

Introduction

- This study compared the levels of *E. coli*, Total Suspended Solids (TSS), and Total Phosphorus in Potash Brook, Bartlett Brook, and Munroe Brook to estimate the load of pollutants entering Shelburne Bay.
- Shelburne Bay is mesotrophic, meaning that it is currently meeting the phosphorus load standards and that the phosphorus concentration in the bay is neither improving nor deteriorating (Lake Champlain Basin Program, 2008).
- The target load of phosphorus for Shelburne Bay is 14 micrograms per liter (Lake Champlain Basin Program, 2008).
- The Vermont Water Quality Standards for *E. coli* are 77 *E. coli* per 1000 mL of water (Vermont Department of Environmental Conservation, 2008).
- Fecal coliforms such as *E. coli* are important indicators of pollution and potential health risks in stream water. High levels of *E. coli* and coliform in stream water often correlate with high levels of suspended solids (Schillinger, et. al, 1985).
- Bartlett brook has the smallest watershed (413.78 acres), while Potash (3761.16 acres) and Munroe brook (3302.54 acres) are much larger and closer in size.

Methods

- Sample Sites were selected based on their proximity to Shelburne bay and the nearest USGS monitoring station
- Flow and gage data were collected from the USGS station located at the site.
- Habitat and site assessments were conducted during the first site visit to assess the quality of the stream and the surrounding environment. This assessment took factors into account such as the riparian zone, rocks and gravel, and stream channelization.
- Samples were taken once a week for six weeks, or more frequently if a storm event occurred.
- Three sample replicates of TSS, total phosphorus, and *E. coli* samples were taken at each site visit.
- A blank replicate of the *E. coli* and phosphorus samples were also taken to ensure water quality control and proper sampling technique.
- A total of twenty one TSS samples, twenty one *E. coli* samples, and twenty one total phosphorus samples were analyzed from each site
- Data were analyzed using Analysis of Variance (ANOVA) and *t*-tests to detect significant differences between the samples at each site.

Acknowledgments

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Abstract

The purpose of this study was to compare the water quality of three streams draining to Shelburne Bay: Potash Brook, Munroe Brook, and Bartlett Brook. These streams have similar land uses but vary in channel size, discharge, and watershed size. Water samples were collected at the sites over six weeks and analyzed for *E. coli*, suspended sediments, and phosphorus. There was no significant difference determined between the concentrations of these constituents in the three streams. However, water flow data indicates that Potash Brook discharges more water than Munroe Brook and Bartlett brook, and therefore it brings the greatest load of *E. coli*, suspended sediment, and total phosphorus to Shelburne Bay.

