Summary Report: 2017 Sampling Results
South Chittenden River Watch

31 March 2018

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1.0 Introduction

This report provides a summary of the 2017 sampling results for the South Chittenden River Watch (SCRW) stations which targeted high-flow conditions. 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 Burlington, VT, through an analytical services partnership grant. A quality assurance review of data was performed by SCRW Sampling Coordinator, Krista Hoffsis. This summary report has been prepared by Kristen Underwood of South Mountain Research & Consulting and Krista Hoffsis.

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 and Mud Hollow Brook are listed as impaired for contact recreation uses due to impacts from agricultural runoff and streambank erosion (VTDEC, 2016a). Additionally, the LaPlatte River main stem downstream of Hinesburg, 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 (VTDEC, 2016b).

Since baseline data now exist for these four watersheds during low to moderate flow conditions, the goal during this 2017 season was to sample water quality during high flow events, as a means of estimating relative contributions of sediment and nutrients to Lake Champlain in the context of the Lake Champlain Total Maximum Daily Load (TMDL) for phosphorus. High-flow sampling has occurred since 2014. Additional stations were established on the 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 (Table 1, Figure 1). A separate SCRW/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. These results are reported under separate cover by VTDEC.

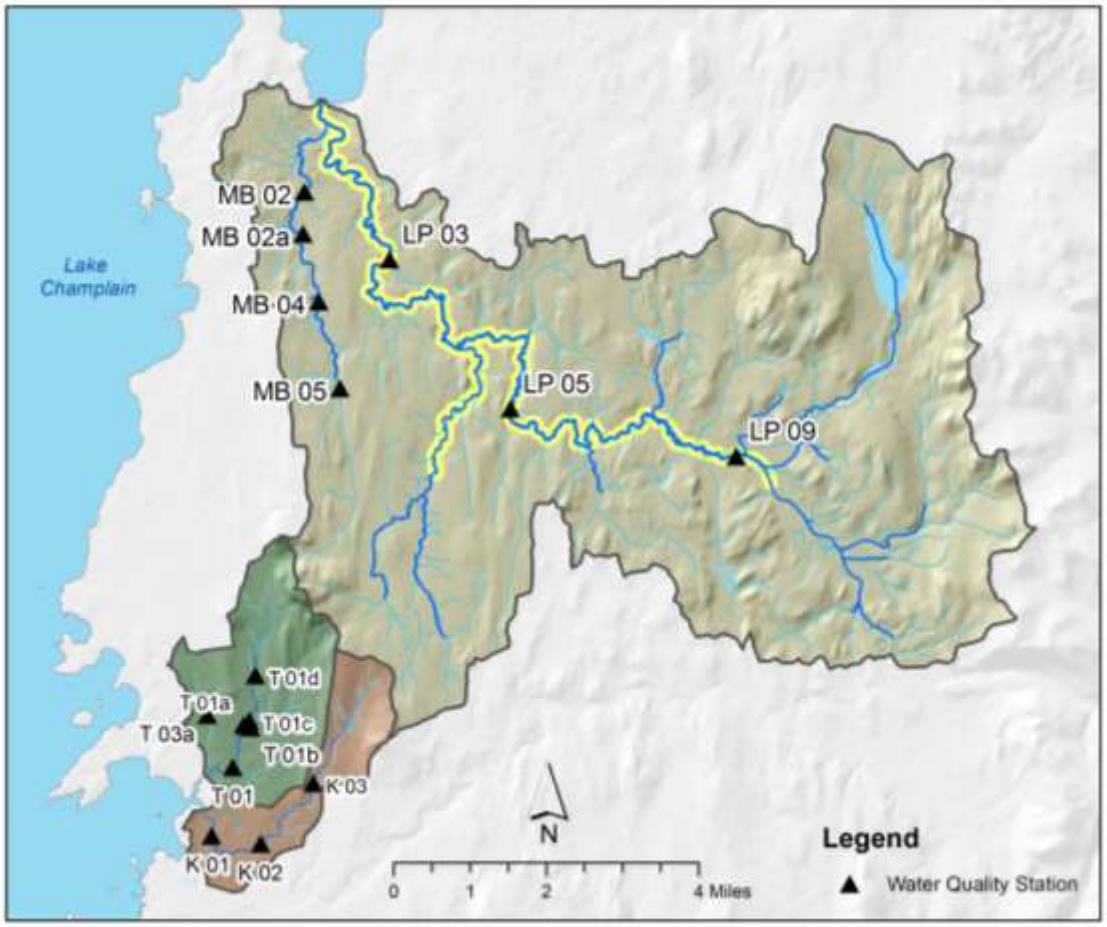

Figure 1. Location of SCRW monitoring stations for 2017 that targeted High Flows

Table 1. 2017 Schedule of Sites / Parameters targeting High Flows

Stream and Location	Scheduled Analyses							
	E. coli	**Cl**	**TSS**	**Turb.**	**TP**	**DP**	**TN**	**NOx**
LaPlatte River – LP09, LP05, LP03		X		X	X	X	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, K01*			X		X	X	X	X

** K01: Landowner permission withdrawn after 4/6/2017*

3.0 Precipitation and Streamflow Data

Overall, calendar year 2017 was a near-normal precipitation year, as recorded at regional weather stations in South Burlington (Airport) and Rutland. Higher-than-normal snowfall during the winter of 2016-2017 (NOAA, 2017) helped the region recover from moderate drought conditions experienced in the previous year (US Drought Monitor, 2017). While precipitation was near normal for the year on average, spring and early summer months were wetter than normal, leading to delays in planting corn and harvesting first-cut hay (UVM Extension, 2017). The months of August through December then received lower-than-normal precipitation (NOAA, 2017).

Streamflow data were compiled from the LaPlatte River USGS streamflow gauging station (#04282750) 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 2017 for the LaPlatte River station. Flows were somewhat elevated above normal in the early summer months, but then trended below normal late in the year.

A flow duration curve is also presented in Appendix A for the LaPlatte River gage based on daily mean flows recorded over 26 years from water years 1991 through 2016 (Figure A-2). According to the VTDEC *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 2017 sampling dates were classified as low, moderate or high (Table 2, Figure 2).

