Focus watershed:
2018 and 2019

Lemon Fair River - 2018 Water Quality Summary

Addison County River Watch Collaborative

Type	Strean	Site	Location	Town
R	Lemon Fair	LFR1.2	Prunier Road bridge	Weybridge
R	Lemon Fair	LFR4	Lemon Fair Rd bridge	Weybridge
S	Lemon Fair	LFR6.7	Route 125 bridge.	Cornwall
S	Lemon Fair	LFR12	Downstream of Route 74 bridge	Shoreham
R	Lemon Fair	LFR15.8	Shacksboro Road bridge	Shoreham
R	Lemon Fair	LFR23.9	Murray Road bridge	Orwell
R	Lemon Fair	LFR26.6	Old Sawmill Rd bridge	Orwell
R	Beaver Br (Lemon Fair)	LFB0.5	Route 125 crossing, Beaver Br.	Cornwall
R	Beaver Br (Lemon Fair)	LFB2.5	Sperry Road crossing, Beaver Br.	Cornwall
R	Beaver Br (Lemon Fair)	LFB5	Clark Rd crossing, Beaver Br.	Cornwall
R	Trib to Beaver Br	LFBS1-0.9	Route 74 crossing, trib to Beaver Br.	Cornwall
R	Bascom Br (Lemon Fair)	LFBasc0.3	Buttolph Rd crossing, Bascom Br.	Shoreham
R	Perry Brook (Lemon Fair)	LFPerr0.5	Buttolph Rd crossing, Perry Br.	Shoreham

The Addison County River Watch Collaborative has been monitoring water quality in the Lemon Fair River since 2003. Year 2018 was the first of a two-year, more intensive monitoring focus in the Lemon Fair where rotational sites as well as long-term sentinel stations were monitored, and additional parameters were tested to better define spatial variability in pathogen, sediment and nutrient concentrations. In particular, new monitoring stations were established on Bascom Brook, Perry Brook and Beaver Branch, tributaries which join the main stem between the Shacksboro Road crossing and the Lemon Fair Road crossing.

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. Flows in the Lemon Fair River were near normal for much of the year, based on the streamflow records for the nearby USGS gaging station on Otter Creek at Middlebury. Following warm summer temperatures and drier-than-average conditions encountered during June and July, flow in area rivers trended below normal during these months. April and May sampling events took place during high flow conditions resulting from snowmelt and spring rains. 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. In the nearby Otter Creek these summer flows were at or below the Low Median Monthly (LMM) flow condition.

Samples from the Lemon Fair watershed 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 the Lemon Fair sites ranged from 10 to 1,011 organisms/100 mL. Vermont Water Quality Criteria (VWMD, 2016) state that *E.coli* is 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 should be above 235 organisms/100 mL. *E.coli* counts exceeded the state's health-based standard of 235

organisms/ 100 mL at on one or more dates at each of the sampled stations except for LFR12. The geometric mean of summer sampling results exceeded the state's geomean standard of 126 organisms/ 100 mL at main stem station, LFR 15.8, and at tributary stations, LFB5 and LFBS1.0.9 in the Beaver Branch watershed, LFPerr0.5 on Perry Brook, and LFBasc0.3 on Bascom Brook (Figure 1).

