utricularia were all present in the pond during the 1994 and 1999 surveys. The presence of these free-floating species in this system is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted as a pollutant (see additional information in the removal comment. An Aquatic Plant Macrophyte impairment is also being added back in as a non-pollutant. Note: Morse Pond will remain an impaired lake segment for the 2018 cycle, however it is very shallow (1.8 m at deep hole) and likely should not be represented as a lake segment (FROM 314 CMR 4.0 Definition for Lakes and Ponds --waterbodies having open water, situated in a topographical depression, generally with a maximum depth of greater than two meters). The topic of lake vs. wetland will require a structured evaluation procedure likely to be developed as part of a future CALM guidance manual. This waterbody is filled in with macrophytes during the growing season, has little oxygen, and should likely more appropriately be described as a wetland rather than a lake.
Aesthetic Use: Not Supporting
The Aesthetics Use for Morse Pond (MA41033) will continue to be assessed as Not Supporting. Google Earth images in July 2003, September 2006, and August 2016 all show high amount of floating cover. Non-rooted, floating aquatic macrophytes including Wolffia, Lemna, and Utricularia were all present in the pond during the 1994 and 1999 surveys. The presence of these free-floating species in this system is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted as a pollutant (see additional information in the removal comment. An Aquatic Plant Macrophyte impairment is also being added back in as a non-pollutant. Note: Morse Pond will remain an impaired lake segment for the 2018 cycle, however it is very shallow (1.8 m at deep hole) and likely should not be represented as a lake segment (FROM 314 CMR 4.0 Definition for Lakes and Ponds --waterbodies having open water, situated in a topographical depression, generally with a maximum depth of greater than two meters). The topic of lake vs. wetland will require a structured evaluation procedure likely to be developed as part of a future CALM guidance manual. This waterbody is filled in with macrophytes during the growing season, has little oxygen, and should likely more appropriately be described as a wetland rather than a lake.

2018/20 Delisted Impairment	Delisting Reason	Delisting Comment
Aquatic Plants (Macrophytes)	Not caused by a pollutant (4c)	Morse Pond (MA41033) was first listed as impaired for Noxious Aquatic Plants in the 1996 reporting cycle. This impairment was remapped to Aquatic Plants (Macrophytes) in the 2010 cycle. Google Earth images in July 2003, September 2006, and August 2016 show high amount of floating cover. Non-rooted, floating aquatic macrophytes including Wolffia, Lemna, and Utricularia were all present in the pond during the 1994 and 1999 surveys. The presence of these free-floating species in this system is reflected in the addition of Nutrient/Eutrophication Biological Indicators as a cause of impairment while the Aquatic Plant Macrophyte impairment is being delisted.

Supporting Information for Delisted Impairments

Aquatic Plants (Macrophytes)

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



Field sheet from DEP 1994 synoptic survey (MassDEP 1994):

9/14/94 10/6/94

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Lake/Pond Morse Pond Date 8 Sept 94

Town/City Southbridge Observers R. Haynes

River Basin Quinebaug R. R. McVoy

USGS Topo _____ PALIS NO. MA 41033

Location/type of access (be specific, e.g., public boat ramp at west cove area off Simpson Street):
From outlet end off Rt 169

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

Posted signs (re aquatic plants, fish advisories, access, etc.):
None

Water quality observations (clarity, dissolved organic staining, blooms, *et cetera*):
- Sl. Tea stain
- Clarity good
- Scum of water meal + duckweed

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

Potamogeton natans? oakesianus, Lemna, Sparodela, Wolffia, Sparganium, Pontederia, Najas flexilis, Potamogeton sp. (thin-leaf), Utricularia vulgaris, Nitella, Utricularia sp (small) Brasenia Nymphaea

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

2/3 of pond area covered by floating vegetation; submerged vegetation in drag samples very dense

V. dense

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

305b - Eutrophic

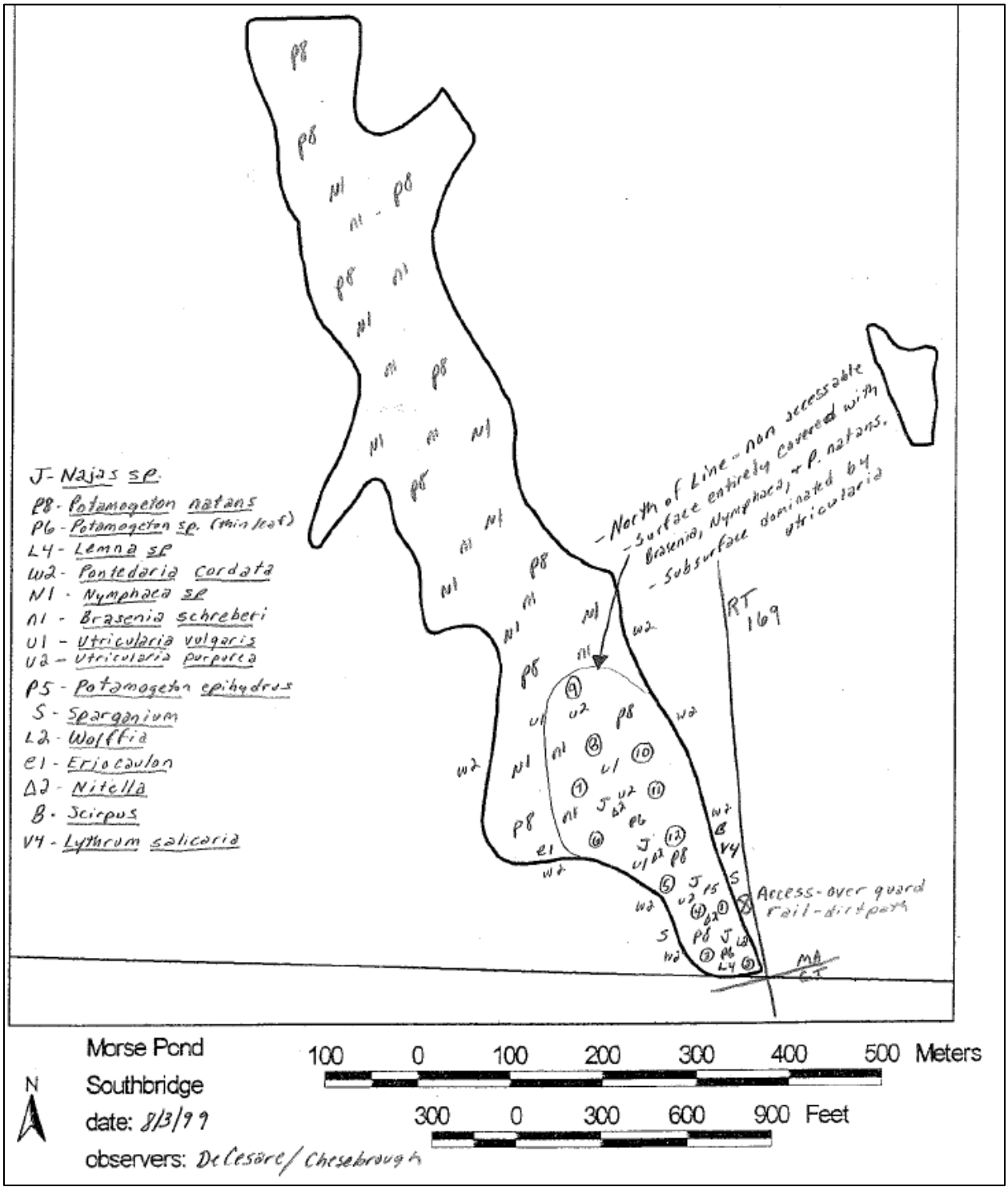
1° Contact - 2/3 Part. Support, 1/3 Unassessed