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 VTDEC. A Quality Assurance Summary report for the 2017 sampling data has been provided under separate cover. Samples were delivered to the Vermont Agricultural & Environmental Laboratory housed in the Hills Building in the University of Vermont campus in Burlington, Vermont.

SCRW volunteers collected grab samples in these four watersheds at 17 sites during two spring events and four summer/fall events (Table 2). Landowner permission for Kimball station K01 was withdrawn by the landowner after the April 6 event. Drier than normal conditions in the late summer and fall, and timing of storms (occurring on weekends, or overnight) made it difficult to fulfill the original sampling goal to capture high flow events. A decision was made in late summer to at least capture a few events regardless of flow condition. In the end, three freshets of reasonable size were sampled on April 6, May 2, and June 6; all three events were classified as high flows and captured water quality conditions as on the rising limb or peak of the discharge hydrograph (Figure 2). One low-flow, base-flow event was captured on October 25.

For select stations in the LaPlatte River and McCabe's Brook, samples were collected on two additional low-flow summer sampling dates as part of a separate SCRW/VTDEC study to monitor potential influence of the Hinesburg WWTF and Shelburne WWTF, respectively.

Table 2. Daily Mean Flows recorded at USGS gage on Sample Dates in 2017, LaPlatte River.

Sample Date	Daily Mean Flow (cfs)	Flow Level	Flow Category
4/6/2017	390	High	Freshet
5/2/2017	150	High	Freshet
6/6/2017	226	High	Freshet
8/31/2017	*3.5 **	*Low*	*Base flow*
9/21/2017	*6.1*	*Low*	*Base flow*
10/25/2017	8.3	Low	Base flow

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

Sample dates in blue italics were for select stations in the LaPlatte River watershed as part of a separate effort to monitor the effluent from Hinesbury WWTF.

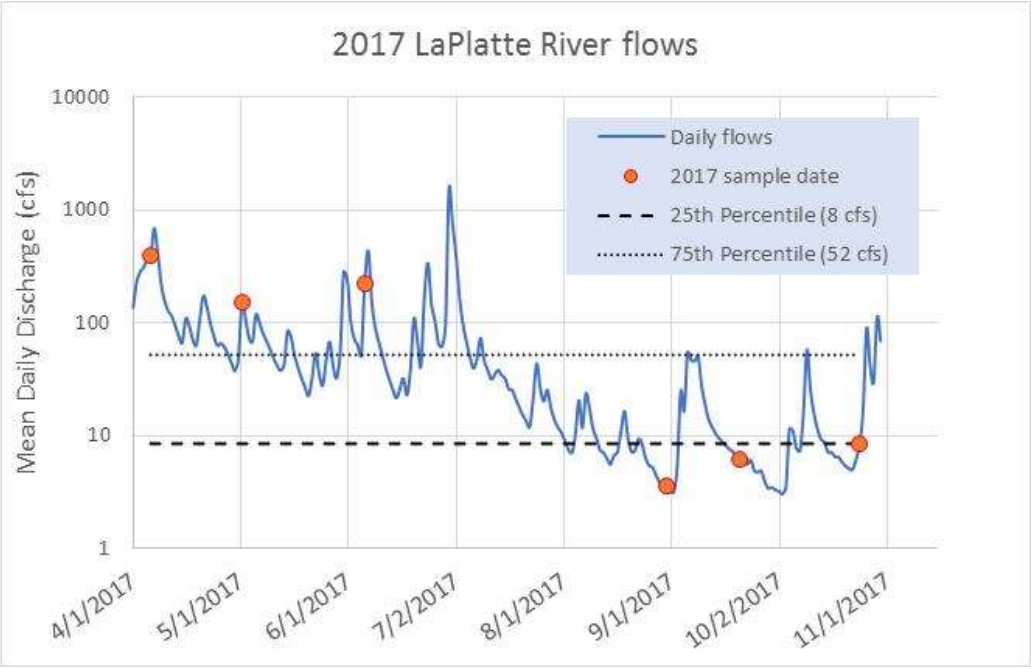

Figure 2. Daily mean discharge recorded for LaPlatte River at Shelburne Falls (USGS Stn #04282750) during 2017. Sample dates are indicated by orange circle symbols.

5.0 Sample Results

A quality-assurance report for the 2017 season for the four SCRW watersheds has been submitted under separate cover to VAEL. In general, water quality results for 2017 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 Thorp watershed to add to the evaluation of spatial trends in constituent concentrations.

5.1 Phosphorus

High-flow Events

Figure 3 depicts the distribution of Total Phosphorus (TP) concentrations recorded during the three 2017 high-flow sampling events. 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 June. 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 (Attachment D , Figures D-1, D-2, D-3). Lower LaPlatte is not monitored by SCRW.

