

Middlebury River - 2014 Water Quality Summary
Addison County Riverwatch Collaborative

River Name	Site	Location	Town
Middlebury River	MIR0	Mouth of Middlebury River	Middlebury
Middlebury River	MIR1.5	Shard Villa Rd. Bridge	Middlebury
Middlebury River	MIR2	Blake Roy Rd. Bridge	Salisbury
Middlebury River	MIR3	Route 7 Access	Middlebury
Middlebury River	MIR5.7	Midd. Gorge @ Rte 125 Bridge	Middlebury
North Branch MR	MRNB1.7	Dugway Road Bridge	Ripton
MR (Middle Branch)	MIR10.6	Natural Turnpike Road	Ripton
South Branch MR	MRSB1	Goshen Road Bridge	Ripton
South Branch MR	MRSB4.2	Brook Road Bridge	Ripton
Halnon Brook MR	MRHT0.1	Upstream of Route 7 crossing	Salisbury

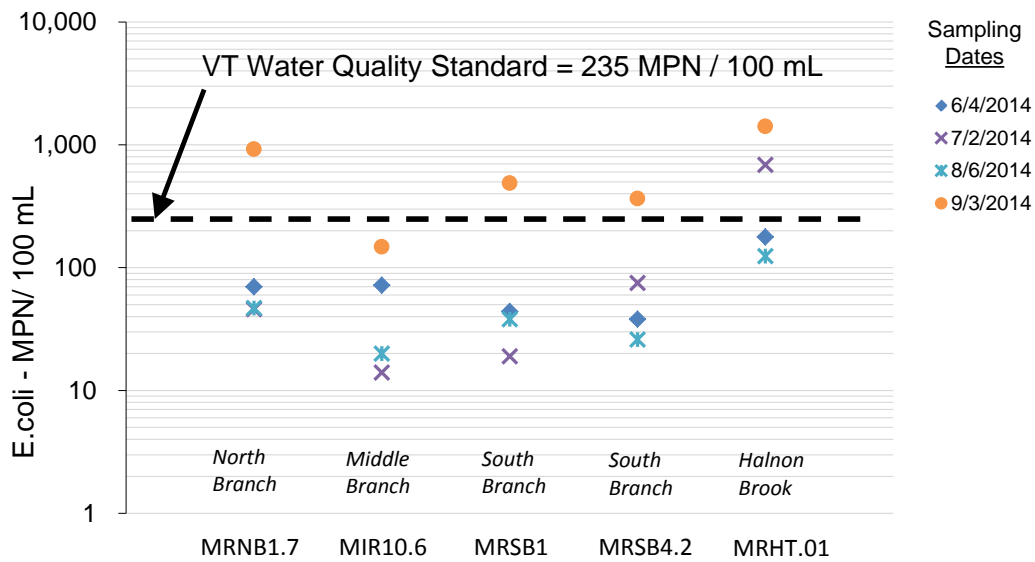
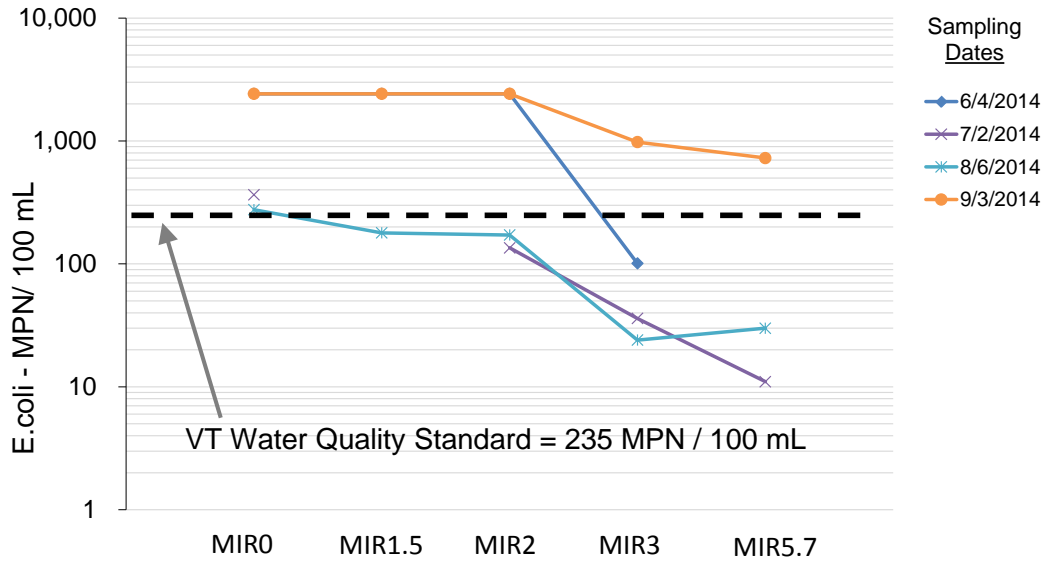
The Addison County Riverwatch Collaborative has been monitoring water quality in the Middlebury River since 1993. For the 2014 and 2015 seasons, the Middlebury River is the subject of a more intensive monitoring focus, where rotational as well as sentinel stations are monitored and additional parameters are tested. Sampled stations include two sentinel sites (MIR1.5 and MIR5.7) and six rotational sites located on the main stem, South Branch, North Branch and Halnon Brook tributaries (see above table). The tributary stations were sampled this season to obtain baseline water quality information; these stations have not been tested previously by the Collaborative. The Middlebury Gorge station was inaccessible during May and June due to ongoing bridge construction activities.

