Summary Report: 2019 Water Quality Sampling Results
South Chittenden River Watch

29 January 2020
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This report has been prepared by Kate Kelly of Lewis Creek Association using a template, partial text, and map provided by Kristen Underwood of South Mountain Research & Consulting, and in collaboration with the Addison County River Watch Collaborative.

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and

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1.0 Introduction

This report provides a summary of the 2019 monitoring results for the South Chittenden River Watch (SCRW) stations. Sampling in 2019 targeted both high-flow conditions and low-flow conditions, although select stations were also monitored during low-flow conditions to bracket wastewater treatment facilities (WWTF) in Hinesburg and Shelburne.

Sampling was carried out by a network of volunteers, operating under an EPA-approved Quality Assurance Project Plan. Analytical services were provided by the Vermont Agricultural & Environmental Laboratory in Randolph, VT, through an analytical services partnership grant. A quality assurance review of data was performed by SCRW Sampling Coordinator, Kate Kelly. This summary report has been prepared by Kate Kelly, with technical editing by Kristen Underwood of South Mountain Research & Consulting supported by grant funding from Watersheds United Vermont.

2.0 Background

The SCRW has been monitoring water quality (including sediment, phosphorus, nitrates, and *E. coli*) in four watersheds in southern Chittenden County (Figure 1) for several years, with the earliest monitoring efforts beginning in 2004 on the LaPlatte River.

- LaPlatte River (53 mi^2)
- McCabe's Brook (tributary of LaPlatte River, 6.2 mi^2)
- Thorp Brook (4.6 mi^2)
- Kimball Brook (2.9 mi^2)

In Figure 1, highlighted segments of the LaPlatte River main stem (downstream of Hinesburg) and Mud Hollow Brook are listed as impaired for contact recreation uses due to impacts from agricultural runoff and streambank erosion (VT DEC, 2018). Additionally, the lower 1.4 miles of McCabe's Brook is impaired for aquatic life support due to nutrients (VT DEC, 2018). Finally, Patrick Brook from Lower Pond to its confluence with the LaPlatte, and the lower 1.1 miles of Kimball Brook are each listed as stressed waters with impacts to aquatic health, aesthetics and secondary contact recreation uses resulting from development, channelization and agricultural land uses (VT DEC, 2016).

Since baseline data now exist for much of these four watersheds during low to moderate flow conditions, the goal during the 2019 season was to sample water quality during three high flow events, as a means of estimating the relative contributions of sediment and nutrients to Lake Champlain in the context of the Lake Champlain Total Maximum Daily Load (TMDL) for phosphorus, and during three low flow events to compare to the Vermont Water Quality Standards. High-flow sampling has occurred since 2014. Additional stations were established in 2016 on Thorp and Kimball Brooks to bracket potential hot spots of sediment and nutrients, and to better understand baseline conditions. Four sentinel study sites were monitored in McCabe's Brook, and three sentinel stations were monitored in LaPlatte River (Figure 1). In 2019, two stations on the lower LaPlatte River (LP1 and LP02) were added to better understand conditions in the lower watershed. In addition, a station was added above the village of Hinesburg (LP10) to bracket the village as it undergoes significant development in future years. A station was added to a tributary to the LaPlatte (LP13)

to understand this tributary's contribution to nutrient loading. Finally, nine stations were added along Patrick Brook and its tributaries in Hinesburg, to understand the contribution of these areas to nutrient loading, and to find hotspots for potential remediation (Figure 1 inset).

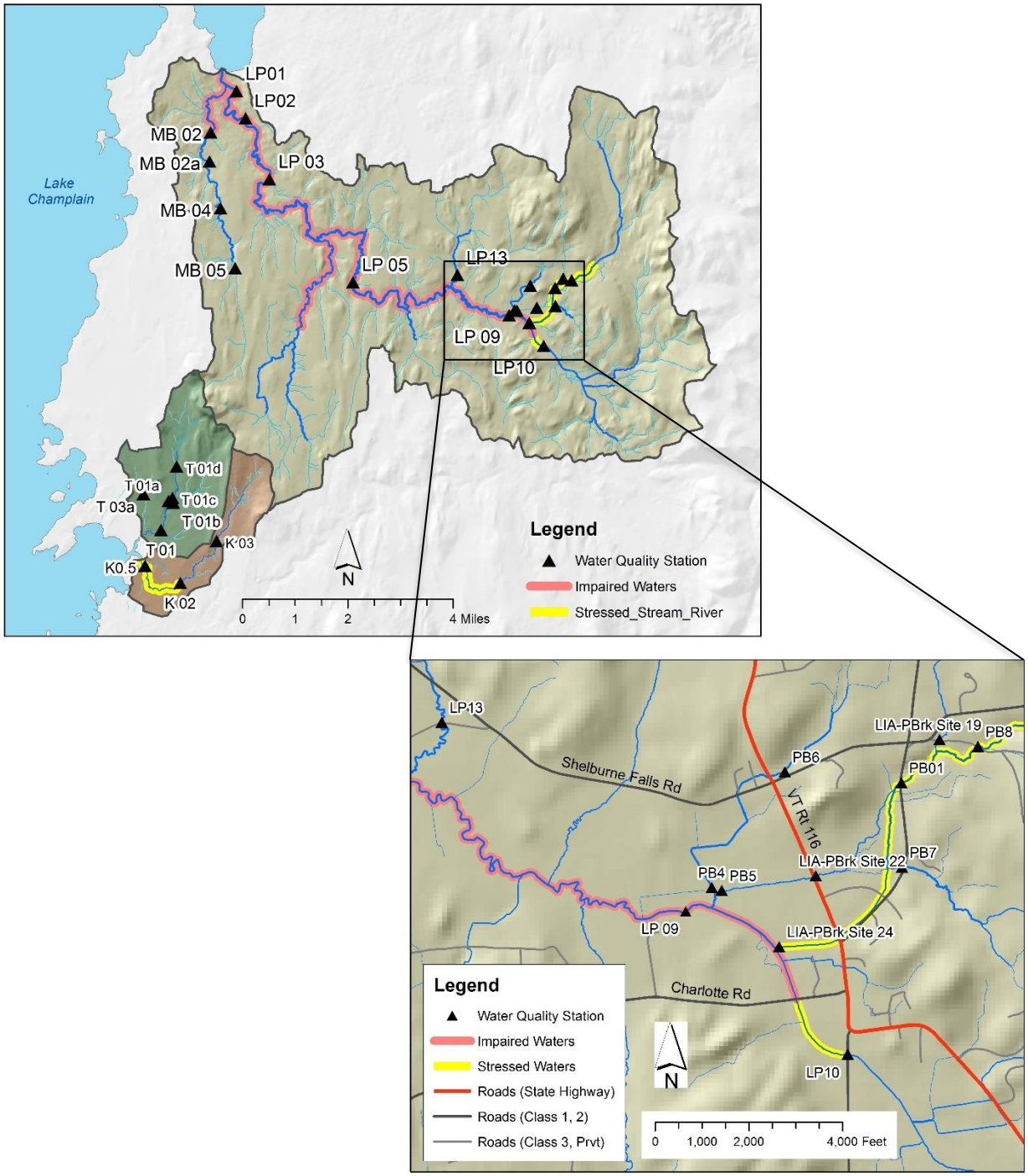

Figure 1. Location of 2019 high and low flow monitoring stations (not including low flow stations bracketing the Shelburne and Hinesburg wastewater treatment plants). Inset is of stations located in Hinesburg. Highlighted sections indicate impaired and stressed reaches of streams.

In past years, SCRW tested samples for chloride, nitrate, *E. coli*, turbidity, TSS, total phosphorus, dissolved phosphorus, total nitrogen, and total suspended sediments. Due to lab constraints, SCRW removed TSS samples at low flows (except for at T01a, T01b, T01c, and T01d). Different parameters were sampled on different streams, as needed to understand conditions in that location (Table 1). A separate SCRW/Vermont Department of Environmental Conservation (VT DEC) initiative was also carried out this season in the LaPlatte River and McCabe's Brook under low flow conditions to characterize potential impacts from the Hinesburg WWTF and Shelburne WWTF, respectively (Figure 2). These results are analyzed separately by VT DEC, but are included in this report.

Table 1. 2019 Schedule of Sites / Parameters

Stream and Location	Scheduled Analyses								
	E. coli	**Cl**	**TSS**	**Turb.**	**TP**	**DP**	**TN**	**NO_x**	**Ammonia**
Spatial Trend Monitoring and Sentinel Stations (Target: 3 High Flows, 3 Low Flows)									
LaPlatte River – LP13, LP10, LP09, LP05, LP03, LP02, LP1		X			X	X	X	X	
Patrick Brook – PB01, LIA-PBrk 19, PB8, PB4, PB5, PB6, PB7, LIA-PBrk 22, LIA-PBrk 24			X*		X				
McCabe's Brook – MB05, MB04, MB02a, MB02		X	X*		X	X	X	X	
Thorp Brook – T01, T01a, T01b, T01c, T01d, T03a			X*		X	X	X	X	
Kimball Brook – K03, K02, K0.5			X*		X	X	X	X	
Bracket Monitoring of Wastewater Treatment Facilities (Target: Low Median Monthly Flow)									
LaPlatte River – LP07a, LP09		X		X	X		X		X
McCabe's Brook – MB01a, MB8		X		X	X		X		X

*TSS only sampled at high flow at all sites except T01a, T01b, T01c, T01d which were sampled at both high and low flow.

Figure 2. Location of bracket monitoring stations that targeted low flows, located upstream and downstream of wastewater treatment facility discharges in Hinesburg and Shelburne.

3.0 Precipitation and Streamflow Data

Overall, calendar year 2019 in Vermont was in the top 10% of precipitation (12th wettest year on record, compared to years of record 1895-2019, NOAA 2020). March was significantly drier than usual (1" less precipitation than average), and no sampling occurred in March. April, May, and June had 2.3", 2.02", and 1.67" more precipitation than average (6th, 15th, and 19th wettest on record), respectively. July had less precipitation than usual, and was the 31st driest on record. August and September were in the normal precipitation range, while October was significantly wetter than usual, with 3.31" more precipitation than average, making it the 7th wettest October on record. November was in the normal range of precipitation. (NOAA 2020)

Streamflow data were compiled from the LaPlatte River USGS streamflow gauging station (#04282795) at Shelburne Falls, VT, which has been operational since 1991. Figure A-1 in Appendix A presents a graph of the instantaneous discharge record (provisional data) from calendar year 2019 for the LaPlatte River station. Flows were elevated in the spring months, but then trended below 50th percentile from mid-July through late September.

