2018 Water Quality Report
Westwood, MA

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neponset river
WATERSHED ASSOCIATION

Introduction:

The Neponset River Watershed Association (NepRWA) has been collecting water quality data in Westwood 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 are three permanent CWMN stations within and bordering the town of Westwood; one on Mill Brook, one on Purgatory Brook and one on the Neponset River. CWMN stations are sampled once per month between May and October. Waterbodies in Westwood 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. Hotspots are tested for *E.coli*, ammonia, and surfactants. The parameters discussed in this report are limited to those that are tested at every site.

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 Westwood occurred in Mill Brook, and Purgatory Brook. In each case, the goal of the Hotspot 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 Hotspot sampling. The raw water quality data are available upon request.

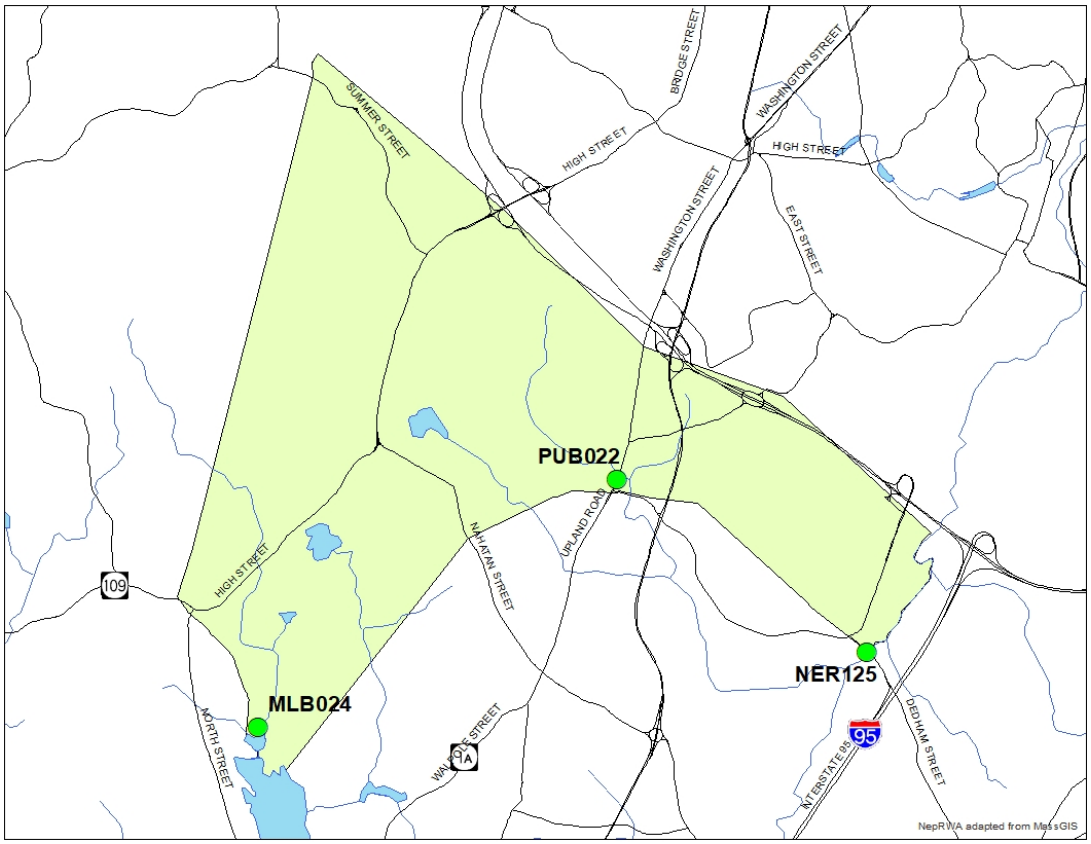

Figure 1: CWMN sampling sites within Westwood, MA

Westwood 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.