2° Contact - 2/3 Part. Surf. 1/3 Bottom Support

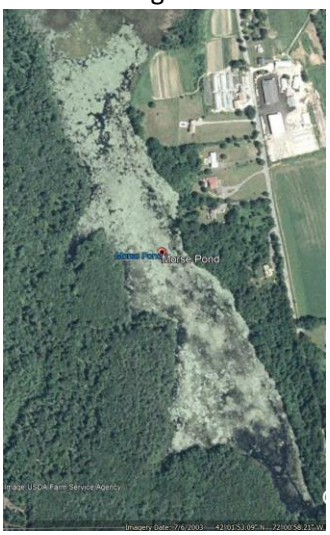
Cause - Noxious Plants - M (2/3 acreage)

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

Weed map from 1999 survey of Morse Pond (MassDEP 1999):



Satellite image of Morse Pond 7/6/2003 (Google Earth Pro Undated):



Satellite image of Morse Pond 9/2006 (Google Earth Pro Undated):

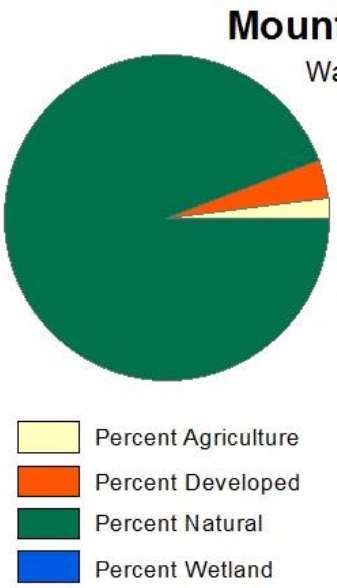
Satellite image of Morse Pond 8/23/2016 (Google Earth Pro Undated):

The maximum depth of Morse Pond measured at station W0713 (deep hole near outlet at southern end, Southbridge) in 1999 was 1.8 m (MassDEP Undated 6). No bathymetry map is available.

Nutrient/Eutrophication Biological Indicators is being added as an impairment based on the presence of non-rooted, floating aquatic macrophytes. The Aquatic Plant Macrophytes impairment is being changed from a Pollutant to a Non-Pollutant because the entire lake is covered/filled in. An Alert is being identified for the potential infestation of *M. heterophyllum*.

Mountain Brook (MA41-18)

Location:	Headwaters, east of Steerage Rock Road (excluding intermittent portion), Brimfield to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.42	1.42	0.52	0.52
Agriculture	1.9%	1.9%	3.8%	3.8%
Developed	3.8%	3.8%	5.3%	5.3%
Natural	93.4%	93.4%	88.3%	88.3%
Wetland	1%	1%	2.5%	2.5%
Impervious Cover	0.5%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

MassDFG biologists conducted backpack electrofishing at one location in Mountain Brook along the edge of the field behind the Meadow Antiques Show off of Route 20 in Brimfield (sample ID 4848) in July 2013. The sampling did not result in the capture of any fish but notes were made that the sampling location was just downstream of a beaver dam and frogs and crayfish were observed.

There is Insufficient Information to assess the Aquatic Life Use for Mountain Brook (MA41-18).

New Boston Road Pond (MA41035)

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

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data for New Boston Road Pond (MA41035) therefore the Aquatic Life Use is Not Assessed.

No. 3 Reservoir (MA41038)

Location:	Southbridge.
AU Type:	FRESHWATER LAKE
AU Size:	23 ACRES
Classification/Qualifier:	A: PWS, ORW

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data for No. 3 Reservoir (MA41038) therefore the Aquatic Life Use was Not Assessed.

No. 4 Reservoir (MA41039)

Location:	Southbridge.
AU Type:	FRESHWATER LAKE
AU Size:	69 ACRES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
The presence of a potential non-native aquatic macrophyte in No. 4 Reservoir (MA41039) was noted during a DEP synoptic survey conducted in 1994 however field confirmation of the *Myriophyllum* sp. has not been made. Due to a lack of any other data there is Insufficient Information to assess the Aquatic Life Use. The "Alert" for the potential non-native aquatic macrophyte infestation is being carried forward.

No. 5 Reservoir (MA41040)

Location:	Southbridge.
AU Type:	FRESHWATER LAKE
AU Size:	30 ACRES
Classification/Qualifier:	A: PWS, ORW (Tributary)

Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no data for No. 5 Reservoir (MA41040) therefore the Aquatic Life Use is Not Assessed.

Pistol Pond (MA41057)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
No data since 2004 have been collected in Pistol Pond (MA41057). The Aquatic Life Use for Pistol Pond will continue to be assessed as Not Supporting based on prior low dissolved oxygen concentrations.

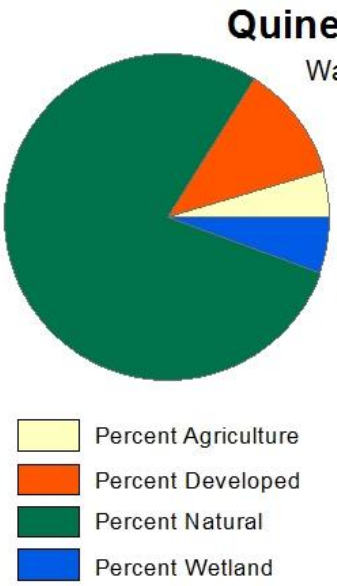
Prindle Lake (MA41043)

Location:	Charlton.
AU Type:	FRESHWATER LAKE
AU Size:	75 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
The presence of *Myriophyllum heterophyllum* in Prindle Lake (MA41043) was noted in herbicide permit applications from 2014-2016. Field confirmation of the presence of a non-native *Myriophyllum* sp. is needed. Due to the lack of other quality assured data and the potential infestation of the non-native macrophyte *Myriophyllum heterophyllum*, there is Insufficient Information to assess the Aquatic Life Use but it is identified with an "Alert".