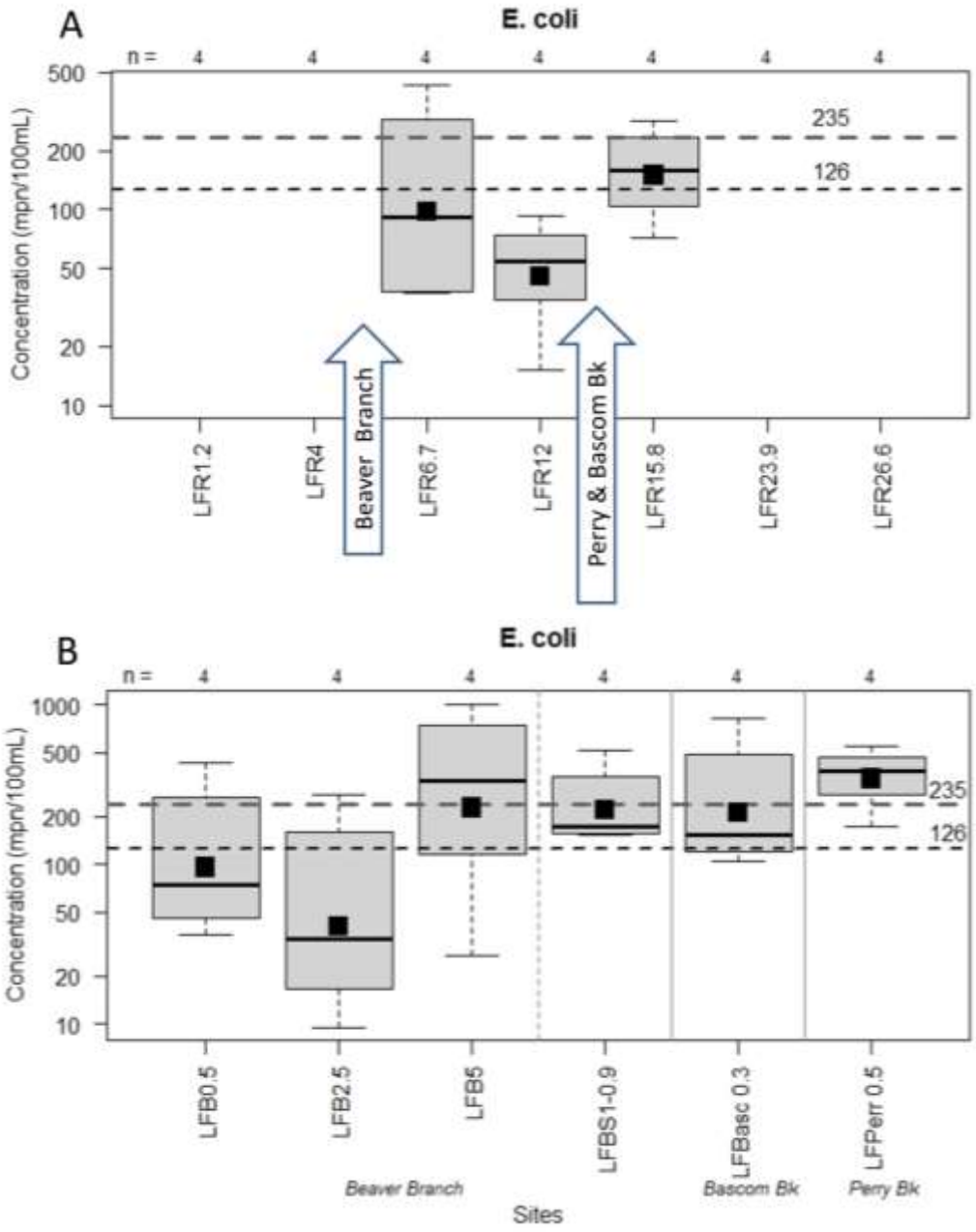

Figure 1. E.coli measured at sites on the Lemon Fair main stem (A) and tributaries (B) on four dry-weather, base-flow events between June and September in 2018. The whiskers extend to the maximum and minimum values, while the gray-shaded box represents the middle 50% of values. The median value is marked 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.

Turbidity levels at the Lemon Fair stations ranged from 3.3 to 358 NTUs. The Vermont state standard of 25 NTUs (for warm-water fisheries) is applicable during dry-weather, baseflow conditions which were relevant to each of the July, August and September events. Mean turbidity concentrations for these three dates were above the standard at main stem stations including and downstream from LFR15.8 (Shacksboro Road Bridge) (Figure 2A). Turbidity increased markedly between LFR15.8 and LFR12, and stayed high at the next downstream station, LFR6.7, before declining again (Figure 2A). These results suggest a contributing source of Turbidity between the Shacksboro Road crossing and Route 74. The Lemon Fair receives runoff from both the Perry and Bascom Brooks between these two stations. However, Turbidity levels measured in these tributaries on the same sample dates were reasonably low and similar in magnitude to upstream station LFR15.8 (Figure 2B). These results suggest an alternate source(s) of Turbidity draining to the Lemon Fair between LFR15.8 and LFR12 (Figure 3A).

Phosphorus was detected at moderate to high levels during the six spring and summer sampling dates of 2018, with concentrations ranging from 19 to 404 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 during June through October. Based on gaging records for nearby rivers of similar character (Little Otter Creek and Otter Creek), flows in Lemon Fair were likely near the low median monthly flow during the July, August and September dates. Mean Total Phosphorus (TP) concentrations for these dates exceeded the instream phosphorus criterion at every main stem and tributary site. It is possible that the Lemon Fair River would instead be classified as a Slow-Winder stream ecotype (not yet determined for the reaches sampled); there is no instream phosphorus criterion yet established for the Slow-Winder ecotype. Dissolved phosphorus (DP) was also tested at each site; as a percentage of TP, DP ranged from 15 to 82% during the six sample dates. As with Turbidity, TP increased notably between LFR15.8 and LFR12, suggesting a contributing source(s) of phosphorus between the Shacksboro Road crossing and Route 74. TP was somewhat elevated in Perry Brook, though not at the magnitude reported at station LFR12 (Figure 3B, Figure 4B).