A flow duration curve is also presented in Appendix A for the LaPlatte River gage based on daily mean flows recorded over 28 years from water years 1991 through 2018 (Figure A-2). According to the VT DEC *Guidance on Streamflow Observations at time of Water Quality Sampling of Rivers and Streams,* high flow levels are defined as those flow conditions which are equaled or exceeded only 25% of the time. Low flow levels are those equaled or exceeded more than 75% of the time, while those flows occurring between 25 and 75% of the time are classified as moderate. Based on this flow duration curve, daily mean flows recorded on the 2019 sampling dates were classified as low, moderate, or high (Table 2, Figure 3).

4.0 Methods

Water quality samples were collected by SCRW volunteers in accordance with quality assurance procedures outlined in the EPA-approved Quality Assurance Project Plan prepared by VT DEC. A Quality Assurance Summary report for the 2019 sampling data has been provided under separate cover. Samples were

delivered to the Vermont Agricultural & Environmental Laboratory (VAEL) housed on the Vermont Technical College campus in Randolph, Vermont.

SCRW volunteers collected grab samples in these four watersheds at 32 sites during two spring events, two summer events, and two fall events (Table 2). Wetter than usual conditions in the summer combined with timing of ideal sampling conditions made it difficult to fulfill the original sampling goal to capture three low flow events. Two low-flow, base-flow events were captured on August 15 and September 16, and one moderate flow, base-flow event was captured on October 14 (Table 2). Three freshets were captured on April 10, May 10, and November 1; two events were classified as high flows and one (November 1) was a flood condition, and all captured water quality conditions on the rising limb or peak of the discharge hydrograph (Table 2, Figure 2). One of these (Sept. 16) had flow at or below the low median monthly flow of 5.0 cfs, and will be helpful to compare water quality results to state standards.

For select stations on the LaPlatte River and McCabe's Brook, samples were collected on the same low-flow/moderate-flow sampling dates as mentioned above (August 15, September 16, and October 14) as part of the separate SCRW/VT DEC study to monitor potential influence of the Hinesburg and Shelburne wastewater treatment facilities.

Table 2. Daily Mean Flows recorded at USGS gage #04282795 on sample dates in 2019, LaPlatte River.

Sample Date	Daily Mean Flow (cfs)	Flow Level	Flow Category
4/10/2019	160.00	High	Freshet
5/10/2019	349.00	High	Freshet
8/15/2019	7.19	Low	Base
9/16/2019	3.63*	Low	Base
10/14/2019	14.40	Moderate	Base
11/1/2019	2080.00	Flood	Freshet

* flow is at or below the Low Median Monthly flow of 5.0 cfs (calculated by B. Hastings, VTWMD, 2014)

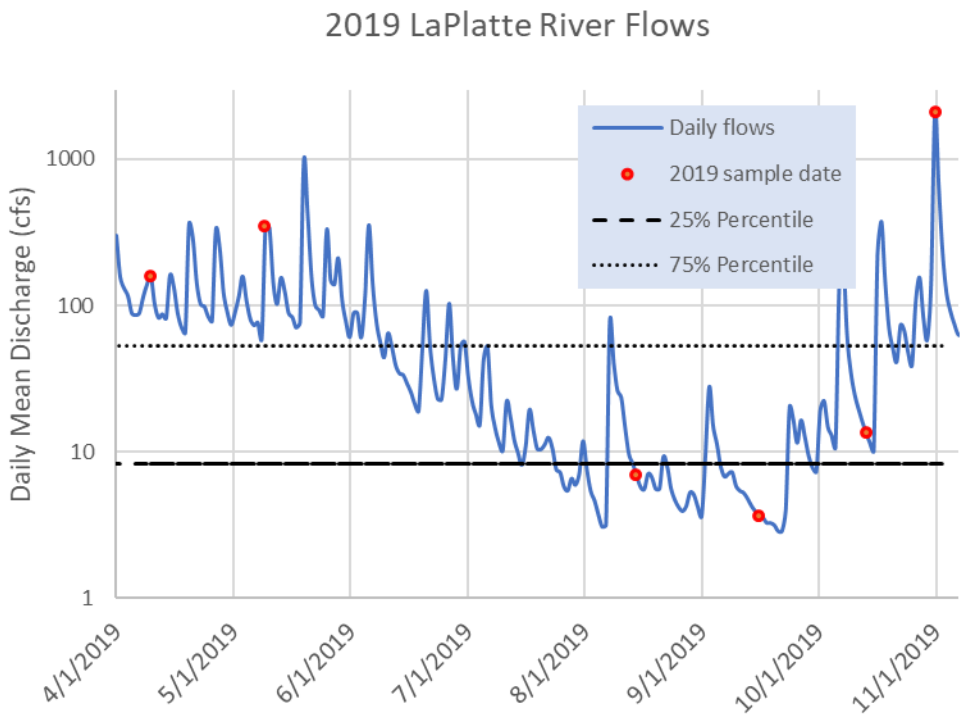

Figure 3. Daily mean discharge (provisional data) recorded for LaPlatte River at Shelburne Falls (USGS Station #04282795) during 2019. Sample dates are indicated by orange circle symbols.

5.0 Spatial Trend Monitoring and Sentinel Station Results

A quality-assurance report for the 2019 season for the four SCRW watersheds has been submitted under separate cover to VAEL. In general, water quality results for 2019 were consistent with historic results and trends summarized in previous summary reports for each of the four watersheds. Expanded information has been gathered for newly-established stations in the Patrick Brook and LaPlatte watershed to add to the evaluation of spatial trends in constituent concentrations.

5.1 Total Phosphorus

5.1.1 High-flow Events

The distribution of total phosphorus (TP) concentrations recorded during the three 2019 high-flow sampling events is depicted in Figure 4. The incremental subwatersheds draining to each water quality station are color-coded based on the mean TP recorded during three sampling events occurring during high flows in April, May, and November. Highest TP concentrations were detected in the western extents of each watershed, coincident with increasing density of glaciolacustrine soils and agricultural and developed land uses (Appendix D, Figures D-1, D-2, D-3).

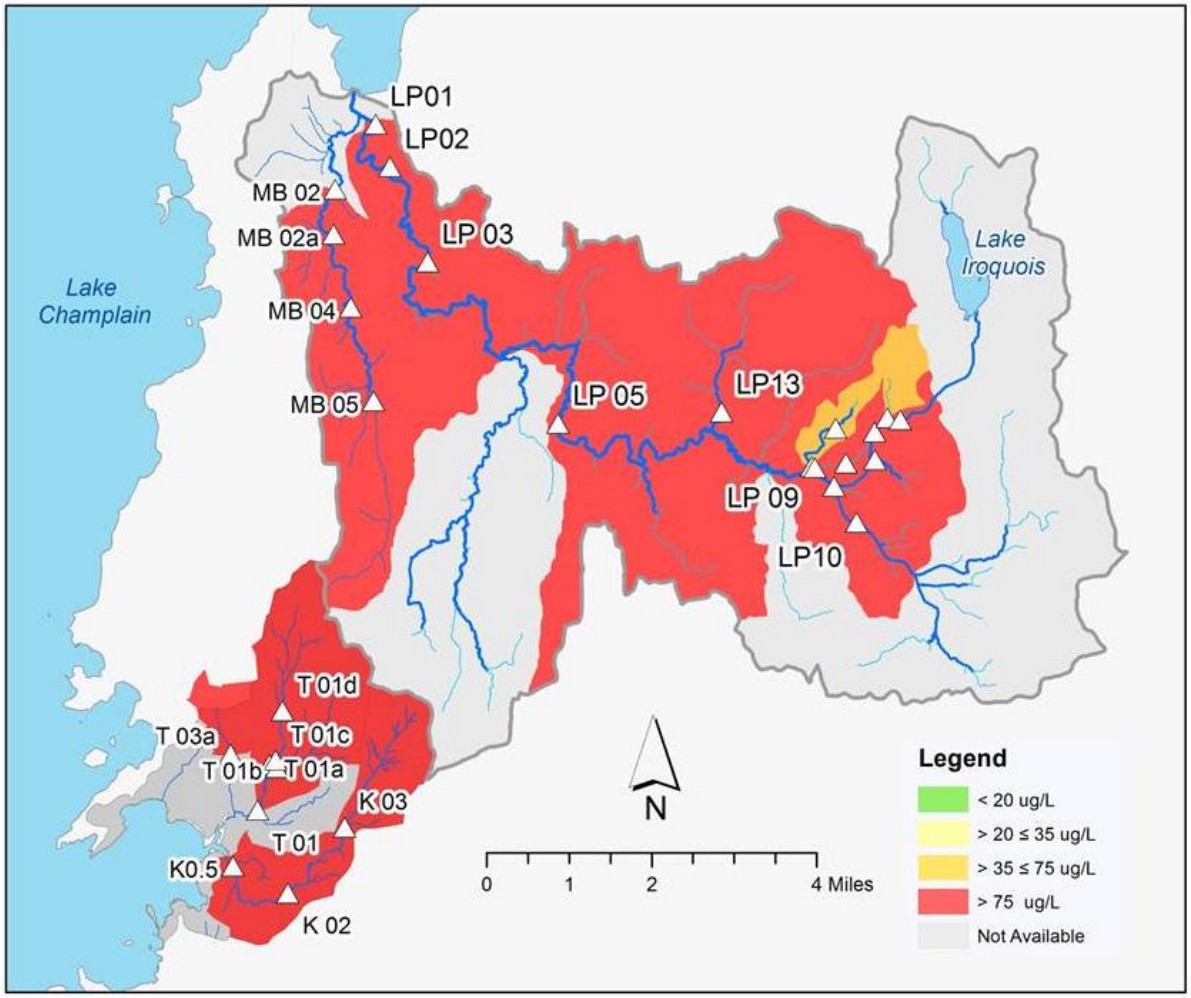

Figure 4. Distribution of mean total phosphorus (TP) in watersheds monitored by the SCRW. Subwatersheds draining to each water quality station are color coded based on mean TP recorded during three sampling events occurring during high flows in April, May, and November, 2019. Shading was cut off for third order or higher tributaries that had no data.

