Focus watershed:
2018 and 2019

Lewis Creek - 2018 Water Quality Summary

Addison County River Watch Collaborative (ACRWC), Lewis Creek Association (LCA)
Prepared by South Mountain Research and Consulting

Type	Stream	Site	Location	Town
R	Lewis Creek	LCR0.3	Boat Access upstream of Hawkins Bay	Ferrisburgh
S	Lewis Creek	LCR3.7	Old Route 7 Bridge	Ferrisburgh
R	Lewis Creek	LCR9.9	Upper Covered Bridge, Roscoe Rd.	Charlotte
R	Pond Brook	LCT3D.5	Silver Street culvert	Monkton
S	Lewis Creek	LCR14	Tyler Bridge	Monkton
O	Hollow Bk (Lewis Ck)	LCHLW1.0	Tyler Bridge Rd X'g of Hollow Bk	Hinesburg
O	Hollow Bk (Lewis Ck)	LCHLW0.1	Hollow Brook at Confl w/ Lewis	Monkton
O	Lewis Creek	LCR14.3	Just above confluence of Hollow Bk	Starksboro
O	Lewis Creek	LCR15	Just above Clifford stabilized crossing	Starksboro
O	Lewis Creek	LCR16	LaRue bridge crossing	Starksboro

The ACRWC and member LCA have been monitoring water quality in the Lewis Creek since 1992. Year 2018 was the first of a two-year , more intensive monitoring focus in the Lewis Creek, where rotational (R) sites as well as long-term, sentinel stations (S) were monitored, and additional parameters were tested to better define spatial variability in pathogen, sediment and nutrient concentrations. Additionally, monitoring in vicinity of the Tyler Bridge Road crossing was continued from the previous year as part of a special project (O = Other) to bracket known or suspected source regions of bacterial contamination, in support of a Total Maximum Daily Load for Bacteria-impaired waters.[4]

During 2018, sampling occurred on two spring dates (April 4 and May 2) and four summer dates (June 6, July 11, August 1, and September 5). The year was characterized by near-normal precipitation, overall. April and May sampling events took place during high flow conditions resulting from snowmelt and spring rains, based on records from the USGS streamflow gaging station near VT Route 7. The June event occurred during moderate-flow, baseflow conditions where river stage was not changing appreciably, and groundwater levels were relatively high following spring rains. The July, August, and September events coincided with low-flow, baseflow conditions, at or below the Low Median Monthly (LMM) flow.

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

E.coli counts at the bracket stations (Figure 1) ranged from 18 to >2420 organisms/100 mL for the four summer sampling dates in 2018. Vermont Water Quality Standards (VWMD, 2016) 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 exceeded the state's health-based standard of 235 org/100 mL for a majority of the sample dates at bracket stations LCR16 through LCR14 (Figure 2). The geometric mean of results exceeded the state's geomean standard of 126 organisms/ 100 mL at these same stations during the dry-weather, base-flow conditions encountered in the summer of 2018 (Figure 3).

[4] http://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mp_bacteriatmdl.pdf