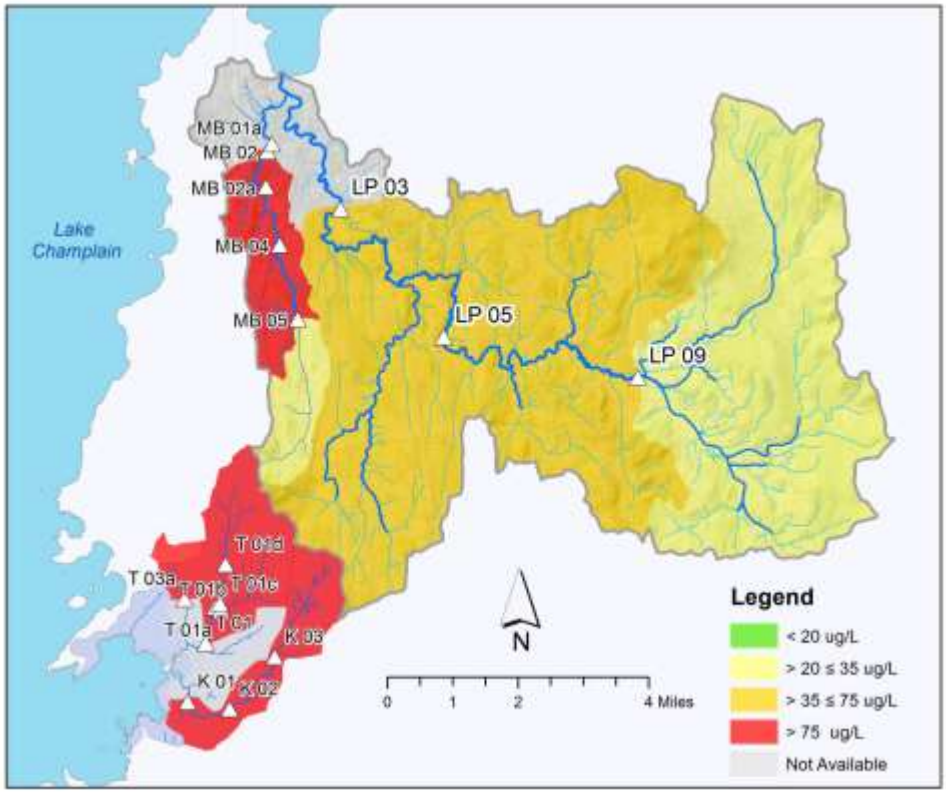

Figure 3. Distribution of Mean Total Phosphorus in Watersheds Monitored by the SCRW. Incremental subwatersheds draining to each water quality station are color coded based on mean TP recorded during three sampling events occurring during high flows in April, May and June, 2017 (except K01 which was sampled only in April).

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 the Hinesburg village, SCRW watersheds tend to have a high percentage of low-infiltration, fine-grained silt and clay soils derived from glacial lake sediments (Attachment 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 was the focus of bracket monitoring in 2017 to better define spatial patterns in water quality, as a series of best management practices is being considered for implementation in the watershed. These preliminary TP results (Figure 4) 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 on April 6 and May 2. 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 5). 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.

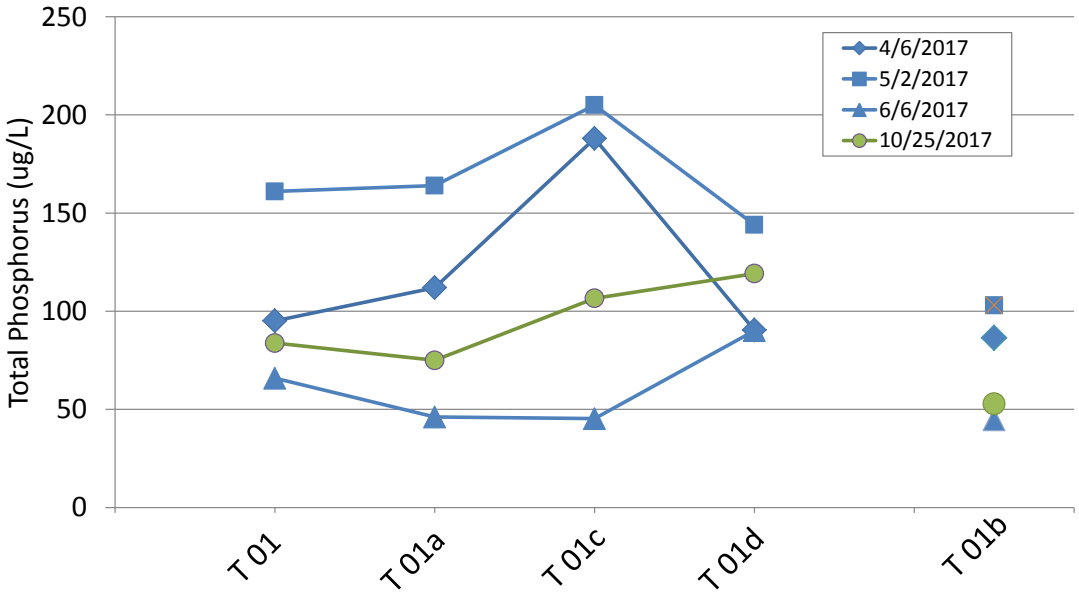

Figure 4. Total Phosphorus on Thorp Brook main stem during freshet flow conditions (in blue) and dry-weather base flow conditions (in green). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and T01a .

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

Low-flow Event

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). Only the October 25 sampling event was classified as a low flow, where daily mean flow measured at Shelburne Falls on the LaPlatte River (8.3 cfs) was nearly at the LMM (5 cfs) (Table 2). TP concentrations on this date exceeded 27 µg/L at all fifteen sampling stations in SCRW watersheds.

5.2 Dissolved Phosphorus

Dissolved phosphorus (DP) was analyzed during each event at all 15 stations, and ranged from 14 to 91% of the TP concentration. The range and mean of these percentages did not vary significantly when results were stratified by flow condition (i.e., low flows vs moderate flows). Generally speaking, highest DP as a percentage of TP was reported for McCabe's Brook and Kimball Brook. Lowest DP as a percentage of TP was reported for the new upper Thorp Brook stations. Elevated DP as a percentage of TP tended to be coincident with low or nondetectable Total Suspended Solids.

5.2 Nitrogen

Total Nitrogen (TN) was analyzed during each event at all 15 stations, and ranged from 0.2 to 2.1 mg/L,. Given elevated nitrogen concentrations detected historically, all stations were also tested for nitrate and nitrite forms of nitrogen (N03-N02). Nitrate-nitrite concentrations ranged from <0.05 to 1.8 mg/L. TN and N03-N02 concentrations on these low-flow (Oct 25) and high-flow (April, May June) sample dates 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).

5.3 Sediment

Sediment was monitored in each of the SCRW watersheds by analyzing for Total Suspended Solids (TSS). Historically, Turbidity had been monitored alongside TSS in SCRW watersheds to determine a positive correlation between Turbidity and TSS. While, Vermont Water quality Standards are established for Turbidity, TSS has been monitored historically to examine patterns in the relative phosphorus burden of sediments with fluctuating discharge, and to enable coarse estimates of sediment loading to receiving waters. In 2017, Turbidity analyses were limited to LaPlatte River stations (Table 1).

