A Window on the Water

The River Dipper volunteer water quality monitoring program of the Black River Action Team*

A view of the Black River from the Downers Covered Bridge on Upper Falls Rd in Weathersfield, VT

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*This document offers a summary of results from water quality monitoring in the Black River Watershed during the summer of 2017

ACKNOWLEDGEMENTS

The Black River Action Team wishes to thank Bill Manner, retired Program Manager for the Watershed Management Program in NE Pennsylvania, for his invaluable help in getting the BRAT's River Dipper program up and running in the wake of Tropical Storm Irene. Also Dipper volunteers Amy Balogh, Tammy Wright, Jessica Curtis, Cathryn Feickert, Carroll Veltrop, Rodger Capron, Alison Buhler, Nancy Heatley, Phil Carter, Reuben Allen, Millie Allen, Lucy Georgeff, Eva Georgeff, and Jeff Pelton for donating time, patience, miles, and good humor in keeping the Dipping program going. Appreciation is also felt for the staff of the LaRosa Partnership Program and Endyne Labs, Inc for their support and high standards for running the chemical and bacterial tests; to Basin Coordinator Marie Levesque-Caduto for her guidance in all aspects of the Dipper program; and to the Ottauquechee Natural Resources Conservation District for continuing to be the BRAT's umbrella organization and fiscal agent. Special note of thanks to the Connecticut River Conservancy for the reimbursement of certain financial costs inherent in the monitoring program, through their grant from the Linthillac Foundation.

OVERVIEW of project goals

The BRAT's River Dipper program is focused on gathering baseline data on the current condition of the Black River and some of her tributaries. The need to recognize trends and identify trouble spots is the underlying goal of the program, yet a strong need for public awareness is key in making any real improvement in water quality. Land use is directly tied to river health, and stakeholders need to understand how their behavior and attitudes can have a direct impact on water quality. From municipal officials to private landowners, from commercial developers to school children, the Black River Action Team is committed to an reaching all corners of the watershed with educational outreach. Ideally, BRAT seeks to encourage stewardship through paradigm shifts.

As part of the LaRosa Partnership Program, we answered the following questions in our application and have listed our 2017 progress below:

1) What will be monitored? Eleven sites in the Black River and three sites in tributary streams were monitored for Total Nitrogen, Total Phosphorus, and Chloride.

2) When will monitoring occur? These sites were sampled monthly on the last Wednesday morning of each month, May through September (inclusive) for a total of 280 bottles being shipped to the LaRosa lab in Burlington.

3) How will samples be collected? Volunteers gathered samples in the bottles provided by the LaRosa Laboratory, placed in coolers with ice, and then assembled for transport to the laboratory via Green Mountain Messenger. Training for the sample collectors was provided by the BRAT Monitoring Coordinator at once during the monitoring season the Monitoring Coordinator reviewed monitoring procedures with sample collectors. Once the sample results were received from the LaRosa Lab, results were entered into a spreadsheet and reviewed. E.coli samples were collected following protocols set forth by the LaRosa Laboratory, with special care being taken not to contaminate the mouth or cap of the sample bottles. Samples were transported in coolers to the Ludlow wastewater treatment facility, where a courier picked them up to deliver to Endyne Labs in Lebanon NH within the hold-time window.

NARRATIVE & NEW STUFF

The 2017 River Dipper program was similar in scope and scale to the 2016 program; however, with the loss of our lead volunteer, Bill Manner, we decided to drop the time-sensitive turbidity samples for 2017 due to complications with the sample delivery schedule. We replaced turbidity with chloride, which should give us a baseline on road salt impacts for some of our sites.

New for 2017 was our participation in an ongoing study by the University of Massachusetts, collecting baseline data for an isotopic comparison of surface and groundwaters around New England. River Dipper volunteers collected an additional bottle of water each month at their sites to be mailed to UMASS for their study. A description from project leader and UMASS senior Shawna Laplante:

> "Basically all water has an isotopic signature, and you can use that signature to identify characteristics of the water. For example, arctic waters have a particularly light isotopic signature, while tropic waters are isotopically heavy. The ocean is like the 0 from which everything else is measured against. And heavier waters fall out of rain clouds before the lighter waters. In New England we get a mixture of precipitation originating from the arctic, the tropics, the ocean, etc. When we take our measurements we can identify this in a particularly large rain event, for example hurricanes. Events like hurricanes are particularly interesting for us because we can track how that water moves because it's so heavy;it's unique enough for us to identify the difference between that and water that has been in our systems. Also groundwater and surface water are isotopically different and so we can track how water is discharging and recharging in our systems."

BRAT will continue its collaboration in this study, working with Ms Laplante and her successor to incorporate the data into outreach opportunities in the Black River watershed and beyond, utilizing spatial maps being generated by UMASS for the project.

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For 2018, six swimming holes will again be sampled weekly for bacteria levels, with samples being tested at Endyne Labs in Lebanon NH via courier from the Ludlow wwtf. Results are posted at Buttermilk Falls in Ludlow and at Greven Field in Proctorsville, as well as at nearby town halls and online at ctriver.org. Funding for the "Adopt-a-Swimminghole" portion of the River Dipper program was provided in 2017 by Okemo Mountain Resort for both Buttermilk Falls and Cavendish Gorge. While Okemo will renew its commitment to Buttermilk Falls for 2018, the funding for Cavendish Gorge is being provided this year by Green Mountain Power, owners and operators of the hydroelectric facility at the head of the Gorge.

The relaxing upper pool at Buttermilk Falls on Branch Brook in Ludlow.

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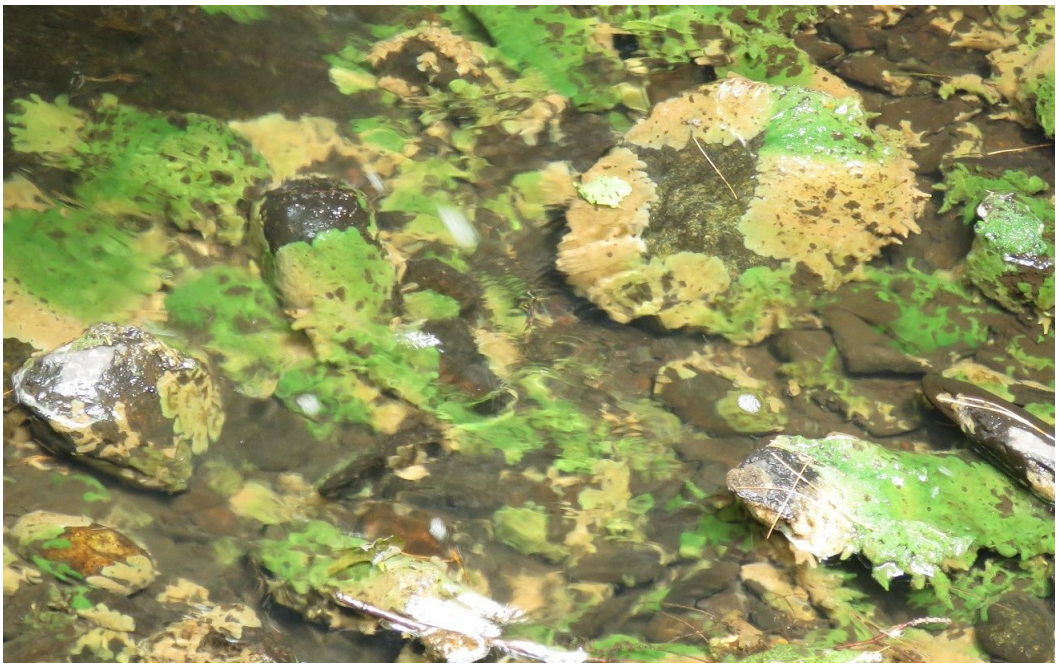
Also in 2017 BRAT began the weekly collection of data, samples, and observations at the newly-opened Muckross State Park in Springfield. BRAT officially adopted Muckross Pond, a small water body roughly 3 meters deep, hemmed in on both sides by evergreen-lined slopes. BRAT volunteers follow protocols set forth by the VT Lakes Lay Monitoring Program and gather samples to be tested for chlorophyll-a as well as for total phosphorus; we also collect readings for pH, temperature, Secchi depth, TDS, salinity, and conductivity. Observations are noted about weather, rainfall, flora, and fauna; bryozoans are plentiful in the pond, and a freshwater sponge is present on the rocks below the dam at the

lower end of the pond. Further bioassessments are being planned for summer 2018, particularly in the fen at the upper end of the pond.

