

Little Otter Creek - 2016 Water Quality Summary
Addison County River Watch Collaborative

Site	Location	Town
LOC4.3	Route 7 Bridge	Ferrisburgh
LOC7.8	Middlebrook Rd (North)	Ferrisburgh
LOC10	Monkton Road	Ferrisburgh
LOC14.4	Plank Rd.	New Haven
LOC20.3	Sawyer Road Bridge	New Haven
LOC21.5	Kilbourn property	Bristol
MDC1.2	Wing Rd./Middlebrook Rd. (South)	Ferrisburgh
LOCNB0.2	Norton Brook	Bristol

The Addison County River Watch Collaborative has been monitoring water quality in the Little Otter Creek since 1997. For the 2016 and 2017 seasons, the Little Otter Creek is the subject of a more intensive monitoring focus, where rotational as well as sentinel stations are monitored and additional parameters are being tested to better define spatial variability in pathogen, sediment and nutrient concentrations. Sentinel station LOC4.3 is located within a river segment that is listed as impaired (303D list, Part D) for contact recreation use due to *E.coli* from agricultural runoff (VTDEC, 2016). Sentinel station MDC1.2 is located on Mud Creek tributary within a segment that is considered stressed by *E.coli* from agricultural runoff that may be impacting contact recreation uses of these waters (VTDEC, 2016). Three new water quality monitoring stations were established in the watershed to complement two existing sentinel stations (LOC4.3 and MDC1.2) and three stations monitored during a previous focus effort in 2010 and 2011 (stations LOC7.8, LOC10, and LOC14.4). Station LOC20.3 was established at the Sawyer Road Bridge crossing of the upper Little Otter Creek. A one-mile segment of the river spanning this station is listed as impaired (303D List, Part A) for aquatic life support uses due to nutrients and sediment resulting from agricultural runoff, and for contact recreation uses due to pathogens (303D List, Part D; VTDEC, 2016). An additional station was established at LOC21.5, approximately one mile upstream of this station and west of Burpee Road. A third new station was set up at the Plank Road crossing of Norton Brook a tributary to Little Otter Creek draining The Watershed Center and adjacent agricultural lands in northwest Bristol.

During 2016, sampling occurred on two spring dates (April 6 and May 4) and four summer dates (June 1, July 6, August 3, and September 7). Following a February thaw and final ice-out and snowmelt in early March, the April and May sampling events took place during relatively low flows, characterized as baseflow conditions on the river, based on streamflow gaging records from the USGS streamflow gage located at the Route 7 crossing of Little Otter Creek. Given below-normal rainfall, the June, July, August and September events occurred during low to very-low flows also representative of baseflow conditions (i.e., relatively stable flow stage, not significantly rising or falling in response to a rainfall or snowmelt event). On an average annual basis, flows in 2016 were below normal in the six Addison County watersheds monitored by the Collaborative.

Samples were tested for *E.coli*, phosphorus (total and dissolved), total nitrogen, total suspended solids, and turbidity; *E.coli* was tested only on the summer dates.

E.coli counts at Little Otter Creek stations ranged from 14.5 to 1414 organisms/100 mL. Vermont Water Quality Criteria (October 2014) state that *E.coli* is not to exceed a geometric mean of 126 org /100mL obtained over a representative period of 60 days, and no more than 10% of samples should be above 235 org/100 mL. *E. coli* counts at four of the stations exceeded the state's health-based standard of 235 org/100 mL on at least one of the four summer sampling dates: LOC7.8 (Middlebrook Rd), LOC20.3 (Sawyer Road), LOC21.5

(Kilbourn), and MDC1.2 (Mud Creek tributary at Middlebrook Rd) (Figure 1). The geometric mean value at these four sites exceeded the state’s water quality standard of 126 org/ 100 mL (Figure 2). Detected *E.coli* counts at sentinel stations LOC7.8 and MDC1.2 were largely consistent with historic monitoring results which have included chronic exceedances of the standard.

