

Upper Otter Creek Watershed Council (UOCWC)
Summer 2019

Water Quality Monitoring Program



Moon Brook at White's Park

Report prepared by Nanci McGuire
with assistance from Rose O'Brien, Hillary Solomon and Sadie Brown

Introduction

Monitoring stream water quality is imperative to understanding natural conditions that support aquatic habitat, and food for many plants and animals. Even small streams can attenuate floodwater from heavy rainfall. Some streams provide drinking water, and many contribute to recreational and commercial uses farther downstream. There are many factors that contribute to the quality of a stream. The factors analyzed in this study is for total phosphorus in multiple areas of four streams in Rutland County that either comprise or contribute to the Otter Creek.

Phosphorus is the essential nutrient for plant life and produced naturally from decaying plants and animals, and as mineralized compounds in soil, rocks, and sediment. When phosphorus gets to excessive levels, usually due to fertilizer runoff, manure, and runoff from other organic waste like sewage, it encourages eutrophication and algae growth. As the limiting nutrient in fresh waters, excessive nutrient enrichment can upset the balance of production vs. consumption in the ecosystem if nutrient loading exceeds the assimilative capacity of that system. This can affect aquatic life in a waterbody if the excessive nutrients and biological oxygen demand creates anaerobic conditions. In addition, ingestion of water with high levels of phosphorus can lead to digestive problems in humans. Phosphorus is measured in units of micrograms of phosphorus per liter. The criterion for phosphorus in streams in Vermont is dependent on their size, gradient, and water temperature. Rivers in this study have phosphorus standards ranging from 15-27 micrograms per liter (2016 VT Water Quality Standards, pp 27-36)

Method

Samples were collected biweekly from the following twelve locations on seven dates throughout the summer every other Tuesday morning from June 4th to August 27th.

Table 1: Sample names and locations

Site #	Description
tenn1.0	Tenney Brook – (Rutland City) - Lincoln Avenue (Rotary Park)
tenn0.8	Tenney Brook – Rutland City) – Baxter St. at Confluence with East Creek
east0.2	East Creek – (Rutland City) - Off of Meadow St. at recreation area
east 2.1	East Creek – (Rutland City) – At Giorgetti Park
moon0.3	Moon Brook – (Rutland City) – At Forest Street Bridge
moon0.9	Moon Brook (Rutland City) – At Porter Place - Above Porter Street Bridge to Howe Center
moon1.5	Moon Brook – (Rutland City) - At White’s Playground
mussey0.1	Mussey Brook – (Rutland City) – At Park Street Bridge
mussey0.8	Mussey Brook – (Rutland City) – At Mussey Street Bridge near VT Sport & Fitness
east10	East Creek – (Pittsford) - Just downstream of Sangamon Road, below hydro bypass tributary
east13	East Creek – (Chittenden) - Just below Chittenden dam, where flume crosses the road
Tenn12	Tenney Brook – (Rutland City) – Behind Seward’s Restaurant