Quinebaug River (MA41-01)

Location:	Outlet Hamilton Reservoir, Holland, to Sturbridge WWTP outfall (NPDES: MA0100421), Sturbridge (excluding Holland Pond segment MA41022 and East Brimfield Reservoir segment MA41014).
AU Type:	RIVER
AU Size:	8.2 MILES
Classification/Qualifier:	B: CWF, HQW



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	64.96	12.85	23.07	4.83
Agriculture	4.5%	2.5%	4.5%	1.5%
Developed	11.5%	16.5%	12.8%	18.7%
Natural	78.4%	76.8%	71.7%	73.3%
Wetland	5.6%	4.3%	11%	6.5%
Impervious Cover	4%			

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

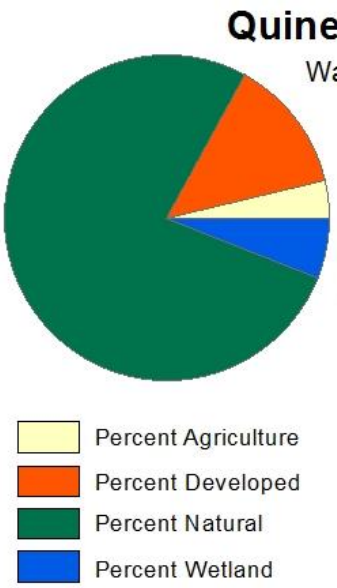
Fish, other Aquatic Life and Wildlife Use: Not Supporting

Physio-chemical water quality monitoring in this Quinebaug River AU (MA41-01) was conducted by MassDEP staff just downstream of the East Brimfield Reservoir (Station W0601) on 44 occasions between March 2005-April 2013 as part of the SMART monitoring project. The data were generally indicative of generally good conditions (i.e., DO $\geq$7 mg/L, maximum saturation 106%, low pH, alkalinity, and conductance with pH 5.7 to 7.1SU with 4 measurements below 6.0SU, maximum alkalinity 18mg/L, and maximum specific conductance 154µS/cm, low concentrations of total phosphorus with a maximum of 0.028mg/L, and toxics such as ammonia ranging between <0.02- 0.05 and chloride between 12-31 mg/L). A statistically significant decreasing trend in the annual total phosphorus concentration was found but not for the summer average (likely an effect from the 2011 tornado which affected the area). The maximum temperature was 27.4°C with 12 measurements in May, June, July and August above 20°C. The summer (June, July, August) temperature averaged 23.1°C. MassDFG biologists most recently conducted backpack electrofishing at one location within this Quinebaug River AU (MA41-01) downstream from the old Mill (Fiskdale) Dam behind the Millyard Marketplace at Route 20 in Sturbridge in August 2016 (SampleID 6165). The sample was dominated by fluvial fishes. Data from this site (SampleIDs 50 and 6165) were determined to be 42.6 percent similar to the Quinebaug River Targeted Fish Community (TFC). Although this segment (MA41-01) is classified as a Class B coldwater in the Massachusetts SWQS and is designated as a CFR by MassDFG, coldwater species were absent from

all fish population samples. MassDEP staff reported infestations of the non-native aquatic macrophyte *Myriophyllum heterophyllum* in the river during field surveys conducted between 2009 and 2012.. Water from the Quinebaug River was for use as either dilution water or as a site control in the Sturbridge WWTP's modified and/or definitive acute and chronic WET tests. Survival of *C. dubia* exposed (either 48 hours or ~7 days) to the river water collected approximately 2300 feet upstream (west) from Old Sturbridge Village Road in Sturbridge was >80% in all 28 of the tests conducted between February 2015 and November 2018. Between August 2008 and November 2018 survival of *P. promelas* exposed (either 48 hours or ~7 days) to the river water was >78% in 31 of 35 tests (89%) but was <75% (ranging from 58 to 73%) in 4 tests (May 2012, May 2014, November 2014, and November 2015) (11% of tests <75% survival).
The Aquatic Life Use is assessed as Not Supporting for this Quinebaug River AU (MA41-01) based on the absence of coldwater fishes, the low percent similarity of the fish community to the TFC model, elevated summer temperatures, low survival of *P. promelas* in toxicity tests, and the presence of the non-native aquatic macrophyte species *Myriophyllum heterophyllum.*

Quinebaug River (MA41-02)

Location:	Sturbridge WWTP outfall (NPDES: MA0100421), Sturbridge to confluence with Cady Brook, Southbridge.
AU Type:	RIVER
AU Size:	6.5 MILES
Classification/Qualifier:	B: CWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	96.76	11.13	34.65	3.76
Agriculture	3.7%	2.8%	3.4%	1.9%
Developed	13.4%	28%	12.9%	19.1%
Natural	76.8%	64.2%	72%	70.3%
Wetland	6.1%	4.9%	11.7%	8.8%
Impervious Cover	5.1%			

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting

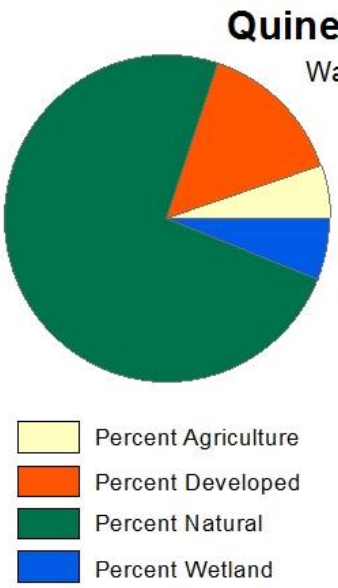
Between August 2008 and November 2018, the Sturbridge WWTP has generally met their whole effluent toxicity (WET) tests using both *C. dubia* (n=26) and *P. promelas* (n=35). One test indicated acute WET (February 2018 with an LC50s 58.3% effluent) and one indicated chronic toxicity (November 2015 CNOEC 12.5% effluent) to *C. dubia*. In an effort to re-assess the Quinebaug River as a whole using the Quinebaug Targeted Fish Community (TFC) model MassDFG biologists conducted backpack electrofishing at five locations on the Quinebaug mainstem in 2016. Three of these locations were within this Quinebaug River AU (MA41-02): near Old Sturbridge Road and the Westville Dam park access in Sturbridge (SampleIDs 6164 and 6166) and downstream from Mill Street in Southbridge (SampleID 6167). The fish samples were 68.35% comparable to the Quinebaug TFC model indicative of good conditions. Although the combined fish community compared favorably with the Quinebaug TFC model, coldwater fishes were absent from all samples. There is a potential (likely) infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Westville Lake which is part of this Quinebaug River AU which needs species confirmation.

The Aquatic Life Use for this designated Cold Water portion of the Quinebaug River (MA41-02) is assessed as Not Supporting based on the absence of coldwater fish. The likely infestation of the non-native aquatic

macrophyte *M. heterophyllum* is being identified as an Alert and the former Alert associated with evidence of instream toxicity to *P. promelas* upstream from the Sturbridge WWTP discharge is also being carried forward.

Quinebaug River (MA41-03)

Location:	Southbridge WWTP outfall (NPDES: MA0100901), Southbridge to dam (NAT ID: MA00114) just upstream of West Dudley Road, Dudley.
AU Type:	RIVER
AU Size:	2.2 MILES
Classification/Qualifier:	B: WWF



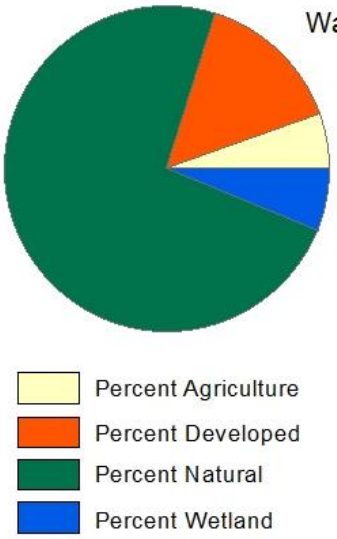
Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	130.99	12.54	47.34	4.59
Agriculture	5.2%	11.7%	4.2%	8.2%
Developed	14.7%	17.2%	14.4%	20%
Natural	73.9%	65.7%	70%	62.4%
Wetland	6.2%	5.4%	11.5%	9.4%
Impervious Cover	5.6%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting

Between August 2008 and November 2018, the Southbridge WWTP has generally met their whole effluent toxicity (WET) tests using *P. promelas* (n=54). One chronic test (November 2014 CNOEC 6.25% effluent) exhibited chronic toxicity that did not meet the permit limit. In August 2016 MassWildlife biologists conducted backpack electrofishing in this Quinebaug River AU (MA41-03) upstream from West Dudley Road in Southbridge specifically to assess the current fish community in comparison to the Quinebaug River targeted fish community model. The percent similarity was 62.96%. conditions. Although the fish sample was ~63% comparable to the Quinebaug TFC model which is indicative of good conditions, the dissolved oxygen, nutrient, and Physical substrate habitat alterations impairments are being carried forward pending data collection showing delistings are warranted.