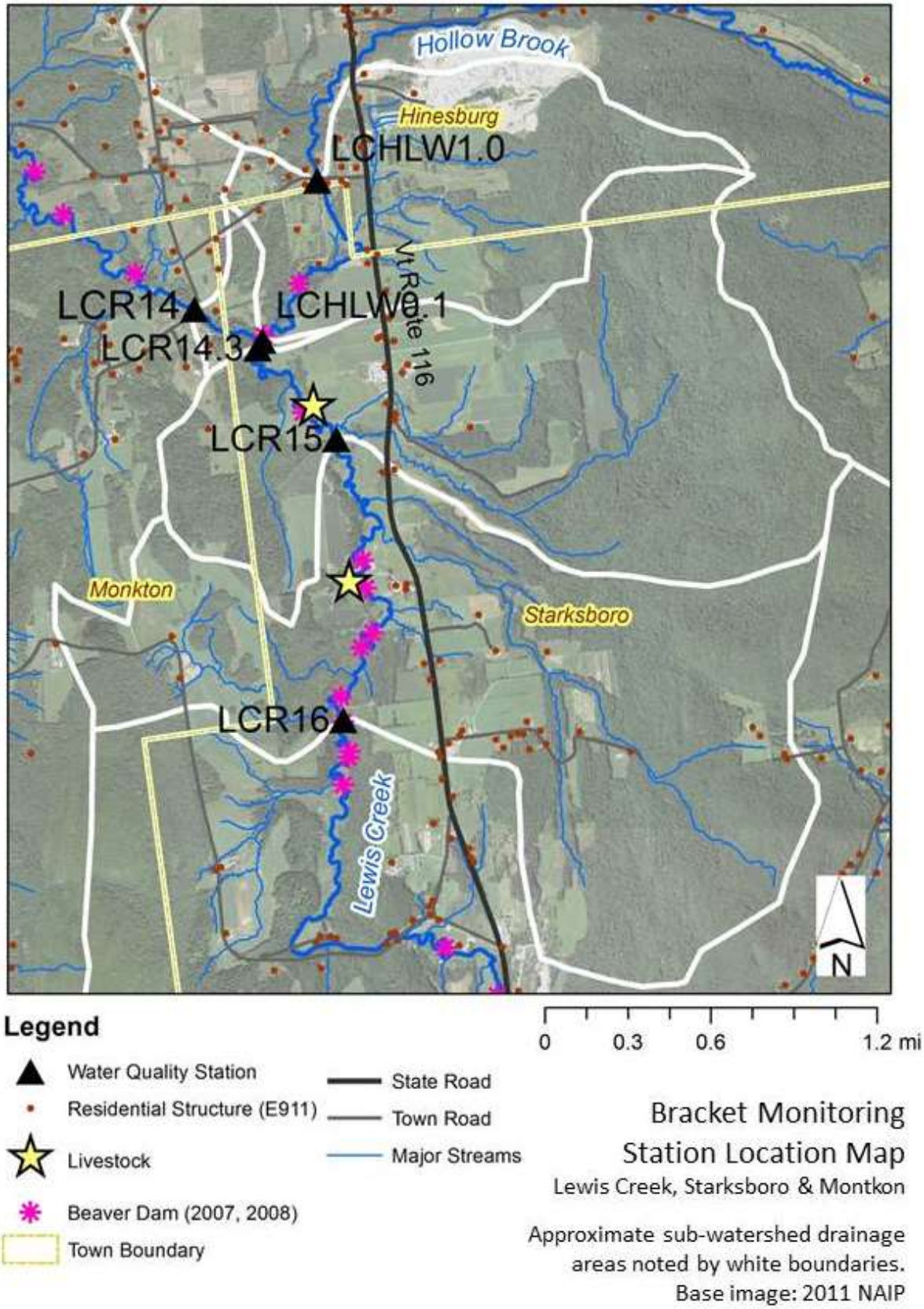

Figure 1. Location of Bracket Monitoring Sites

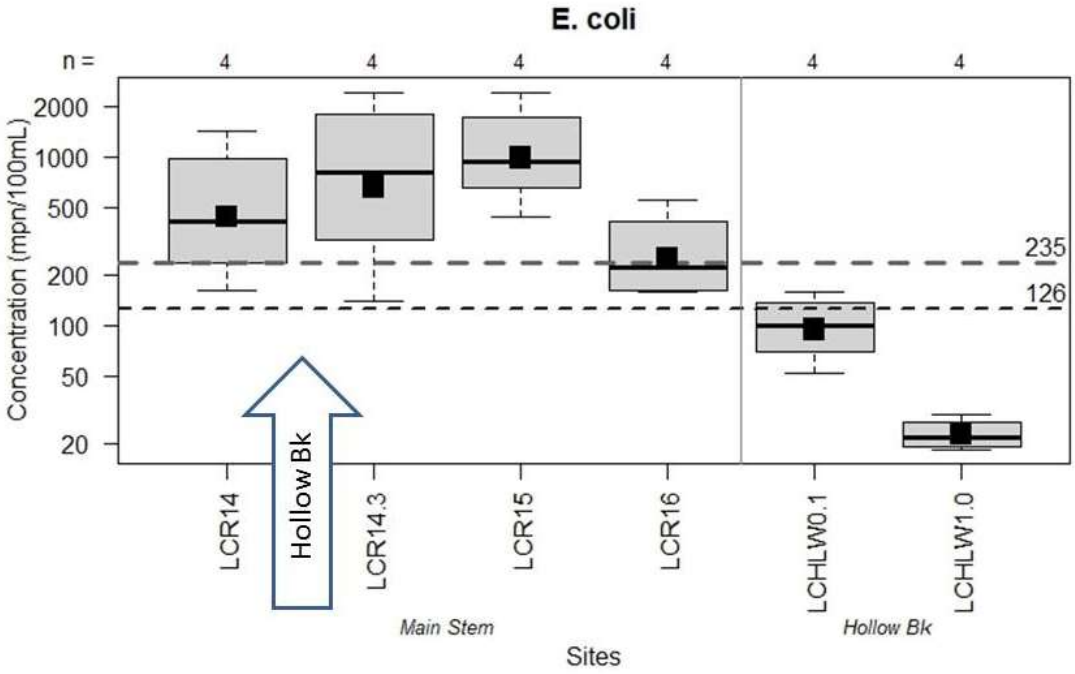

Figure 2. E.coli measured at Lewis Creek and Hollow Brook bracket monitoring stations on four dry-weather, base-flow events between June and September in 2018. The whiskers extend to the maximum and minimum values, while the gray-shaded box represents the middle 50% of values. The median value is marked by the dark horizontal line. The geometric mean of all available samples for each station is displayed as the black square symbol. The horizontal, gray dashed lines represent the health-based (235) and geomean (126) standards for E.coli.

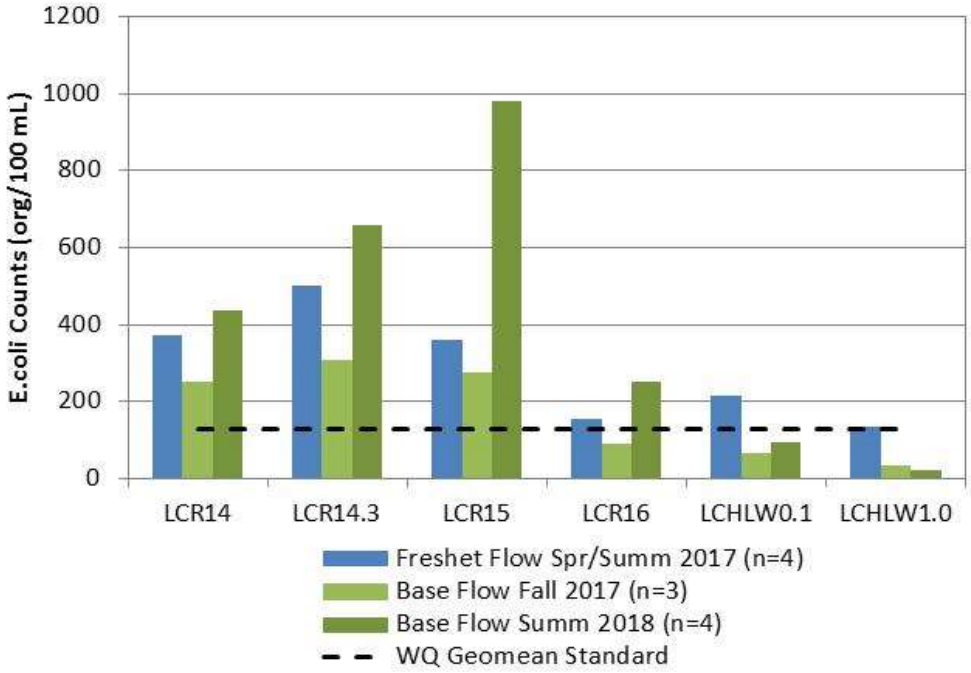

Figure 3. Geometric mean of E.coli monitoring results for Lewis Creek and Hollow Brook bracket monitoring stations during wet-weather, freshet flow events (in blue) versus dry-weather, baseflow events (in green) during 2017 and 2018.

When proceeding downstream along the main stem, a marked increase in mean *E.coli* counts was apparent between upstream "control "station LCR16 and station LCR15, followed by a decline in *E.coli* counts at stations LCR14.3. A similar pattern was encountered under both dry-weather and wet-weather conditions in the previous year(Figure 3). These results indicate a contributing source(s) of bacteria within the incremental drainage area for LCR15. Continuing downstream, mean *E.coli* counts decline at station LCR14, likely due in large part to dilutionary effects of inputs from the Hollow Brook. The geometric mean at each of these two Hollow Brook stations was below the mean recorded for each of the main stem stations.