Water quality in the SCRW watersheds varies in space, depending on the geologic setting and soil types present in the catchment areas draining to each station, as well as variation in land use and land cover characteristics. A separate study recently completed by the Addison County River Watch Collaborative found a strong, and statistically-significant, positive correlation between mean water quality concentrations (for total phosphorus, *E. coli* and turbidity) and both the percentage of fine-grained glacial lake soils and the percentage of agricultural land use in the catchments draining to water quality stations (ACRWC & SMRC, 2016). Except for the headwater portions of LaPlatte River east of Hinesburg village, SCRW watersheds tend to have a high percentage of low-infiltration, fine-grained silt and clay soils derived from glacial lake sediments (Appendix D, Figures D-1, D-2). These areas are also characterized by higher densities of agricultural and developed land uses (Figure D-3).

The Thorp Brook watershed has been the focus of bracket monitoring since 2017 (Figure 5) to better define spatial patterns in water quality, as a series of best management practices either have been implemented or are being considered for implementation in the watershed. These preliminary TP results (Figures 6 and 7) build on 2017 & 2018 results and suggest a source of TP between station T01d (at Common Way crossing) and station T01c (just above E. Thompson's Point Rd), during high flows in April and May (T01c not sampled in November). A similar increase in TP was evident at low-flow, base-flow conditions in August and September. The upstream to downstream pattern from T01d to T01 seems to suggest a source of TP upstream of T01d. Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a (Figures 6 and 7). Relatively lower detected concentrations of TP at station T01b suggest that TP concentrations in the Thorp Brook main stem are diluted by surface water contributions from this eastern tributary.

Figure 5. Location of bracket monitoring stations on Thorp Brook.

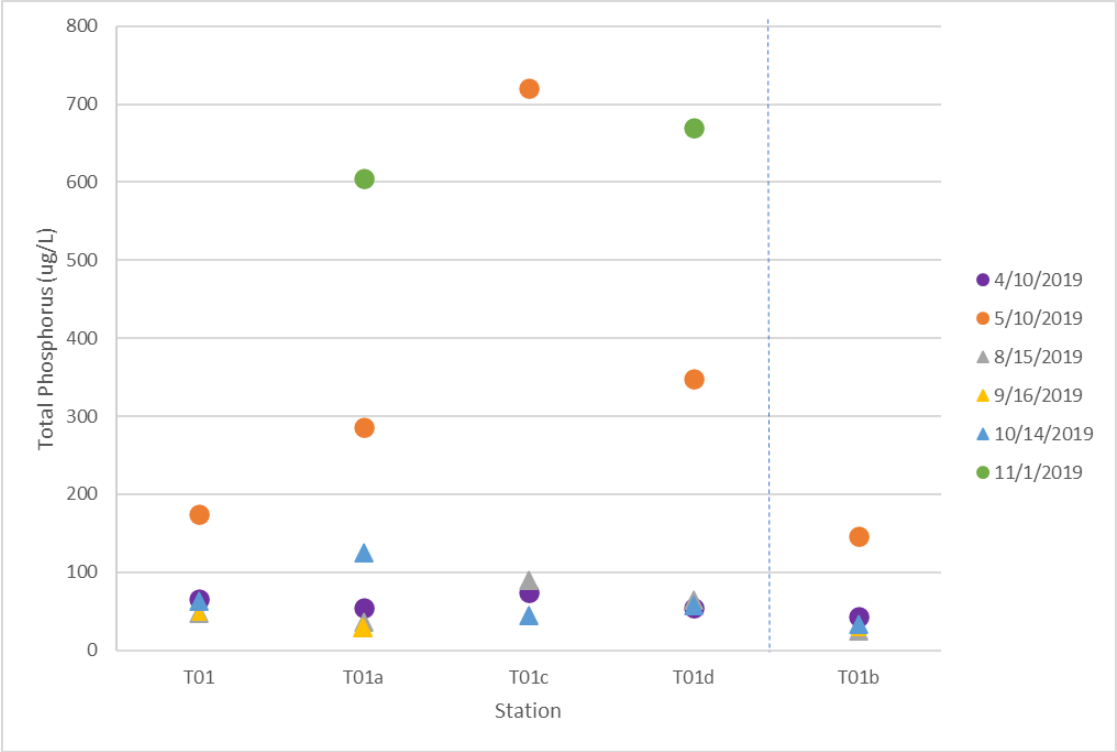

Figure 6. Total Phosphorus on Thorp Brook main stem during freshet flow conditions (circles) and dry-weather base flow conditions (triangles). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a.

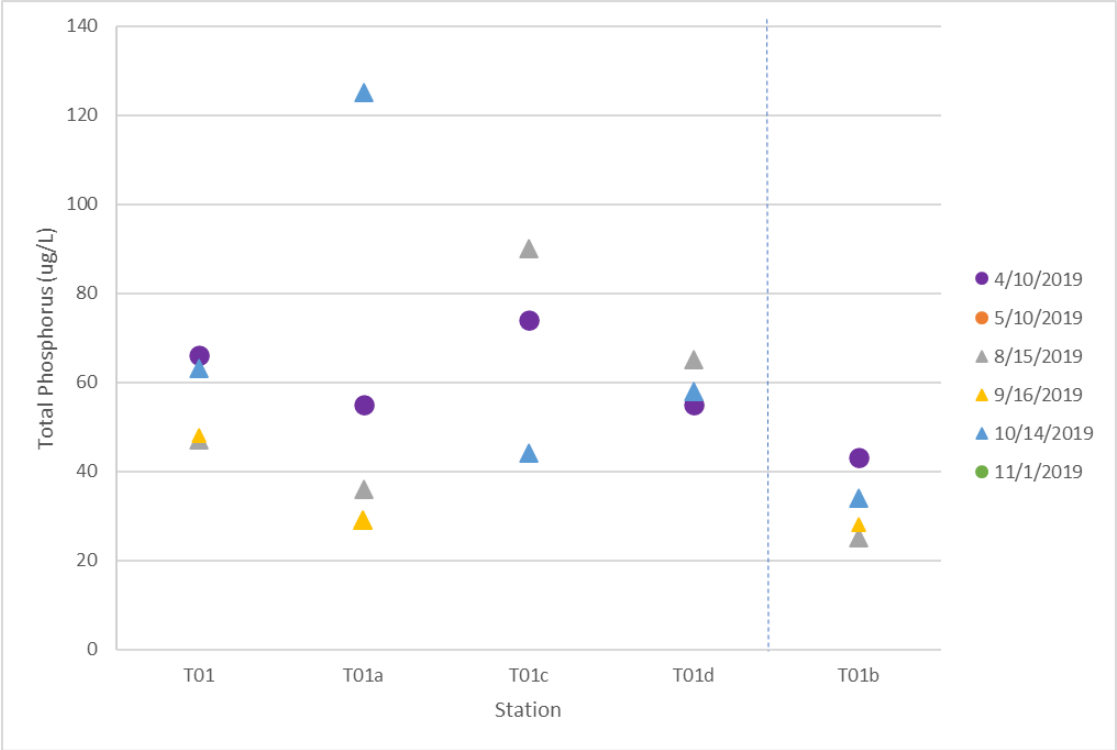

Figure 7. Details of lower portion of chart of Total Phosphorus on Thorp Brook during freshet flow conditions (circles) and dry-weather base flow conditions (triangles). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a.

5.1.2 Low-flow Events

The instream phosphorus criterion of 27 µg/L for warm-water medium gradient (WWMG) wadeable stream ecotypes in Class B waters is applicable at low median monthly (LMM) flow conditions during June through October (VWMD, 2016). The Total Phosphorus (TP) regulatory value for B(2) medium high gradient (MHG) streams is 15 µg/L, which applies to Patrick Brook stations. Only the September 16 sampling event was classified as a low flow, where daily mean flow measured at Shelburne Falls on the LaPlatte River (3.63 cfs) was below the LMM (5 cfs) (Table 2). Other low flow samples did not meet the LMM conditions. TP concentrations on this date exceeded total phosphorus standards at nineteen sampling stations in SCRW watersheds (all stations accurately sampled, except LP03, PB01, and PB8). It should be noted that the TP concentration at K0.5 was by far the highest during this base-flow event, which was measured at 280 µg/L - more than twice as much as the next highest value. This is the same condition as in last year, when K0.5 had more than double the TP concentration of the next highest value. The highest TP values, behind K0.5, were at T03a (121 µg/L) and PB5 (Patrick Brook before joining with tributary and entering the LaPlatte River, 106 µg/L).

5.2 Dissolved Phosphorus

Dissolved phosphorus (DP) was analyzed at 20 stations, and ranged from 5 to 129% of the TP concentration. The range and mean of these percentages did not vary significantly when results were stratified by time of year (spring/summer vs. fall/winter), but means were different when stratified by flow condition. During targeted high flow events, mean DP concentration was 64% of TP, while during targeted low flow events, mean DP concentration was 74%. Mean DP concentration varied from 26% to 129% under low flow conditions, and from 5% to 103% under high flow conditions. This is likely an indication of what are likely higher levels of solids in the water at high flow, which would cause a lower mean DP concentration at high flow levels. Generally speaking, highest DP as a percentage of TP was reported for McCabe's Brook and Thorp Brook, which is slightly different from 2017 and 2018 results (where highest DP as a percentage of TP was reported in McCabe's Brook and Kimball Brook). Lowest DP as a percentage of TP was reported for Kimball Brook stations (different from last year, where lowest was in Thorp Brook stations).

5.3 Nitrogen

Total nitrogen (TN) was analyzed during each event at 20 spatial-trend-monitoring stations (except in cases noted in the QA report), and four wastewater treatment facility bracketing stations, and ranged from 0.22 to 3.16 mg/L. This is lower than last year's TN range (which was 0.41 to 6.03 mg/L), and similar to 2017's s TN range (which was 0.2 to 2.1 mg/L). TN concentrations on these low-flow [August 15, September 16, and October 14 (moderate flow)] and high-flow (April 10, May 10, and November 1) sample dates still were well below the water quality standard for Class B waters of 5.0 mg/L as nitrate-N (which applies at flows exceeding LMM; VTWMD, 2016). The highest TN value (3.16 mg/L) was from K0.5, which also had the highest TN value last year.

NO_x (nitrogen dioxide and nitrate) was analyzed during each event at 20 spatial-trend-monitoring stations (except in cases noted in the QA report), and ranged from <0.050 to 0.997 mg/L. NO_x concentrations on these low-flow [August 15, September 16, and October 14 (moderate flow)] and high-flow (April 10, May 10, and November 1) sample dates still were well below the water quality standard for Class B waters of 5.0 mg/L as nitrate-N (which applies at flows exceeding LMM; VTWMD, 2016). The highest NO_x value (0.997 mg/L) was from K02.