Quinebaug River (MA41-04)

Location:	From dam (NAT ID: MA00114) just upstream of West Dudley Road, Dudley to Connecticut state line, Dudley.
AU Type:	RIVER
AU Size:	2.2 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	134.33	6.58	48.59	2.50
Agriculture	5.5%	16.1%	4.5%	13.6%
Developed	14.8%	13.3%	14.3%	14.4%
Natural	73.6%	64.9%	69.8%	62%
Wetland	6.2%	5.7%	11.4%	10.1%
Impervious Cover	5.5%			

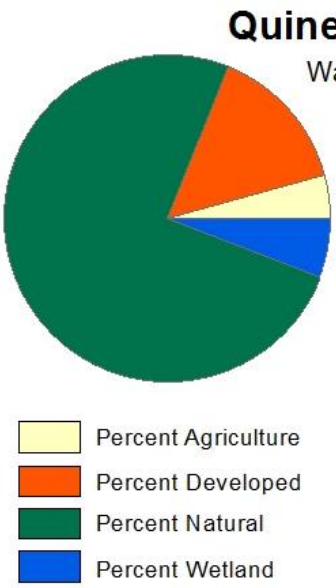
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

Monitoring of the Quinebaug River was conducted by MassDEP staff just downstream of the Massachusetts/Connecticut State line and the USGS stream gage (W0600) as part of the SMART monitoring project. Between March 2005 and September 2013 sampling included DO, temperature, pH, specific conductance, chloride, and nutrients (total phosphorus, total nitrogen, ammonia) (n=44). Water quality monitoring data were indicative of good conditions (minimum DO 7.6mg/L, maximum temperature 24.6°C, pH 6.5 to 7.6SU, low concentrations of ammonia- nitrogen [<0.02- 0.13], chloride [23-82 mg/L, and total phosphorus [0.009-0.061 mg/L] with statistically significant decreasing trends of total phosphorus concentrations between 1994 and 2013 for both annual and summer seasonal means. USGS also collected continuous DO data at their gage in Quinebaug CT (01124000) in the summers of 2015, 16, and 17. The minimum DO was 6.5mg/L and the maximum diel shift was 2.8mg/L. The other water quality data (pH, saturation, conductivity) were also indicative of good conditions.

The Aquatic Life Use for this Quinebaug River AU (MA41-04) is assessed as Fully Supporting based on the physico-chemical water quality data collected just downstream from the MA/CT state line between 2005 and 2013 and the USGS data collected during the summers of 2015, 2016, and 2017. The former Alert issues (the impounded and productive nature of the watershed, hydromodification (streamflow fluctuation) associated with the West Dudley Project Number 7254, elevated heavy metals in sediment and PCB in whole fish in Sandersdale section of Southbridge) are being carried forward.

Quinebaug River (MA41-09)

Location:	From confluence with Cady Brook, Southbridge to Southbridge WWTP outfall (NPDES: MA0100901), Southbridge.
AU Type:	RIVER
AU Size:	1.3 MILES
Classification/Qualifier:	B: WWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	113.27	11.28	40.88	4.24
Agriculture	4.2%	2.1%	3.6%	1.2%
Developed	14.8%	33.7%	14.7%	29.7%
Natural	75%	60.1%	70.7%	63%
Wetland	5.9%	4.1%	11.1%	6.2%
Impervious Cover	5.7%			

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

Survival of *C. dubia* exposed (~7 days) to the river water was >80% in all 28 of the tests conducted between August 2008 and November 2014. Between August 2008 and November 2018 survival of *P. promelas* exposed (~7 days) to the river water was >75% in 36 of 42 tests (86%) but was <75% (ranging from 58 to 70%) in 6 tests (August 2008, February 2009, May 2012, November 2014, November 2017 and March 2018) with 14% of tests resulting in <75% survival.

The Aquatic Life Use for this Quinebaug River AU (MA41-09) is assessed as Not Supporting based on the occasional toxicity to *P. promelas* (~14% of the tests conducted between August 2008 and November 2018). The benthic macroinvertebrate bioassessment impairment will be carried forward.

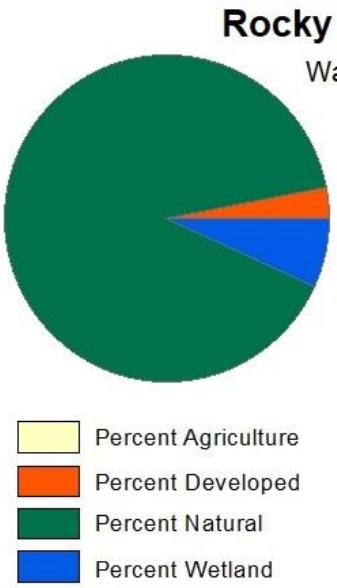
Railroad Pond (MA41058)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There is an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Railroad Pond (MA41058). Because of the infestation of *M. heterophyllum* the Aquatic Life Use is assessed as Not Supporting.

Rocky Brook (MA41-22)

Location:	Headwaters east of Chamberlain Pond (excluding intermittent portion), Douglas to the state line Douglas, MA/Thompson, CT.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	4.51	4.51	1.59	1.59
Agriculture	0.2%	0.2%	0.1%	0.1%
Developed	3%	3%	0.1%	0.1%
Natural	89.9%	89.9%	84.8%	84.8%
Wetland	6.9%	6.9%	15%	15%
Impervious Cover	1.7%			

Fish, other Aquatic Life and Wildlife Use: Insufficient Information

During the summer of 2011 MassDEP biologists sampled Rocky Brook as part of their Reference Site Network (RSN) project at one site downstream from a footbridge near the extension of High Street in the Douglas State Forest in Douglas. Over the course of the summer streamflow was reduced to a trickle because of a beaver dam upstream and therefore the representativeness of these data (biological data including both benthic and fish population data) were considered compromised. Water temperatures from a long-term thermistor deployed in the brook (W2221) from June 13th until November 18th of 2011 ranged from 10.4 to 28.0°C. Temperatures were above 20°C for much of June, July, and August. Nutrient and chloride samples were collected on three dates. These data were indicative of good conditions (i.e., ammonia-nitrogen, total phosphorus, and chloride concentrations -- <0.02, ≤0.02, and ≤6 mg/L, respectively). There is Insufficient Information to assess the Aquatic Life Use for Rocky Brook (MA41-22).

