

A Window on the Water

2019 Annual Report of the River Dipper volunteer water quality monitoring program of the Black River Action Team*



Multiparameter probes and calibration solutions made possible by the VT Watershed Grant Program

Prepared by Kelly Stettner
February 2020

*This document offers a summary of results from water quality monitoring in the Black River Watershed during the summer of 2019

Acknowledgements

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Methods, Quality Control

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- Total Phosphorus
- Total Nitrogen
- Chloride
- E.coli

Charts

Maps

Vermont's Watershed Grant Program features several license plate designs for donors to choose from. Some of the funding for the BRAT's 2019 River Dipper water quality monitoring program came from this grant program.



ACKNOWLEDGEMENTS

The Black River Action Team wishes to thank Antioch University grad student Maura Anderson who was again invaluable in keeping the River Dipper program afloat and running smoothly this year amidst her many other obligations, deadlines, and personal events. River Dipper volunteers included Rhonda Benoit, Tammy Wright, Randy Gray, Rodger Capron, Alison Buhler, Sharon Bixby, Deb Harrison, Betty McEnaney, Reuben Allen, Millie Allen, Lucy Georgeff, Eva Georgeff, Beth Gray, Armando Stettner, and Jeff Pelton. These folks donated 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 gratitude to the State of Vermont Agency of Natural Resources Watershed Grant Program for providing funding for the purchase of several multi-parameter probes and calibration solutions.

REVIEW of project goals

The BRAT's River Dipper program continues to be 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 reaching all corners of the watershed with educational opportunities. 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 2019 progress below:

1) What was monitored? Eleven sites in the Black River and eight sites (up five from 2018) in tributary streams were monitored for Total Nitrogen, Total Phosphorus, and Chloride.

2) When did monitoring occur? These sites were sampled monthly on the last Wednesday morning of each month, May through September (inclusive); thanks to a volunteer courier, all bottles were hand-delivered to the LaRosa/VAEL lab in Randolph.

3) How were samples collected? Volunteers gathered samples in the bottles provided by the LaRosa Laboratory, placed them in a cooler with ice, and then sorted for transport to the laboratory via BRAT volunteer Maura Anderson. Training for the sample collectors was provided by the BRAT Monitoring Coordinator at the beginning of the season, and reviewed throughout the sampling season. 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 for 2019

The 2019 River Dipper program built on previous years with an eye toward building a database of chloride results.

We continued 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 of the project:

"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 UMASS to incorporate the data into outreach opportunities in the Black River watershed and beyond, utilizing spatial maps being generated by UMASS for the project.

The BRAT again participated in the CT River Conservancy's "Samplepalooza" collection program, gathering water samples from the lowest reach of the Black River to share with the CRC.

According to organizer Ryan O'Donnell: "The Samplepalooza is an effort between CRC, VT DEC, and NH DES to collect nutrient data throughout the upper Connecticut River watershed. The idea is to get a snapshot of conditions across political boundaries. While monitoring is happening in all three states, it usually doesn't all happen at the same time. We are concerned about nutrients because of eutrophication in Long Island Sound due to excessive nitrogen. Watershed-wide efforts like Samplepalooza can help us understand where nutrients are coming from and where we may need to target restoration efforts." Time

will tell what the Connecticut River's impact is having on Long Island Sound, and whether any particular tributary is contributing sediment or nutrients.

For 2019, five swimming holes were sampled weekly for bacteria levels, with samples being tested at Endyne Labs in Lebanon NH via courier from the Ludlow wwtf. The Upper Falls Road sampling site was dropped from the roster as bacteria results were consistently excellent for several years in a row and no impacts are suspected. Results are posted by volunteers 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 continues to be sought through outreach to area businesses and organizations. While Okemo Mountain Resort renewed its commitment to Buttermilk Falls for 2019, the funding for Cavendish Gorge was provided this year by Green Mountain Power, owner/operator of the hydroelectric facility at the head of the Gorge.



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

Also continuing from 2018, BRAT again collected data, samples, and observations at the recently-opened Muckcross State Park in Springfield. BRAT officially adopted Muckcross 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; construction and clearing activities continue at the park, promising greater public access and opportunities for recreation and stewardship.



Armando Stettner assists with data collection at Muckcross Pond.

OUTREACH

In a first-time effort at engaging the public in the larger conversation about water quality, BRAT organized an exhibit at The Great Hall in Springfield VT entitled “Our River Runs Through It.” Featuring BRAT’s citizen science work with water quality monitoring, the exhibit asked the question “How do YOU connect with the Black River?” and also hosted displays of Black-River-themed artwork, hand-crafted kayaks, and several projects completed by local students. All displays were visually connected by a “river” of blue-hued tulle streaming overhead in tumbling waves, leading visitors through the gallery. During the summer, while the exhibit was on full display, BRAT hosted a speaker to discuss lake monitoring and blue-green algae. The exhibit ended on closing night with a live demonstration of the “stream table” by members of the Ottauquechee Natural Resources Conservation District.

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 to 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 cooler 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 to 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 cooler 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 deionized water, while duplicate samples were collected for Phosphorus on each sample date.

PARAMETERS *Optimal levels are for Class B(2) Ecological Waters per VT Water Quality Standards; http://dec.vermont.gov/sites/dec/files/documents/wsmd_water_quality_standards_2016.pdf*

Quotes from VT Agency of Natural Resources Dept of Environmental Conservation

Total Nitrogen (Measured in mg/L; optimal level is below 5.0 mg/L)

Total Phosphorus (Measured in micrograms/L; optimal level is 12-15 ug/L)

Total Chloride (Measured in mg/L; no standard, but should be below 20 mg/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; should be below 20 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

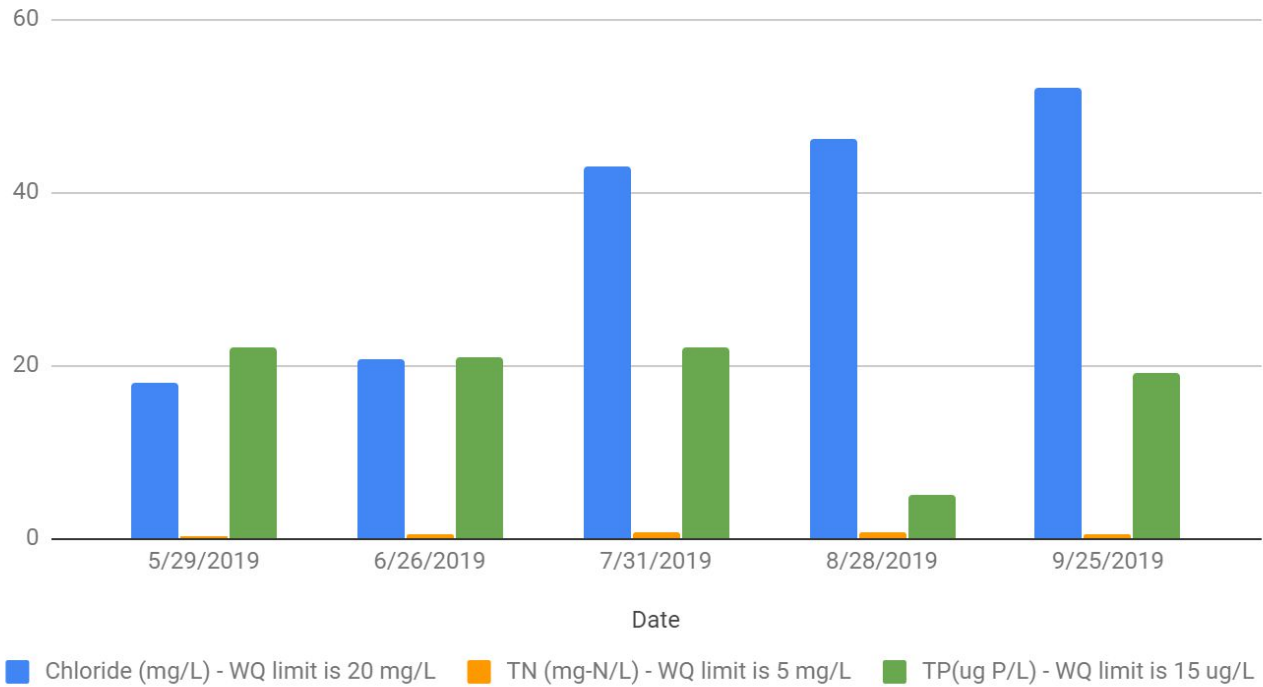
rains can increase normal (ambient) bacteria levels by washing animal waste, fertilizer, and other substances into water bodies, so it is highly recommended to avoid swimming within 24 hours of a heavy rain or anytime the water appears cloudy. The US EPA has set a “safe swimming” upper limit of 235 cfu/100ml 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 did we sample?

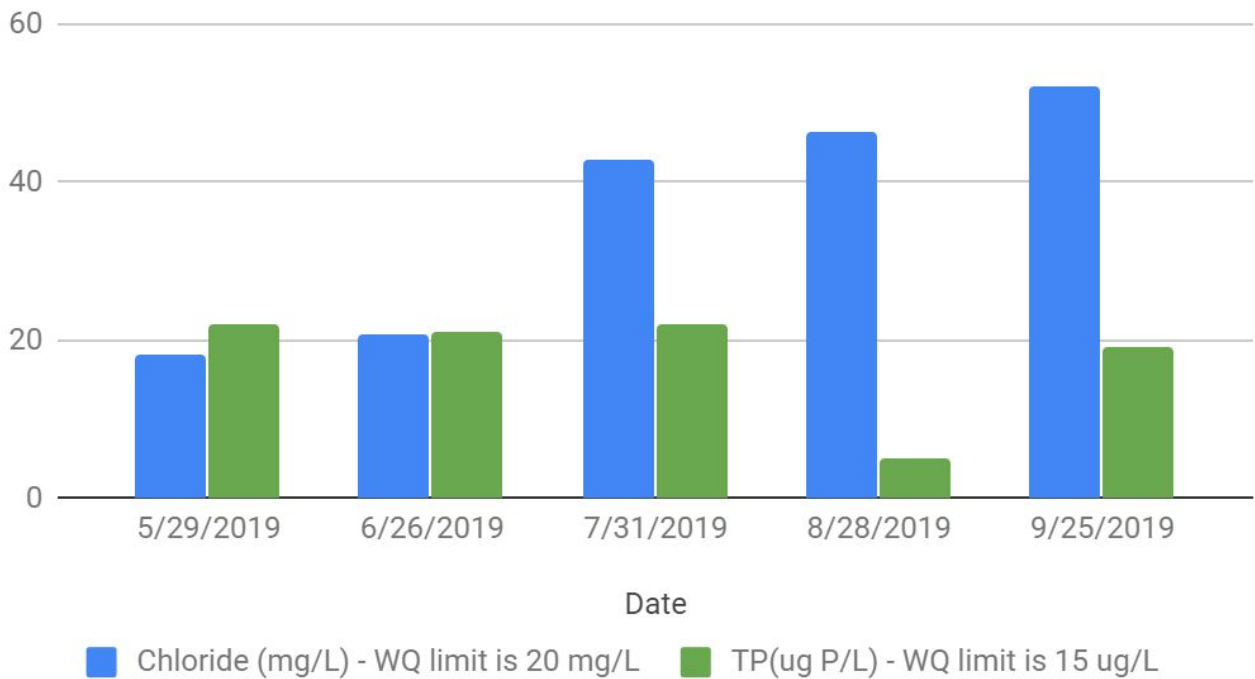
Site #BRAT.BR.1.6 [43.271162, -72.449806] -- Perley Gordon Rd is a representation reach that is connected to the Connecticut River just 2 miles downstream; this site is influenced by the flow regime of the hydro dams on the CT River at Bellows Falls and at Hartland Dam. The river here is wide and flat, 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.



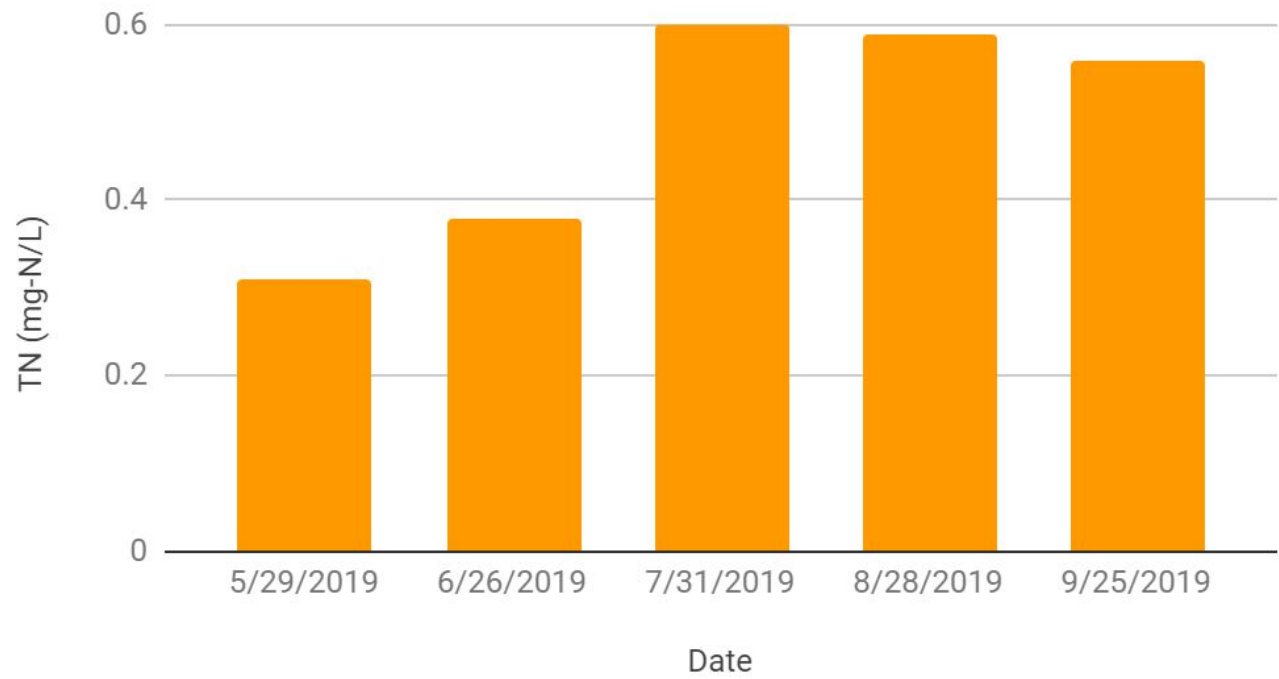
Perley Gordon Road



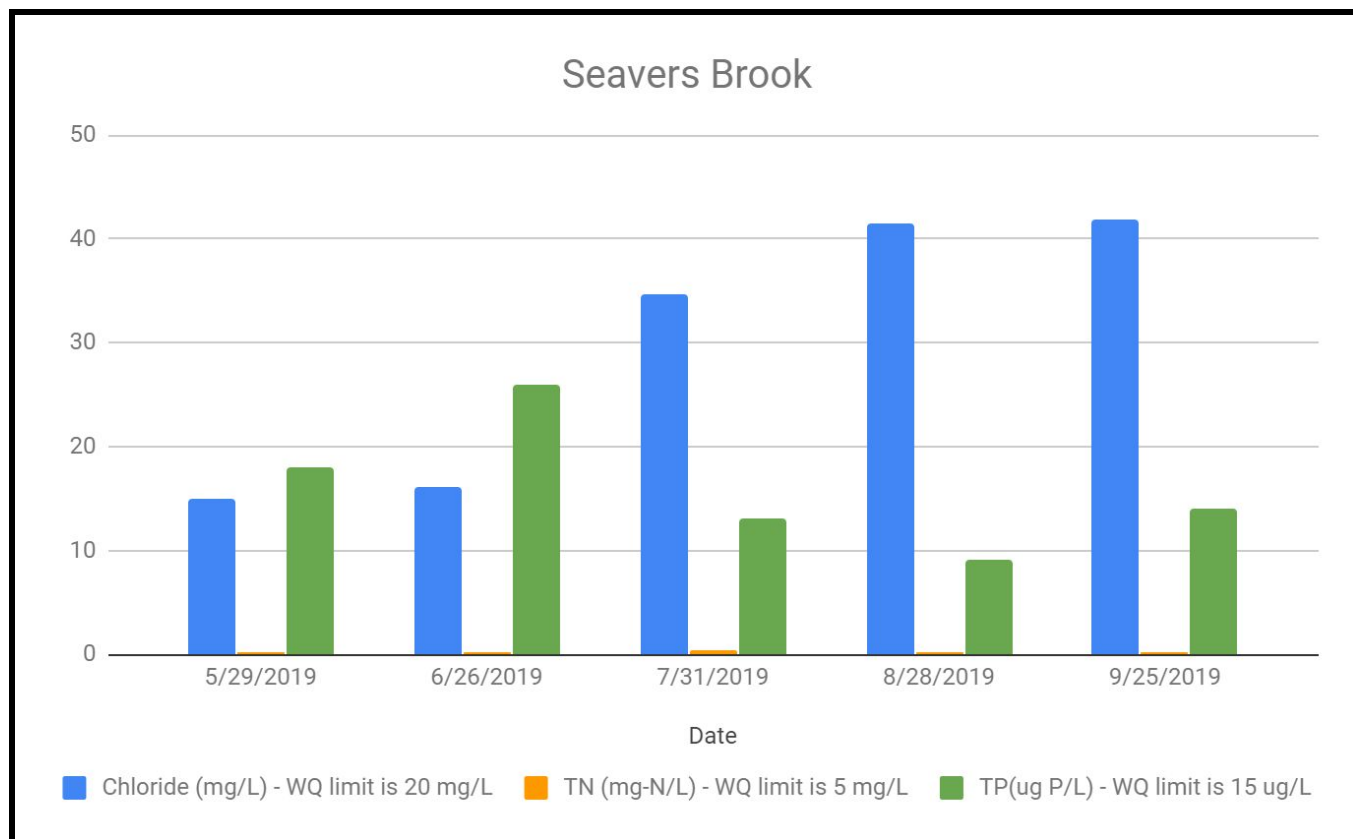
Total Chloride & Phosphorus for Perley Gordon Road



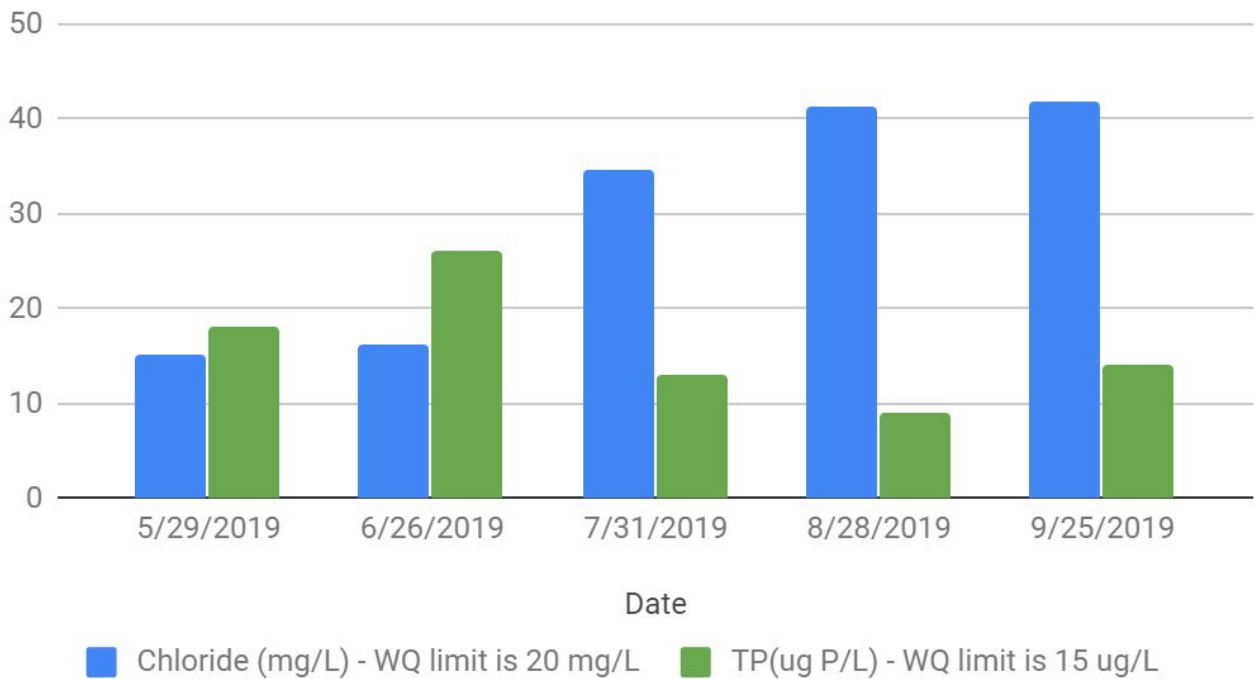
Total Nitrogen for Perley Gordon Road



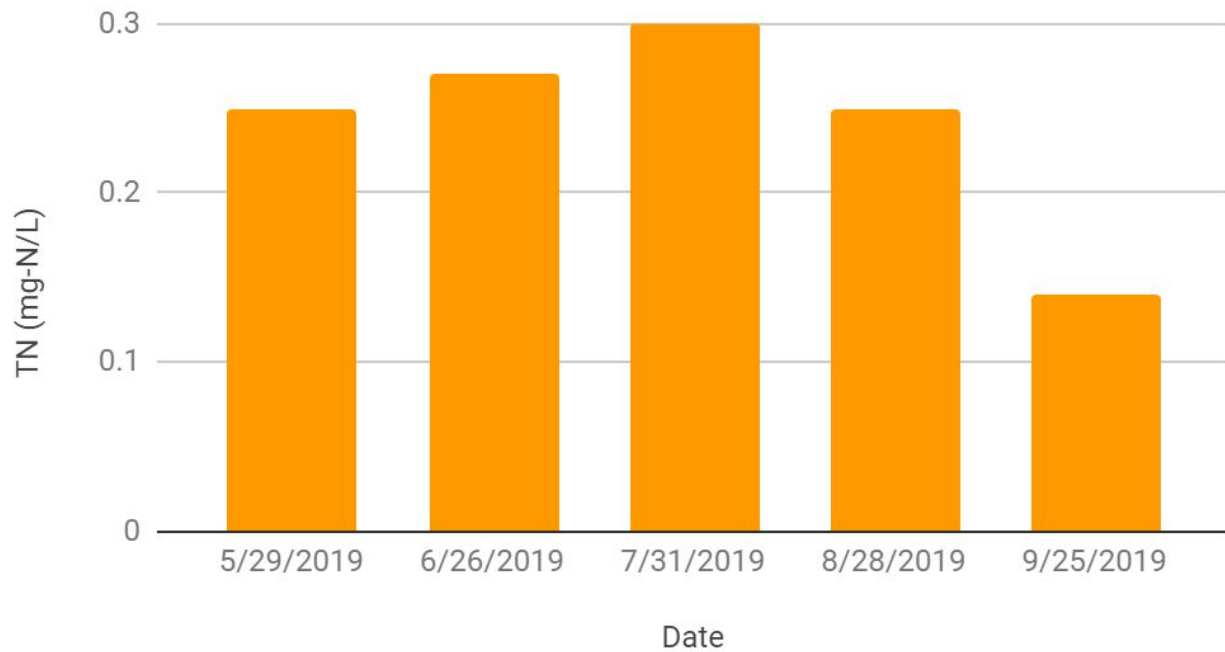
Site #BRAT.SvB.000 [43.279261, -72.467150] -- Tumbling and winding its way down a steep hillside, Seavers Brook follows a paved road for several miles and has been impacted by erosion and road salt over the years. The brook drains 6.3 square miles of watershed through a course that is mostly shaded and rocky. Sampled by Maura Anderson.