During 2014, sampling occurred on two spring dates (April 9 and May 7) and four summer dates (June 4, July 2, August 6, and September 3). The April event occurred just after ice out during a time of snow melt and represented high flow conditions on the river, based on streamflow gaging records from nearby gages (on the New Haven River and Lewis Creek). The August event also captured high flows resulting from an overnight thunderstorm. The May and June events occurred during moderate flow conditions related to higher-than-normal rainfall in the spring months. The July and September events captured low to baseflow conditions. On an average annual basis, flows in 2014 were near normal in the Addison County watersheds monitored by the Collaborative.

Samples were tested for E.coli, total phosphorus, total nitrogen and turbidity; E.coli was tested only on the summer dates. As part of the baseline water quality study, alkalinity was tested at the newly-established tributary sites during the summer months only.

E.coli counts at sites on the Middlebury River main stem and tributaries ranged from 11 to >2,420 organisms/ 100 mL (see graphs on following page). Along the main stem (top graph), E.coli counts showed an increasing trend with distance downstream from the Middlebury Gorge, consistent with historic results. Values exceeded the recently-modified state standard of 235 organisms/100 mL on all four summer sampling dates at the downstream-most station, MIR0, near the confluence with Otter Creek. E.coli counts exceeded this standard at all stations on September 3; low-flow conditions and warm temperatures likely contributed to elevated E. coli counts on this date. During moderate flow conditions on June 4, E. coli counts exceeded the standard at downstream stations MIR2, MIR1.5, and MIR0. Agricultural land uses dominate the river corridor in this lower end of the Middlebury River.

