Section 5-6
Presumpscot River & Tributaries (Presumpscot River Watch)

Presumpscot River

The Presumpscot River originates at Sebago Lake Basin and flows approximately 25 miles (40 km) to the Atlantic Ocean (Casco Bay) through Cumberland County, Maine. The Presumpscot River contributes the largest freshwater input into Casco Bay, draining approximately 648 square miles. The Presumpscot watershed below Sebago Lake is slightly more than 200 square miles. Nine dams, seven of which are used to generate hydroelectric power, create impoundment and associated tailwater habitats. The uppermost dam is located at the Sebago Lake outlet, whereas the lowermost dam is located at the SAPPI Mill in Westbrook.

Major tributaries to the Presumpscot River include the Pleasant River, Little River, and the Piscataqua River; minor tributaries include Otter Brook, Nason Brook, Black Brook, Colley Wright Brook, Inkhorn Brook, and Mill Brook. Highland Lake and Forest Lake are the primary lakes in the Presumpscot River watershed; Mill Brook and the Piscataqua River, respectively, connect them to the main stem of the Presumpscot River.

Windham, Gorham, Westbrook, Cumberland, Falmouth, and Portland represent primary municipalities in the Presumpscot River watershed, and are characterized by multiple land uses. Urban areas include residential and commercial dwellings, commercial businesses, light industry, and water and wastewater treatment plants. Westbrook and Portland contribute combined sewer overflow (CSO) discharge to the Presumpscot River below Saccarappa Falls. The SAPPI paper mill is located in Westbrook. Agricultural practices such as row crop and pasture constitute the agricultural land use component, whereas mixed deciduous and coniferous forest comprise the forest component.

Segments of the Presumpscot River are listed in the Maine Department of Environmental Protection (DEP) Integrated Monitoring and Assessment Report as impaired for recreational use (bacteria). These segments include: Colley Wright Brook, Hobbs Brook, Inkhorn Brook, Mosher Brook, Otter Brook, Nason Brook, Pleasant River, Piscataqua River and Presumpscot River-Westbrook (CSO abatement ongoing). The following segments are also listed as impaired due to dissolved oxygen: Colley Wright Brook, Hobbs Brook, Inkhorn Brook, Mosher Brook, Otter Brook, and Pleasant River (including Thayer Brook).

According to Maine's statutory Water Classification System, the Presumpscot River Basin has designations listed below.

- Presumpscot River, main stem.
    - From the outlet of Sebago Lake to the confluence with the Pleasant River – Class A. (Note: Dundee Pond is a great pond, classified GPA)
    - From the confluence with the Pleasant River to Saccarappa Falls – Class B.

  - From the Saccarappa Falls to tidewater – Class C.
  - Below head-of-tide – Class SC.
- Presumpscot River tributaries below Sebago Lake – Class B.

Monitoring History

• The Maine DEP Biological Monitoring Program has been monitoring the river and tributaries since 1985. This data is available on DEP's website.

• Presumpscot River Watch (PRW), incorporated as a not-for-profit organization in 1989. The mission of PRW is to preserve and improve the health of the Presumpscot River watershed by scientifically monitoring water quality and sharing data to increase awareness of the condition of the river. PRW's commitment is primarily accomplished through a seasonal (summer) volunteer water quality monitoring program that enhances public awareness of river water quality in the Presumpscot River watershed. The data generated from the monitoring program also serve other purposes: (1) verification of State water quality standards; (2) identification of specific problem areas; (3) establishment of baseline water quality monitoring data; and (4) use of water quality monitoring results by other organizations.

• Presumpscot River Watch joined the Volunteer River Monitoring Program in 2009.

Methods and Sampling Sites

The volunteers monitor the Presumpscot River annually. There are thirty-four monitoring sites in the watershed. Although PRW's goal is to monitor all sites each year, they generally sample a subset of sites every year. All stations are above the head-of-tide at Presumpscot Falls.

Monitoring is conducted every two weeks from May through August. At each of the sites, the monitors take measurements of dissolved oxygen and temperature using either a YSI meter. Conductivity is measured with either a YSI meter or EC Testr 11/11+ pen. Grab samples are collected for *E. coli* bacteria and transported to the PRW office for analysis using IDEXX Quanti-Tray 2000 method.

Table 5-6-1. Presumpscot River Watch sampling sites, ordered from upstream down for the main stem and the same for the tributaries at their confluence with the Presumpscot River (*indicates non-approved sites).

Site ID	Organization Site Code	Sample Location	Class
Mainstem (ordered from upstream to downstream)			
Presumpscot River-R225-VRMP	P200	Route 35 Crossing	A
Presumpscot River-R202-VRMP	P170	Presumpscot River	A
Presumpscot River-R195-VRMP	P160	Presumpscot River	A
Presumpscot River-R166-VRMP	P150	Presumpscot River	A
Presumpscot River-R163-VRMP	P140	Presumpscot River	B
Presumpscot River-R161-VRMP	P145	Presumpscot River	B
Presumpscot River-R157-VRMP	P135	Gambo Park	B
Presumspcot River-R133-VRMP	P110	Presumpscot River	B
Presumpscot River-R129-PRW*	P089	Presumpscot River	B
Presumpscot River-R126-PRW*	P080	Presumpscot River	B
Presumpscot River-R47-VRMP	P030	Presumpscot River	C
Presumpscot River-R24-VRMP	P020	Blackstrap River	C
Presumpscot River-R07-VRMP	P015	Presumpscot River	C
Pleasant River & Tributaries			
Pleasant River-RPL47-VRMP	PL040	Route 302	B
Pleasant River-RPL37-VRMP	PL030	Pleasant River	B
Pleasant River-RPL29-VRMP	PL020	Pope Road	B
Pleasant River-RPL06-VRMP	PL010	Lovett Bridge	B
Ditch Brook-RPL00-VRMP	DB010	Ditch Brook	B
Baker Brook-RPLBK17-VRMP	BB010	Baker Brook	B
Upper Presumpscot Tributaries			
Little River-RLT89-VRMP	L050	Little River	B
Little River-RLT15-VRMP	L020	Little River	B
Little River-RLT08-VRMP	L010	Little River	B
Douglas Brook-RLTNBDG20-VRMP	DG010	Douglas Brook	B
Tannery Brook-RLTTN06-VRMP	TA010	Queen Street	B

Black Brook-RBK05-VRMP	BL010	Black Brook	B
Otter Brook-ROT06-VRMP	OB010	Otter Brook	B
Nason Brook-RNS11-VRMP	N010	Nason Brook	B
Colley Wright Brook-RCW28-VRMP	CW020	Colley Wright Brook	B
Colley Wright Brook-RCW10-VRMP	CW010	Colley Wright Brook	B
Inkhorn Brook-RIK05-VRMP	IN010	Inkhorn Brook	B
Lower Presumpscot River Tributaries			
Piscataqua River-RPS12-VRMP	PI020	Leighton Road	B
E. Branch Piscataqua River-RPSEB05-VRMP	PI010	Falmouth Road	B
Mill Brook-RML63-VRMP	M030	Below Highland Lake	B
Mill Brook-RML01-VRMP	M010	Bridge Street	B

Presumpscot River Sampling Sites, Main Stem
Presumpscot River Watch

Figure 5-6-1: Map of Presumpscot River Watch main stem sampling sites.

Presumpscot River Sampling Sites, Pleasant River
Presumpscot River Watch

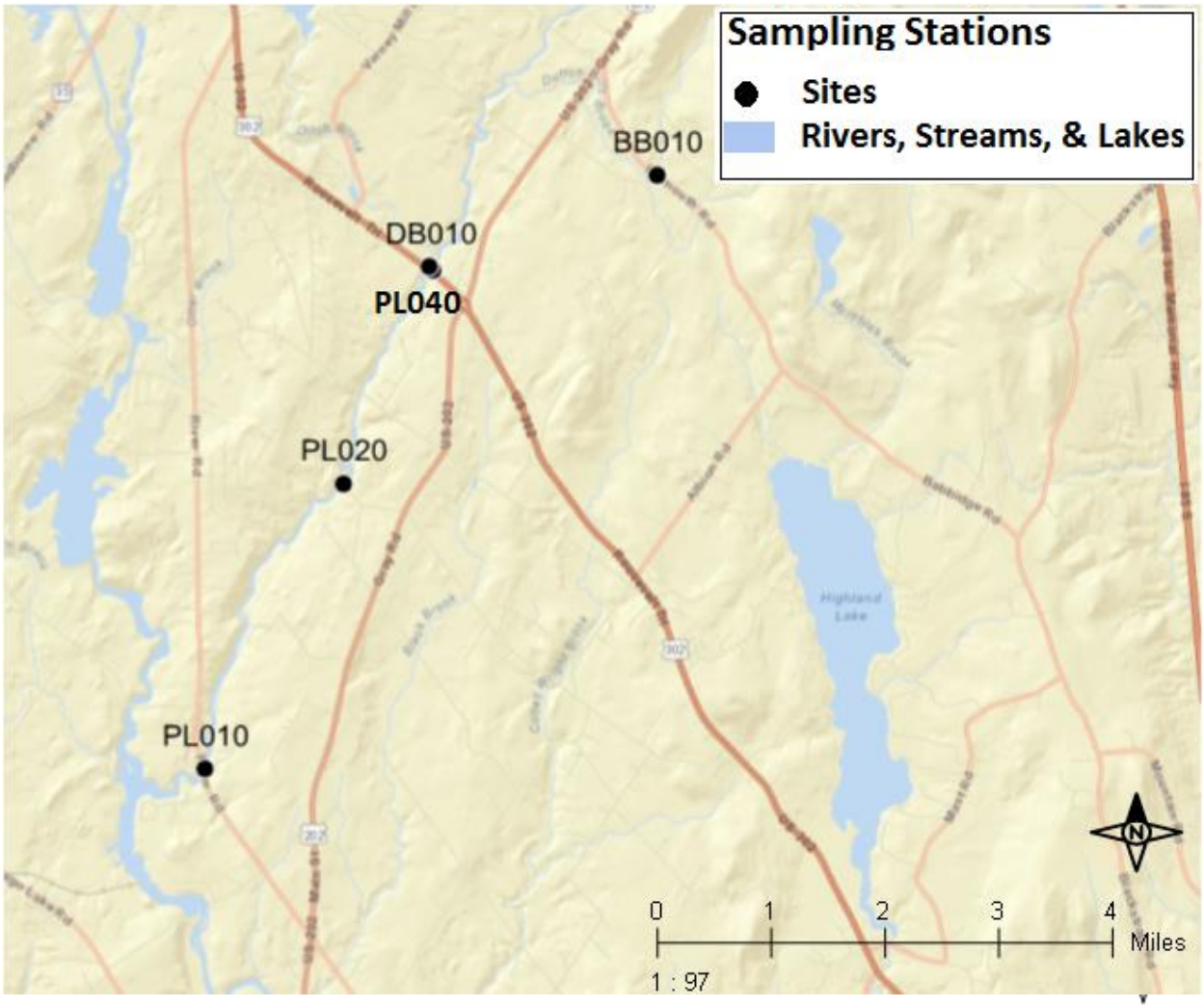


Figure 5-6-2: Map of Presumpscot River Watch sampling sites at Pleasant River and tributaries.

Presumpscot River Sampling Sites, Upper Presumpscot Tributaries
Presumpscot River Watch

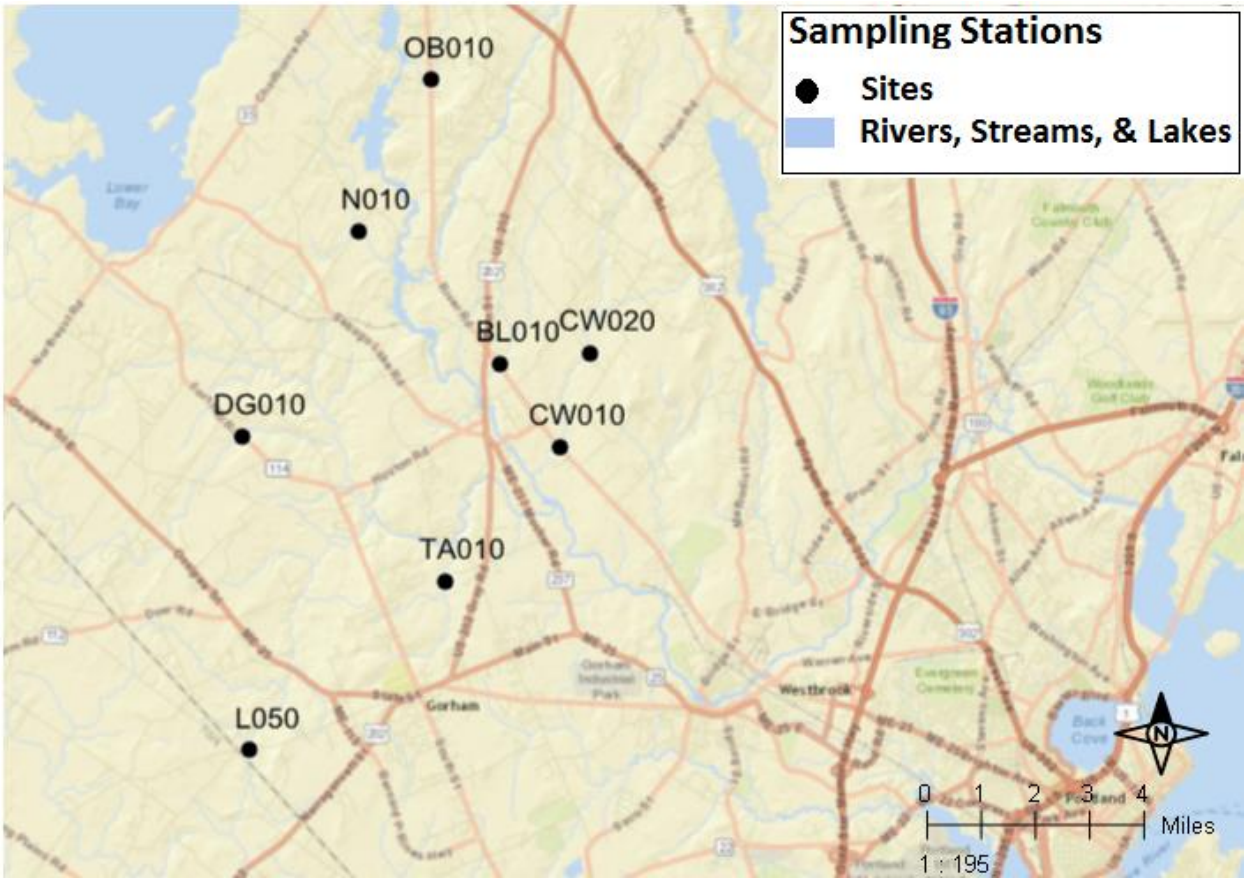


Figure 5-6-3: Map of Presumpscot River Watch sampling sites, Upper Presumpscot tributaries.