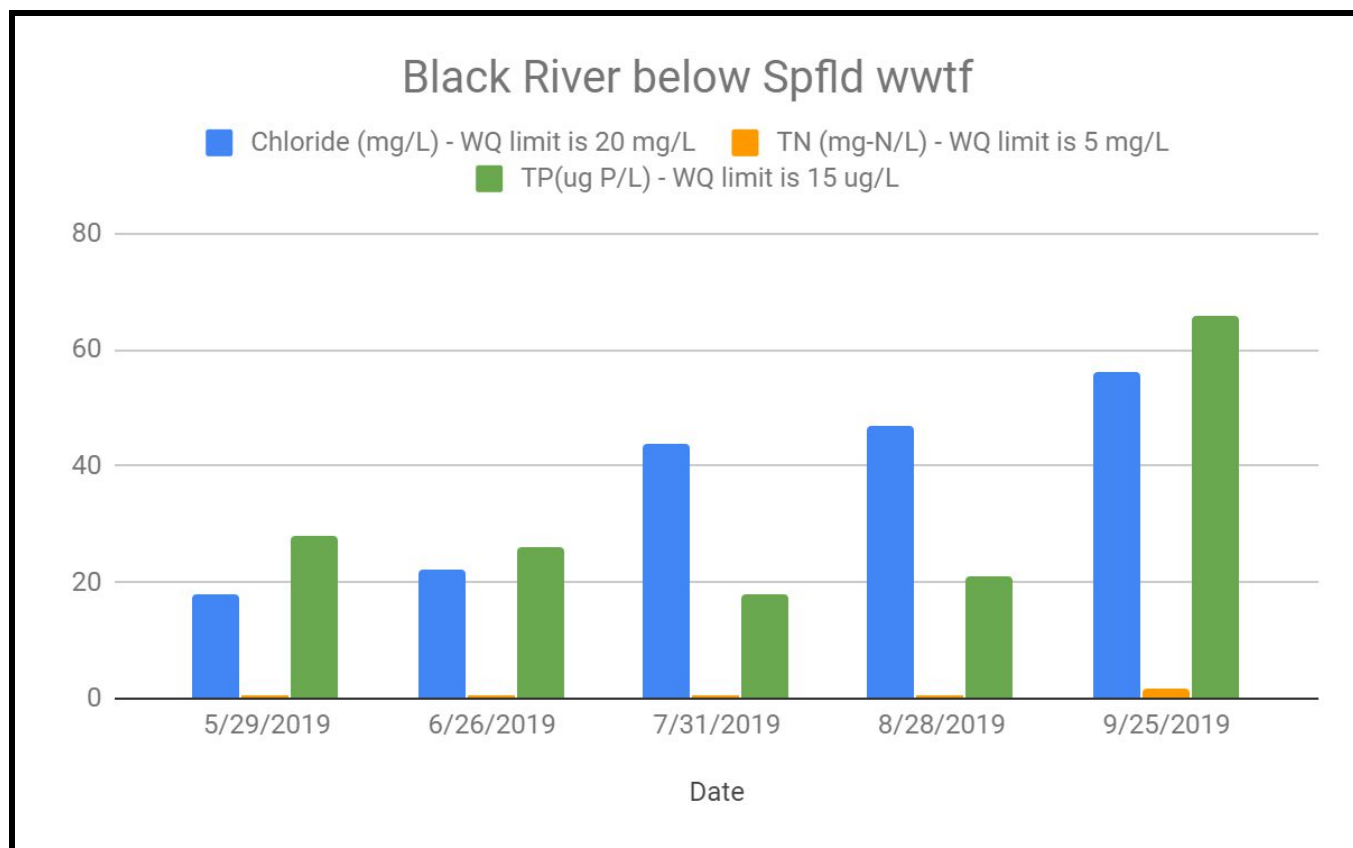
Total Chloride & Phosphorus for Seavers Brook



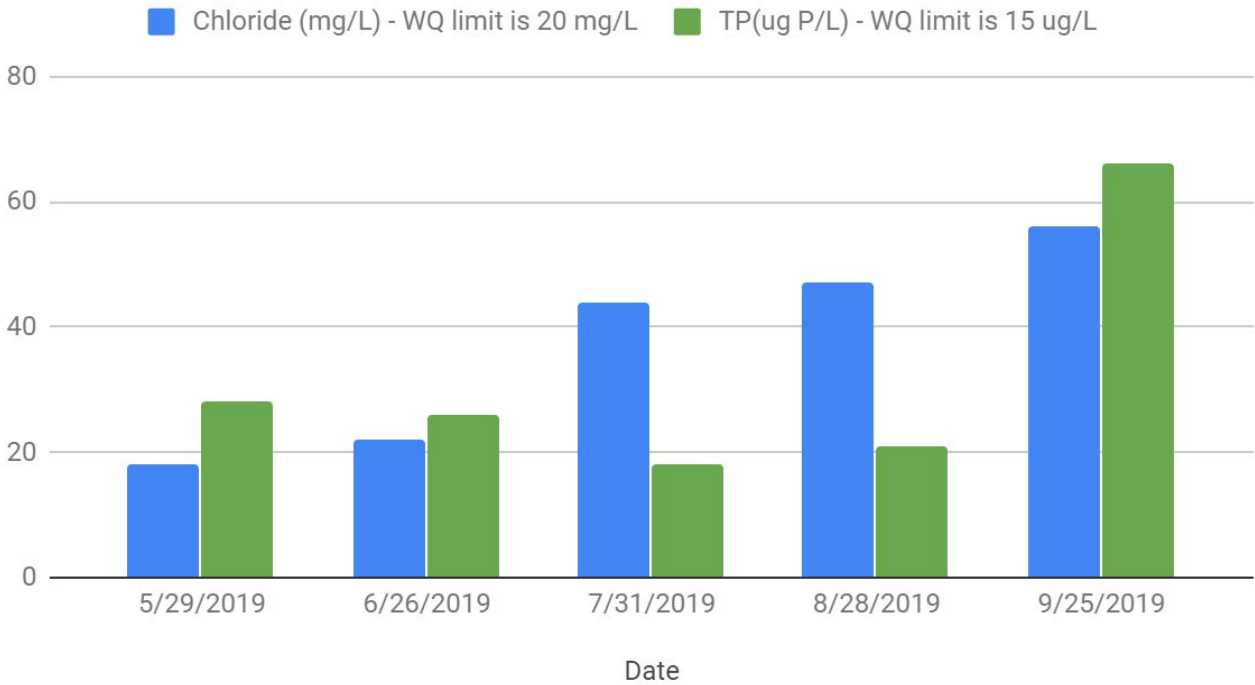
Total Nitrogen for Seavers Brook



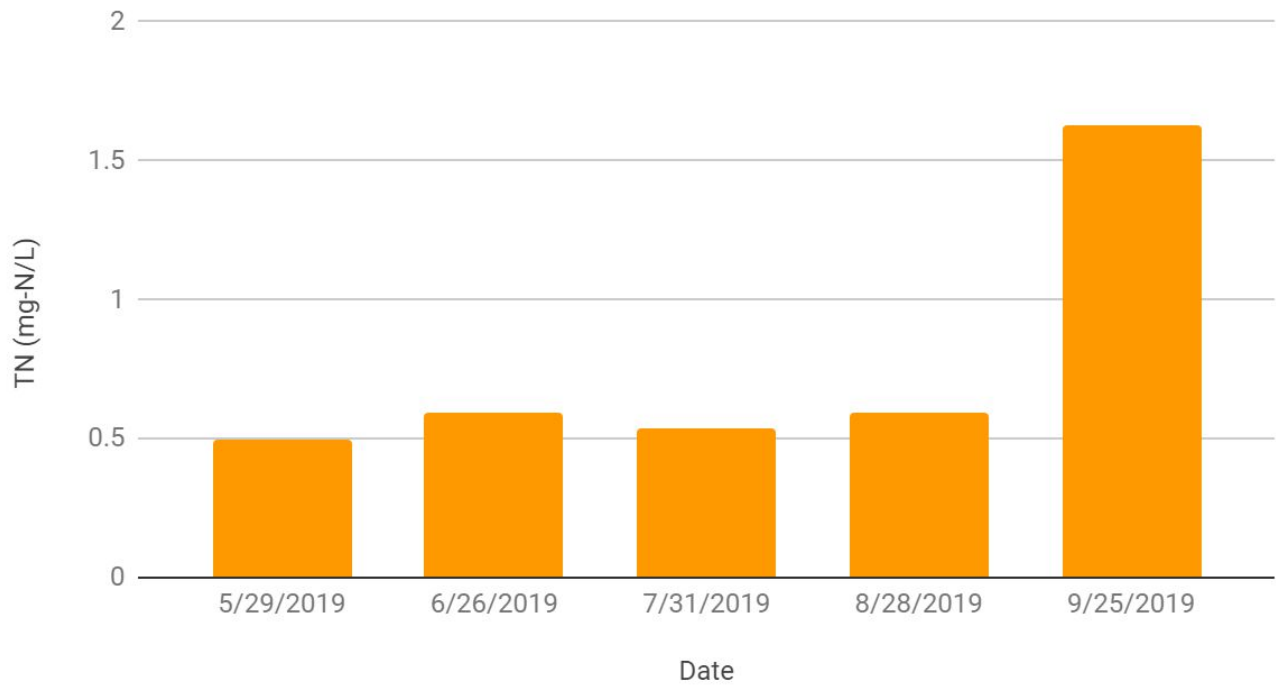
Site #BRAT.BR.2.4 [43.279674, -72.467553] -- Downstream of Springfield's wastewater treatment facility. This site is roughly 200' below the outflow of the wwtf and just upstream from the confluence of Seaver Brook. Sampled by Kelly Stettner and son Armando.



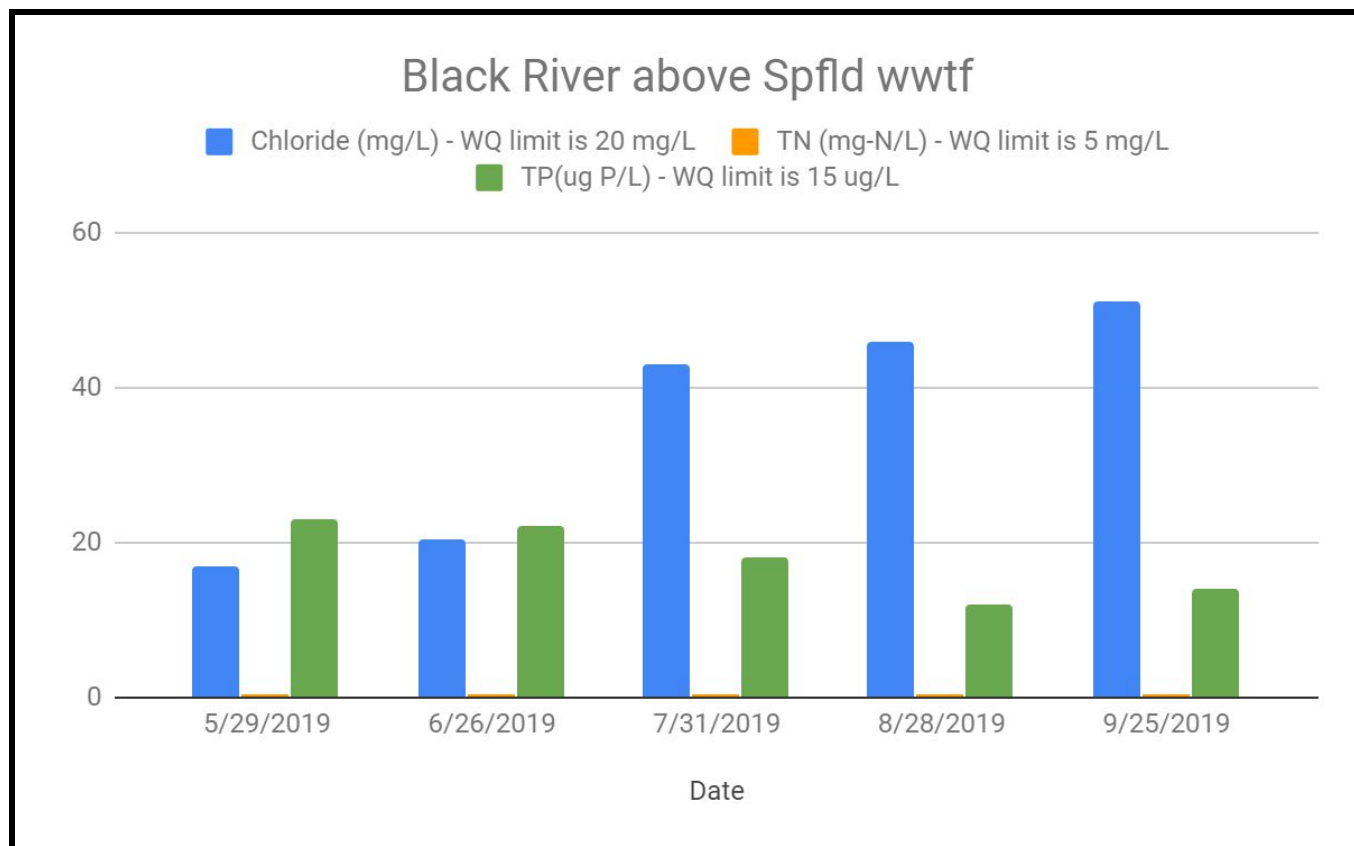
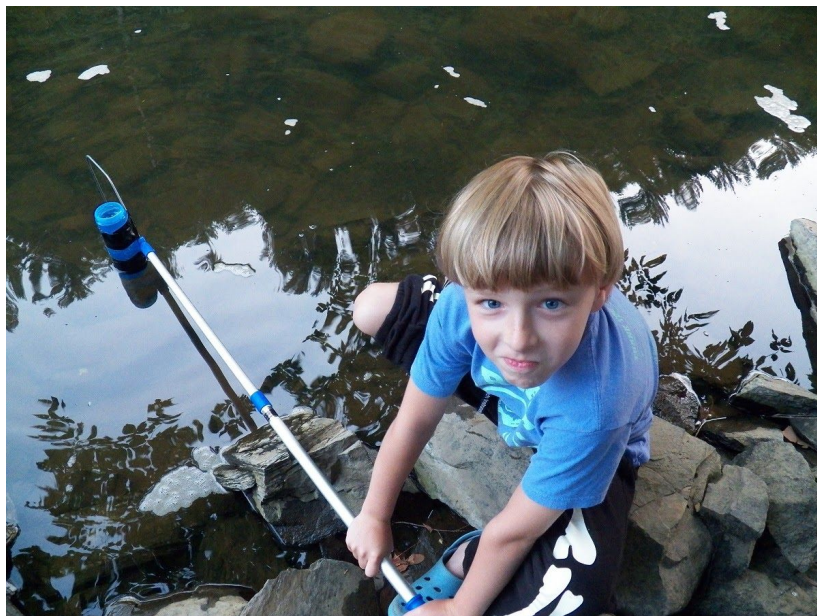
Total Chloride & Phosphorus for Black River below Spfld wwtf



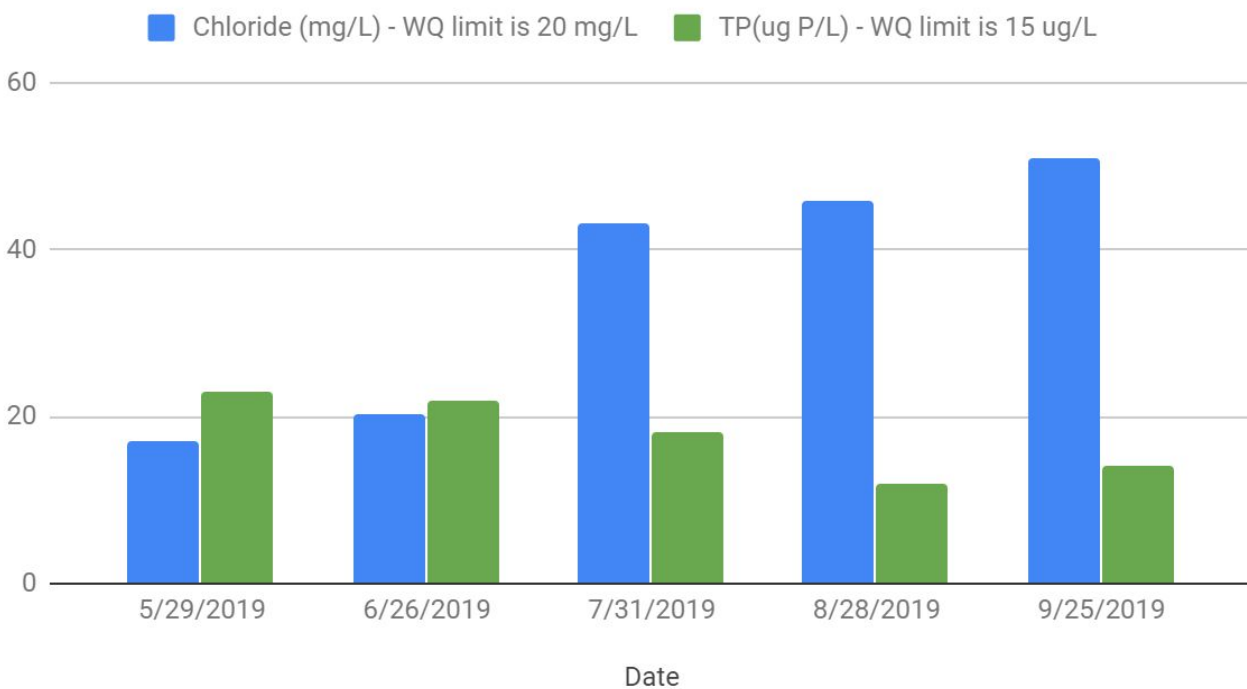
Total Nitrogen for Black River below Spfld wwtf



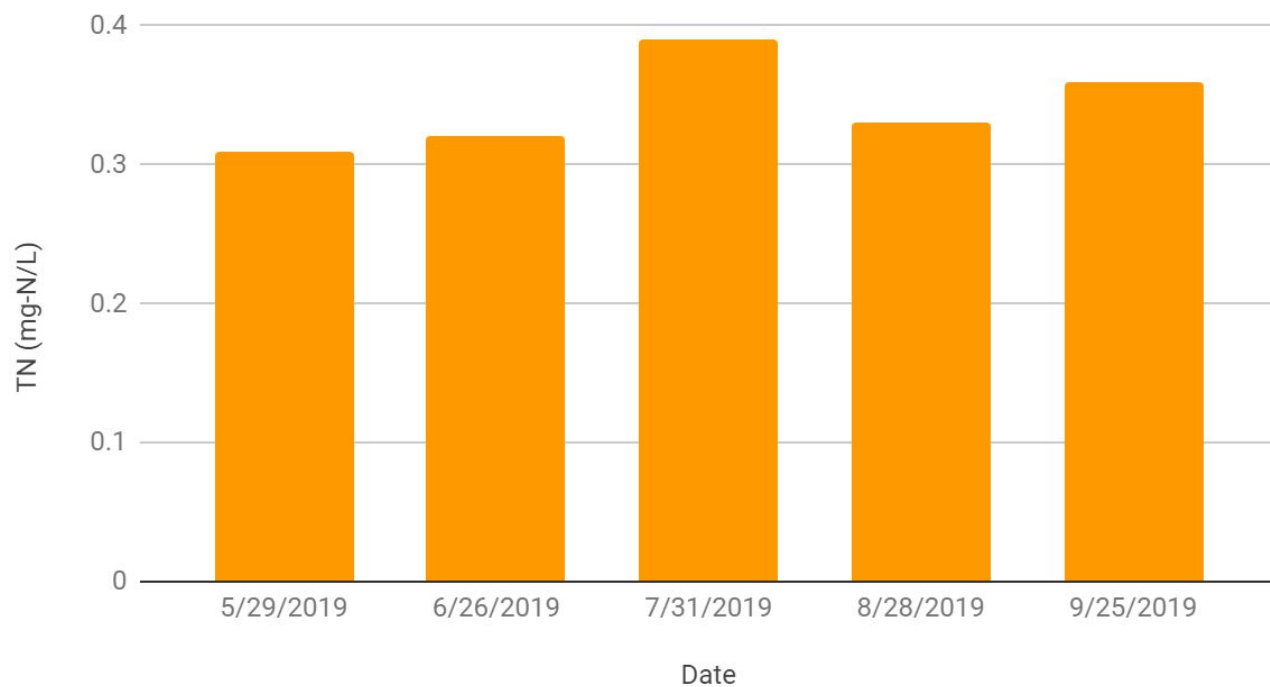
Site #**BRAT.BR.2.75** [43.280659, -72.46846] -- Upstream of Springfield wwtf. Sited just above the outflow of the wwtf, data "brackets" any potential impact. Sampled by Kelly Stettner & son Armando.



