2012 – 2013
Focus Watershed

Lemon Fair River - 2013 Water Quality Summary

Addison County Riverwatch Collaborative

The Addison County Riverwatch Collaborative has been monitoring water quality in the Lemon Fair River since 2003. For the 2012 and 2013 seasons, the Lemon Fair River has been the subject of a more intensive monitoring focus, where rotational as well as sentinel stations were monitored and additional parameters were tested. Six sites are located on the main stem, and two stations are located on the Beaver Branch tributary in the lower watershed (see table at right).

Site	Location	Town
LFR0	Weybridge Road bridge	Weybridge
LFR1.2	Prunier Road bridge	Weybridge
LFR6.7	Route 125 bridge.	Cornwall
LFR12	Downstream of Route 74 bridge	Shoreham
LFR15.8	Shacksboro Road bridge	Shoreham
LFR23.9	Murray Road Bridge	Orwell
LFB2.5	Sperry Road crossing, Beaver Branch	Cornwall
LFBS1-0.9	Route 125 crossing, trib to Beaver Branch	Cornwall

During 2013, sampling occurred on two spring dates (April 3 and May 1) and four summer dates (June 5, July 10, August 7, and September 4). The spring and early summer dates represented moderate flow conditions on the river, based on streamflow gages in area rivers. August and September sample dates captured baseflow conditions, while the July 10 event captured moderate to high flows following a storm event on July 3-4 and higher-than-normal May and June rainfall. On an average annual basis, flows in 2013 were near normal in the Addison County watersheds monitored by the Collaborative.

Samples from the Lemon Fair watershed were tested for phosphorus (total and dissolved), total nitrogen, total suspended solids, and turbidity; E.coli was tested only on the summer dates. As detailed in the following sections, results suggest the need to focus on improved land management practices in the middle stretch of this river between stations LFR15.8 and LFR6.7 (Bridport, Shoreham).

E.coli counts at most sites in the Lemon Fair watershed often exceeded the state standard of 77 organisms/ 100 mL on the four summer sampling dates. Detected E.coli counts were relatively consistent with historic monitoring results. Figure 1 shows results for the stations located on the Lemon Fair main stem from upstream (right) to downstream (left). During the low-flow conditions on August and September sample dates, a possible local contribution of E.coli is evidenced by the jump in readings between stations LFR12 and LFR6.7. This pattern was also evident during low-flow sampling events from 2012.

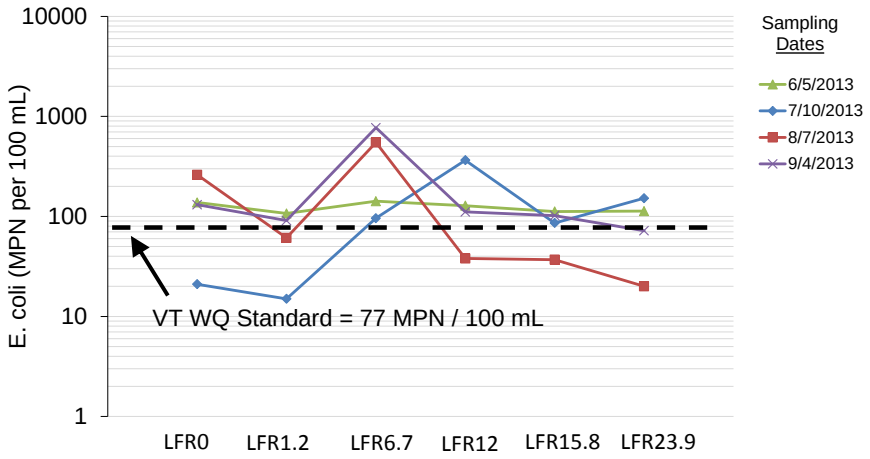


Figure 1. 2013 E. Coli results for stations along the Lemon Fair River main stem.