Presumpscot River Sampling Sites, Lower Presumpscot Tributaries
Presumpscot River Watch

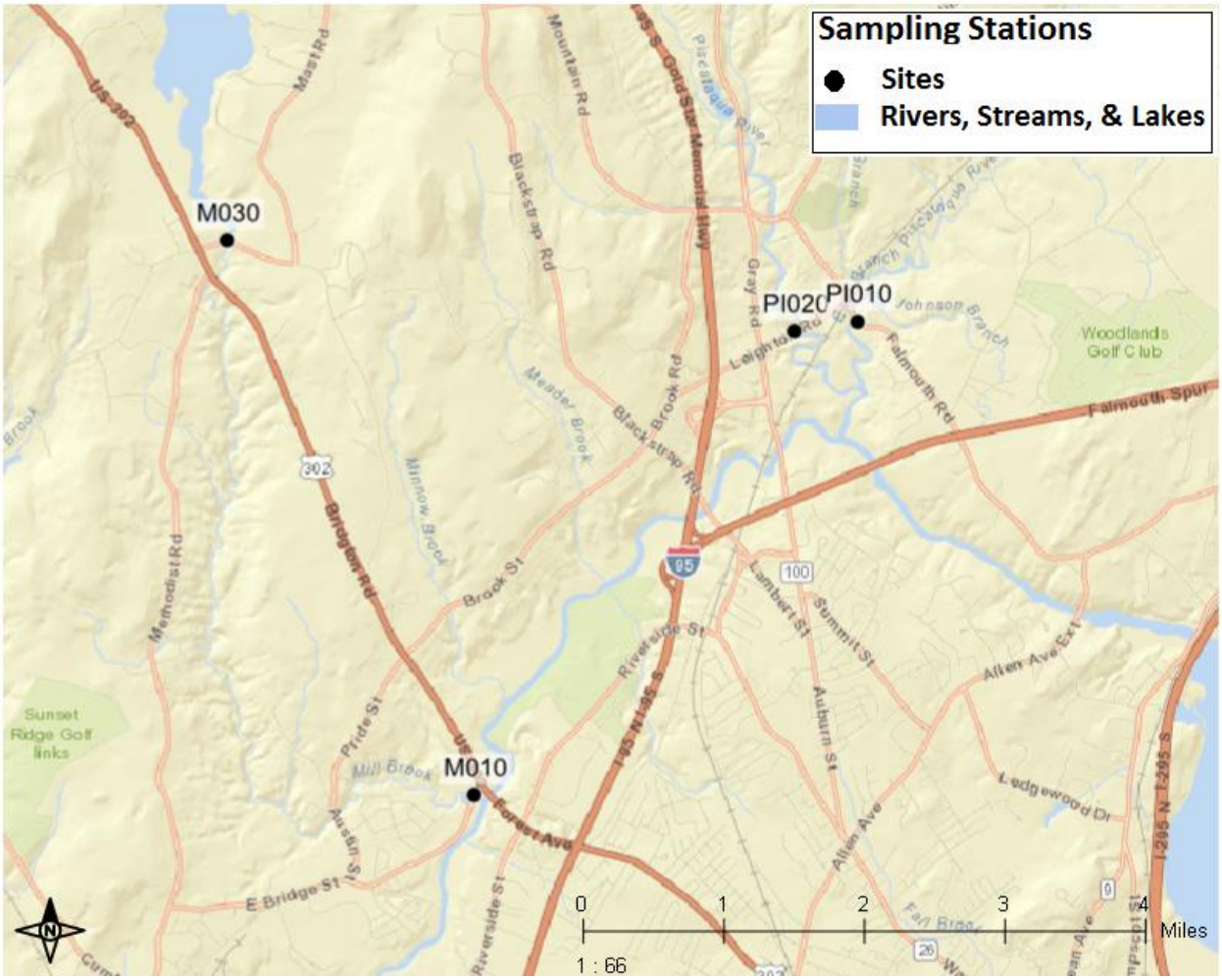


Figure 5-6-4: Map of Presumpscot River Watch sampling sites on the lower Presumpscot tributaries.

Results

For the purpose of discussion, the sampling stations were divided into Presumpscot River main stem (site code P200 – P015), Pleasant River and tributaries, upper Presumpscot tributaries and lower Presumpscot tributaries. Refer to Appendix A-1 for discussion of individual site data and trends.

Dissolved Oxygen

Dissolved oxygen (DO) levels are generally lowest early in the morning and then increase during the day, peaking in the mid-to-late afternoon. Monitors should try to collect some samples early in the morning. Dissolved oxygen is also affected by flow conditions and temperature. During high flow conditions, more oxygen is added to the river from the atmosphere as the water is more turbulent and there is more opportunity for mixing. If flow during the summer months is higher or lower than normal, dissolved oxygen will be affected.

Class A and Class B criteria for dissolved oxygen are a minimum of 7 mg/l (milligrams/liter) or 75% saturation. Class C criteria for dissolved oxygen are a minimum of 5 mg/l or 60 % saturation. To meet water quality criteria, both concentration and saturation standards must be met.

2016 Results

Mainstem sites: In 2016, only two mainstem sampling sites were monitored. Both of these sites met criteria for both dissolved oxygen (DO) concentration and percent saturation. Overall DO was excellent on the mainstem sites.

Pleasant River and tributaries: The Pleasant River mainstem site did not meet criteria for both DO concentration (July-August) and percent saturation (one date in June and late July-August) on four sampling dates. Overall, DO was poor on the Pleasant River (which is different than previous years) and excellent for the Ditch Brook site (DB010).

Upper Presumpscot Tributaries: All of the sites (except Black Brook, BL010) did not meet DO concentration criterion on one to five sampling dates and did not meet percent saturation criterion on one to six sampling dates. Black Brook and Colley Wright Brook (CW010 & CW020) were only sampled two times and had DO readings slightly below criteria. Douglas Brook , Nason Brook, Little River and Tannery Brook were similar to each other, with depressed DO levels from mid-July to late August. Otter Brook (site OB010) had low dissolved oxygen most of the season. Overall, dissolved oxygen was worse at the Upper Presumpscot Tributary sites in 2016, likely due to it being a dry summer with low flow conditions.

Lower Presumpscot Tributaries: Piscataqua River-East Branch (site PI010) did not meet DO concentration criterion on six of seven sampling dates and did not meet percent saturation criterion on seven of eight sampling dates (note: DO concentration was not recorded for one sample date). Piscataqua River (site PI020) met criteria on all sample dates. Will slightly depressed DO levels, the Mill Brook sites (M010 & M030) did not meet DO concentration criterion on one to three sample dates. Overall, dissolved oxygen was good to excellent at all these tributaries, except site PI010, which was poor.

Table 5-6-2: A summary of minimum, maximum, and mean dissolved oxygen concentration values (mg/l) at Presumpscot River Watch monitoring sites.

Mainstem Sites (Ordered from upstream to downstream)							
Site	**Class**	**#Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
P030	C	6	8.1	6.6	9.7	5	0
P020	C	5	8.1	7.2	9.4	5	0
Pleasant River and Tributaries							
PL040	B	7	6.6	5.6	8.1	7	4
DB010	B	7	8.5	8.0	9.4	7	0
Upper Presumpscot Tributaries							
L010	B	7	7.4	6.1	9.3	7	4
DG010	B	5	6.7	5.8	7.9	7	3
TA010	B	7	7.3	6.1	8.7	7	3
BL010	B	2	8.3	7.3	9.2	7	0
OB010	B	7	5.3	3.2	8.2	7	5
N010	B	7	7.6	6.8	8.8	7	2
CW020	B	2	7.8	6.8	8.7	7	1
CW010	B	2	7.3	6.5	8.0	7	1
Lower Presumpscot River Tributaries							
PI020	B	7	8.6	7.7	9.7	7	0
PI010	B	7	6.2	5.6	7.2	7	6
M030	B	7	7.0	6.0	8.1	7	3
M010	B	6	8.0	6.7	9.1	7	1

Table 5-6-3: A summary of minimum, maximum, and mean dissolved oxygen saturation values (%) at Presumpscot River Watch monitoring sites.

Mainstem Sites (Ordered from upstream to downstream)							
Site	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Not Meeting Criterion**
P030	C	6	89.7	81.2	95.2	60	0
P020	C	5	89.1	86.7	93.6	60	0
Pleasant River and Tributaries							
PL040	B	7	73.1	62.6	93.2	75	4
DB010	B	7	92.3	89.8	95.8	75	0
Upper Presumpscot Tributaries							
L010	B	7	79.9	69.3	90.5	75	1
DG010	B	5	70.9	62.9	83.7	75	4
TA010	B	7	76.7	68.9	83.0	75	2
BL010	B	2	79.8	70.6	88.9	75	1
OB010	B	7	52.8	32.2	75.4	75	6
N010	B	7	77.0	72.6	85.2	75	3
CW020	B	2	76.2	68.1	84.3	75	1
CW010	B	2	73.3	66.7	79.8	75	1
Lower Presumpscot River Tributaries							
PI020	B	8	91.1	86.2	97.2	75	0
PI010	B	8	70.9	63.5	90.8	75	7
M030	B	8	84.9	75.4	95.0	75	0
M010	B	6	83.6	76.5	88.3	75	0

Figure 5-6-5: Graph of dissolved oxygen concentrations at sites on the mainstem of the Presumpscot River

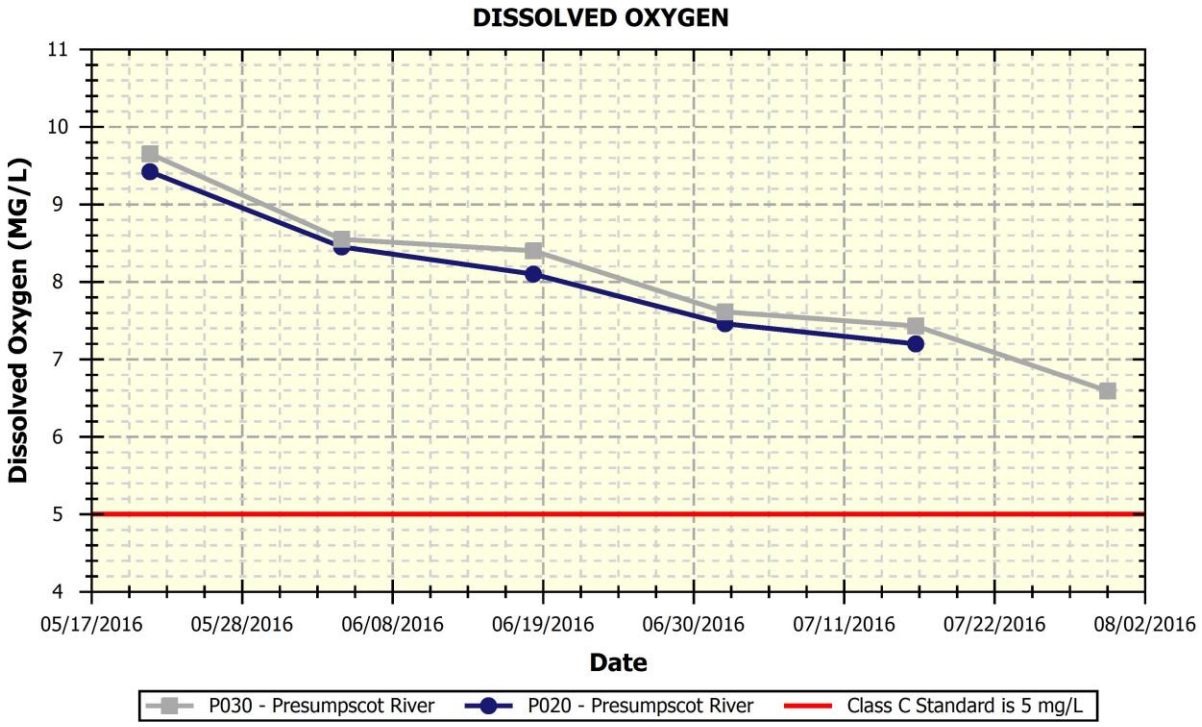


Figure 5-6-6: Graph of dissolved oxygen concentrations at sites on the Pleasant River and tributaries

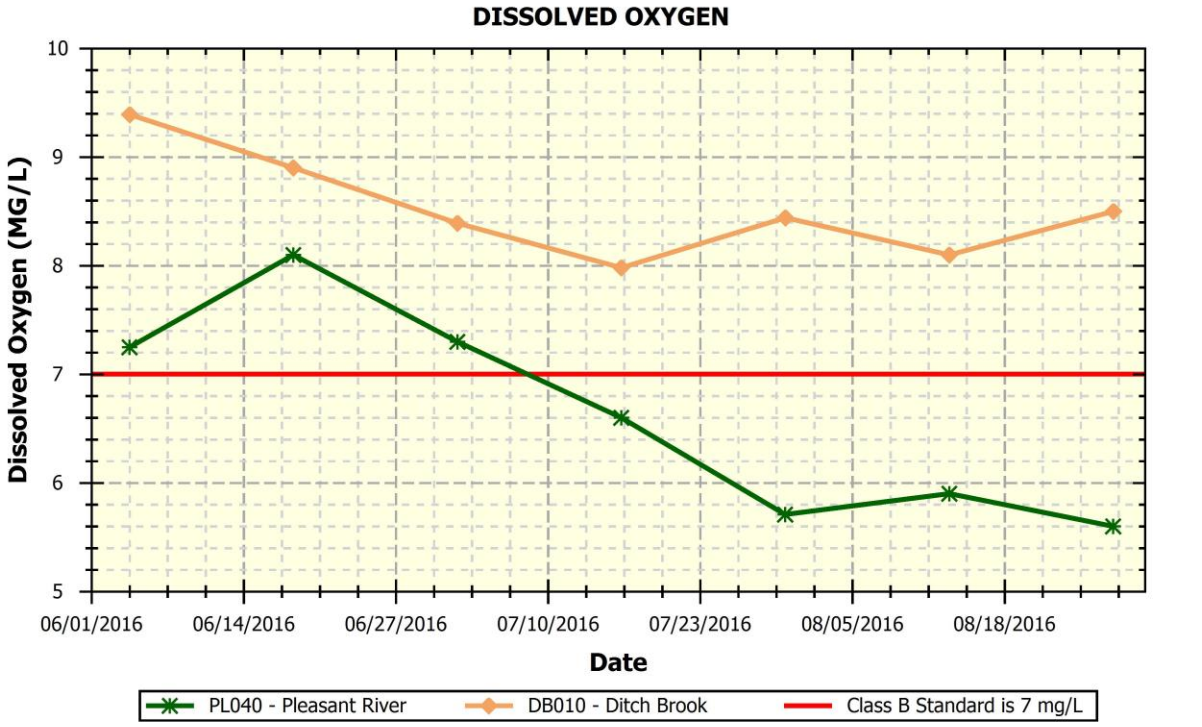


Figure 5-6-7: Graph of dissolved oxygen concentrations at sites on the upper Presumpscot tributaries-I.