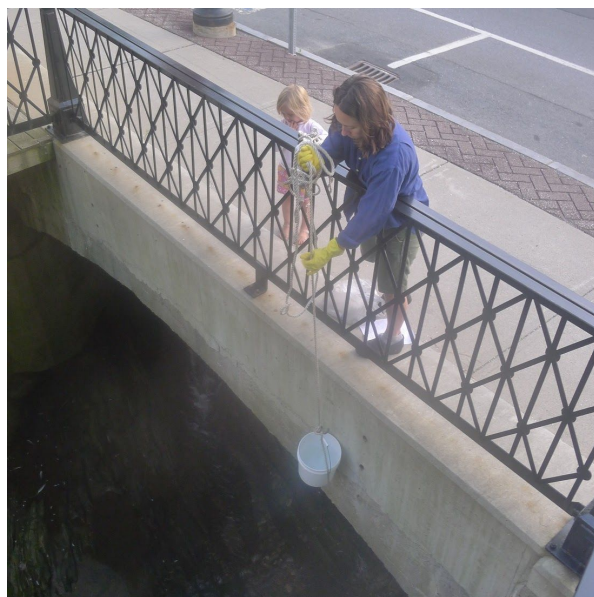
Total Chloride & Phosphorus for Black River above Spfld wwtf



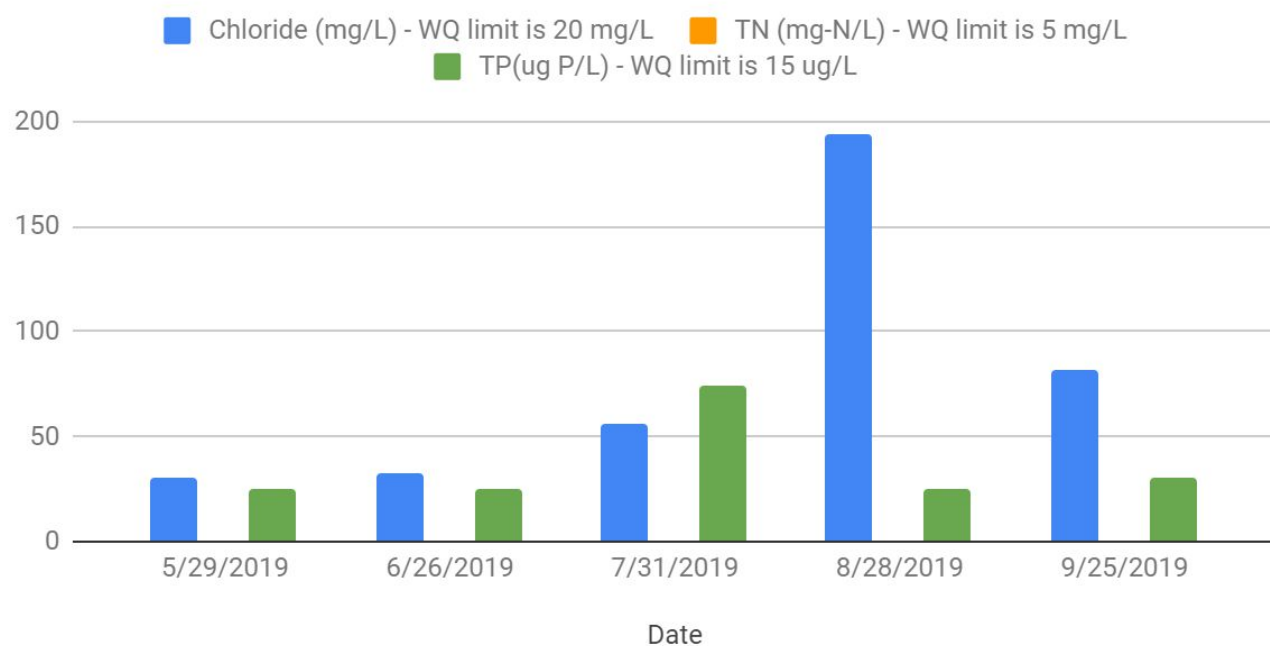
Total Nitrogen for Black River above wwtf



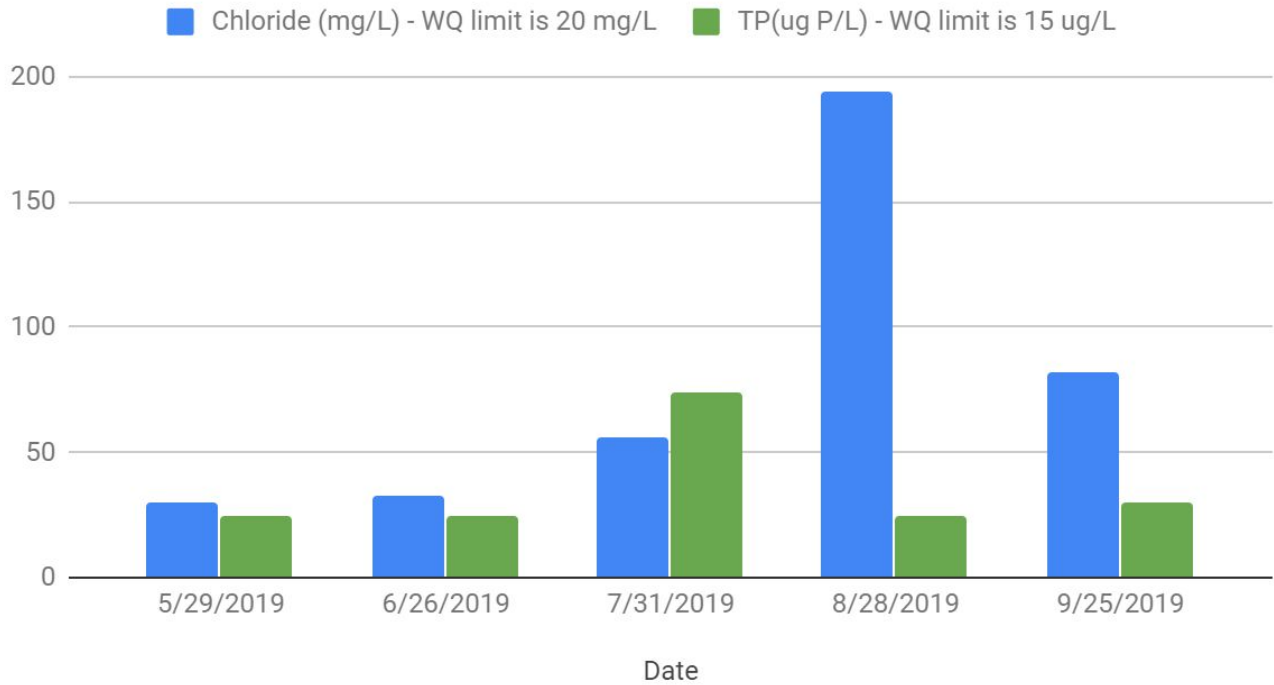
Site #BRAT.MB.0.0 [43.299249, -72.482152] -- This site is on Mile Brook (aka Valley Street Brook), just at the confluence of the stream with the Black River, after it emerges from an underground box-culvert below Main Street in downtown Springfield. Sampled by Lucy Georgeff and daughters.



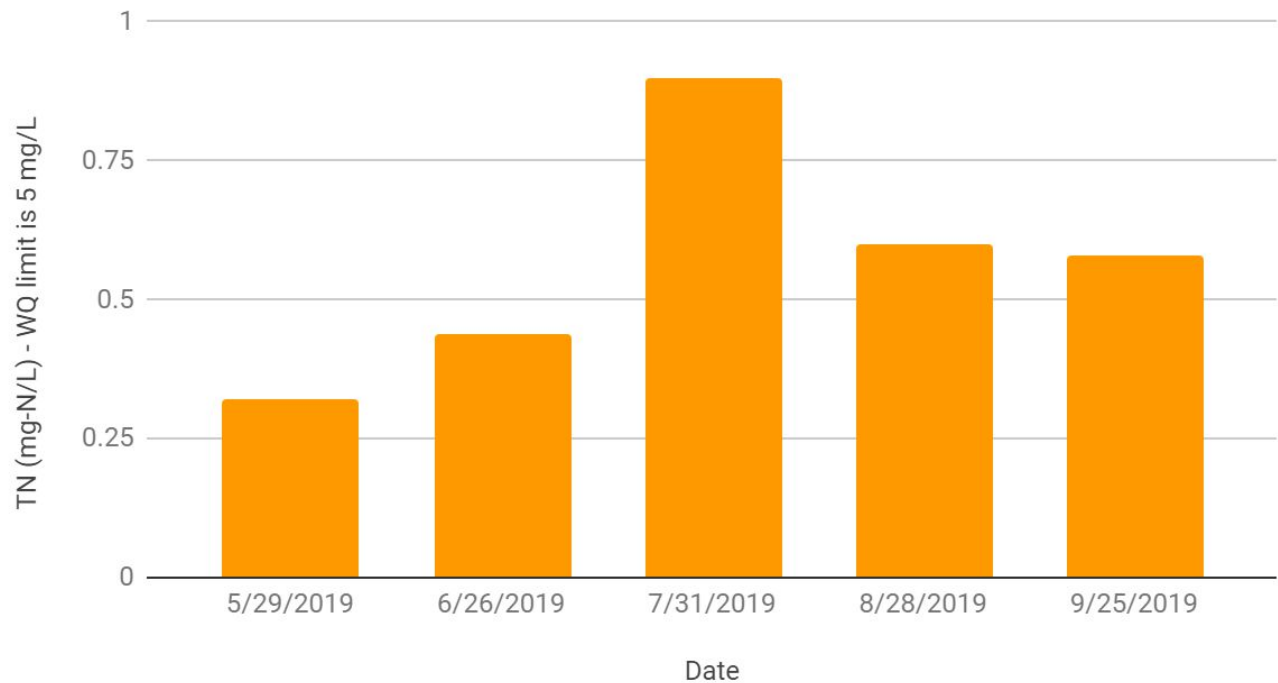
Mile Brook (aka Valley St Brook) near confluence with Black River



Total Chloride & Phosphorus for Mile Brook near confluence



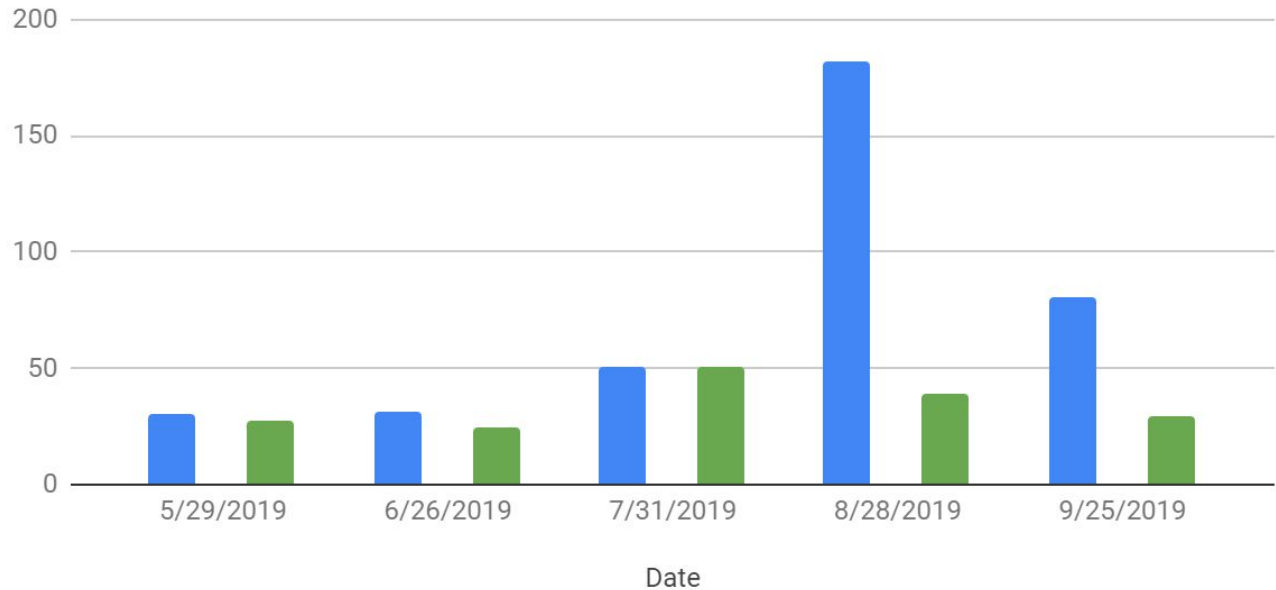
Total Nitrogen for Mile Brook near confluence



Site #BRAT.MB.0.2 [43.299487, -72.480961] -- The second site on Mile Brook (aka Valley St 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.

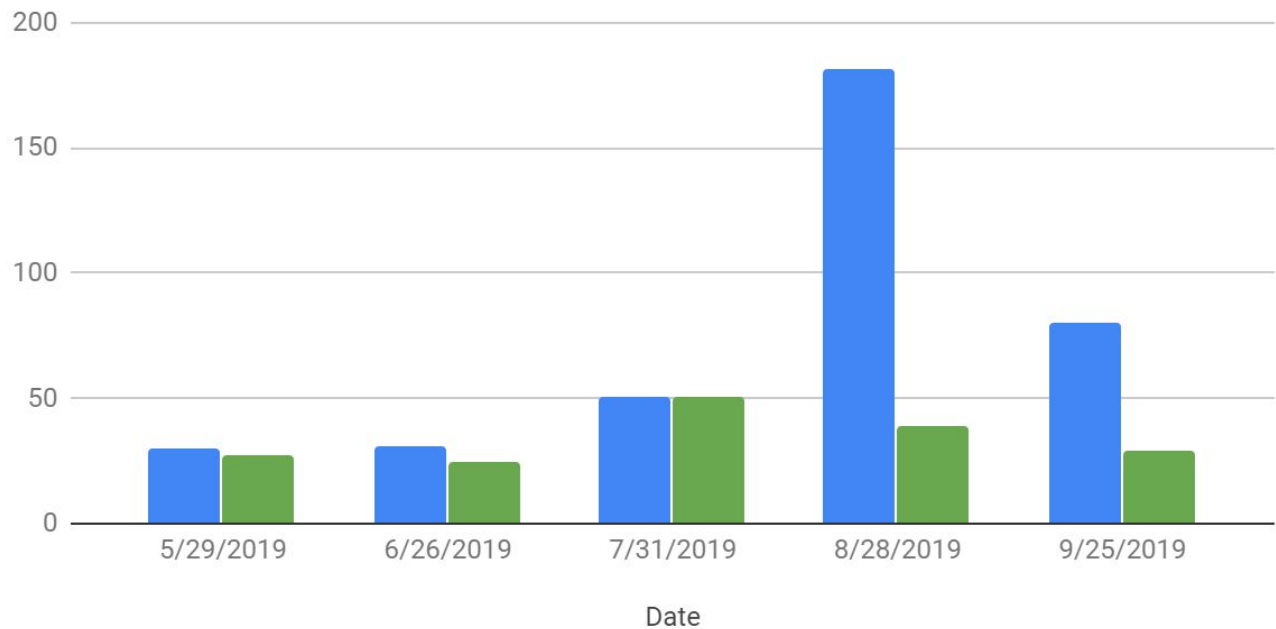
Mile Brook (aka Valley St Brook) above town

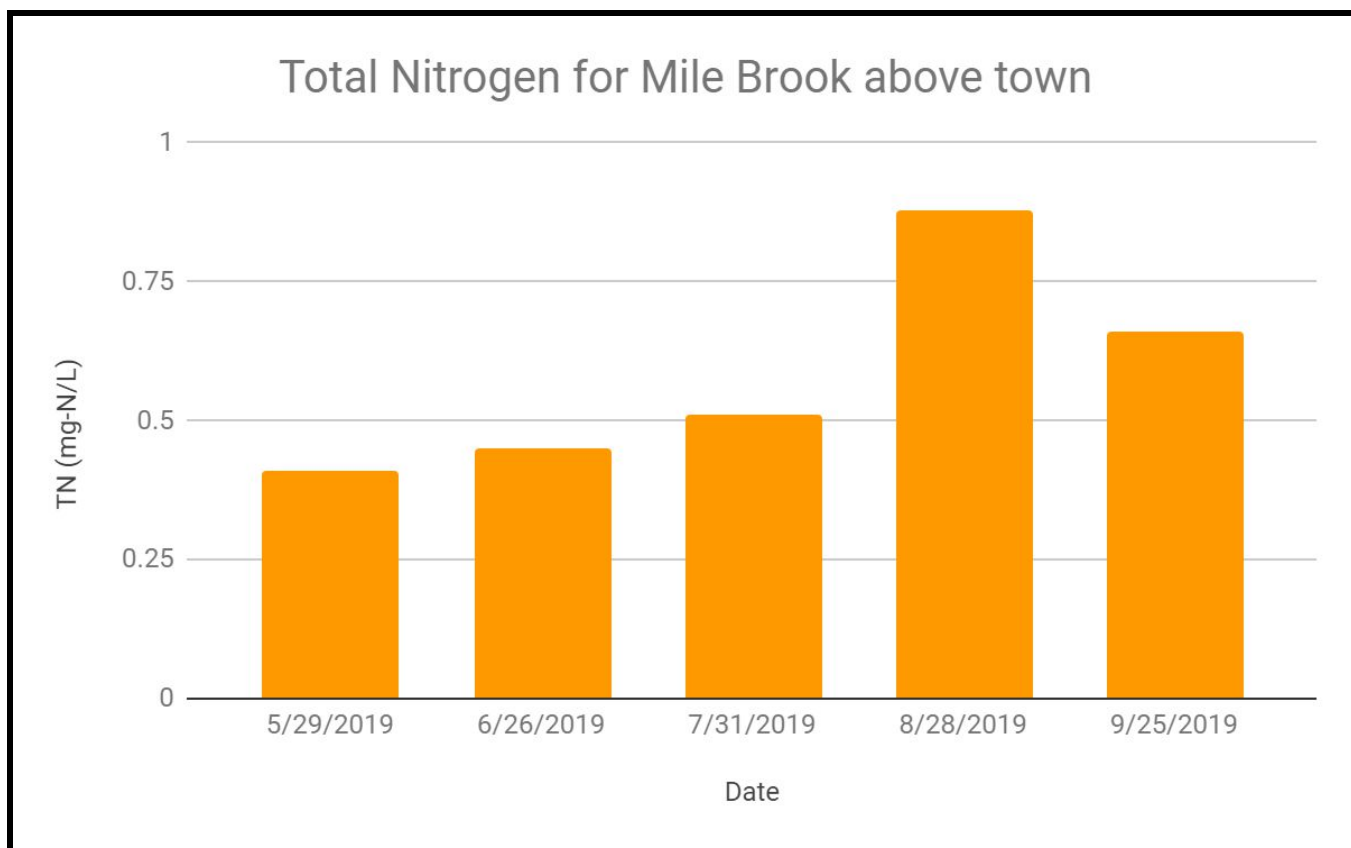
■ Chloride (mg/L) - WQ limit is 20 mg/L ■ TN (mg-N/L) - WQ limit is 5 mg/L
■ TP(ug P/L) - WQ limit is 15 ug/L