Figure 1: Locations of sampling sites

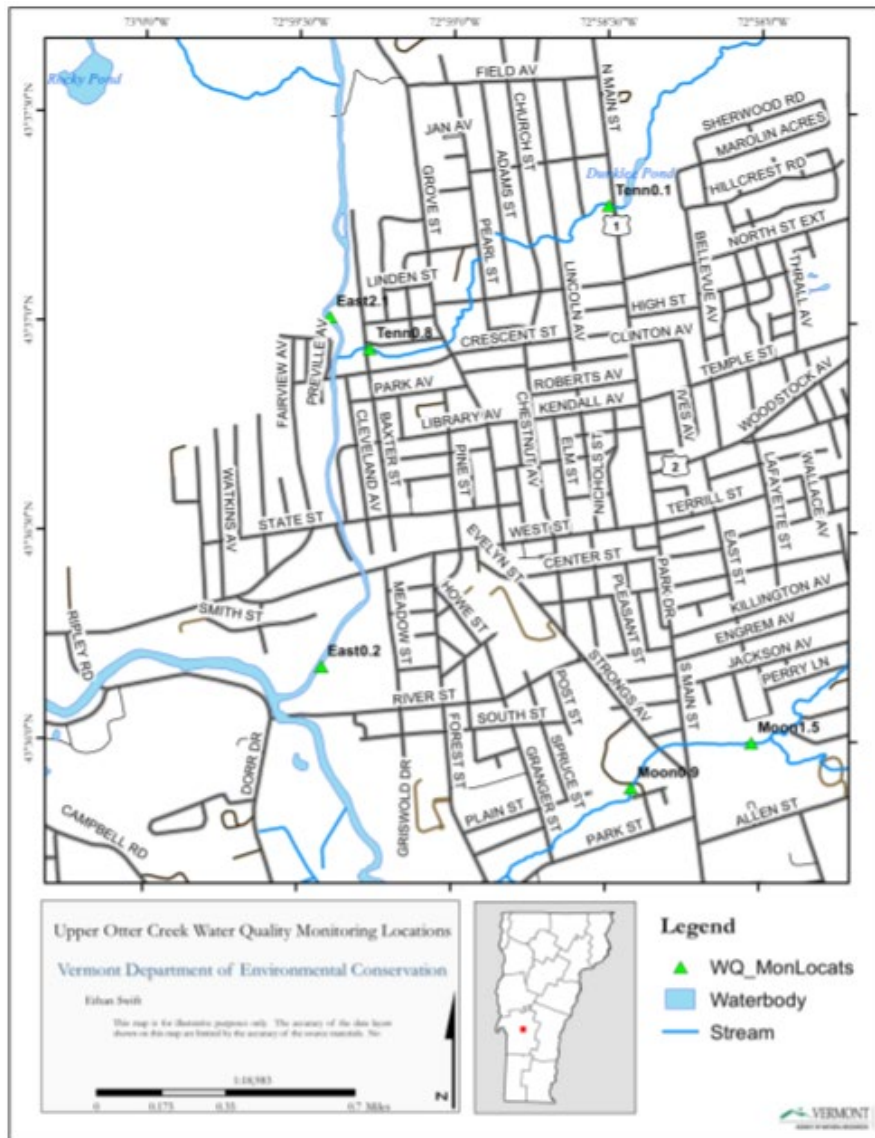
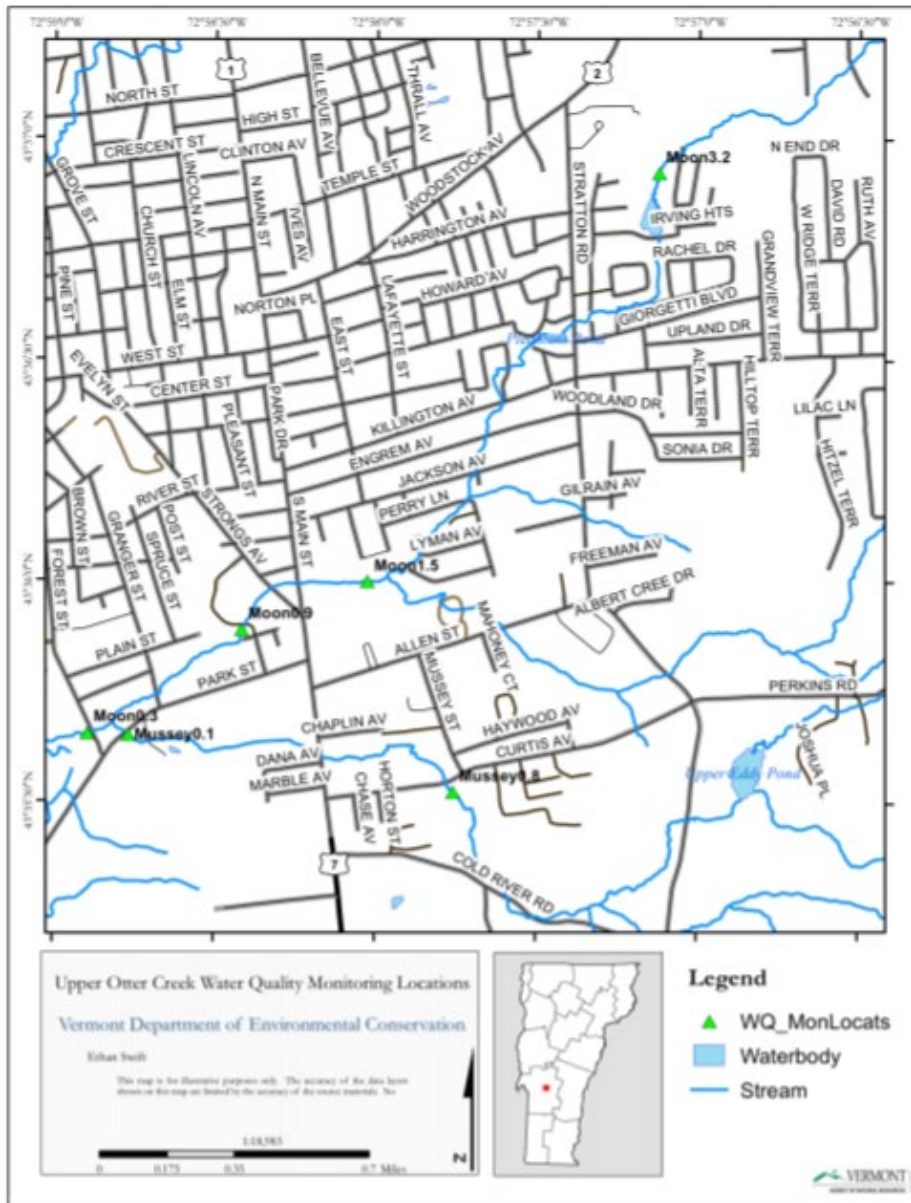


