

## McCabe's Brook Watershed

### 2015 Water Quality Summary

### South Chittenden River Watch

2015 Water quality monitoring took place at six different sites along McCabe's Brook as part of a focus study to obtain detailed water quality data during spring and summer months, between the upper reaches along Lime Kiln Road in Charlotte and the lower reaches along Harbor Road in Shelburne. The VT DEC LaRosa Program performed all lab services, and worked with SCRW to ensure that all work was in accordance with a joint EPA approved Quality Assurance Plan. All QA approved data were entered into the State and EPA Storet databases. With help from the Shelburne Wastewater Plant, base flow data was collected on three dates in September 2015. High flow data were collected by SCRW on ten dates throughout the spring and summer, based on rainfall at McCabe's Brook at Shelburne Wastewater Treatment Facility. SCRW uses high flow target rates of greater than 75 cfs.

Only high flow data was used for the focus study for several reasons. First, high flow events lead to more sediment and nutrient loading in Shelburne Bay and Lake Champlain. Second, sampling only high flow events over multiple years makes for results that are more comparable. Third, high flows enhance the sensitivity of results to impacts affecting water quality and specific characteristics of the watershed. Lastly, high flow events provide more complete data on the influence of upstream flow on the entire stream, whereas low and moderate flows are highly variable and are therefore not an accurate depiction of the whole system. It is important to note that water quality results taken at high flow rates are not comparable to results prior to 2014 taken at random flow rates.

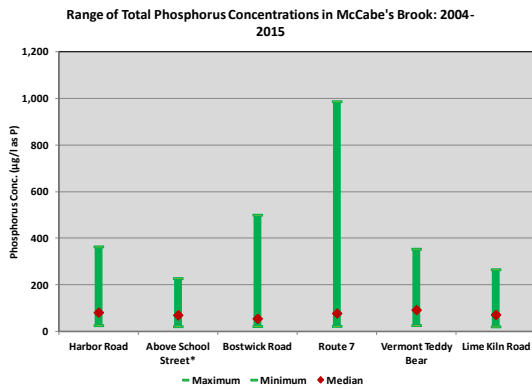
*Escherichia coli* in 2014 were well below the state limit of 235 organisms/100mL in April and May, yet far exceeded the limit of the test in June, July, and August. Due to high flow monitoring and the limits of the test, E.coli was suspended in 2015. The 2014 *E. coli* results strongly reinforce the conclusion that manure runoff from agricultural fields and an animal watering pond may have contributed to the high *E. coli* counts and the high levels of dissolved phosphorus and nitrogen, particularly nitrate plus nitrite. These data results coincide with an increase in particulate phosphorus and a decrease in dissolved phosphorus from the upper reaches to the lower reaches of the stream.

**Chloride** increased slightly from 2014 to 2015 and occurs in animal waste and road salts. A stream with natural levels of chloride that is unaffected by outside sources will range between 10 and 20 mg/l of chloride. The median concentration of chloride in the upper-most reach measured was 16 mg/l. Chloride concentrations steadily increased downstream, with a median concentration of 45 mg/l at Harbor Road. This suggests road salts are impacting the chloride concentrations. In addition, chloride concentrations decreased during high flow events as the summer progressed. Again, this coincides with road salts from the winter being washed into streams in greatest concentrations in the spring, and decreasing as there is less salt entering the system throughout the season. The increase over the downstream reach adjacent to the School Street neighborhood in 2015

suggests the influence of storm drainage entering from outfalls in the School Street neighborhood and Shelburne Town.

**Suspended Sediment** levels were consistent in the upper reaches of McCabe’s Brook, with little variability. Concentrations increased at the School Street neighborhood in Shelburne, where there is storm water discharge. Between Route 7 and Bostwick Road, the stream is subject to stream bank failure and bottom scour at several sites, making it a “hot spot” for nutrients and sediment to enter the stream. The river channel is constricted by Route 7 and is therefore at continued risk for mass failure. Increased suspended sediment concentrations are directly correlated with increased particulate phosphorus concentrations.

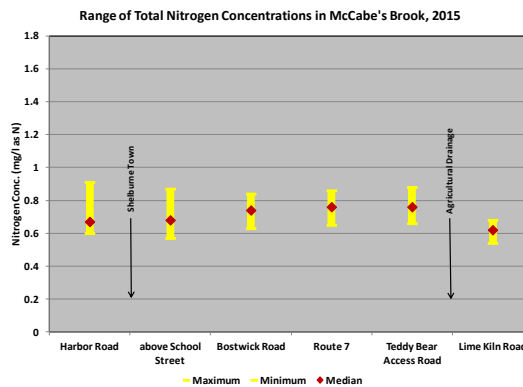
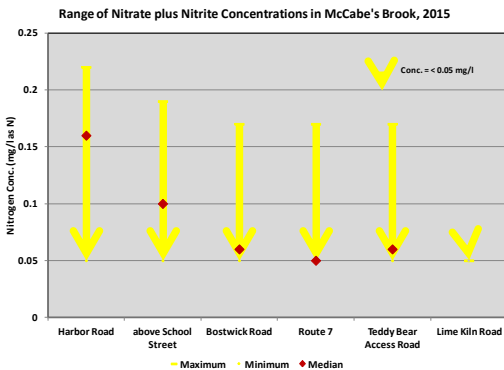
**Phosphorus** concentrations can be broken down into dissolved phosphorus and particulate phosphorus. Spikes in phosphorus levels can be correlated with a large influx of



particulate matter, such as the stream bank collapse near Route 7, in which the phosphorus concentration reached 987 µg/l on one occasion, 950 µg of which was particulate phosphorus. Historically, total phosphorus levels have been below 100 µg/l. Spikes in dissolved phosphorus is typically indicative of agricultural runoff. The stretch of McCabe’s Brook between Lime Kiln Road and Vermont Teddy Bear is an example of this. Increased levels of dissolved phosphorus were accompanied by increased total nitrogen

