The Water Bulletin

Community Science Institute Newsletter

SPRING 2015

SAVE THE DATES:

April 15th - 11th Annual CSI Volunteer Symposium, Tompkins County Public Library, 5-8 PM

June 25th - Ecosystem Invaders: What's In Your Watershed?, Ithaca Town Hall, 6-8 PM

October 1st - Permitted to Pollute: What's In Your Watershed?, Location TBD, 6-8 PM

Road Salt In Local Streams

Throughout the winter, road salt is applied by municipalities across the country to combat icy road conditions and prevent accidents. Table salt, which we're all familiar with, is made up of sodium chloride (NaCl) while road salt takes a few different forms: calcium chloride ($CaCl_2$) and magnesium chloride ($MgCl_2$) as well as sodium chloride, and mixtures of the three. The CSI lab uses the test for chloride as an indicator for road salt contamination. You might expect that chloride levels would spike in the winter due to the application of road salt, but it turns out to be not so simple.

Cayuga Lake at Stewart Park, where chloride levels in tributary streams may be too high to support aquatic life.

Roughly 80% of the time, streams are under "base flow" conditions, meaning that the water in the stream is not coming from rain or snowmelt runoff. Groundwater is recharged as rain and snow melt soak into the ground, and eventually come back to the surface in the stream bed. Road salt contamination can enter streams via stormwater runoff and sewer drains, but the majority enters streams by infiltration to groundwater. Chloride from road salt is absorbed into groundwater over time, eventually leading to increased chloride levels in streams. This is why chloride levels stay relatively stable throughout the year, rather than increasing in the winter and decreasing in the summer (shown on page 2 graph). The salt does not simply wash off the road and directly into the stream; it is a slower, longer process.

Road salt dissolves into groundwater, leading to increased chloride levels in streams

One of the ways this can be seen is by looking at chloride concentrations as you move from upstream to downstream. In Six Mile Creek, for example, concentrations in the upper reaches of the watershed average around 9 mg/L, midway through the watershed around 20 mg/L and eventually reach 35 mg/L at the mouth of the stream in downtown Ithaca. The concentrations gradually increase as the water moves downstream. The reason is not entirely clear but it could be due to greater road density, resulting in higher concentrations of chloride in groundwater.

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Road Salt and Chloride, continued

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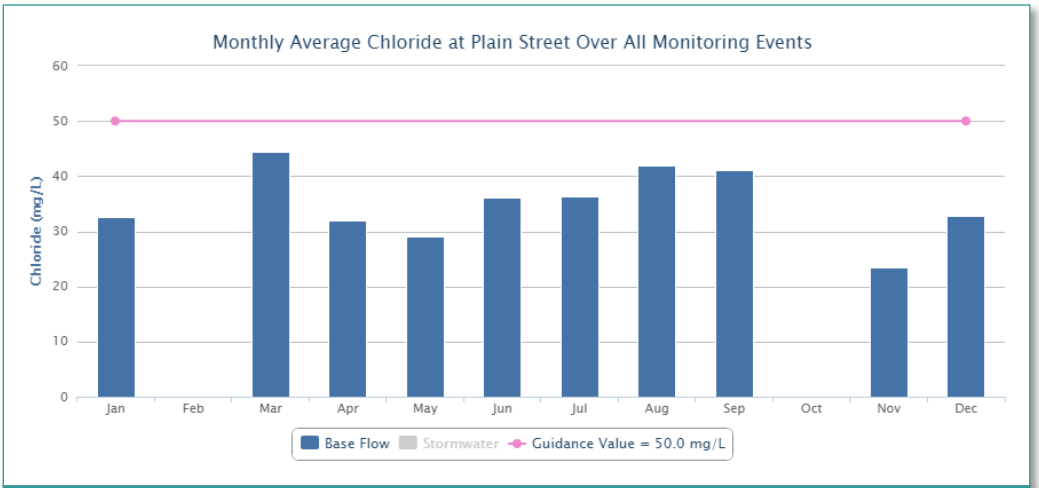
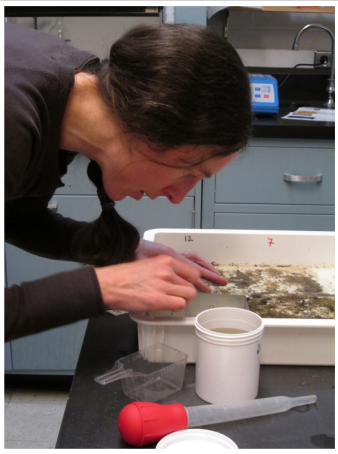
Chloride can be toxic to aquatic life and can pose taste or odor issues in drinking water supplies. If the levels are elevated over 250 mg/L, water can become salty tasting. It begins to threaten aquatic life if continuously elevated above 230 mg/L, according to the EPA. Stricter, but non-enforceable guidelines from the Hudson Basin River Watch (HBRW) set the healthy level for streams at 50 mg/L. Long-term data sets developed from CSI's volunteer monitoring partnerships have revealed 14 locations in the Cayuga Lake watershed that have had chloride concentrations in excess 250 mg/L at some point in time, while 9 locations have average concentrations above the 50 mg/L HBRW guideline. (www.communityscience.org/database for more)



This graph from the CSI database shows average chloride levels by month in Six Mile Creek and demonstrates how chloride levels are relatively stable throughout the year.