Armando Stettner assists with data collection at Muckross Pond.

Organisms of special note observed at or near Muckross Pond in 2017 include a freshwater sponge:



multiple colonies of bryozoa:

Found in higher quality freshwater ponds and lakes, bryozoan colonies are biologically similar to coral.

and an adult Tiger spiketail dragonfly discovered at the Paddock Rd bridge just below Muckross State Park - the state's 100th documented dragonfly species:

The Tiger spiketail (Cordulegaster erronea), taken by Dale Ferland, July 2017.

METHODS

The sample collection protocols as described in our QAPP document were followed; all samples were collected from mid-depth in the water column using a U-shaped movement while facing upstream, allowing the current to fill the bottle while preventing surface water from entering the bottles:

1) Nitrogen samples required a plastic 50 ml centrifuge tube be filled with the river sample to the 50-ml line. These samples also required that the sample tube be rinsed three times with river water before collecting the sample. Sample bottles were then labeled with the pre-printed labels, organized in racks, packed in a cooled with ice, and shipped to the LaRosa lab by courier.

2) Phosphorus samples were collected using 60 ml glass vials, filled to the line marked on the side of the vial. No rinsing was to be performed, and after collection the vials were labeled, organized, and packed as above.

3) Chloride samples also required a plastic 50 ml centrifuge tube be filled with the river sample to the 50-ml line. These samples also required that the sample tube be rinsed three times with river water before collecting the sample. Sample bottles were then labeled with the pre-printed labels, organized in racks, packed in a cooled with ice, and shipped to the LaRosa lab by courier.

4) E.coli samples were gathered in 100 ml plastic bottles, which were unsealed on site just before use.

Care was taken not to touch the inside of the caps or the bottles, to prevent contamination. Field blanks were also collected using deinoized water, while duplicate samples were collected for Phosphorus on each sample date.

PARAMETERS *optimal levels are for Class A(1) Ecological Waters per VT Water Quality Standards; quotes from VT Agency of Natural Resources Dept of Environmental Conservation*

Total Nitrogen (Measured in mg/L; optimal level is below 2.0 mg/L)
Total Phosphorus (Measure in micrograms/L; optimal level is below 54.0 ug/L)

"Phosphorus and nitrogen are both closely tied to the productivity of an aquatic ecosystem. "These nutrients are naturally limited in the environment and high levels cause aquatic plants, especially algae, and cyanobacteria (formerly known as blue-green algae) to grow in much greater densities than the aquatic ecosystem would naturally support. Phosphorus is the limiting nutrient in freshwater systems, while nitrogen is more typically the limiting nutrient in marine systems. The term 'limiting' here means that the amount of nutrients available regulates productivity of the food web in waters. A limiting nutrient is akin to eggs in a cookie recipe - too few eggs means only a small batch of cookies can be baked regardless of how much flour or butter may be available.

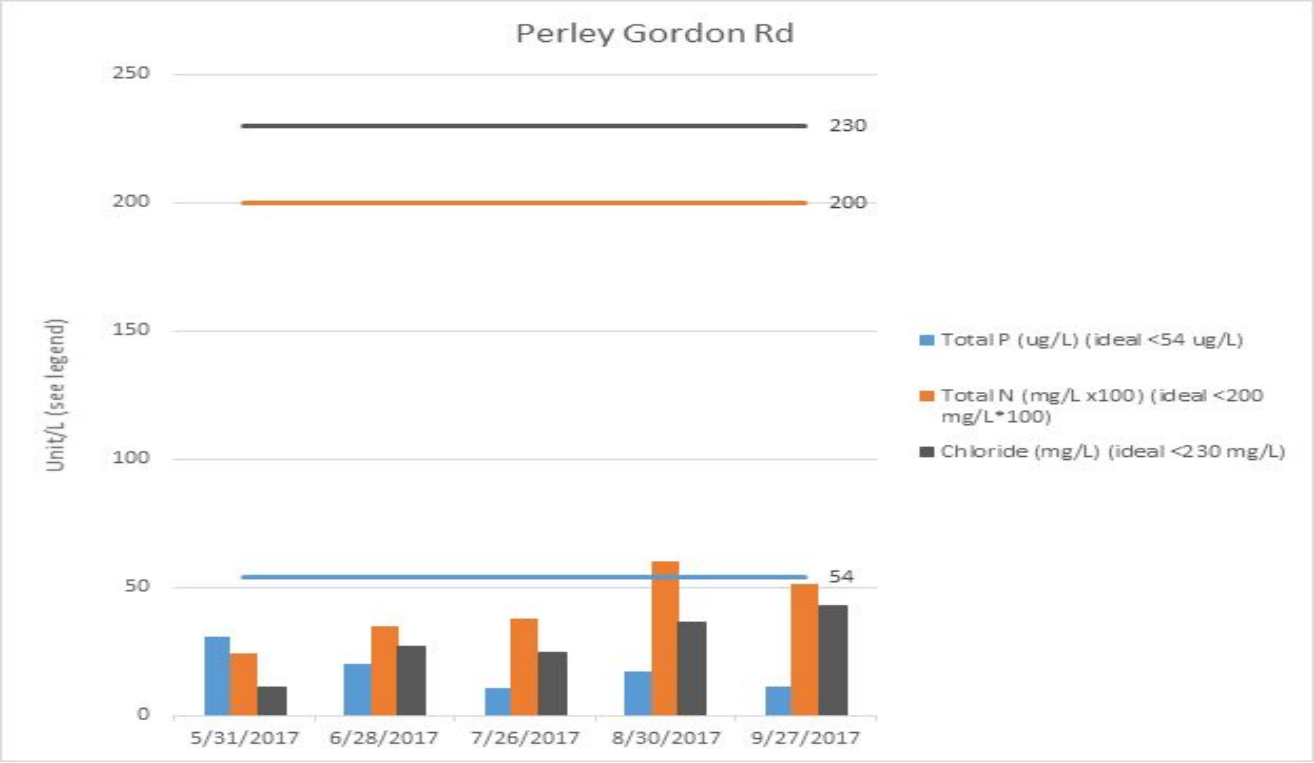
"In excessive amounts, algae and cyanobacteria can impair recreational uses, aesthetic enjoyment, the taste of drinking water, and the biological community. In some cases, cyanobacteria may produce toxins harmful to animals and people." Excess aquatic vegetation will die and decompose, eating up available oxygen which is required by aquatic animals such as fish. Nutrients can enter waterways through animal manure from farms, pet waste, fertilizers on lawns and croplands, erosion, and septic systems. Managing stormwater on private and municipal property is an effective tool for keeping water on land as long as possible to spread out, slow down, and soak in before hitting the river. Some solutions are as simple as rain barrels, rain gardens, and less paved surface.

Chloride (Measured in mg/L; optimal chronic level is below 230 mg/L) This element is naturally occurring in rivers to some extent, if a streambed contains minerals with high salt content, for instance. Chloride may also enter the river through runoff (snow- and ice-melt) from salted roads, but also from septic system effluents, landfill leachate, and agricultural waste. Some organisms, including many fish, are not impacted by chloride concentrations exceeding 10,000 mg/L, but many others experience poor health and limited reproductions at chloride levels of 230 mg/L.

