2018 Water Quality Report
Milton, MA

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neponset river
WATERSHED ASSOCIATION

Introduction:

The Neponset River Watershed Association (NepRWA) has been collecting water quality data in Milton and throughout the Neponset River watershed for over 20 years. Samples are collected by volunteers through the Citizen Water Monitoring Network (CWMN) and by NepRWA staff through the Hot Spot program.

There are ten permanent CWMN stations within and bordering the town of Milton; three on Pine Tree Brook, three on Unquity Brook and four on the Neponset River. CWMN stations are sampled once per month between May and October. Waterbodies in Milton are tested for *E.coli*, total phosphorus, pH, dissolved oxygen, temperature, and flow rate. Select sites may also be tested for ortho-phosphate, total nitrogen, ammonia, and chlorophyll a. Hot spots are tested for *E.coli*, ammonia, and surfactants. The parameters discussed are limited to those that are tested at every site.

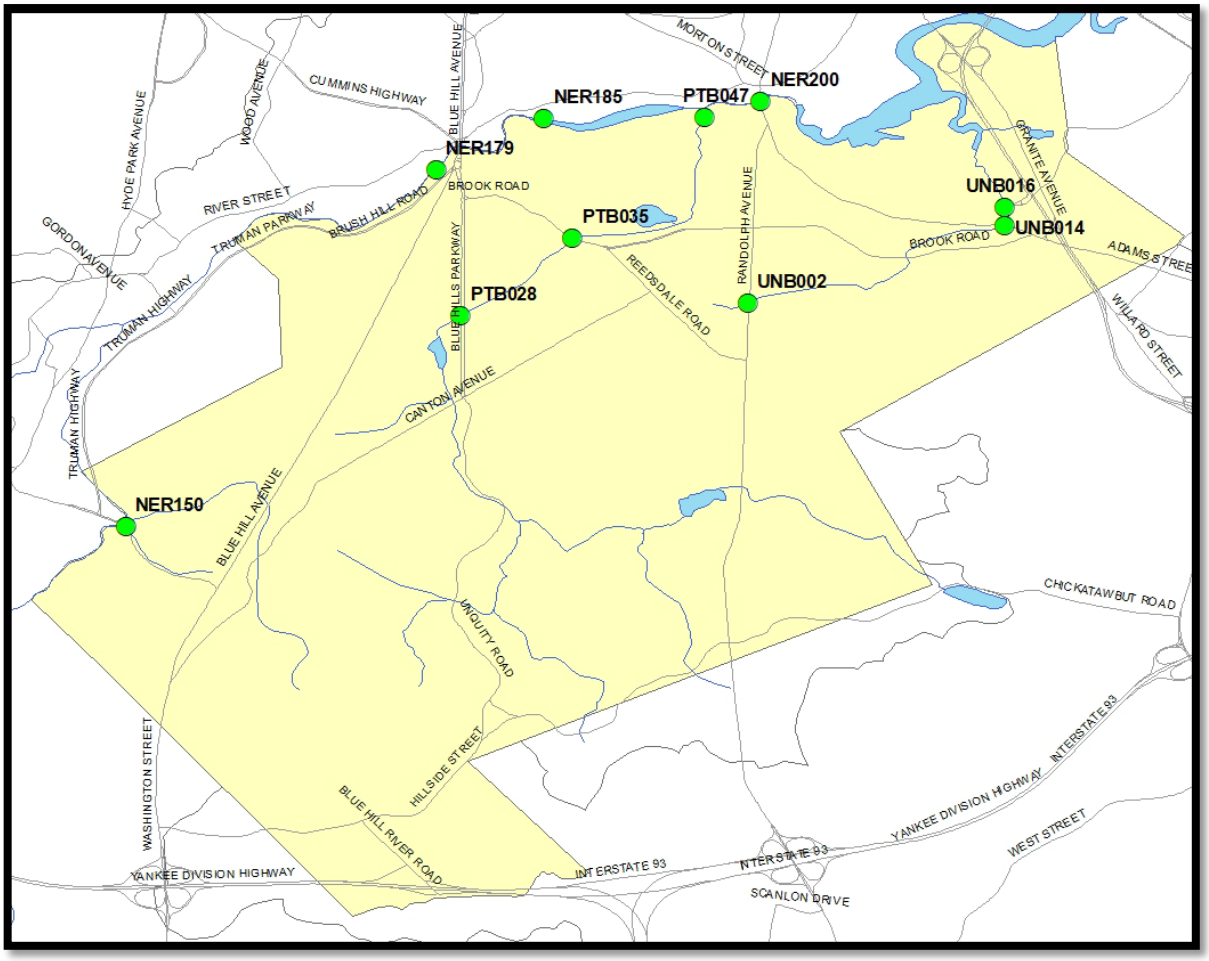


Figure 1: Map of CWMN Sites in Milton

Data gathered by the CWMN volunteers are used to track the health of the Neponset River and its tributaries, and to locate pollution hot spots for follow-up sampling. Hot Spot sampling in Milton has occurred in Unquity Brook, and Pine Tree Brook. In each case, the goal of the Hot Spot sampling was to locate potential sources of sewage contamination.

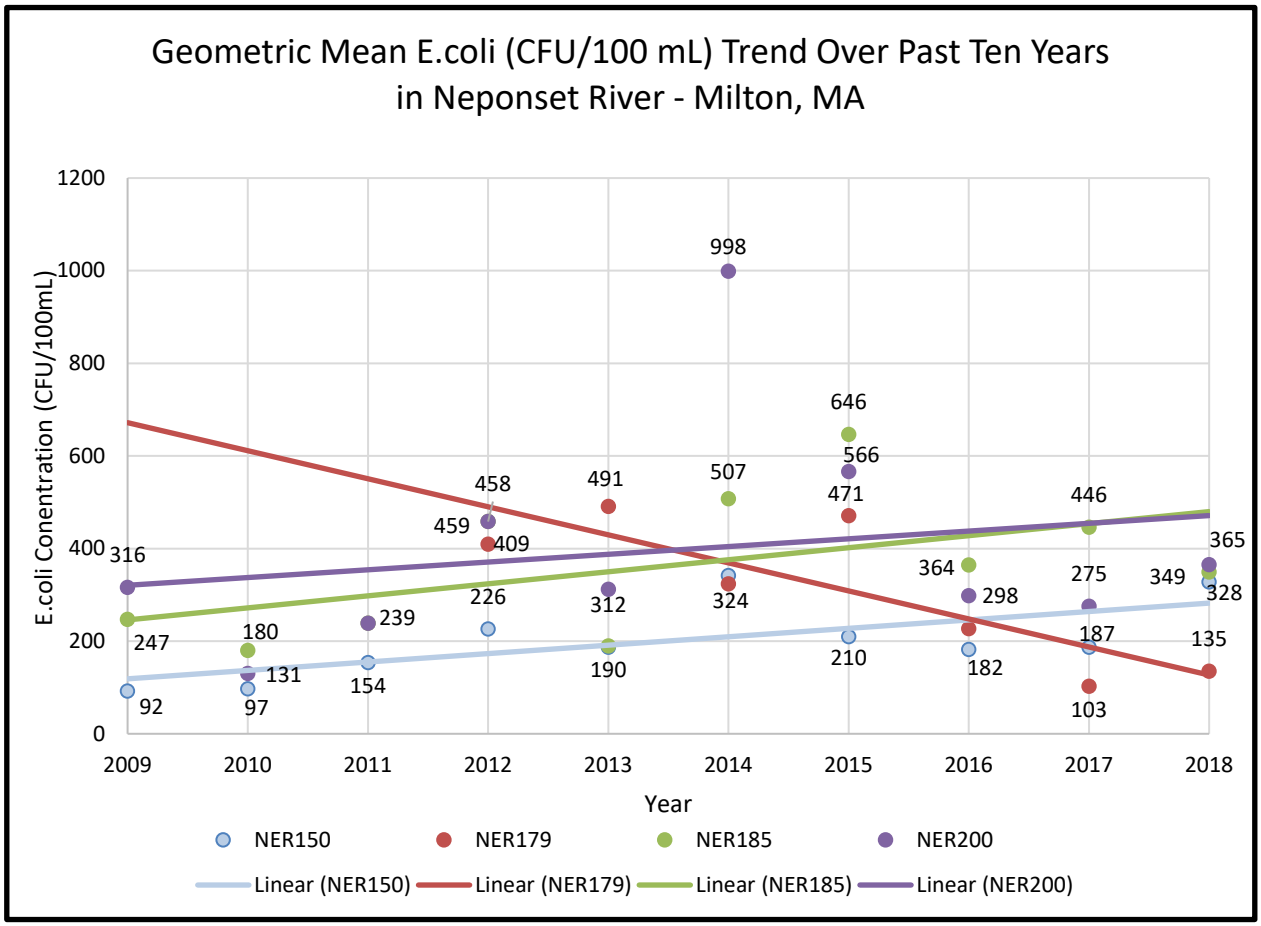
This report is intended to provide a summary and interpretation of the results from CWMN 2018 and subsequent Hot Spot sampling. The raw water quality data are available upon request.