Total Chloride & Phosphorus for Mile Brook above town

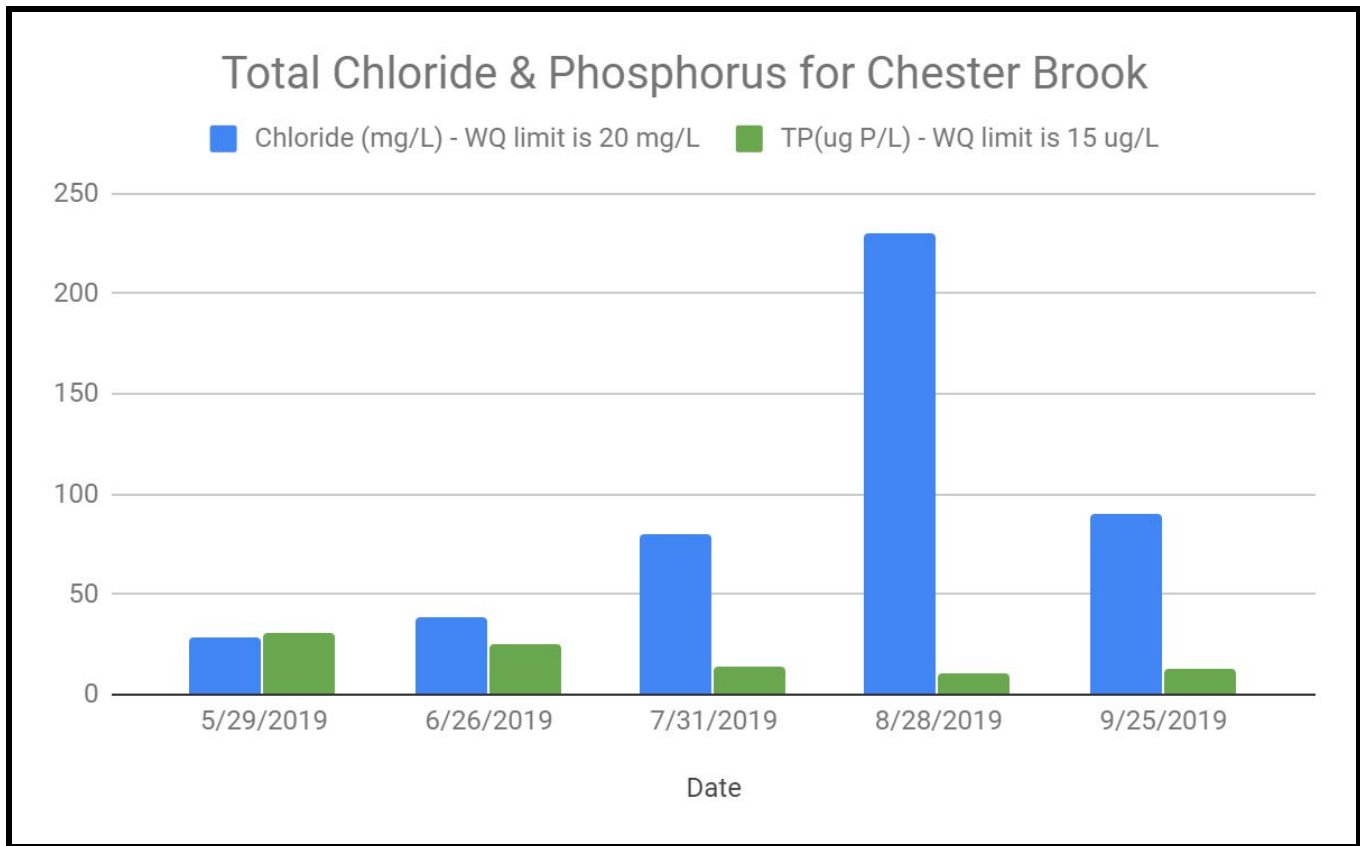
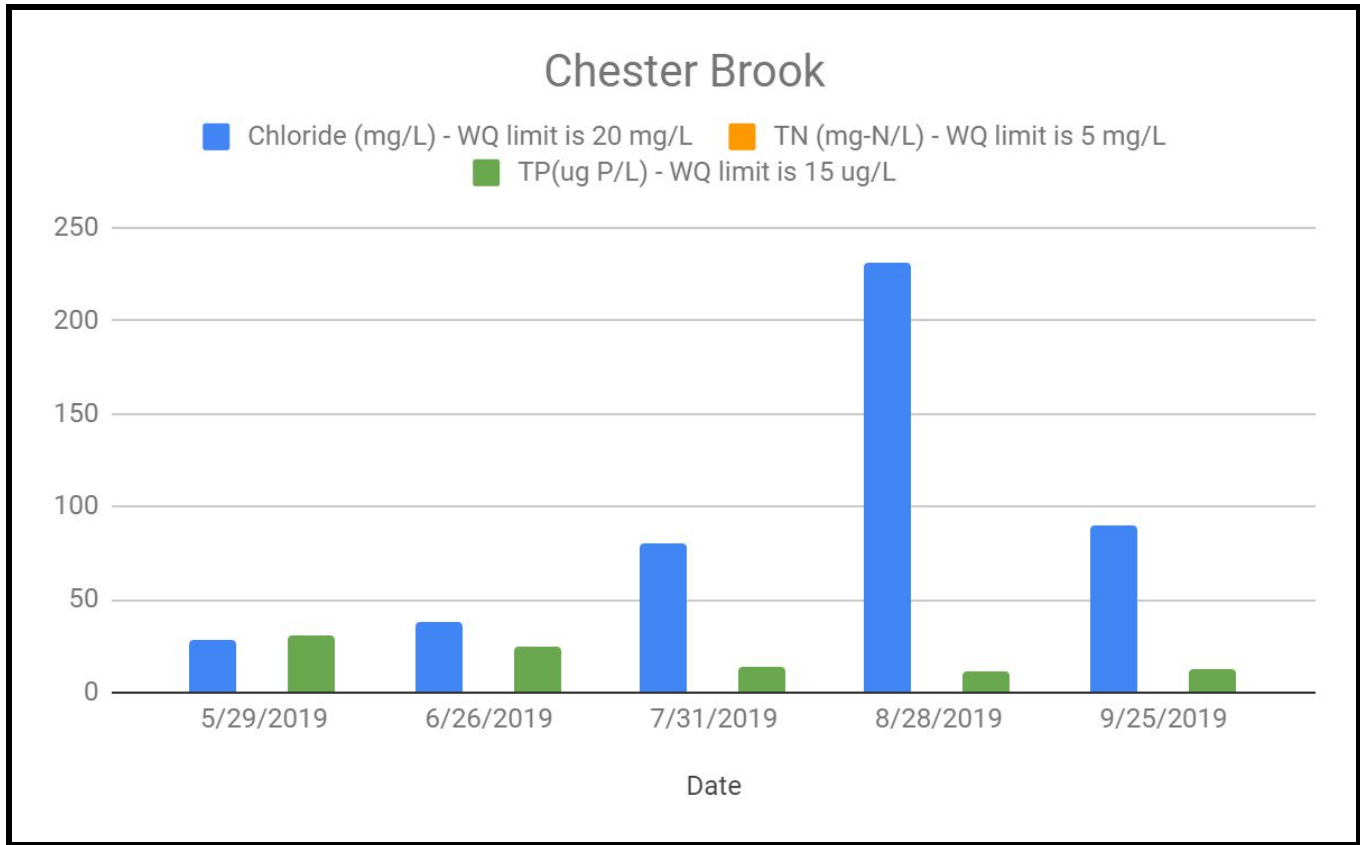
■ Chloride (mg/L) - WQ limit is 20 mg/L ■ TP(ug P/L) - WQ limit is 15 ug/L



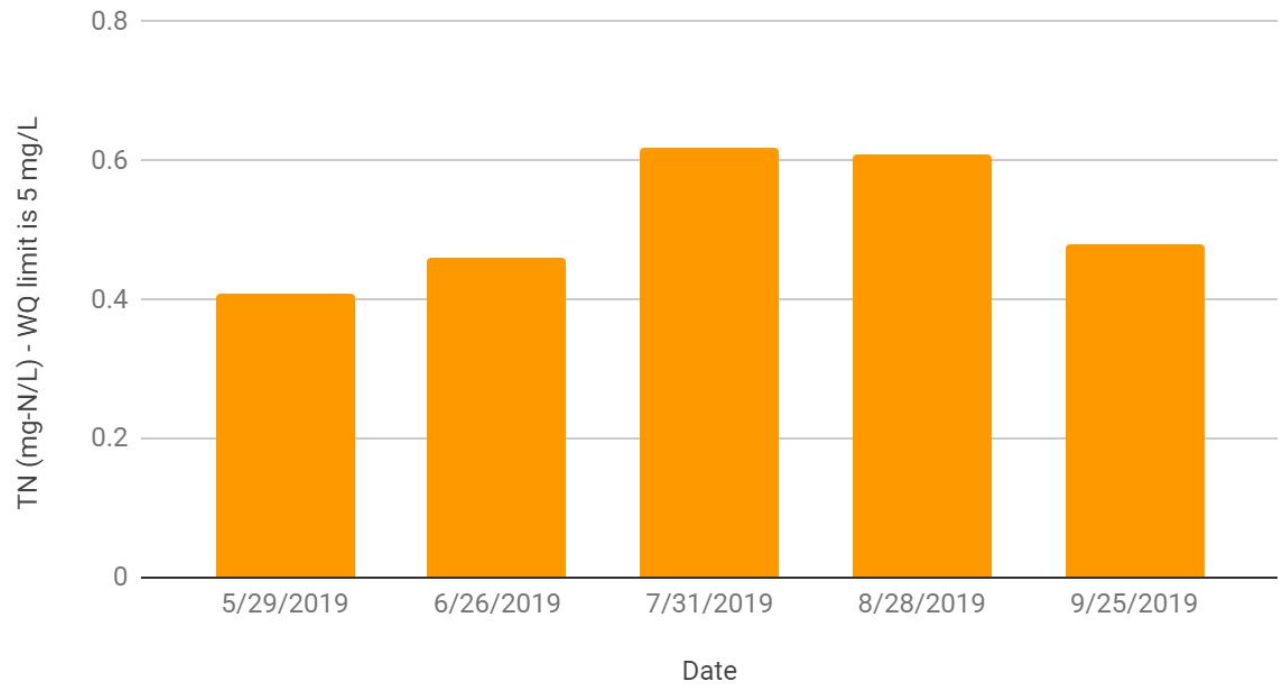


Site #BRAT.ChB.003 [43.302944, -72.493904] -- Chester Brook, Springfield. Draining 4.5 square miles of mostly forested hillside before running alongside Route 11 into Springfield, Chester Brook

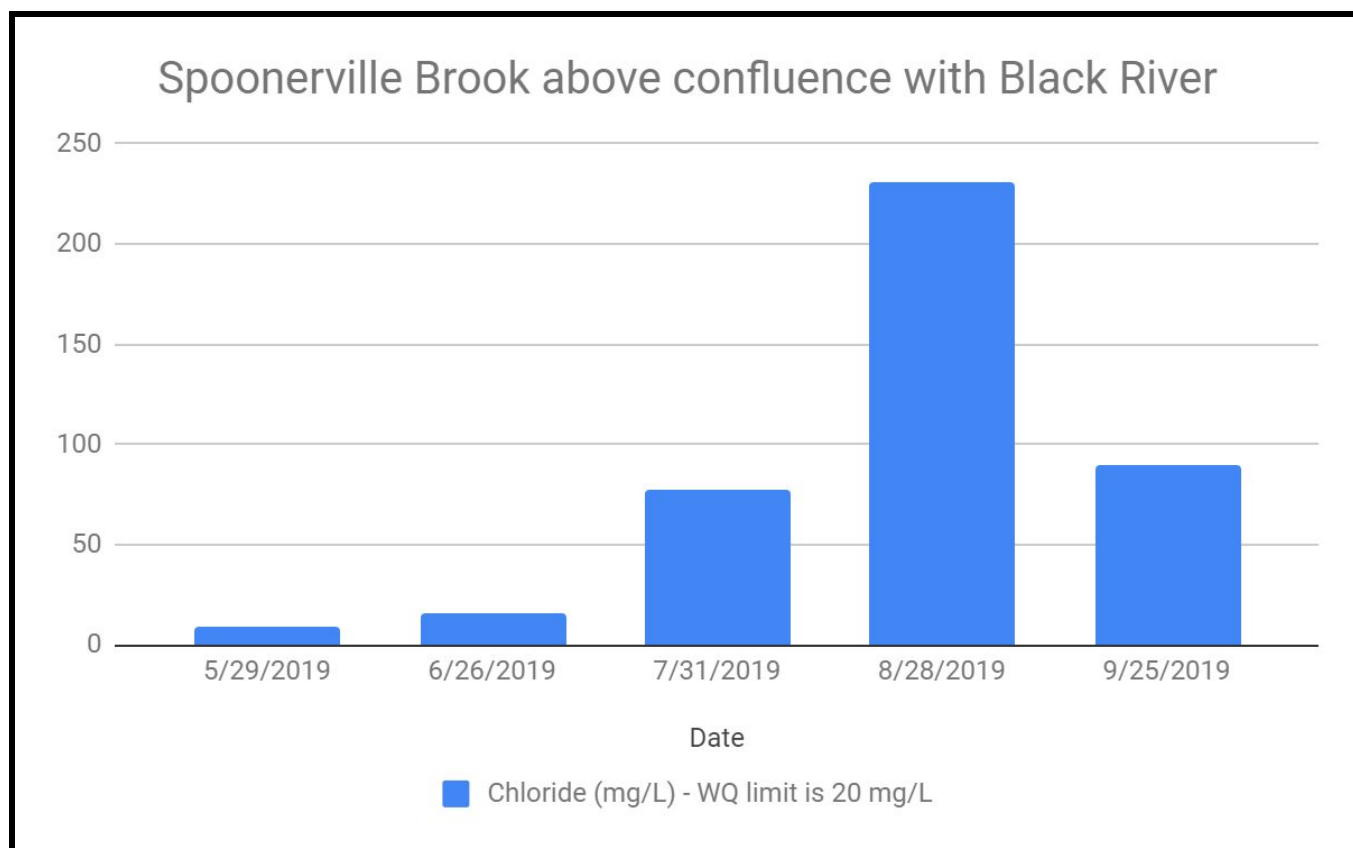
meets the Black River at one of the town’s winter snow dumps.



