

2019 Water Quality Report Foxborough, MA

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neponset river
WATERSHED ASSOCIATION

Introduction:

The Neponset River Watershed Association (NepRWA) has been collecting water quality data in Foxborough 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 Foxborough. It is located at Crackrock Pond which is part of the main stem of the Neponset River, at North Street. This station is sampled once per month between May and October. Crackrock pond 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 have state defined water quality standards. Hotspots are tested for *E.coli*, ammonia, and surfactants.

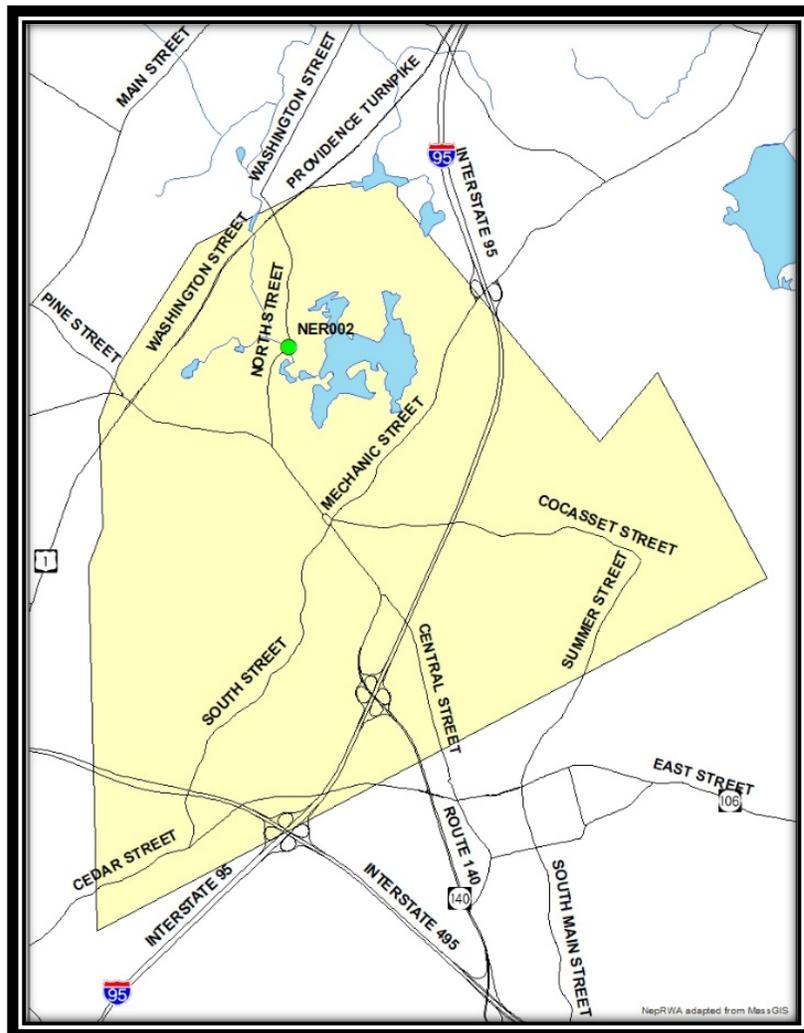


Figure 1: CWMN sampling sites within Foxborough, MA

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

Foxborough occurred at the CWMN site. In this case, the goal of the Hotspot sampling was to investigate excessive aquatic plant growth, and to gather more information about low dissolved oxygen issues.

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

Foxborough 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, also referred to as the swimming standard, 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, also referred to as the boating standard, the geometric mean of at least 5 samples taken within the same season shall not exceed 630 CFU/100ml.