Figure 2: Location of sampling sites



Map source: Ethan Swift, VT DEC

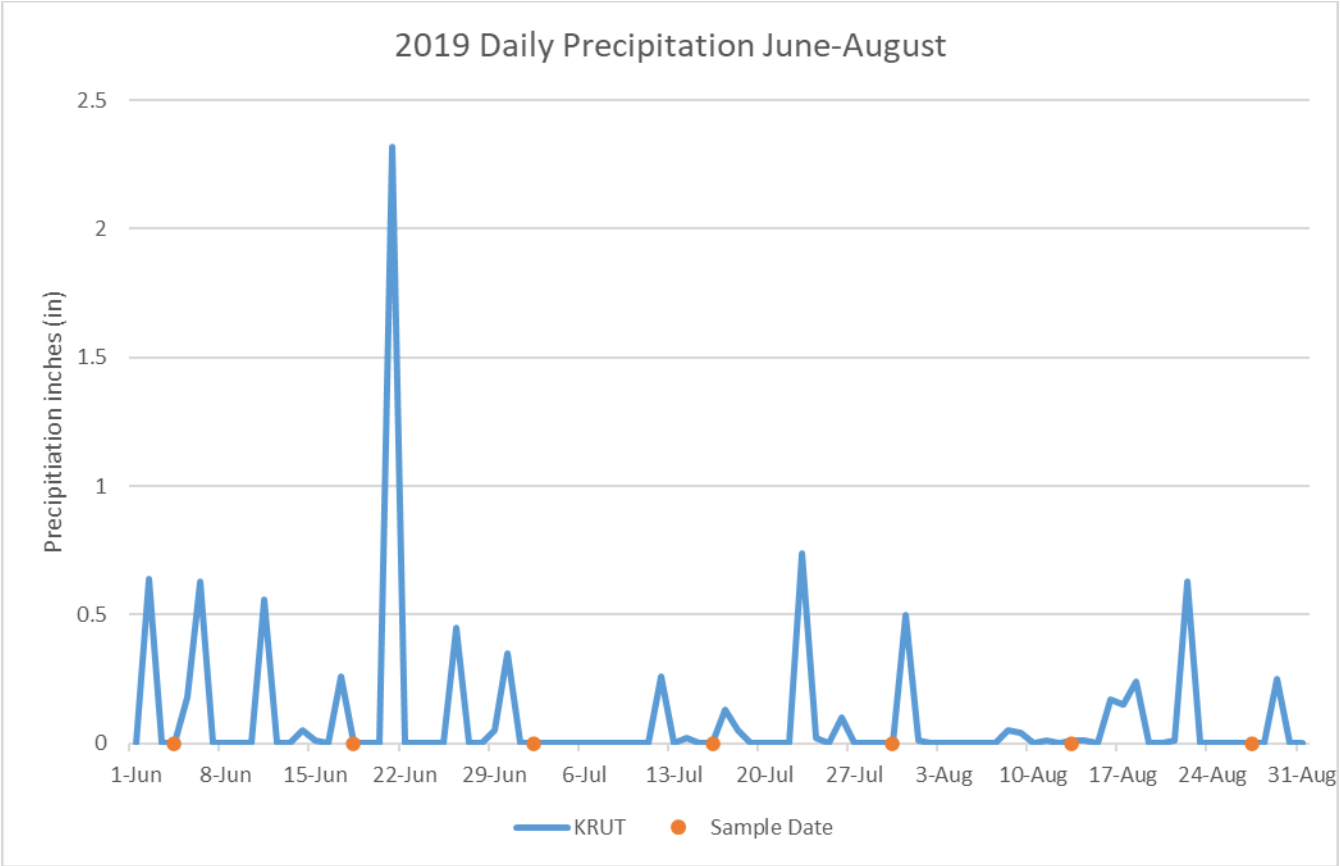


Figure 3. Precipitation data in inches of rainfall per day for the summer of 2019 from Rutland gage (weather underground).

Results:

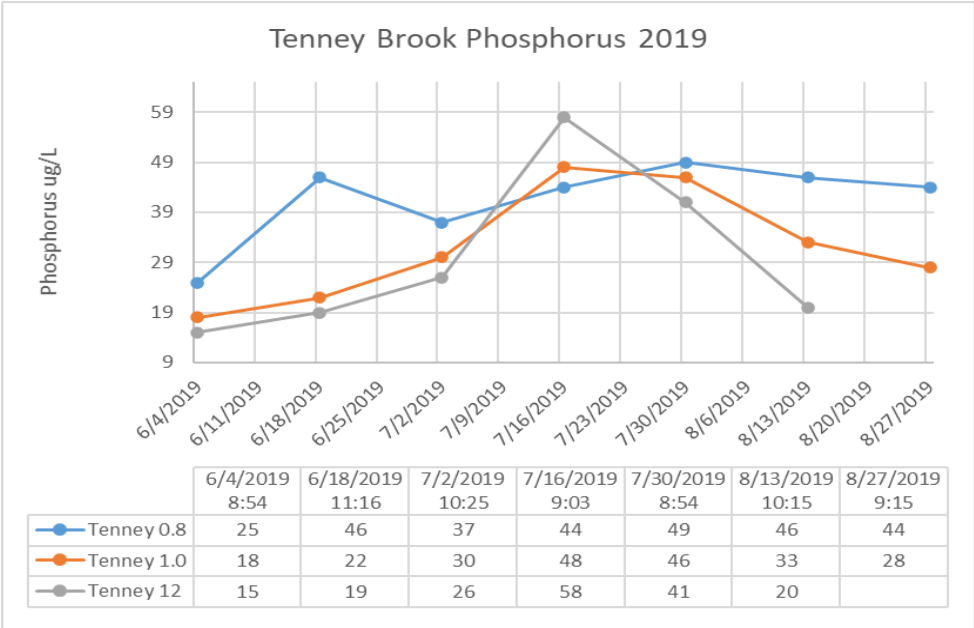


Figure 4. Graph depicting the total phosphorus measured in Tenney Brook.