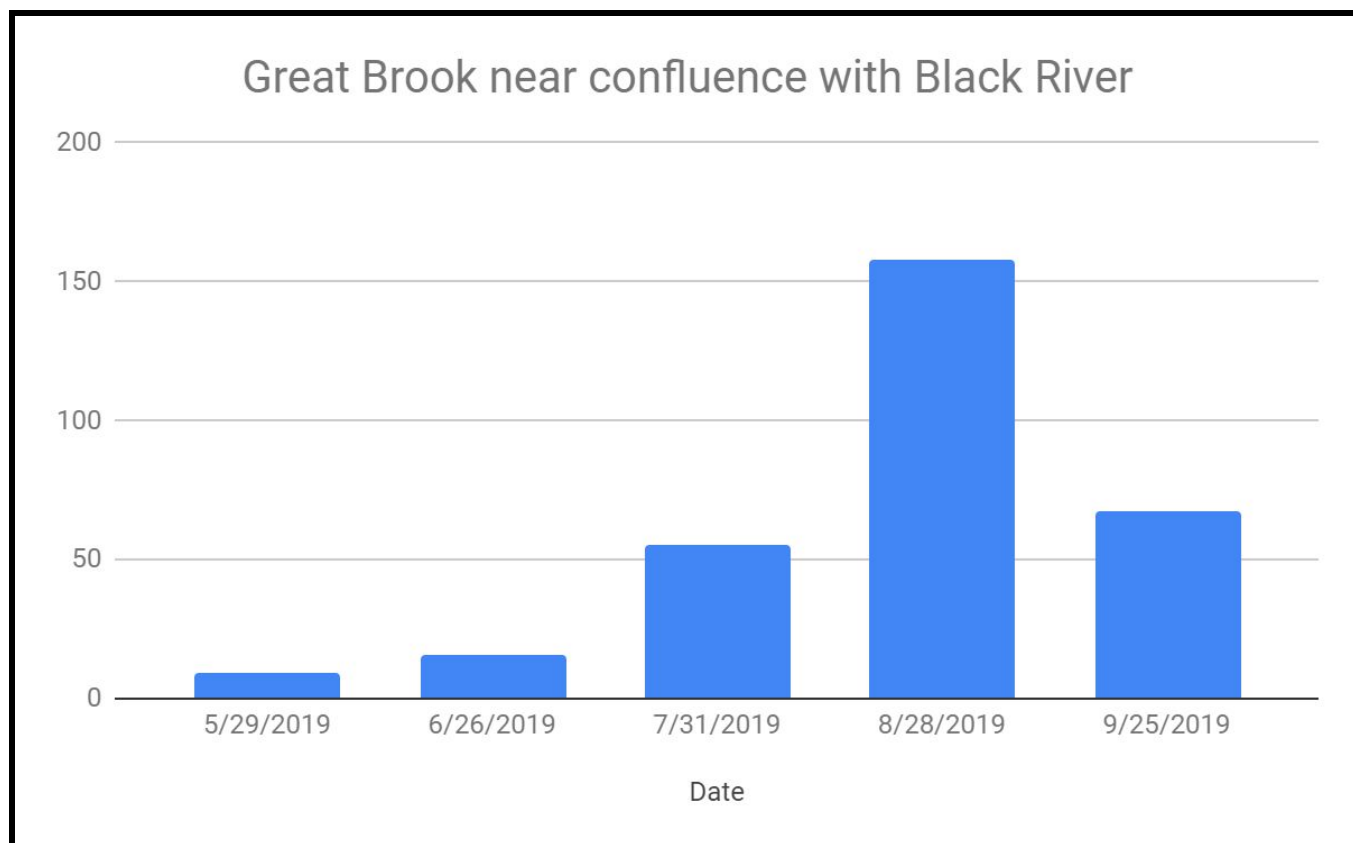
Total Nitrogen for Chester Brook



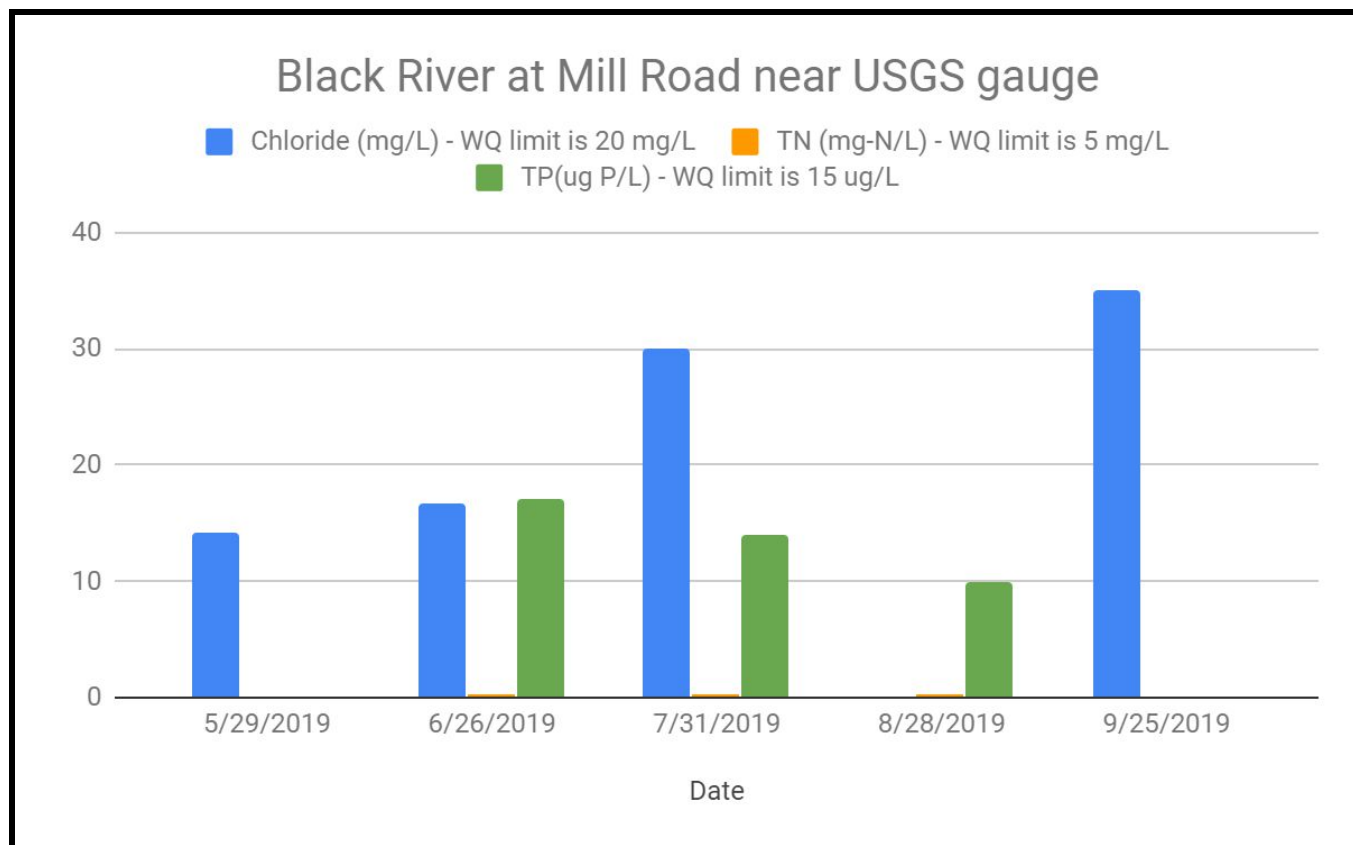
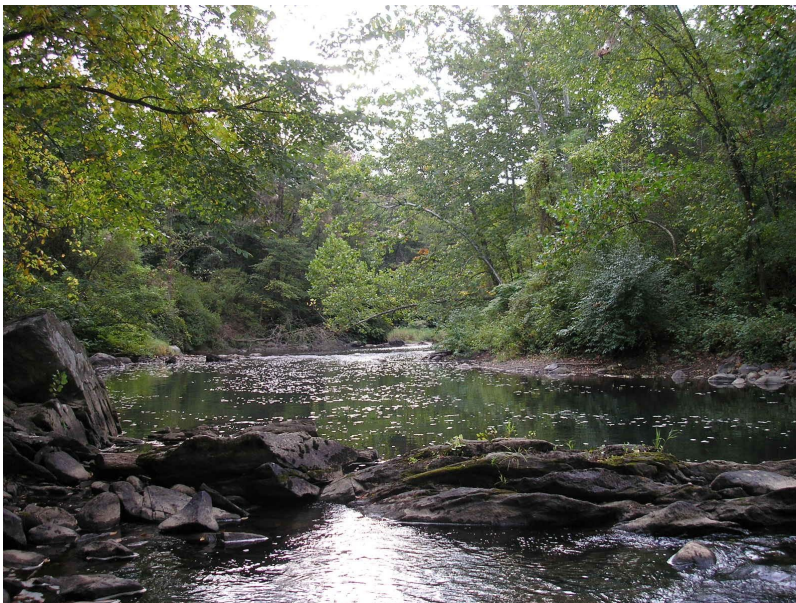
Site #BRAT.SB.0.1 [43.330792, -72.520739] -- Spoonerville Brook, N. Springfield. A small winding brook, the brook drains only 5 square miles of watershed but runs very close to the road in many places. We elected to drop Total P and Total N for 2019 and focus on Chloride only. Sampled by Randy Gray.



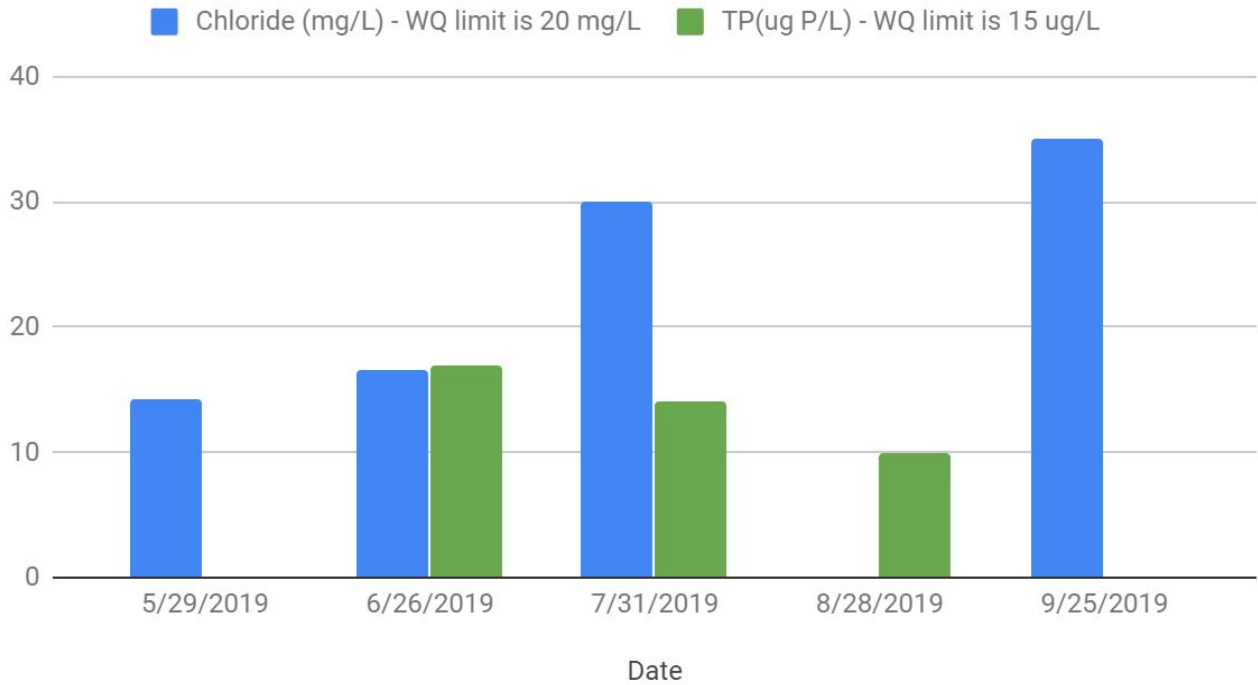
Site #BRAT.GB.0.3 [43.332602, -72.524993] -- Great Brook runs along Main St in N. Springfield. Draining a watershed three times larger than the Spoonerville, Great Brook enters the Black River about 200' upstream from the smaller brook. Like Spoonerville, we elected to drop nutrient testing. Sampled by Randy Gray.



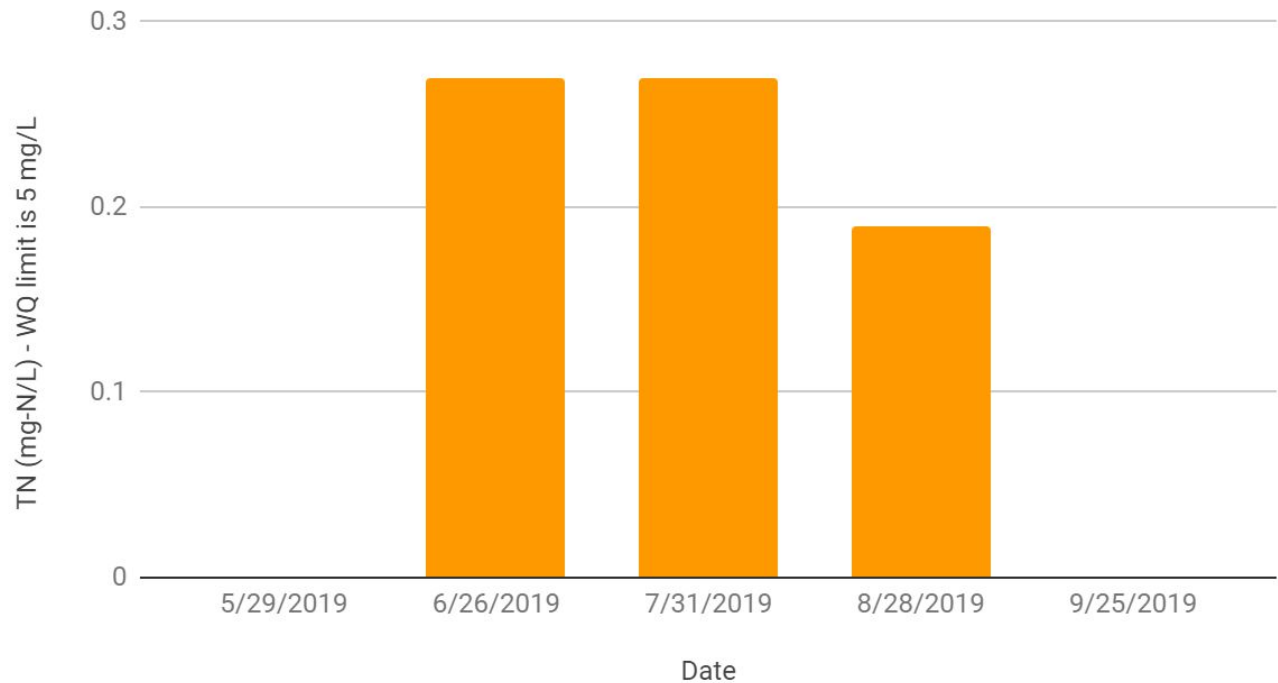
Site #BRAT.BR.8.6 [43.333445, -72.514757] -- Mill Road, North Springfield. This spot is just downstream from the flood control dam managed by the US Army Corps of Engineers, which holds back up to 16.7 billion gallons of water from the Black River main stem and the North Branch. Sample is collected by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



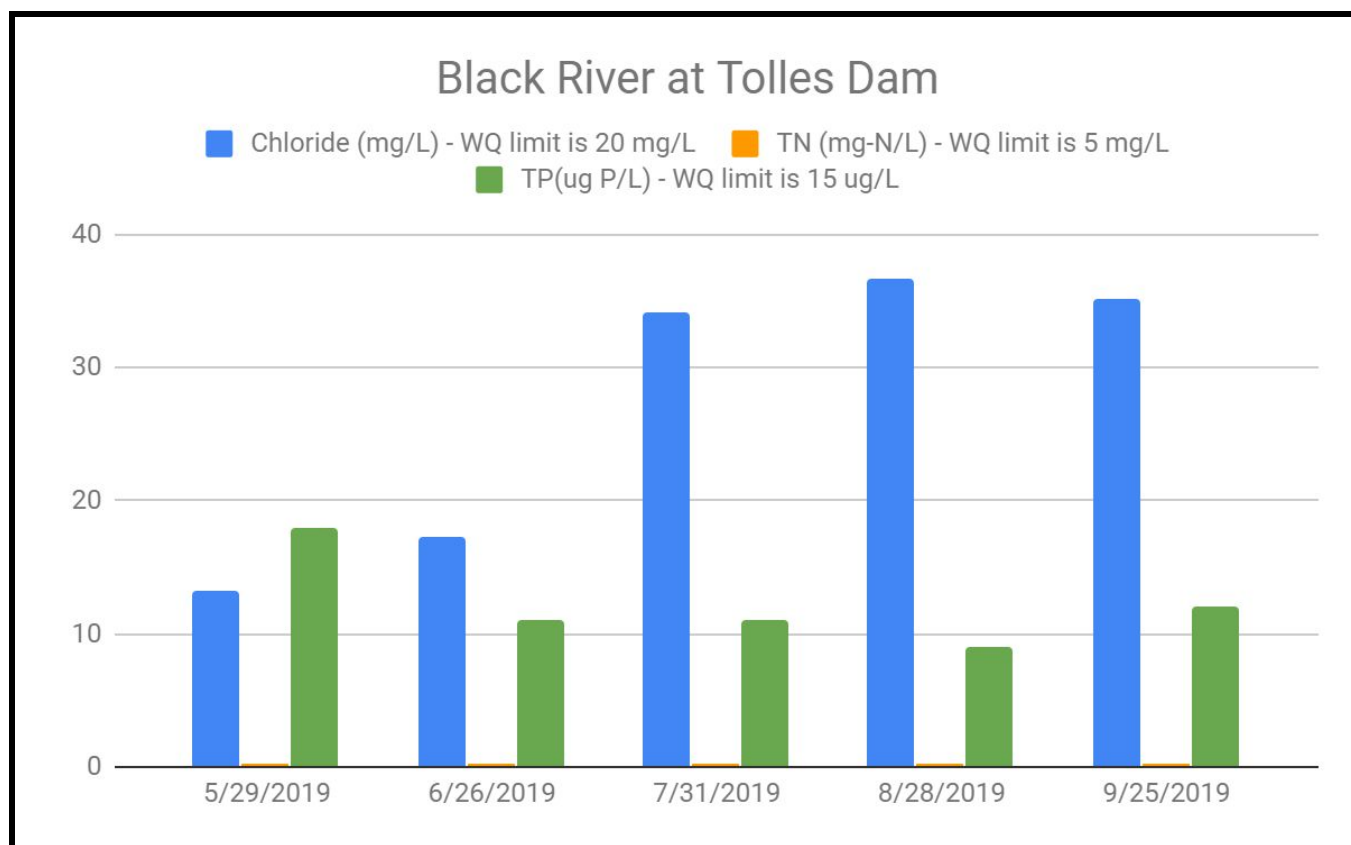
Total Chloride & Phosphorus for Black River at Mill Road



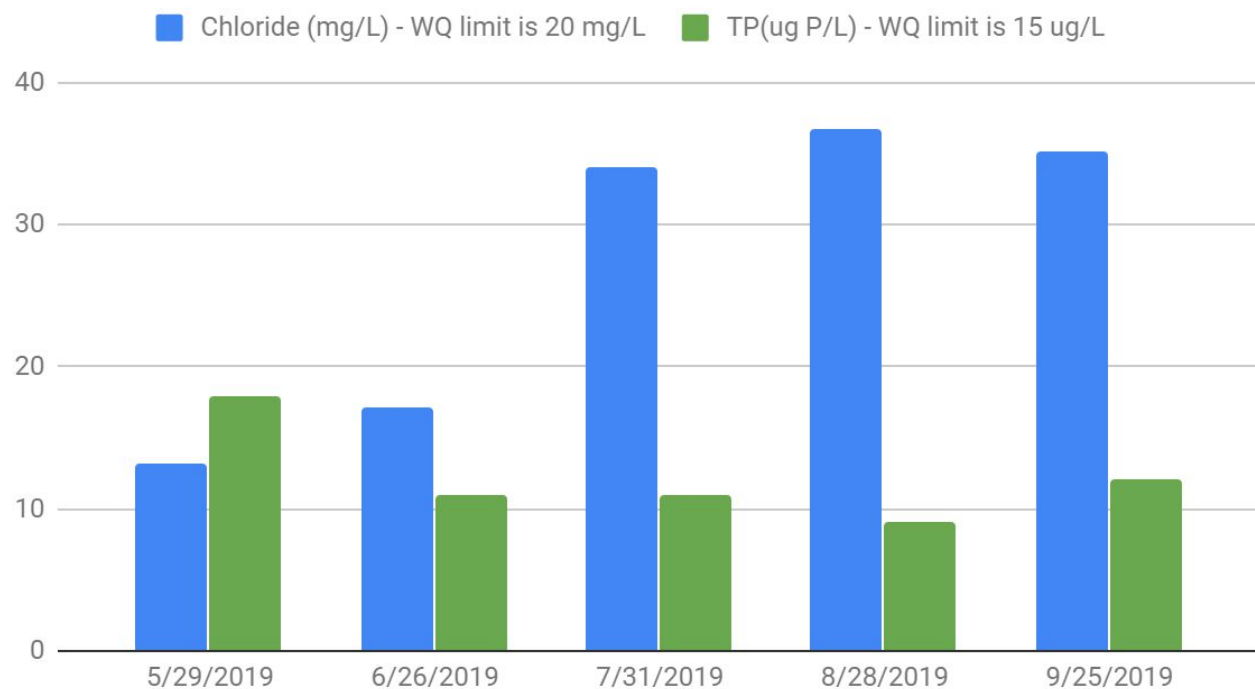
Total Nitrogen for Black River at Mill Rd



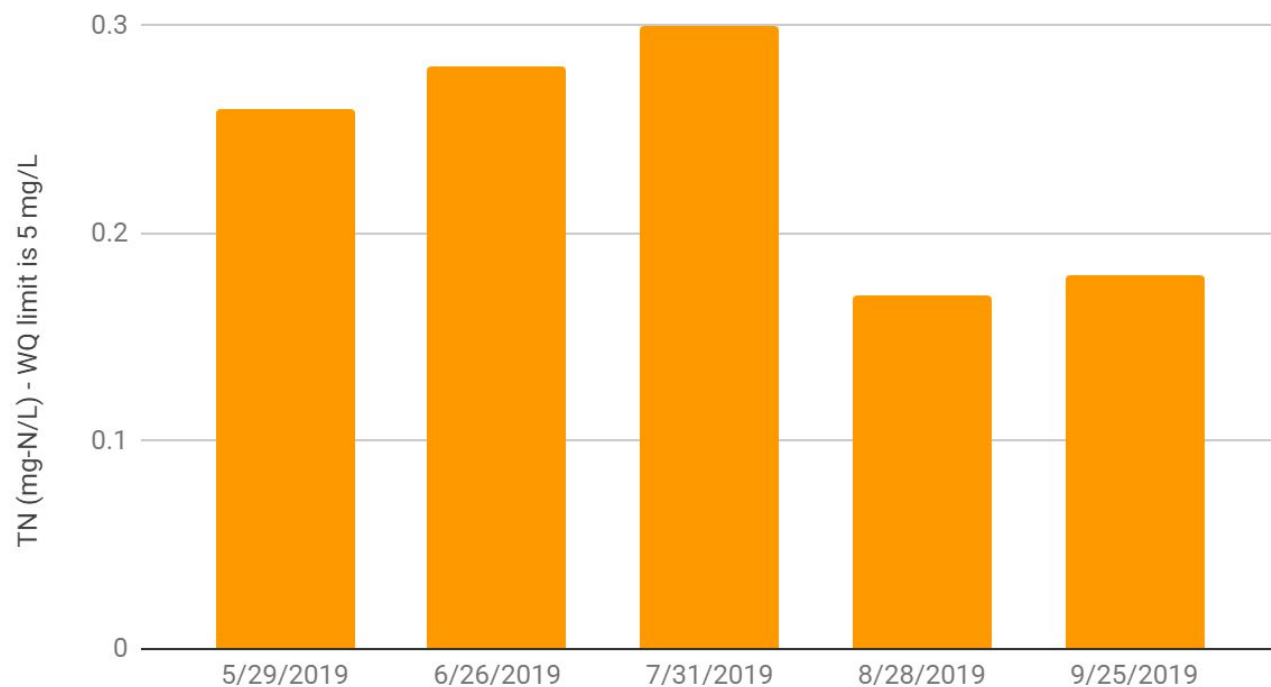
Site #BRAT.BR.12.3 [43.368773, -72.501317] -- Tolles Dam, Maple St, Perkinsville. This sample is collected at a popular swimming spot located on property managed by the US Army Corps of Engineers. Sampled by Rodger Capron.