The drop in E.coli counts between station LFR6.7 and LFR1.2 may reflect decay of E.coli concentrations with downstream distance or dilutionary effects of groundwater and/or tributary inputs. Beaver Brook enters the Lemon Fair River between these two stations. Two stations are monitored on this tributary; in 2013, E coli counts ranged from 214 to 649 MPNs/100 mL in the downstream station (LFB2.5) and from 61 to 1,553 MPNs/100 mL at the upstream station (LFBS1.09).

E.coli results from both 2012 (a drier-than-normal year) and 2013 (a near normal year) are summarized in Figure 2 (total number of samples at each station = 8). E.coli counts at stations LFR15.8, LFR12, and LFR6.7 along the main stem in Bridport and Shoreham are chronically above the state water quality standard of 77 MPN/100mL, consistent with historic sampling results.

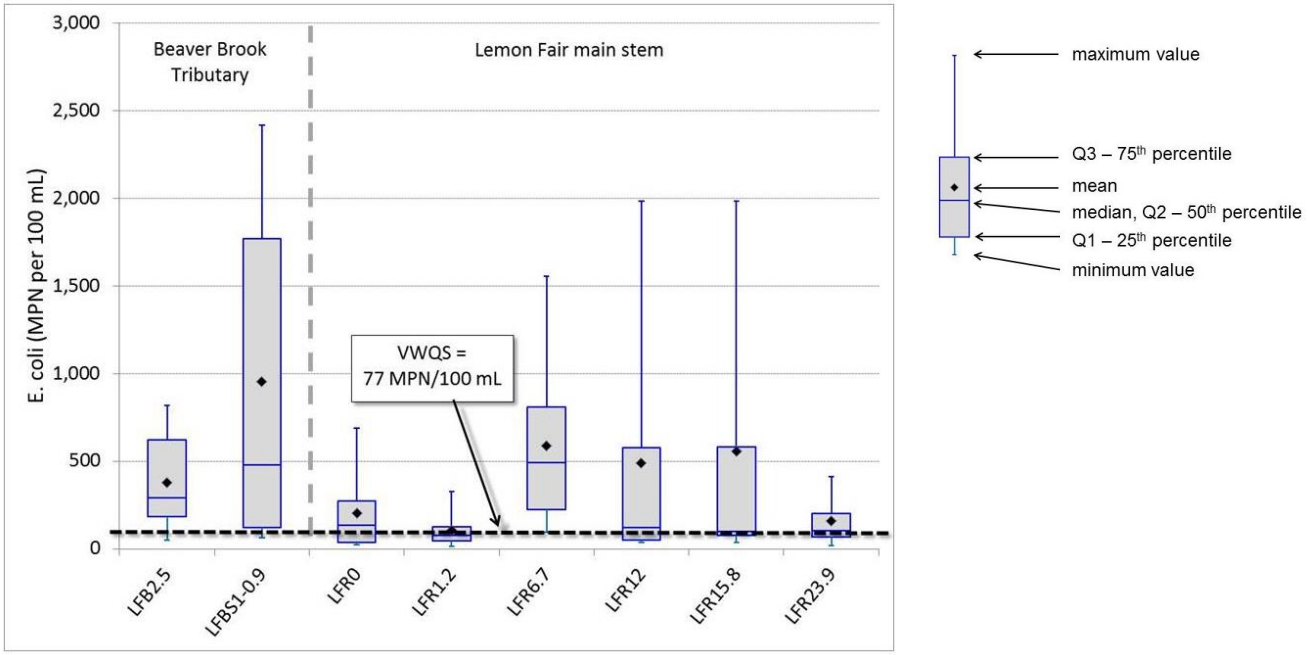


Figure 2. 2012 and 2013 E. Coli results for focus stations in the Lemon Fair watershed.