Sherman Pond (MA41046)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting (Alert)
There is an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Sherman Pond. Water quality monitoring was conducted in July 2003. A water quality profile at the deep hole revealed low dissolved oxygen beginning at 2.5 meters and extending to the bottom at 2.8 meters. Bathymetry data is not available for Sherman Pond therefore the extent of the low DO cannot be calculated. The other limited data were indicative of generally good conditions (e.g., maximum temperature 29.7°C, maximum saturation 103%, good pH, chlorophyll *a* 8.2µg/L). The Aquatic Life Use for Sherman Pond is assessed as not supporting based on the presence of the non-native aquatic macrophyte *Myriophyllum heterophyllum*. Low DO is identified as an alert.

Sibley Pond (MA41047)

Location:	North Basin, Charlton.
AU Type:	FRESHWATER LAKE
AU Size:	22 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no new data for the North Basin of Sibley Pond (MA41047) therefore, the Aquatic Life Use will remain assessed as Not Supporting due to low dissolved oxygen documented at depth in the pond during MassDEP surveys conducted in July and August 1999.

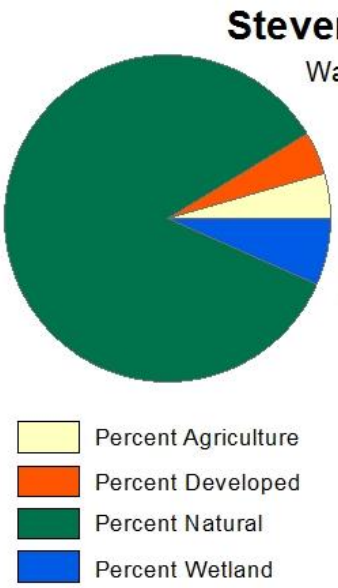
Sibley Pond (MA41048)

Location:	South Basin, Charlton.
AU Type:	FRESHWATER LAKE
AU Size:	19 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There are no new data for the South Basin of Sibley Pond (MA41048) therefore, the Aquatic Life Use will remain assessed as Not Supporting due to low dissolved oxygen documented at depth in the pond during MassDEP surveys conducted in July and August 1999.

Stevens Brook (MA41-19)

Location:	From the state line Wales, MA/Stafford, CT to mouth at inlet of Hamilton Reservoir, Holland.
AU Type:	RIVER
AU Size:	4.7 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.86	3.55	1.36	1.26
Agriculture	4.4%	4.5%	5.3%	4.9%
Developed	4.2%	4.6%	4.4%	4.7%
Natural	84.7%	83.9%	75.7%	74.8%
Wetland	6.6%	7%	14.6%	15.5%
Impervious Cover	2.1%			

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

MassDFG biologists conducted backpack electrofishing at three locations on Stevens Brook (MA41-19) in July 2006 near the corner of Union and Stafford roads in Wales (SampleD 1980) and further downstream in June 2000 upstream of Old Stafford Road and near the mouth in Holland (SampleIDs 121 and 122, respectively). As part of the 2011 probabilistic streams survey MassDEP biologists sampled in the middle portion of Stevens Brook in the summer of 2011 downstream from Old Stafford Road crossing nearest Howlett Road in Holland. Biological sampling was conducted at this MAP2-031 site (both benthic macroinvertebrates B0713 and fish (SampleID 4598), as well as water quality (W2191). While the taxonomy for the benthic sample is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Three of four locations were dominated by fluvial dependants and specialists and included reproducing brook trout populations. The fish population at the downstream location near Hamilton Reservoir was comprised of 45 percent fluvial species and included brown trout which were most likely stocked. Physio-chemical water quality monitoring included temperature, pH, turbidity, dissolved oxygen, specific conductivity, chloride, total phosphorus, nitrate/nitrite, total nitrogen, ammonia, and metals. At no time was dissolved oxygen below 6.0mg/l during the probe deployed from June 24, 2011 until September 7, 2011. Two temperature probes were deployed by MassDEP in 2011. One was deployed for the whole season and one was deployed on three separate occasions for 3-5 days on each occasion. Combining data from both probes, temperatures from early May to late October ranged between 10.7–26.1°C (mean 18.5°C). Stevens Brook is a Class B water however it is considered a CFR by MassWildlife. Water temperatures exceeded coldwater criteria of 20°C for at least some period in May, June, July and August 2011 with most occurring in July and short-term small exceedances happening during the other months. Nutrient concentrations were low (total phosphorus 0.014-0.040 mg/L, total nitrogen 0.26--0.49 mg/L) and there were no indicators of nutrient enrichment (maximum diel DO shift 0.8mg/L). There were no exceedances of acute or chronic criteria for ammonia, chloride, or metals (n= 3 sampling events for Cd, Cr, Cu, Pb, Ni, Ag, Zn, As, Se).

The Aquatic Life Use for Stevens Brook (MA41-19) is assessed as Fully Supporting based on good biological condition (fish sampling), and with the exception of temperature during the summer months, the water quality data were also indicative of excellent conditions. Temperature is being identified as an Alert issue.

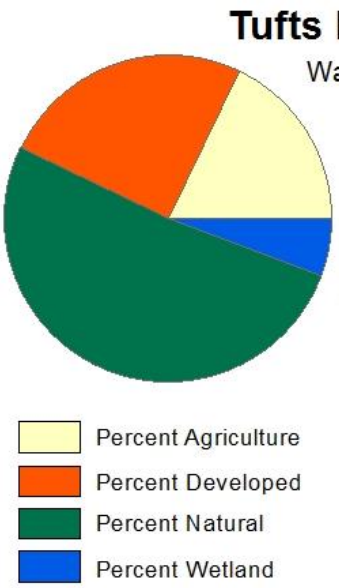
Sylvestri Pond (MA41049)

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

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There is an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Sylvestri Pond (MA41049). Because of the infestation of *M. heterophyllum* the Aquatic Life Use is assessed as Not Supporting.

Tufts Branch (MA41-10)

Location:	Headwaters, north of Dudley-Southbridge Road, Dudley to the state line, Dudley, MA/Thompson, CT.
AU Type:	RIVER
AU Size:	2.8 MILES
Classification/Qualifier:	B: CWF



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.47	3.44	1.34	1.33
Agriculture	17.8%	17.6%	16%	15.5%
Developed	25.2%	25.3%	19.8%	20%
Natural	51.2%	51.3%	55.3%	55.7%
Wetland	5.8%	5.8%	8.9%	8.9%
Impervious Cover	5.4%			

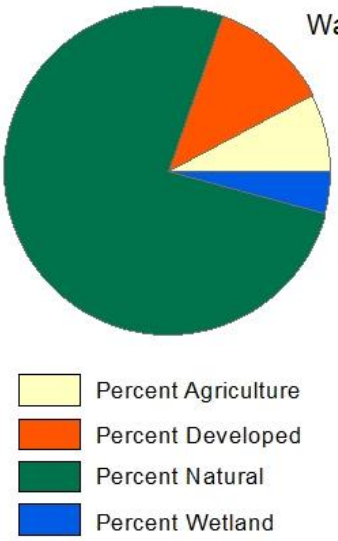
Fish, other Aquatic Life and Wildlife Use: Not Assessed
No new data are available so the Aquatic Life Use for Tufts Branch (MA41-10) is Not Assessed.