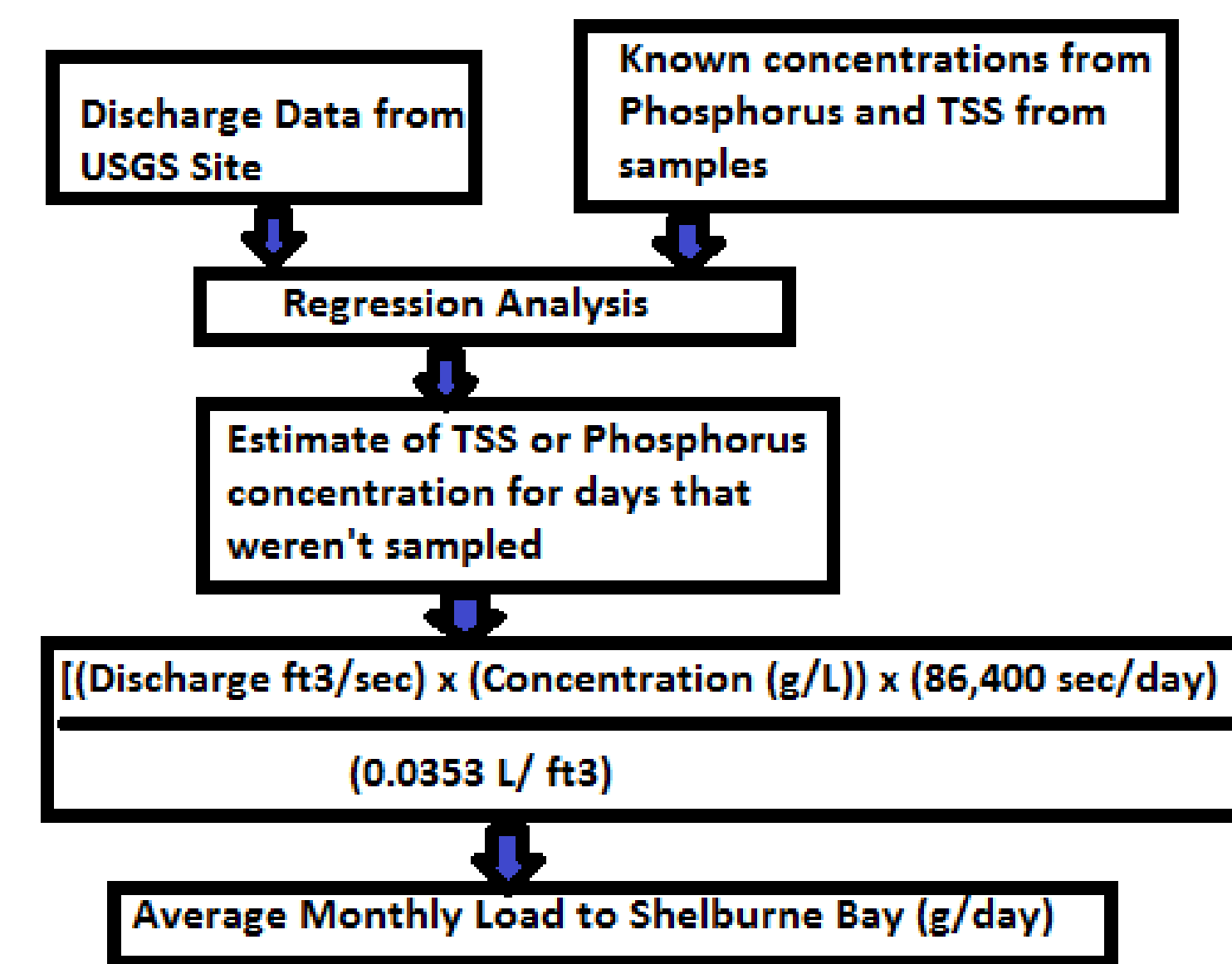


Figure 1: How the Average Load to Shelburne Bay is Calculated. Discharge data from the USGS station at each site was collected from the online database. Using the samples collected and the discharge data from the time of sampling, a load could be estimated for dates that were not sampled to create an estimation of the monthly load to Shelburne Bay.

Table 1: A Summary of Watershed Size, Average Daily flow, and Average Monthly Load of Phosphorus and Suspended Sediment from Potash, Bartlett, and Munroe Brooks. Potash brook has the largest watershed area and carries the largest load of phosphorus and suspended sediment. Bartlett Brook has the smallest watershed and loads less phosphorus and sediment to Shelburne Bay.

Stream Site	Watershed Area (Acres)	Average Daily Flow (ft ³ /sec)	Average Load of Phosphorus During Summer Season (g/month)	Average Load of TSS During Summer Season (g/month)
Potash	3761.2	18.2	1981.0	334284.5
Bartlett	413.8	0.7	95.5	13543.9
Munroe	3302.5	2.9	484.1	17622.0