Turbidity levels at the sampled stations in Lemon Fair watershed ranged from 2.5 to 136 NTUs in 2013. Concentrations exceeded the Vermont state standard of 25 NTUs (for Class B warm-water fisheries) at a majority of stations on nearly all sample dates except the upstream station LFR23.9 (Murray Road crossing) and the two stations on Beaver Brook. Figure 3 shows results for the stations located on the Lemon Fair main stem from upstream (right) to downstream (left). An increase in Turbidity is evident between LFR15.8 and LFR12 on all of the six sample dates, consistent with historic results. The decline in Turbidity levels at station LFR1.2 and LFR0 on a few sample dates (e.g., July 10, September 4) may reflect dilutionary effects of groundwater recharge zones or tributary inputs.

Turbidity results from both 2012 (a drier-than-normal year) and 2013 (a near normal year) are summarized in Figure 4 (total number of samples at each station = 12). Turbidity levels at stations LFR12, LFR6.7, and LFR1.2 along the main stem in Shoreham, Cornwall, and Weybridge are chronically above the state water quality standard of 25 NTUs, consistent with historic sampling results.

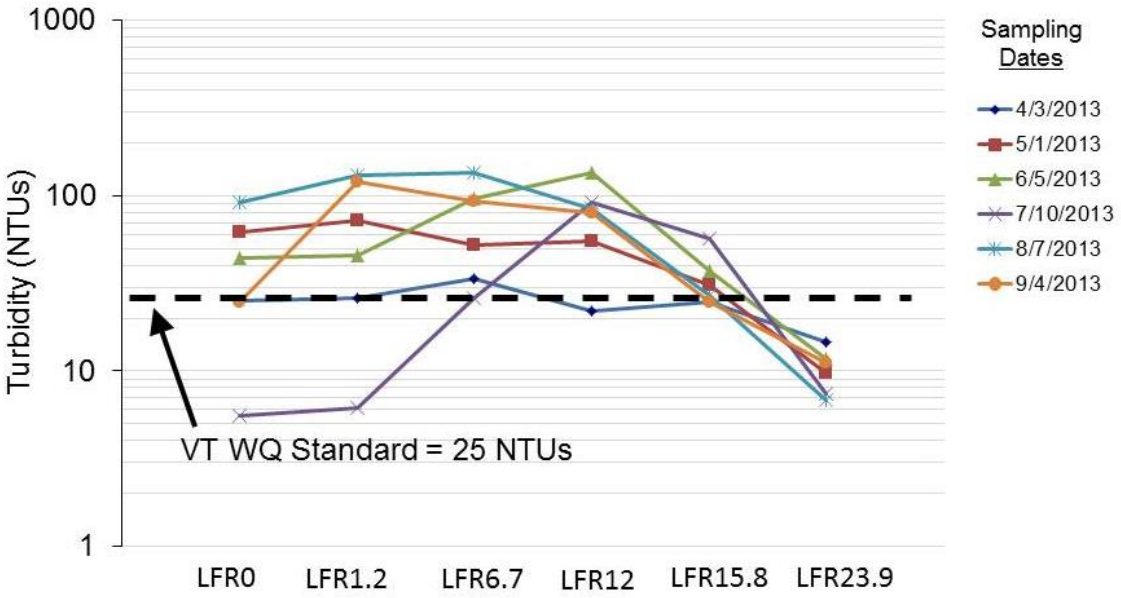


Figure 3. 2013 Turbidity results for stations along the Lemon Fair River main stem.