Unnamed Tributary (MA41-16)

Location:	Unnamed tributary to Mill Brook, headwaters, outlet Sherman Pond, Brimfield to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	1.2 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA41-16

Watershed Area: 6.11 square miles

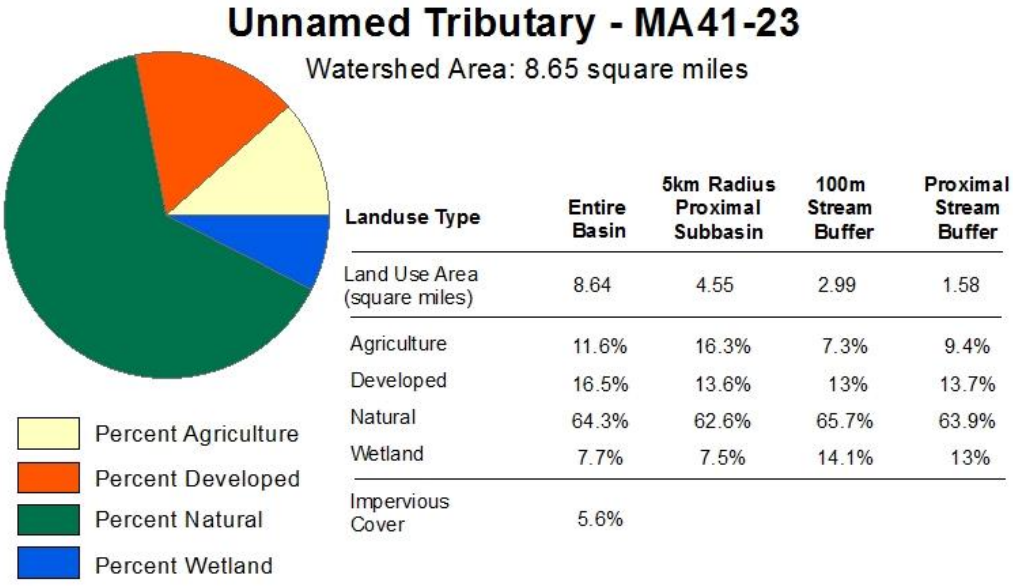


Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.10	4.45	1.97	1.50
Agriculture	7.6%	9.6%	8.9%	11.2%
Developed	12%	13.3%	15.1%	17.1%
Natural	76.3%	72.1%	66.5%	60.9%
Wetland	4.2%	4.9%	9.5%	10.9%
Impervious Cover	3.9%			

Fish, other Aquatic Life and Wildlife Use: Not Supporting
Without any new data for this Unnamed Tributary (MA41-16), locally referred to as East Brook, the Aquatic Life Use remains assessed as Not Supporting based on the moderately impacted benthic community, degraded habitat quality associated with sedimentation/siltation, and low dissolved oxygen documented during the surveys conducted in the summer of 2004.

Unnamed Tributary (MA41-23)

Location:	Unnamed tributary to the Quinebaug River from headwaters at the outlet of an unnamed pond on the Southbridge/Charlton border to mouth at confluence with the Quinebaug River, Southbridge.
AU Type:	RIVER
AU Size:	1.9 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	8.64	4.55	2.99	1.58
Agriculture	11.6%	16.3%	7.3%	9.4%
Developed	16.5%	13.6%	13%	13.7%
Natural	64.3%	62.6%	65.7%	63.9%
Wetland	7.7%	7.5%	14.1%	13%
Impervious Cover	5.6%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

This Unnamed tributary (MA41-23) was sampled by MassDFG biologists in August 2009 near the gravel pit near Sandersdale Rd (Dresser Hill Rd) (SampleID: 3043), using a backpack electrofisher. A total of 89 individuals were collected with 10 species being represented including one cold water species (brown trout likely stocked). The sample was dominated by fluvial specialists/dependents and 27% were intolerant/moderately intolerant pollution.

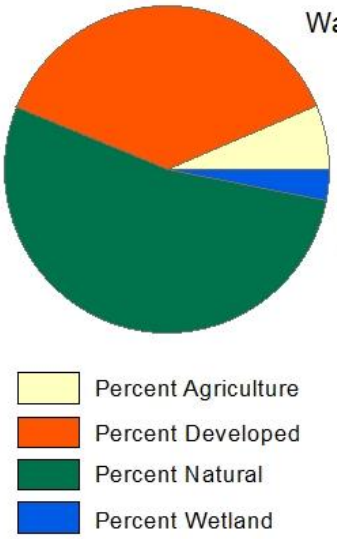
The Aquatic Life Use for this Unnamed Tributary (MA41-23) will continue to be assessed as Fully Supporting based on these most recent fish population data.

Unnamed Tributary (MA41-25)

Location:	Unnamed tributary to Tufts Branch, headwaters, outlet Wielock Pond, Dudley to mouth at confluence with Tufts Branch, Dudley.
AU Type:	RIVER
AU Size:	0.2 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA41-25

Watershed Area: 1.04 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.02	1.02	0.37	0.37
Agriculture	6.4%	6.4%	1.1%	1.1%
Developed	37.5%	37.5%	32.7%	32.7%
Natural	53%	53%	58.6%	58.6%
Wetland	3.2%	3.2%	7.6%	7.6%
Impervious Cover	8.6%			

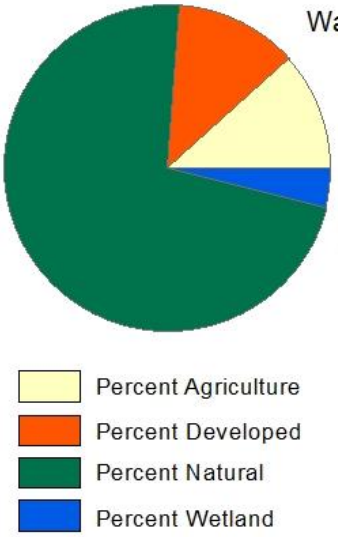
Fish, other Aquatic Life and Wildlife Use: Not Assessed
No new data are available for this Unnamed Tributary (MA41-25) therefore the Aquatic life Use is Not Assessed.

Unnamed Tributary (MA41-26)

Location:	Unnamed tributary locally known as 'Freeman's Brook' from headwaters west of Cronin Road, Warren to an unnamed tributary to Long Pond, Sturbridge.
AU Type:	RIVER
AU Size:	2.6 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA41-26

Watershed Area: 5.04 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	5.03	5.03	1.96	1.96
Agriculture	11.7%	11.7%	12.4%	12.4%
Developed	12.2%	12.2%	8.8%	8.8%
Natural	72.2%	72.2%	72.1%	72.1%
Wetland	3.9%	3.9%	6.8%	6.8%
Impervious Cover	4.3%			

Fish, other Aquatic Life and Wildlife Use: Fully Supporting

MassDFG biologists sampled one location on the Unnamed Tributary locally known as Freemans Brook (MA41-26) downstream from Cronin Road in Warren in August 2012 using a backpack electroshocker. The sample was dominated by fluvial dependents/specialists and included multiple age classes of Eastern brook trout (seven of which were less than or equal to 140 mm).