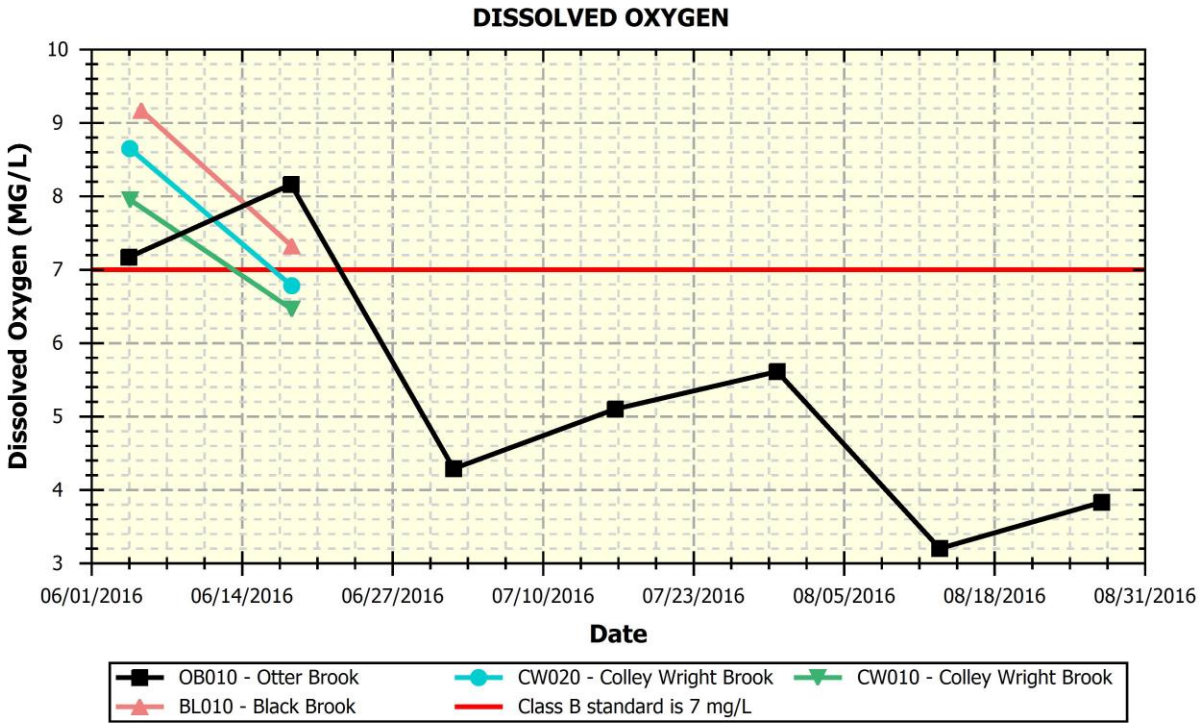


Figure 5-6- 8: Graph of dissolved oxygen concentrations at sites on the upper Presumpscot tributaries-II.

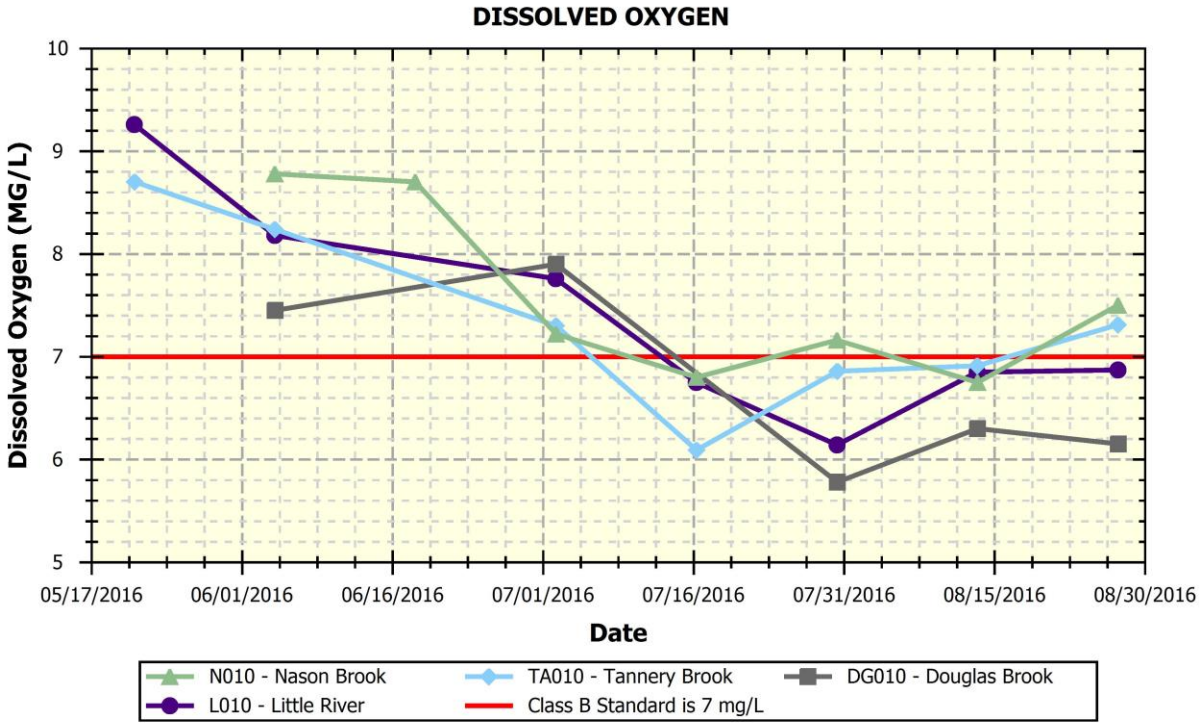


Figure 5-6- 9: Graph of dissolved oxygen concentrations at sites on the lower Presumpscot tributaries.

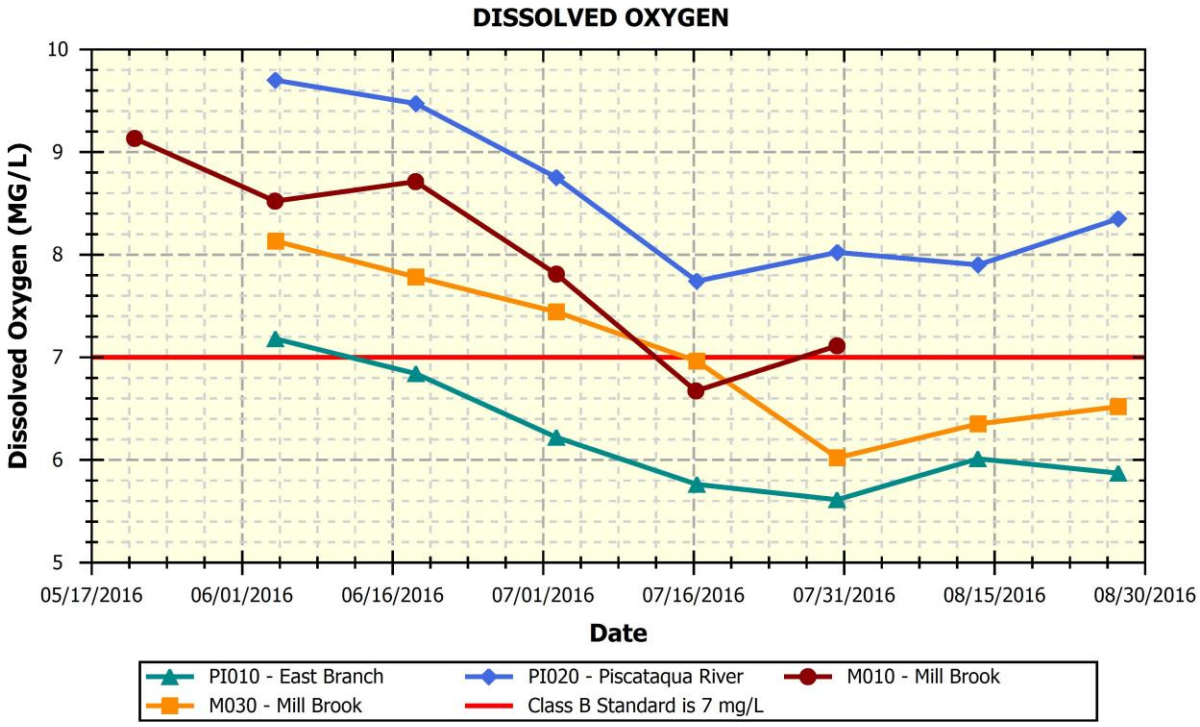


Figure 5-6-10: Graph of dissolved oxygen saturation at sites on the mainstem of the Presumpscot River

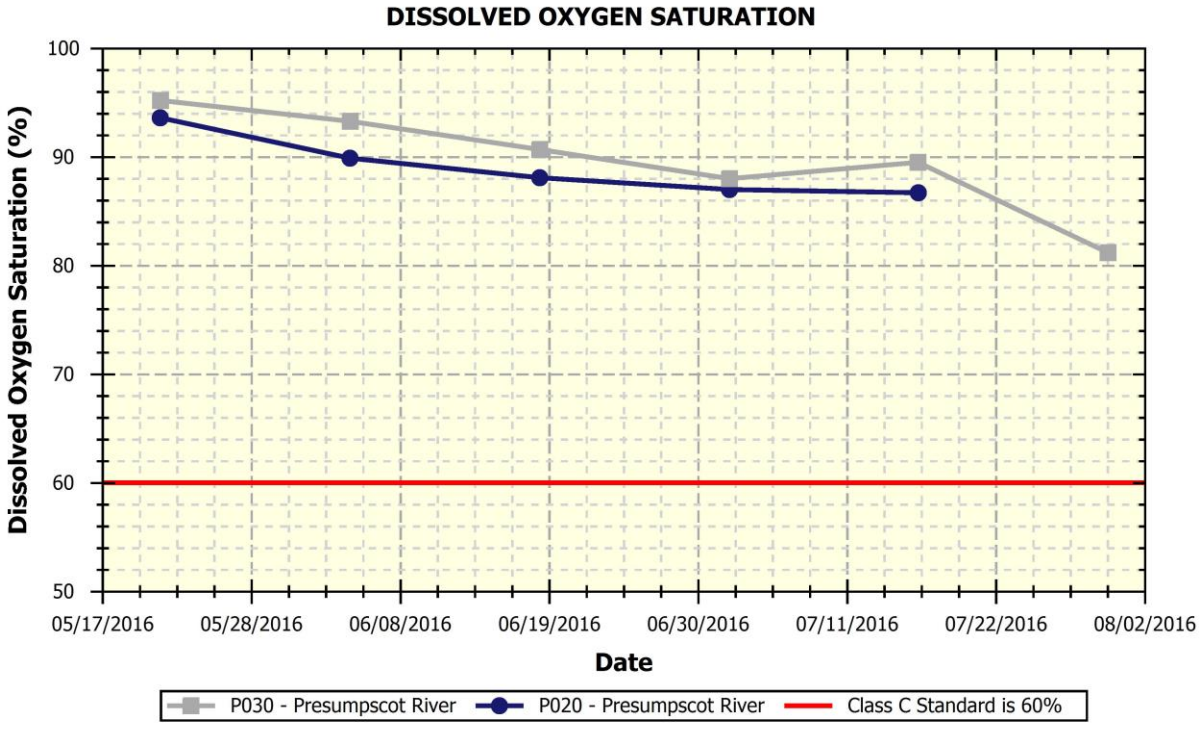


Figure 5-6-11: Graph of dissolved oxygen saturation at sites on the Pleasant River and tributaries

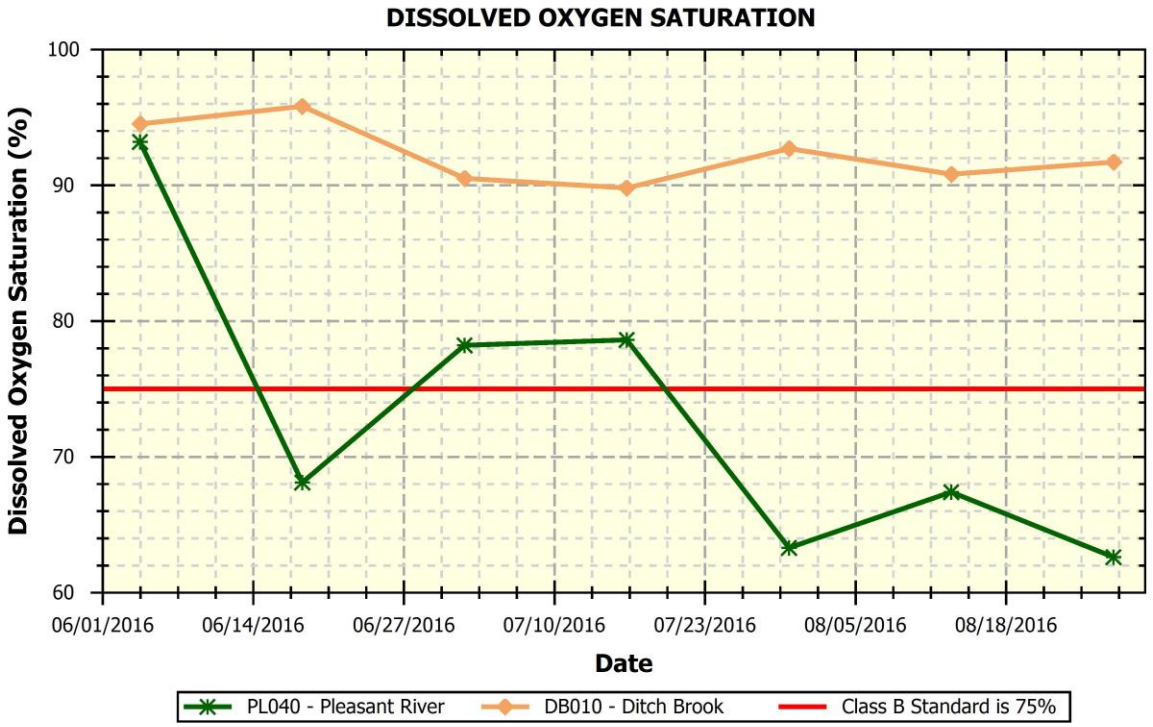


Figure 5-6-12: Graph of dissolved oxygen concentrations at sites on the upper Presumpscot tributaries-I.

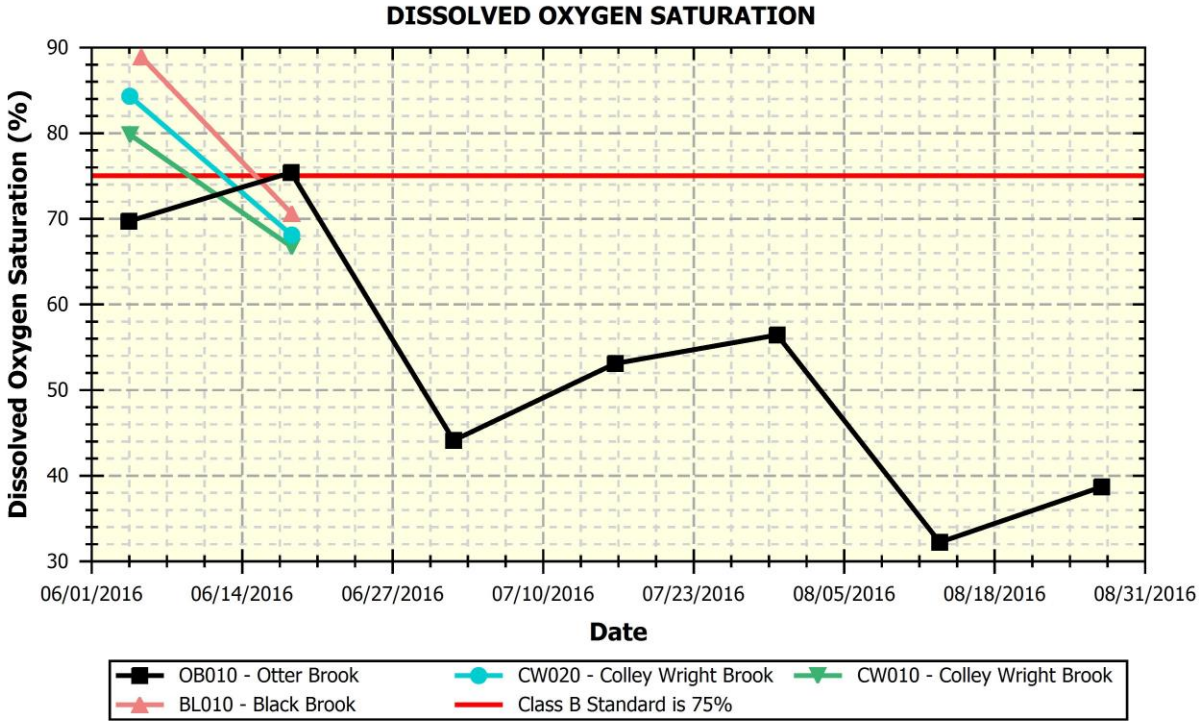


Figure 5-6-13: Graph of dissolved oxygen saturation at sites on the upper Presumpscot tributaries-II.