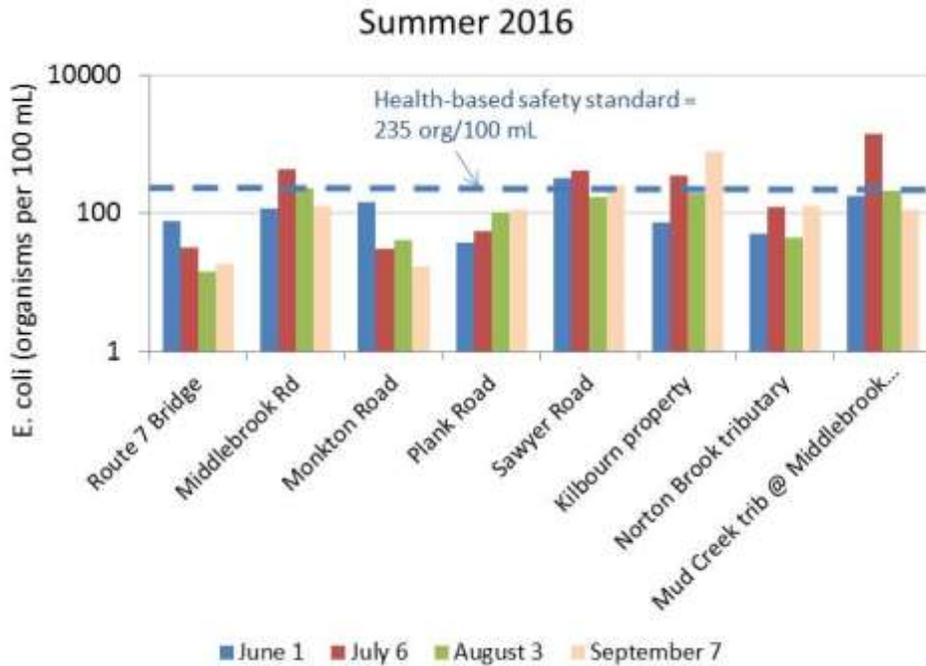


Figure 1. *E.coli* measured at Little Otter Creek stations on four dry-weather, low-flow dates in 2016.

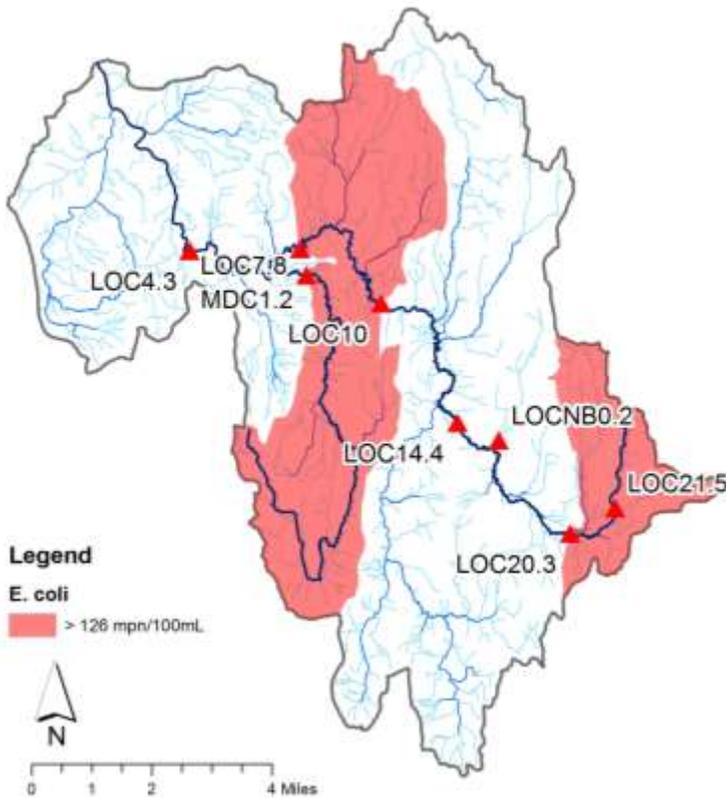


Figure 2. *E.coli* monitoring results for Little Otter Creek, on four summer sampling dates exhibiting dry-weather, low-flow conditions, 2016. Subwatersheds draining to stations with geometric mean values greater than 126 org/100 mL are depicted in red.