Sources of fecal matter in surface waters can be variable, and include humans, ruminants (e.g., deer and cows), wildlife, and waterfowl (USEPA, 2011). The upstream drainage area to Tyler Bridge Road is sparsely populated by residential structures serviced by onsite septic systems (Figure 1). Failing septic systems can be a source of *E.coli* to groundwater and to the Creek, particularly for those structures located within the riparian corridor. Station LCR14 is located one mile downstream of a pasture where for several decades dairy cows have had direct access to the stream along a mile of pasture (small, conventional dairy). A second conventional dairy farm, located 0.3 mile upstream of LCR14, has excluded cows along 3,600 feet the Lewis Creek with fencing since 2007, and has reduced access to a single stabilized crossing. Several management practices have also been implemented at this farm in recent years, resulting in expansion of vegetated riparian buffers, increased setbacks of crop fields and pasture areas, and cedar revetments and willow waddle treatments to enhance streambank stability (SMRC, 2010, 2017). In October 2018, livestock were removed from the upper site, as part of a farm transition and sale of the property. Bracket sampling will continue at these sites in 2019 to monitor for anticipated changes in water quality.

Turbidity levels at the Lewis Creek stations ranged from <0.2 to 33 NTUs for the six sample dates. The Vermont state standard of 10 NTUs (for cold-water fisheries) is applicable during dry-weather, baseflow conditions which were relevant to the four summer events. The mean concentrations were below the standard at all sites (Figure 4). Based on past years' sampling results, turbidity can be elevated at times of increased flow – during a summer thunderstorm, or during spring runoff conditions – especially in the lower reaches of the river. An increasing trend in turbidity with distance downstream is generally observed during all flow conditions.

Phosphorus was detected at low to high concentrations during the six Spring and Summer sampling dates, ranging from <5 to 132 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, a condition which was captured during the July, August, and September sample dates. Detected concentrations of phosphorus on these dates exceeded the instream nutrient standard of 27 µg/L at main stem stations, LCR15 and LCR0.3, as well as Pond Brook station LCT3D.5 (Figure 5). These results are relatively consistent with historic results which have shown an increasing trend in phosphorus concentration with distance downstream, as well as a tendency for elevated phosphorus concentrations during high flows.