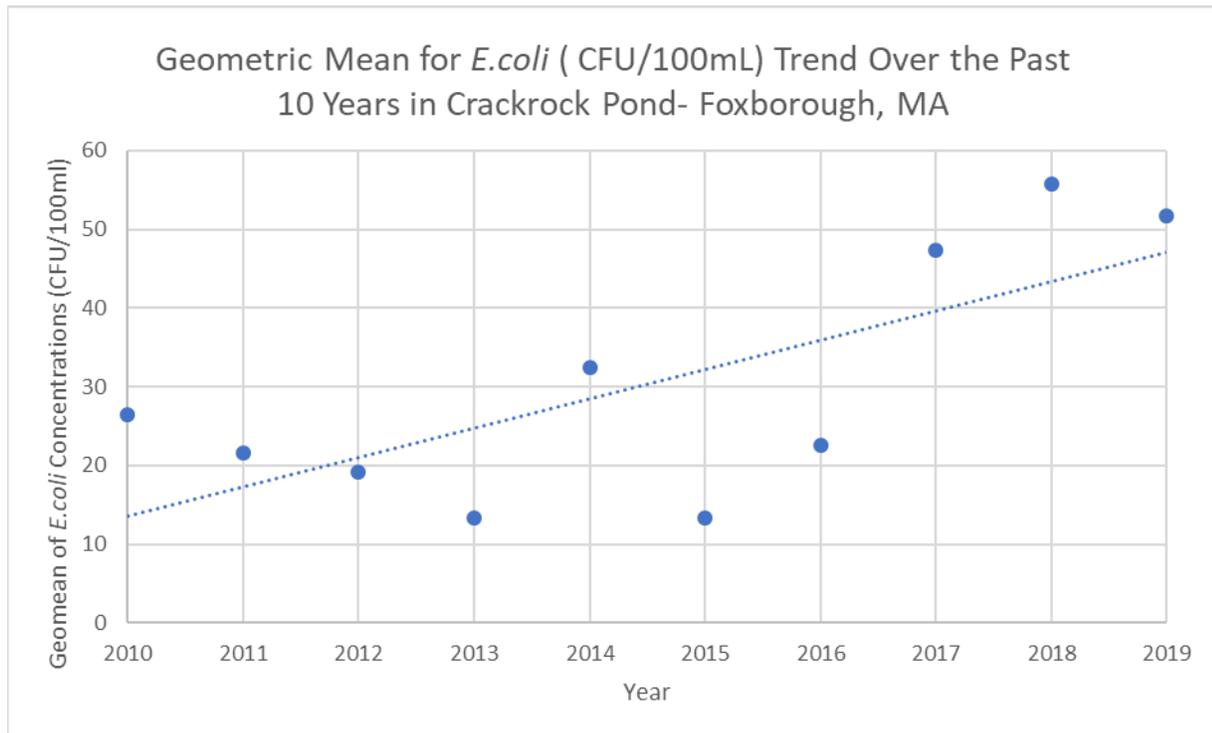


Figure 2: This Chart depicts the ten year trend of *E. coli* Geometric means in Foxborough, Massachusetts.

Figure 2 suggests that *E. coli* concentrations have been slowly increasing over the past several years, and values were highest in 2018. However, *E. coli* values are compliant with the

swimmable standard. Crackrock pond was one of the top 5 cleanest waterbodies in the Neponset watershed in terms of *E.coli* concentrations in 2019. *E.coli* contamination does not appear to be a water quality issue for Crackrock Pond.

Table 1: Geometric mean of *E.coli* concentrations (MPN/100mL) for at least five samples 2018 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	28	52

One contributing factor to the higher than usual *E.coli* values in 2018 is that there were more wet weather sampling days in 2019 than average. Table 2 below shows a positive correlation between *E.coli* concentrations and wet weather. Again, the *E.coli* concentrations in Crack Rock Pond are relatively low and no cause for concern.

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

Weather	Total Number of Samples 2018	Geometric Mean <i>E.coli</i> Conc. (cfu/100ml)
Dry	2	44
Wet	4	56

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 blooms, destruction of important subaquatic 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. Crackrock pond has both dissolved oxygen and algal bloom problems. The gold book standard states that Total Phosphorus levels should not exceed 0.025mg/l in ponds.

Table 3: Average Total Phosphorus concentrations during varying weather in Crackrock Pond 2020

Site ID	Dry Weather (mg/l)	Wet Weather (mg/l)	Combined (mg/l)
NER002	0.621802	0.203011	0.37053

The data in table 3 suggest that Phosphorus levels in 2019 were over ten times higher than the gold book threshold. The extremely high concentrations during dry weather suggest that internal loading of phosphorus is a major issue in Crackrock Pond. The results also suggest that

stormwater runoff is contributing to the phosphorus problem at this site. During the summer months Crackrock Pond shows many of the symptoms of a highly eutrophic system. The entire pond becomes covered in duckweed and watermeal from June through August, and dissolved oxygen levels crash to almost 0 in the late summer. Phosphorus is a major problem in Crackrock Pond.

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. Other common sources of phosphorus loading that are not associated with stormwater runoff, include: improperly maintained septic systems, illicit discharges, and internal loading through the release of phosphorus from sediments and detritus. In the case of Crackrock pond, it is likely that the majority of the phosphorus is legacy pollution from former industrial activities upstream on the Neponset Reservoir.

Reducing the internal loading of phosphorus will be critical to restoring the health of Crackrock Pond. Internal phosphorus could be dealt with by using a flocculant like alum to sequester the phosphorus, or through repeated mechanical removal of plant material from the pond. Structural and non-structural BMPs could help to reduce the concentrations of Phosphorus entering the system.