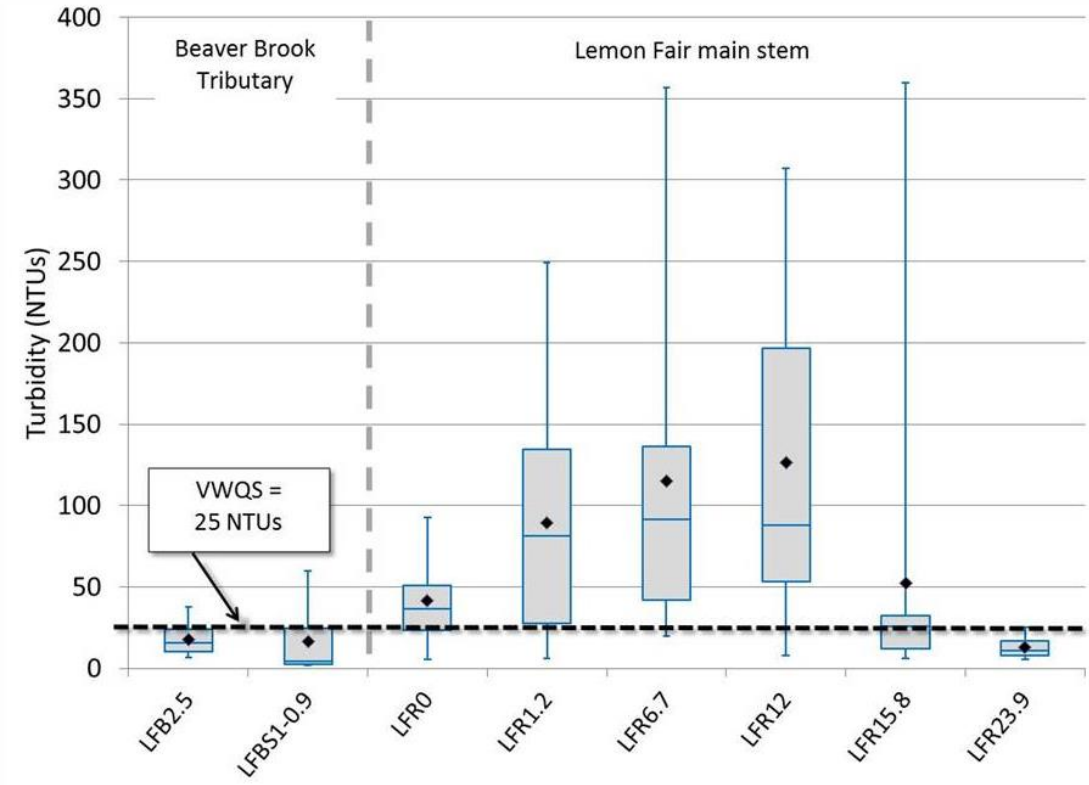


Figure 4. 2012 and 2013 Turbidity results for focus stations in the Lemon Fair watershed.

Total Suspended Sediments ranged from 1.1 to 128 mg/L in 2013 at the eight focus stations. TSS can be related to Turbidity by a linear regression of log-transformed data (Figure 5).