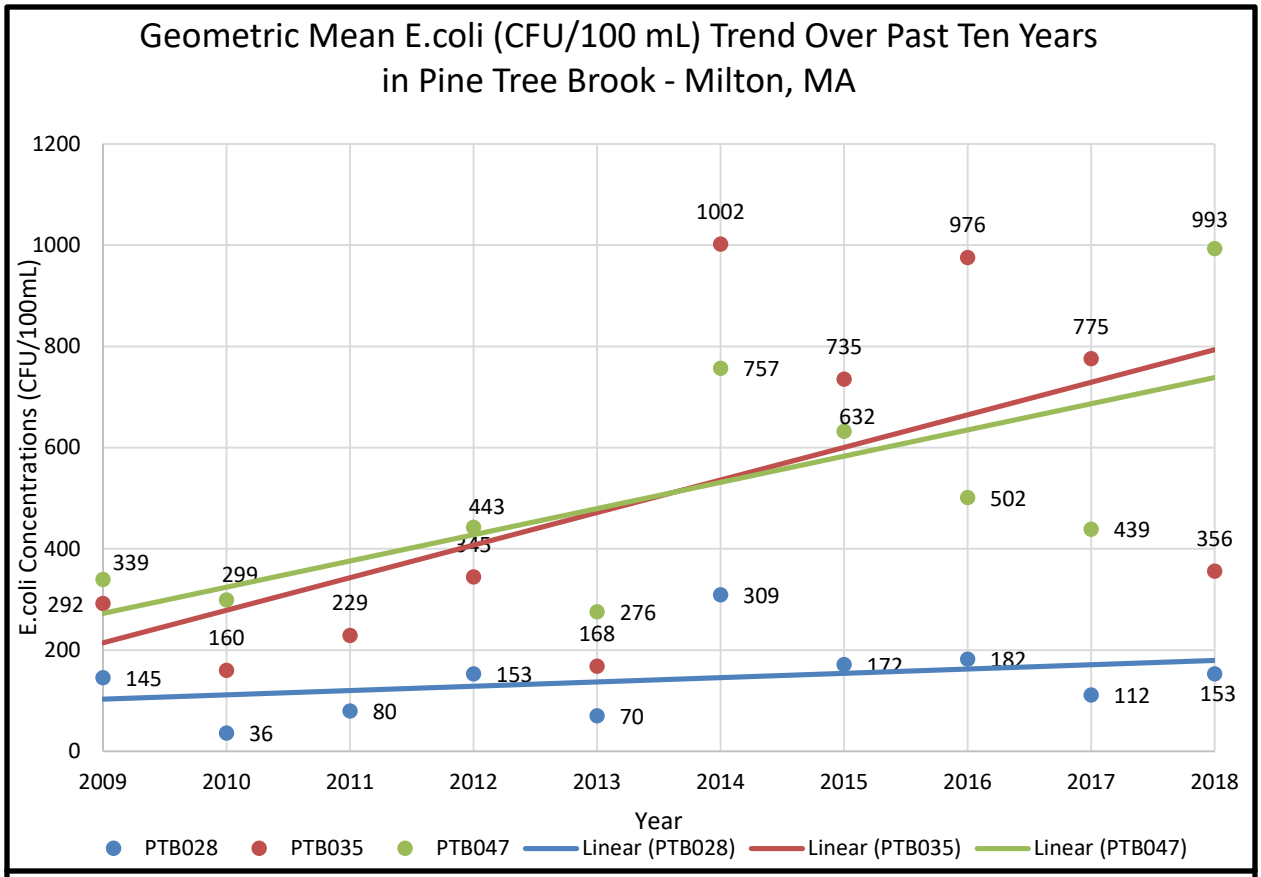
Milton Water Quality Analysis

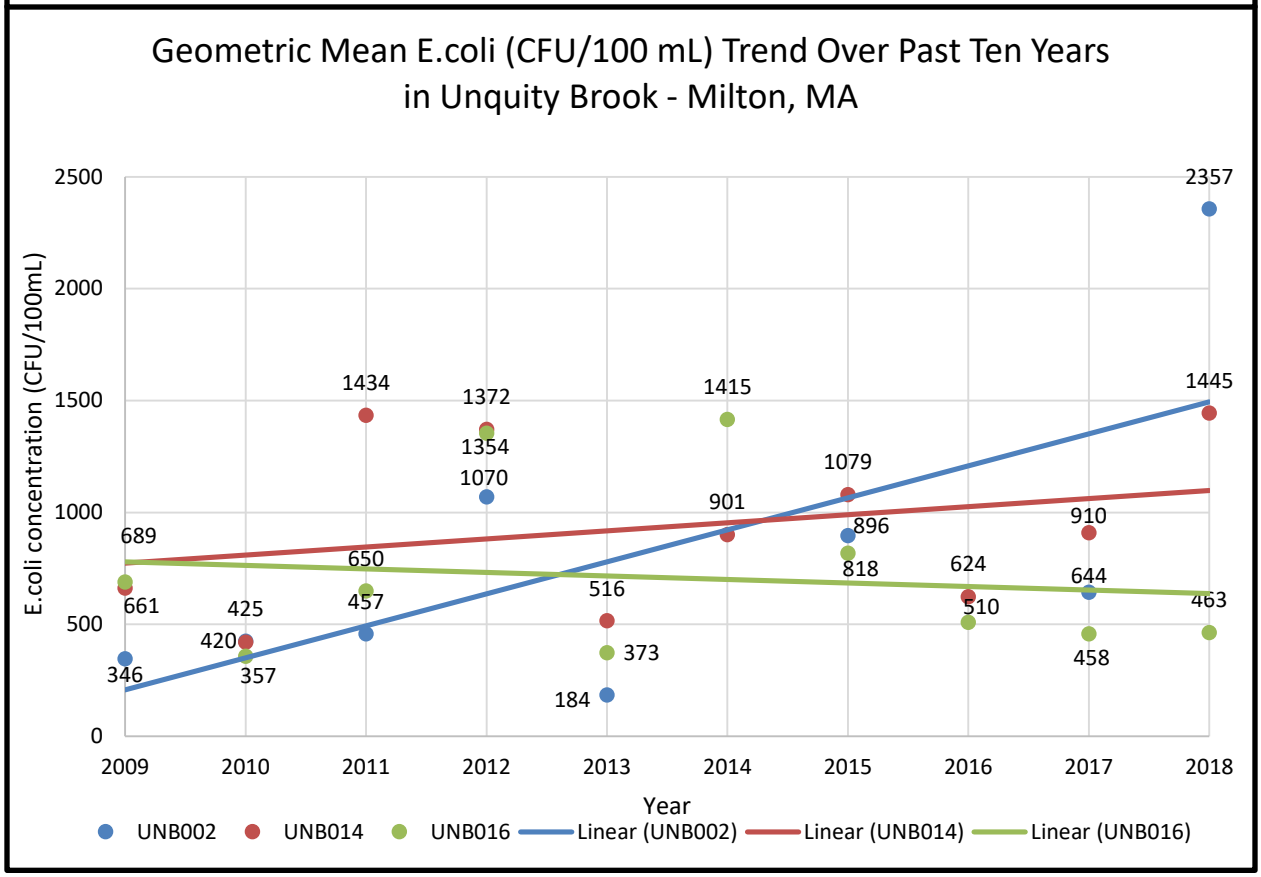
E.coli

E.coli bacteria are used to assess a waterbody's suitability for human contact during recreational activities. They are often used as indicators of the presence of other more dangerous pathogens associated with human and animal waste. In Massachusetts there are two criteria for what is considered an acceptable level of *E.coli* within a Class B waterbody. No single sample shall exceed 235 Colony Forming Units (CFU) and/or the geometric mean of at least 5 samples taken within the same season shall not exceed 126 CFU.

Figure 2-4: Geometric mean of *E.coli* concentrations over the past 10 years in Milton, MA




Geometric Mean E.coli (CFU/100 mL) Trend Over Past Ten Years
in Pine Tree Brook - Milton, MA
E.coli Concentrations (CFU/100mL)
1200
1000
800
600
400
292
200
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
339
299
229
443
345
276
309
757
735
632
976
1002
502
775
439
993
356
160
168
145
153
80
36
70
172
182
112
153
PTB028
PTB035
PTB047
Linear (PTB028)
Linear (PTB035)
Linear (PTB047)


Geometric Mean E.coli (CFU/100 mL) Trend Over Past Ten Years
in Unquity Brook - Milton, MA
E.coli concentration (CFU/100mL)
2500
2000
1500
1000
500
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year
689
661
425
420
357
346
650
457
1434
1372
1354
1070
516
373
184
1415
901
1079
896
818
624
510
910
644
458