Total Suspended Solids

TSS was analyzed during each event at all 15 stations (except for the Nov 22 event at LaPlatte stations), and ranged from 2.5 to 165 mg/L. The range and mean of TSS concentrations were somewhat higher for the high flow events than for the one low-flow event. Highest TSS concentrations were detected in Thorp Brook stations during the April and May high-flow events. In Thorp Brook, a source of suspended solids is indicated between bracket stations T01d and T01c during the May 2 high-flow event (Figure 6).

Turbidity

Turbidity was sampled at LaPlatte River stations LP03, LP05 and LP09. The Vermont Water Quality Standard for Turbidity in warm-water Class B streams (25 NTUs) is applicable as an annual average under dry-weather, base-flow conditions (VWMD, 2016). Only one sample date during 2017 met these conditions. On October 25, Turbidity did not exceed that standard at any of the three LaPlatte River stations.

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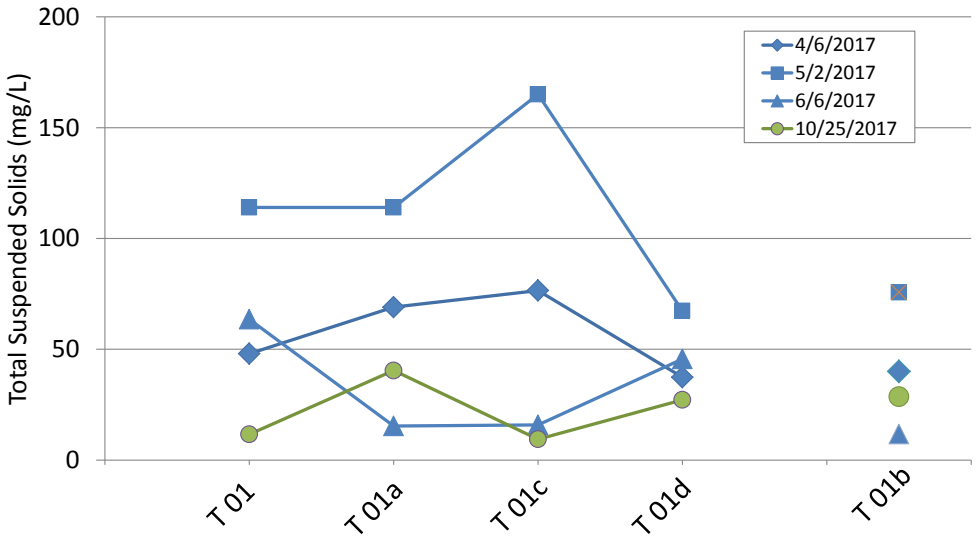

Figure 6. Total Suspended Solids on Thorp Brook main stem during freshet flow conditions (in blue) and dry-weather base flow conditions (in green). Results are presented for main stem stations alongside results from station T01b located on a tributary that joins Thorp Brook between stations T01c and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

6.0 Project Implementation

In 2018, SWRC will 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. The same stations will be monitored in LaPlatte River and McCabe's Brook . In Kimball Brook, station K01 will no longer be samples since the landowner has retracted permission. Instead, K0.5 will be sampled, which is slightly downstream but will still capture the agricultural use between Greenbush Rd/K02 and the Lake. In the Thorp Brook, SWRC 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 about to be, implemented by stakeholders (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.

Water quality results for South Chittenden River Watch watersheds are used by Lewis Creek Association for community education and outreach. They will be shared with 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 storm water practices and sewer treatment systems and to inform optimal conservation practice designs for water quality improvement projects.

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

Site	Description	Partners
A	Mack Farm Field gullies – stabilization Status: Seeking Funding	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 secured; Installation planned summer 2018	Big Oak Lane association, VT Watershed Grant, Milone & MacBroom

7.0 References

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VT DEC Water Quality Division, 2016a, *State of Vermont 2016 303(d) List of Waters*: *Part D – Impaired Surface Waters in Need of TMDL*.

VT DEC Water Quality Division, 2016b, *State of Vermont Stressed Waters List*.

Vermont Watershed Management Division, 2016. *Vermont Water Quality Standards*. Effective 15 January 2017. Montpelier, VT. http://www.watershedmanagement.vt.gov/rulemaking/docs/wrprules/wsmd_wqs2014.pdf

