

2019 Water Quality Report Dedham, MA

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neponset river
WATERSHED ASSOCIATION

Introduction:

The Neponset River Watershed Association (NepRWA) has been collecting water quality data in Dedham and throughout the Neponset River watershed since 1996. Samples are collected by volunteers through the Citizen Water Monitoring Network (CWMN) and by NepRWA staff through the Hotspot program.

There is one CWMN station within the town of Dedham. It is located on Mother Brook at Washington Street. This station is sampled once per month between May and October. Mother Brook is tested for *E.coli*, total phosphorus, pH, dissolved oxygen, temperature, ortho-phosphate, total nitrogen, and ammonia. The scope of this report is limited to *E.coli*, total phosphorus, pH, and dissolved oxygen because these are the parameters for which the state has defined water quality standards. Hotspots are tested for *E.coli*, ammonia, and surfactants.

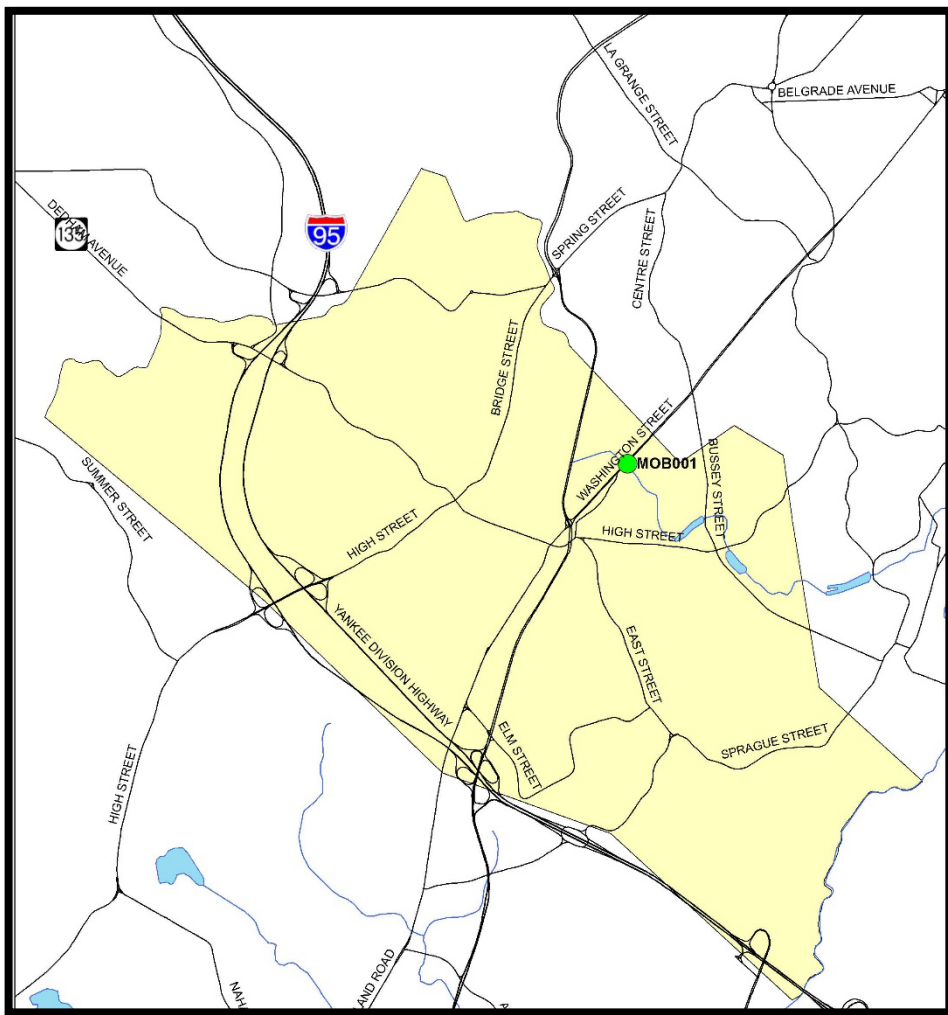


Figure 1: CWMN sampling sites within Dedham, MA

The data gathered by CWMN volunteers from Dedham and elsewhere in the watershed are used to track the health of the Neponset River and its tributaries. Areas with chronic water quality issues or sudden declines in water quality are marked for follow-up Hotspot sampling. In each

case, the goal of the Hotspot sampling was to locate potential sources of sewage contamination and/or gather more information about low dissolved oxygen issues.