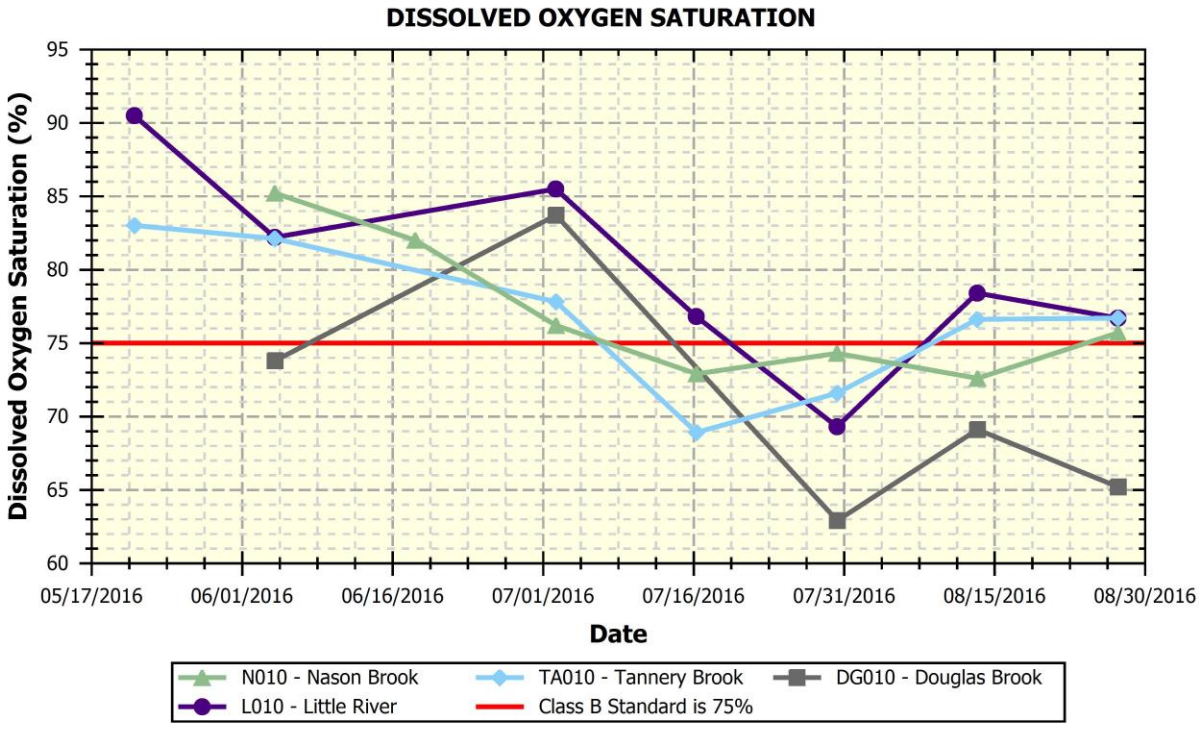
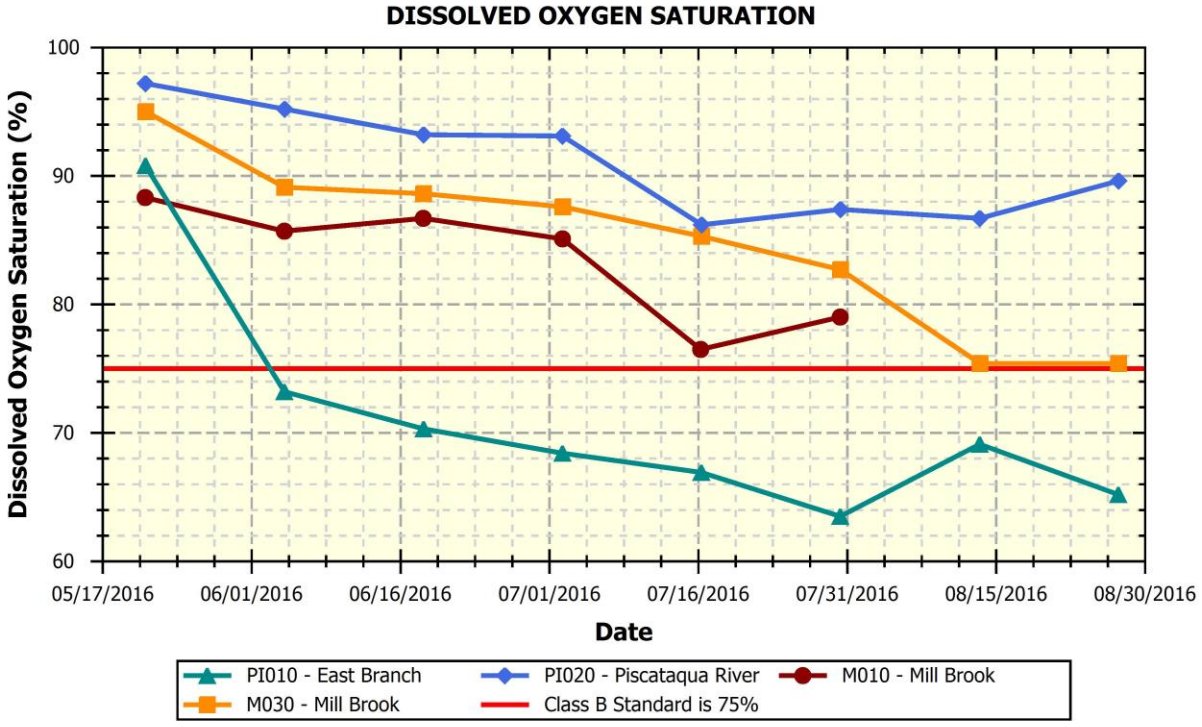


Figure 5-6- 14: Graph of dissolved oxygen saturation at sites on the lower Presumpscot tributaries.



Water Temperature

Maine's Regulations Relating to Temperature (06-096 CMR Chapter 582) require that discharge of pollutants not raise the temperature of any river and stream above the EPA criteria for indigenous species (23 °C maximum and 19 °C weekly average) or 0.3 °C (0.5 °F) above the temperature that would naturally occur outside a mixing zone established by the Board of Environmental Protection. Pollutant is defined in statute as many things including dirt and heat. For tidal waters, discharge of pollutants may not raise the temperature more than 4 °F (2.2 °C) or more than 1.5°F (0.8 °C) from June 1st to September 1st, and may not cause the temperature of any tidal waters to exceed 85 °F (29 °C) at any point outside a mixing zone established by the Board of Environmental Protection. These temperature criteria do not apply to this VRMP data.

2016 Results

Mainstem sites: Temperatures at the mainstem sites were very similar especially as the season progressed. Minimum temperatures ranged from 14.8-15.0°C and maximum temperatures ranged from 24.9-26.2 °C. Main stem sites are generally higher than tributary sites. Higher temperatures at these sites are likely due to the canopy around the river being open with limited shade.

Pleasant River and tributaries: The Pleasant River site and tributary had minimum values ranging from 15.6-15.7 °C and maximum temperatures ranging from 21.0-23.2 °C. Temperature at Pleasant River was warmer than previous years, staying above 20.0 °C for July-mid-August. Overall temperature at these sites was fair to good.

Upper Presumpscot tributaries: The Presumpscot River tributaries had cool temperatures overall and were fairly similar to each other. The exception was Little River, which had the highest temperature (14.3-22.2 °C). Higher temperatures at Little River are likely because the river is bigger and surrounded by a more open canopy. Otter Brook was the coolest. Overall temperatures were good to excellent.

Lower Presumpscot tributaries: Temperatures at the lower Presumpscot tributaries were somewhat high with the exception of site ML030 which was high. Site ML030 is at the outlet of Highland Lake, so higher temperatures are expected there.

Table 5-6-4: A summary of minimum, maximum, and mean water temperature values (°C) at Presumpscot River Watch monitoring sites.

Mainstem Sites (Ordered from upstream to downstream)							
Site	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
P030	C	6	21.2	14.8	26.2	n/a	n/a
P020	C	5	20.2	15.0	24.9	n/a	n/a
Pleasant River and Tributaries							
PL040	B	7	19.4	15.6	23.2	n/a	n/a
DB010	B	7	19.0	15.7	21.0	n/a	n/a
Upper Presumpscot Tributaries							
L010	B	7	19.5	14.3	22.2	n/a	n/a
DG010	B	5	18.0	15.0	19.7	n/a	n/a
TA010	B	7	17.6	13.3	21.5	n/a	n/a
BL010	B	2	14.1	14.0	14.1	n/a	n/a
OB010	B	7	15.6	11.9	18.4	n/a	n/a
N010	B	6	16.1	12.5	18.8	n/a	n/a
CW020	B	2	15.0	14.5	15.4	n/a	n/a
CW010	B	2	16.1	15.4	16.7	n/a	n/a
Lower Presumpscot River Tributaries							
PI020	B	8	19.3	14.6	22.7	n/a	n/a
PI010	B	8	17.5	14.0	20.6	n/a	n/a
M030	B	8	22.4	18.2	25.6	n/a	n/a
M010	B	6	17.8	13.7	22.4	n/a	n/a

Figure 5-6-15: Graph of water temperature at sites on the main stem of the Presumpscot River

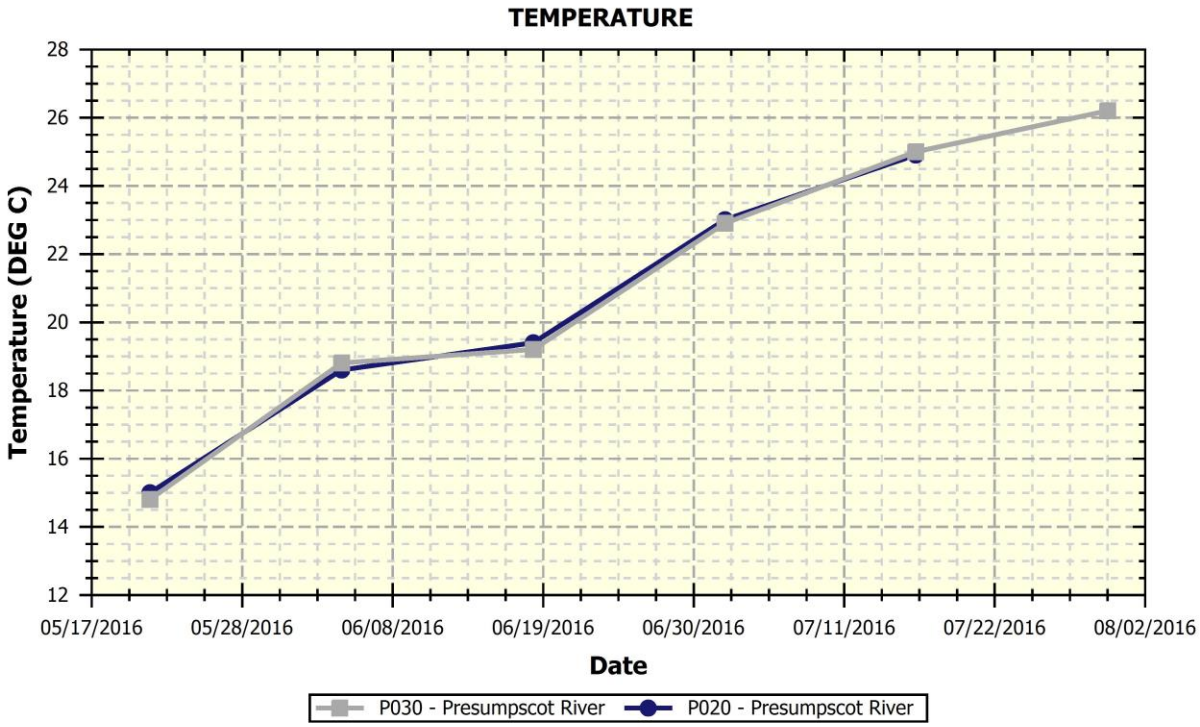


Figure 5-6-16: Graph of water temperature at sites on the Pleasant River and tributaries

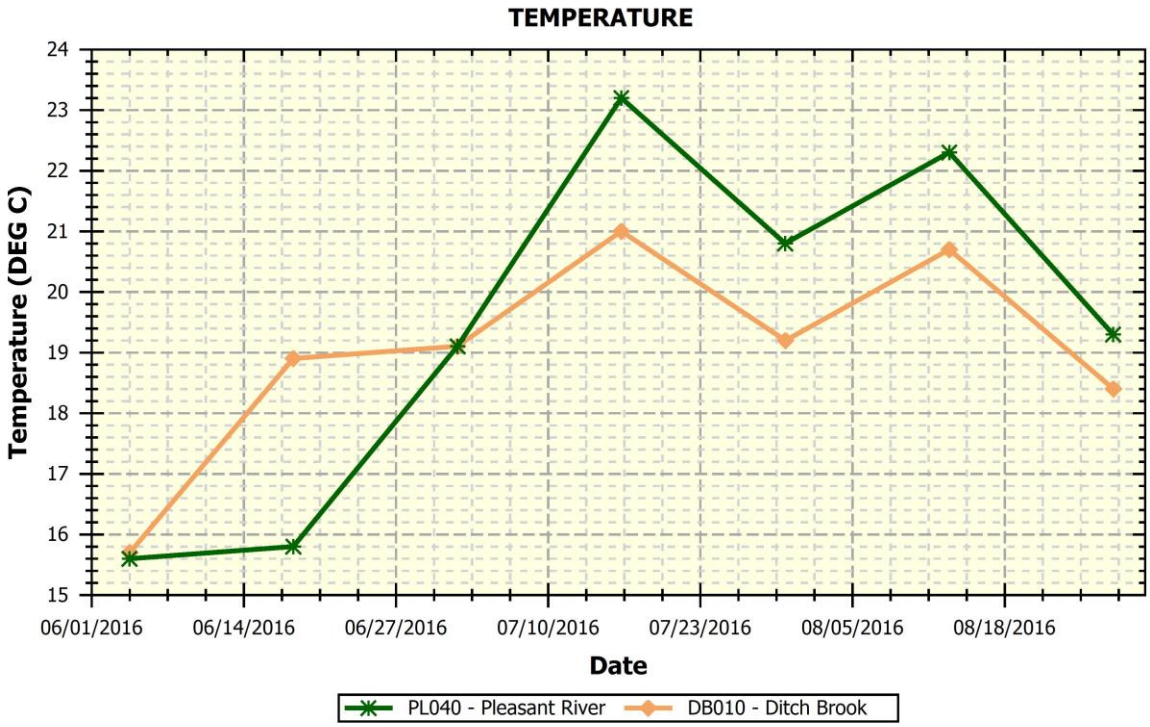


Figure 5-6-17: Graph of water temperature at sites on the upper Presumpscot tributaries-I.