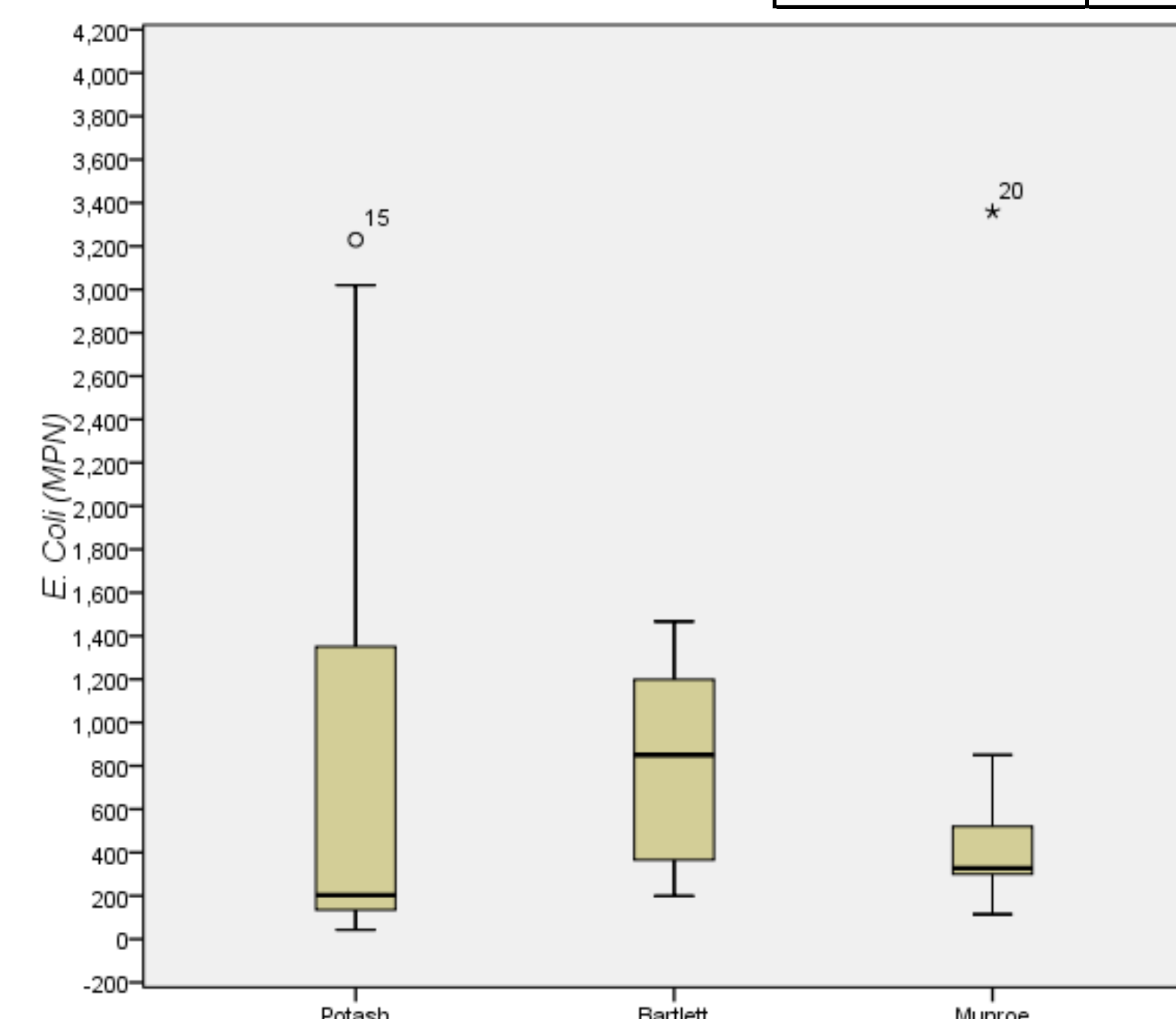


Figure 3: Distribution of *E. coli* in Bartlett, Munroe, and Potash Brooks. There was no significant difference between the concentrations of *E. coli* in these three streams (F value =1.74; F crit value =3.18).