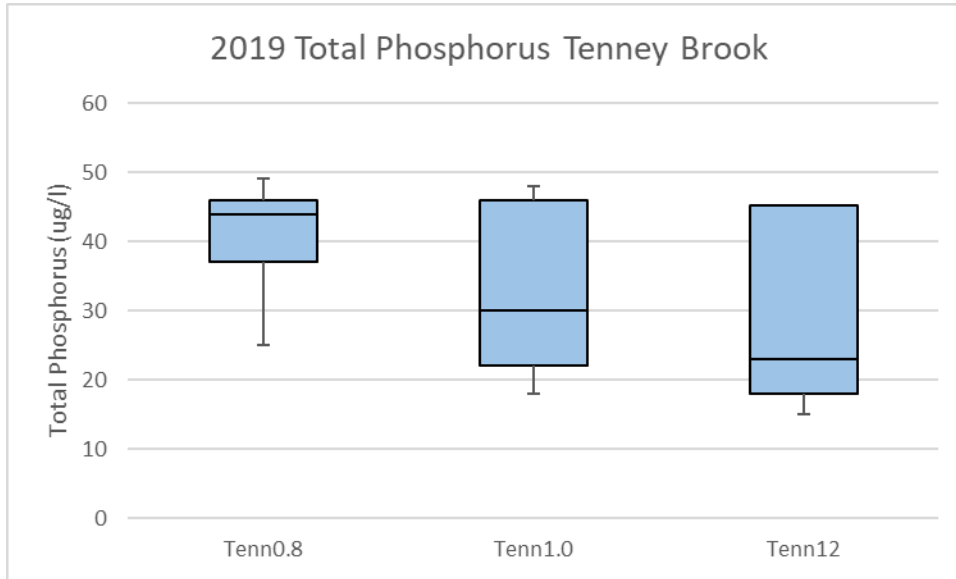


Figure 5. Graph depicting distribution of total phosphorus levels recorded in Tenney Brook.

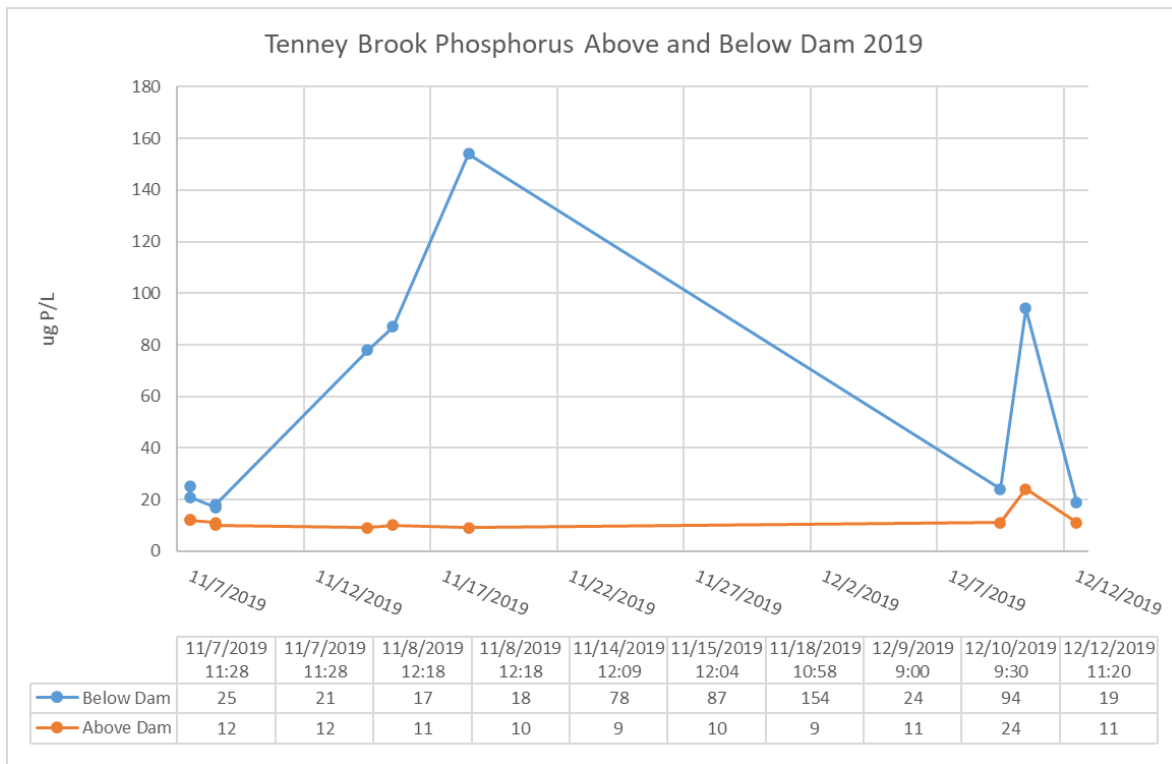


Figure 6. Graph depicting total phosphorus below and above dam on Tenney Brook.

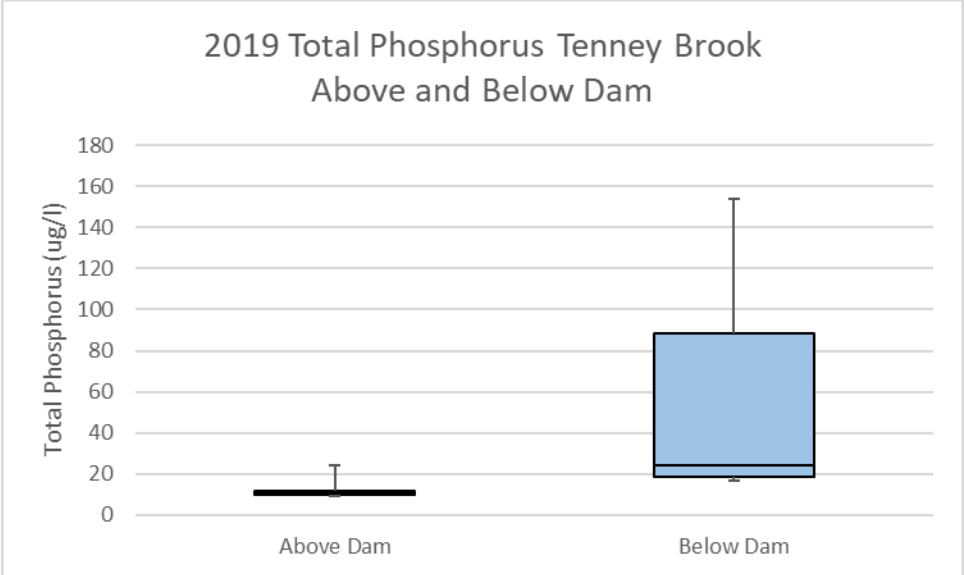


Figure 7. Graph depicting distribution of total phosphorus recorded the dam site on Tenney Brook.