5.4 Sediment

Sediment was monitored in some of the SCRW watersheds by analyzing for total suspended solids (TSS) at high flow (additionally, on the LaPlatte River turbidity was monitored in April before being removed due to financial constraints). Historically, turbidity had been monitored alongside TSS in SCRW watersheds and determined a positive correlation between turbidity and TSS. While Vermont Water Quality Standards are established for turbidity, TSS is monitored to examine patterns in the relative phosphorus burden of sediments with fluctuating discharge, and to enable coarse estimates of sediment and particulate phosphorus loading to receiving waters. As mentioned above, in 2019, TSS analyses were eliminated from the low flow sampling plan (except for at T01a, T01b, T01c, T01d) due to the high cost of analysis.

5.4.1 Total Suspended Solids

TSS was analyzed during each high flow event at 22 stations, and at four stations at low flow (except where noted in QA report), and ranged from 2 to 652 mg/L. TSS values were highest during the second sampling event in May (high flow) and second highest in November (flood conditions).

The highest TSS concentrations were detected in Thorp Brook stations during the May sampling event (Figures 8 and detailed view in Figure 9) were later than peak TSS conditions in 2017 and 2018 (which had their highest TSS values in April). Like in 2017 and 2018, in Thorp Brook, a source of suspended solids is indicated between bracket stations T01d and T01c particularly during the April and May events when vegetative cover would have been less. As well, numerous edge of field gullies are documented in the Thorp Brook corridor upstream of T01c.

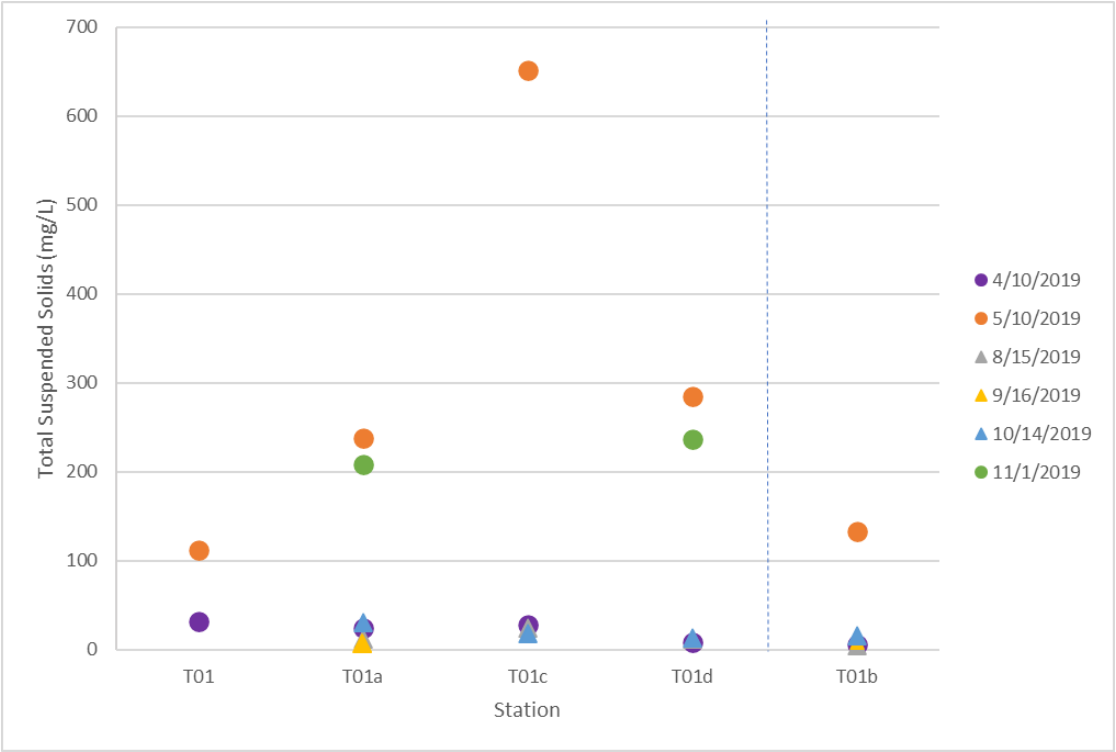

Figure 8. Total Suspended Solids on Thorp Brook during freshet flow conditions (circles) and dry-weather base flow conditions (triangles). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a.

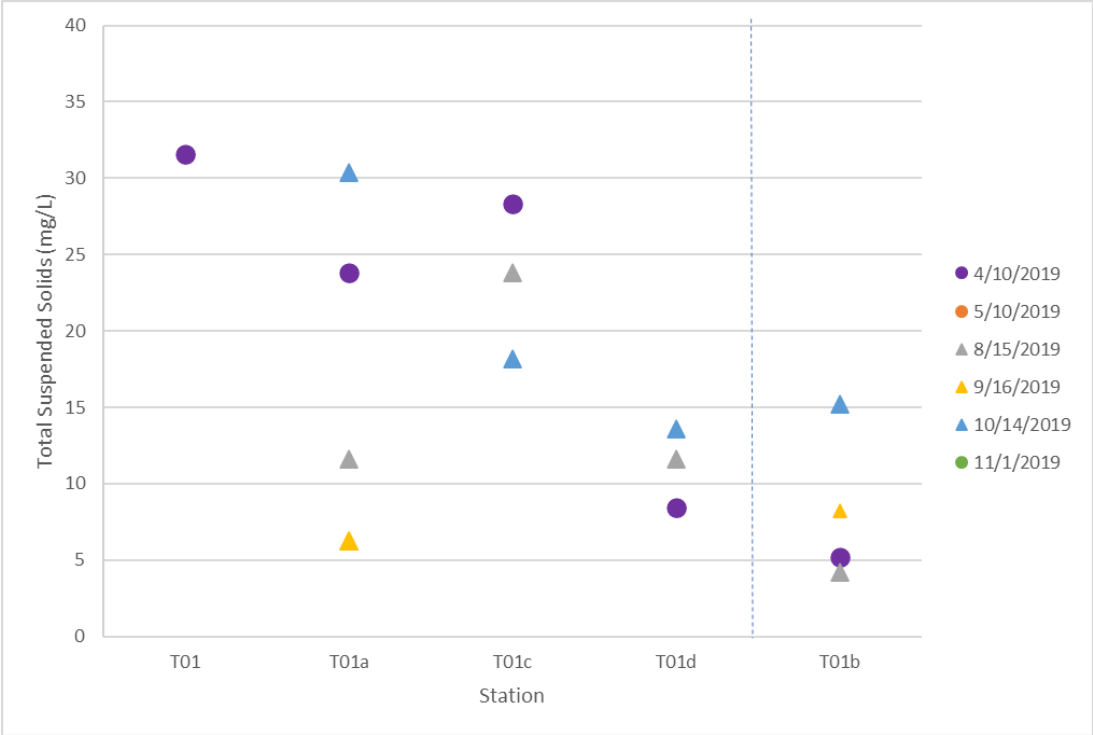

Figure 9. Details of lower portion of chart of Total Suspended Solids on Thorp Brook during freshet flow conditions (circles) and dry-weather base flow conditions (triangles). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a.

5.5 Chloride

The average allowable concentration (chronic criteria) for chloride is 230,000 µg/L (equivalent to 230 mg/L, VWMD 2016). This value is the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) once every three years without deleterious effects. All chloride values were below this level, with the highest level at MB05 (McCabe's Brook at Lime Kiln Road), with a level of 117.8 mg/L on September 16, 2019.

5.6 Low Flow Events and WWTF Study

Three low flow, or base flow, events were captured to contribute to an ongoing VT DEC study of waste water treatment facility (WWTF) outfalls in Hinesburg and Shelburne. Biological data captured by VT DEC indicates a decrease in benthic macro-invertebrate health downstream of the WWTF in Hinesburg and Shelburne. By bracketing the WWTFs - sampling above and below the wastewater treatment facility outfall - we can determine the chemical changes in the water to help explain the decrease in biological health. Temperatures were consistent above and below the WWTF outfalls. In Shelburne, there was a slight but consistent increase in total nitrogen and ammonia between the upstream and downstream stations on McCabe's Brook during all 3 sampling events. However, the noted difference between upstream and downstream values is less than the detection limit of the respective analytical method for TN (9/16) and

ammonia (8/15, 9/16). For turbidity, the trend was reversed, with higher turbidity values upstream than downstream. This could have been affected by beaver activity upstream during our last two sampling periods (that was not present at our first period), although the trend still stood during our first sample. There was no discernible pattern for chloride, where the difference on two sample dates (8/22 and 9/25) fell under the detection limit of 2 mg/L. On the third sample (10/23) downstream values were 6 mg/L higher than upstream values. For phosphorus, there was no apparent trend, with one sample (8/15) having a higher value downstream, and one (10/14) having a higher value upstream, and one (9/16) having similar values close to the detection limit. It is worth noting here the increased beaver activity on 10/14 that could have increased turbidity and possibly phosphorus upstream.

In Hinesburg, there was no difference in total phosphorus from upstream to downstream stations on the LaPlatte River, but there was a detectable decrease in ammonia downstream on one date (8/15, 0.64 to 0.79 mg-N/L), a substantial increase in total nitrogen (on 10/14), and decrease in turbidity (on 8/15). Other differences fell within the detection limit or were discarded due to sampling in the incorrect location (LP07a, 9/16).

6.0 Project Implementation and Recommendations for 2021

In 2020, SCRW will be taking a hiatus in sampling due to COVID-19 and retracted funding from the LaRosa Volunteer Monitoring Program under resulting state-wide budget constraints. In 2021, SCRW will hopefully continue high-flow monitoring to track longer-term water quality trends in these direct-drainage systems to prioritize outreach and remedial actions at the subwatershed scale, and will target low flow events in addition. In the Thorp Brook, SCRW will continue with T03 monitoring and bracket monitoring upstream of station T01a to further refine spatial trends and bracket three watershed improvement practices recently or soon to be implemented with partners (Table 3). These projects have been identified as part of the “Ahead of the Storm” project and will address water quality stressors including pathogens, sediments and nutrients, as well as concentrated stormwater runoff. The upstream to downstream pattern from T01d to T01 seems to suggest a source of TP and TSS upstream of T01d.