This report is intended to provide a summary and interpretation of the results from CWMN 2019. The raw water quality data are available upon request.

Dedham 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. For primary recreation (swimming) no single sample shall exceed 235 Colony Forming Units (CFU) per 100 ml, and/or the geometric mean of at least 5 samples taken within the same season shall not exceed 126 CFU/100ml. For secondary recreation (boating), the geometric mean of at least 5 samples taken within the same season shall not exceed 630 CFU/100ml.

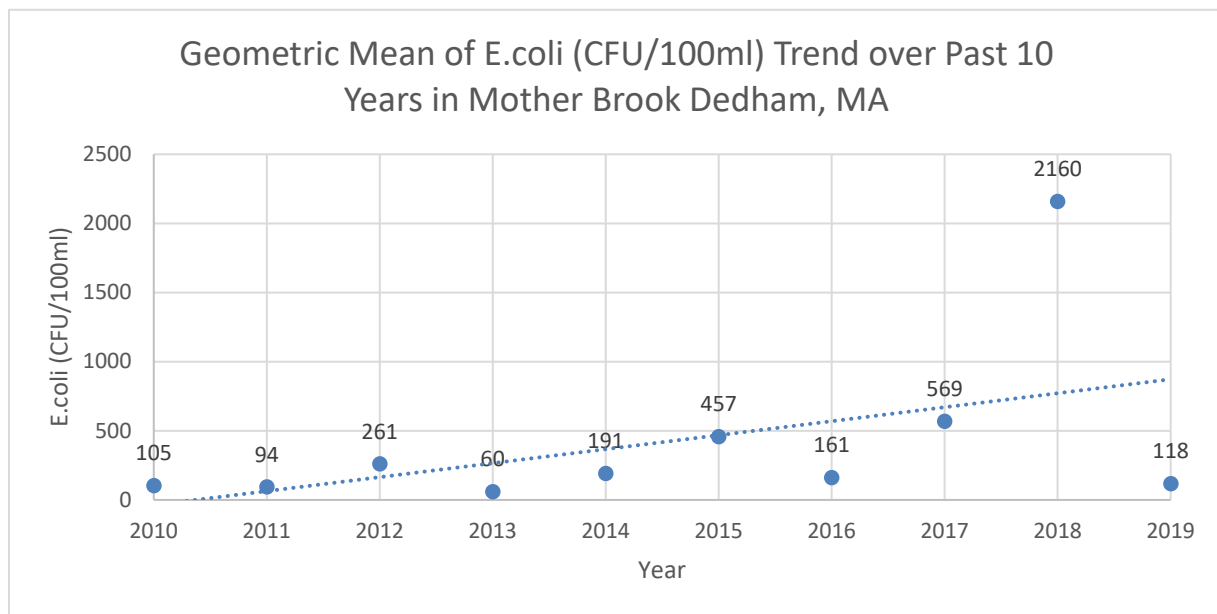


Figure 2: The ten-year trend of *E.coli* Geometric means of at least five samples in Dedham, Massachusetts.

Figure 2 suggests that *E.coli* concentrations had been slowly increasing over the past several years, and values spiked in 2018. In 2019, *E.coli* levels returned to concentrations that met the primary contact standard. Mother Brook met swimming standards in 2010, 2011, 2013, and 2019, and met boatable standards in all other years except 2018. In general, *E.coli* concentrations have been fair over the past 10 years, but they improved in 2019.

Several factors are suspected in contributing to the spike in *E.coli* bacteria in 2018. Discharges from the transfer station, a nearby goose colony, and stagnated flow during downstream dam maintenance may have caused a perfect storm of *E.coli* contamination. Hotspot sampling in

2016-2018 documented high *E.coli* loading coming from the Dedham Transfer Station during dry weather, and the town was subsequently notified.

Upon notification, the town took actions to sanitize the transfer station’s drain system, and ultimately shut down operations at the transfer station due to safety concerns. *E.coli* levels have dramatically fallen in Mother Brook since the closure of the transfer station, and in 2019 *E.coli* levels met swimmable standards for the first time in 5 years.

Table 1: Geometric mean of *E.coli* concentrations (CFU/100ml) for at least five samples 2019 vs previous 10-year average

Site ID	Average Geometric Mean of <i>E.coli</i> (CFU/100ml) 2010-2018	Geometric mean of <i>E.coli</i> concentrations (CFU/100ml) 2019
MOB001	451	118

Table 2 shows a positive correlation between *E.coli* concentrations and wet weather. Stormwater runoff is a common source of *E.coli* contamination. While concentrations during wet weather are higher than we would like, they are orders of magnitude lower than they have been in the past. This suggests that shutting down the transfer station has eliminated a major source of pollution in Mother Brook. We will continue to monitor the situation to confirm this finding.