Appendix A

Flow Data

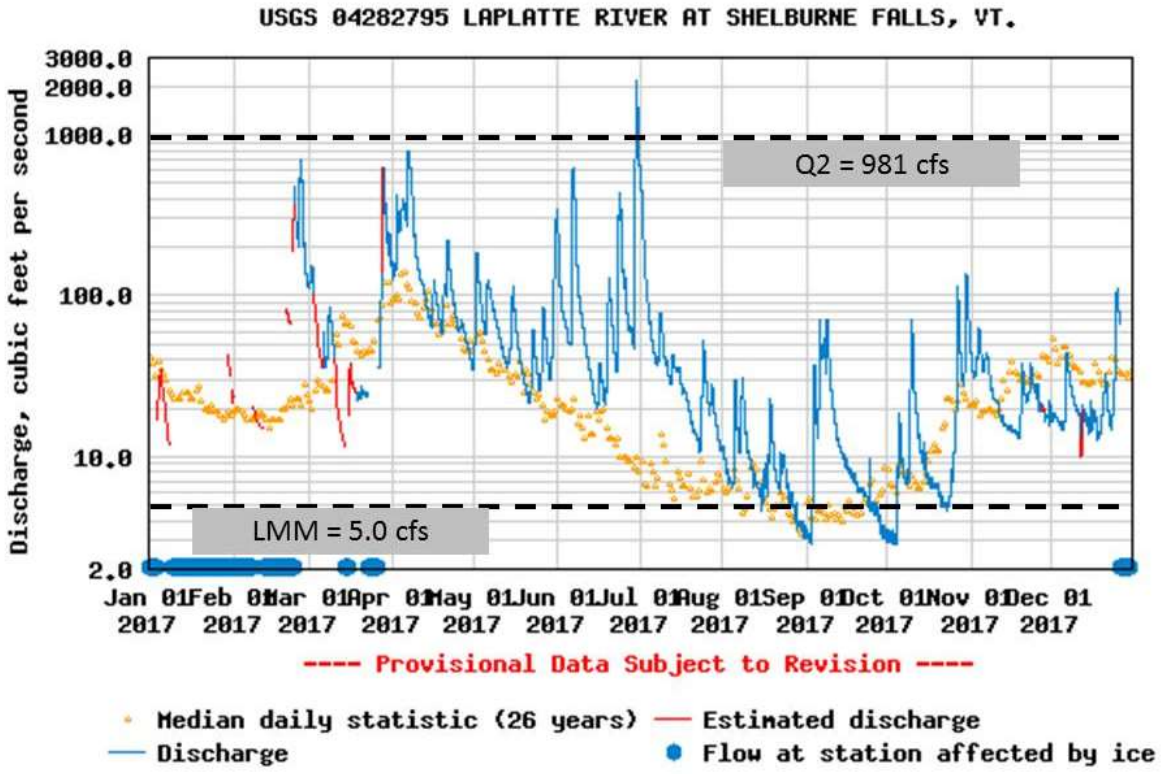

Figure A-1. Instantaneous Discharge Recorded at Shelburne Falls on the LaPlatte River in 2017.

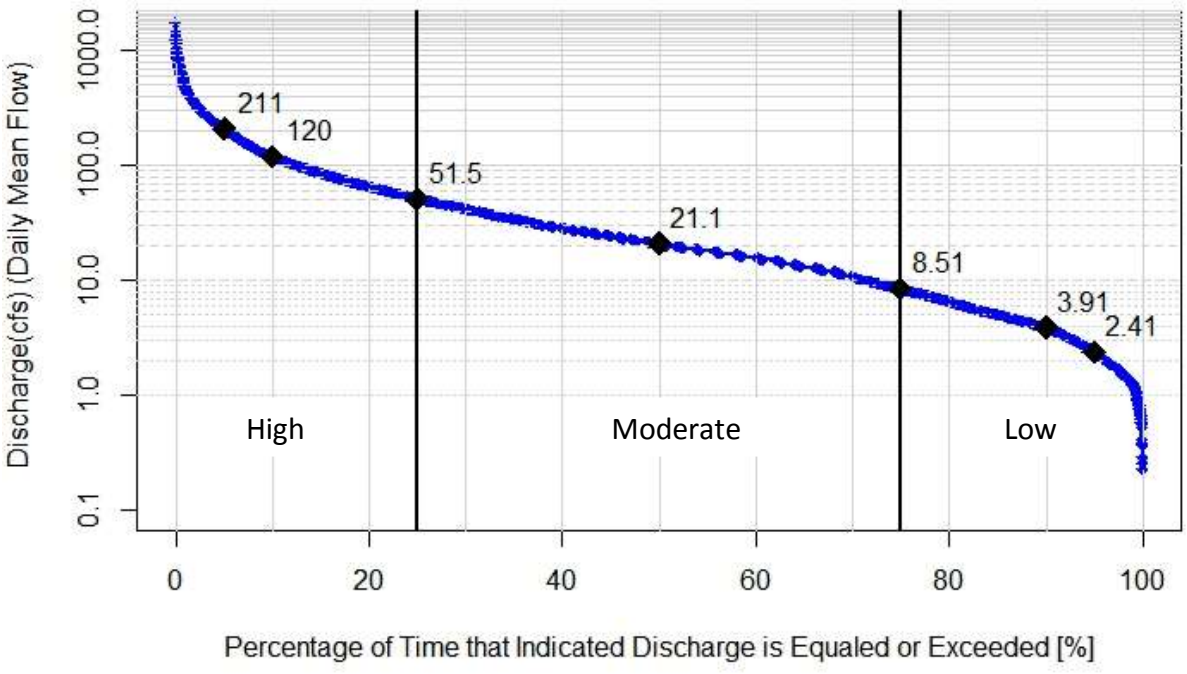

Figure A-2. Flow Duration Curvey for LaPlatte River at Shelburne Falls, water years 1992-2016.

Appendix B

Water Quality Data Tables by Watershed

Abbreviations:

TN = Total Nitrogen
TP = Total Phosphorus
DP = Dissolved Phosphorus
TSS = Total Suspended Sediments

MPN/100 mL = organisms per 100 milliliters
mg/L = milligrams per liter
ug/ 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	Chloride (mg/L)	TN (mg/L)	NO2-NO3 (mg/L)	TP (µg/L)	DP (µg/L)	TSS (mg/L)	Turbidity (NTU)
LP 03	4/6/2017	14.4	0.52	0.2	62.3	32.9		24.9
LP 05	4/6/2017	14.7	0.47	0.18	54.4	25		15.2
LP 09	4/6/2017	17.9	0.47	0.16	36.7	15.8		9.37
LP 03	5/2/2017	21.1	0.66	< 0.05	114	25.5		51.2
LP 05	5/2/2017	25.2	0.63	< 0.05	78.2	27.7		33.4
LP 09	5/2/2017		0.49	< 0.05	47.4	24		10.1
LP 03	6/6/2017	18.9	0.35	0.06	30.7	14		7.56
LP 05	6/6/2017	18.8	0.41	0.07	50.2	20.3		9.32
LP 09	6/6/2017	23.2	0.22	< 0.05	30.3	15.1		5.77
LP 03	10/25/2017	27.8	0.26	< 0.05	28.2	16.7		4.4
LP 05	10/25/2017	33.4	0.45	0.15	35.9	15.5		7.5
LP 09	10/25/2017	31.8	0.43	0.06	46	20.1		8.75

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 ug/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.