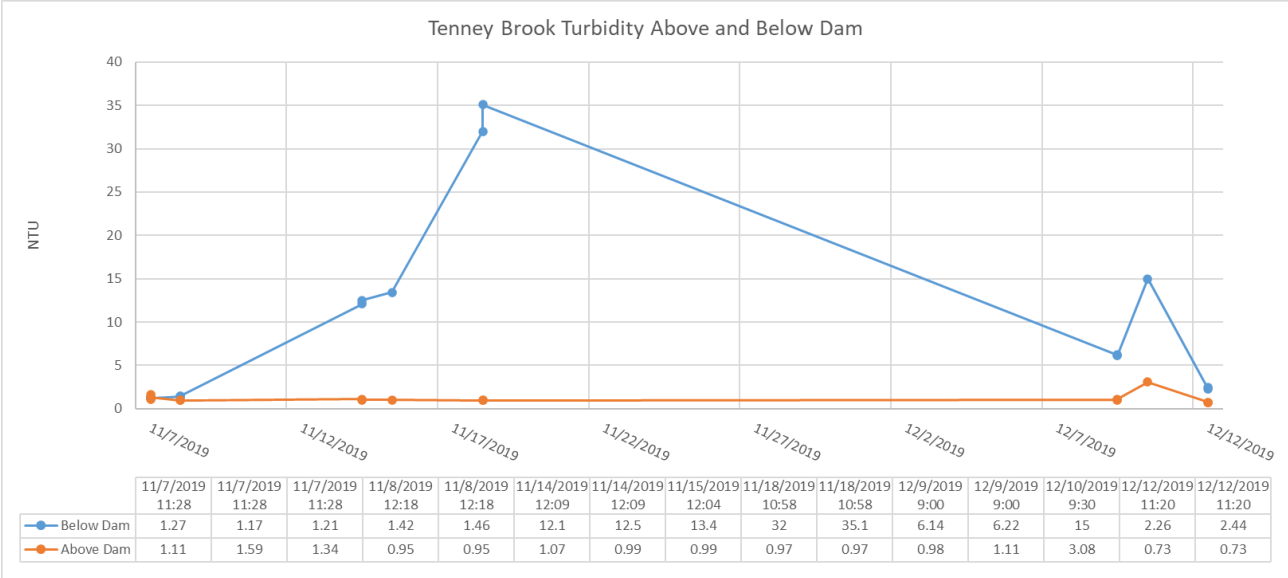


Figure 8. Graph depicting the turbidity levels at the dam site in Tenney Brook.

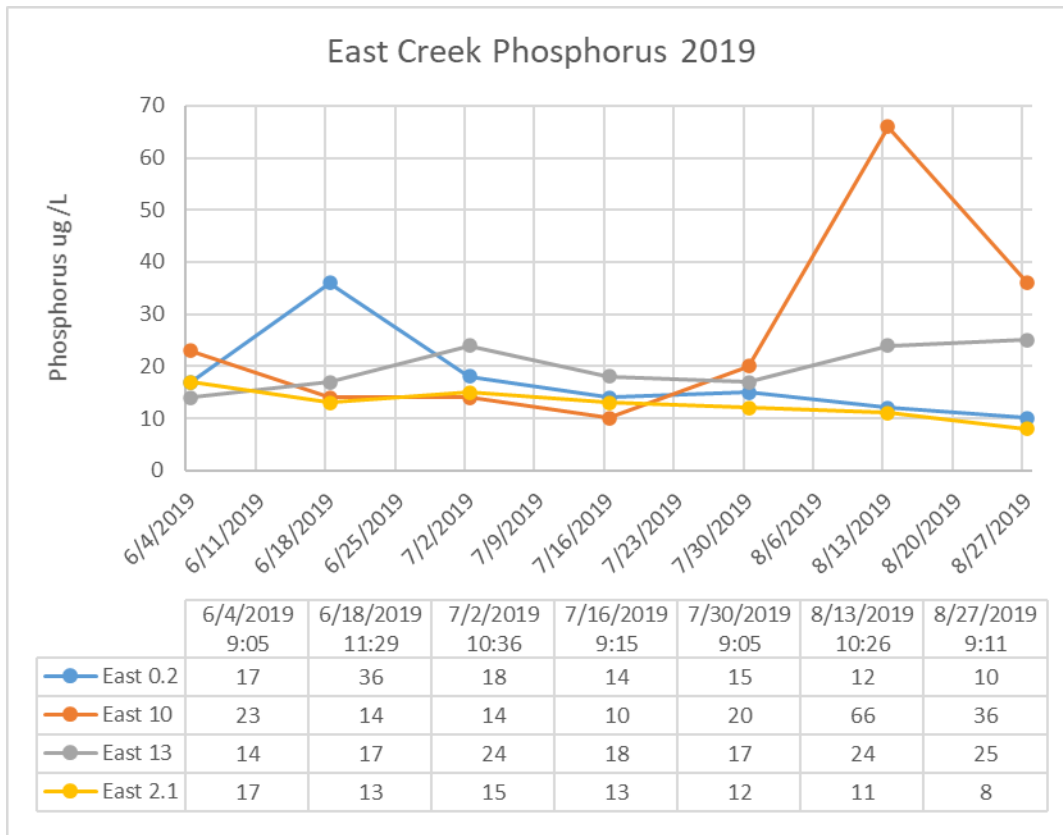


Figure 9. Graph depicting the phosphorus levels measured at East Creek.