Additional refinement of stations along Patrick Brook in Hinesburg will occur, to help determine baseline conditions and which tributaries are contributing most to phosphorus loading in the LaPlatte River.

Station K0.5 should be paid special attention to next sampling season, as it is a new station as of midway through the 2017 sampling season, and has had consistently high total phosphorus and nitrogen values over two sampling seasons.

Since some values of TN were above 1, with some NOx values approaching 1 (although none were above the state’s water quality standard criteria) – especially in Kimball Brook – we recommend continuing sampling for TN and NOx only where there are potential agricultural sources.

We propose adding two stations on Mud Hollow Brook to update data on *E. coli* impairment there. We also suggest dropping chloride from most stations, except those near roads.

Turbidity should replace TSS, in order to compare to water quality standards.

Water quality results for South Chittenden River Watch watersheds are used by Lewis Creek Association for community education and outreach, and water quality improvement project planning. They will be shared with partners including watershed towns, Lake Iroquois Association, CCRPC, VLT, TNC, Champlain Valley Farmers Alliance, VT DEC, Vermont Agency of Agriculture, the Natural Resources Conservation Service and District offices, UVM Extension, USDA Farm Service Agency, US Fish & Wildlife Service, and Vermont Fish & Wildlife Department. Results are used to understand baseline water quality conditions, determine effectiveness of BMPs, and identify hot spot phosphorus loading and critical source area locations in need of remediation recommendations and investments. Towns, regional government and citizens rely on SCRW monitoring data results to understand stream water quality conditions under current regulations, inform education outreach efforts, town plan and regulation updates, regional plan updates, monitor effectiveness of stormwater practices and sewer treatment systems and to inform optimal conservation practice designs for water quality improvement projects.

Table 3. Description of select improvement projects to be implemented in Thorp Brook watershed.

Site	Description	Partners
A	Mack Farm Field gullies – stabilization Status: Monitoring to see if change in land use from corn to hay will naturally stabilize gullies	Landowner, USDA Farm Service Agency, NRCS
B	East Thompson's Point Road – road ditch improvements including stone-lined swale, grass swale, buffer improvements, check dams, and bioretention Status: Funded and installed August 2016, Annual Monitoring	Town of Charlotte, Better Back Roads, Milone & MacBroom
C	Big Oak Lane – gully stabilization and enhanced stormwater retention Status: Funding and installed July 2019, Annual Monitoring	Big Oak Lane association, VT Watershed Grant, Milone & MacBroom

7.0 References

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Appendix A

Flow Data

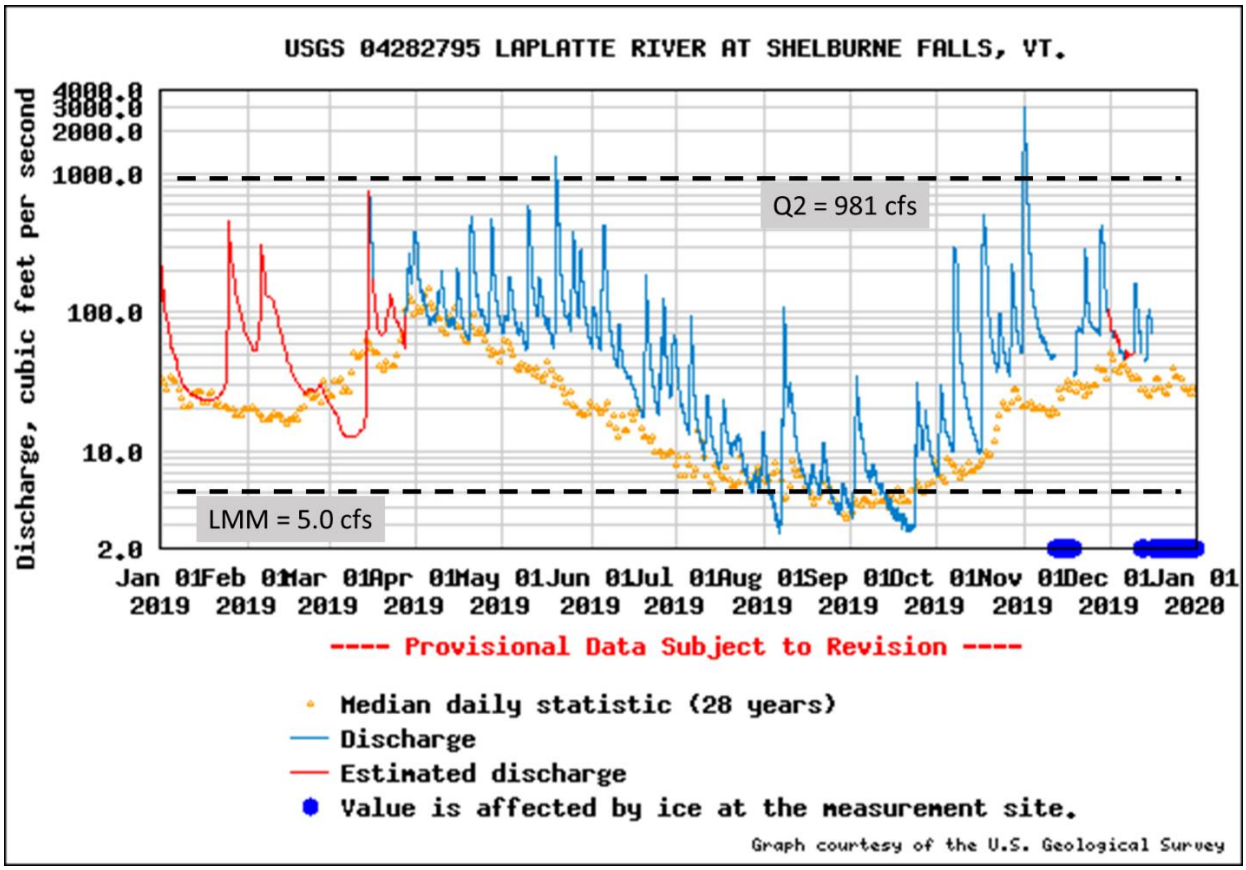

Figure A-1. Instantaneous Discharge Recorded at Shelburne Falls on the LaPlatte River in 2019.

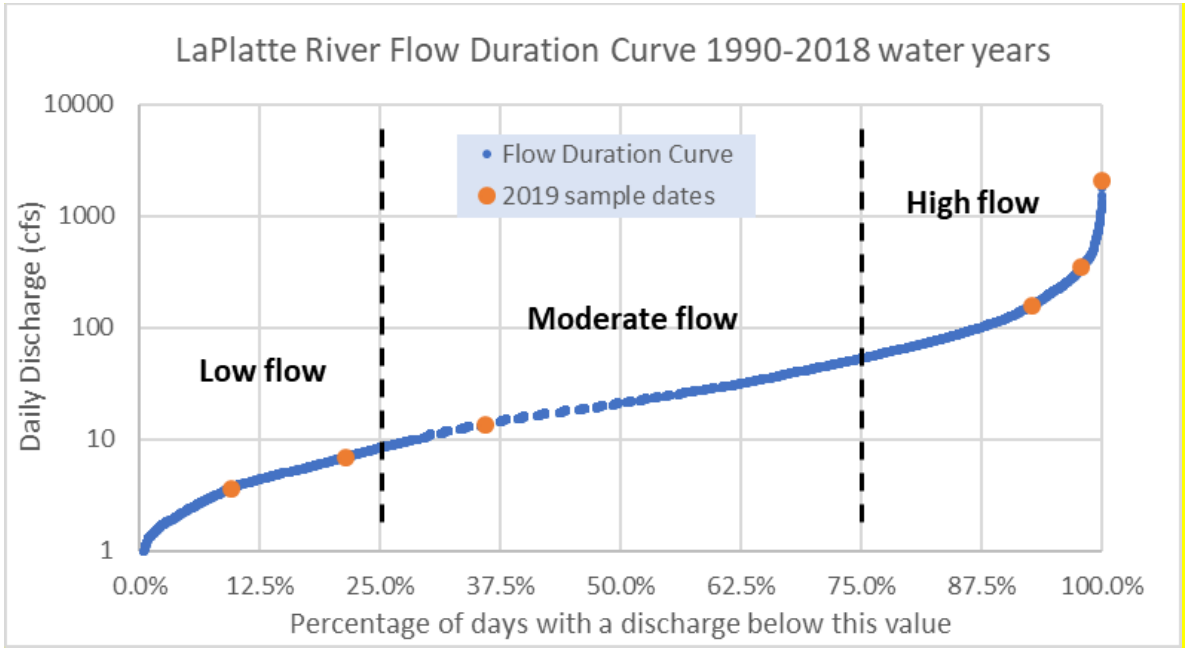

Figure A-2. Flow Duration Curve for LaPlatte River at Shelburne Falls, water years 1990-2018.

Appendix B

Water Quality Data Tables by Watershed

Abbreviations:

TN = Total Nitrogen
TP = Total Phosphorus
DP = Dissolved Phosphorus
TSS = Total Suspended Sediments
NOx = Nitrate + Nitrite

MPN/100 mL = organisms per 100 milliliters
mg/L = milligrams per liter
µg/ L = micrograms per liter
NTU = Nephelometric Turbidity Units

-- = No Data
NS = Not Sampled
NA = Not Analyzed (e.g., insufficient sample volume; vial broken in transit)
NM = Not Measured

JB = estimated value; constituent was present in an associated field blank

JD = estimated value; Relative Percent Difference (RPD) of primary and field duplicate sample values exceeded the QAPP RPD goal for that constituent