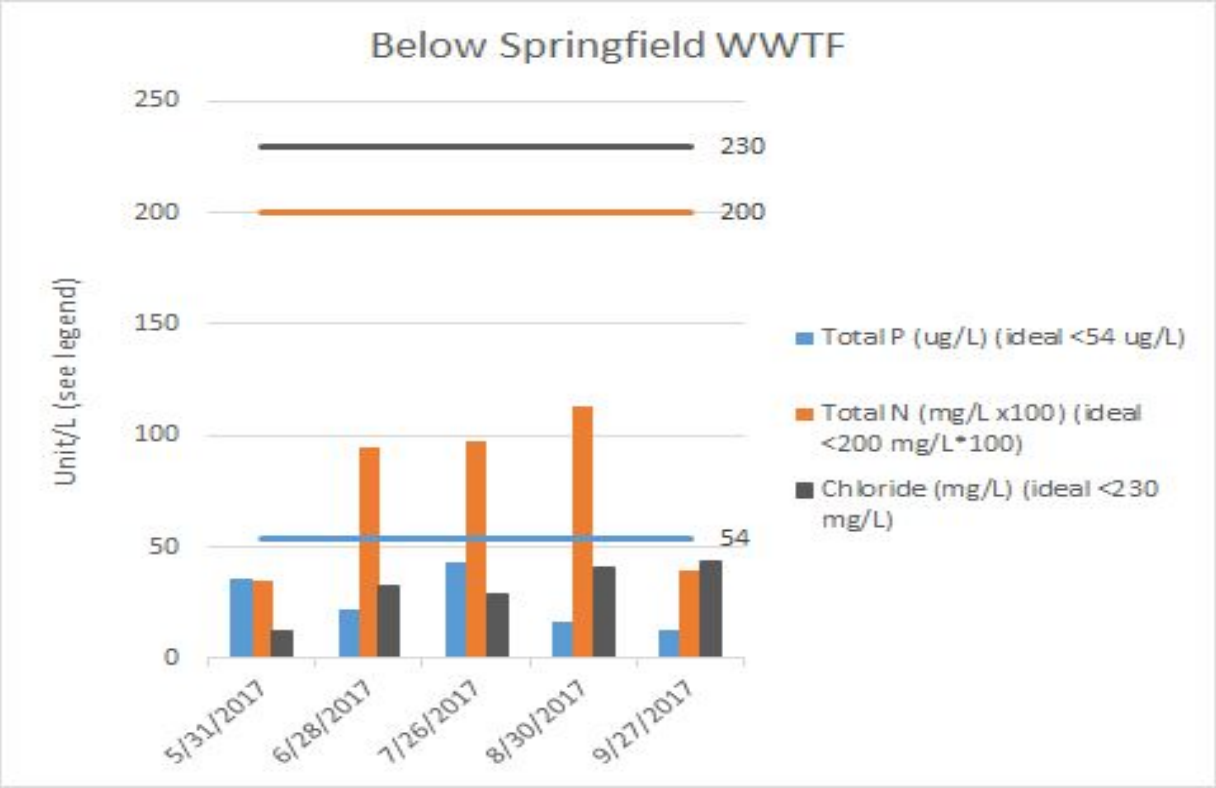
E.coli (Measured in # of colony-forming units/100 ml) Found in the gut of all warm-blooded animals, E.coli bacteria can cause often severe illness in humans who come into full contact with contaminated water. Heavy rains can increase normal (ambient) bacteria levels by washing animal waste, fertilizer, and other substances into water bodies, so it is highly recommended to avoid swimming within 24 hours of a heavy rain or anytime the water appears cloudy. The US EPA has set a "safe swimming" upper limit of 235 cfu/100ml of water; one of BRAT's swimming hole sites tested consistently higher than the ambient level of roughly 70 cfu. BRAT will continue monitoring all swimming holes, to determine if the high bacteria level is an ongoing problem.

Where do we sample?

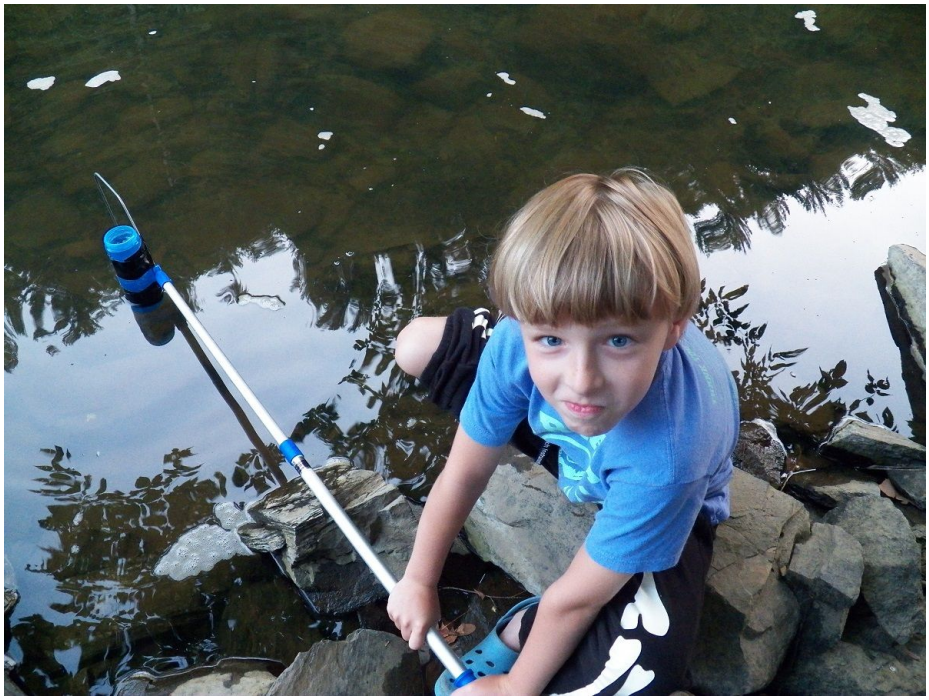
Site #1: [43.271162, -72.449806] BRAT.BR.1.6 -- Perley Gordon Rd is a representation reach that is connected to the Connecticut River just 2 miles downstream; this site is influenced by the flow regime of the hydro dams on the CT River at Bellows Falls and at Hartland Dam. The river here is wide and flat, with a silty bed and a paved road on either bank. About 1/3 mile upstream is a waterfall that once hosted the Gould Mill. Sampled by Kelly Stettner and son Armando.