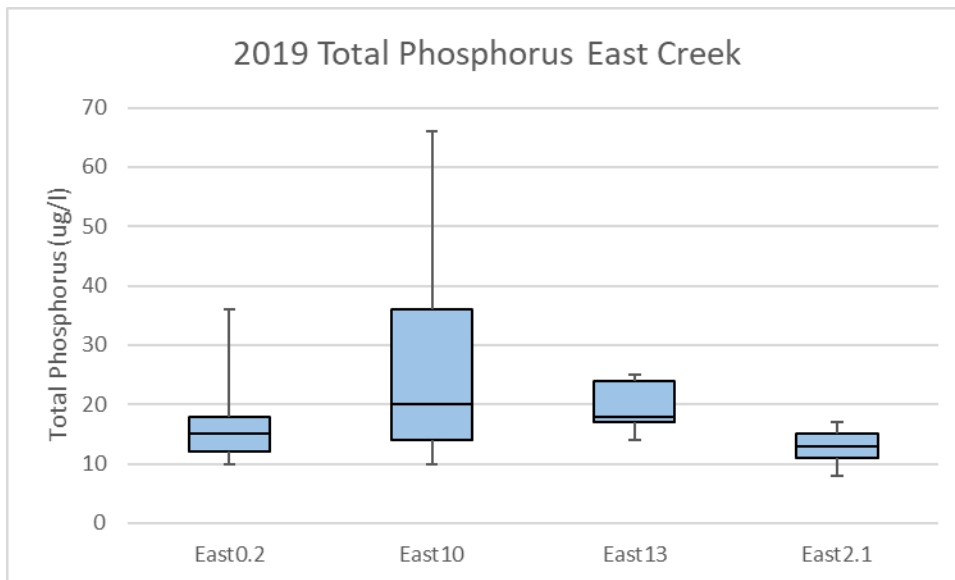


Figure 10. Graph depicting the distribution of phosphorus recorded at East Creek.

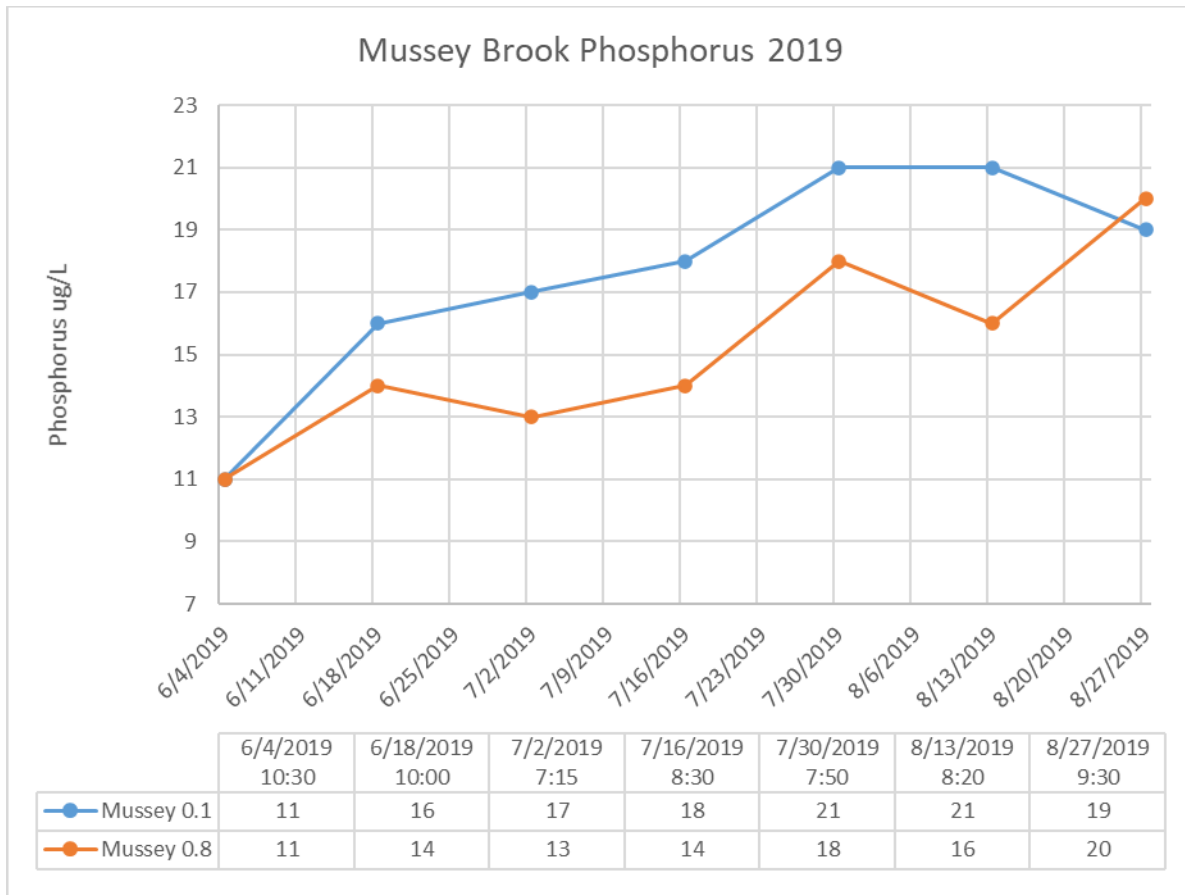


Figure 11. Graph depicting the phosphorus recorded at Mussey Brook.