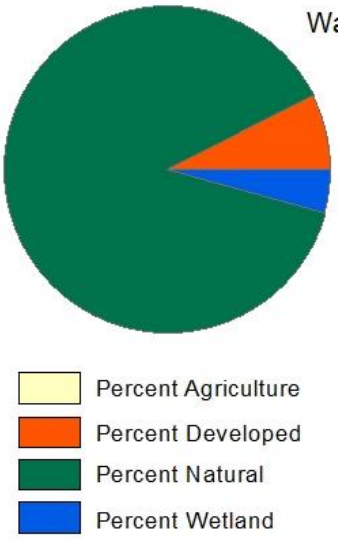
The Aquatic Life Use is assessed as Fully Supporting in this Unnamed Tributary based on the fish population data.

Unnamed Tributary (MA41-27)

Location:	Unnamed tributary to Mill Brook, headwaters south of East Hill Road, Brimfield to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	1.7 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA41-27

Watershed Area: 1.26 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.26	1.26	0.44	0.44
Agriculture	0.7%	0.7%	1.5%	1.5%
Developed	7.4%	7.4%	5.5%	5.5%
Natural	87.6%	87.6%	82%	82%
Wetland	4.3%	4.3%	10.9%	10.9%
Impervious Cover	2.1%			

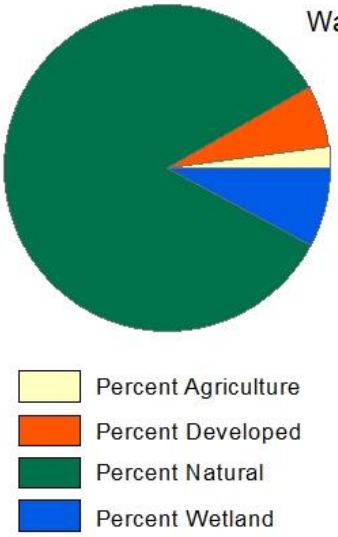
Fish, other Aquatic Life and Wildlife Use: Not Assessed
There are no new data for Unnamed Tributary (MA41-27), therefore, the Aquatic Life use is Not Assessed.

Unnamed Tributary (MA41-29)

Location:	Unnamed tributary to unnamed pond (eventually to Quinebaug River), headwaters (perennial portion) east of Arnold Road, Sturbridge to mouth at inlet unnamed pond north of Route 90, Sturbridge.
AU Type:	RIVER
AU Size:	0.6 MILES
Classification/Qualifier:	B

Unnamed Tributary - MA41-29

Watershed Area: 0.56 square miles



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	3.03	0.54	0.15	0.15
Agriculture	2%	12%	2.1%	2.1%
Developed	6.2%	3.8%	1.4%	1.4%
Natural	83.8%	72.7%	67.4%	67.4%
Wetland	8%	11.4%	29.2%	29.2%
Impervious Cover	3.2%			

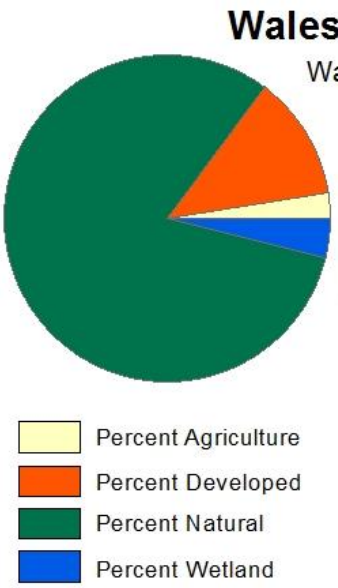
Fish, other Aquatic Life and Wildlife Use: Fully Supporting (Alert)

As part of the 2011 probabilistic streams survey MassDEP biologists sampled the Unnamed Tributary (MA41-29) approximately 900 feet upstream from the Massachusetts Turnpike (Route 90) in Sturbridge. Sampling included fish population, benthic macroinvertebrates, and physiochemical water quality monitoring (W2206). Benthic macroinvertebrate sampling was conducted in July 2011 and backpack electrofishing was conducted in September 2011 just four days after Hurricane Irene. While the taxonomy for the benthic sample is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. The fish sample was comprised entirely of blacknose dace, a tolerant fluvial specialist species. Physio-chemical water quality data collected on six surveys between 5/26 and 10/3 were indicative of good conditions: temperature (15.1- 19.5°C), dissolved oxygen (7.0-8.3 mg/l), pH (6.4-7.0 SU). An unattended probe measuring DO and temperature was deployed on three separate occasions for three to four days between 6/24-9/7/2011. An additional unattended temperature probe was also deployed from 5/26 to 10/3/2011. Temperatures ranged between 12.1-26.3°C and DO ranged between 5.5-8.4 mg/L (average 7.3 mg/L) with a maximum diel shift of 2.6 mg/L. Nutrient sampling was conducted on five occasions including analysis for total phosphorus and total nitrogen. Total phosphorus concentrations were elevated ranged from 0.089-0.28mg/l while total nitrogen concentrations were low (0.41--0.84 mg/l). Ammonia and chloride concentrations were also low. Samples were also collected and analyzed for metals on three occasions during the summer and early fall of 2011. There were no exceedances of acute or chronic criteria.

The Aquatic Life Use for this Unnamed Tributary (MA41-29) is assessed as Fully Supporting based on the biological (fish) and water quality data collected from the brook upstream from the Massachusetts Turnpike during the summer/fall of 2011. Total phosphorus concentrations were elevated so will be identified with an Alert since there were no other indicators of nutrient enrichment.

Wales Brook (MA41-08)

Location:	Headwaters, outlet Lake George, Wales to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	5.2 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	6.51	3.22	1.95	0.95
Agriculture	2.4%	4%	2%	3.9%
Developed	12.5%	10.7%	16.5%	14.7%
Natural	81.1%	81.1%	70%	68.1%
Wetland	4%	4.3%	11.5%	13.4%
Impervious Cover	3.7%			

Fish, other Aquatic Life and Wildlife Use: Not Assessed
No new data are available, so the Aquatic Life Use for Wales Brook (MA41-08) is Not Assessed.

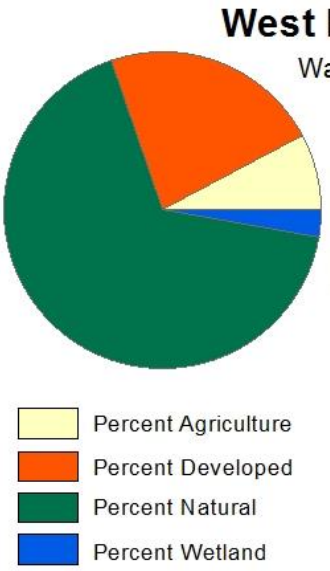
Walker Pond (MA41052)

Location:	Sturbridge.
AU Type:	FRESHWATER LAKE
AU Size:	104 ACRES
Classification/Qualifier:	B

Fish, other Aquatic Life and Wildlife Use: Not Supporting
There is an infestation of the non-native aquatic macrophyte, *Myriophyllum heterophyllum*, in Walker Pond (MA41052). Because of the infestation of *M. heterophyllum* the Aquatic Life Use is assessed as Not Supporting.