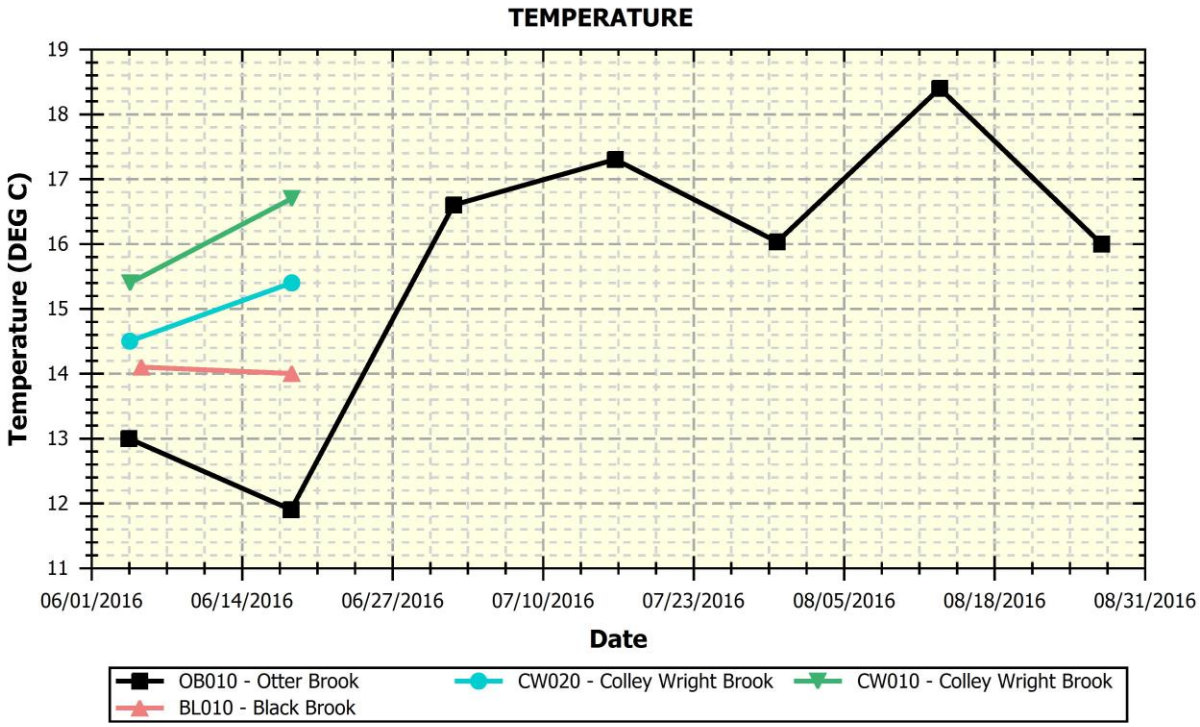


Figure 5-6-18: Graph of water temperature at sites on the upper Presumpscot Tributaries-II.

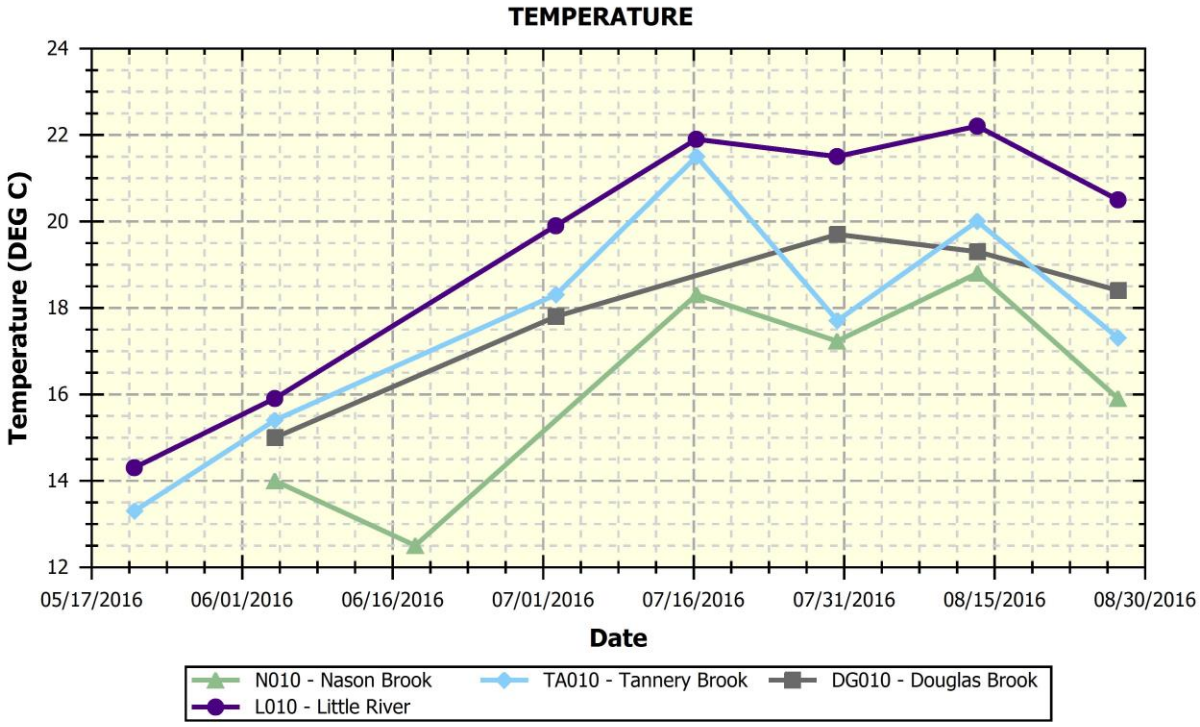
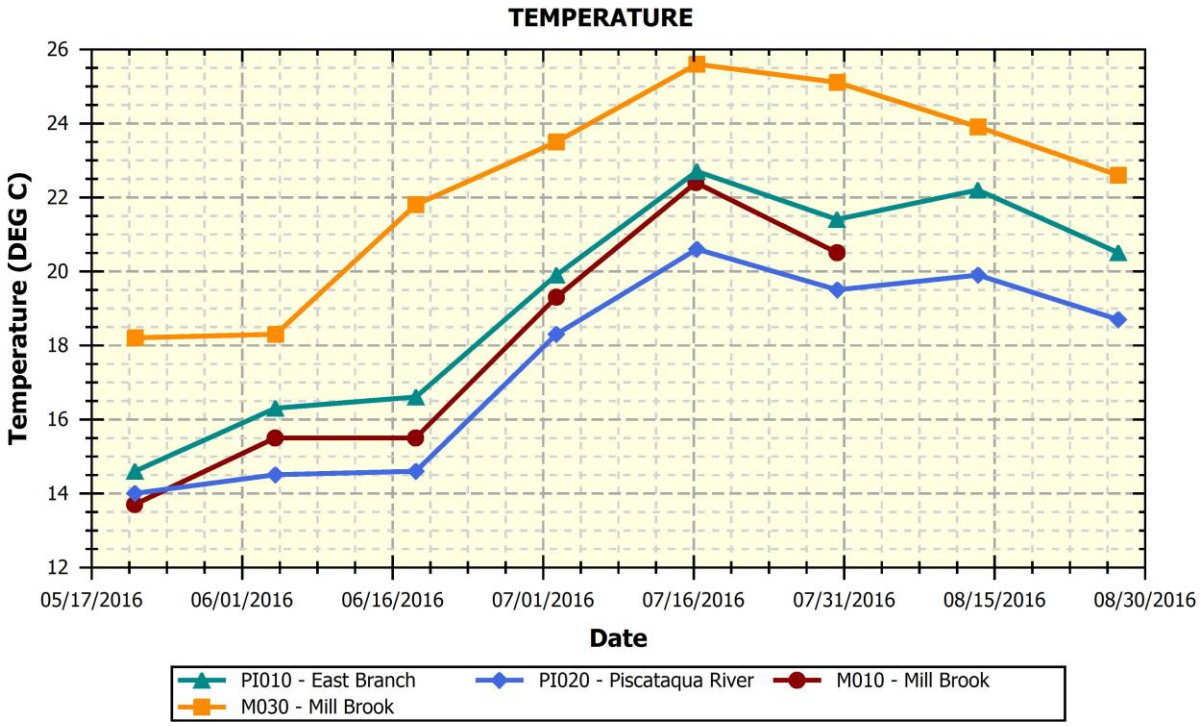


Figure 5-6- 19: Graph of water temperature at sites on the lower Presumpscot tributaries.



Specific Conductance

Specific conductance (SPC) is related to the amount of dissolved materials in the water. While there are no numerical standards, a relationship exists between conductivity and chloride which has numerical criteria. In general, streams located in urban areas tend to have higher specific conductance due to polluted urban stormwater runoff. This may also in large part be due to salt buildup in surface and groundwater from road maintenance practices.

2016 Results

Mainstem sites: Specific conductance at the mainstem sites was overall low. Specific conductance at the mainstem sites was excellent.

Pleasant River and tributaries: The one site on the Pleasant River (PL040) that was sampled for specific conductance had somewhat high conductivity [240-400 µS/cm]. Ditch Brook was fairly low overall. The Specific Conductance at the Pleasant River site (PL040) was fair and Ditch Brook (DB010) was good.

Upper Presumpscot tributaries: Tannery Brook (site TA010) had the highest specific conductance with values ranging from 414-486 µS/cm. Black Brook (BL010) was second highest with values ranging from 280-320 µS/cm. The other tributaries were similar with the exception of Nason Brook (site N010), which had low SPC readings; values at these sites ranged from 10-300 µS/cm. Specific conductance at these sites ranged from poor to good. Most of the sites were sampled only two to three times.

Lower Presumpscot tributaries: In general, the specific conductance at the Piscataqua River site (PI020) was somewhat high, with values ranging from 266-390 µS/cm. The Piscataqua-East Branch site (PI010) was similar to PI020, but slightly lower. The Mill Brook sites (M010, M030) were overall low. Specific conductance at these sites ranged from fair to excellent.

Table 5-6-5: A summary of minimum, maximum, and mean values for specific conductance (µS/cm) at Presumpscot River Watch monitoring sites.

Mainstem Sites (Ordered from upstream to downstream)							
Site	**Class**	**# Sample Points**	**Mean**	**Minimum**	**Maximum**	**Criterion**	**# Exceeding Criterion**
P030	C	4	80	72	88	n/a	n/a
P020	C	3	80	75	84	n/a	n/a
Pleasant River and Tributaries							
PL040	B	6	317	240	400	n/a	n/a
DB010	B	6	172	130	200	n/a	n/a

Upper Presumpscot Tributaries							
L010	B	3	217	210	224	n/a	n/a
DG010	B	3	181	176	184	n/a	n/a
TA010	B	3	455	414	486	n/a	n/a
BL010	B	2	300	280	320	n/a	n/a
OB010	B	5	218	10	300	n/a	n/a
N010	B	6	110	80	130	n/a	n/a
CW020	B	2	210	210	210	n/a	n/a
CW010	B	2	210	210	210	n/a	n/a
Lower Presumpscot River Tributaries							
PI020	B	8	341	266	390	n/a	n/a
PI010	B	8	263	172	340	n/a	n/a
M030	B	8	79	48	100	n/a	n/a
M010	B	4	144	131	163	n/a	n/a

Figure 5-6-20: Graph of specific conductance at sites on the main stem of the Presumpscot River

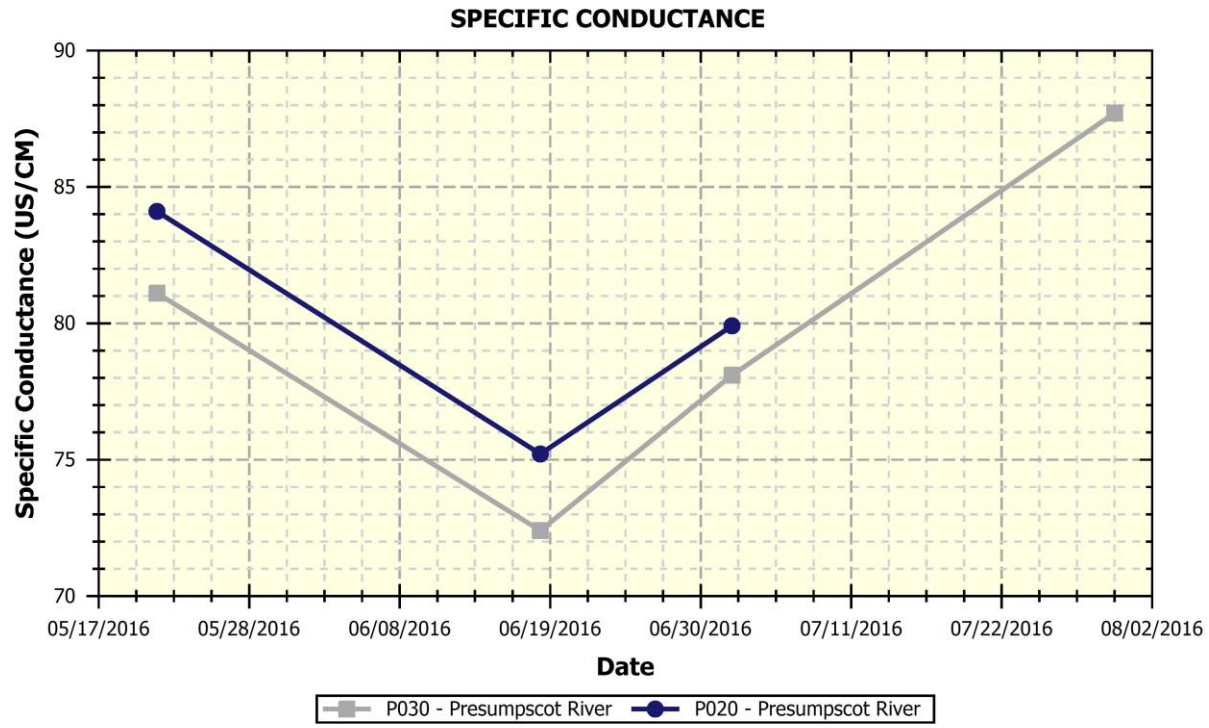


Figure 5-6-21: Graph of specific conductance at sites on the Pleasant River and tributaries.