McCabe's Brook (LaPlatte River Tributary)

Site	Date	Chloride (mg/L)	TN (mg/L)	NO2-NO3 (mg/L)	TP (µg/L)	DP (µg/L)	TSS (mg/L)	Turbidity (NTU)
MB 02	4/6/2017	34	0.72	0.36	98	46.1	31.8	
MB 02a	4/6/2017	33	0.66	0.32	63.8	49.1	12.8	
MB 04	4/6/2017	24.5	0.73	0.33	58.2	52.9	8.14	
MB 05	4/6/2017	16.7	0.38	0.06	27.9		4.25	
MB 02	5/2/2017	38.3	1.03	0.11	190	88.3	59.5	
MB 02a	5/2/2017	35.45	0.93	0.09	156	98.8	25.6	
MB 04	5/2/2017	30.2	0.98	0.08	150	106	18.86	
MB 05	5/2/2017	19.9	0.58	< 0.05	58.6	31.1	14.57	
MB 02	6/6/2017	44.35	0.35	0.07	39.5	22.3	7	
MB 02a	6/6/2017	40.15	0.3	< 0.05	31.6	24.2	2.821	
MB 04	6/6/2017	48.3	0.39	< 0.05	47	35.6	3.291	
MB 05	6/6/2017	15.6	0.38	< 0.05	38.9	30.6	2.469	
MB 02	10/25/2017	37.4	0.23	< 0.05	105.8	38.3	19.25	
MB 02a	10/25/2017	63	0.22	< 0.05	35.2	18	5.8	
MB 04	10/25/2017		0.35	< 0.05	78.6	31.3	3.8	
MB 05	10/25/2017	30.6	0.59	< 0.05	156	130	5.2	

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 ug/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.

Thorp Brook (direct drainage to Lake Champlain)

Site	Date	Chloride (mg/L)	TN (mg/L)	NO2-NO3 (mg/L)	TP (µg/L)	DP (µg/L)	TSS (mg/L)	Turbidity (NTU)
T 01	4/6/2017		0.65	0.33	95.1		48	
T 01a	4/6/2017		0.58	0.31	112	26.9	69	
T 01b	4/6/2017		0.41	0.16	86.4	19.9	40	
T 01c	4/6/2017		0.72	0.43	188	30.3	76.5	
T 01d	4/6/2017		0.72	0.42	90.4	31	37.4	
T 03a	4/6/2017		2.13	1.81	62	45.3	4.6	
T 01	5/2/2017		0.71	0.06	161		114	
T 01a	5/2/2017		0.67	0.05	164	25.3	114	
T 01b	5/2/2017		0.43	< 0.05	103	14.1	75.67	
T 01c	5/2/2017		0.94	0.11	205	36.2	165	
T 01d	5/2/2017		0.84	0.12	144	36.5	67.33	
T 03a	5/2/2017		0.81	< 0.05	80.1	40.7	4.6	
T 01	6/6/2017		0.36	0.09	65.9	20.3	63.544	
T 01a	6/6/2017		0.36	0.1	46.1	20	15.402	
T 01b	6/6/2017		0.24	< 0.05	44.7	21	11.714	
T 01c	6/6/2017		0.53	0.35	45.3	29.3	15.89	
T 01d	6/6/2017		0.71	0.52	90.1	29	45.61	
T 03a	6/6/2017		0.54	< 0.05	85.6	53	6.41	
T 01	10/25/2017		0.27	< 0.05	83.8	43.3	11.6	
T 01a	10/25/2017		0.41	< 0.05	75	21.3	40.4	
T 01b	10/25/2017		0.27	< 0.05	52.8	12.2	28.6	
T 01c	10/25/2017		0.44	< 0.05	106.6	66.5	9.4	
T 01d	10/25/2017		0.42	< 0.05	119.2	64	27.2	
T 03a	10/25/2017		0.45	< 0.05	366	136	7.43	

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 ug/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.

Kimball Brook (direct drainage to Lake Champlain)

Site	Date	Chloride (mg/L)	TN (mg/L)	NO2-NO3 (mg/L)	TP (µg/L)	DP (µg/L)	TSS (mg/L)	Turbidity (NTU)
K 01	4/6/2017		1.55	1	134	108	9	
K 02	4/6/2017		1.71	1.4	75.1	44.7	22.2	
K 03	4/6/2017		0.61	0.27	75.2	46.2	18	
K 02	5/2/2017		0.81	0.12	108	50.4	50.29	
K 03	5/2/2017		0.61	< 0.05	80	40.8	27.8	
K 02	6/6/2017		1.65	1.66	43.4	25.5	10	
K 03	6/6/2017		0.33	< 0.05	75.1	57.2	10.13	
K 02	10/25/2017		0.5	< 0.05	351	291	3.67	
K 03	10/25/2017		0.3	< 0.05	51.7	46.3	9.33	

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 ug/L** at low median monthly flow during June through October in a section of the stream representative of well-mixed flow.

Appendix C

Monitoring Station Locations and Rationale

LaPlatte River

Site ID	Flow Target	Site Location and Remarks	Site Lat	Site Long
LP 03 (LR04)	H	LaPlatte River at Falls Road. East (right bank), 30 meters south of Falls Rd bridge. Hinesburg. Upstream drainage 44.8 sm.	44.37022	-73.21577
LP 05	H	LaPlatte River at Carpenter Road Bridge. Left bank, 5 meters upstream from bridge. Charlotte. Upstream drainage 31.2 sm.	44.34176	-73.1838
LP07a	L	LaPlatte River below Hinesburg WWTF Outfall near DEC Biostation		
LP 08	L	LaPlatte River ~40 meters below Hinesburg WTF Outfall.	44.33319	-73.12618
LP 09	H/L	LaPlatte River. 15 meters upstream of Hinesburg WTF Outfall. Hinesburg. Upstream drainage 17.7 sm.	44.33395	-73.126

McCabe's Brook (LaPlatte River watershed)

Station No.	Flow Target	Coordinates	Town	Description	Remarks
MB 02	H	44.38305 -73.23853	Shelburne	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.
MB 02a	H	44.37502 -73.23881	Shelburne	McCabe's Brook off path starting from the end of School Street in Shelburne. Right bank.	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.
MB 03 (LR 03)	H	44.36892 -73.23586	Shelburne	McCabe's Brook, Bostwick Rd. Bridge. Left bank at downstream discharge from culvert.	Stream plunges upstream below Route 7. Forest, wetlands, in-stream pebble, sand, and silt deposition.
MB 04	H	44.36230 -73.23461	Shelburne	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 on east drainage.
MB 04a	H	44.36086 -73.23405	Shelburne	McCabe's Brook, Vermont Teddy Bear access road	Upstream Route 7 fill disposal on farm fields on east drainage. Upstream from disposal site, pasture and corn fields with manure spreading on west drainage. Upstream drainage 3.31 mi^2.
MB 05 (LR 05)	H	44.34582 -73.22868	Charlotte	McCabe's Brook, Lime Kiln Rd. bridge. Downstream discharge from culvert.	Horses upstream, west (left) bank. Nordic Farm upstream west drainage.