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 a substance 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 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 for waterbodies in the state is 6.5-8.3.

Table 4: Average pH values during varying weather in Crackrock Pond 2019

Site ID	Max pH	Min pH	Average pH
NER002	7.58	6.25	6.85

The data in table 4 suggest that pH was typically within a healthy range in 2019. There was one sample in June that was below the healthy minimum threshold of 6.5, but all others were in the healthy range.

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 stressful to aquatic organisms. The table below shows the DO data collected by CWMN volunteers in 2019

Table 5: Average dissolved oxygen concentrations in Crackrock Pond 2019

Site ID	Max DO	Min DO	Average DO (mg/L)
NER002	6.55	0.82	3.0

Dissolved oxygen levels in Crackrock Pond were harmful to aquatic life in 2019. Conditions were healthier early in the sampling season, but as weather got warmer the dissolved oxygen levels crashed (see figure 3). Oxygen levels were dangerously low in July and August. The summer dissolved oxygen crashes were likely driven the extremely high phosphorus concentrations and excessive plant growth. Decomposition of plant material in the bottom of the pond depletes oxygen from the water column.

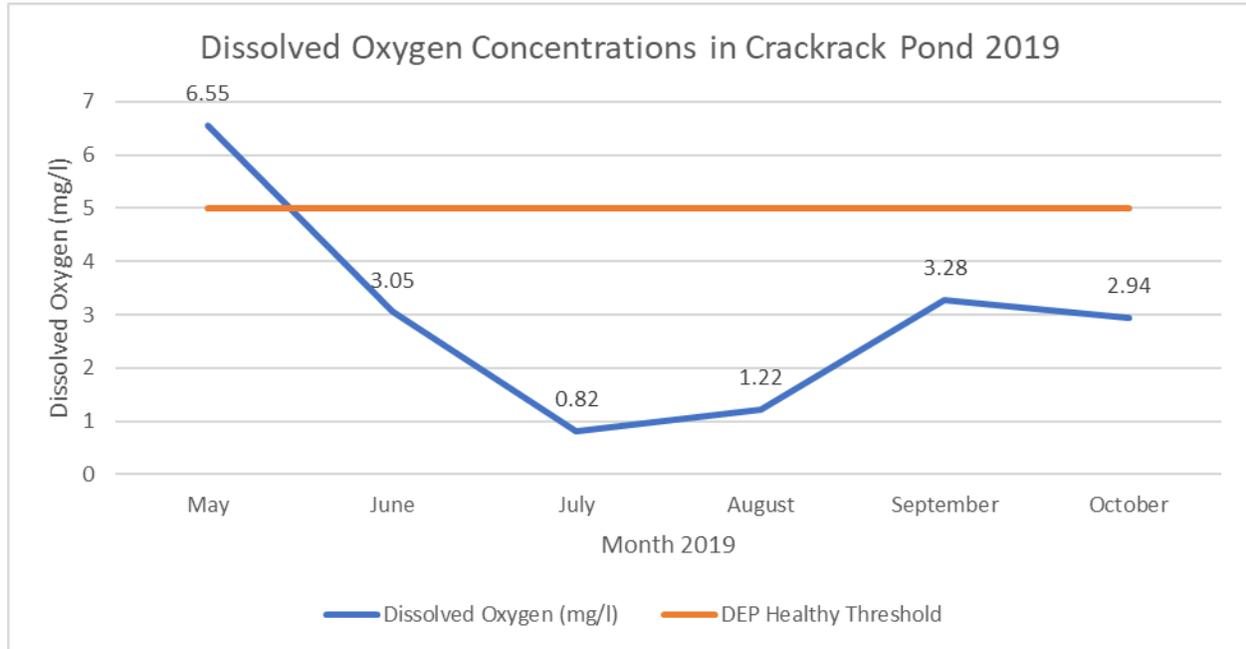


Figure 3: Dissolved Oxygen Concentrations in Crackrock Pond vs the DEP threshold

Additionally, warmer water has less capacity to hold dissolved oxygen than cold 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

The main water quality issue in Crackrock Pond is phosphorus. Actions need to be taken to reduce phosphorus levels within the pond, which should improve dissolved oxygen concentrations and reduce foul smelling blooms. While reducing stormwater pollution should

help, it appears that much of the phosphorus issues are due to internal cycling from the sediments. Flocculant treatment, aeration of the bottom layers, or mechanical removal of vegetation should help to reduce phosphorus levels in Crackrock Pond.

While Crackrock Pond's water quality issues pose a serious challenge for the town, it can be resolved. With continued thoughtful planning, and proper investment, Foxborough should be able to restore water quality in Crackrock Pond and the Neponset River.