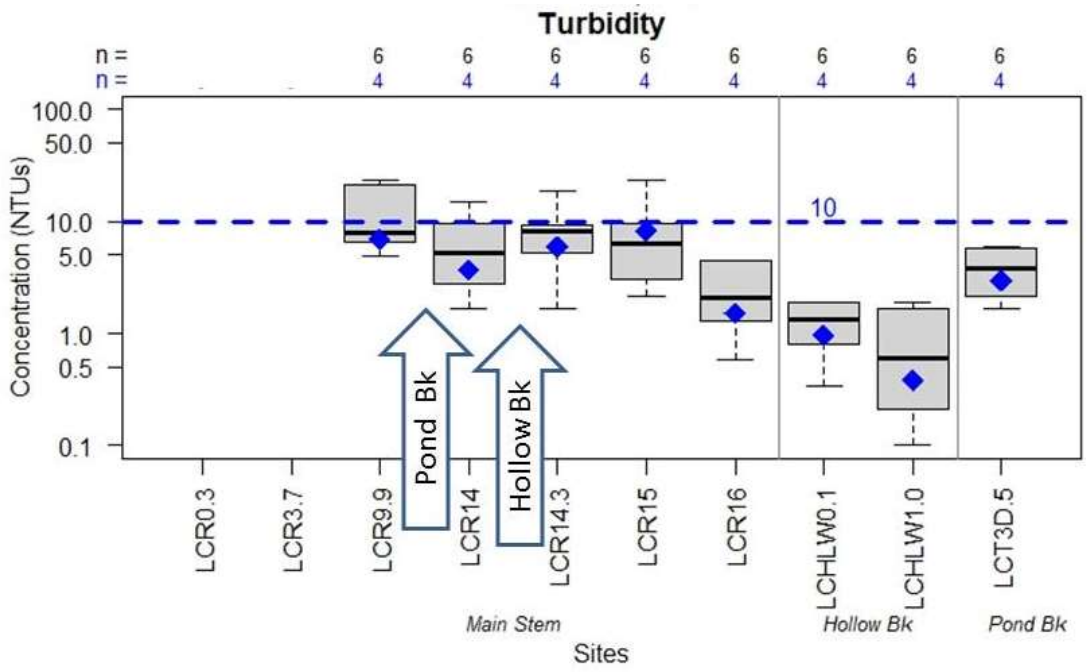

Figure 4. Summary of Turbidity results for Lewis Creek, 2018. The whiskers extend to the maximum and minimum values detected over six sampling events, while the gray-shaded box represents the middle 50% of values. The median value is marked by the dark horizontal line. The blue diamond marks the mean of that subset of samples collected during base-flow conditions, with the corresponding number of samples (n) indicated in blue along the top of the chart.

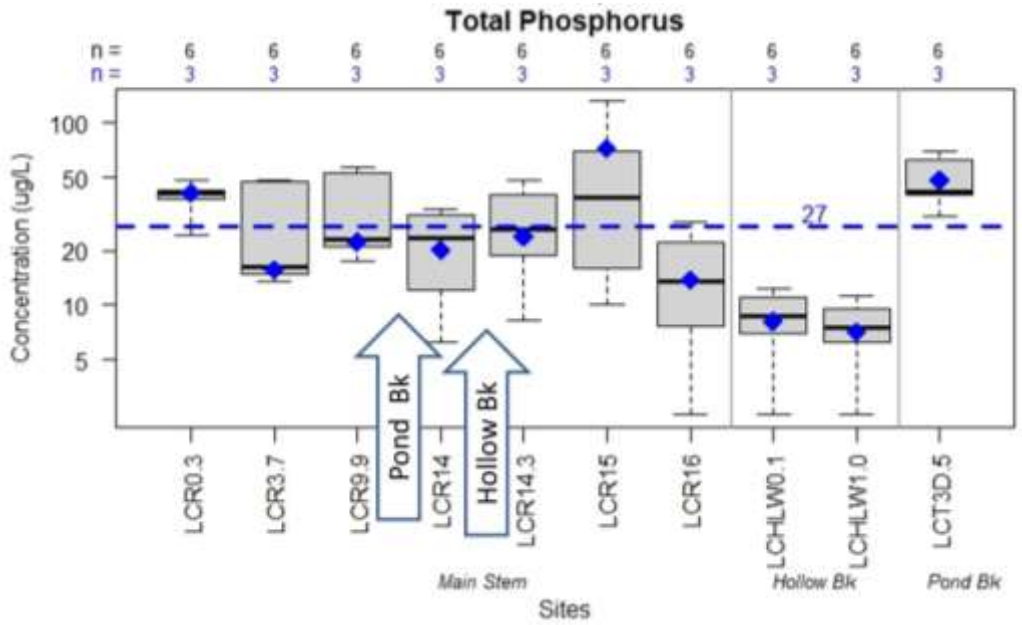

Figure 5. Summary of Total Phosphorus results for Lewis Creek, 2018. The whiskers extend to the maximum and minimum values detected over six sampling events, while the gray-shaded box represents the middle 50% of values. The median value is marked by the dark horizontal line. The blue diamond marks the mean of that subset of samples (n=3) collected during base-flow conditions at or below the Low Median Monthly Flow.

2019: Focus monitoring will continue in the Lewis Creek for a second year in 2019. The Collaborative will continue with bracket monitoring at stations in vicinity of the Tyler Bridge Road crossing to gain a better understanding of water quality patterns following livestock removal from the Creek as part of a farm transition that occurred in October 2018. Focus-monitoring results will inform ongoing municipal-level discussions and basin-planning efforts regarding water quality management and classification.