Note: QA/QC issues further detailed in separate QA Summary Report

LaPlatte River

Site	Date	Flow Level	Flow Category	TP	DP	TN	NOx	Turbidity	Chloride
LP1	4/10/2019	High	Freshet	50	23	0.59	0.194	16.6	27.7
LP1	5/10/2019	High	Freshet	34	35	0.35	<0.050		25.6
LP1	8/15/2019	Low	Base	72	52	1.31	<0.050		29.3
LP1	11/1/2019	Flood	Freshet	487	432	1.36	<0.050		6.11
LP02	4/10/2019	High	Freshet	57	27	0.64	0.227	20.9	25.2
LP02	5/10/2019	High	Freshet	50	51	0.35	<0.050		35
LP02	8/15/2019	Low	Base	45	30	0.51	<0.050		29.3
LP02	9/16/2019	Low	Base	39	30	0.37	<0.050		39.2
LP02	10/14/2019	Moderate	Base	32	23	0.49	0.081		26.8
LP02	11/1/2019	Flood	Freshet	406	328	1.2	0.088		5.76
LP03	4/10/2019	High	Freshet	54	27	0.62	0.201	13.6	21.8
LP03	5/10/2019	High	Freshet	187	322	1.1	0.081		18.6
LP03	8/15/2019	Low	Base	27	22	0.47	<0.050		28.2
LP03	9/16/2019	Low	Base	20	21	0.32	<0.050		37
LP03	10/14/2019	Moderate	Base	31	23	0.51	0.116		25.5
LP03	11/1/2019	Flood	Freshet	358	256	1.09	0.066		5.04
LP05	4/10/2019	High	Freshet	47	21	0.61	0.217	10.4	23.2
LP05	5/10/2019	High	Freshet	70	44	0.52	0.063		21.6
LP05	8/15/2019	Low	Base	37	29	0.76	0.201		32.8
LP05	10/14/2019	Moderate	Base	37	25	0.72	0.333		27
LP05	11/1/2019	Flood	Freshet	338	150	1.07			
LP09	4/10/2019	High	Freshet	33	14	0.5	0.212	3.64	27.3
LP09	5/10/2019	High	Freshet	89	37	0.51	0.112		34.3
LP09	8/15/2019	Low	Base	41	31	0.68	0.147		35
LP09	9/16/2019	Low	Base	29	33	0.39	0.156		36.3
LP09	10/14/2019	Moderate	Base	25	17	0.4	0.126		29.4
LP09	11/1/2019	Flood	Freshet	188	96	0.93			
LP10	4/10/2019	High	Freshet		26	0.59	0.296	4.28	21.6
LP10	5/10/2019	High	Freshet		22	0.5	0.233		20.4
LP10	8/15/2019	Low	Base		38	0.5	0.218		30.6
LP10	9/16/2019	Low	Base		21	0.51	0.255		32.4
LP10	10/14/2019	Moderate	Base		26	0.44	0.181		25.7
LP10	11/1/2019	Flood	Freshet	216	60	0.62	<0.050		4.68
LP13	4/10/2019	High	Freshet	47	35	0.87	0.354	6.4	20.8
LP13	5/10/2019	High	Freshet	60	30	0.55	<0.050		19.4
LP13	8/15/2019	Low	Base	106	49	0.77	<0.050		31.5
LP13	9/16/2019	Low	Base	66	35	0.6	<0.050		44.9
LP13	10/14/2019	Moderate	Base	50	33	0.69	<0.050		28.3
LP13	11/1/2019	Flood	Freshet	248	186	0.88	<0.050		4.48

WWTF Bracket Monitoring

Site	Date	Flow Level	Flow Category	TP	TN	Turbidity	Chloride	Ammonia
LP07a	8/15/2019	Low	Base	53	1.45	2.35	44.3	0.64
LP07a	9/16/2019	Low	Base	36	1.16	4.23	46.5	0.42
LP07a	10/14/2019	Moderate	Base	25	1.07	3.09	36.5	<0.05
LP09	8/15/2019	Low	Base	54	1.54	2.57	45.8	0.79
LP09	9/16/2019	Low	Base	30	0.4	3.68	36.3	<0.05
LP09	10/14/2019	Moderate	Base	25	0.41	3.14	29.2	<0.05

VT Water Quality Standards, 2016 (effective January 15, 2017):

- **Turbidity** (warm water Class B) = **25 NTUs** as an annual average under dry weather base-flow conditions.
- ***E. coli*** (Class B): Not to exceed a geometric mean of 126 organisms /100ml obtained over a representative period of 60 days, and no more than 10% of samples above **235 organisms/100 ml**. In waters receiving combined sewer overflows, the representative period shall be 30 days.
- **Phosphorus** (Class B, Warm-water Medium Gradient): Not to exceed **27 µg/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.
- **Nitrogen** as nitrate (NO_3) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. Total nitrogen includes organic and inorganic forms of nitrogen. A test of NO_3-NO_2 inorganic forms of nitrogen is required to evaluate water quality relative to the VWQS.

McCabe's Brook (LaPlatte River Tributary)

Site	Date	Flow Level	Flow Category	TP	DP	TSS	TN	NOx	Chloride
MB02	4/10/2019	High	Freshet	56	32	20.4	0.76	0.36	53.6
MB02	5/10/2019	High	Freshet	170	60	91	0.73	0.08	39.9
MB02	8/15/2019	Low	Base	100	58		0.52	0.144	40.8
MB02	9/16/2019	Low	Base	49	53		0.28	<0.050	37.1
MB02	10/14/2019	Moderate	Base	68	46		0.41	<0.050	44.6
MB02a	4/10/2019	High	Freshet	49	34	7	0.75	0.318	49.1
MB02a	5/10/2019	High	Freshet	140	47	83	0.66	0.053	56.4
MB02a	8/15/2019	Low	Base	29	16		0.27	<0.050	30.7
MB02a	9/16/2019	Low	Base	46	52		0.31	<0.050	73.8
MB02a	10/14/2019	Moderate	Base	28	28		0.34	<0.050	55.4
MB04	4/10/2019	High	Freshet	39	39	<2.00	0.8	0.277	42
MB04	5/10/2019	High	Freshet		226	107	1.39	0.148	25.3
MB04	8/15/2019	Low	Base	126	104		0.74	<0.050	32.3
MB04	9/16/2019	Low	Base	67	32		0.71	<0.050	25.5
MB04	10/14/2019	Moderate	Base	64	44		0.56	<0.050	45.5
MB04	11/1/2019	Flood	Freshet	256	248	39.4	0.95	0.216	8.84
MB05	4/10/2019	High	Freshet	23	22	<2.00	0.47	<0.050	23
MB05	5/10/2019	High	Freshet	65	111	78	0.8	<0.050	7.87
MB05	8/15/2019	Low	Base	69	68		0.77	<0.050	25.1
MB05	9/16/2019	Low	Base	43	26		0.46	<0.050	117.8
MB05	10/14/2019	Moderate	Base	62	53		0.57	<0.050	24.3
MB05	11/1/2019	Flood	Freshet	193	175	42.8	0.7	0.157	8.08

WWTF Bracket Monitoring

Site	Date	Flow Level	Flow Category	TP	TN	Turbidity	Chloride	Ammonia
MB8	8/15/2019	Low	Base	236	0.54	13.5	39.3	0.12
MB8	9/16/2019	Low	Base	71	0.36	20.6	68.6	<0.05
MB8	10/14/2019	Moderate	Base	192	0.54	19.5	62	<0.05
MB01a	8/15/2019	Low	Base	302	0.9	11.3	40.5	0.14
MB01a	9/16/2019	Low	Base	63	0.39	16.8	67.4	<0.05
MB01a	10/14/2019	Moderate	Base	105	1.43	16	68.2	1.34

VT Water Quality Standards, 2016 (effective January 15, 2017):

- **Turbidity** (warm water Class B) = **25 NTUs** as an annual average under dry weather base-flow conditions.
- ***E. coli*** (Class B): Not to exceed a geometric mean of 126 organisms /100ml obtained over a representative period of 60 days, and no more than 10% of samples above **235 organisms/100 ml**.
  In waters receiving combined sewer overflows, the representative period shall be 30 days.

- **Phosphorus** (Class B, Warm-water Medium Gradient): Not to exceed **27 µg/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.
- **Nitrogen** as nitrate (NO_3) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. Total nitrogen includes organic and inorganic forms of nitrogen. A test of NO_3-NO_2 inorganic forms of nitrogen is required to evaluate water quality relative to the VWQS.

Patrick Brook (LaPlatte River Tributary)

Site	Date	Flow Level	Flow Category	TP	DP	TSS
PB01	4/10/2019	High	Freshet	9		<2.00
PB01	5/10/2019	High	Freshet	33		12.4
PB01	8/15/2019	Low	Base	17		
PB01	9/16/2019	Low	Base	9		
PB01	10/14/2019	Moderate	Base		8	
PB01	11/1/2019	Flood	Freshet	258		147
PB4	4/10/2019	High	Freshet	25		4.4
PB4	5/10/2019	High	Freshet	43		8.4
PB4	8/15/2019	Low	Base	24		
PB4	9/16/2019	Low	Base	35		
PB4	10/14/2019	Moderate	Base	33		
PB4	11/1/2019	Flood	Freshet	61		14.6
PB5	4/10/2019	High	Freshet	38		<2.00
PB5	5/10/2019	High	Freshet	244		201
PB5	8/15/2019	Low	Base	48		
PB5	9/16/2019	Low	Base	106		
PB5	10/14/2019	Moderate	Base	17		
PB5	11/1/2019	Flood	Freshet	106		41.4
PB6	4/10/2019	High	Freshet	22		5.2
PB6	5/10/2019	High	Freshet	69		45
PB6	8/15/2019	Low	Base	19		
PB6	9/16/2019	Low	Base	20		
PB6	10/14/2019	Moderate	Base	24		
PB6	11/1/2019	Flood	Freshet	117		65.6
PB7	4/10/2019	High	Freshet		11	<2.00
PB7	5/10/2019	High	Freshet		85	46.67
PB7	8/15/2019	Low	Base		19	
PB7	9/16/2019	Low	Base		28	
PB7	10/14/2019	Moderate	Base		14	
PB7	11/1/2019	Flood	Freshet	84		44.6
PB8	4/10/2019	High	Freshet	9		<2.00
PB8	5/10/2019	High	Freshet	21		4.2
PB8	8/15/2019	Low	Base	24		
PB8	9/16/2019	Low	Base	9		

PB8	10/14/2019	Moderate	Base		7	
PB8	11/1/2019	Flood	Freshet	218		134.2
LIA-Brk 24	4/10/2019	High	Freshet		9	<2.00
LIA-Brk 24	5/10/2019	High	Freshet		26	22.6
LIA-Brk 24	8/15/2019	Low	Base		25	
LIA-Brk 24	9/16/2019	Low	Base		72	
LIA-Brk 24	10/14/2019	Moderate	Base		29	
LIA-PBrk 19	4/10/2019	High	Freshet	8		<2.00
LIA-PBrk 19	5/10/2019	High	Freshet	59		32.4
LIA-PBrk 19	8/15/2019	Low	Base	22		
LIA-PBrk 19	9/16/2019	Low	Base	25		
LIA-PBrk 19	10/14/2019	Moderate	Base		15	
LIA-PBrk 19	11/1/2019	Flood	Freshet	55		16.6
LIA-PBrk 22	4/10/2019	High	Freshet		9	<2.00
LIA-PBrk 22	5/10/2019	High	Freshet		45	15.6
LIA-PBrk 22	8/15/2019	Low	Base		17	
LIA-PBrk 22	9/16/2019	Low	Base		18	
LIA-PBrk 22	10/14/2019	Moderate	Base		13	
LIA-PBrk 22	11/1/2019	Flood	Freshet	94		47.4

VT Water Quality Standards, 2016 (effective January 15, 2017):

- **Turbidity** (warm water Class B) = **25 NTUs** as an annual average under dry weather base-flow conditions.
- ***E. coli*** (Class B): Not to exceed a geometric mean of 126 organisms /100ml obtained over a representative period of 60 days, and no more than 10% of samples above **235 organisms/100 ml**.
  In waters receiving combined sewer overflows, the representative period shall be 30 days.
- **Phosphorus** (Class B, Medium High Gradient): Not to exceed **15 µg/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.
- **Nitrogen** as nitrate (NO_3) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. Total nitrogen includes organic and inorganic forms of nitrogen. A test of NO_3-NO_2 inorganic forms of nitrogen is required to evaluate water quality relative to the VWQS.

