

2018 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 for 23 years. 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 that the state has defined water quality standards. Hotspots are tested for *E.coli*, ammonia, and surfactants.

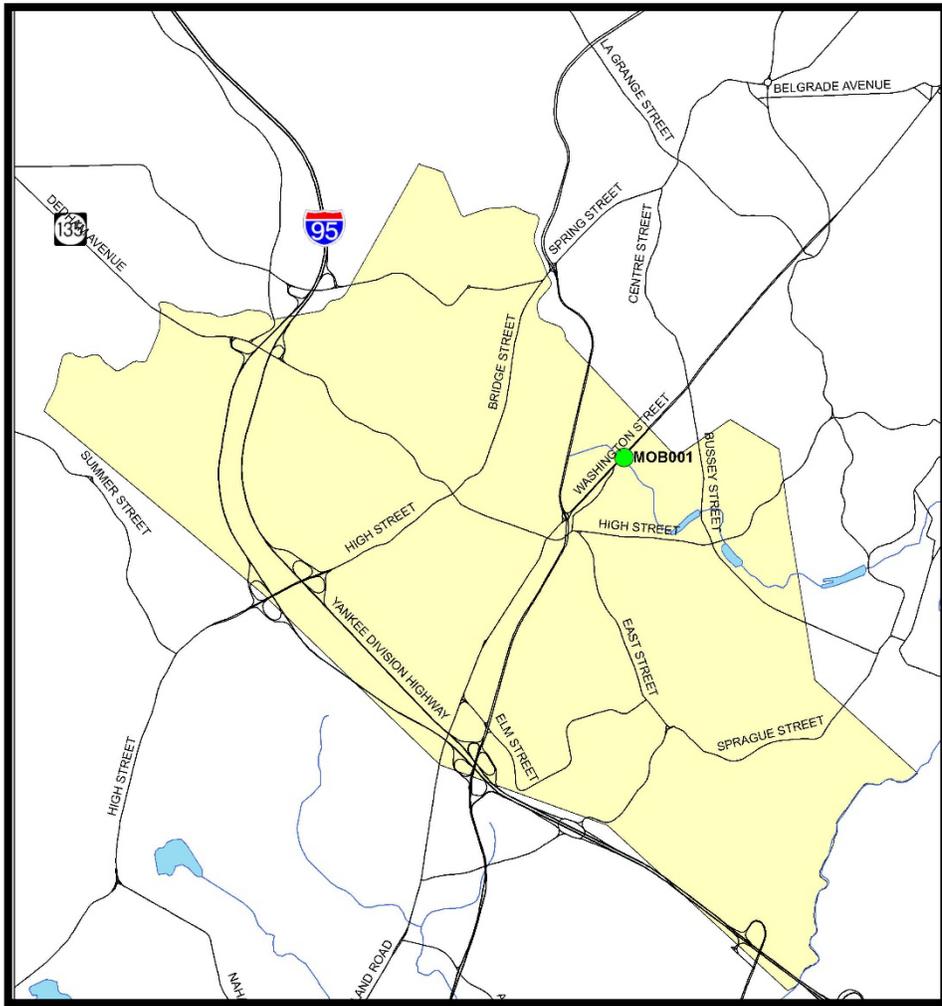


Figure 1: CWMN sampling sites within Dedham, MA

The data gathered by CWMN volunteers are used to track the health of the Neponset River and its tributaries, and to locate pollution hotspots for follow-up sampling. Hotspot sampling in Dedham occurred just upstream of the CWMN site, near the transfer station. 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 2018 and subsequent Hotspot sampling. 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 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, the geometric mean of at least 5 samples taken within the same season shall not exceed 630 CFU/100ml.