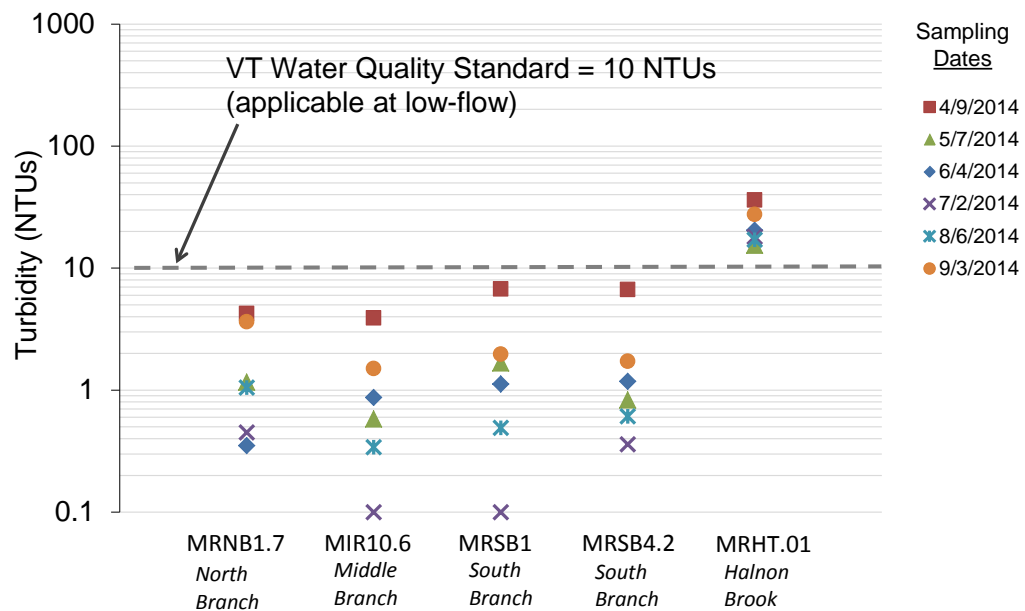
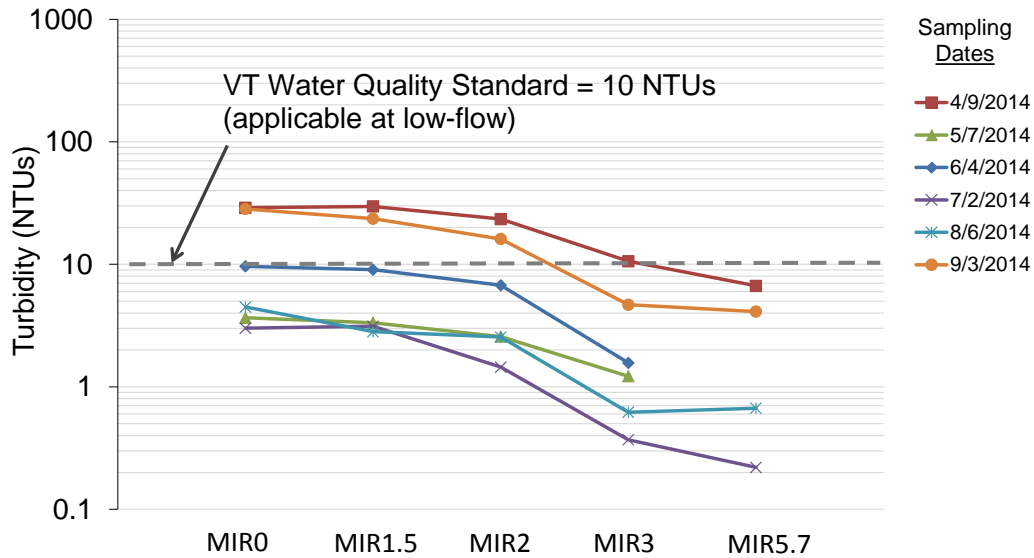
At the newly-established tributary stations (bottom graph), E.coli counts were generally below the standard, except for four stations (on the North Branch, South Branch and Halnon Brook) on September 3 and Halnon Brook station (MRHT.01) on July 2.



Nitrogen levels were detected at very low concentrations during the six spring and summer sampling dates. Concentrations ranged from 0.3 to 0.9 mg/L, with an average of 0.5 mg/L. A past standard for nitrogen as nitrate (5 mg/L) was eliminated during the 2014 update of the Vermont Water Quality Standards.