Results

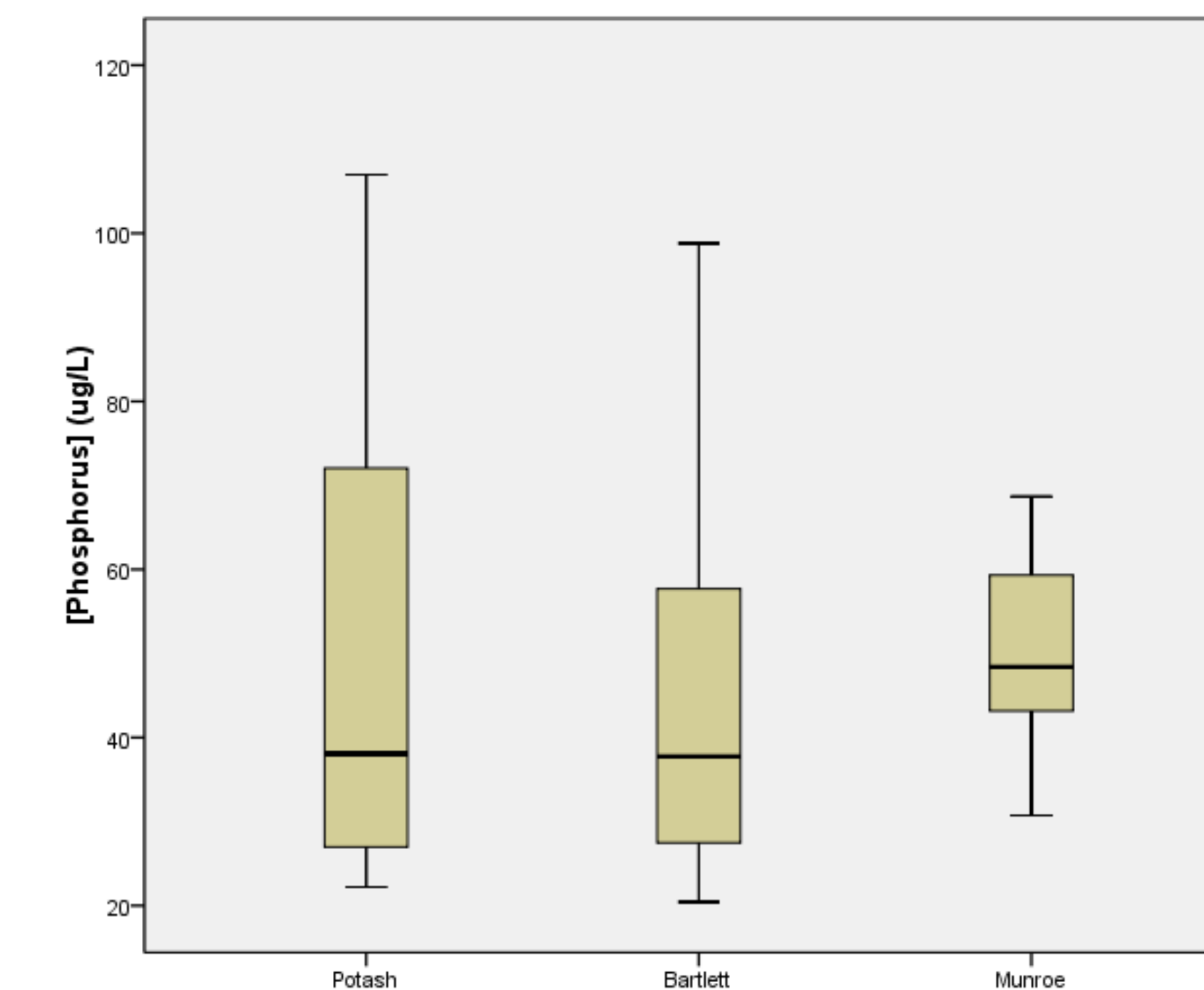


Figure 2: Distribution of the Concentration of Phosphorus in Potash, Bartlett, and Munroe Brooks. There was no significant difference between the phosphorus concentrations in the three streams (F value =0.144; F crit value= 3.55).

Figure 4: Distribution of Suspended Solids in Bartlett, Munroe, and Potash Brooks. There was no significant difference between the amount of suspended sediments in these three streams (F value = 1.00; F crit value = 3.16).