Thorp Brook (direct drainage to Lake Champlain)

Site	Date	Flow Level	Flow Category	TP	DP	TSS	TN	NOx
T01	4/10/2019	High	Freshet	66	20	31.6	0.68	0.335
T01	5/10/2019	High	Freshet	175	143	112.33	0.63	0.1
T01	8/15/2019	Low	Base	47	26		0.38	0.052
T01	9/16/2019	Low	Base	48	50		0.33	<0.050
T01	10/14/2019	Moderate	Base	63	29		0.38	<0.050
T01a	4/10/2019	High	Freshet	55	21	23.8	0.65	0.318
T01a	5/10/2019	High	Freshet	286	290	238	1.01	0.154
T01a	8/15/2019	Low	Base	36	18	11.6	0.26	<0.050
T01a	9/16/2019	Low	Base	29	32	6.2	0.27	0.055
T01a	10/14/2019	Moderate	Base	125	32	30.4	0.7	<0.050
T01a	11/1/2019	Flood	Freshet	605	600	208	1.56	0.31
T01b	4/10/2019	High	Freshet	43	40	5.2	0.52	0.256
T01b	5/10/2019	High	Freshet	146	30	133	0.72	<0.050
T01b	8/15/2019	Low	Base	25	28	4.2	0.22	<0.050
T01b	9/16/2019	Low	Base	28	36	8.2	0.27	0.065
T01b	10/14/2019	Moderate	Base	34	34	15.2	0.33	<0.050
T01c	4/10/2019	High	Freshet	74	67	28.33	0.79	0.453
T01c	5/10/2019	High	Freshet	720	38	651.67	1.79	0.194
T01c	8/15/2019	Low	Base	90	106	23.8	0.76	<0.050
T01c	10/14/2019	Moderate	Base	44	41	18.2	0.37	0.066
T01d	4/10/2019	High	Freshet	55	51	8.4	0.78	0.412
T01d	5/10/2019	High	Freshet	348	322	285	1.24	0.152
T01d	8/15/2019	Low	Base	65	74	11.6	0.57	0.099
T01d	10/14/2019	Moderate	Base	58	74	13.6	0.93	0.525
T01d	11/1/2019	Flood	Freshet	670	590	237	2.58	0.407
T03a	4/10/2019	High	Freshet	42	25	<2.00	0.9	0.367
T03a	5/10/2019	High	Freshet	130	99	15.8	1.05	0.213
T03a	8/15/2019	Low	Base	100	62		0.79	0.067
T03a	9/16/2019	Low	Base	121	62		0.36	0.123
T03a	10/14/2019	Moderate	Base	137	52		1.03	0.18
T03a	11/1/2019	Flood	Freshet	143	86	30	0.52	0.092

VT Water Quality Standards, 2016 (effective January 15, 2017):

- **Turbidity** (warm water Class B) = **25 NTUs** as an annual average under dry weather base-flow conditions.
- ***E. coli*** (Class B): Not to exceed a geometric mean of 126 organisms /100ml obtained over a representative period of 60 days, and no more than 10% of samples above **235 organisms/100 ml**. In waters receiving combined sewer overflows, the representative period shall be 30 days.

- **Phosphorus** (Class B, Warm-water Medium Gradient): Not to exceed **27 µg/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.
- **Nitrogen** as nitrate (NO_3) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. Total nitrogen includes organic and inorganic forms of nitrogen. A test of NO_3-NO_2 inorganic forms of nitrogen is required to evaluate water quality relative to the VWQS.

Kimball Brook (direct drainage to Lake Champlain)

Site	Date	Flow Level	Flow Category	TP	DP	TSS	TN	NOx
K0.5	4/10/2019	High	Freshet	144		9.2	0.82	0.228
K0.5	5/10/2019	High	Freshet	73	44	4.2	0.61	<0.050
K0.5	8/15/2019	Low	Base	367	595		3.16	<0.050
K0.5	9/16/2019	Low	Base	280	150		1.77	<0.050
K0.5	10/14/2019	Moderate	Base	187	162		0.98	<0.050
K02	4/10/2019	High	Freshet	58	32	14.4	1.35	0.997
K02	5/10/2019	High	Freshet	49	28	19.2	0.98	0.74
K02	11/1/2019	Flood	Freshet	350	228	195	0.99	0.291
K03	4/10/2019	High	Freshet	56	35	8	0.62	0.251
K03	5/10/2019	High	Freshet	124	47	76.72	0.76	<0.050
K03	11/1/2019	Flood	Freshet	282	173	80.8	0.8	0.114

VT Water Quality Standards, 2016 (effective January 15, 2017):

- **Turbidity** (warm water Class B) = **25 NTUs** as an annual average under dry weather base-flow conditions.
- ***E. coli*** (Class B): Not to exceed a geometric mean of 126 organisms /100ml obtained over a representative period of 60 days, and no more than 10% of samples above **235 organisms/100 ml**. In waters receiving combined sewer overflows, the representative period shall be 30 days.
- **Phosphorus** (Class B, Warm-water Medium Gradient): Not to exceed **27 µg/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.
- **Nitrogen** as nitrate (NO_3) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. Total nitrogen includes organic and inorganic forms of nitrogen. A test of NO_3-NO_2 inorganic forms of nitrogen is required to evaluate water quality relative to the VWQS.

Appendix C

Monitoring Station Locations and Rationale

LaPlatte River

Station No.	Lat	Long	Description	Remarks
LP01	44.3945	-73.22879	LaPlatte River, end of walking trail at Yacht Haven Drive.	
LP02 (LR02)	44.38707	-73.22515	LaPlatte River, Route 7 bridge north of Shelburne Village. Right bank under bridge.	
LP03 (LR04)	44.37022	-73.21577	LaPlatte River, intersection of Thomas and Falls Roads. East (right bank), approximately 30 meters south of Falls Rd. bridge.	Dairy farms drain via tributaries below LP4. Upstream drainage 44.8 mi^2.
LP05	44.34176	-73.18383	LaPlatte River, Carpenter Rd. bridge. Left bank, 5 meters upstream from bridge.	Dairy farms drain from right bank downstream from LP4b. Bank erosion upstream. Upstream drainage 31.2 mi^2.
LP09	44.33343	-73.12559	LaPlatte River, 15 meters upstream of Hinesburg sewage treatment plant outfall.	Drains fields adjacent to Hinesburg village. Upstream drainage 17.7 mi^2.
LP13	44.34448	-73.14347	O'Neil Rd. bridge, tributary to LaPlatte.	Sample right bank just below the culvert. Captures several farms, Rocky Ridge golf course, St. George.
LP10 (LR11)	44.32524	-73.11015	LaPlatte River, Silver St. bridge. Right bank, downstream end of bridge.	

McCabe's Brook (LaPlatte River watershed)

Station No.	Lat	Long	Description	Remarks
MB02	44.38305	-73.23853	McCabe's Brook, Harbor Rd. bridge. Left bank, 30 meters below bridge.	Surface drain channel enters from right bank about half way between the bridge and the sampling point. Upstream drainage 4.57 mi^2.
MB02a	44.37502	-73.23881	McCabe's Brook off path starting from the end of School Street in Shelburne. Right bank. Blue stake at sampling location	Upstream from the School Street neighborhood. Stream flows from Bostwick Road to sampling location along fields and through woods. Small tributary enters upstream from west.

MB04	44.3623	-73.23461	McCabe's Brook, Route 7 bridge. Right bank at upstream end of bridge.	Upstream bank erosion. Vermont Teddy Bear storm drainage pond overflow immediately upstream. Cultivated fields upstream below MB5, west (left) bank.
MB05 (LR05)	44.34582	-73.22868	McCabe's Brook, Lime Kiln Rd. bridge. Downstream discharge from culvert. Left bank	Horses upstream, west (left) bank. Nordic Farm upstream.

Patrick Brook

Station No.	Lat	Long	Description	Remarks
PB4	44.33495	-73.12138	At ballfields, sample left bank of tributary that drains from CVU (50 meters upstream of where this tributary enters Patrick Brook)	
PB5	44.33477	-73.12052	From ballfields, sample right bank just below bridge over Patrick Brook (40 meters upstream of where the tributary from CVU enters)	
PB6	44.34173	-73.11545	Trib that drains from CVU: upstream of 116, north of CVU Rd and downstream of CVU firepond (at Riggs driveway, upstream side)	
PB01 (LIA-PBrk Site 20)	44.34115	-73.10594	Patrick Brook, Mechanicsville Rd. bridge. Right bank, upstream entrance to culvert.	This sampling location is above the bridge off Mechanicsville Road. The site drains the section of forested area between Partridge Hill Road and the start of Hinesburg's urban footprint. The sampling location is above the culvert on the east side of the Road.
LIA-PBrk Site 19	44.34368	-73.10284	The sampling location is above the culvert on the north side of Partridge Hill Road.	This site is located on Partridge Hill Road below a mostly forested area of light residential density with some influence from multiple roads in its upper reach.
PB8	44.343302	-73.099704	This site is located on Partridge Hill Road (further east from LIA-PBrk Site 19). The sampling location is above the culvert on	Well below the dam at the Iroquois Manufacturing facility and a mostly forested area of light residential density with

			the north side of the road.	minimal influence from Richmond Road in its upper reach.
PB7	44.33621	-73.10583	Where tributary to Patrick Brook crosses Mechanicsville Road, downstream of Mechanicsville Road	
LIA-PBrk Site 22	44.33566	-73.11286	This site drains much of Hinesburg's urban development prior to entering a straight, channelized run to its confluence with the LaPlatte River. The sampling location is just below Route 116 in Hinesburg.	in 2018, moved downstream of culvert
LIA-PBrk Site 24	44.3315	-73.1158	This site drains much of the urban, channelized portion of Patrick Brook Canal just above and adjacent to its confluence with the LaPlatte River.	The area is surrounded by agricultural fields to the north and is below the former Saputo cheese factory to the east.