Thorp and Kimball Brooks

Station No.	Target Flow	Coordinates	Town	Description	Remarks
T 01	H	44.273073 -73.256597	Charlotte	Thorp Brook west of Greenbush Road. Right bank. Walk downstream about 50 feet. Sample mainstem below confluence of tributary	Upstream from Lake Champlain backwater. Drains residential, farms and agricultural land from the north. Upstream drainage 2.93 mi^2.
T 01a	H	44.28177 -73.25335	Charlotte	Thorp Brook north side of East Thompson's Point Road and downstream of trib.	Drains road, residential,farm and agricultural land from the north. Upstream drainage ____ mi^2.
T 03	H	44.2835 -73.26279	Charlotte	West Tributary to Thorp Brook south side of East Thompson's Point Road.	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.
K 01	H	44.2604 -73.2617	Charlotte	Kimball Brook 10 feet south of Town Line Road.	Drains agriculture and pollutants from Town Line Rd to Greenbush Road.
K 02	H	44.25934 -73.24867	Charlotte	Kimball Brook 25 feet east of Greenbush Road.	Upstream from Lake Champlain backwater. Drain farmland and housing lots from the east, and including wooded land west of Route 7 and Mount Philo. Upstream drainage 1.87 mi^2.
K 03	H	44.2706 -73.2352	Charlotte	Kimball Brook west of Route 7, about 20 feet upstream of the culvert under road into the Claflin Farm development.	Drains agricultural runoff and Route 7 and local roads runoff.

Appendix D

Physical Characteristics of SCRW Watersheds

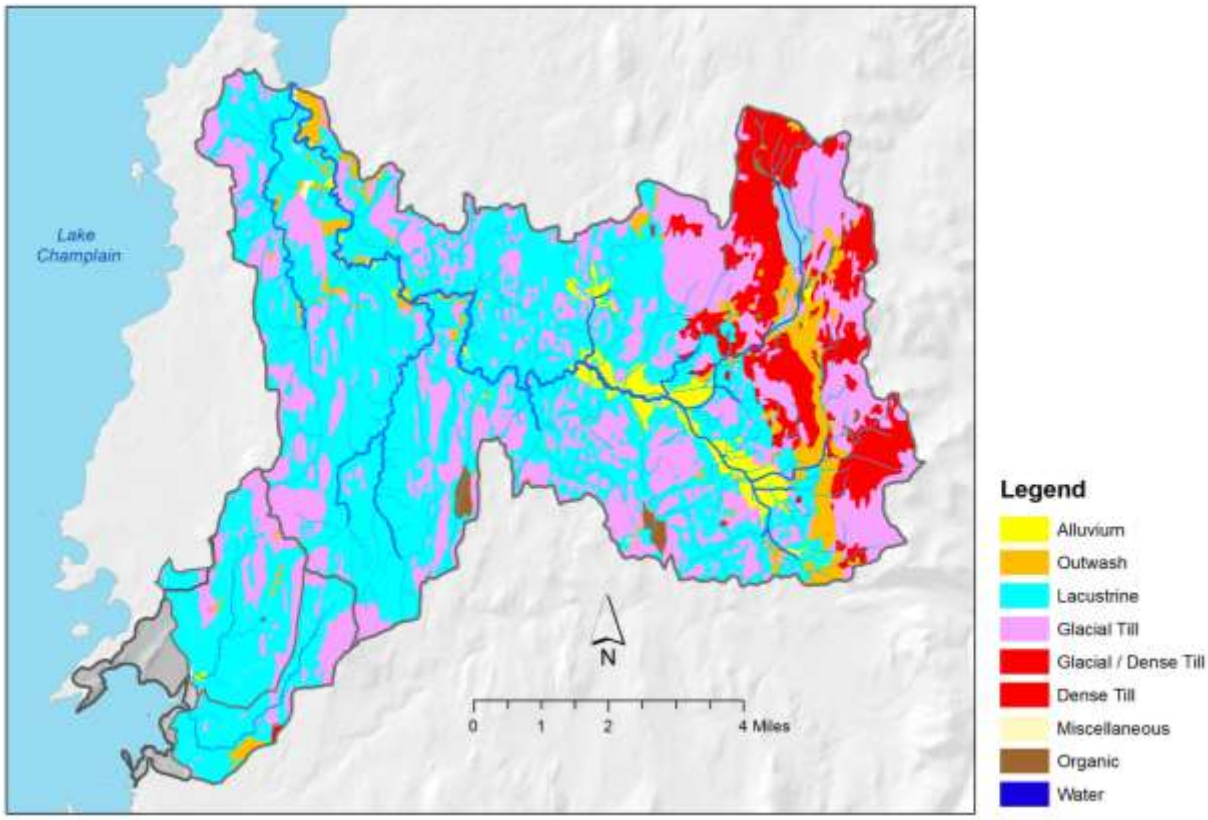

Figure D-1. Distribution of Soils, by Parent Material, in the SCRW watersheds.