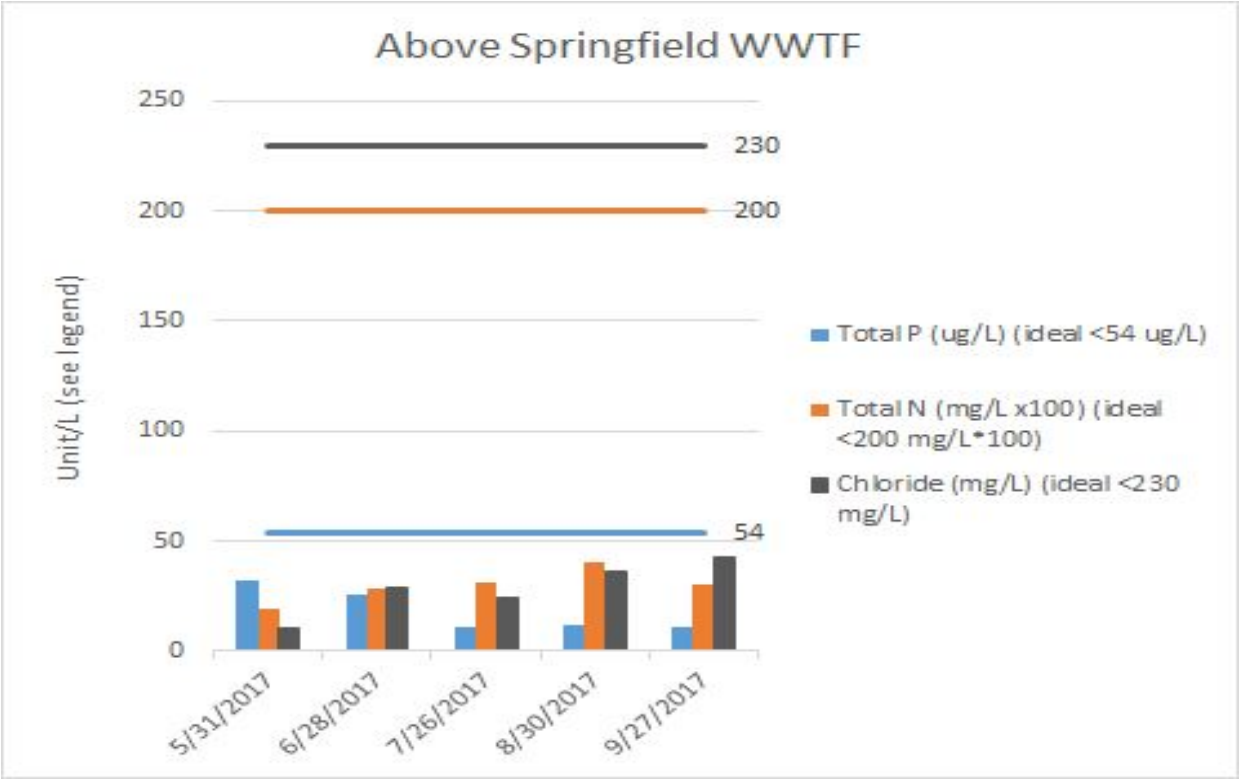


Site #2: [43.279674, -72.467553] BRAT.BR.2.4 -- Downstream of Springfield's wastewater treatment facility. This site is roughly 200' below the outflow of the wwtf and just upstream from the confluence of Seaver Brook. Sampled by Kelly Stettner and son Armando.

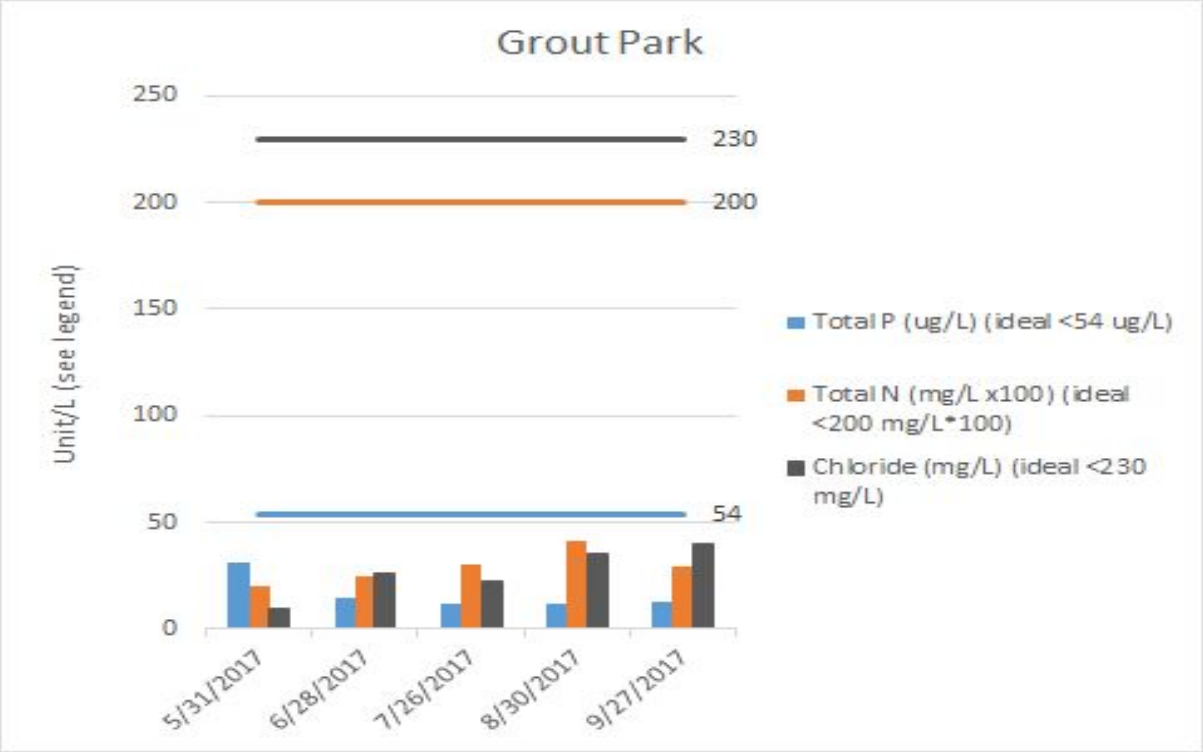


Site #3: [43.280659, -72.46846] BRAT.BR.2.75 -- Upstream of Springfield wwtf. Sited just above the outflow of the wwtf, data "brackets" any potential impact. Sampled by Kelly & Armando Stettner.