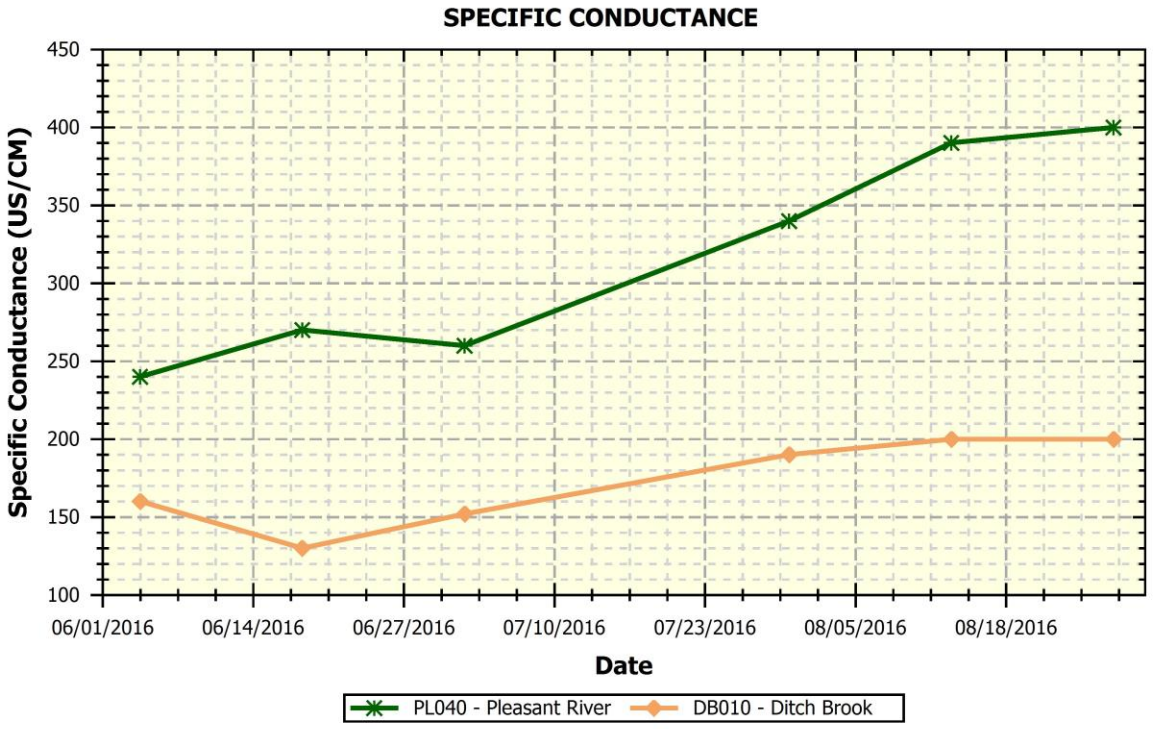


Figure 5-6-22: Graph of specific conductance at sites on the upper Presumpscot tributaries-I.

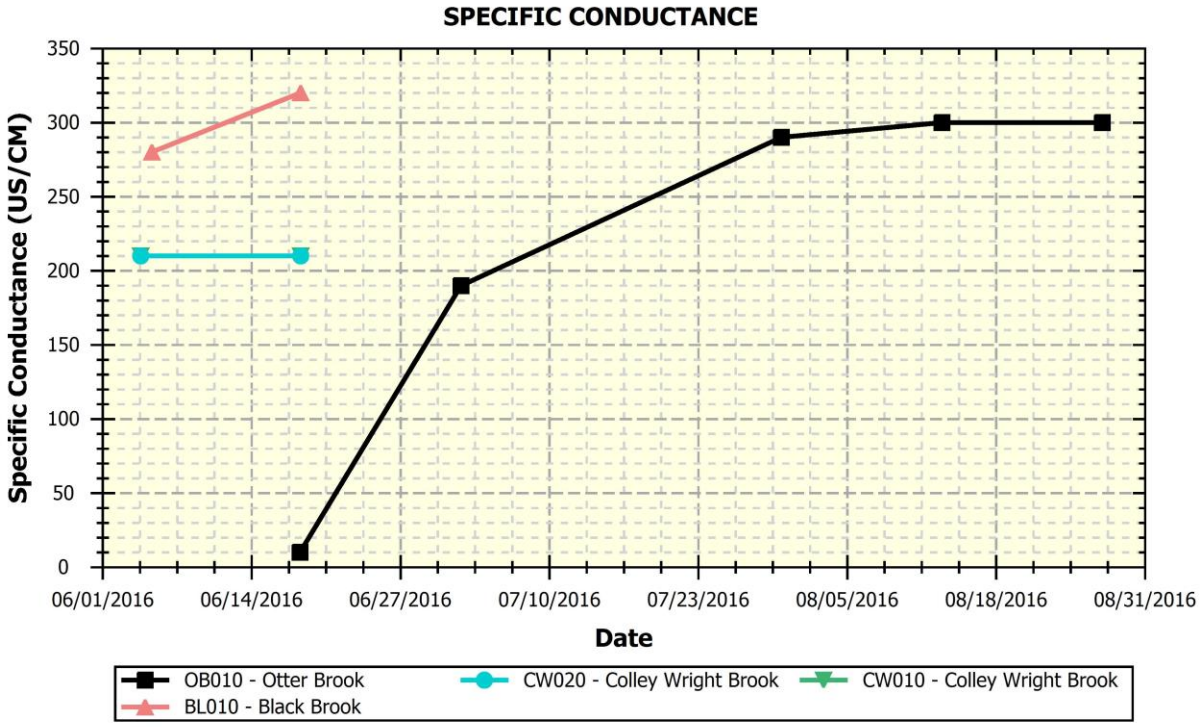


Figure 5-6-23: Graph of specific conductance at sites in the upper Presumpscot tributaries-II.

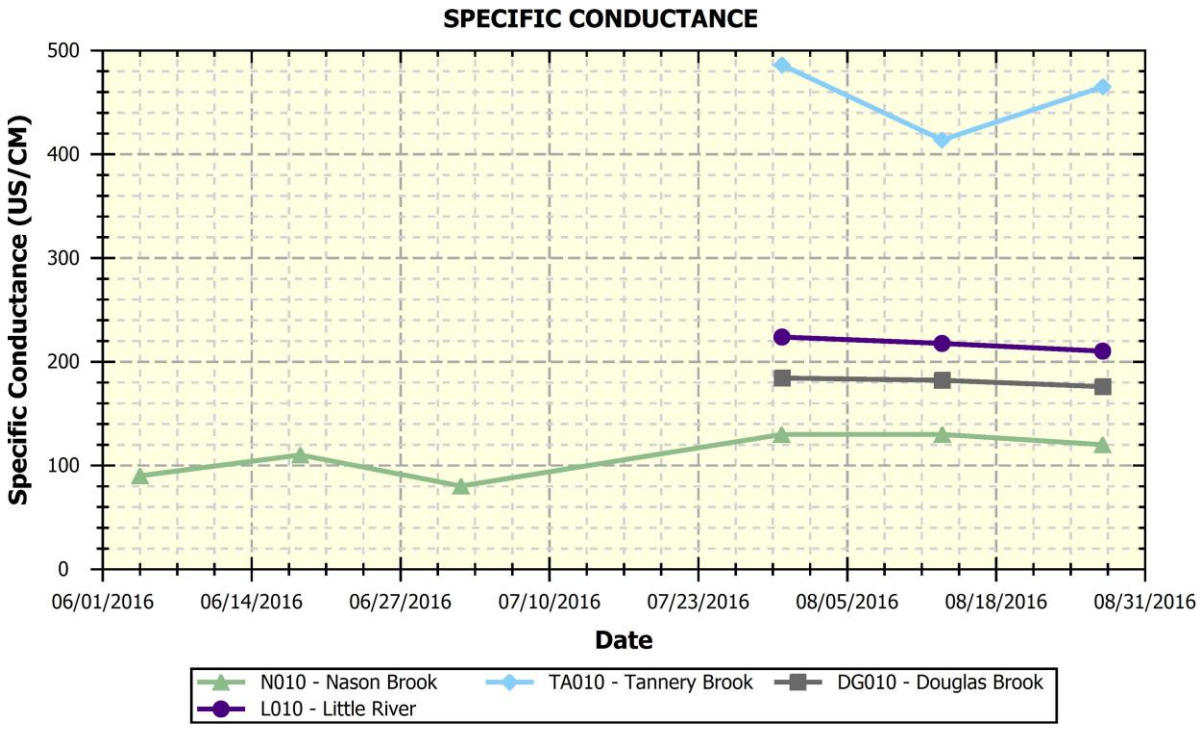
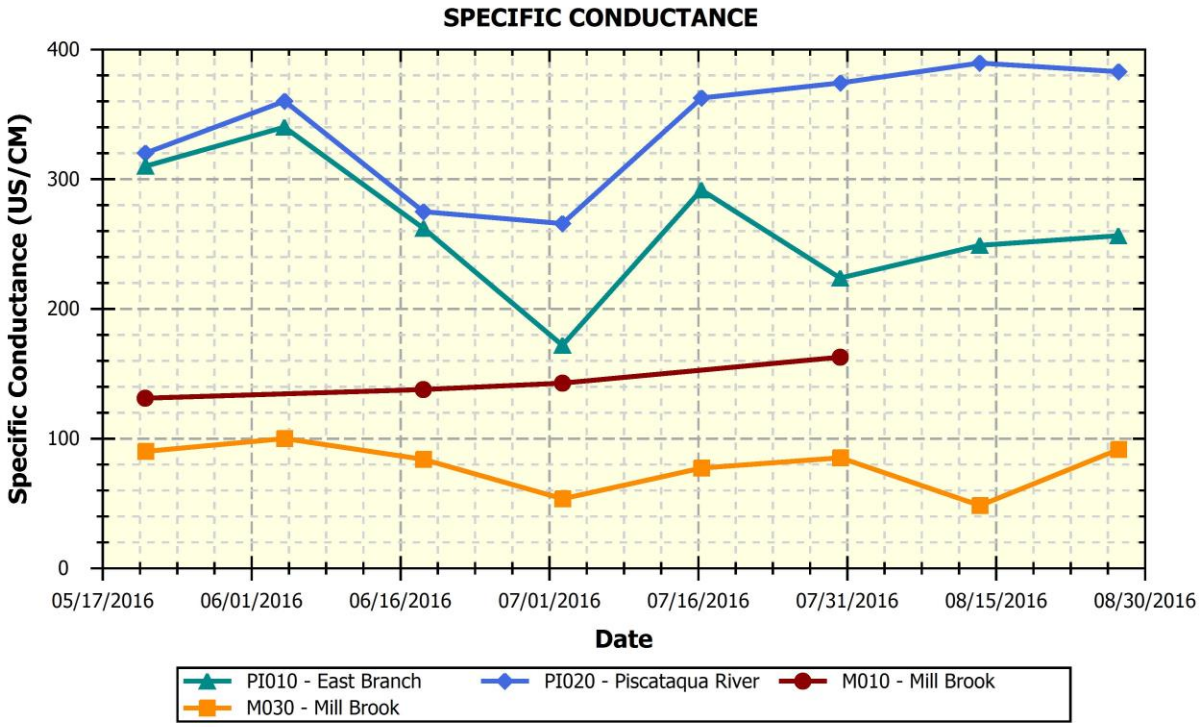


Figure 5-6- 24: Graph of specific conductance at sites on the lower Presumpscot tributaries.



Bacteria

Escherichia coli (*E. coli*) bacteria are used as the indicator organism for freshwaters. While this type of bacteria is not a pathogen, its presence in the water may indicate the presence of other organisms including bacteria and viruses that can cause gastrointestinal illnesses. Monitoring should include at least six samples and include a mix of dry and storm event sampling.

Class B criteria for bacteria are as follows: "Between May 15th and September 30th, the number of *E. coli* of human and domestic origin shall not exceed a geometric mean of 64/100 ml (milliliters) or an instantaneous level of 236/100 ml." Class C criteria are: "Between May 15th and September 30th, the number of *E. coli* of human and domestic origin shall not exceed a geometric mean of 126/100 ml (milliliters) or an instantaneous level of 236/100 ml." Geometric means are calculated instead of averages because it is more appropriate to use this calculation for something like bacteria where there may be one or more high or low values that can skew the mean.

2016 Results

Mainstem sites: Bacteria at the mainstem sites were overall low, with the exception of one date. Sites P030 and P020 exceeded the instantaneous criterion on one date (8/13/16) which coincided with a heavy rain event in the previous 24 hours. Presumpscot mainstem sites appear to have high bacteria levels following significant rain events. Other sites do not appear to follow this pattern, perhaps suggesting more local sources. Overall, bacteria levels at the mainstem sites were good.

Pleasant River and tributaries: The Pleasant River site (PL040) had high bacteria, exceeding the instantaneous criterion on three of seven sample dates as well as exceeding the geometric mean criterion. Ditch Brook (DB010) had one high value (7/2/16) and also exceeded the geometric mean criterion. Overall, these sites ranged from poor (PL040) to good (DB010).

Upper Presumpscot River tributaries: All of the Upper Presumpscot River tributaries had high bacteria levels in general. All sites exceeded the instantaneous criterion two to seven times and all sites also exceeded the geometric mean criterion. The worst site was Nason Brook (N010), which exceeded the instantaneous criterion on all sample dates. Generally, these sites ranged from poor to fair.

Lower Presumpscot River tributaries: All the lower Presumpscot River tributaries were high with the exception of site M030. The Piscataqua River sites (PI010 & PI020) and Mill Brook (M010) exceeded the instantaneous criterion on three to six sample dates and site PI010 exceeded the geometric mean criterion.

Table 5-6-6: A summary of minimum, maximum, and geometric mean values (MPN/100 mL) for bacteria at Presumpscot River Watch monitoring sites.

Mainstem Sites (Ordered from upstream to downstream)							
Site	**Class**	**# Sample Points**	**Geometric Mean**	**Minimum**	**Maximum**	**Criterion Inst/Geo**	**# Exceeding Criterion**
P030	C	7	95	17	1986	236/126	1
P020	C	6	107	19	980	236/126	1
Pleasant River and Tributaries							
PL040	B	7	391*	150	2420	236/64	3
DB010	B	7	106*	20	2420	236/64	1
Upper Presumpscot Tributaries							
L010	B	7	226	28	1203	236/64	5
DG010	B	5	387*	173	2420	236/64	2
TA010	B	7	319	56	2419	236/64	4
BL010	B	2	772	344	1733	236/64	2
OB010	B	7	441*	142	2420	236/64	5
N010	B	7	939*	435	2420	236/64	7
CW020	B	2	1706*	1203	2420	236/64	2
CW010	B	2	1119*	517	2420	236/64	2
Lower Presumpscot River Tributaries							
PI020	B	8	320	52	1414	236/64	5
PI010	B	8	320	78	1300	236/64	3
M030	B	8	27	6	210	236/64	0
M010	B	7	671	79	1986	236/64	6

***CW010, CW020, DB010, DG010, N010, OB010 and PL040, geometric mean calculations include one sample point where bacteria was over the maximum reporting limit (>2419.6). Value of 2419.6 was used to calculate the geometric mean.**

Figure 5-6-25: Graph of *E. coli* (MPN/ml) at sites on the main stem of the Presumpscot River.