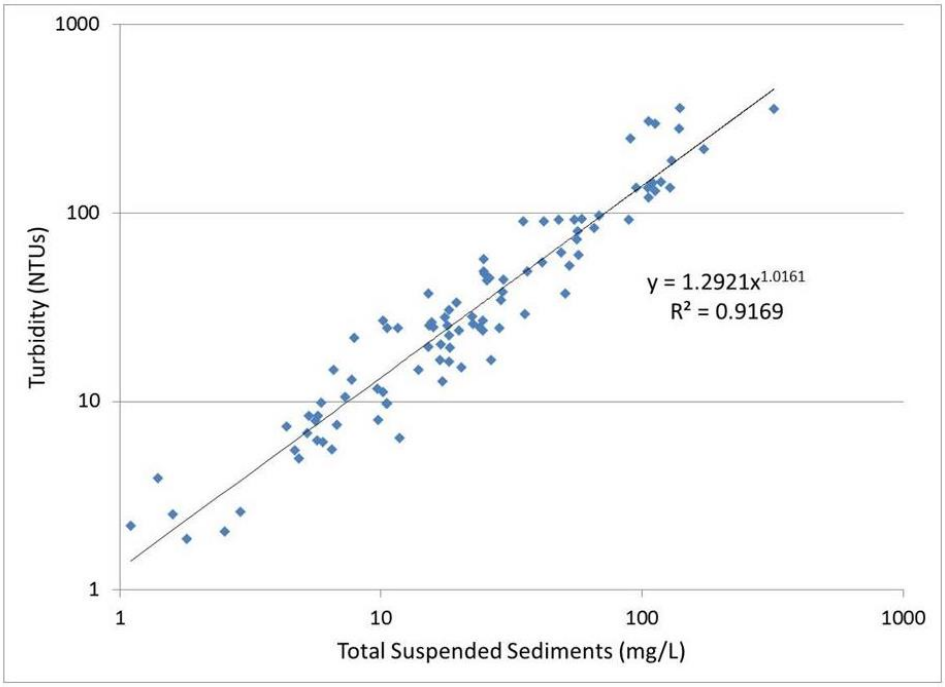


Figure 5. Realtionship of TSS to Turbidity for 2012 and 2013 results at eight focus stations in the Lemon Fair watershed.

Phosphorus was detected at moderate levels during the six spring and summer sampling dates of 2013. Concentrations ranged from 14.5 to 460 ug/L, with an average of 120 ug/L. With the exception of upstream station LFR23.9 (Murray Road Bridge), the mean of the two available, low-flow, summer sample results at each station (including the two Beaver Branch sites) exceeded the recently proposed instream phosphorus criterion of 44 ug/L for warm-water medium gradient (WWMG) wadeable stream ecotype in Class B waters. It is possible that Lemon Fair River would instead be classified as a slow-winder stream ecotype (not yet determined for the reaches sampled); there is no proposed instream phosphorus criterion to date for the slow-winder ecotype.

Figure 6 shows results for the stations located on the Lemon Fair main stem from upstream (right) to downstream (left). An increasing trend in phosphorus with downstream distance is suggested by the results. Of particular note is the increase in phosphorus concentration between stations LFR23.9 and LFR12 – consistent with the previously indicated rise in turbidity for the same stations. Dissolved phosphorus results for these dates (not shown) indicate that this rise is predominantly associated with the particulate fraction of total phosphorus.

Total Phosphorus results from both 2012 (a drier-than-normal year) and 2013 (a near normal year) are summarized in Figure 7 (total number of samples at each station = 12). Phosphorus levels at stations LFR12, LFR6.7, and LFR1.2 along the main stem in Shoreham, Cornwall, and Weybridge are particularly elevated, consistent with the pattern for turbidity.

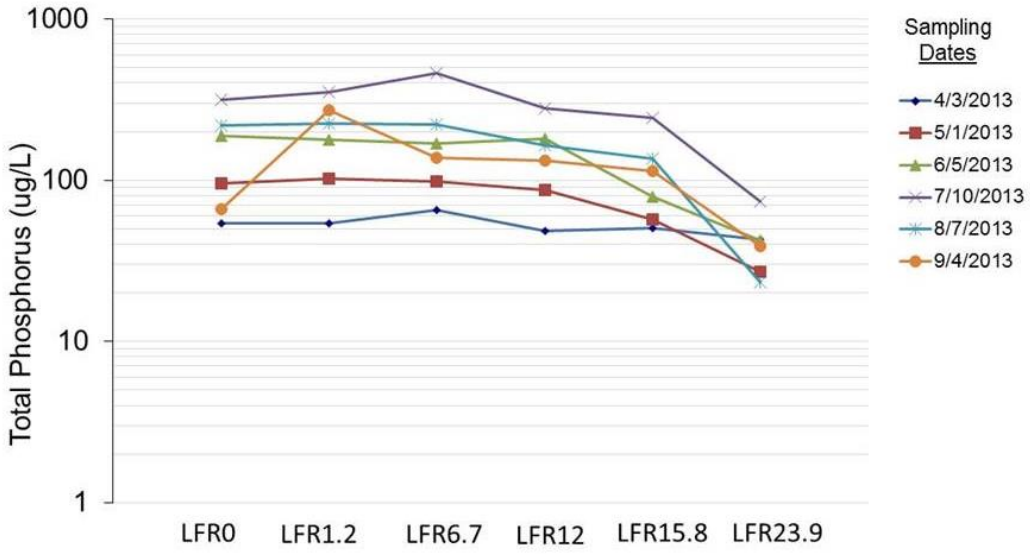


Figure 6. 2013 Total Phosphorus results for stations along the Lemon Fair River main stem.