Turbidity levels reported for the Little Otter Creek stations ranged from 0.5 to 156 NTUs, with a mean level of 29 NTUs for the six sample dates. The Vermont state standard of 10 NTUs (for Class B cold-water fisheries) is applicable during dry-weather, baseflow conditions which were relevant to all six sample dates. Except for stations LOC20.3 and LOC21.5, Turbidity values exceeded this standard on three or more sampling dates. The distribution of Turbidity results is displayed in the box-and-whisker plot below (Fig 3). The whiskers extend to the maximum and minimum values detected over six sampling events, while the gray-shaded box represents the interquartile range of values. The median value is marked by the dark horizontal line. The blue diamond marks the mean of that subset of samples collected during baseflow conditions, with the corresponding number of samples (n) indicated in blue along the top of the chart. Based on past years' sampling results, Turbidity values tend to increase with distance downstream along the main stem. Turbidity can also become elevated at times of increased flow – during a Summer thunderstorm, or during Spring runoff conditions.

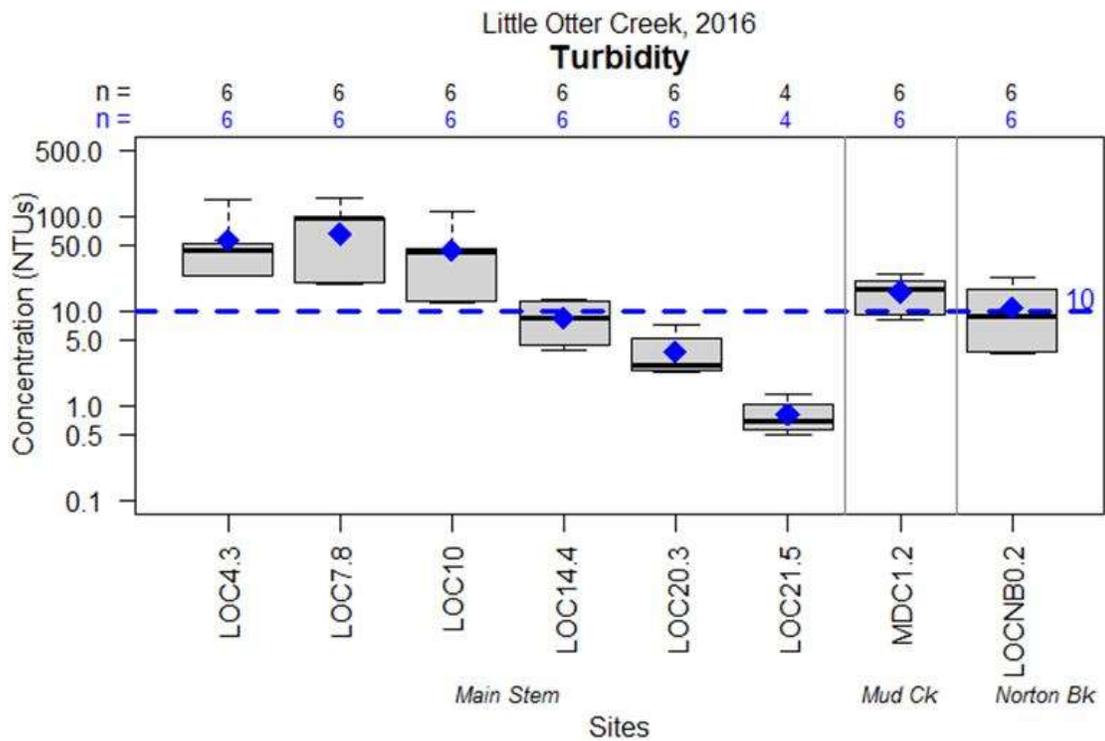


Figure 3. Summary of Turbidity Results for Little Otter Creek, 2016.