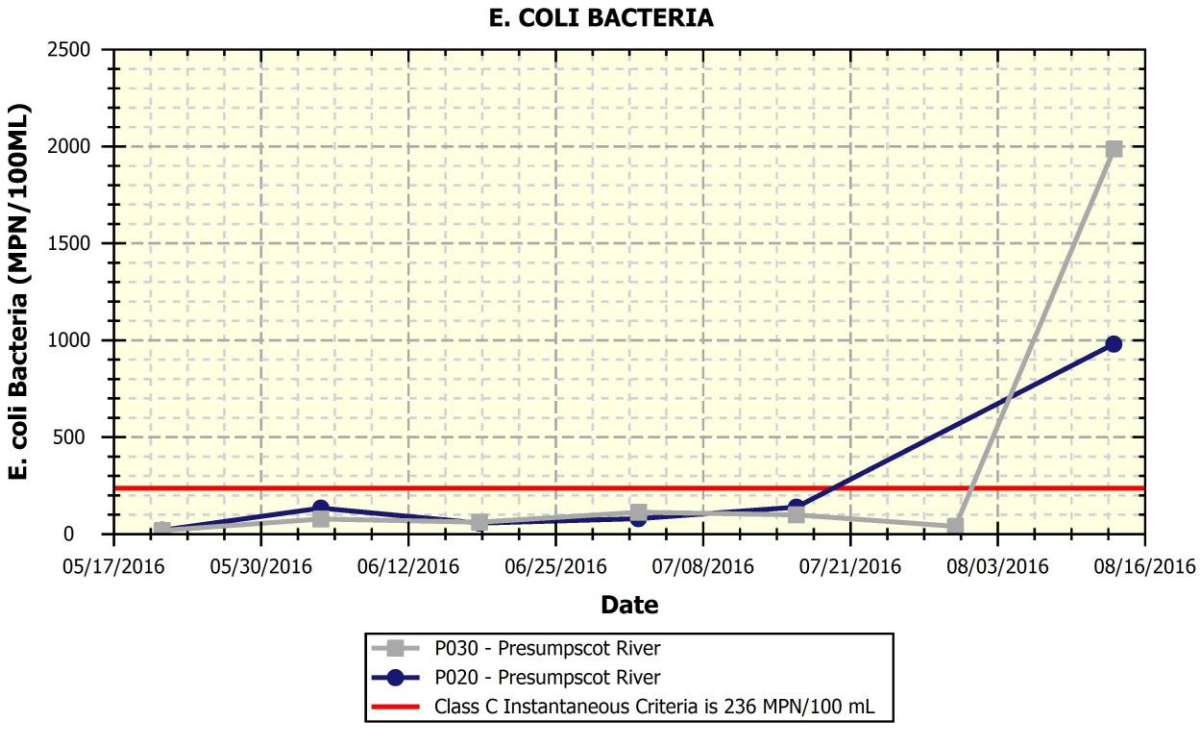


Figure 5-6-26: Graph of *E. coli* (MPN/ml) at sites on the Pleasant River and Tributaries.

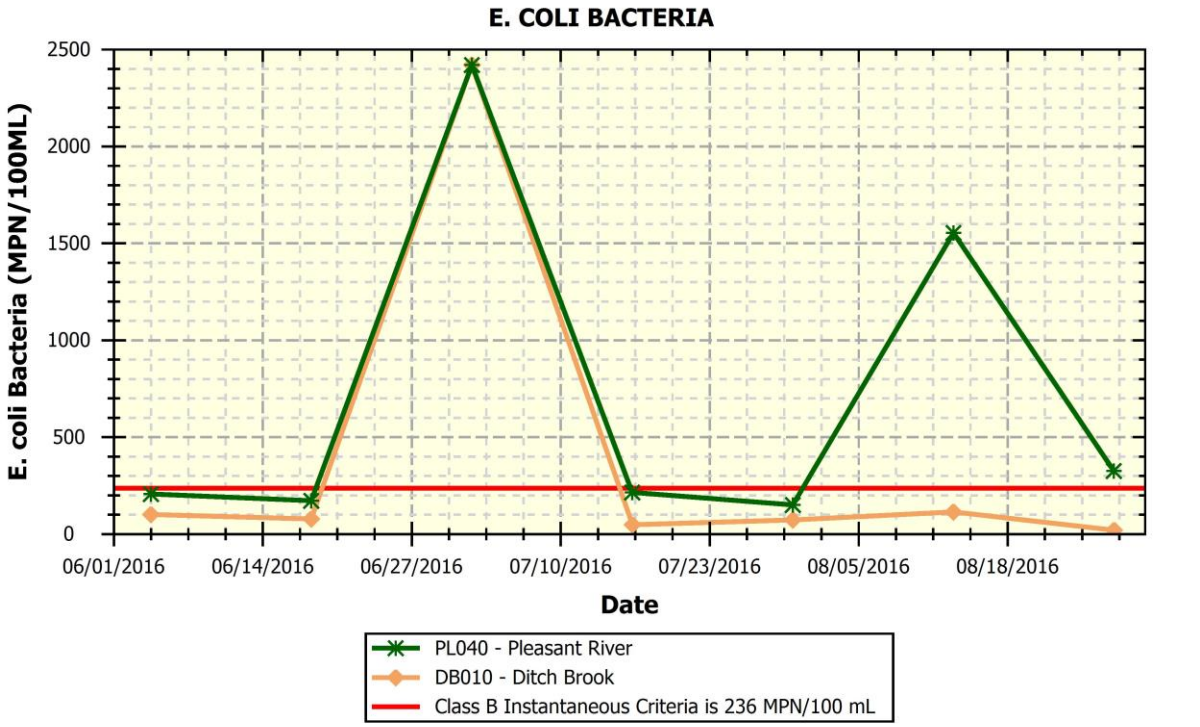


Figure 5-6-27: Graph of *E. coli* (MPN/ml) at sites on the upper Presumpscot tributaries-I.

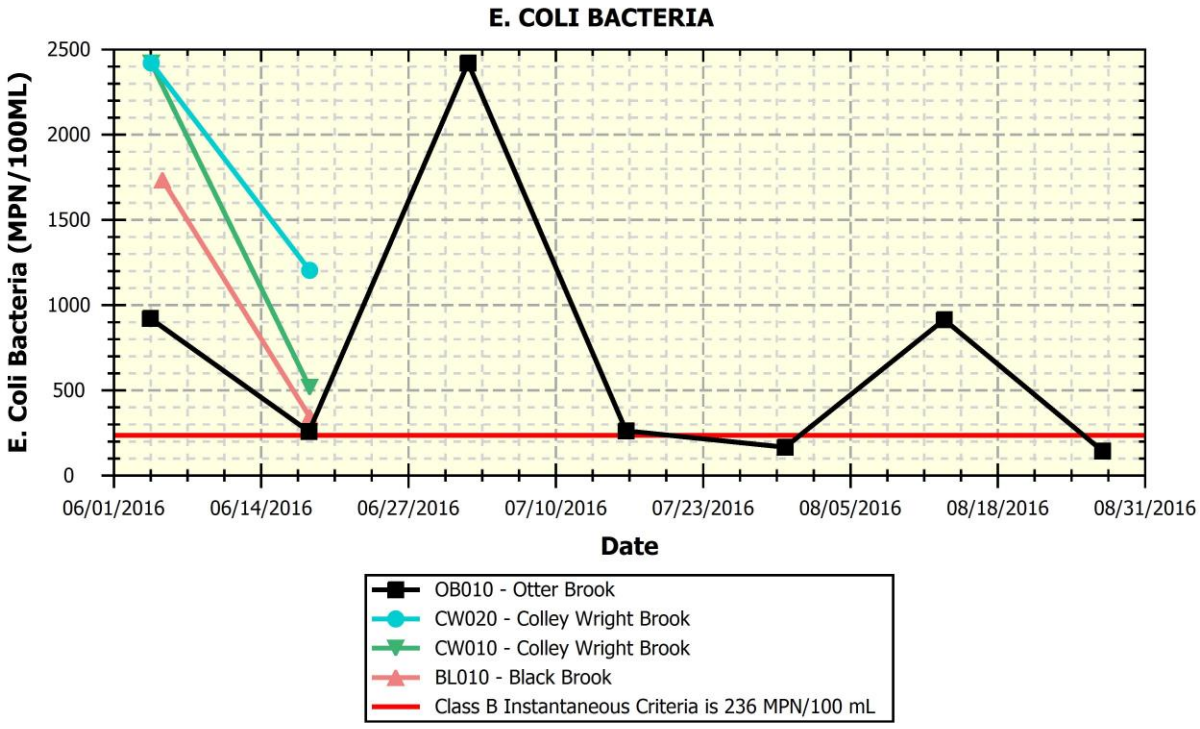


Figure 5-6-28: Graph of *E. coli* (MPN/ml) at sites at sites in the upper Presumpscot tributaries-II.

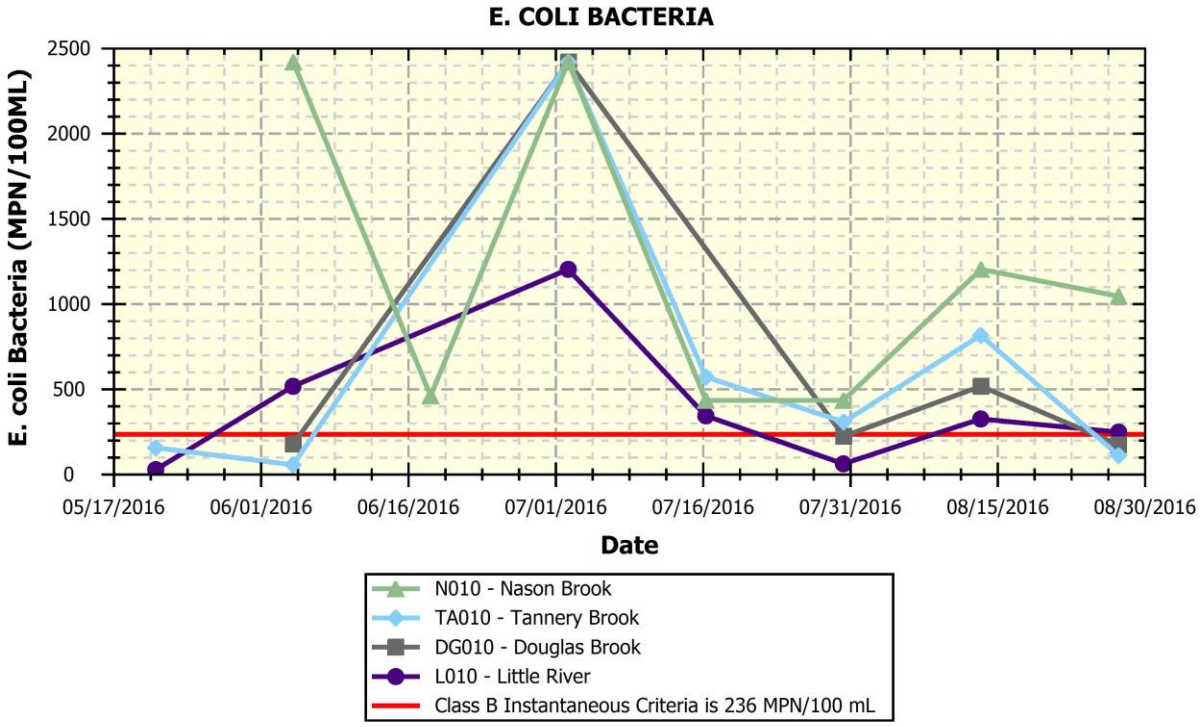
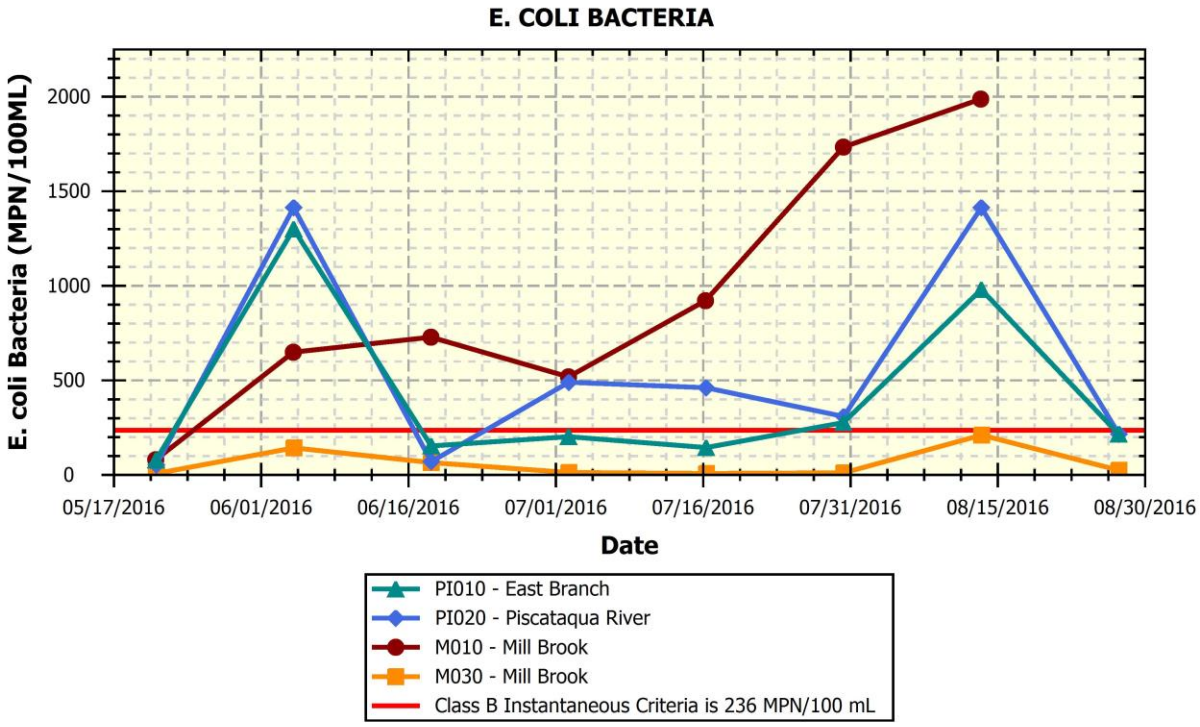


Figure 5-6-29: Graph of *E. coli* (MPN/ml) at sites on the lower Presumpscot tributaries.



Discussion and Recommendations

There are numerous sources of pollution and other stresses to the Presumpscot River watershed that could potentially have an impact on water quality. Some of those sources of pollution and stress may include:

- Non-point source pollution (e.g., eroded soil, fertilizers, pesticides, heavy metals, petroleum residues, road salt, wildlife and pet feces) and polluted stormwater originating from impervious surfaces (e.g., streets, parking lots, driveways, rooftops), agriculture, and forestry.
- Dams and impoundments (which often create more pond-like aquatic habitat conditions that may have higher water temperatures and lower dissolved oxygen concentrations than if the river section was free-flowing).
- Natural effects of wetlands (such as contributing waters to a stream/river that have low dissolved oxygen levels due to the decomposition of large amounts of organic matter, respiration of abundant plant matter, and low re-aeration rates that is characteristic of many wetlands).
- Point sources (e.g., failing private septic systems, wastewater treatment plants, combined sewer overflows [CSO], and industrial discharges) of pollution.

The following are recommendations for future monitoring:

- **Continue early morning sampling to document daily low dissolved oxygen readings. Later day monitoring is not likely to represent critical conditions, which makes it difficult to assess the overall river condition. Early morning monitoring is particularly important during the summer months of July to early September when temperatures are warmest, flows are low, and dissolved oxygen tends to be at the lowest levels.**
- **Although access may be difficult, we strongly recommend an additional site directly upstream of Presumpscot Falls in order to document dissolved oxygen levels in the lowest freshwater reach of the river. This is where, longitudinally, the lowest dissolved oxygen readings for the lower Presumpscot are expected to be found.**
- **Further monitoring of *E. coli* bacteria in the tributaries in order to determine sources. Consider bracketing expected sources. Possibly partner with DEP to do some follow-up monitoring.**

Appendix A-1

* Sampling depths are only reported for Tier 1 VRMP sites.