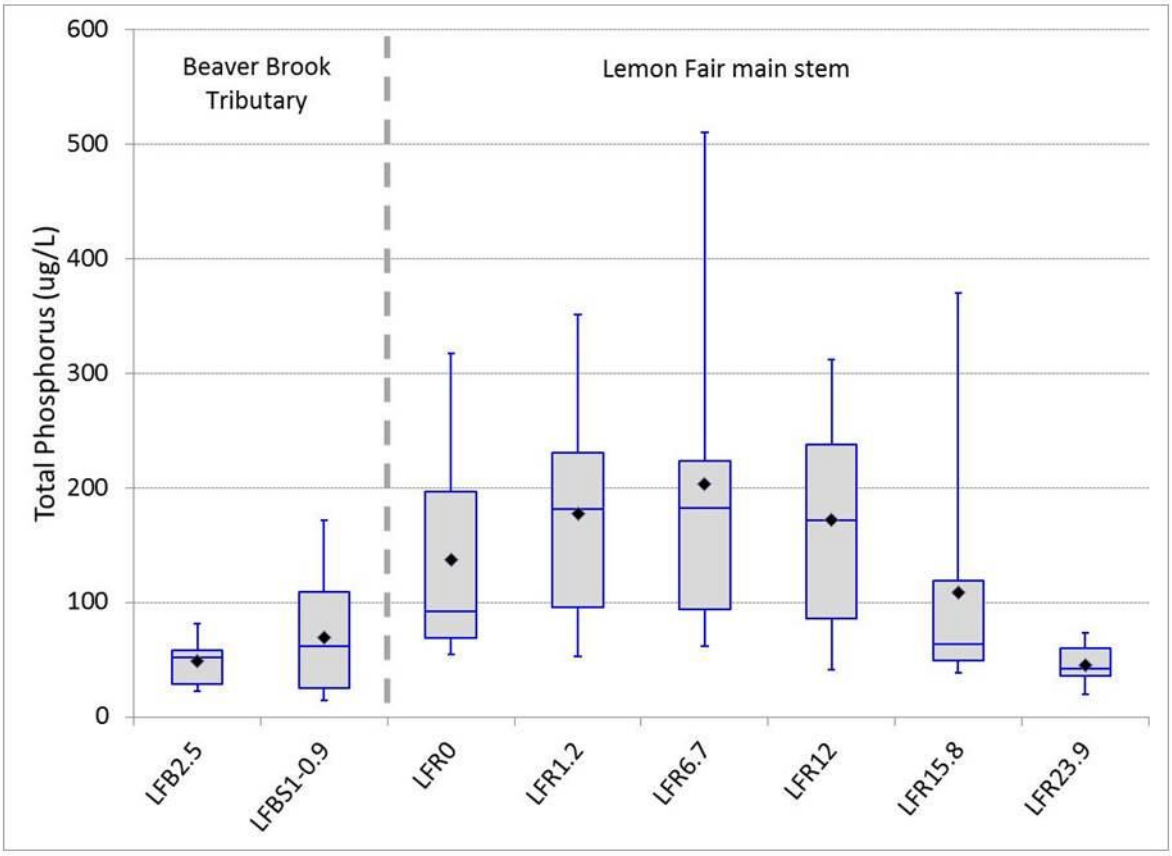
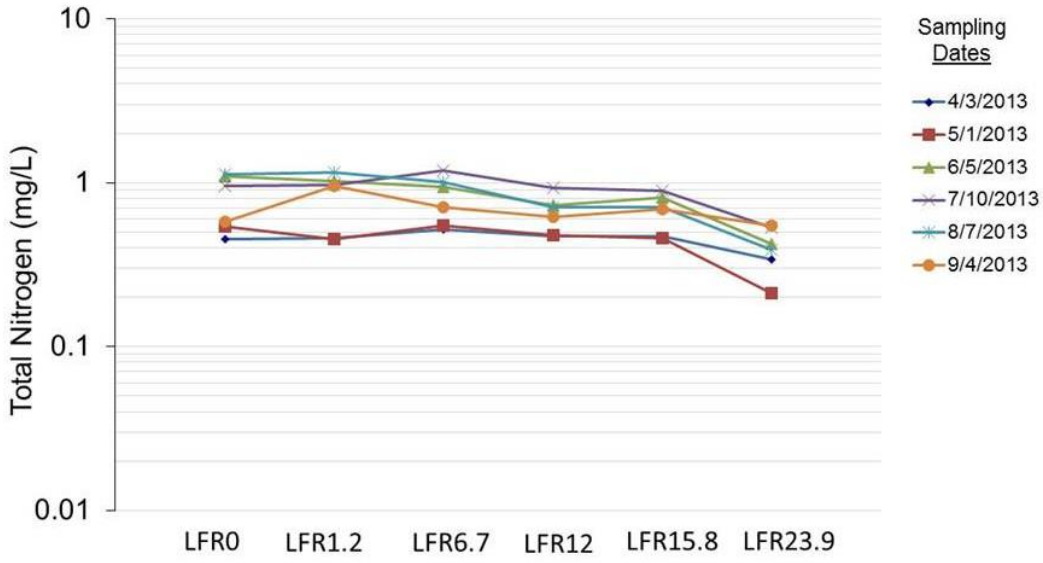