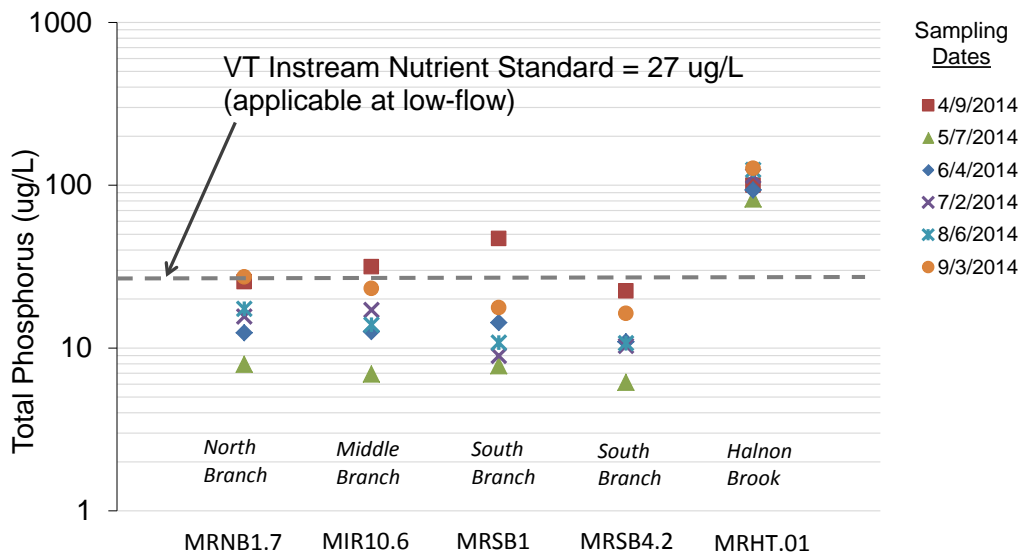
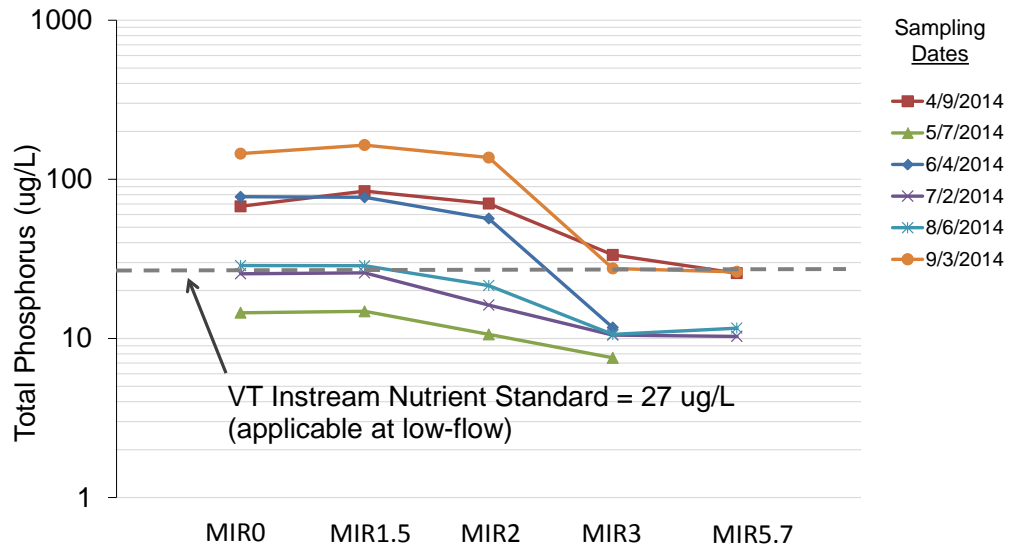
Turbidity levels in the Middlebury River were relatively low, ranging from <0.2 to 36 NTUs, with an average level of 7.1 NTUs for all six sample dates. Main stem results (upper graph) are largely consistent with historic trends. Based on past years' sampling results, turbidity can become elevated at times of increased flow – during a summer thunderstorm, or during spring runoff conditions – especially in the lower reaches

of the river below the Route 7 bridge. A slight increasing trend in turbidity with distance downstream is generally observed during all flow conditions. The Vermont state standard of 10 NTUs (for Class B cold-water fisheries) is applicable during low-flow conditions. The turbidity standard was exceeded on one of the two low-flow events (September 3) at downstream stations MIR2, MIR1.5 and MIR0. It is possible that low-flow turbidity on September 3 was at least partly associated with algae. Turbidity was also elevated at these stations during high flows following the spring runoff (April 9). Turbidity values at the newly-established tributary stations (lower graph) were all below 10 NTUs on all sample dates, except for the Halnon Brook tributary station. Turbidity values exceeded 10 NTUs during low to high flow conditions on all sample dates at MRHT.01. This station is located downstream from a fish hatchery.