Nitrogen levels were detected at low to moderate concentrations at most stations during the 2018 spring and summer sampling dates, ranging from 0.3 to 1.8 mg/L. Highest nitrogen concentrations were detected during baseflow conditions at or below the Low Median Monthly flow. 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.

2019: Focus monitoring will continue in the Lemon Fair River for a second year in 2019. The Collaborative will continue with bracket monitoring sites established on the Beaver Branch, Bascom Brook and Perry Brook tributaries to further define sources of elevated nutrients and sediment detected along the main stem between established stations at Shacksboro Rd in Shoreham and Route 125 in Cornwall.

For more information, contact the Lemon Fair sampling coordinator:
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or visit our web page at: www.acrpc.org/acrwc

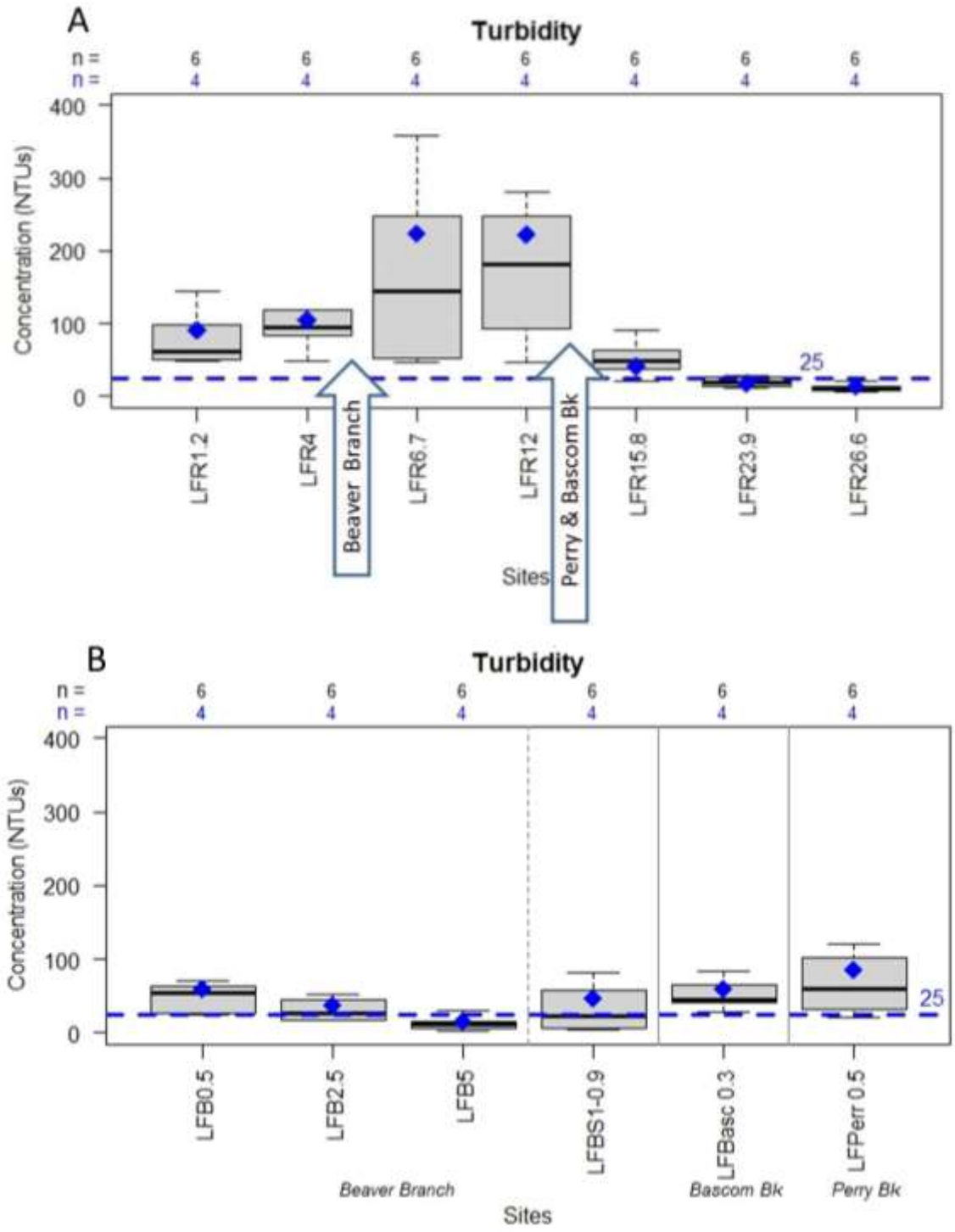

Figure 2. Summary of Turbidity measured at sites on the Lemon Fair main stem (A) and tributaries (B) in 2018. The whiskers extend to the maximum and minimum values detected over six sampling events, while the gray-shaded box represents the middle 50% of values. The median value is marked by the dark horizontal line. The blue diamond marks the mean of that subset of samples collected during dry-weather, base-flow conditions, with the corresponding number of samples (n) indicated in blue along the top of the chart.