Figure 7. 2012 and 2013 Total Phosphorus results for focus stations in the Lemon Fair watershed.

Nitrogen concentrations were generally low (ranging from 0.2 to 1.2 mg/L) and well below the state standard for nitrogen as nitrate (5 mg/L). The mean of the four, low-flow, summer sample results at sites LFR6.7, LFR1.2, LFR0 and Beaver Brook station LFBS1-0.9 exceeded the recently proposed instream nitrogen criteria of 0.75 mg/L for WWMG wadeable stream ecotype in Class B waters.



Focus Study Findings:

- For the 2012 and 2013 seasons, the Lemon Fair River was the subject of a more intensive monitoring focus, including additional sampling stations and testing parameters.
- At stations LFR15.8, LFR12, and LFR6.7 along the main stem in Bridport and Shoreham and at the upper Beaver Brook station LFBS1.09, E.coli counts are chronically above the state water quality standard of 77 MPN/100mL, and often above the federal health-based standard of 235 MPN/100 mL, consistent with historic sampling results.
- At stations LFR12, LFR6.7, and LFR1.2 along the main stem in Shoreham, Cornwall, and Weybridge:
  - turbidity levels are chronically above the state water quality standard of 25 NTUs; and
  - phosphorus levels are particularly elevated, consistent with the pattern for turbidity.
- Sampling results suggest the need to focus on improved land management practices in the middle stretch of the Lemon Fair River between stations LFR15.8 and LFR6.7 (Bridport, Shoreham).

2014: In years 2014 through 2017, the Lemon Fair watershed will rotate back to a reduced frequency of monitoring at two sentinel stations, LFR6.7 and LFR12. The Addison County Riverwatch Collaborative will sample for total and dissolved phosphorus, total nitrogen, total dissolved solids, turbidity, and E.coli.