Table 2: *E.coli* concentrations (CFU/100ml) during wet vs dry weather for *E.coli* in Dedham, MA for 2019

Weather	Total Number of Samples 2019	Geometric Mean <i>E.coli</i> Conc. (cfu/100ml)
Dry	2	54
Wet	4	206

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 support vegetation. This is important because too much phosphorus can lead to too much vegetation; especially algae which utilize 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 aquatic plant communities through reduced light penetration, and harmful cyanobacteria blooms that can be 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, the EPA gold book standard was to assess the presence of a phosphorus problem. The gold book standards state that total phosphorus levels should not exceed 0.025mg/l in ponds and 0.05 mg/l in streams.

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.

There are also common sources of phosphorus loading that are not associated with stormwater runoff. These include improperly maintained septic systems, illicit discharges, and internal loading through the release of phosphorus from sediments and dead aquatic plant material.

Table 3: Average Total Phosphorus concentrations during varying weather in Mother Brook 2019

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
MOB001	0.065758	0.063272	0.064101

The data in table 3 suggest that phosphorus levels were just slightly above the gold book threshold in 2019. They also suggest that stormwater runoff is not solely driving the phosphorus levels at this site on Mother Brook. It is possible that phosphorus is being released from the sediments or it is coming from areas upstream on the Charles River.

Structural and non-structural BMPs could help to reduce the concentrations of Phosphorus upstream. Educating residents and business owners about the proper disposal of yard waste, proper use of fertilizers, and keeping gutters clean will help address this issue. Other non-structural BMPs such as street vacuuming and regular catch basin cleaning will also continue to help. Finally, structural BMP's that collect and filter out phosphorus before it reaches a water body could have a positive impact on water quality.

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. pH also influences the behavior of nutrients, determining whether they are available for plants to utilize or not. pH is often influenced by bedrock characteristics, groundwater seepage, acid rain, or heavy loading of tannin rich leaves/needles. The state of Massachusetts determined that the healthy range of pH is 6.5-8.3.

Table 4: Average pH values during varying weather in Mother Brook 2019

Site ID	Max pH	Min pH	Average pH
MOB001	6.9	7.42	7.12

The pH of upper Mother Brook ranged from 6.9 to 7.42 in 2019. Table 4 suggests that pH was consistently within a healthy range in 2019 and is not a cause for concern.

Dissolved Oxygen:

Dissolved oxygen (DO) is 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 stressful to aquatic organisms. Warmer water has less

capacity to hold dissolved oxygen than colder water, and impoundments are known to create heating effects that remain further downstream. Other factors that affect water temperature are lack of canopy and shading, flow rate, water depth and volume, season, and ground water seepage.

The table below shows the DO data collected by CWMN volunteers in 2019.

Table 5: Average dissolved oxygen concentrations under varying weather in Mother Brook 2019

Site ID	Max DO (mg/L)	Min Do (mg/l)	Average DO (mg/L)
MOB001	11.9	6.4	7.8

Dissolved oxygen levels were consistently healthy in 2019. At no point did the dissolved oxygen levels drop below the 5 mg/l threshold. The restoration of flow after the completion of the downstream dam repairs likely helped the restored dissolved oxygen in 2019.

Conclusion

Based on the data collected in 2019, the main water quality issues faced in upper Mother Brook are *E.coli* and phosphorus. Phosphorus and *E.coli* improved dramatically since the shutdown of the transfer station and completion of downstream dam repairs. These issues can be further addressed through public education campaigns aimed at improving stormwater and fertilizer related behavior. With a little more work, upper Mother Brook could be made swimmable even during wet weather.

Dissolved oxygen and pH were within healthy ranges in 2019. These water quality parameters are not a concern. Dissolved oxygen improved greatly since last year, which is likely due to the completion of downstream dam repairs and the restoration of flow at the sampling station.

While Dedham's water quality issues pose a challenge for the town, they are much better now than they were a year ago. The town is already making major strides by shutting down the transfer station and retrofitting its properties with stormwater BMPs. With continued thoughtful planning and proper investment Dedham should be able to restore water quality in Mother Brook and the Neponset River.