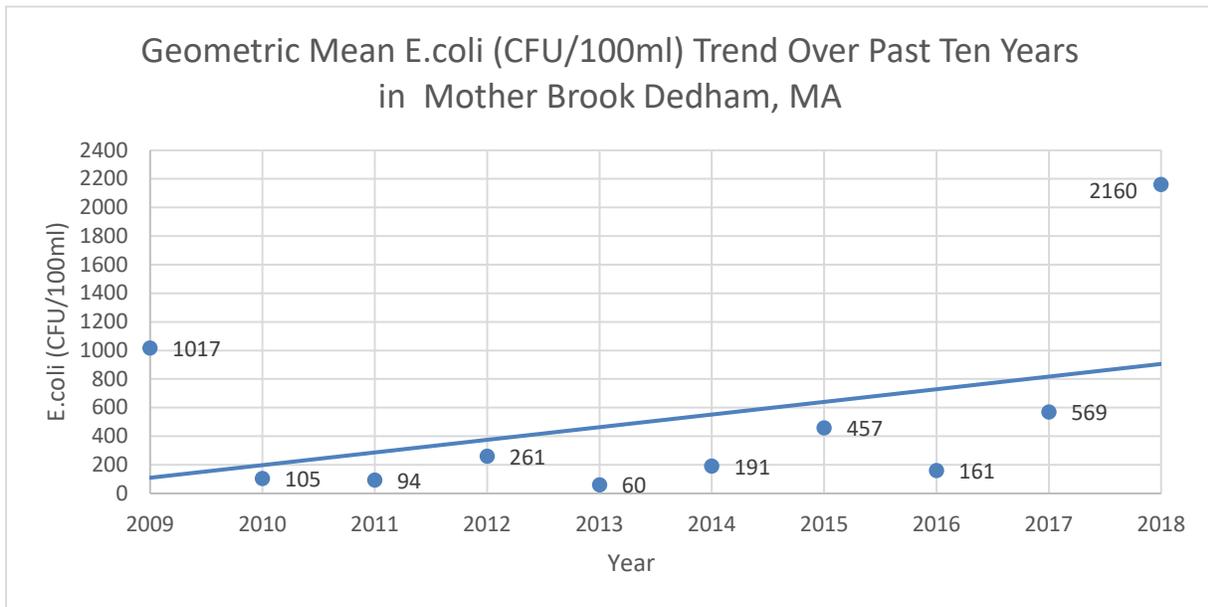


Figure 2: This Chart depicts the ten year trend of *E.coli* Geometric means of at least five samples in Canton, Massachusetts.

Figure 2 suggests that *E.coli* concentrations have been slowly increasing over the past several years, and values spiked in 2018. Mother Brook met fishable/swimmable standards in 2010, 11, and 12, and met boatable standards in all other years except 2018 and 2009. In general *E.coli* concentrations have been fairly good over the past 10 years. However, the spike in *E.coli* concentrations in 2018 is cause for concern.

Several factors are suspected in contributing to the spike in *E.coli* bacteria in 2018. We believe that 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.

Since Dedham was made aware of the issue, it has taken actions to sanitize the transfer station's drain system, restrict the processing of high pollutant load wastes, and restrict the use of sprinklers for dust control. Dedham is continuing to investigate the site, and monitor the outflow of the system. We are hopeful that these actions, coupled with restored flow upon completion of the dam repairs, will bring the *E.coli* counts in Mother Brook back to safer levels.

Table 1: Geometric mean of *E.coli* concentrations (CFU/100ml) for at least five samples 2018 vs previous 10 year average

Site ID	Average Geometric Mean of <i>E.coli</i> (CFU/100ml) 2008-2017	Geometric mean of <i>E.coli</i> concentrations (CFU/100ml) 2018
MOB001	221	2160

Another factor contributing to the high *E.coli* values in 2018 was that there were more wet weather sampling days in 2018 than average. Table 2 below shows a strong positive correlation between *E.coli* concentrations and wet weather. However, it is worth noting that even during dry weather in 2018 this site had *E.coli* concentrations that were higher than the 10 year average which contains a combination of both wet and dry weather events (see Table 1). It is critical that we continue to watch these trends closely in order to determine if 2018 was an anomaly, and if the actions taken by Dedham will bring the *E.coli* levels back down to swimmable levels.

Table 2: *E.coli* concentrations (CFU/100ml) during wet vs dry weather for *E.coli* in Dedham, MA for 2018

Weather	Total Number of Samples 2018	Geometric Mean <i>E.coli</i> Conc. (cfu/100ml)
Dry	3	379
Wet	3	12,306

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 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 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 in Dedham. The gold book standards states that Total Phosphorus levels should not exceed 0.025mg/l in ponds and 0.05 mg/l in streams.

Table 3: Average Total Phosphorus concentrations during varying weather in Mother Brook 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
MOB001	0.102605	0.055021	0.078813

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, including: improperly maintained septic systems, illicit discharges, and internal loading through the release of phosphorus from sediments and dead aquatic plant material.

The data in table 3 suggest that Phosphorus levels were just slightly above the gold book threshold in 2018. They also suggest that stormwater runoff is not driving the higher levels of phosphorus at this site on Mother Brook. It's possible that phosphorus was being released from the sediments due to stagnant flows.

Structural and non-structural BMPs could help to reduce the concentrations of Phosphorus found locally. 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 help. Finally, structural BMP's that collect and filter out phosphorus before it reaches a water body would have a large 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. 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. The state of Massachusetts determined that the healthy range of pH for waterbodies in the state is 6.5-8.3.

Table 4: Average pH values during varying weather in Mother Brook 2018

Site ID	Dry Weather pH	Wet Weather pH	Combined pH
MOB001	6.86	6.66	6.76

The data in table 5 suggest that pH was consistently within a healthy range in 2018. pH is often influenced by bedrock characteristics, groundwater seepage, acid rain, or heavy loading of tannin rich leaves/needles.

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: Average dissolved oxygen concentrations under varying weather in Mother Brook 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined Weather (mg/L)
MOB001	5.5	4.9	5.2

Dissolved oxygen levels were moderately healthy in Mother Brook in 2018 with the Exception of June and July. During these months flow was greatly reduced for dam repair activities downstream. This is likely what caused dissolved oxygen levels to drop as low as 1.7 and .24 mg/l in June and July respectively. Hot Spot monitoring found that these low dissolved oxygen levels were localized to the area upstream of Maverick St. While these conditions are deadly for aquatic wildlife locally, we hope that mobile organisms like fish were able to escape to oxygenated waters elsewhere in mother brook.

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.

Conclusion

Based on the data we have collected, the main water quality issues faced by the town of Dedham 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 improvements at the Dedham transfer station, completion of dam repairs downstream, and public education campaigns aimed at improving stormwater and fertilizer related behavior.

While Dedham's water quality issues pose a serious challenge for the town, they are not insurmountable. The town is already making major strides towards improving 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.