For more information, contact the Lemon Fair interim sampling coordinator:
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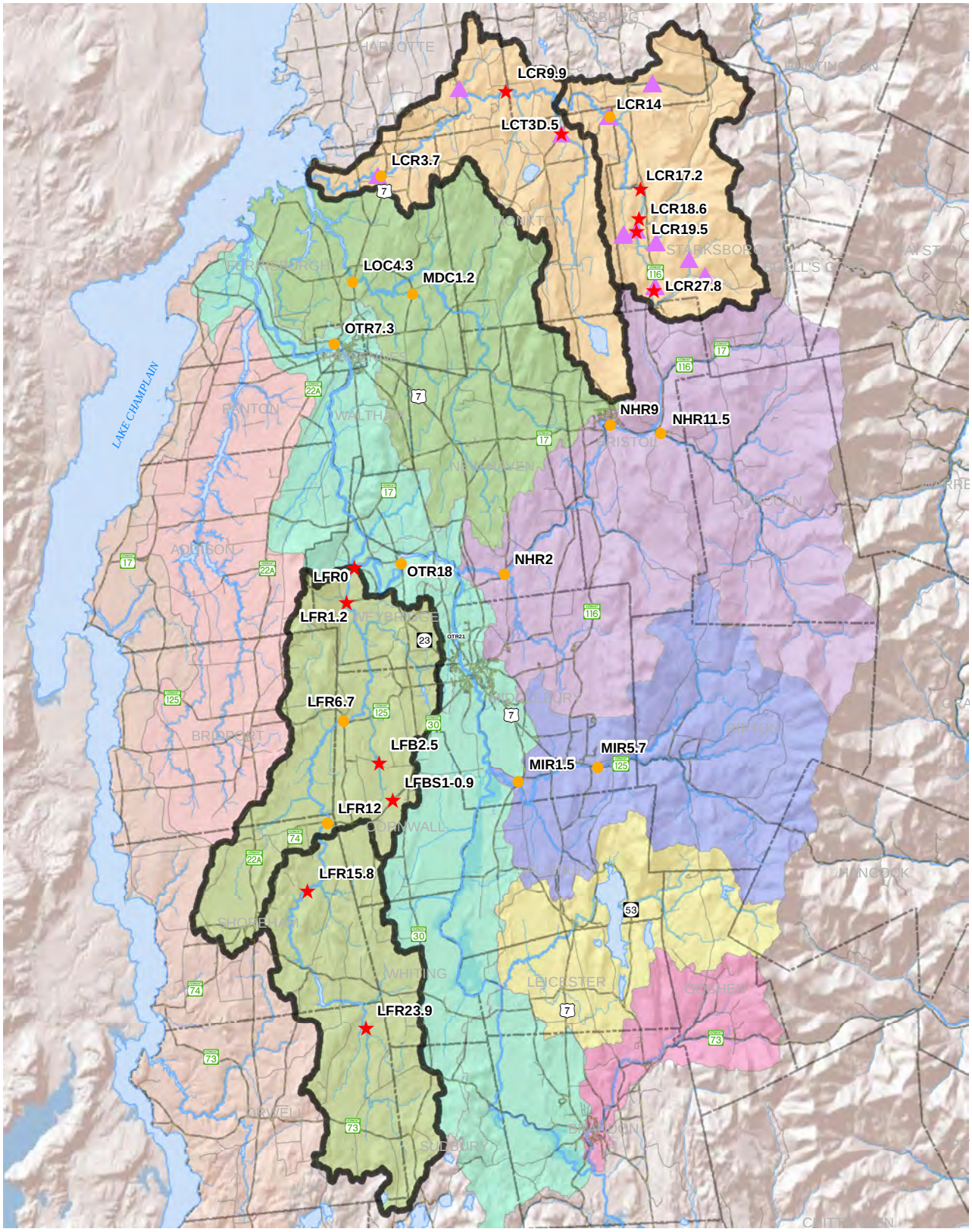
Addison County Riverwatch Collaborative coordinator: Matt Witten, 434-3236, mwitten@gmavt.net
or visit our web page at: www.acrpc.org/acrwc

Addison County Riverwatch Collaborative

Water Quality Monitoring Sites by Watershed, 2013



ACRWC 2013 Sampling Sites

- Rotational Basin Site 2013
- Sentinel Site
- Biomonitoring Study Site

Rotational Basins 2013

- Lemon Fair River
- Lewis Creek

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

Roads

- Pavement
- Gravel

Miles: 0 2 4 6

N

Addison County Regional Planning Commission

The **Addison County Riverwatch Collaborative** is a citizen organization whose mission is to collect and assess the water quality of Vermont surface waters, and to facilitate water quality and stream corridor improvement measures on a watershed scale.

ACRPC 1/2013