2357
1445
463
UNB002
UNB014
UNB016
Linear (UNB002)
Linear (UNB014)
Linear (UNB016)

Figures 2-4 suggest that *E.coli* concentrations have generally been increasing over the past ten years, with the exception of NER179 where *E.coli* concentrations have been declining. The sites that have seen the largest increases in *E.coli* concentrations over the past decade are UNB002, PTB035, and PTB047.

UNB002 had alarmingly high concentrations of *E.coli* pollution in 2018. This site typically has very low flow during the summer months, and occasionally becomes a series of isolated pools. This is the perfect conditions for *E.coli* to breed. This brook is also heavily influenced by stormwater runoff as seen in Table 2.

PTB035 had lower than average *E.coli* concentrations in 2018, but is still trending upward because of high concentrations in recent years. Conversely, water quality in PTB047 had been improving in recent years until it peaked in 2018. Almost all of the sites had higher E.coli concentrations in 2018 than the average of the previous 9 years, see Table 1.

NER150, NER185, and PTB028 were the only sites to meet swimmable standards in the past 10 years, and they only did so sporadically. None of the sites on Unquity Brook met swimmable standards this decade. The majority of the sites on the Neponset River met boatable standards over the past decade, with the exception of 6 instances, all within the last 5 years. The sites on Pine Tree Brook also met boatable standards the majority of the time. Unquity brook only met boatable standards about a quarter of the time over the past decade, with UNB016 having the best compliance rate.

Table 1: *E.coli* concentrations in 2018 compared to previous 10 year average

Site ID	Average Geometric Mean of *E.coli* (CFU/100mL) 2009-2017	Geometric mean of *E.coli* concentrations (CFU/100mL) 2018
NER150	174	328
NER179	301	135
NER185	328	349
NER200	351	365
PTB028	117	153
PTB035	399	356
PTB047	473	993
UNB002	477	2357
UNB014	813	1445
UNB016	654	463

One major source of *E.coli* contamination is stormwater runoff. Table 2 suggests that all of the sites in Milton are heavily impacted by stormwater runoff. At some sites *E.coli* values were over 10 times the concentration they were under dry weather conditions. Although, it is worth pointing out that some sites have poor *E.coli* water quality regardless of weather.

Improper disposal of pet waste in the street, lawns, and catch basins is the most common source of *E.coli*. However, some is also the result of naturally occurring wildlife waste. Non-structural BMPs that educate citizens about proper pet waste disposal, and regular cleaning of

catch basins should help reduce *E.coli* loads. Infiltration BMPs are also highly effective in reducing *E.coli* loading before it reaches a waterbody and building those types of BMPs should be a prioritized when possible.