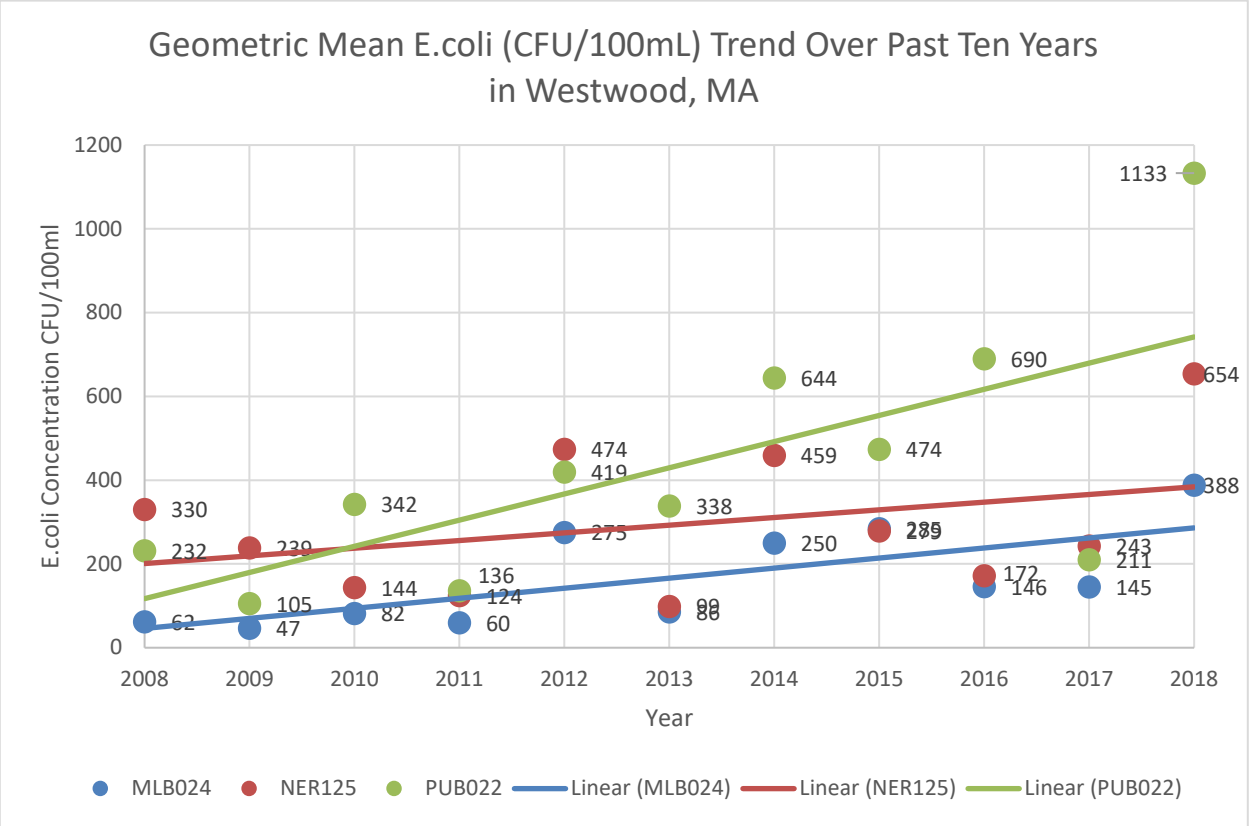

Figure 2: This Chart depicts the ten year trend of *E.coli* Geometric means of at least five samples in Canton, Massachusetts.

Figure 2 and Table 1 suggest that *E.coli* concentrations have been increasing over the past several years, and values spiked in 2018. Purgatory brook has seen the largest increase in *E.coli* over the past few years. While Purgatory Brook did meet swimmable standards in 2009 and 2011, it has failed to meet even boatable standards in three of the last five years. 2018 was a particularly bad year. Hot spot sampling over the past two years has not been able to uncover any sources of the *E.coli* pollution in Purgatory Brook. Purgatory brook does pass through a long culvert immediately upstream of our sampling location that we are unable to inspect. We would recommend CCTVing this culvert.

Over the past decade, Mill Brook has met boatable standards every year, and has met swimmable standards all but 4 years. There appears to have been a slight increase over the past five years. We will continue to keep an eye on this site to determine if 2018 was an anomaly.

Finally, *E.coli* concentrations have been increasing in the Neponset Mainstem, at Dedham St, over the past decade as well. However, the pattern seems to fluctuate more than some of the other sites. It appears the upward trend may be driven by the large increase in 2018. We need to keep tracking to the trend to determine what is happening. Regardless of this trend, none of the sites in Westwood met swimmable standards in 2018 and that is cause for concern.

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 *E.coli* (CFU/100mL) 2008-2017	Geometric mean of *E.coli* concentrations (CFU/100mL) 2018
MLB024	96	388
NER125	232	654
PUB022	313	1133

One major source of *E.coli* contamination is stormwater runoff. Improper disposal of pet waste in the street, on lawns, and in catch basins is the most common source of *E.coli* in stormwater. However, some *E.coli* may 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, so building those types of BMPs should be prioritized when possible.

One possible explanation for the abnormally high E.coli concentrations in 2018 is that there were more wet weather sampling days in 2018 than we typically have in a single sampling season. 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, NER125 and PUB022 had *E.coli* concentrations that were higher than the 10 year average, which contains a combination of both wet and dry weather events (see Table1). It is critical that we continue to watch these trends closely in order to determine if 2018 was an anomaly driven by weather or if there is something else at play here.

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

Weather	Total Number of Samples 2018	Geometric Mean *E.coli* Conc. (cfu/100ml)
MLB024		
Dry	3	68
Wet	3	1241
NER125		
Dry	3	182
Wet	3	4467

PUB022		
Dry	3	753
Wet	3	2503

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 Westwood. 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 Westwood 2018

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
MLB024	0.09619	0.05345	0.07054
NER125	0.04881	0.07017	0.05735
PUB022	0.07258	0.05332	0.06295

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 was an issue at all of the sites in Westwood in 2018. Concentrations were higher during dry weather suggesting that internal loading of phosphorus or faulty septic systems may be the dominate pathway for the nutrients.

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
MLB024	6.91	7.25	7.11
NER125	6.91	6.91	6.91
PUB022	6.91	6.87	6.89

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)
MLB024	8.35	7.63	7.92
NER125	4.70	4.78	4.73
PUB022	8.91	7.91	8.41

Dissolved oxygen levels were excellent in Mill Brook and Purgatory Brook in 2018, but were slightly lower than we would like in the Neponset River. The deeper and slower moving water of the Neponset was likely driving some of the dissolved oxygen issues there. 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 Westwood 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 in stormwater management and public education campaigns aimed at improving stormwater and fertilizer related behavior.

While Westwood's water quality issues pose a serious challenge for the town, they are not insurmountable. With continued thoughtful planning and proper investment Westwood should be able to restore water quality in Mother Brook and the Neponset River.