2019 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 since 1996. 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, and temperature. 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 Purgatory Brook. 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 2019 and subsequent Hotspot sampling. The raw water quality data are available upon request.

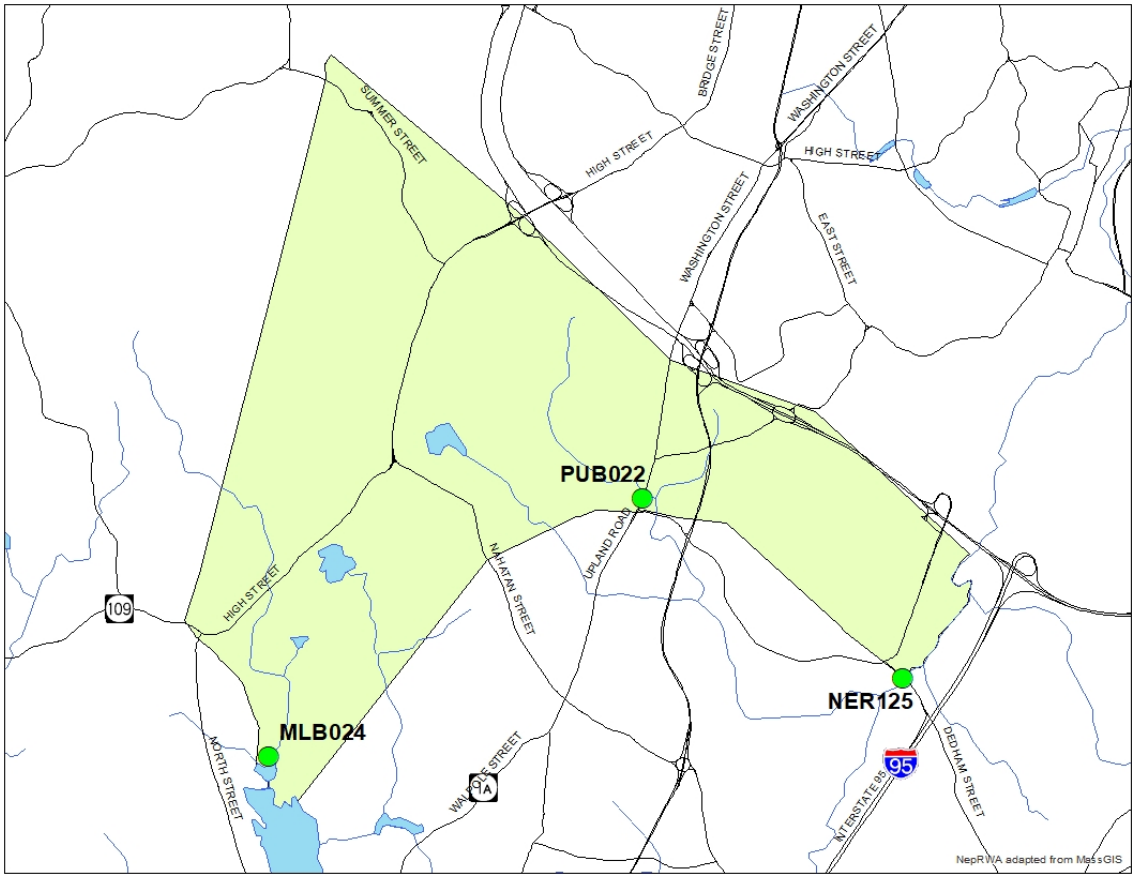

Figure 1: CWMN sampling sites within Westwood, MA

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 (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.