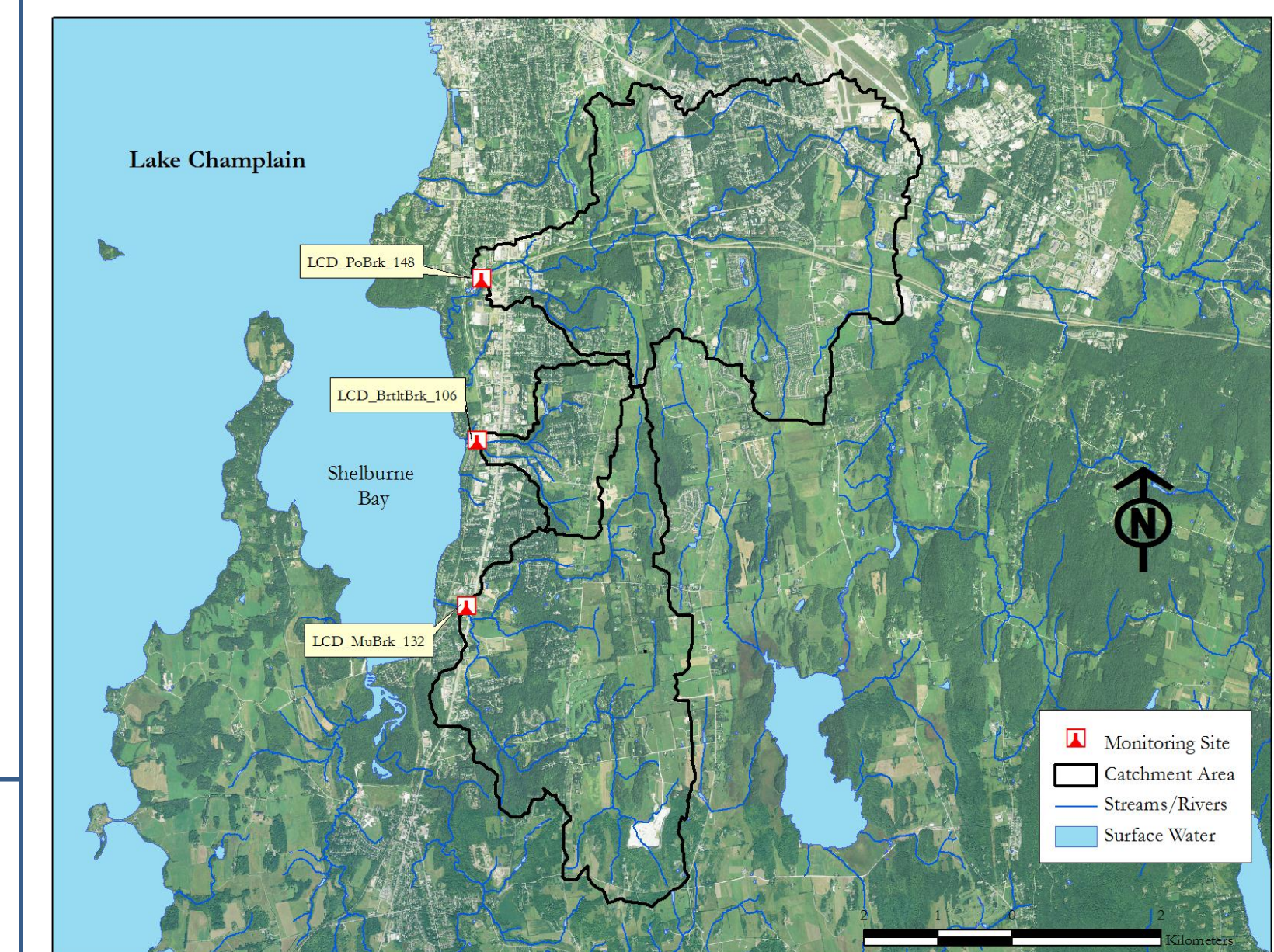


Figure 5: Map of Shelburne Bay and Sampling Sites. The sampling sites were chosen based on proximity to Shelburne Bay, accessibility, and location of the nearest USGS monitoring station.

Discussion

- Storms and rain showers increased the concentration of *E. coli*, suspended sediment, and total phosphorus in the streams. These data created outliers in the dataset.
- Though the average concentrations of *E. coli*, total phosphorus, and suspended sediment are not significantly different from each other, Potash brook has the greatest discharge. Therefore it loads the most *E. coli*, suspended sediment, and phosphorus to Shelburne Bay.
- Despite having a much smaller watershed, the concentrations of TSS and total phosphorus in Bartlett Brook is not significantly different from the two larger watersheds, which may indicate a need for best management practices (BMPs) to improve water quality.
- The Munroe Brook watershed is similar in size to the Potash Brook watershed, yet loads 76% less phosphorus and 95% less suspended sediment than Potash Brook.

Works Cited

- Lake Champlain Basin Program. "State of the Lake and Ecosystem Indicators Report." Lake Champlain Basin Program: Grand Isle, Vermont. 2008.
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