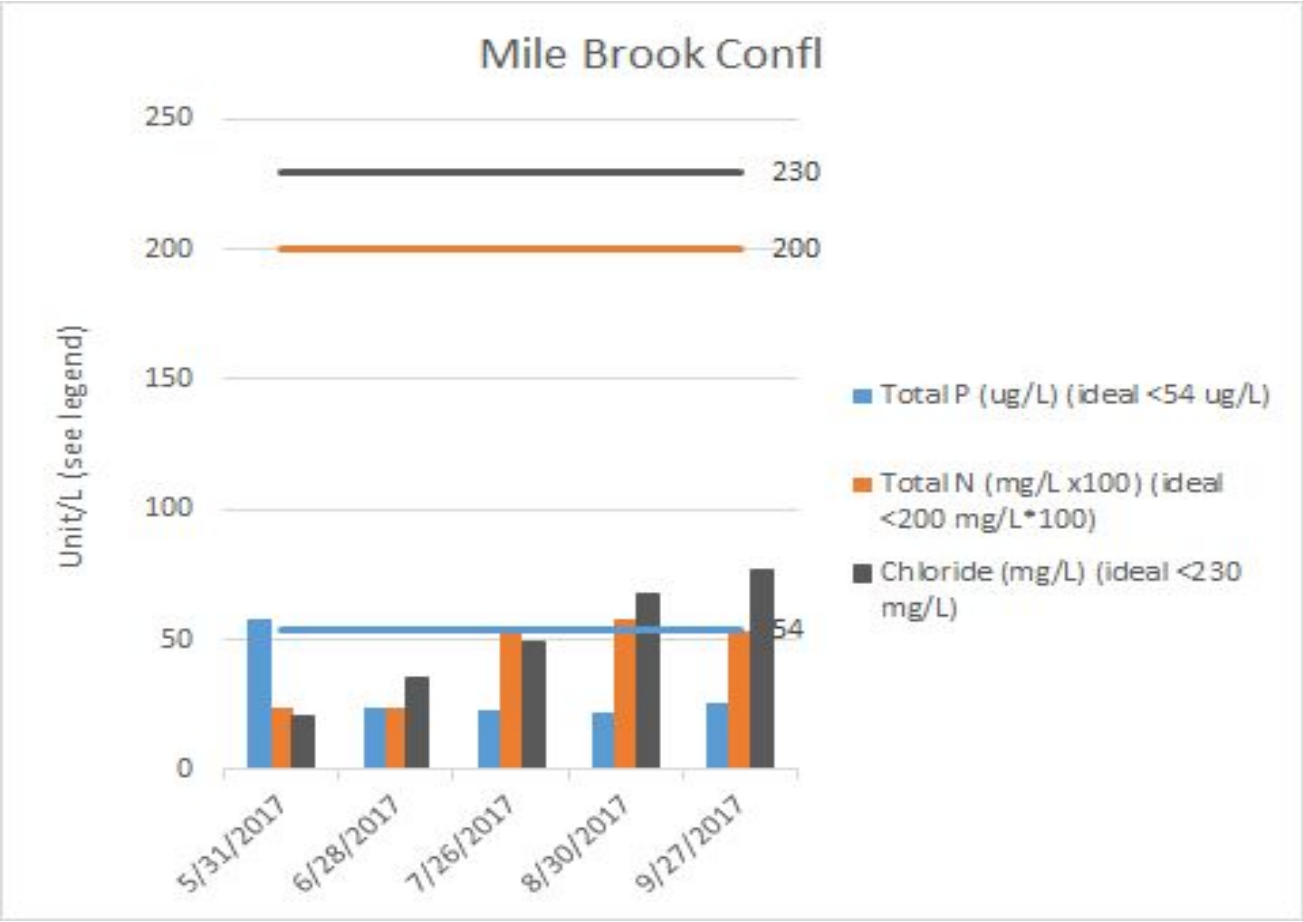




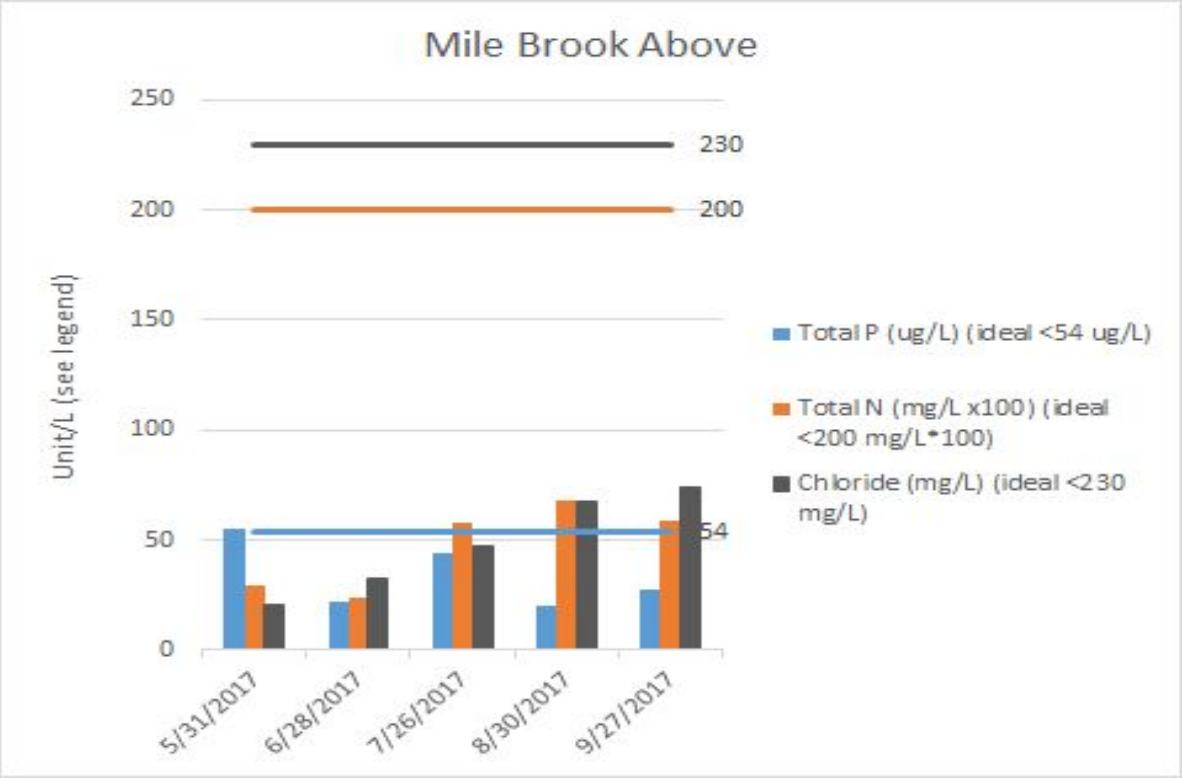
Site #4: [43.294897, -72.480513] BRAT.BR.3.6 -- Grout Park. This site is just below the last man-made dam on the Black River mainstem and below the main industrial area of Springfield. Sampled by Jess Curtis and Cathryn Feickert.



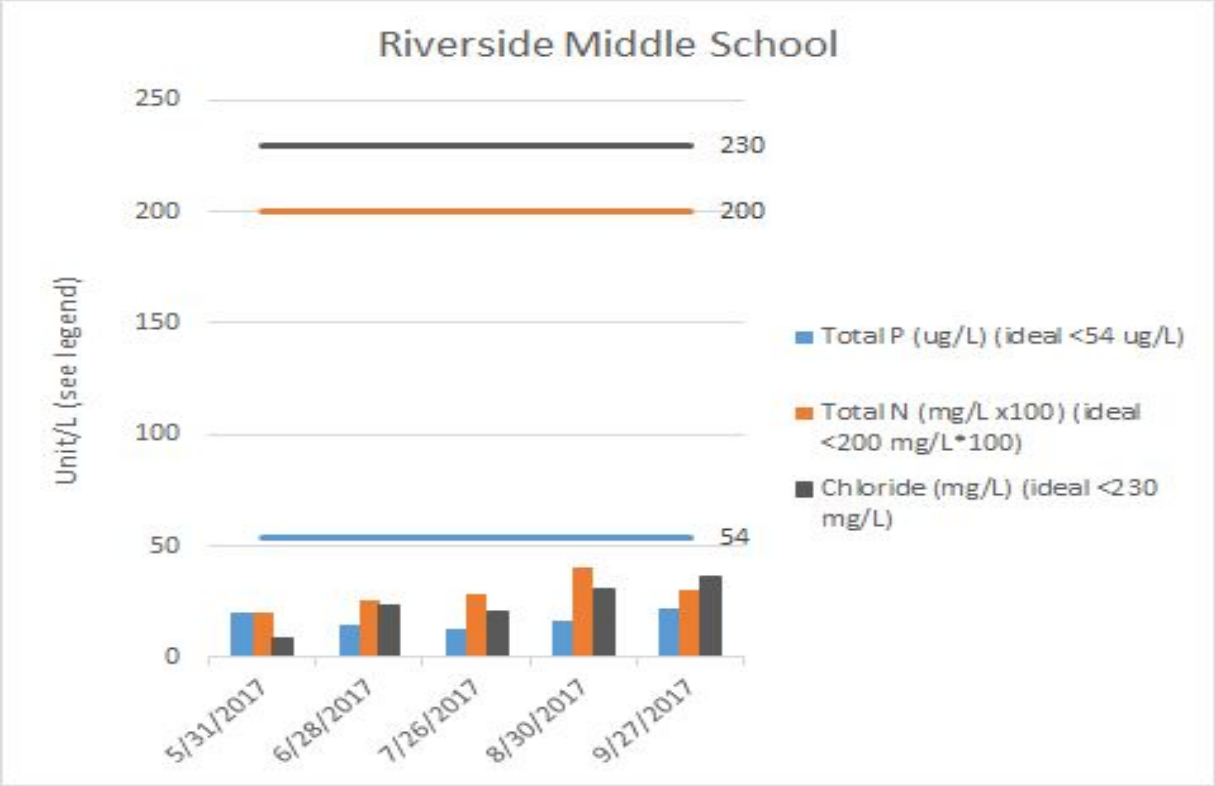
Site #5: [43.299249, -72.482152] BRAT.MB.0.0 -- This site is on Mile Brook, just at the confluence of the stream with the Black River, after it emerges from an underground box-culvert below Main Street in downtown Springfield. Sampled by Lucy Georgeff and daughter Eva.