West Brook (MA41-17)

Location:	Headwaters, west of the Dix Hill Road/Route 19 intersection (excluding intermittent portion), Brimfield to mouth at confluence with Mill Brook, Brimfield.
AU Type:	RIVER
AU Size:	1.8 MILES
Classification/Qualifier:	B



Landuse Type	Entire Basin	5km Radius Proximal Subbasin	100m Stream Buffer	Proximal Stream Buffer
Land Use Area (square miles)	1.41	1.41	0.51	0.51
Agriculture	7.8%	7.8%	8.3%	8.3%
Developed	22.6%	22.6%	17.3%	17.3%
Natural	66.9%	66.9%	67.9%	67.9%
Wetland	2.7%	2.7%	6.5%	6.5%
Impervious Cover	5.8%			

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

In 2011, MassDEP biologists conducted benthic macroinvertebrate, fish, and water quality sampling in West Brook just upstream from Route 20 in Brimfield (W2198). While the taxonomy for the benthic sample (B0719) is complete these data were not analyzed using an RBPIII approach. Rather, the benthic data will be compared to biocriteria thresholds which are currently under development. Therefore these (benthic macroinvertebrate) data will not be used as part of the Aquatic Life Use assessment for this reporting cycle. Fish population data (SampleID 4593) from August documented five species of fish including two moderately tolerant macrohabitat generalists. Water quality data (including dissolved oxygen and temperature were collected during five-day deploys as well as temperature only during a longer deploy) using unattended probes at the water quality sampling location (W2198). The mean of the daily minimum dissolved oxygen (DO) concentration during the two 5-day deployments was 4.7 mg/l which is slightly below the USEPA 7 day mean minimum of 5.0 mg/ although the minimum DO was 3.8 mg/L. The average DO concentration was 5.1 mg/l and the maximum diel shift was 2.14 mg/L. Attended dissolved oxygen measurements averaged 4.9 mg/l. Temperatures ranged between 15.2 – 28.1 °C between 5/26 and 10/3, with a maximum 7-DADM of 26.8 °C. Water quality samples were collected on 5 occasions and the data are summarized as follows: chloride (8-15 mg/l), ammonia (<0.02-0.12 mg/l), turbidity, total phosphorus (0.019-0.034 mg/l), total nitrogen (0.34-0.55 mg/l) and there were no exceedances of any acute or chronic metals criteria.

The Aquatic Life Use for West Brook is assessed as Fully Supporting based the fish and water quality data. Low DO was documented although may be associated with natural conditions resulting from the presence of beaver activity and the low gradient nature of the brook in this reach so is identified with an Alert.

Wielock Pond (MA41056)

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

Fish, other Aquatic Life and Wildlife Use: Insufficient Information (Alert)
Although a baseline lake water quality monitoring (profile) of Wielock Pond (MA41056) in 2004 found low oxygen near the bottom, this waterbody is so shallow the single profile was not adequate to determine the areal extent of low dissolved oxygen conditions. Chlorophyll a concentrations were high, resulting in the assignment of an alert status in the previous cycle. Since no more recent data have been collected there is Insufficient Information to assess the Aquatic Life Use for Wielock Pond and the alert is being carried forward for elevated Chlorophyll a.

References

Beaudoin, Therese. "Technical Memorandum French and Quinebaug Rivers Watershed Smart Monitoring Program 2005-2010." CN 427.0, Division of Watershed Management , Massachusetts Department of Environmental Protection, Worcester, MA, 2016.

Beaudoin, Therese. "Technical Memorandum French and Quinebaug Rivers Watershed Smart Monitoring Program 2011-2013." CN 415.0, Divison of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2016.

Chen, Xiaoning. "RE: Question about Charlton WWTP treatment plant upgrade." Email to Laurie Kennedy (MassDEP Watershed Planning Program), Wastewater Program, Massachusetts Department of Environmental Protection, Worcester, MA, January 15, 2020.

CT DEEP. "2018 Integrated Water Quality Report Appendix A-1." Connecticut Department of Energy and Environmental Protection. Hartford, CT 2019. https://www.ct.gov/deep/lib/deep/water/water_quality_management/305b/2018_CT_IWQR_Appendix_A-1.pdf.

Dunn, William J. "1989 Lower Quinebaug River Water Quality Data Wastewater Discharge Data Water Quality Analysis." Publication 41-ABC-2, Technical Services Branch, Division of Water Pollution Control, Massachusetts Department of Environmental Protection, Westborough, MA, 1990.

Google Earth Pro. "Google Earth Pro Images." Undated.

Haque, Albelee A., and Mark D. Mattson, PhD. "Baseline Lake Survey 2003 Technical Memo." CN 205.1, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2007.

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

Kennedy, Laurie E., Stella Kiras, and Richard McVoy. "French & Quinebaug River Watersheds 2001 Water Quality Assessment Report." CN 51.0, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2002.

MassDEP. "2015 Scanned Project Files, Aquatic Plant Maps, Completed Fieldsheets, 1999 pdf file D33-15." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 1999.

MassDEP. "2015 Scanned Project Files, French and Quinebaug Watershed 1994 Lakes Survey Data pdf file D01-17.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 1994.

MassDEP. "DWM Data Use Guidelines." CN 000.83b, Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, MA, 2007.

MassDEP. "French and Quinebaug River Watersheds 2004-2008 Water Quality Assessment Report ." CN 178.5, Division of Watershed Management, Massachusetts Department of Environmental Protection , Worcester, MA, 2009.

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

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

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

MassDEP. "Open file analysis of 2005-2017 fish community data in comparison with the Target Fish Community model." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 2.

MassDEP. "Open file analysis of DWM WPP water quality data collected between 2000 and 2015 using CALM guidance." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 3.

MassDEP. "Open file of fish sample data collected as part of RSN or probabilistic stream surveys." Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester, MA, Undated 4.

MassDEP. "Open Files of NPDES permit information, whole effluent toxicity testing (ToxTD) data, and associated georeferencing data." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 5.

MassDEP. "Open files of unpublished, validated water quality monitoring data, field sheet data, and GIS datalayers in development." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, Undated 6.

MassDEP. "Scanned files of 1999 lake survey weed maps, 41033-morsepd--sou.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 1999.

MassDEP. "Scanned historical 305b reports and 303d coding sheets quinebaug91_02_searchable.pdf." Division of Watershed Management, Massachusetts Department of Environmental Protection, Worcester, Massachusetts, 2002.

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

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

Slater, Caleb. "Personal communication with Robert Maietta (MassDEP Watershed Planning Program) regarding habitat restoration of Hamant Brook." Division of Fisheries and Wildlife, Massachusetts Department of Fish and Game, Westborough, MA, October 1, 2019.

Stolarski, Jason. "Inland Bathymetry Shape Files." Files Emailed to Laurie Kennedy (MassDEP Watershed Planning Program) on October 5, 2018 With Subject Line "Re: Bathymetry Files", Massachusetts Division of Fisheries and Wildlife, Massachusetts Department of Fish and Game, Westborough, Massachusetts, 2018.

USGS. "USGS National Water Information System: Web Interface." *USGS 01124000 Quinebaug River at Quinebaug, CT.* January 2020. https://nwis.waterdata.usgs.gov/usa/nwis/uv/?cb_00300=on&format=gif_default&site_no=01124000&period=&begin_date=2015-06-09&end_date=2017-09-28.