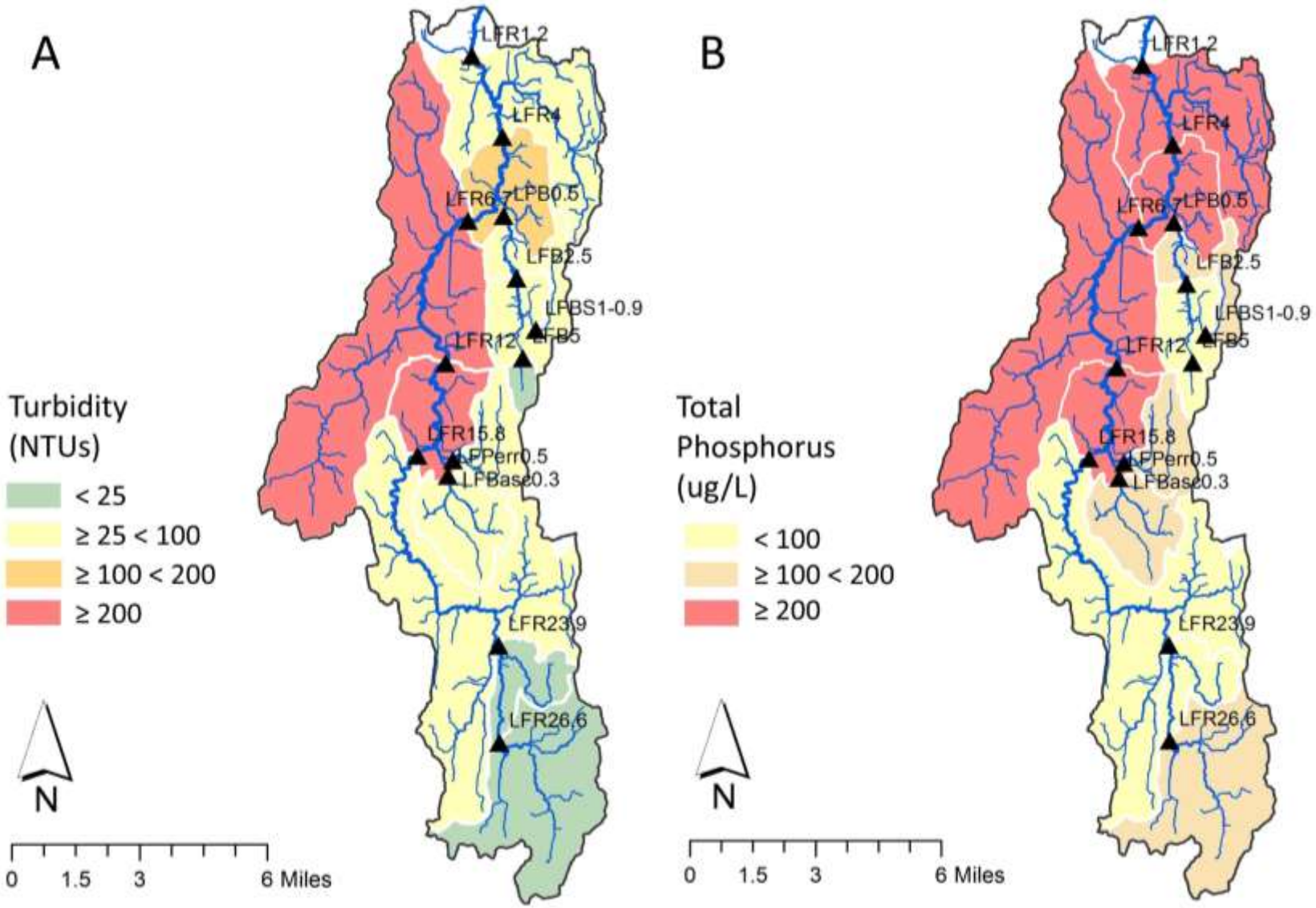

Figure 3. Mean values of (A) Turbidity detected during dry-weather, baseflow events (n=4) and (B) Total Phosphorus detected during baseflow conditions at or below the Low-Median-Monthly Flow in the Lemon Fair River watershed.

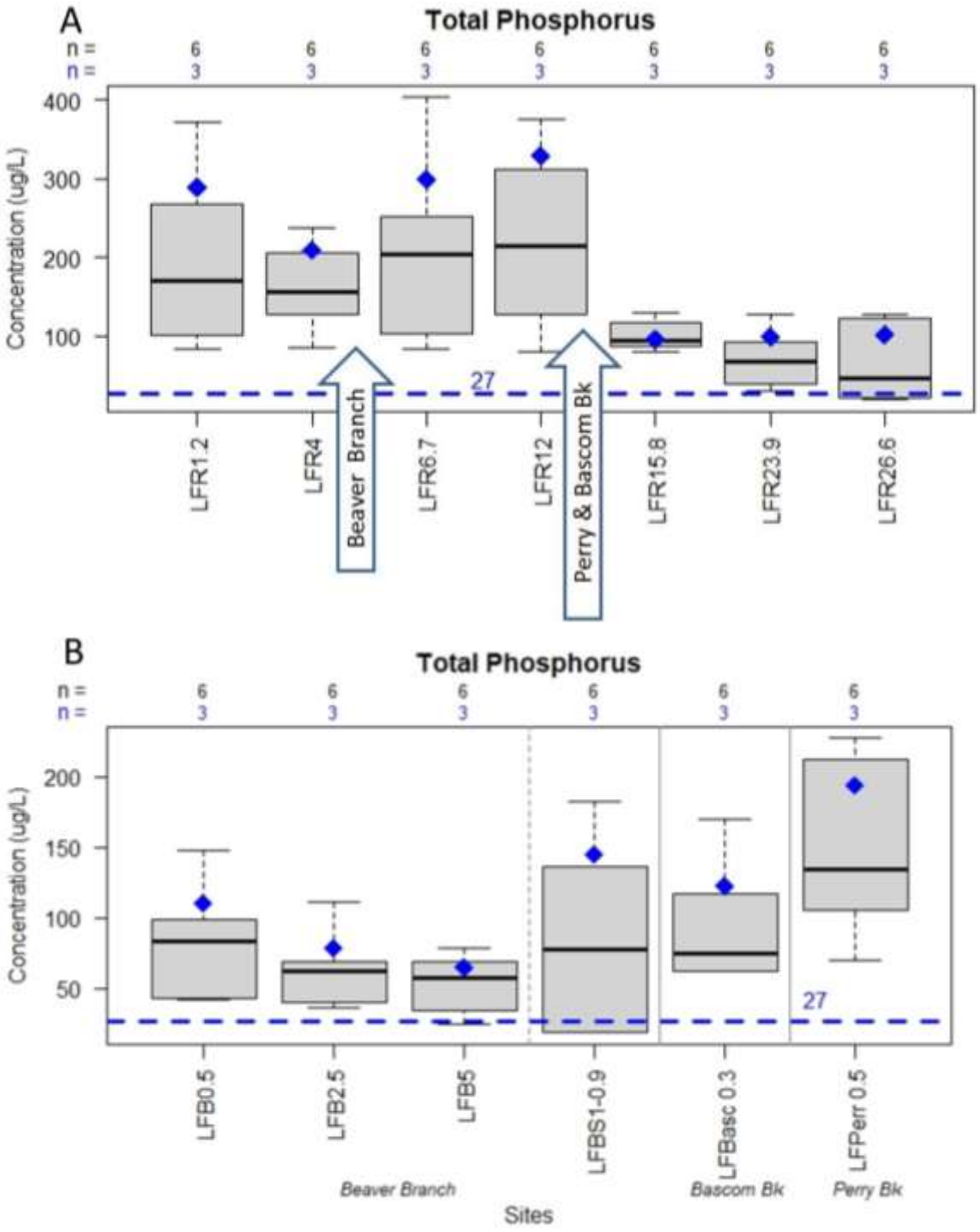

Figure 4. Summary of Total Phosphorus measured at sites on the Lemon Fair main stem (A) and tributaries (B) in 2018. The whiskers extend to the maximum and minimum values detected over six sampling events, while the gray-shaded box represents the middle 50% of values. The median value is marked by the 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.