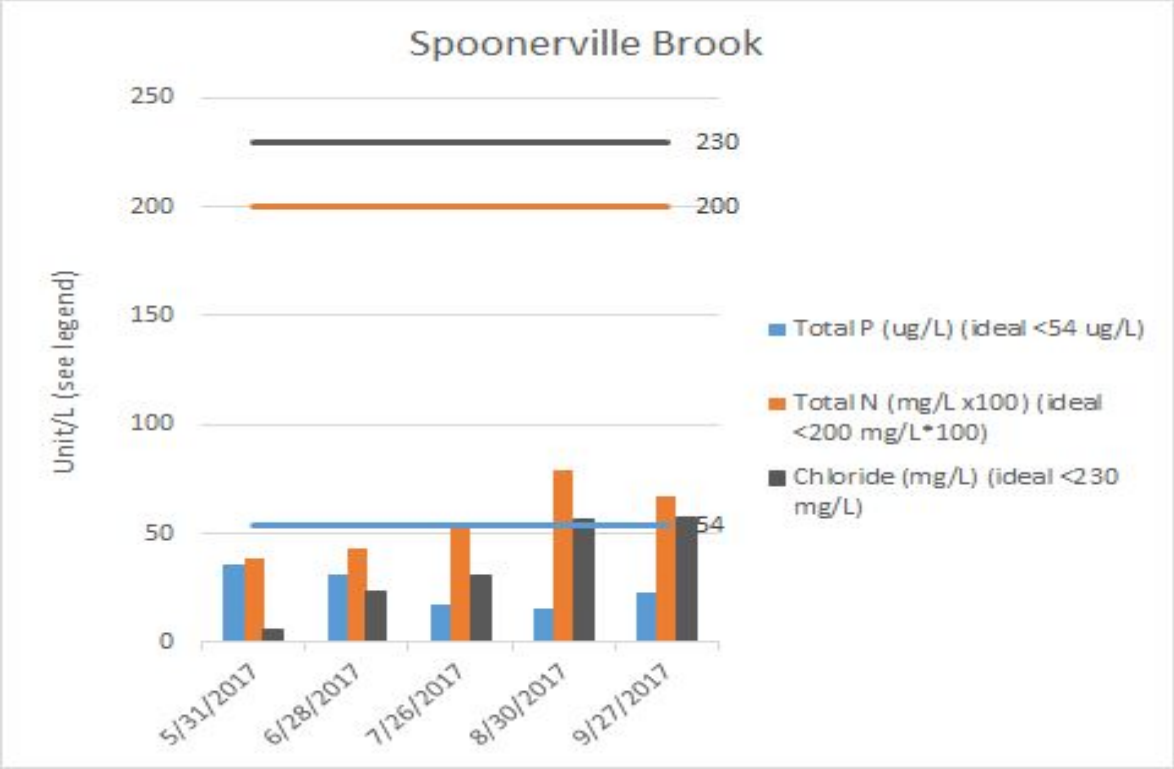
Site #6: [43.299487, -72.480961] BRAT.MB.0.2 -- The second site on Mile Brook is sampled just before the stream enters the underground culvert below Main Street, at the upper end of the movie theater parking lot. Sampled by Lucy Georgeff and daughter Eva.



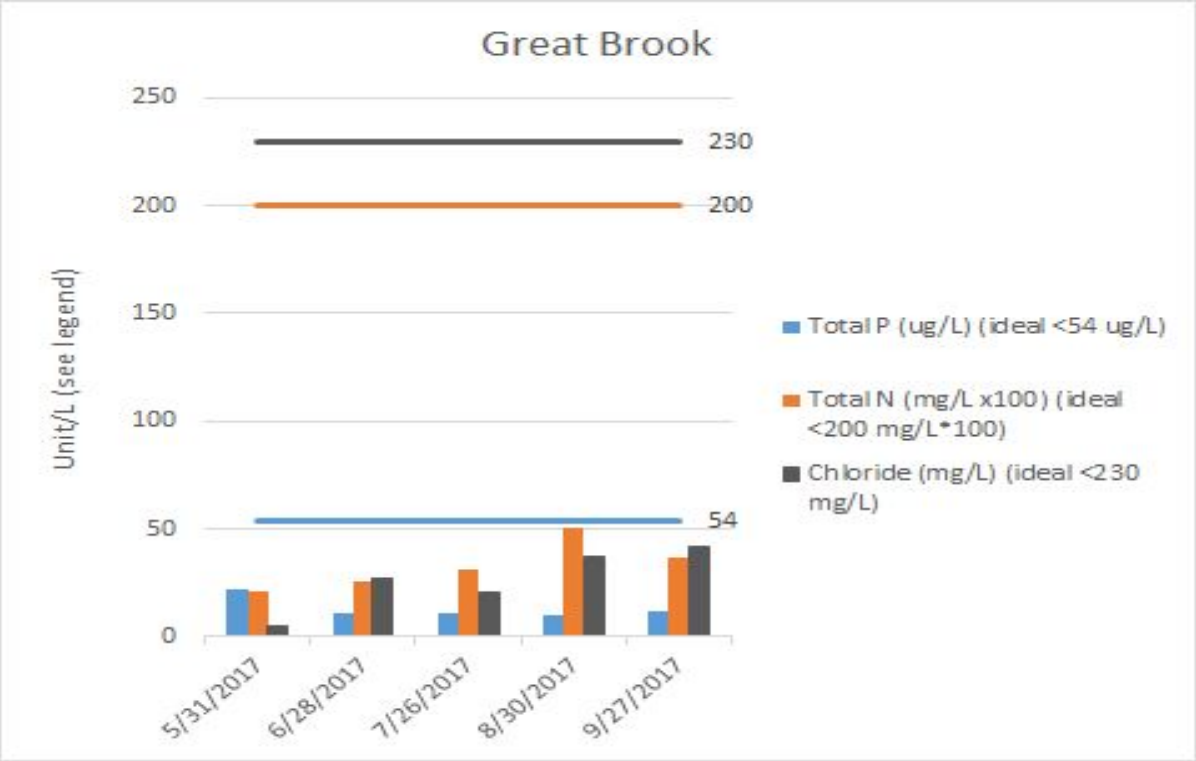
Site #7: [43.304581, -72.494394] BRAT.BR.5.1 -- Riverside Middle School. A wide, flat, sandy-bottomed reach that is influenced by slow flow as the river enters a sharp oxbow bend downstream. The water here tends to be warmer, as there is little shading canopy overhead. Sampled by Carroll Veltrop.



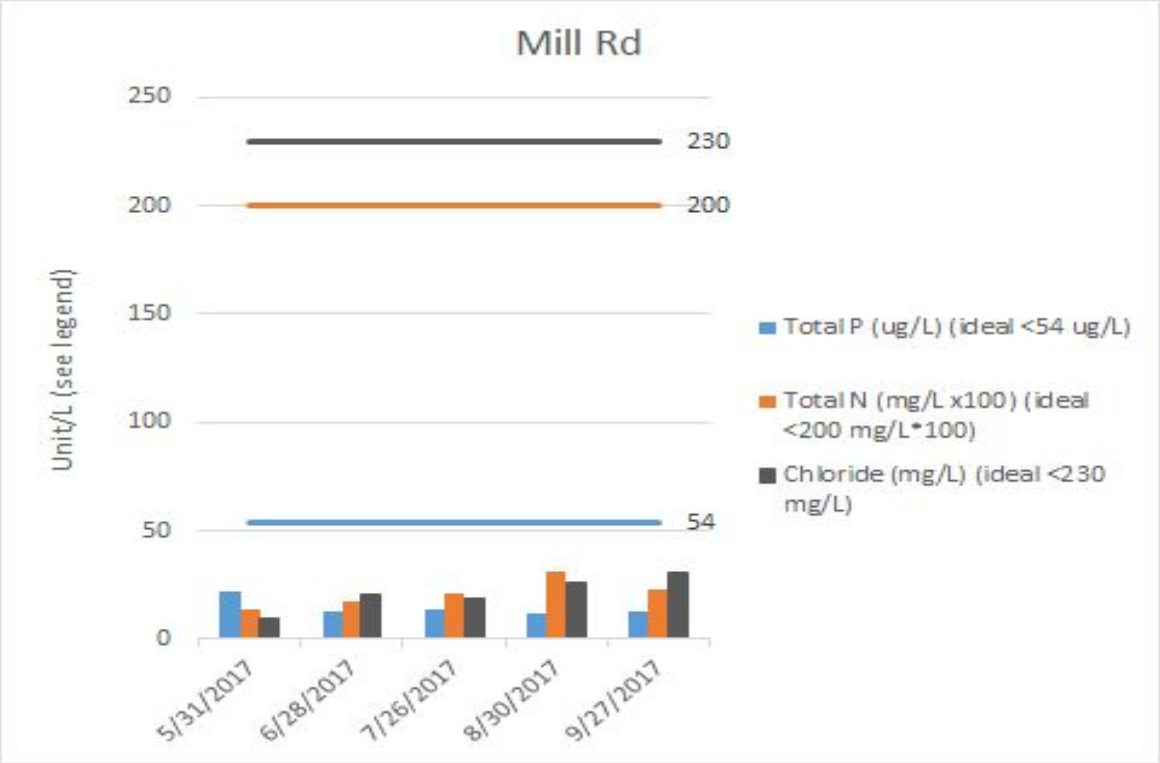
Site #8: [43.330792, -72.520739] BRAT.SB.0.1 -- Spoonerville Brook, North Springfield. A small winding brook, the Spoonerville drains only 5 square miles of watershed but runs very close to the road in many places. Sampled by Tammy Wright.