Nitrogen levels were detected at relatively low concentrations at most stations during the spring and summer sampling dates. Concentrations ranged from 0.2 to 6 mg/L, with an average of 1.6 mg/L. Highest nitrogen concentrations were detected in the two headwaters stations, LOC20.3 and LOC21.5, which have incremental drainage areas characterized by 42 % and 65% agricultural land use, respectively. According to Vermont Water Quality Standards, nitrogen as nitrate (NO₃) is not to exceed 5.0 mg/L at flows exceeding the low median monthly discharge. In order to evaluate nitrogen levels in the Little Otter Creek with respect to this standard, a more specific lab test will be scheduled for these stations in 2017 to distinguish between nitrite and nitrate forms of nitrogen.

Phosphorus levels were detected at low to moderate concentrations during the six spring and summer sampling dates, ranging from 16 to 185 µg/L, with an average of 79 µg/L. 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 flow conditions during June through October. Flows in the Little Otter Creek were below the low median monthly flow on the July, August, and September sample dates, based on records from the USGS streamflow gage located at the Route 7 crossing. The mean of the phosphorus results available for these three summer sampling dates exceeded the instream nutrient standard of 27 µg/L at all sampled stations (Figure 4). Historic results for both sentinel and rotational sites have shown an increasing trend in phosphorus concentration with distance downstream, as well as a tendency for elevated phosphorus concentrations during high flows. Dissolved phosphorus was also tested at each site; as a percent of Total Phosphorus, DP ranged from 19 to 100% during these six sample dates which occurred during dry-weather, low-flow conditions.

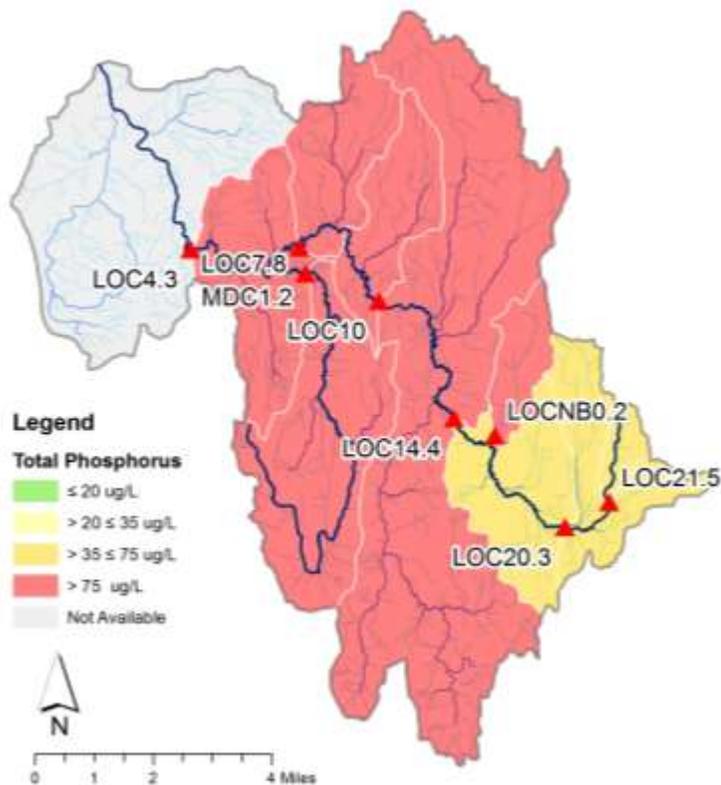


Figure 4. Mean value of Total Phosphorus detected on July, August and September sample dates during low flow conditions at or below the Low-Median-Monthly Flow, Little Otter Creek, 2016.

2017: The Little Otter Creek will continue to be a focus watershed in 2017, with the same sentinel and rotational sites monitored for *E.coli*, total and dissolved phosphorus, total nitrogen, and turbidity. Given the elevated TN concentrations at upper main stem sites, an additional lab analysis has been scheduled to distinguish between nitrite and nitrate forms of nitrogen. Beginning in year 2018 and continuing through 2021, the number of sampling locations in this watershed will be reduced to two sentinel stations, LOC4.3 and MDC1.2, as the focus of more intensive sampling rotates to another Collaborative watershed.

For more information, contact the Little Otter Creek sampling coordinator:
 Deb Healey, 475-2944, lumiere@gmavt.net
 Addison County River Watch Collaborative managing director:
 Matt Witten, 434-3236, mwitten@gmavt.net
 or visit our web page at: www.acrpc.org/acrwc