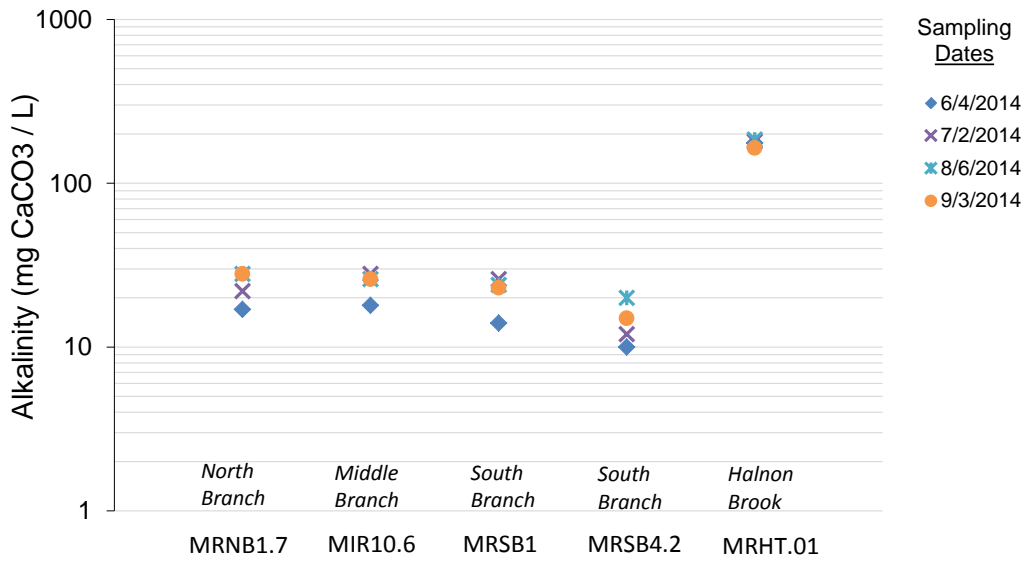


Phosphorus levels were detected at low to moderate concentrations during the six spring and summer sampling dates, ranging from 6.2 to 164 ug/L, with a mean of 39 ug/L. Along the main stem (top graph), phosphorus concentrations showed an increasing trend with distance downstream from the Middlebury Gorge, consistent with historic results. The mean concentration of Total Phosphorus for the two available low-flow summer sample dates (July and September) at MIR2 (77 ug/L), MIR1.5 (95 ug/L), and MIR0 (85 ug/L) each exceeded the approved instream nutrient standard of 27 ug/L for the warm-water medium gradient (WWMG) wadeable stream ecotype in Class B waters.

Phosphorus concentrations at the tributary stations were generally lower than concentrations along the main stem on all sample dates, with the exception of the Halnon Brook station. Phosphorus concentrations at this location were elevated during all flow conditions relative to the other Middlebury River stations. The mean concentration of Total Phosphorus for the two available low-flow summer sample dates (July and September) at MRHT.01 (121 ug/L) exceeded the instream nutrient standard (27 ug/L) for the WWMG stream ecotype.



Alkalinity detected at tributary monitoring sites during the summer sampling dates ranged from 10 to 185 mg CaCO₃ per liter. Highest values were consistently detected at the Halnon Brook station, MRHT.01.



2015: Focused monitoring at both sentinel and rotational sites in the Middlebury River watershed will continue in 2015. Based on feedback received during outreach meetings in Ripton, additional stations will be added on the North Branch and Middle Branch to expand baseline water quality monitoring on these two tributaries.

For more information, contact the Middlebury River sampling coordinator:

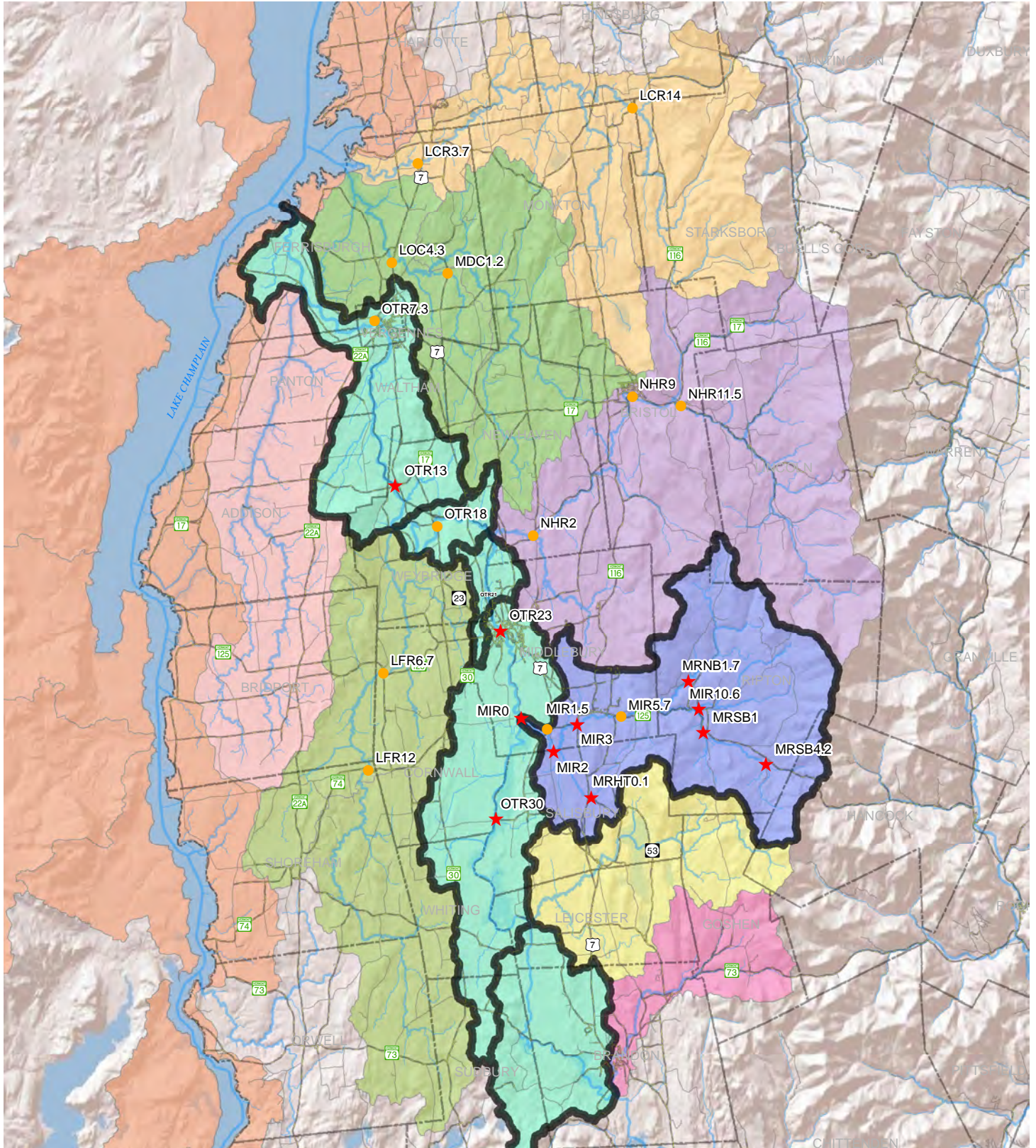
Heidi Willis, 352-4327, redsprings@nbnworks.net

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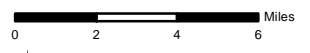
or visit our web page at: www.acrpc.org/acrwc

Addison County River Watch Collaborative

Water Quality Monitoring Sites by Watershed, 2014



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|-------------------|--------------|-------------------------------|------------------------------|------------------------------|
| ★ Rotational Site | Roads | Rotational Basins 2014 | Orange Lake Champlain Direct | Pink Dead Creek |
| ● Sentinel Site | — Pavement | Black Otter Creek | Yellow Lewis Creek | Light Green Lemon Fair River |
| | — Gravel | Black Middlebury River | Green Little Otter Creek | Yellow-Green Leicester River |
| | | | Light Blue Otter Creek | Blue Middlebury River |
| | | | Purple New Haven River | Magenta Neshobe River |



The Addison County River Watch 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.