Site #9: [43.332602, -72.524993] BRAT.GB.0.3 -- Great Brook runs along Main St in North Springfield. Draining a much larger watershed than the Spoonerville, Great Brook enters the Black River about 200' upstream from the smaller brook. Sampled by Tammy Wright.



Site #10: [43.333445, -72.514757] BRAT.BR.8.6 -- Mill Road, North Springfield. This spot is just downstream from the flood control dam managed by the US Army Corps of Engineers, which holds back up to 16.7 billion gallons of water from the Black River main stem and the North Branch. Sample is collected by the only USGS gauge on the Black River. Sampled by Reuben Allen and daughter Millie.



Site #11: [43.368773, -72.501317] BRAT.BR.12.3: Tolles Dam, Maple St, Perkinsville. This sample is collected at a popular swimming spot located on property managed by the US Army Corps of Engineers. Sampled by Rodger Capron.

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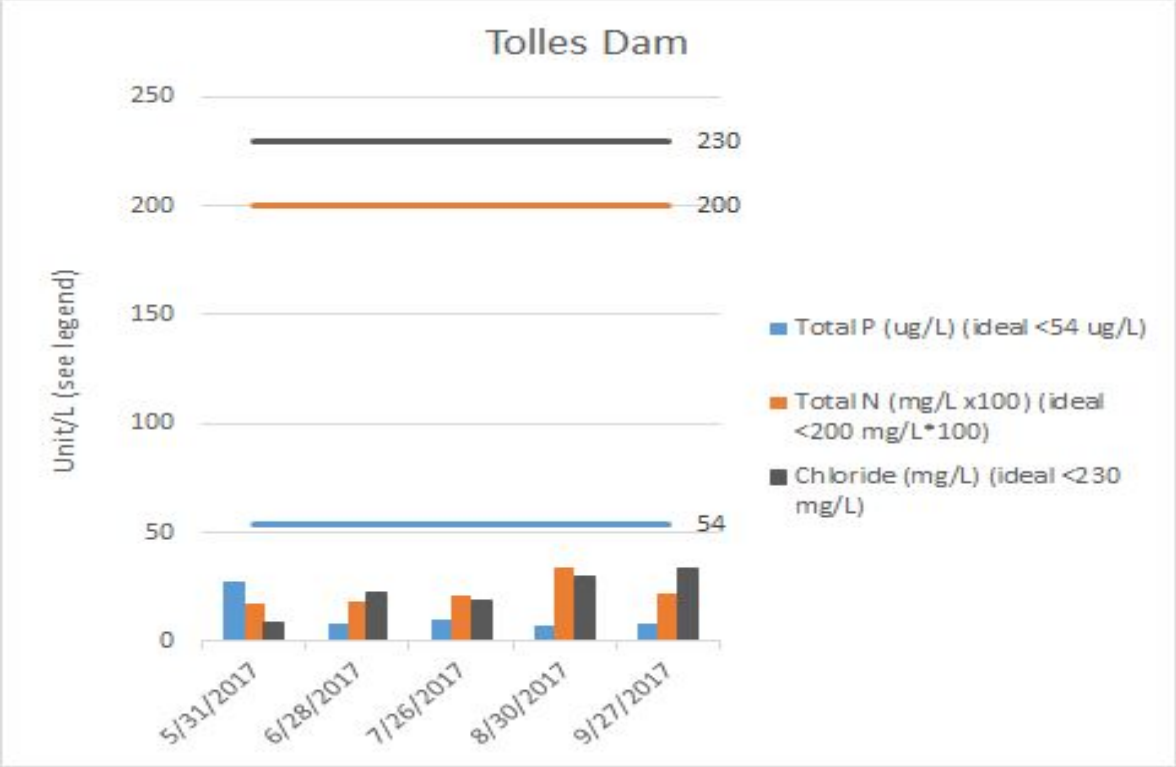
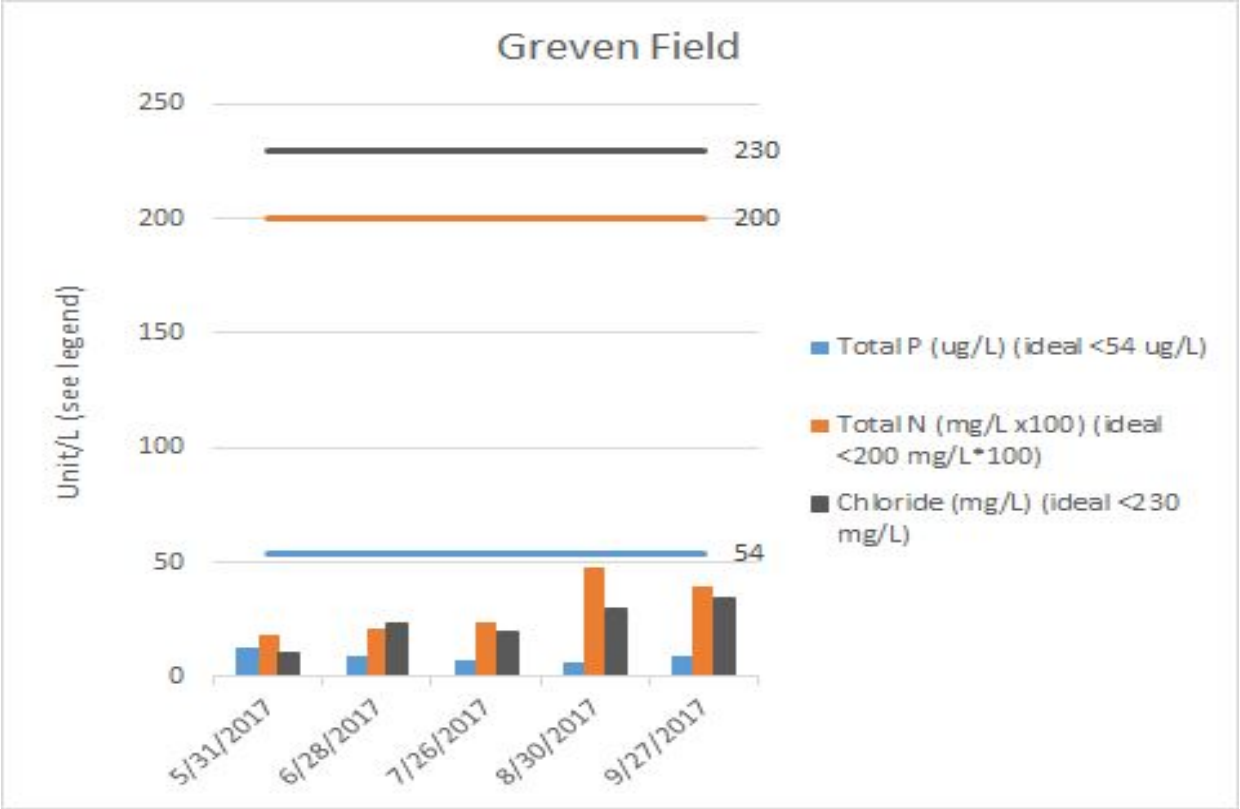
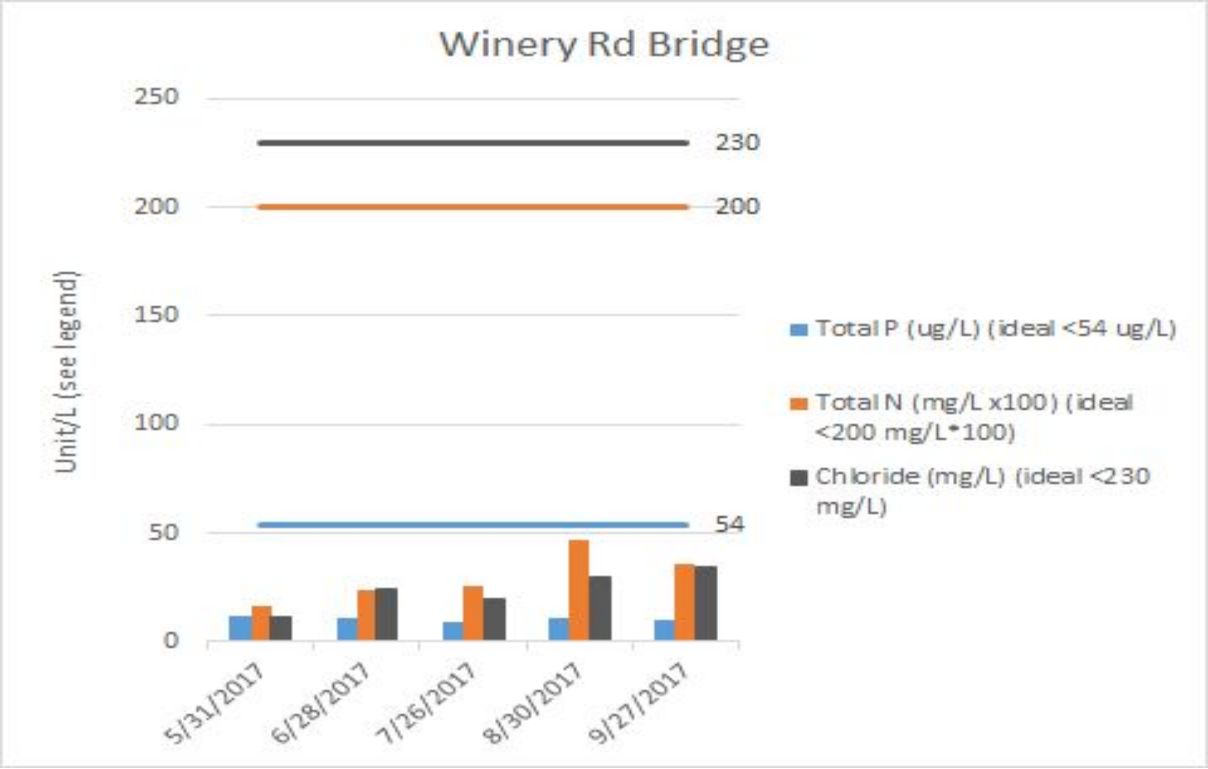