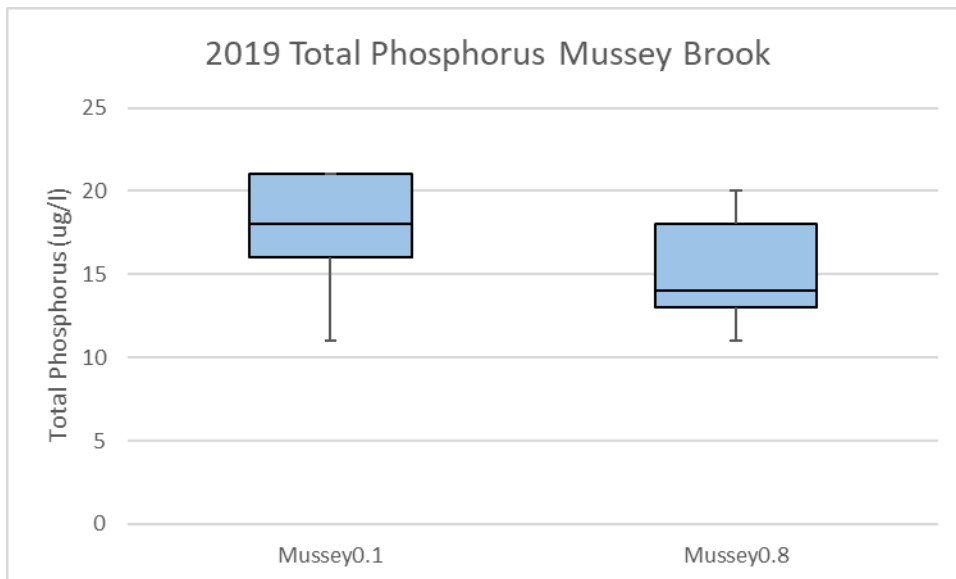


Figure 12. Graph depicting the distribution of phosphorus levels recorded at Mussey Brook.

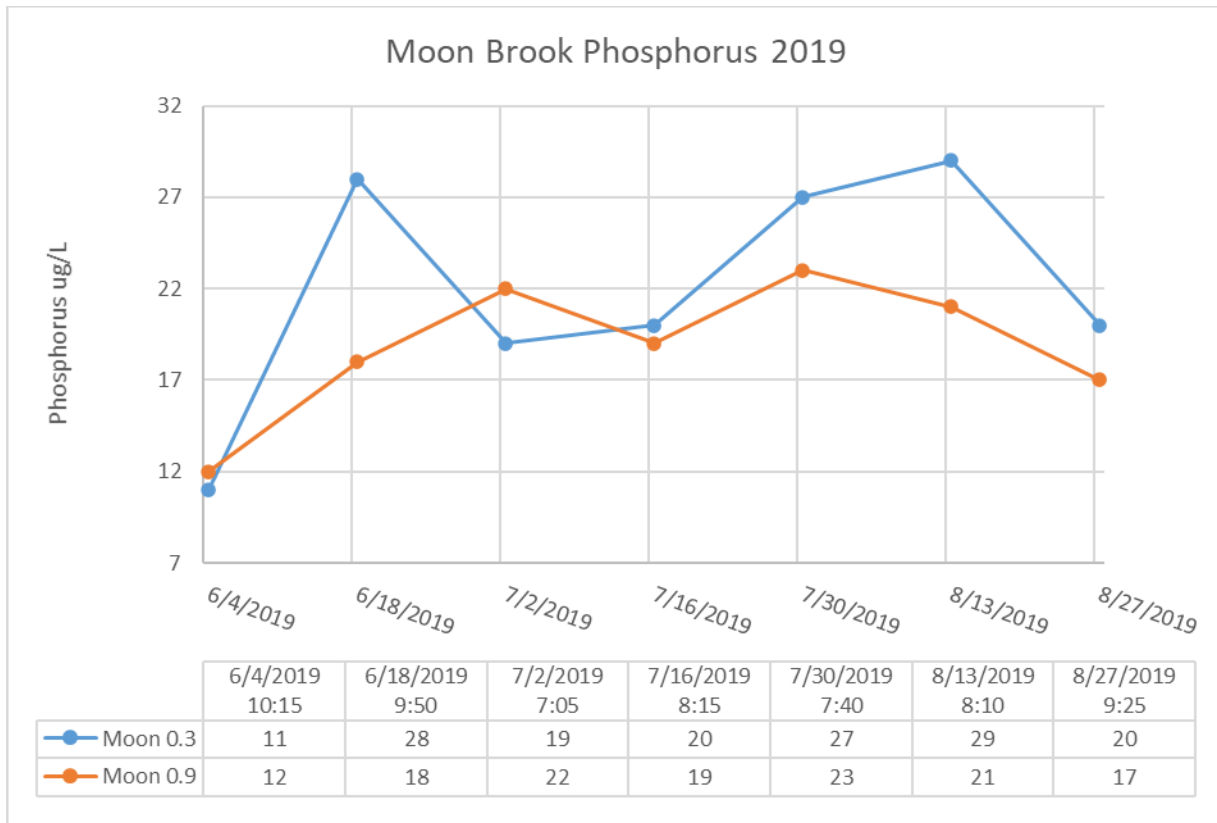


Figure 13. Graph depicting the phosphorus measured at Moon Brook.