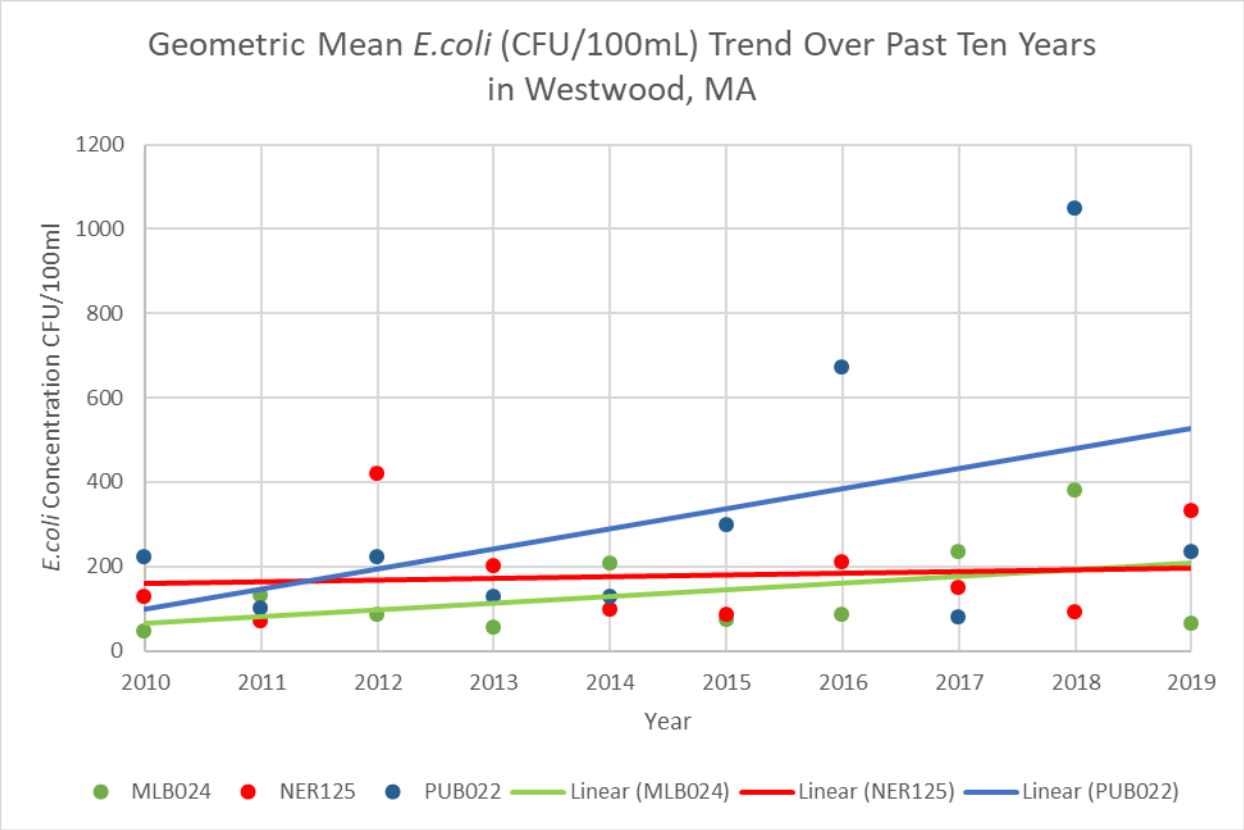

Figure 2: This Chart depicts the ten-year trend of *E.coli* Geometric means of at least five samples in Westwood, Massachusetts.

E.coli levels were better in 2019 than they were in 2018. Mill Brook met the primary contact standard in 2019, while Purgatory Brook and the Neponset River at Dedham Street only met the secondary contact standard. However, Purgatory Brook and Mill Brook were much improved over last year. The trend line in Figure 2 suggests that *E.coli* concentrations in Purgatory Brook have increased over the past 10 years. However, the slope of the trend line appears to be driven by two exceptionally bad years in 2016 and 2018. Most years appear to center around 200 CFU/100ml.

E.coli concentrations in Purgatory Brook were much lower than last year, meeting the secondary contact standard in 2019. There is a lot of year-to-year variability in E.coli levels in Purgatory Brook. One possible explanation is the strong influence of stormwater runoff on the brook's water quality. Table 3 shows the correlation of wet weather and *E.coli* levels in Purgatory Brook in 2019.

Over the past decade, Mill Brook has met boatable standards every year, and has met swimmable standards all but 4 years. E.coli concentrations have remained relatively constant over the past decade. The slight positive slope appears to be driven by the abnormally high concentrations in 2018. *E.coli* concentrations returned to swimmable in 2019.

Finally, *E.coli* concentrations have remained somewhat constant in the Neponset mainstem at Dedham St. over the past decade. Unfortunately, *E.coli* concentrations were higher than usual in 2019. Table 1 suggests that E.coli values in 2019 are about twice the 10 year average for that site.

Table 1: Geometric mean of *E.coli* concentrations (MPN/100mL) for at least five samples 2019 vs previous 9-year average

Site ID	Average Geometric Mean of *E.coli* (CFU/100mL) 2010-2018	Geometric mean of *E.coli* concentrations (CFU/100mL) 2019
MLB024	144	63
NER125	16	332
PUB022	322	234

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 be 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.

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 2019, NER125 and PUB022 had *E.coli* concentrations that were higher than the 10-year average (see Table 1).

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

Weather	Total Number of Samples 2019	Geometric Mean *E.coli* Conc. (cfu/100ml)
MLB024		
Dry	2	187
Wet	4	272
NER125		
Dry	2	259
Wet	4	542
PUB022		
Dry	2	388

Wet	3	1066

Phosphorus

Phosphorus is often the limiting nutrient in freshwater aquatic ecosystems, meaning that the amount 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 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. 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 standard states 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, including 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 Westwood 2019

Site ID	Dry Weather (mg/L)	Wet Weather (mg/L)	Combined (mg/L)
MLB024	0.05957	0.06151	0.06087
NER125	0.06413	0.05262	0.05645
PUB022	0.08089	0.09711	0.09062

The data in table 3 suggest that phosphorus was an issue at all sites in Westwood in 2019. Phosphorus was particularly an issue at Purgatory Brook. Recent construction and riparian clearing at 427 Washington Street may have contributed to the high phosphorus concentrations. Concentrations at NER125 were higher during dry weather, suggesting that internal loading of phosphorus or faulty septic systems may be the dominant 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 available for plants to utilize. The state of Massachusetts determined that the healthy range of pH is 6.5-8.3.

Table 4: Summary of pH values in Westwood 2019

Site ID	Max pH	Min pH	Average pH
MLB024	7.54	6.69	7.23
NER125	7.7	6.9	7.16
PUB022	7.53	6.72	7.09

The data in table 4 suggest that pH was consistently within a healthy range in 2019. 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 2019

Table 5: Summary dissolved oxygen concentrations in Westwood 2019

Site ID	Max DO	Min DO	Dissolved Oxygen (mg/L)
MLB024	9.68	6.21	8.02
NER125	6	3.64	4.94
PUB022	9.27	7.87	8.51

Dissolved oxygen levels were excellent in Mill Brook and Purgatory Brook in 2019 but were less than ideal in the Neponset River. Dissolved oxygen was below 5 mg/L in June, July and October of 2019. 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 there are several impoundments upstream in Walpole that may be heating the water before it reaches Westwood. 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 collected, the main water quality issues faced by the Town of Westwood are *E.coli* contamination and phosphorus. It appears that 2018 was an anomaly. E.coli and phophorus were lower in 2019, however they are still not able the swimming standard in the Neponset River and in Purgatory Brook.

Dissolved oxygen remains a concern in the Neponset River. More work needs to be done upstream to improve flow and oxygenation in the Neponset River. 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, and dam removal.

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 the town's waterbodies.