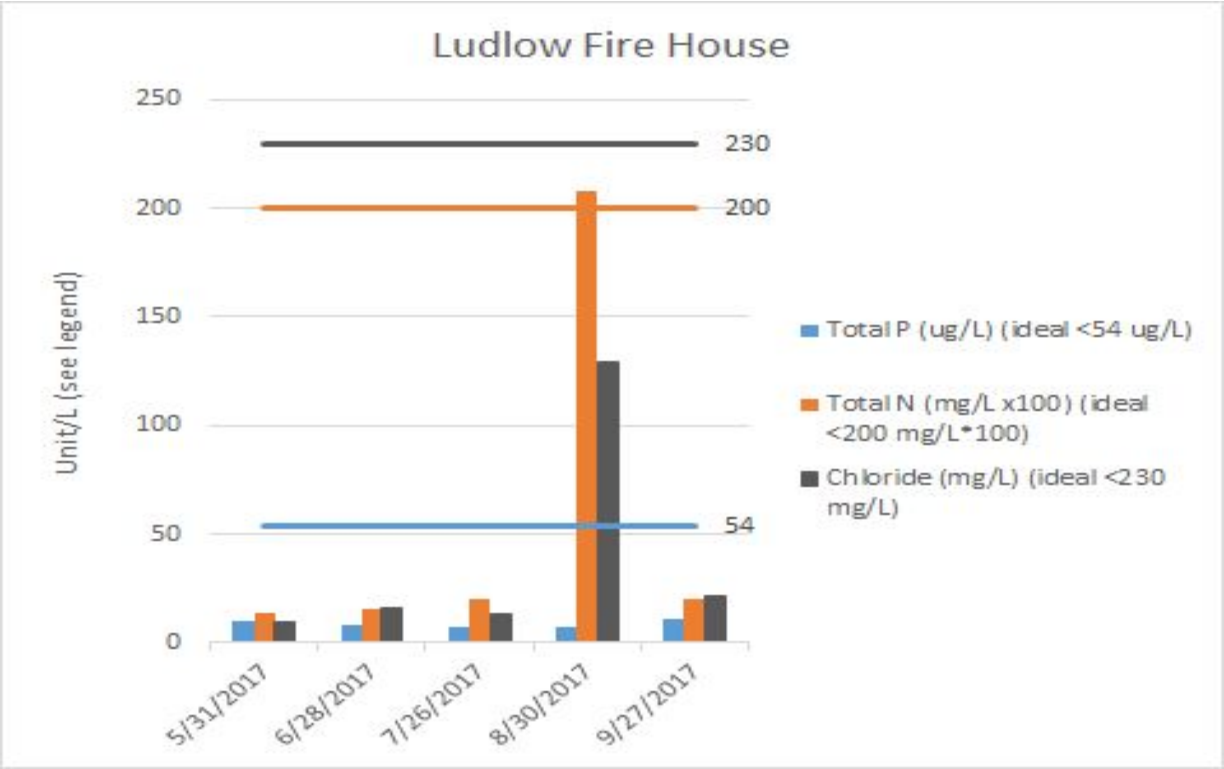
Site #12: [43.38071, -72.64011] BRAT.BR.23.0 -- Greven Field, Cavendish. A popular community recreation area for shallow swimming, wading, and kayak launching, Greven Field was sampled by Amy Balogh in 2017.



Site #13: [43.387369, -72.653637] BRAT.BR.24.1 -- Winery Road bridge, Cavendish. This site is located at the intersection of Winery Road and Route 103, just downstream from the Ludlow wastewater treatment facility and a canine "day care" facility. Sampled by Amy Balogh.



Site #14: [43-401529, -72.705827] BRAT.BR.27.3 -- Ludlow Fire Station, Ludlow. Located behind the Ludlow fire station on Pond Road and just downstream from a golf course, this site is also home to an inflatable diversion dam used by Okemo Resort for snowmaking. Sampled by Phil Carter.



Learn more about the Black River Action Team, the River Dipper program, and all our activities at our website at http://www.BlackRiverActionTeam.org or by getting in touch with BRAT Director Kelly Stettner at blackrivercleanup@gmail.com.
Messages can also be left at 802-738-0456.