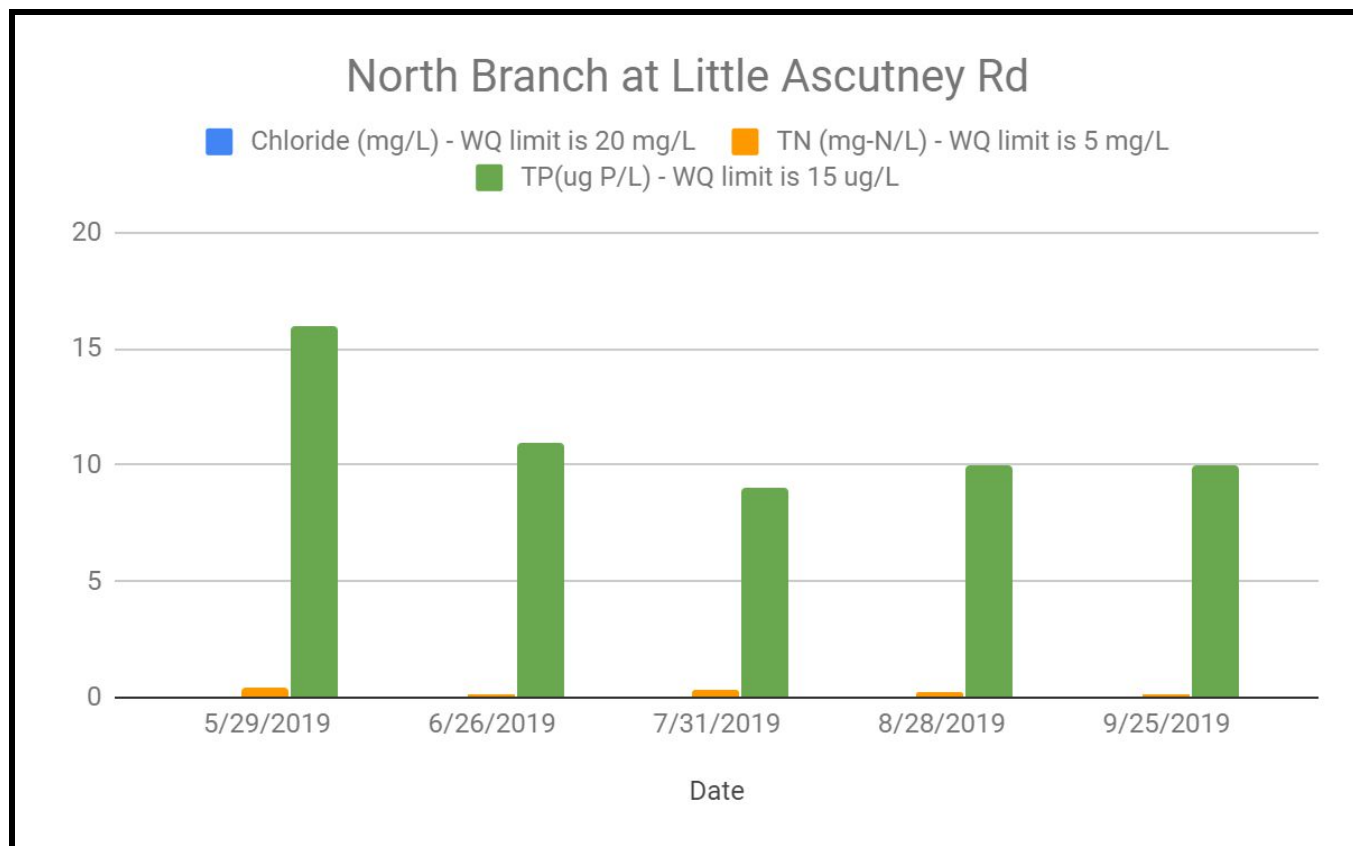
Total Chloride & Phosphorus for Black River at Tolles Dam



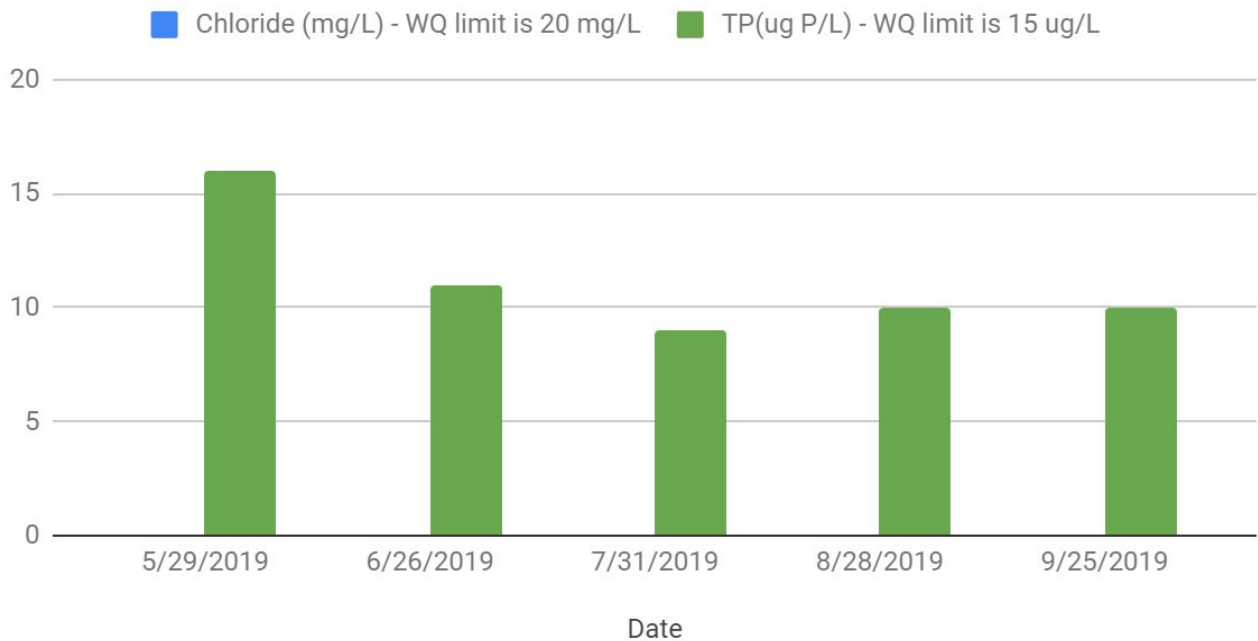
Total Nitrogen for Black River at Tolles Dam



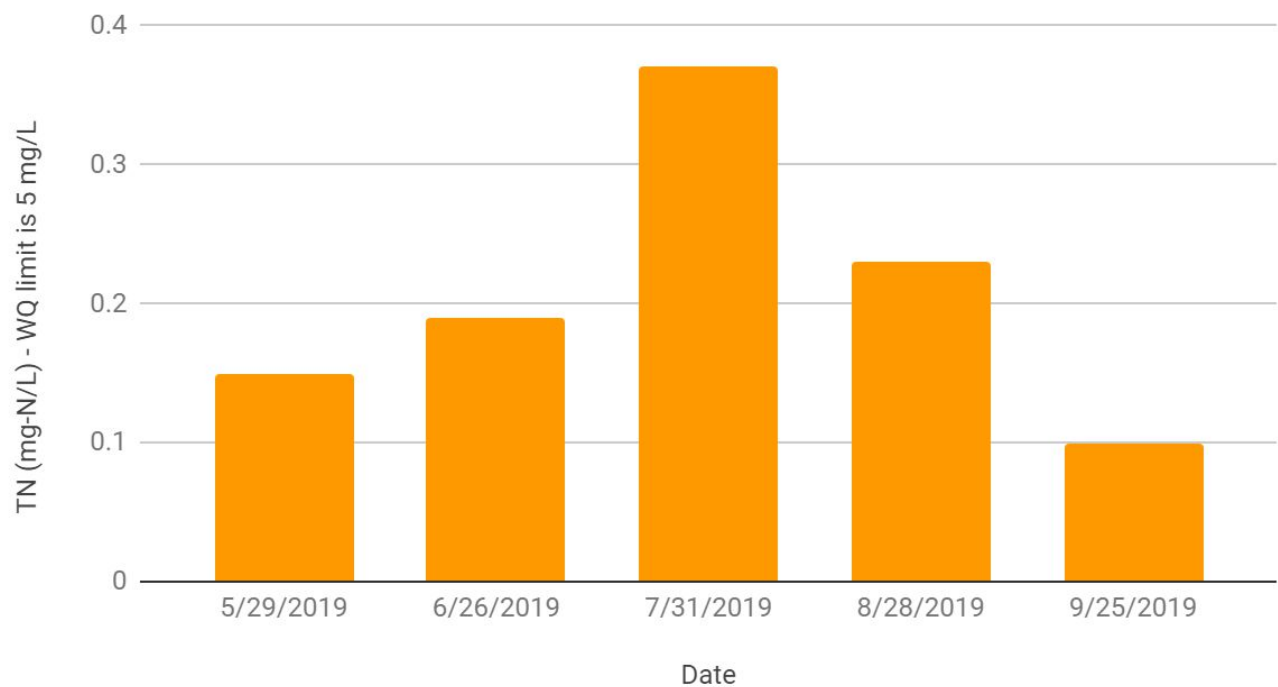
Site #BRAT.NBB.3.8 [43.417448, -72.51667] -- Little Ascutney Road, Weathersfield. Our first site on the North Branch of the Black River, this spot is a locally-popular swimming hole next to a dirt road. The river has wound through hayfields and around the base of nearby Mount Ascutney; open and exposed with sparse shoreline vegetation, this site may have multiple stressors and is being monitored for bacteria and nutrient levels.



Total Chloride & Phosphorus for North Branch at Little Ascutney Rd

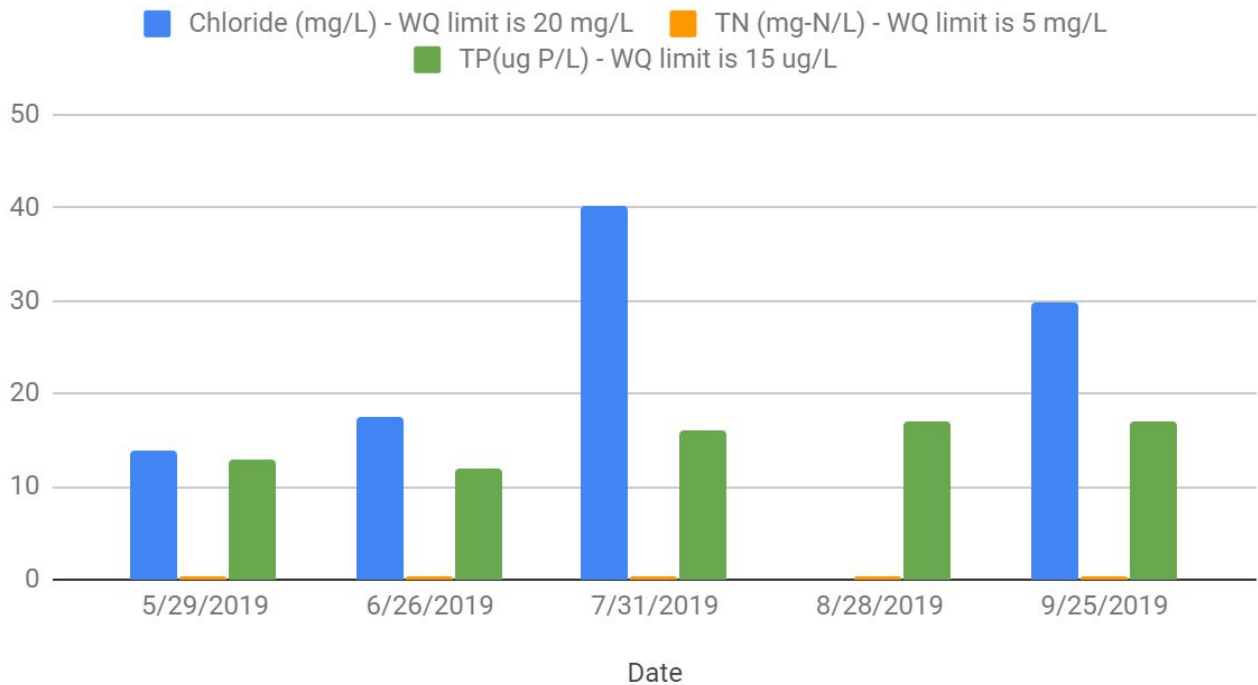


Total Nitrogen for North Branch at Little Ascutney Rd

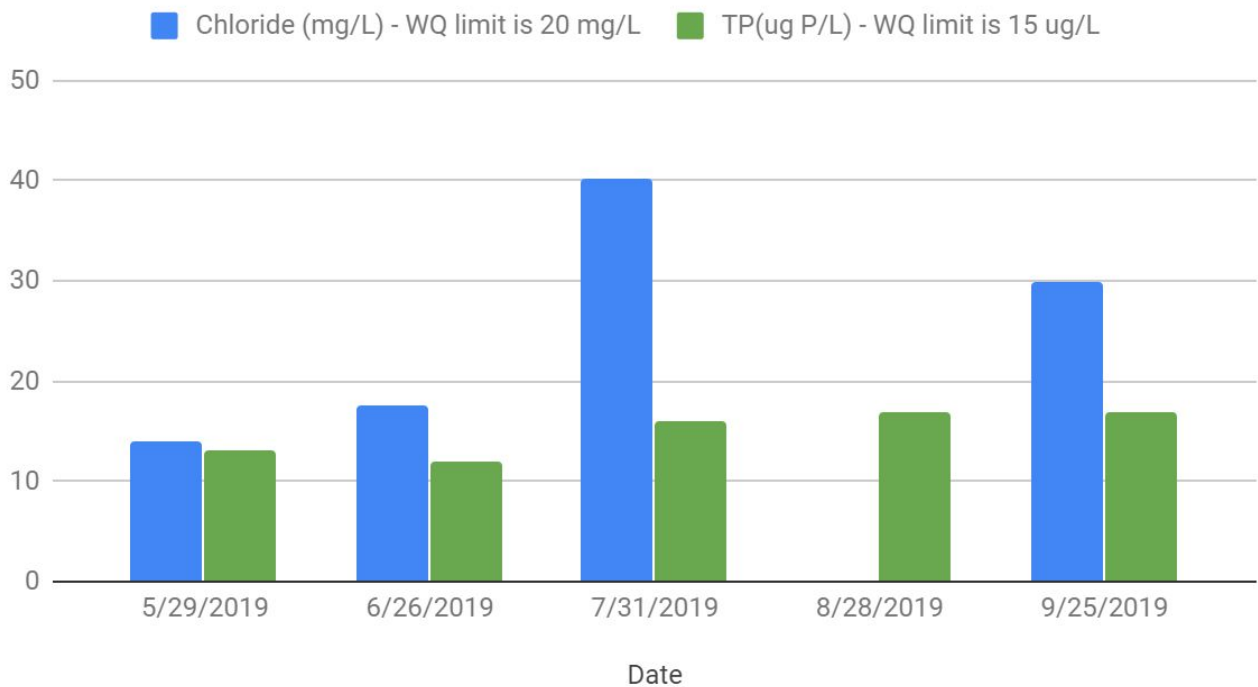


Site #BRAT.BR.23.0 [43.38071, -72.64011] -- Greven Field, Cavendish. A popular community recreation area for shallow swimming, wading, and kayak launching, Greven Field was sampled by Tammy Wright.

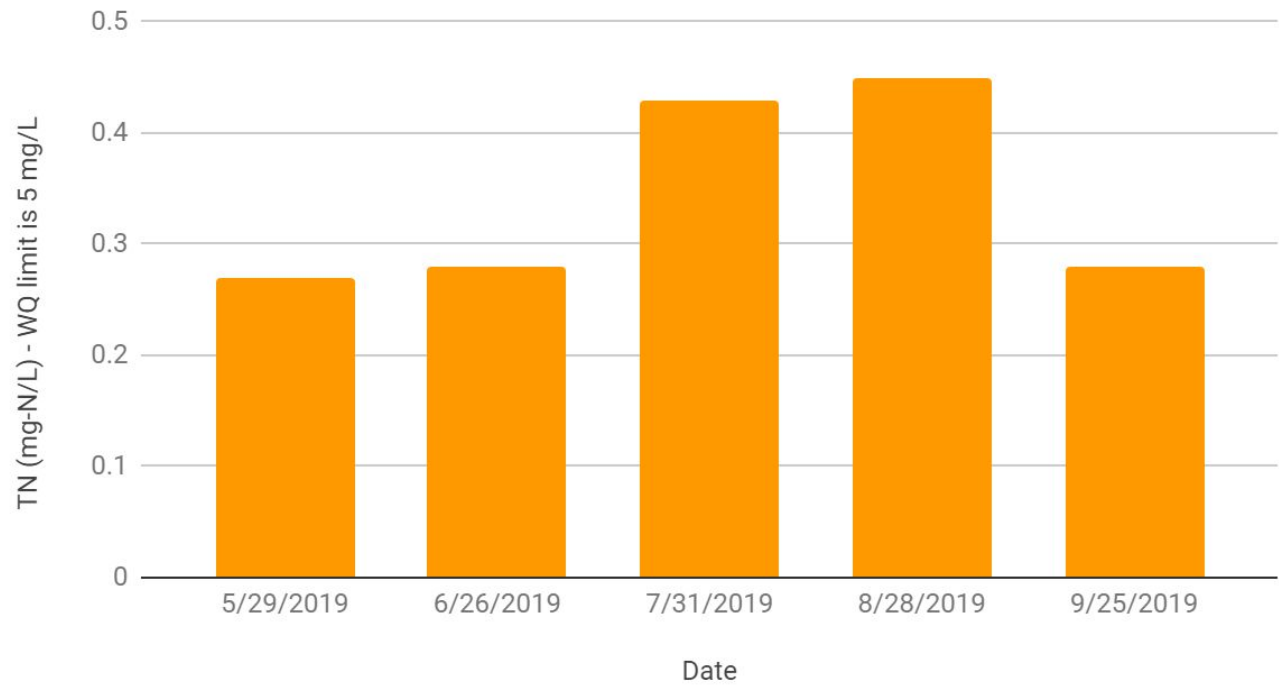
Black River at Greven Field



Total Chloride & Phosphorus for Black River at Greven Field

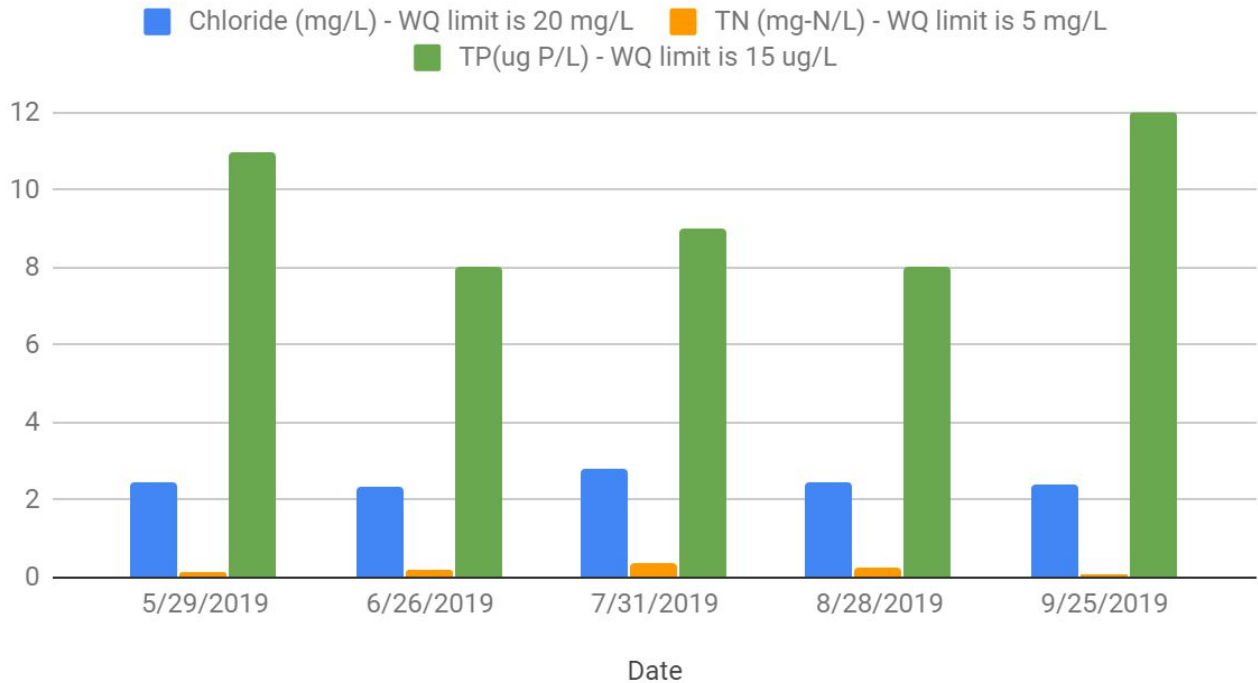


Total Nitrogen for Black River at Greven Field

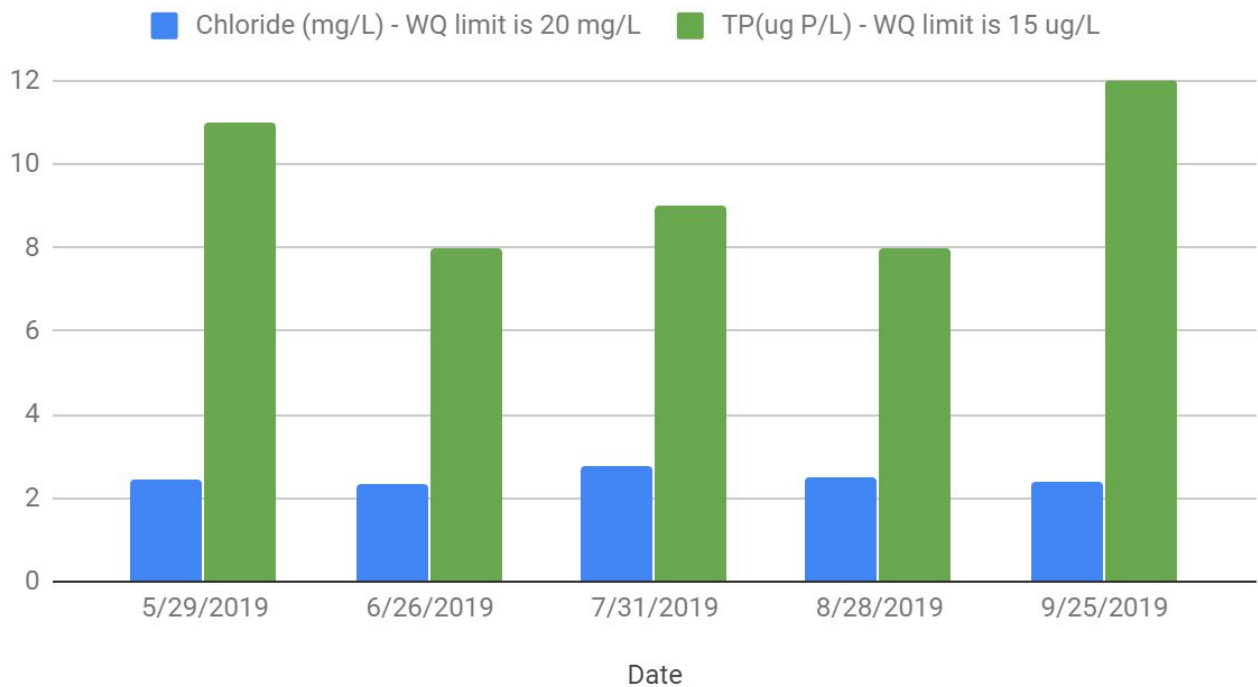


Site #BRAT.BR.27.3 [43-401529, -72.705827] -- Ludlow Fire Station, Ludlow. Located behind the Ludlow fire station on Pond Road and just downstream from a golf course, this site is also home to an inflatable diversion dam used by Okemo Resort for snowmaking. Sampled by Sharon Bixby.