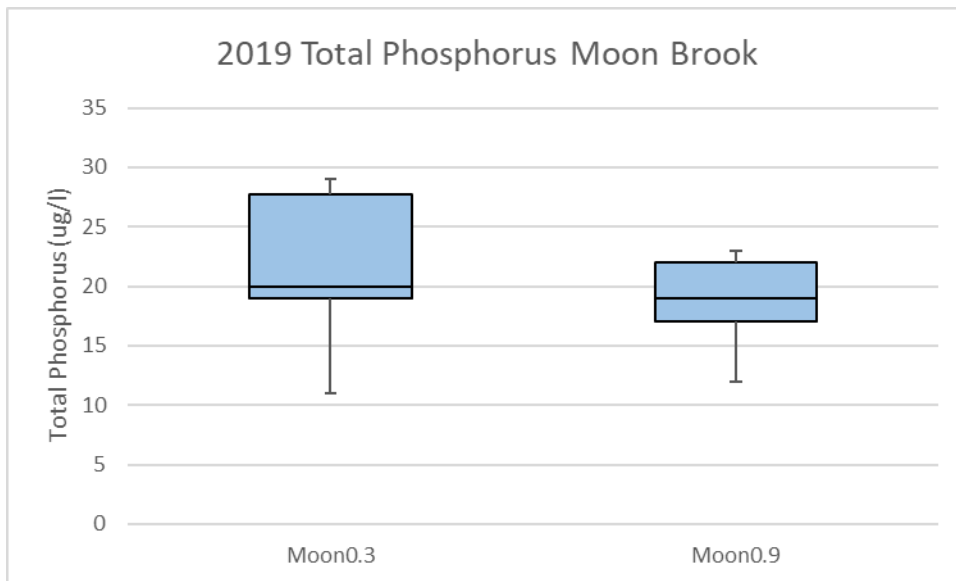


Figure 14. Graph of the distribution of phosphorus recorded at Moon Brook.

Analysis:

The data for Tenney Brook is summarized in Figures 4 and 5. The maximum occurred on 7/16/19 for Tenney1.0 (48ug/l) and Tenney12 (58ug/l), while the maximum value for Tenney0.8 (49ug/l) occurred on 7/30/19. The maximum levels of phosphorus analyzed occurred on days with low flow and with a

water temperature between 66°F and 70°F. The level of total phosphorus shows an increasing trend at the downstream sites.

Additional data was gathered outside of the seven summer sample dates on a dam located on Tenney Brook. These samples were collected from 11/7-12/12/19 from locations both below and above the dam structure. The two sample sites show a significant difference between total phosphorus measured in the water with the below dam site testing much higher. The rise and peaks of TP concentrations correspond to days with precipitation. On 12/10/19 there was a recorded .58 inches of precipitation which is the date of the maximum phosphorus concentrations recorded for the above dam site and one of the peaks of the below dam site. The other precipitation events during sampling occurred on 11/14/19 which corresponds to when the below dam site begins to increase in TP levels. While the maximum level recorded for the below dam site occurred a few days after this precipitation event, it is likely connected to it due to the low temperatures and the possibility of ice release. The Turbidity level followed the same trend as the phosphorus, the below dam site consistently testing higher, with a max of 35.1 NTU below dam.

There were four sites sampled on East Creek throughout the 2019 season, the data is summarized in Figures 9 and 10. The maximum phosphorus concentration recorded for the East 0.2 site was 36ug/l and occurred on 6/18/19 with a corresponding water temperature of 59°. The maximum value for the East10 site was 66 ug/l and occurred on 8/16/19 on a medium flow day. The maximum for East13 was 25 ug/l and for East2.1 was 17 ug/l, both of which occurred on a low flow day with a water temperature of 53°. Of the four sample sites, East10 had the widest range in Total Phosphorus measured as well as the highest median point.

Both sites on Mussey Brook showed an increasing trend of Phosphorus as the sampling season progressed, this is shown in Figures 11 and 12. Of the two sites, Mussey0.1 was consistently higher than Mussey0.8, which is common when comparing downstream to upstream sites. The upstream site showed two peaks at sample dates 6/18 (18 ug/l) and 7/30/19 (20 ug/l), however, they are within the increasing trend and fall along the first and third quartile as compared to the downstream site (Mussey0.1).

Two sites were sampled on Moon Brook as shown in Figures 13 and 14. While Moon0.3 had a higher reading of TP than Moon0.9 on five of the seven sample days, most of the samples are within the same range. Moon0.3 is downstream of Moon0.9 as well as just below the confluence with Mussey Brook thus contributing to the fluctuation of data. The maximum for Moon0.3 occurred on a low flow day, 8/13, with water temperatures recorded at 67°. The maximum at Moon0.9 occurred on 7/30 and was recorded as having low flow and a water temperature of 70°.

Conclusion:

The majority of the sites showed an increasing trend of TP concentration from upstream to downstream within each waterbody. This is common to see for these types of streams especially when paired with increasing development as well as stream size.

When looking at the summer sample sites, East creek experienced both the highest phosphorus level of 60ug/l recorded at East10, as well as the location with the most consistent low phosphorus concentrations (East2.1). The sample location on Tenney Brook above the dam was another consistently low phosphorus site. With the exception of East2.1 and East0.2, all of the maximum and

higher recordings were sampled towards the end of the season. These samples were coupled with med-low flow events and warmer air and water temperatures.

During the additional fall sampling of the dam on Tenney Brook a high recording of 154ug/l occurred at the below dam site on 11/18. While the maximum level recorded for the below dam site occurred a few days after the recorded precipitation event, it is likely still connected due to the low temperatures and the possibility of ice/sediment release from the bank. The connection between the phosphorus recorded and the turbidity level suggests this sediment release as well.