Thorp and Kimball Brooks

Station No.	Lat	Long	Description	Remarks
T01	44.27307	-73.2566	Thorp Brook west of Greenbush Road. Right bank	Upstream from Lake Champlain backwater. Drains farms and agricultural land from the north to the Thorp Brook watershed. Upstream drainage 2.93 mi^2.
T01a	44.28177	-73.25335	Thorp Brook north side of East Thompson's Point Road and downstream of trib.	Drains road, residential, farm and agricultural land from the north.
T03a	44.2835	-73.26279	West Tributary to Thorp Brook south side of Thompson's Point Road, which is west of Greenbush Rd.	Drains residential and agricultural land. History of very high nitrogen levels at T 03.5 located east side of Lake Road at Converse Bay Road latitude.
T01b	44.28161	-73.25215	Thorp Brook eastern tributary, north of East Thompson's Point Road	Drains BOL Road, residential, ag
T01c	44.28198	-73.25206	Charlotte Thorp Brook north side of stream, upstream of eastern tributary	Drains fields (residential, ag)
T01d	44.29131	-73.2505	Charlotte Thorp Brook just south of Common Way Road	Drains road, residential, and ag. Perched culvert.

K0.5	44.26392	-73.26209	Kimball Brook just downstream of trib on Town Line LLC property	Drains agriculture and pollutants from Town Line Rd to Greenbush Road. Access through Peter Swift property.
K02	44.25926	-73.24852	Kimball Brook east of Greenbush Road.	Upstream from Lake Champlain backwater. Drain farmland and housing lots from the east and including wooded land east of Route 7 and Mount Philo. Upstream drainage 1.87 mi^2.
K03	44.2706	-73.2352	Kimball Brook, west of Route 7, 20 feet upstream of Claflin Farm Rd culvert development.	Drains agricultural runoff and Route 7 and local roads runoff.

Appendix D

Physical Characteristics of SCRW Watersheds

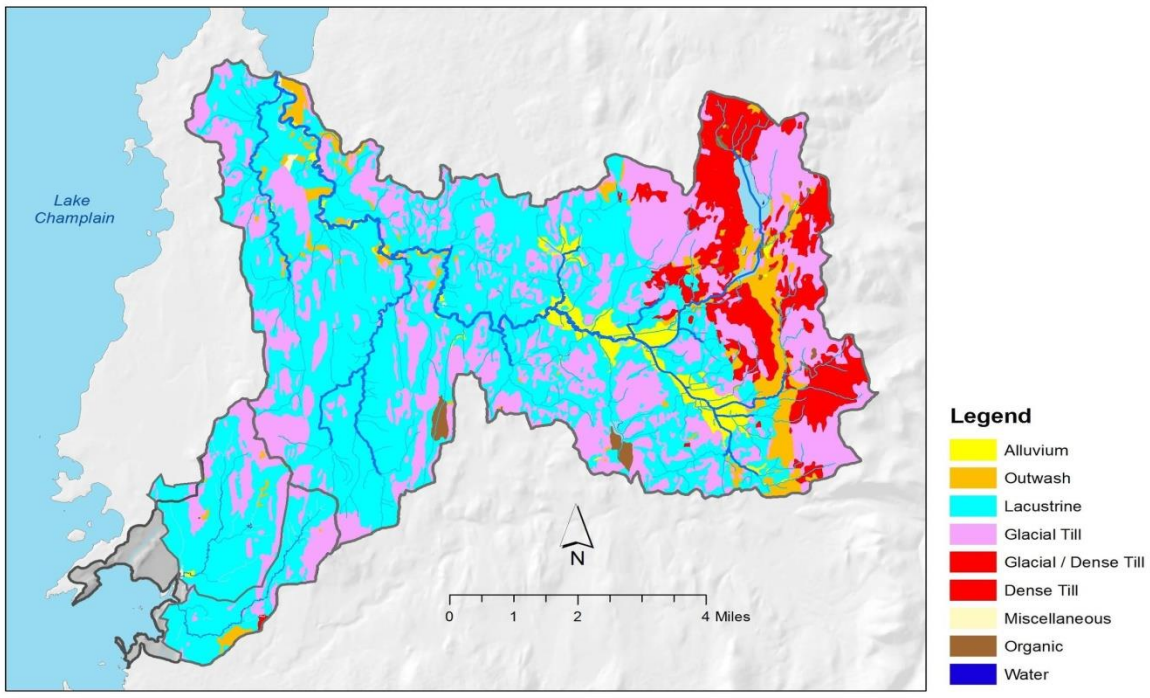

Figure D-1. Distribution of Soils, by Parent Material, in the SCRW watersheds.

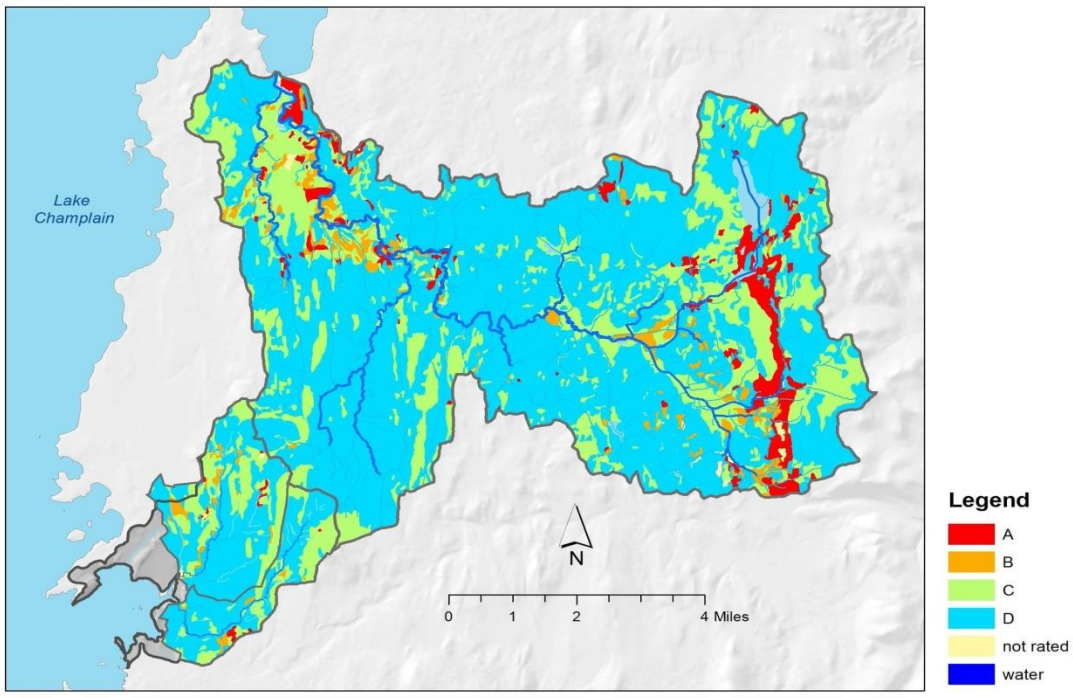

Figure D-2. Distribution of Soils, by Hydrologic Soil Group, in the SCRW watersheds.

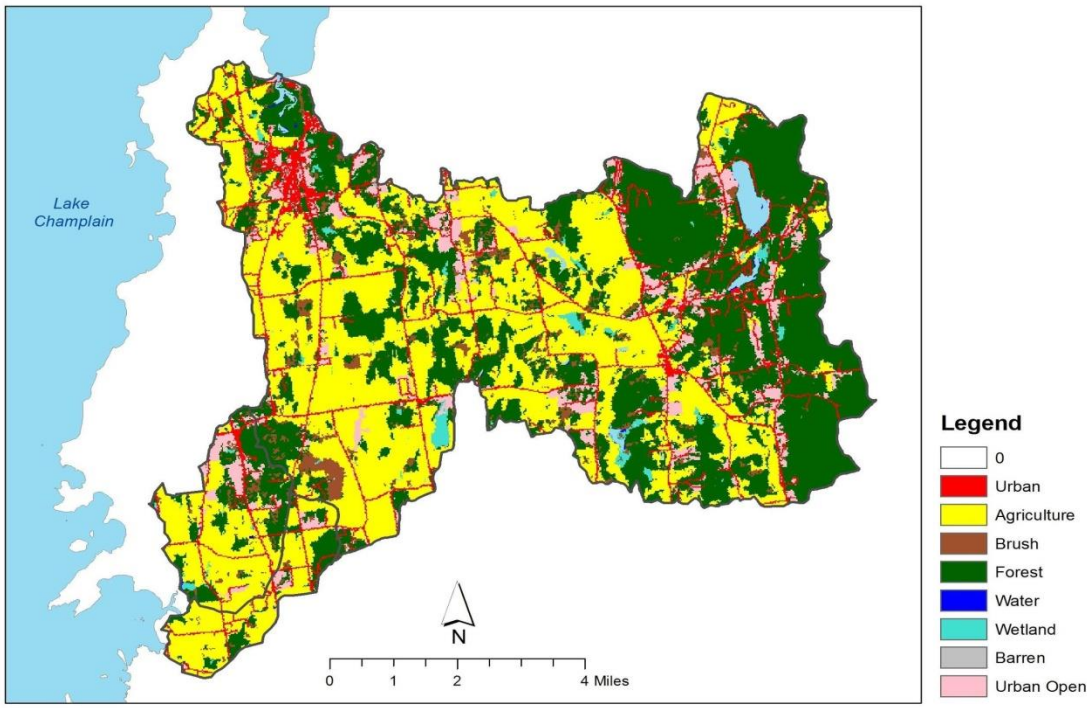

Figure D-3. Distribution of Land Cover / Land Use in the SCRW watersheds (source date: 2001).