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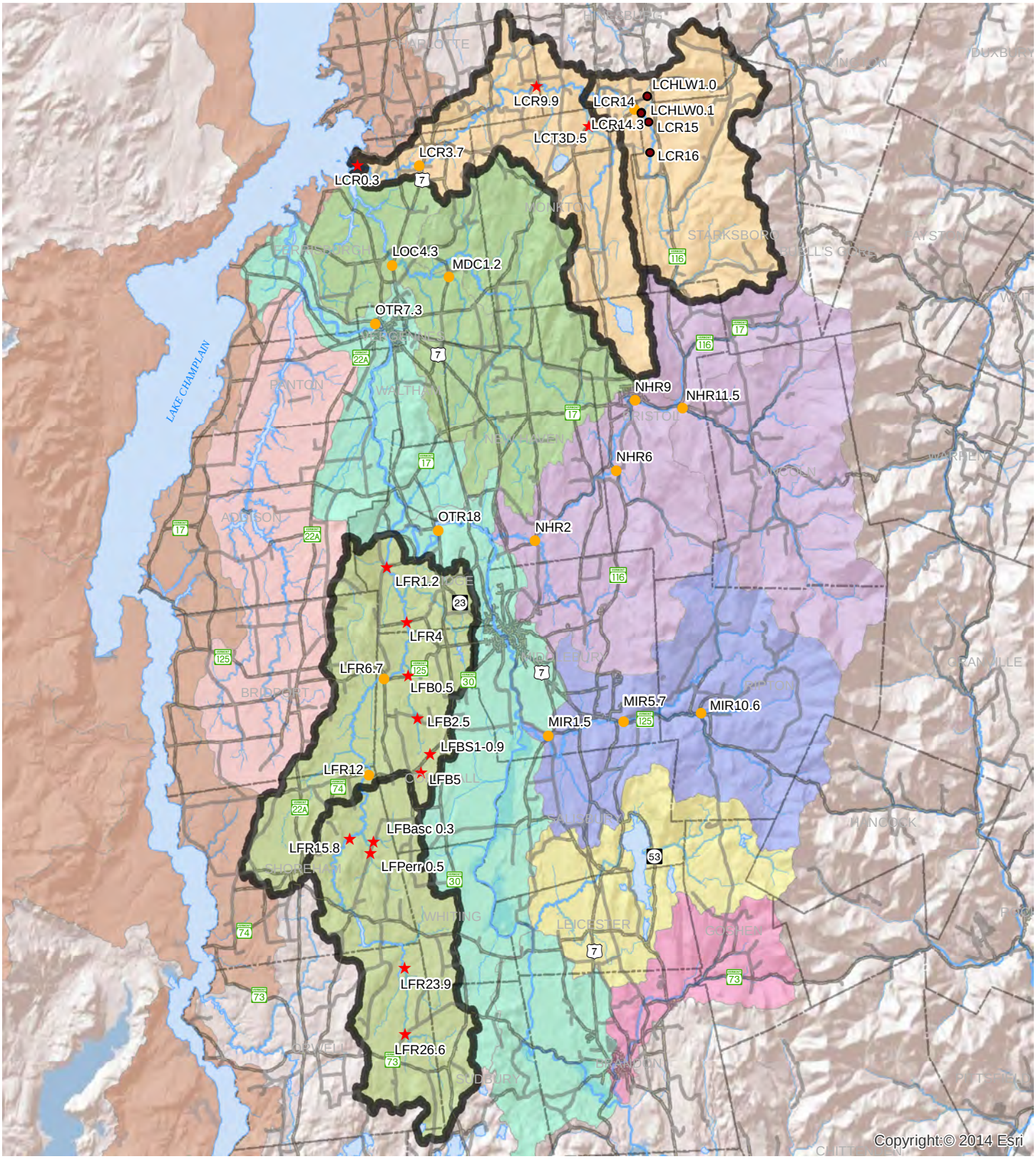
Water Quality Monitoring Sites by Watershed, 2018



- 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.