Table 2: *E.coli* concentrations in 2018 during wet and dry weather

Weather	Total Number of Samples 2018	Geometric Mean *E.coli* Conc. (cfu/100ml)	Weather	Total Number of Samples 2018	Geometric Mean *E.coli* Conc. (cfu/100ml)
NER150			**PTB035**		
Dry	3	82	Dry	3	170
Wet	3	1302	Wet	2	1072
NER179			**PTB047**		
Dry	3	45	Dry	3	301
Wet	3	401	Wet	3	3278
NER185			**UNB002**		
Dry	3	163	Dry	3	969
Wet	3	748	Wet	3	5733
NER200			**UNB014**		
Dry	3	144	Dry	3	611
Wet	3	925	Wet	3	3420
PTB028			**UNB016**		
Dry	3	58	Dry	3	308
Wet	3	398	Wet	3	700

In 2016, three suspected illicit discharges along Unquity brook were discovered by NepRWA staff via Hot Spot monitoring. The discovered sites were behind the police station, a private sewer discharging under Brook Rd, and the culvert discharging from under Reedsdale Rd. The Milton police station received major stormwater upgrades, which we are hoping will translate into water quality improvements at UNB002. Follow up sampling at the Brook Rd illicit discharge shows that the town has resolved this issue.

Hot Spot monitoring of Pine Tree Brook has not uncovered any conclusive illicit discharges. However, it does support the notion that there are high instream *E.coli* levels in Pine Tree Brook most of the time. Continued efforts in this area will hopefully uncover the source of the *E.coli* bacteria.

While there are four CWMN stations along the Neponset River that abut the Town of Milton we do not suspect that Milton is the major contributor of *E.coli* in these areas. There are several known illicit discharges in Hyde Park and Mattapan that are likely causing the high levels of *E.coli* during dry weather in this part of the river. Further monitoring of the Milton outfalls in this section of the river would be good in order to confirm this.

Phosphorus

Phosphorus is often the limiting nutrient in freshwater aquatic ecosystems, meaning that the level of available phosphorus in any given waterbody is directly linked to that waterbody's ability to produce plant biomass. This is important because too much phosphorus leads to too much biomass, especially of algae which are able to utilize free phosphorus suspended in the water column. This process is called eutrophication. Eutrophication can result in crashes of dissolved oxygen; a critical resource required by all aquatic animals, unsightly and strong smelling algal blooms, destruction of important subaquatic plant communities through reduced light penetration, and harmful cyanobacteria blooms that can be lethally toxic to humans and pets.

The state of Massachusetts does not provide numerical phosphorus standards for classification of water quality impairments. Instead MassDEP uses a narrative standard that includes the EPA gold book standard as well as dissolved oxygen problems and recorded presence of algal blooms. For the purpose of this report, we only used the EPA gold book standard of .05mg/l for streams and .025 mg/l for ponds, to assess the presence of a phosphorus problem since we don't record algae data and phosphorus typically affects dissolved oxygen levels in ponds which we don't sample regularly.

Table 3: Phosphorus concentrations during wet, dry and combined weather in 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
NER150	0.05238	0.07747	0.06493
NER179	0.04694	0.05028	0.04861
NER185	0.04458	0.05123	0.04791
NER200	0.04556	0.05724	0.05140
PTB028	0.04024	0.06451	0.05238
PTB035	0.05665	0.06795	0.06117
PTB047	0.04356	0.08082	0.06219
UNB002	0.07896	0.12594	0.10245
UNB014	0.04337	0.06781	0.05559
UNB016	0.04686	0.07181	0.05934

Phosphorus loading can come from several sources including stormwater runoff, particularly runoff loaded with sediment or from over-fertilized lawns. Fallen leaves especially those fallen on impervious surfaces, concentrated in gutters, illegally dumped in riparian zones, or collected in catch basins can also contribute to phosphorus loading in stormwater. Finally, improperly maintained septic systems, illicit discharges, and internal loading through the release of phosphorus from sediments and dead aquatic plant material are also common sources of phosphorus loading that are not related to stormwater runoff.