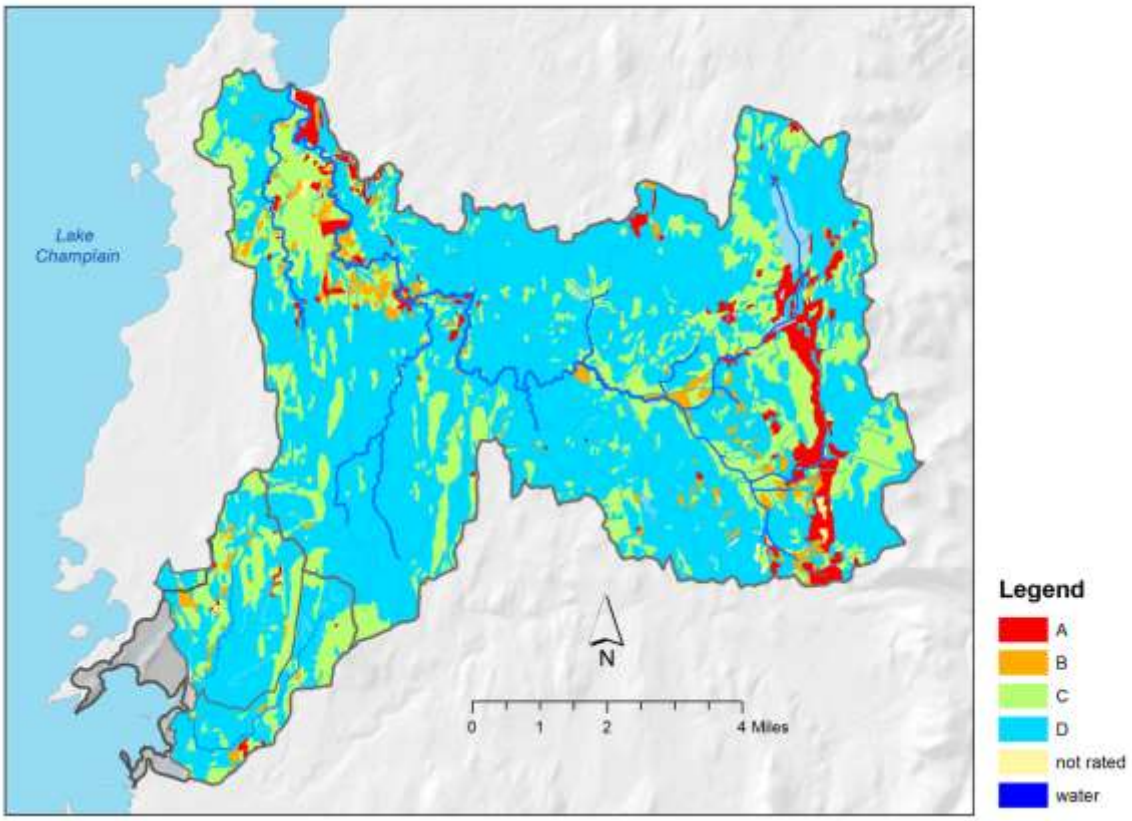

Figure D-2. Distribution of Soils, by Hydrologic Soil Group, in the SCRW watersheds.

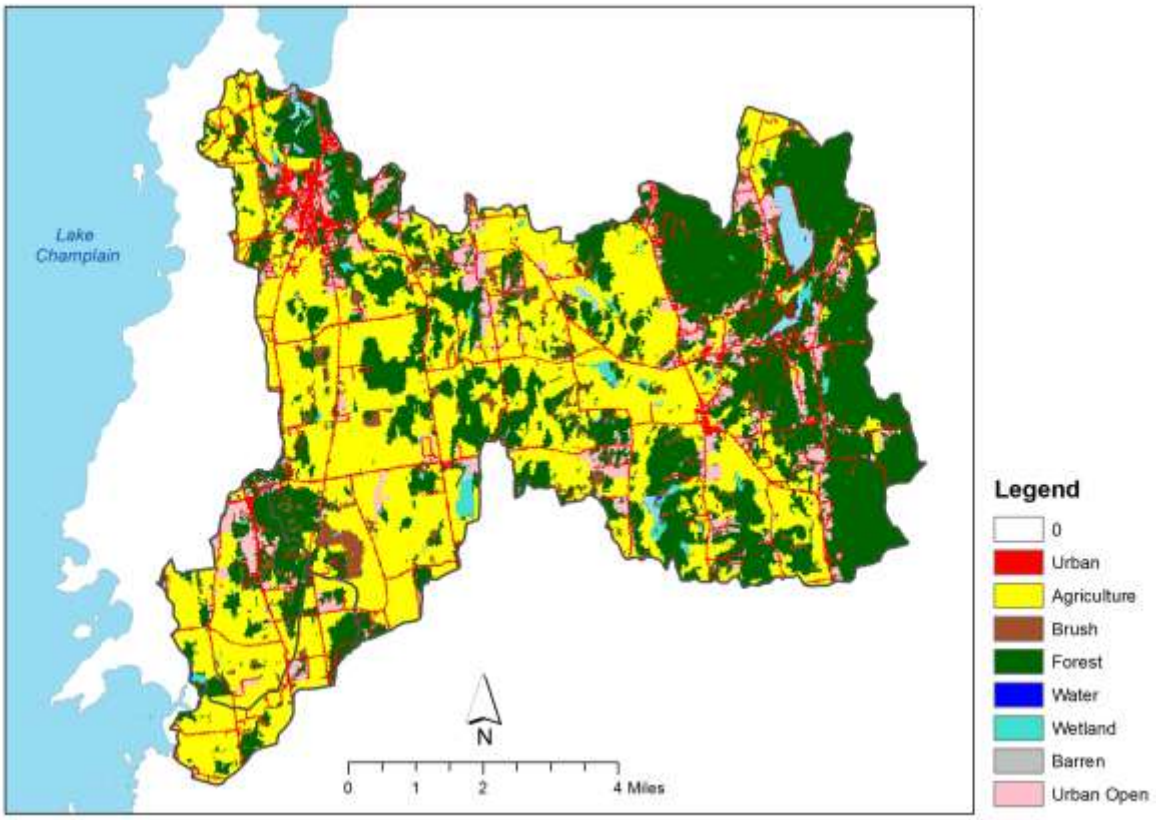

Figure D-3. Distribution of Land Cover / Land Use in the SCRW watersheds (source date: 2001).