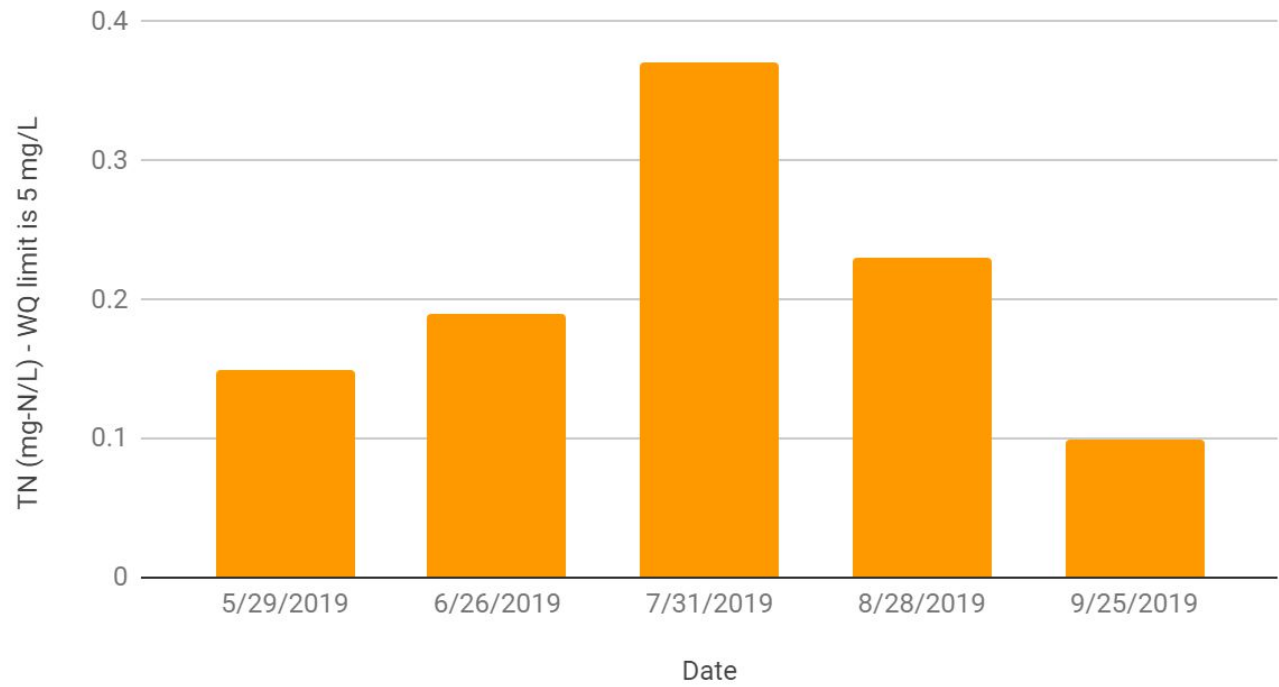
Black River at Ludlow Fire Dept



Total Chloride & Phosphorus for Black River at Ludlow Fire Dept

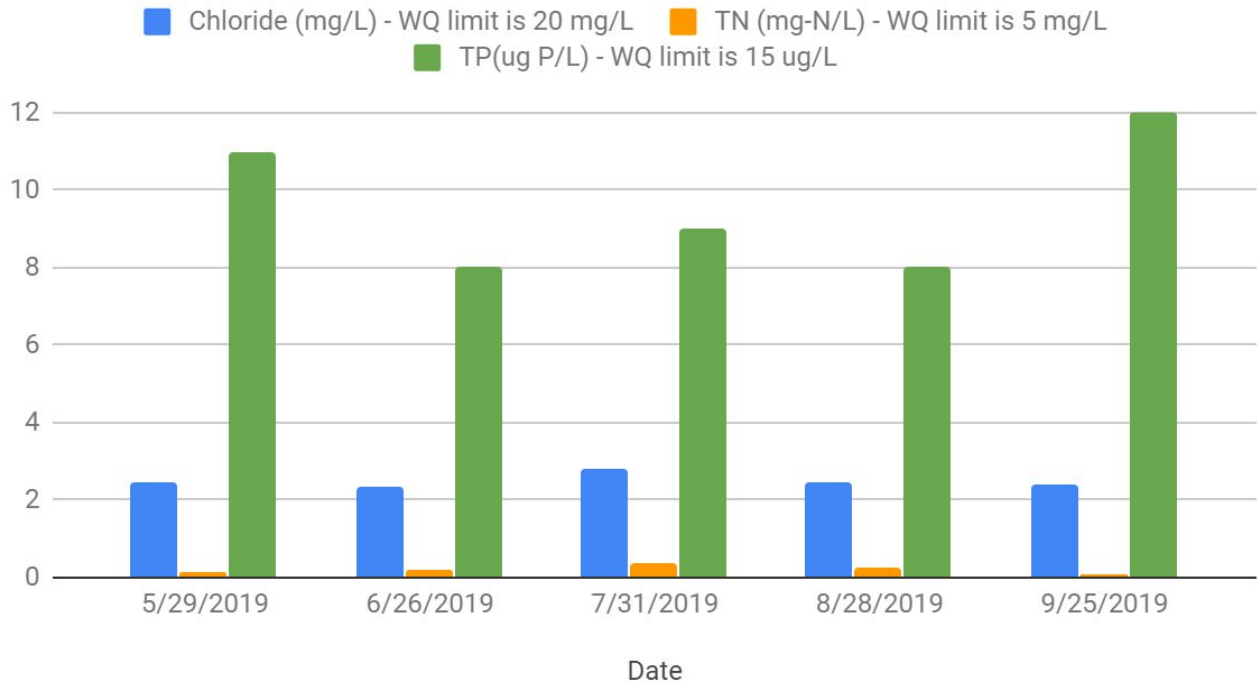


Total Nitrogen for Black River at Ludlow Fire Dept

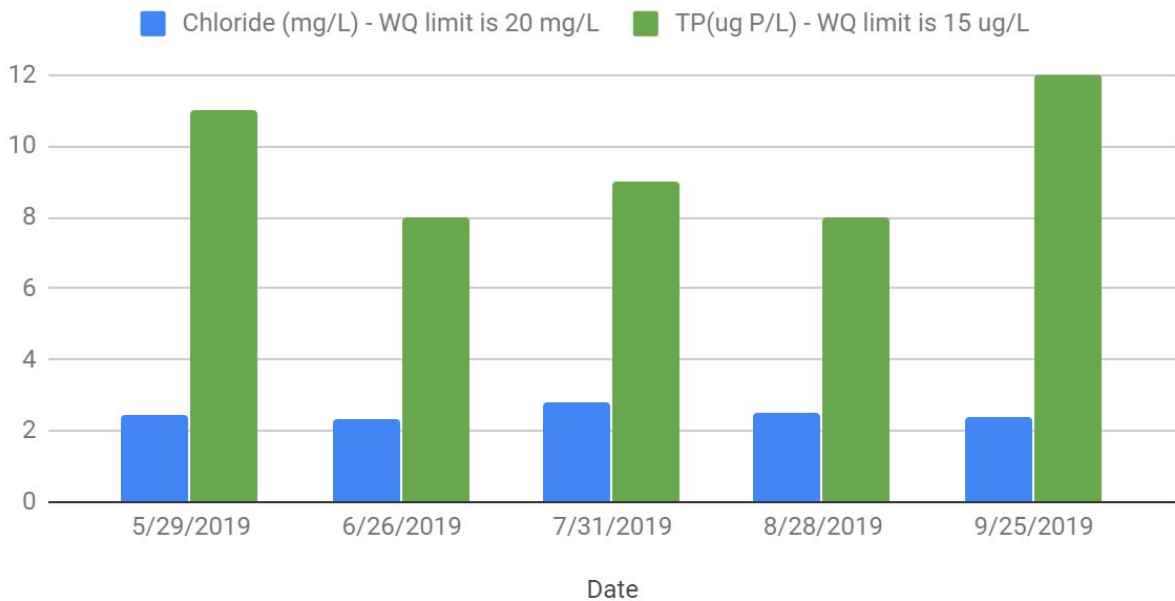


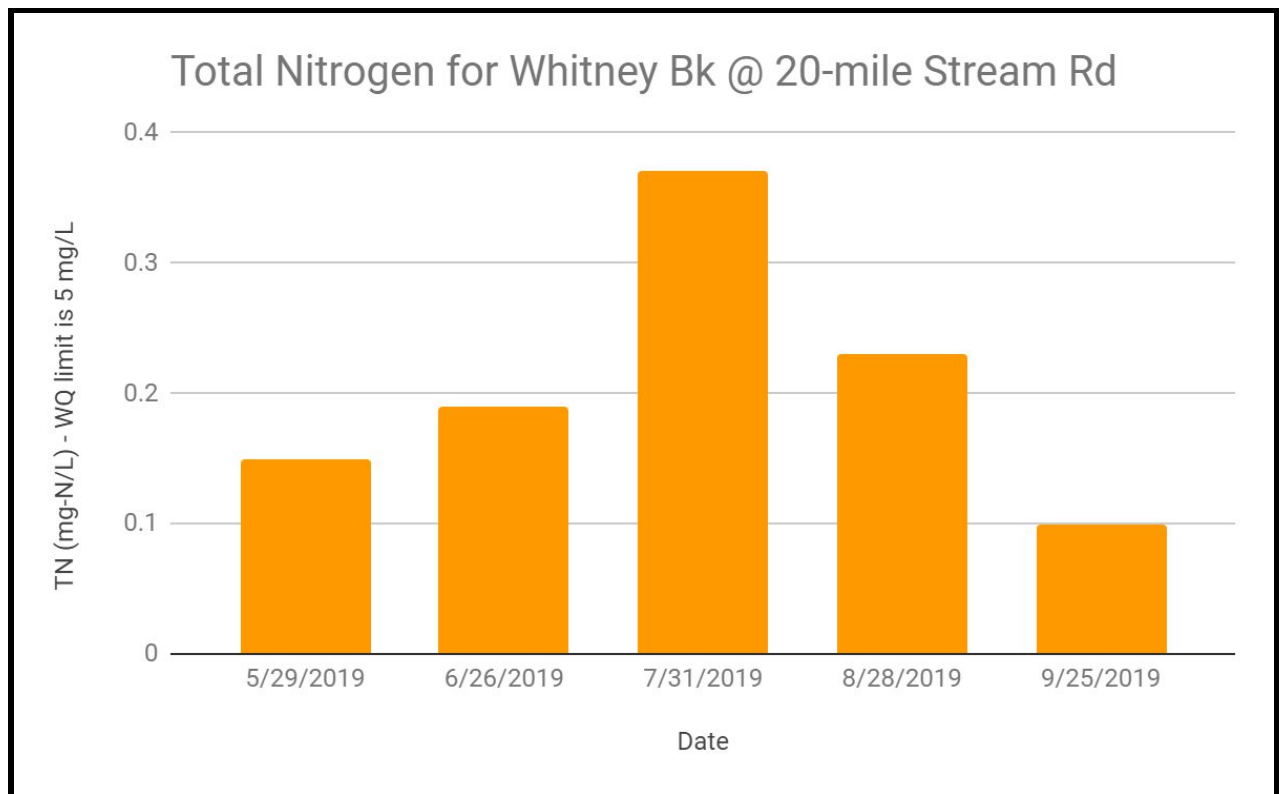
Site #BRAT.WhB.001 [43.415425, -72.651202] -- Whitney Brook @ 20-mile Stream Rd, Cavendish.
The first of four sites continued in 2019 to gather baseline data around the newly-constructed Coolidge Solar field. The solar project features over 83,000 panels over nearly 86 acres of farmland in the headwater area for brook trout streams. Sampled by Beth Gra

Whitney Brook @ 20-mile Stream Rd



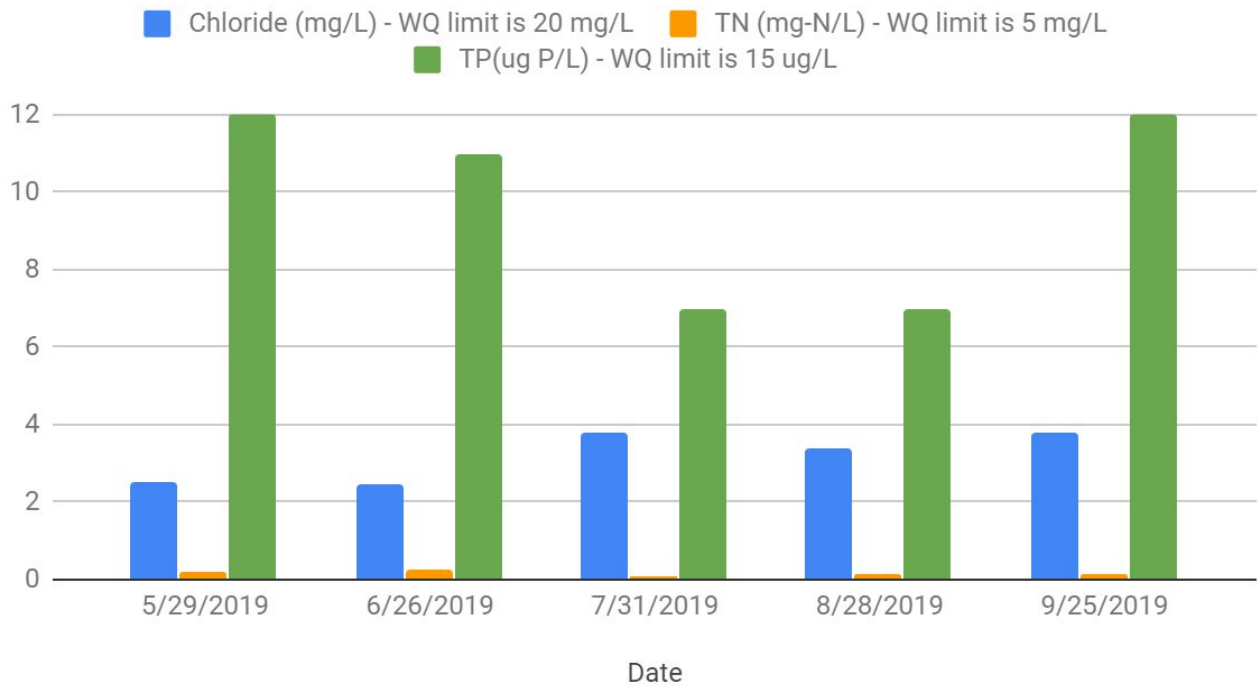
Total Chloride & Phosphorus for Whitney Bk @ 20-mile Stream Rd



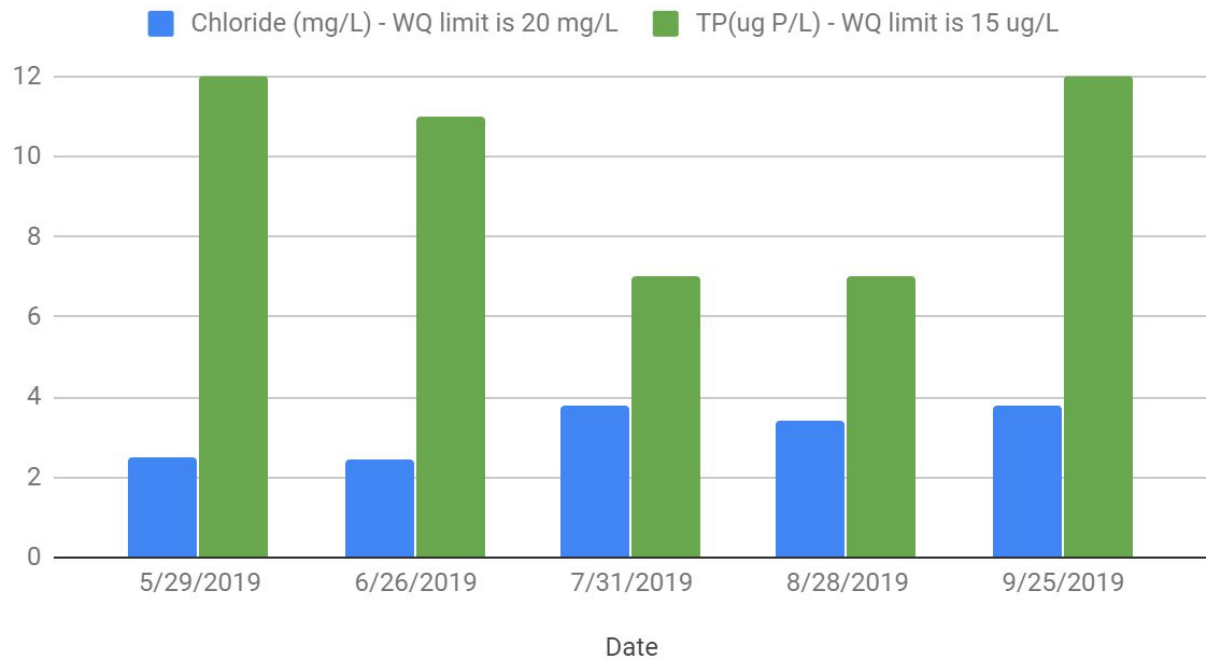


Site #BRAT.WhB.014 [43.424161, -72.66923] -- Whitney Brook @ Barker Rd, Cavendish. The second of four sites around the newly-constructed Coolidge Solar field. Sizeable slimy sculpin were observed just below the culvert under Barker Rd in fall of 2018. Sampled by Beth Gray.