For more information, contact the Lewis Creek sampling coordinator:
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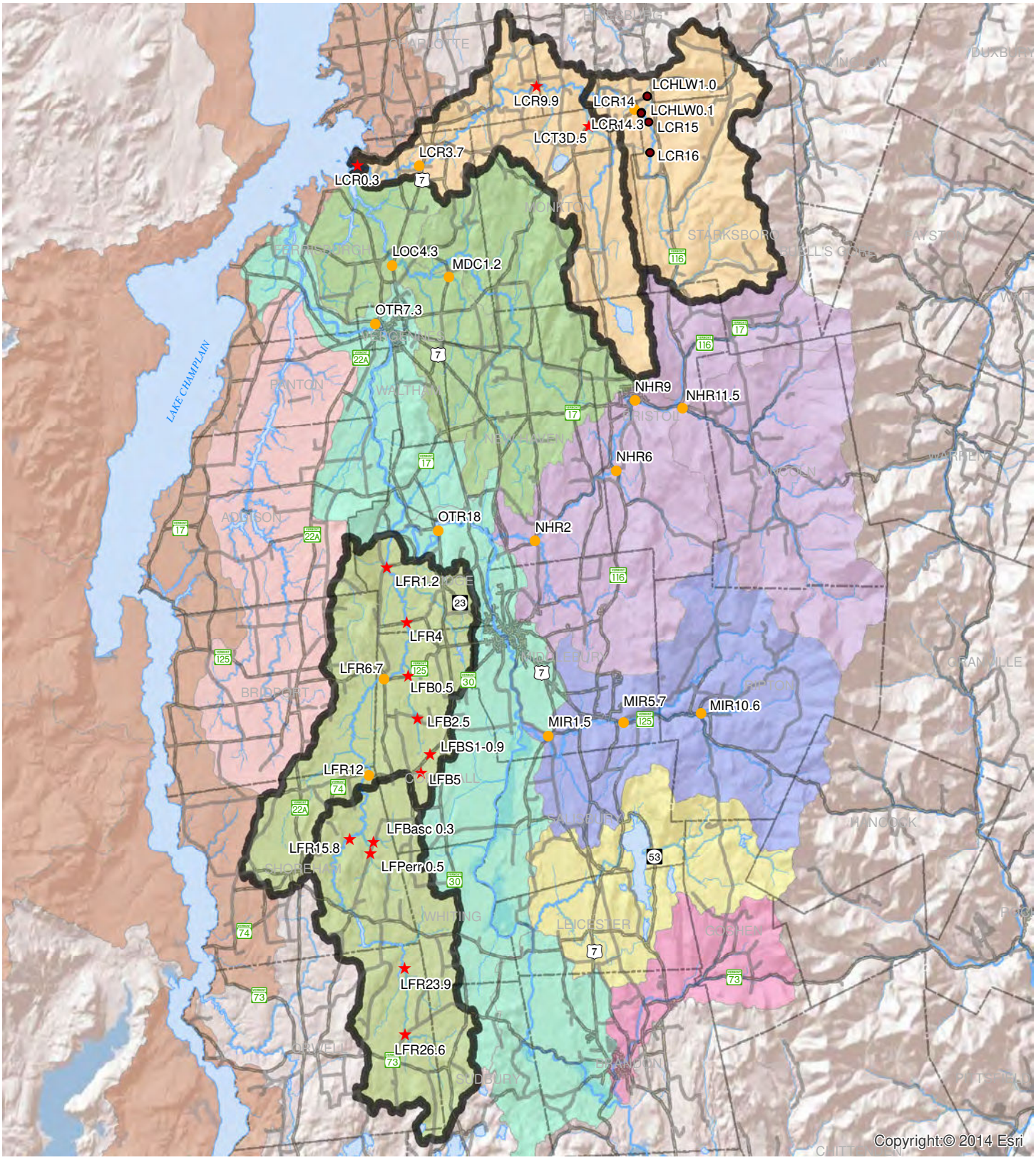
Or, go to LewisCreek.org

Addison County River Watch Collaborative

Water Quality Monitoring Sites by Watershed, 2018



- Sentinel Site
- Rotational Site
- Special Project Site (E.coli monitoring)

Rotational Basins 2018

- Lewis Creek
- Lemon Fair

- Lake Champlain Direct
- Lewis Creek
- Little Otter Creek
- Otter Creek
- New Haven River
- Dead Creek
- Lemon Fair River
- Leicester River
- Middlebury River
- Neshobe River

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Addison County Regional Planning Commission

ACRPC 2/2018

The **Addison County River Watch Collaborative** is a citizen organization that monitors and assesses the condition and use of our local rivers over the long term, raises public awareness of the values and functions of our watersheds, and cultivates partnerships that support water quality stewardship.