The data in Table 3 show that stormwater runoff is affecting some of Milton's waterbodies more than others. Unquity Brook appears to be particularly impacted by phosphorus rich stormwater discharges compared to Pine Tree Brook and the Neponset River. In 2018, NER179 and NER200 met the gold book standard for Total phosphorus.

It's clear from the data that total phosphorus is a problem in Milton waterways. Structural and non-structural BMPs could help to reduce the concentrations of Phosphorus found locally. Education of citizens about the proper disposal of yard waste, proper lawn fertilization, and keeping gutters clean will help address this issue. Other non-structural BMPs such as streets vacuuming and regular catch basin cleaning will also help. Sewage often contains high concentrations of phosphorus, so eliminating known illicit discharges should help address the problem. Finally, structural BMP's that collect and filter out phosphorus before it reaches a water body will have a large positive impact on water quality, especially those proposed in the heavily impacted Unquity Brook sub-watershed.

pH

pH is a measure of how acidic or basic something is. The pH of a waterbody is an important factor of habitat quality for aquatic life since water that is too acidic or too basic can be toxic. The pH of a waterbody also influences the behavior of nutrients, determining whether they will be made unavailable by bonding to free carbon in sediments or made available by being released from such bonds. pH is often influenced by bedrock characteristics, groundwater seepage, acid rain, or heavy loading of tannin rich leaves/needles. These do not appear to be issues affecting pH in Milton. The state of Massachusetts determined that the healthy range of pH for waterbodies in the state is 6.5-8.3.

Table 4: pH values in 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
NER150	7.01	6.86	6.93
NER179	6.99	6.97	6.98
NER185	6.93	7.23	7.08
NER200	7.10	7.28	7.19
PTB028	7.15	7.13	7.14
PTB035	7.11	7.15	7.12
PTB047	6.83	7.16	7.00
UNB002	6.94	6.97	6.96
UNB014	7.01	7.11	7.06
UNB016	7.08	7.40	7.24

The data in Table 4 suggest that pH is consistently within a healthy range in Milton.

Dissolved Oxygen:

Adequate levels of dissolved oxygen (DO) are necessary to support many aquatic insects, fish and mollusks. These animals utilize dissolved oxygen to breathe. The state of Massachusetts determined that dissolved oxygen levels below 5 mg/L are considered stressful to aquatic organisms. The table below shows the DO data collected by CWMN volunteers in 2018

Table 5: Dissolved Oxygen Concentrations during wet, dry, and combined in 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined Weather (mg/L)
NER150	5.76	5.13	5.13
NER179	7.73	6.67	7.20
NER185	8.20	6.70	7.45
NER200	8.55	8.11	8.33
PTB028	6.61	5.63	6.12
PTB035	6.83	5.94	6.39
PTB047	7.87	7.03	7.45
UNB002	5.37	4.71	5.04
UNB014	8.46	7.67	8.14
UNB016	9.07	8.24	8.65

In general dissolved oxygen is healthy in Milton. UNB002 in Unquity Brook had a slight problem during wet weather in 2018. Dissolved Oxygen is influenced by water volume, water temperature, and the amount of atmospheric mixing through rapids or wind that is allowed to occur. The site UNB002 can become a series of shallow disconnected stagnant pools during the dry summer months. This is likely the cause of the poor dissolved oxygen in this section of the brook.

Conclusion

Based on the data we have collected, the main water quality issues faced by the town of Milton are *E.coli* contamination and phosphorus. Dissolved oxygen and pH are typically within healthy ranges aside from a few exceptions. Many of these issues can be simultaneously addressed through the implementation of stormwater BMPs, repairing illicit discharges, and through public education campaigns aimed at improving stormwater-related behavior.

While Milton's water quality issues pose a serious challenge for the town, they are not insurmountable. Having a dedicated stormwater utility in place reduces budgetary uncertainty and will allow Milton to plan further ahead than they previously could. With thoughtful planning and proper investment Milton should be able to restore water quality to Unquity brook, Pine Tree Brook, and the Neponset River.