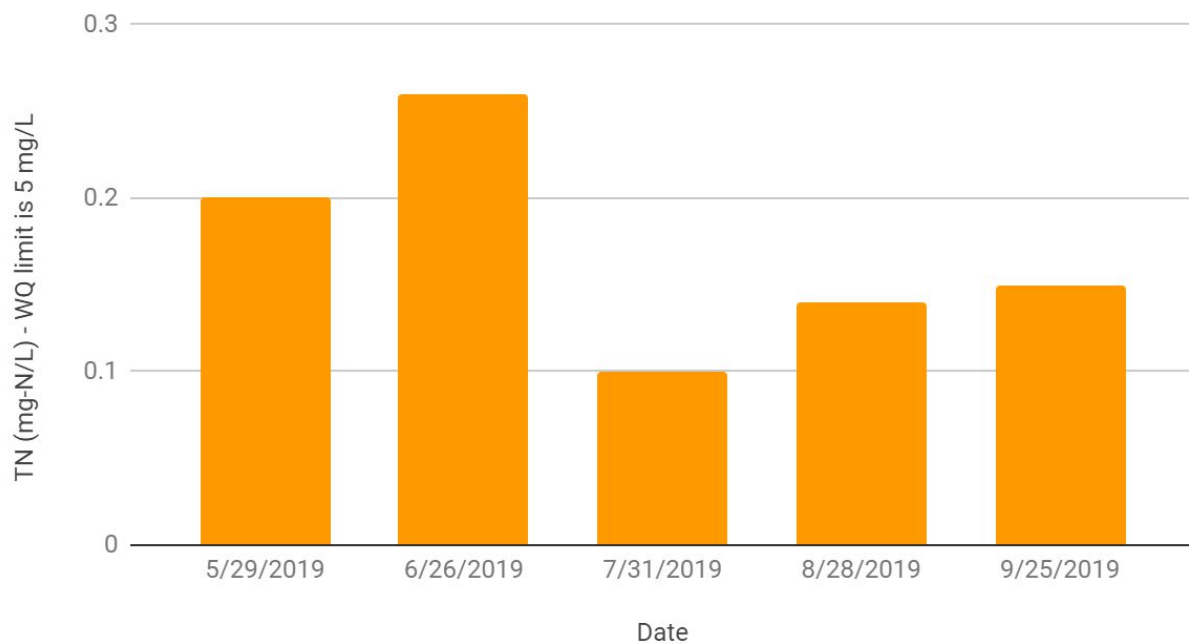
Whitney Brook @ Barker Rd



Total Chloride & Phosphorus for Whitney Bk @ Barker Rd

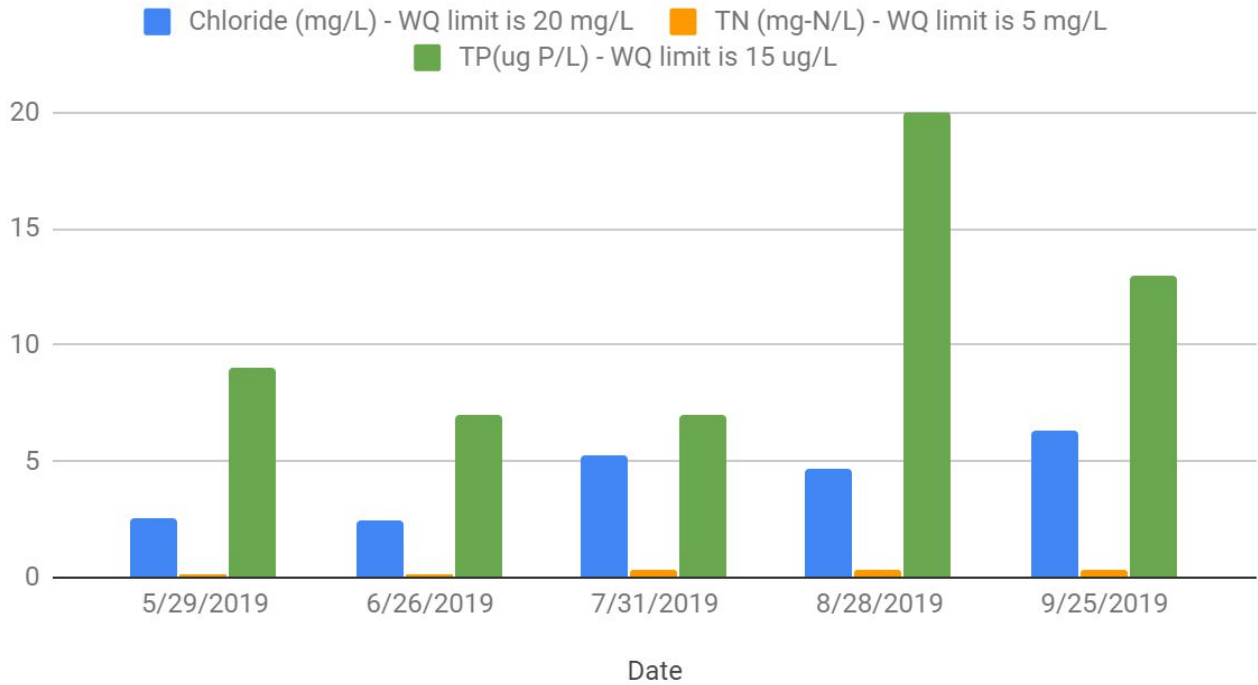


Total Nitrogen for Whitney Bk @ Barker Rd

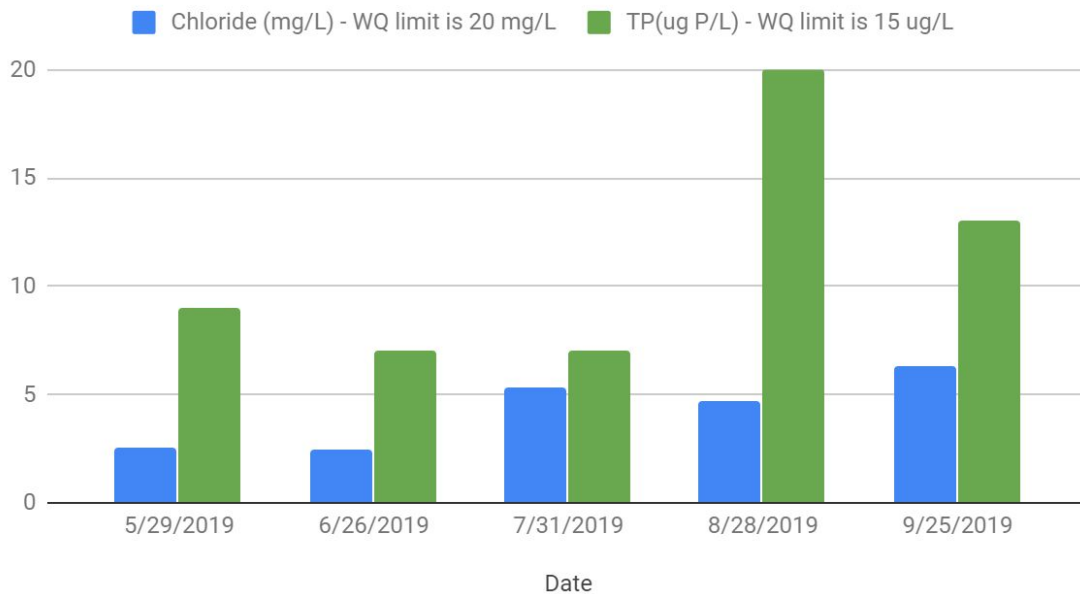


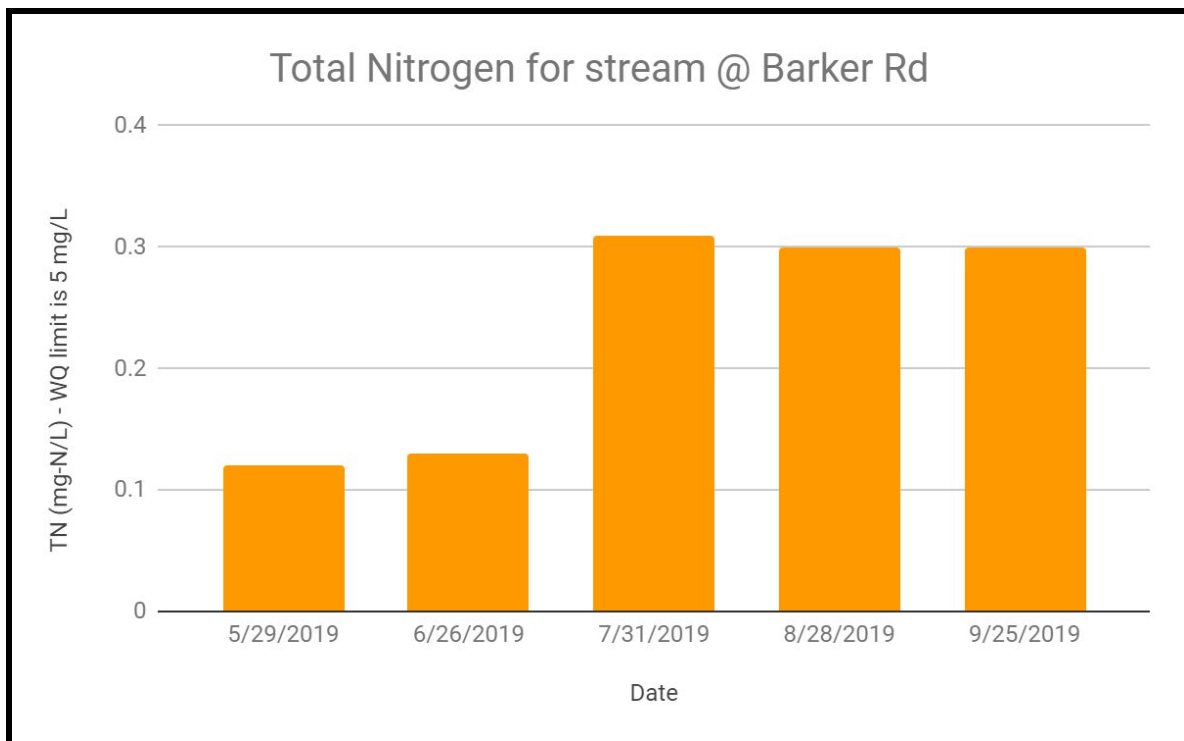
Site #BRAT.QPR.005 *[43.427080, -72.661480]* -- Trout stream @ Barker Rd (near GMP substation), Cavendish. The third of four sites around the newly-constructed Coolidge Solar field. Sampled by Kate Hazen & daughter Honore.

Stream @ Barker Rd



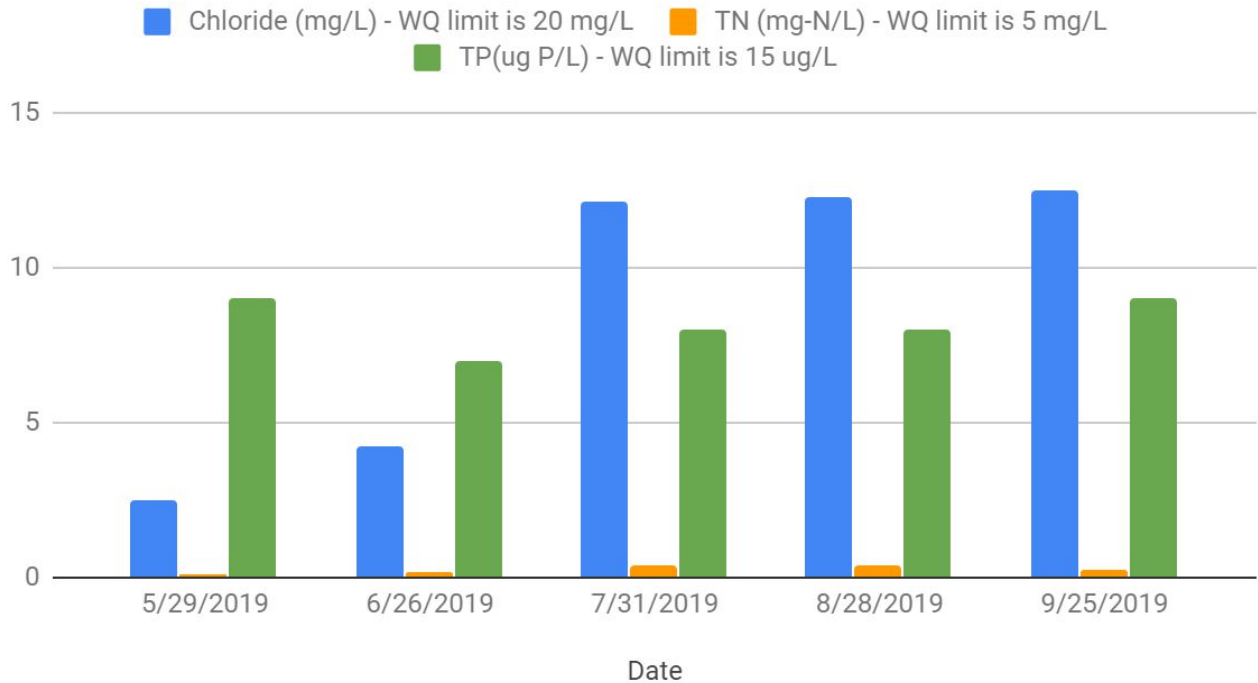
Total Chloride & Phosphorus for stream @ Barker Rd



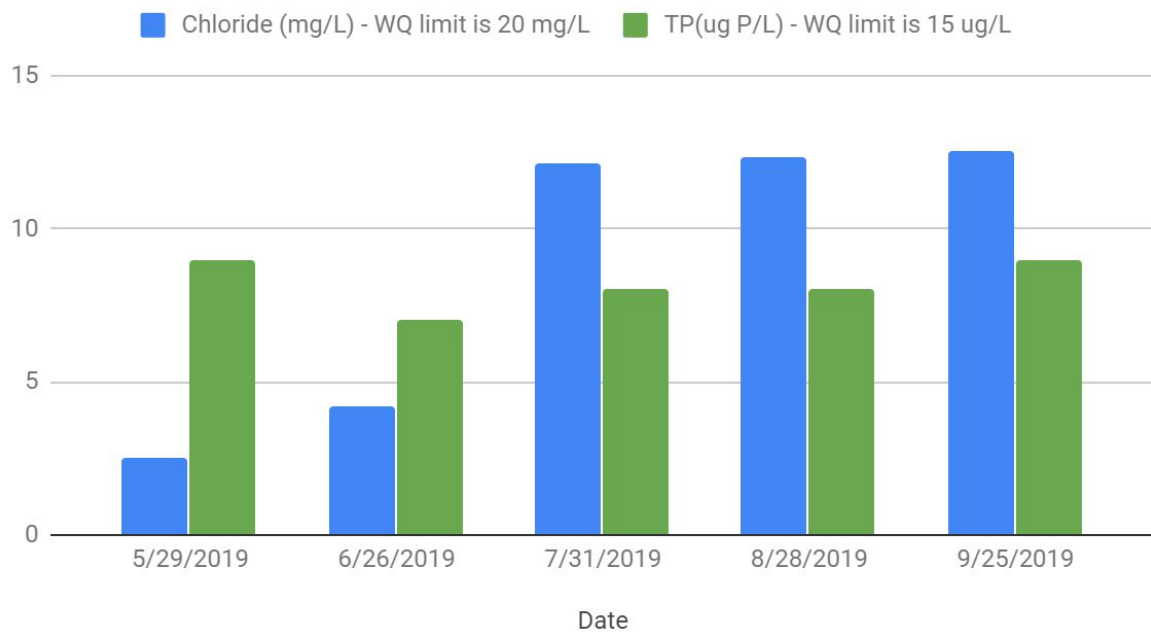


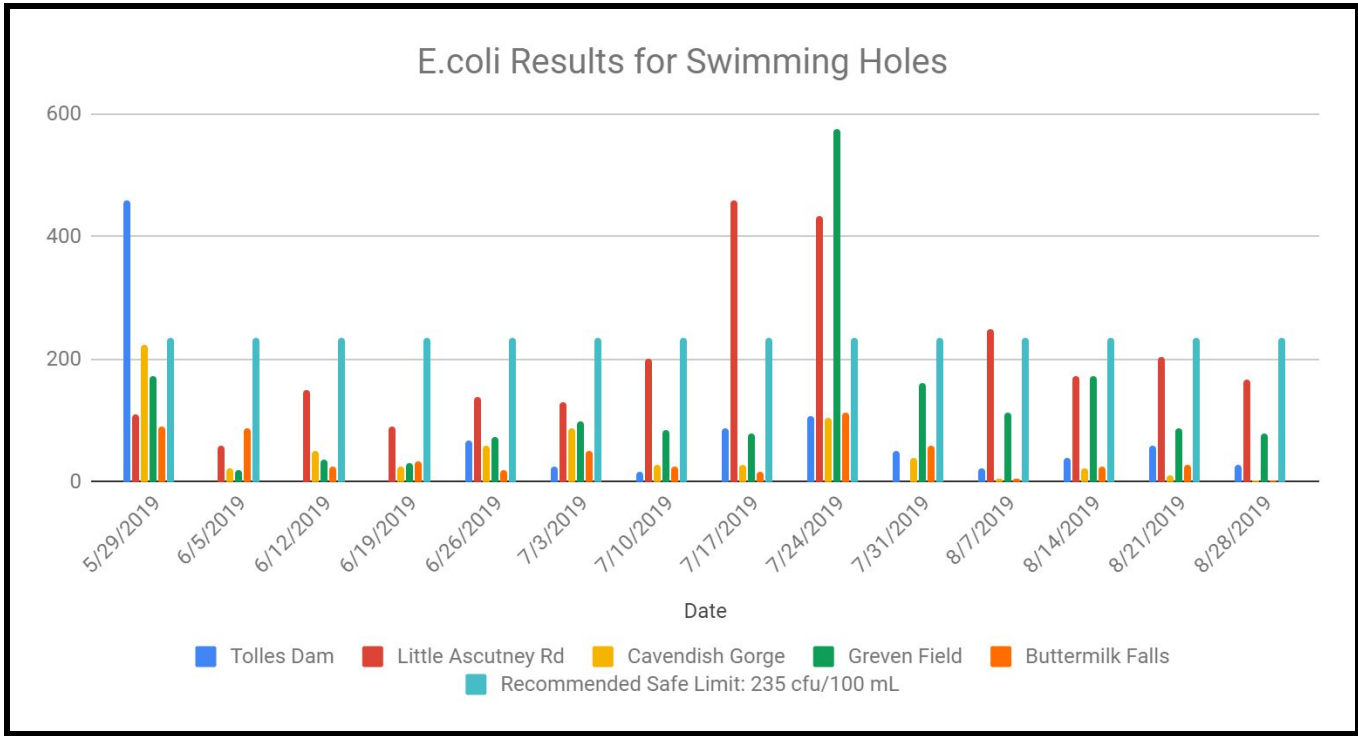
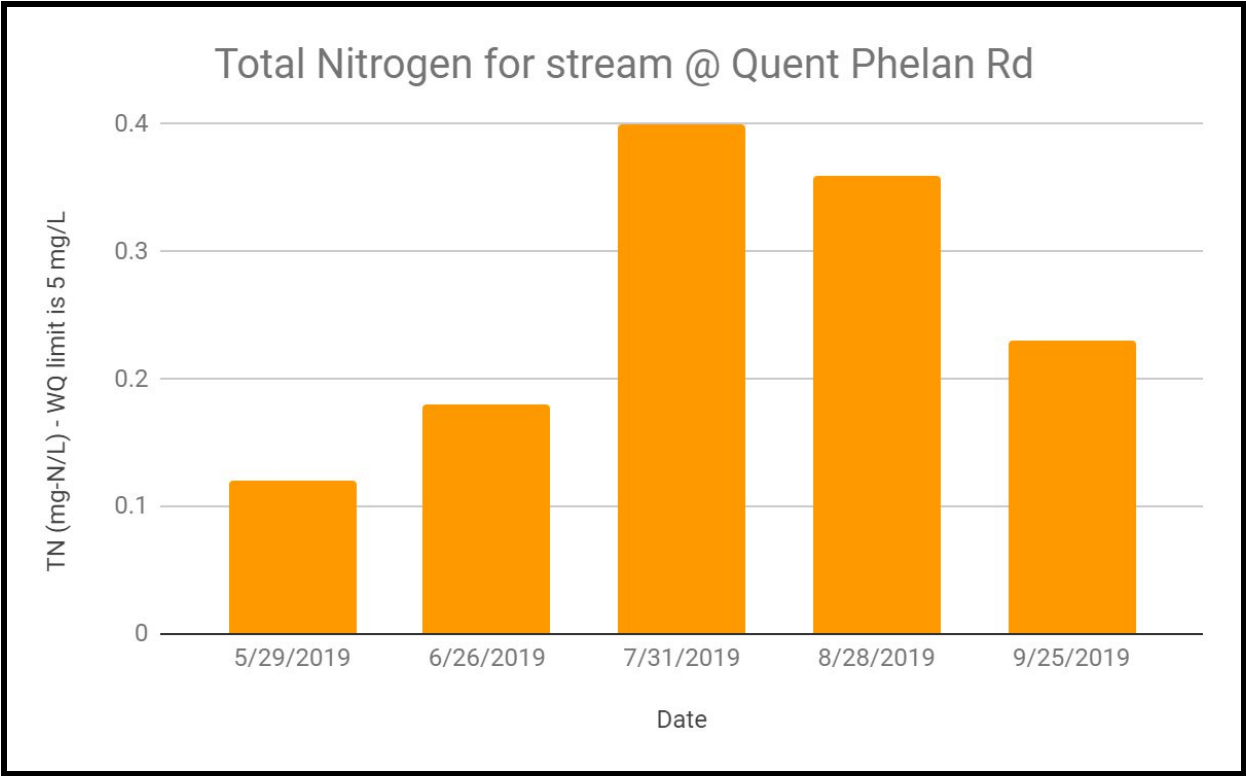
Site #BRAT.QPR.001 [43.42392, -72.65572] -- Trout stream @ Quent Phelan Rd, Cavendish. The final of four sites around the newly-constructed Coolidge Solar field. This site is in the backyard of the Palmer family, just below their small cow-pen. Sampled by Kate Hazen & daughter Honore.

Stream @ Quent Phelan Rd



Total Chloride & Phosphorus for stream @ Quent Phelan Rd





E.coli results from 2019 weekly sampling at 6 swimming areas; results posted weekly at <http://connecticutriver.us/site/content/sites-list>

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 or leave a message at 802-738-0456.