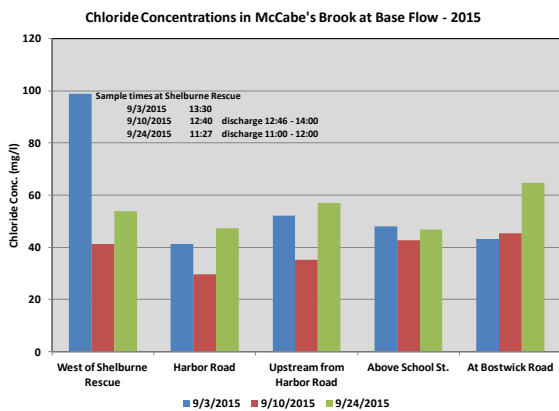
and nitrate plus nitrite, further indicating agricultural runoff was the cause. Concentrations of dissolved phosphorus decreased downstream, and concentrations of particulate phosphorus inversely increased downstream.

**Nitrogen** is sensitive to runoff events and is therefore a good indicator of agricultural runoff. Concentrations of nitrogen and nitrate plus nitrite during high flow events in 2015 were slightly higher than historic records, though lower than 2014 records. In particular, between Lime Kiln Road and Vermont Teddy Bear has increased nitrogen values, indicating runoff from an animal watering pond and horse farm which drains to that particular stretch of McCabe’s Brook.



**Loading Rates** of nutrients and suspended sediments are difficult to compare throughout the entirety of McCabe’s Brook due to the complex morphology of the stream. The flow and loading rates are more meaningful when broken down into two distinct segments - one above Vermont Teddy Bear (upstream drainage area) and one below Harbor Road (downstream drainage area). The upstream drainage area had consistent phosphorus and nitrogen loading rates, while the downstream drainage area had highly variable phosphorus and nitrogen loading rates, due to the highly variable flow rates from upstream. Suspended solids loading rates were consistent and low upstream, and were high and variable downstream where they were impacted by in-stream scour, erosion, and urban storm drainage.

**Base flow** data was collected on three occasions in September 2015 to supplement a VT DEC Biomonitoring assessment at VT DEC’s lower MacCabe’s Brook Biomonitoring site. Base flow refers to the water in a stream that originated from ground water, and not rain



(and therefore not runoff). Two September sampling dates were not affected by rainfall, but the September 10<sup>th</sup> sampling date was likely affected by rainfall. Sampling yielded low values for phosphorus and nitrogen concentrations, reflecting little influence by outside sources of runoff. Chloride values ranged from 35 mg/l to 99 mg/l. A stream that is unaffected by outside sources of chloride will range between 10 and 20 mg/l, which indicates that the groundwater feeding McCabe’s Brook is affected by road salts. Monitoring base flow conditions also allowed for

seeing the impact of the effluent from the Shelburne Waste Water Treatment Facility #2 on the stream, without variables such as rain affecting the data results. The 2015 results suggest that the effluent does impact stream water quality, in particular total phosphorus and chloride.

### Recommendations and Follow-up Actions

- Monitoring of water quality in McCabe’s Brook should be continued at all sampling sites due to the complex factors affecting water quality and the importance of upstream and downstream “Hot Spots”. Moreover, the ongoing VT Department of Conservation evaluation of McCabe’s Brook based upon these data and biological samples taken at low flow will determine the future classification of this water body.
- Targeting of high flows should be continued because:
  - Results are consistent from year to year
  - Results are highly sensitive to factors affecting water quality and events in the watershed
  - High flows represent the whole watershed and stream in contrast to low and moderate flows at which downstream flows are influenced in highly variable

ways by upstream flows, raising the question of the validity of random flow sampling

- In general, there has been a high degree of consistency among monitoring results for solids, phosphorus, and nitrogen, suggesting that median concentrations determined at high flows may provide a useful tool for following trends and changes in water quality in response to mitigation efforts or other changes within the watershed
- The upstream “Hot Spot” between Lime Kiln Road and Vermont Teddy Bear influenced by agricultural and farm runoff should be targeted in an effort to improve best management practices to reduce nutrient flow to the stream originating from agricultural and farm runoff and vulnerability to high risk events.
- Priority should be given to projects, such as the floodplain encroachment hot spot area adjacent to Route 7, to relieve exacerbating mass failure conditions in the stream that degrade flow characteristics, stream equilibrium conditions and water quality.
- The downstream “Hot Spot” in the School Street neighborhood should be targeted to identify i) specific sources of sediment and nutrients and ii) potential actions to reduce sources and their impact on the stream.
- The Town of Shelburne should implement water quality improvement strategies recommended in the Lewis Creek Association report “ Phase Two Geomorphic Study and Corridor Plan, McCabe’s Brook Watershed” (Milone and MacBroom, 2012) to address drainage and stormwater issues in the lower McCabe’s Brook.

The South Chittenden River Watch is funded in part by the Towns of Shelburne and Charlotte. The 2015 SCRW team included: Bill Hoadley, Susan Moegenburg, Thomas Newcomb, Judy Raven, Bob Hyams, Myra Handy, Joannah Ralston, Ray Mainer, Ed Sengle, Jon Trefry, Andrea Morgante and Marty Illick. Shelburne Water Treatment Plant Chris Robinson and Steve Williams assisted with the 2015 base flow study.

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