** "NA" = normal environmental sample ; "D" = field duplicate; "D.O." = dissolved oxygen; "Spec. Cond" = specific conductance; "TSS" = total suspended solids"

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. Sat. (%)	** D.O. (MG/L)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turb-idity (NTU)	Total Diss. Solids (MG/L)	** TSS (MG/L)	E Coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
Presumpscot River- Presumpscot River Watch: Approved Sites																
BL010	BLACK BROOK- RBK05 -VRMP	6/5/2016	7:15 AM	NA			14.1	88.9	9.2	280					1732.87	
BL010	BLACK BROOK- RBK05 -VRMP	6/18/2016	7:00 AM	NA			14.0	70.6	7.3	320					344.1	
CW010	COLLEY WRIGHT BROOK - RCW10 - VRMP	6/4/2016	7:45 AM	NA			15.4	79.8	8.0	210					>2419.6	
CW010	COLLEY WRIGHT BROOK - RCW10 - VRMP	6/18/2016	7:11 AM	NA			16.7	66.7	6.5	210					517.2	
CW020	COLLEY WRIGHT BROOK - RCW28 - VRMP	6/4/2016	7:30 AM	NA			14.5	84.3	8.7	210					>2419.6	
CW020	COLLEY WRIGHT BROOK - RCW28 - VRMP	6/18/2016	6:47 AM	NA			15.4	68.1	6.8	210					1203.31	
DB010	DITCH BROOK - RPL00 - VRMP	6/4/2016	6:05 AM	NA			15.7	94.5	9.4	160					101	
DB010	DITCH BROOK - RPL00 - VRMP	6/18/2016	6:00 AM	NA			18.9	95.8	8.9	130					78	
DB010	DITCH BROOK - RPL00 - VRMP	7/2/2016	6:20 AM	NA			19.1	90.5	8.4	152					>2419.6	
DB010	DITCH BROOK - RPL00 - VRMP	7/16/2016	6:20 AM	NA			21.0	89.8	8.0						47.2	
DB010	DITCH BROOK - RPL00 - VRMP	7/30/2016	6:37 AM	NA			19.2	92.7	8.4	190					72.7	
DB010	DITCH BROOK - RPL00 - VRMP	8/13/2016	6:55 AM	NA			20.7	90.8	8.1	200					113	
DB010	DITCH BROOK - RPL00 - VRMP	8/27/2016	7:01 AM	NA			18.4	91.7	8.5	200					19.9	
DG010	DOUGLAS BROOK - RLTNBDG20 - VRMP	6/4/2016	7:05 AM	NA			15.0	73.8	7.5						178.5	
DG010	DOUGLAS BROOK - RLTNBDG20 - VRMP	7/2/2016	7:20 AM	NA			17.8	83.7	7.9						>2419.6	
DG010	DOUGLAS BROOK - RLTNBDG20 - VRMP	7/30/2016	8:00 AM	NA			19.7	62.9	5.8	184.3					224.7	
DG010	DOUGLAS BROOK - RLTNBDG20 - VRMP	8/13/2016	7:10 AM	NA			19.3	69.1	6.3	182					517.2	
DG010	DOUGLAS BROOK - RLTNBDG20 - VRMP	8/27/2016	7:45 AM	NA			18.4	65.2	6.2	175.8					172.5	
L010	LITTLE RIVER - RLT08 - VRMP	5/21/2016	6:30 AM	NA			14.3	90.5	9.3						27.5	
L010	LITTLE RIVER - RLT08 - VRMP	5/21/2016	6:30 AM	D											47.1	
L010	LITTLE RIVER - RLT08 - VRMP	6/4/2016	6:05 AM	NA			15.9	82.2	8.2						517.2	
L010	LITTLE RIVER - RLT08 - VRMP	7/2/2016	6:35 AM	NA			19.9	85.5	7.8						1203.31	
L010	LITTLE RIVER - RLT08 - VRMP	7/2/2016	6:35 AM	D			19.9	85.6	7.8						829.7	
L010	LITTLE RIVER - RLT08 - VRMP	7/16/2016	6:25 AM	NA			21.9	76.8	6.8						344.8	
L010	LITTLE RIVER - RLT08 - VRMP	7/30/2016	7:15 AM	NA			21.5	69.3	6.1	223.8					62.9	
L010	LITTLE RIVER - RLT08 - VRMP	8/13/2016	6:20 AM	NA			22.2	78.4	6.9	217.7					325.5	
L010	LITTLE RIVER - RLT08 - VRMP	8/27/2016	7:00 AM	NA			20.5	76.7	6.9	210.2					248.1	
M010	MILL BROOK - RML01 - VRMP	5/21/2016	6:50 AM	NA			13.7	88.3	9.1	131					78.9	
M010	MILL BROOK - RML01 - VRMP	6/4/2016	7:05 AM	NA			15.5	85.7	8.5						648.8	
M010	MILL BROOK - RML01 - VRMP	6/18/2016	7:15 AM	NA			15.5	86.7	8.7	137.8					727	
M010	MILL BROOK - RML01 - VRMP	7/2/2016	7:35 AM	NA			19.3	85.1	7.8	142.6					517.2	
M010	MILL BROOK - RML01 - VRMP	7/16/2016	5:40 AM	NA			22.4	76.5	6.7						920.8	
M010	MILL BROOK - RML01 - VRMP	7/30/2016	6:50 AM	NA			20.5	79.0	7.1	162.6					1732.87	
M010	MILL BROOK - RML01 - VRMP	8/13/2016	6:31 AM	NA											1986.28	
M030	MILL BROOK - RML63 - VRMP	5/21/2016	8:20 AM	NA			18.2	95.0		90					7.4	
M030	MILL BROOK - RML63 - VRMP	6/4/2016	8:25 AM	NA			18.3	89.1	8.1	100					141.7	
M030	MILL BROOK - RML63 - VRMP	6/18/2016	8:09 AM	NA			21.8	88.6	7.8	83.9					63.8	
M030	MILL BROOK - RML63 - VRMP	7/2/2016	8:10 AM	NA			23.5	87.6	7.4	53.4					12.1	
M030	MILL BROOK - RML63 - VRMP	7/16/2016	8:10 AM	NA			25.6	85.3	7.0	77.2					6.3	
M030	MILL BROOK - RML63 - VRMP	7/30/2016	7:53 AM	NA			25.1	82.7	6.0	85					9.4	
M030	MILL BROOK - RML63 - VRMP	8/13/2016	8:45 AM	NA			23.9	75.4	6.4	48.4					209.6	

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. Sat. (%)	** D.O. (MG/L)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turb-idity (NTU)	Total Diss. Solids (MG/L)	** TSS (MG/L)	E Coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
M030	MILL BROOK - RML63 - VRMP	8/27/2016	8:10 AM	NA			22.6	75.4	6.5	91.5					24.3	
N010	NASON BROOK - RNS11 - VRMP	6/4/2016	6:35 AM	NA			14.0	85.2	8.8	90					2419.17	
N010	NASON BROOK - RNS11 - VRMP	6/18/2016	6:35 AM	NA			12.5	82.0	8.7	110					461.1	
N010	NASON BROOK - RNS11 - VRMP	7/2/2016	6:50 AM	NA				76.2	7.2	80					>2419.6	
N010	NASON BROOK - RNS11 - VRMP	7/16/2016	6:45 AM	NA			18.3	72.9	6.8						435.2	
N010	NASON BROOK - RNS11 - VRMP	7/30/2016	6:55 AM	NA			17.2	74.3	7.2	130					435.2	
N010	NASON BROOK - RNS11 - VRMP	8/13/2016	7:23 AM	NA			18.8	72.6	6.8	130					1203.31	
N010	NASON BROOK - RNS11 - VRMP	8/27/2016	7:20 AM	NA			15.9	75.7	7.5	120					1046.24	
OB010	OTTER BROOK - ROT06 - VRMP	6/4/2016	5:20 AM	NA			13.0	69.7	7.2						920.8	
OB010	OTTER BROOK - ROT06 - VRMP	6/18/2016	5:20 AM	NA			11.9	75.4	8.2	10					258.1	
OB010	OTTER BROOK - ROT06 - VRMP	7/2/2016	6:30 AM	NA			16.6	44.1	4.3	190					>2419.6	
OB010	OTTER BROOK - ROT06 - VRMP	7/16/2016	5:20 AM	NA			17.3	53.1	5.1						261.3	
OB010	OTTER BROOK - ROT06 - VRMP	7/16/2016	5:20 AM	D											121.1	
OB010	OTTER BROOK - ROT06 - VRMP	7/30/2016	5:39 AM	NA			16.0	56.4	5.6	290					165.8	
OB010	OTTER BROOK - ROT06 - VRMP	8/13/2016	6:21 AM	NA			18.4	32.2	3.2	300					913.9	
OB010	OTTER BROOK - ROT06 - VRMP	8/27/2016	6:15 AM	NA			16.0	38.7	3.8	300					142.1	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	5/21/2016	7:40 AM	NA			14.6	90.8		310					77.6	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	6/4/2016	7:40 AM	NA			16.3	73.2	7.2	340					1299.65	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	6/18/2016	7:36 AM	NA			16.6	70.3	6.8	262					152.9	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	7/2/2016	7:35 AM	NA			19.9	68.4	6.2	171.7					201.4	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	7/16/2016	7:35 AM	NA			22.7	66.9	5.8	291.6					143.9	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	7/16/2016	7:35 AM	D			22.7	59.9	5.2	292.3					198.9	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	7/30/2016	7:20 AM	NA			21.4	63.5	5.6	223.7					275.5	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	8/13/2016	8:05 AM	NA			22.2	69.1	6.0	248.9					980.4	
PI010	EAST BRANCH PISCATAQUA RIVER - RPSEB05 - VRMP	8/27/2016	7:40 AM	NA			20.5	65.2	5.9	256.3					214.3	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	5/21/2016	7:55 AM	NA			14.0	97.2		320					52.1	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	6/4/2016	8:00 AM	NA			14.5	95.2	9.7	360					1413.6	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	6/18/2016	7:48 AM	NA			14.6	93.2	9.5	274.8					70.3	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	7/2/2016	7:50 AM	NA			18.3	93.1	8.8	265.6					488.4	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	7/16/2016	7:50 AM	NA			20.6	86.2	7.7	362.5					461.1	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	7/30/2016	7:33 AM	NA			19.5	87.4	8.0	374.1					307.6	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	8/13/2016	8:20 AM	NA			19.9	86.7	7.9	389.5					1413.6	
PI020	PISCATAQUA RIVER - RPS12 - VRMP	8/27/2016	7:50 AM	NA			18.7	89.6	8.4	382.8					214.3	
PL040	PLEASANT RIVER - RPL47 - VRMP	6/4/2016	5:40 AM	NA			15.6	93.2	7.3	240					206.3	
PL040	PLEASANT RIVER - RPL47 - VRMP	6/18/2016	5:40 AM	NA			15.8	68.1	8.1	270					172.3	
PL040	PLEASANT RIVER - RPL47 - VRMP	7/2/2016	6:05 AM	NA			19.1	78.2	7.3	260					>2419.6	
PL040	PLEASANT RIVER - RPL47 - VRMP	7/16/2016	6:04 AM	NA			23.2	78.6	6.6						214.3	
PL040	PLEASANT RIVER - RPL47 - VRMP	7/30/2016	6:02 AM	NA			20.8	63.3	5.7	340					150	
PL040	PLEASANT RIVER - RPL47 - VRMP	8/13/2016	6:35 AM	NA			22.3	67.4	5.9	390					1553.07	
PL040	PLEASANT RIVER - RPL47 - VRMP	8/27/2016	6:35 AM	NA			19.3	62.6	5.6	400					325.5	
P020	PRESUMPSCOT RIVER - R24 - VRMP	5/21/2016	6:20 AM	NA			15.0	93.6	9.4	84.1					18.7	
P020	PRESUMPSCOT RIVER - R24 - VRMP	6/4/2016	6:35 AM	NA			18.6	89.9	8.5						133.4	
P020	PRESUMPSCOT RIVER - R24 - VRMP	6/18/2016	6:45 AM	NA			19.4	88.1	8.1	75.2					56.1	
P020	PRESUMPSCOT RIVER - R24 - VRMP	7/2/2016	7:00 AM	NA			23.0	87.0	7.5	79.9					79.4	
P020	PRESUMPSCOT RIVER - R24 - VRMP	7/16/2016	5:50 AM	NA			24.9	86.7	7.2						139.1	
P020	PRESUMPSCOT RIVER - R24 - VRMP	8/13/2016	6:00 AM	NA											980.4	
P030	PRESUMPSCOT RIVER - R47 - VRMP	5/21/2016	6:35 AM	NA			14.8	95.2	9.7	81.1					17.3	
P030	PRESUMPSCOT RIVER - R47 - VRMP	6/4/2016	6:50 AM	NA			18.8	93.3	8.6						77.1	

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. Sat. (%)	** D.O. (MG/L)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turb-idity (NTU)	Total Diss. Solids (MG/L)	** TSS (MG/L)	E Coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
P030	PRESUMPSCOT RIVER - R47 - VRMP	6/18/2016	7:00 AM	NA			19.2	90.7	8.4	72.4					60.9	
P030	PRESUMPSCOT RIVER - R47 - VRMP	7/2/2016	7:20 AM	NA			22.9	88.0	7.6	78.1					111.9	
P030	PRESUMPSCOT RIVER - R47 - VRMP	7/16/2016	5:35 AM	NA			25.0	89.5	7.4						98.8	
P030	PRESUMPSCOT RIVER - R47 - VRMP	7/16/2016	5:35 AM	D											117.8	
P030	PRESUMPSCOT RIVER - R47 - VRMP	7/30/2016	6:35 AM	NA			26.2	81.2	6.6	87.7					39.3	
P030	PRESUMPSCOT RIVER - R47 - VRMP	8/13/2016	6:23 AM	NA											1986.28	
TA010	TANNERY BROOK - RLTTN06 - VRMP	5/21/2016	6:50 AM	NA			13.3	83.0	8.7						155.3	
TA010	TANNERY BROOK - RLTTN06 - VRMP	6/4/2016	6:25 AM	NA			15.4	82.1	8.2						55.6	
TA010	TANNERY BROOK - RLTTN06 - VRMP	7/2/2016	7:00 AM	NA			18.3	77.8	7.3						2419.17	
TA010	TANNERY BROOK - RLTTN06 - VRMP	7/16/2016	6:45 AM	NA			21.5	68.9	6.1						571.7	
TA010	TANNERY BROOK - RLTTN06 - VRMP	7/30/2016	7:35 AM	NA			17.7	71.6	6.9	485.8					307.6	
TA010	TANNERY BROOK - RLTTN06 - VRMP	8/13/2016	6:40 AM	NA			20.0	76.6	6.9	413.5					816.4	
TA010	TANNERY BROOK - RLTTN06 - VRMP	8/27/2016	7:25 AM	NA			17.3	76.7	7.3	464.9					111.2	