From April-October, the 4-H20 Youth Monitoring Club collects and analyzes water samples in Ithaca's idyllic Stewart Park. Chloride concentrations in Cayuga Lake are around 42 mg/L, but streams that flow through Stewart Park have chloride concentrations that average up to 300 mg/L, raising concerns about maintaining a healthy aquatic habitat. Investigative sampling of small tributary streams upstream in Cayuga Heights and near the Ithaca High School has shown chloride concentrations as high as 430 mg/L at some locations, which could account for the elevated levels in Stewart Park.

Road salt is an easy target to blame for increases in chloride concentrations in streams, but there is far more to it than salt washing off of the road and into the water. With more frequent and heavier winter precipitation, even as municipalities get creative about road management, chloride will continue to increase in groundwater, and in local streams.



Bio-Monitoring Program Coordinator Adrianna Hirtler sorts a Biological Monitoring sample

Biological Monitoring Shows Long-Term Impacts

Biological Monitoring is a fun, interactive way to get to know more about the life in local streams. You might be surprised to learn that many common insects like dragonflies and beetles begin their life cycles as tiny organisms under rocks in the stream bed!

Thanks to support from the Legacy Foundation of Tompkins County, the Biological Monitoring program expanded its activities to engage young people in water monitoring activities last year. The grant allowed CSI to bring the "BMI In the Classroom" module to two local high schools and increase the number of Biological Monitoring samples collected by the 4-H20 Youth Monitoring Club from one to two per year. The 4-H20 Club, which previously would take a break during the winter, has added programming that includes monthly sessions at the CSI lab where participants learn how to identify aquatic insects that are indicators of water quality. Club members collected a biological sample from Cascadilla Creek in the fall and have been working on identification and counting during the winter sessions.

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Biological Monitoring is an effective method for monitoring long-term ecosystem health because it examines the inhabitants of an aquatic community that are affected by water quality over time. If water quality is being degraded, collecting a biological sample can show an impact, whereas chemical testing may not. A single BMI sample, collected sometime from May-October, can be used to represent the overall health of a stream, whereas water samples for chemical testing need to be collected multiple times to identify problems and trends.

A Common Netspinner Caddisfly (Hydropsychidae) under the microscope

CSI staff Adrianna Hirtler and Michi Schulenberg are taking Biological Monitoring to the next level and have become Certified Family-Level Aquatic Taxonomists. This certification means that their identification skills are at a professional level and results they review are considered to be reliable to agencies like the NYSDEC. Adrianna will continue holding "BMI ID Nights" on Thursday evenings from 6-9 PM until mid-May when the sampling season starts up again. If you'd like to learn more about who's living in our streams and want to learn from the best, Biological Monitoring is the perfect opportunity!

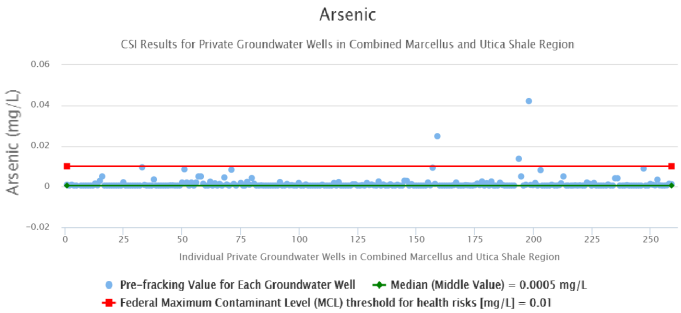
Online Database Continues to Evolve

Since 2007, the CSI database has served an instrumental role in making certified water quality data freely available to the public. Initially created to hold data from stream monitoring events, the database has grown significantly, and now also contains data from private groundwater wells tested for baseline parameters related to hydrofracking, and information about regulatory water quality guidelines.

A common question when presenting water quality data is, "So what does it mean?" and the newer features of the database help answer that question. Many users will be surprised to find how few water quality guidelines exist from state and federal authorities, particularly for surface water. Unless a surface water body is used as a drinking water source or a public recreation area, there are no enforceable water quality limits. In lieu of more comprehensive limits, CSI uses guidelines developed by the Hudson Basin River Watch (HBRW) for Healthy NY Streams. Where limits do exist, the database shows the levels with a pink line to make an easy comparison to results shown on the graphs.

In the groundwater database, users can view test results from private wells. Although private wells are not regulated in New York, there are health-based federal and state limits for public water supplies that can be used to evaluate well water quality. These limits appear as red lines on groundwater graphs, clearly showing how many wells are in exceedance. Users can view results at different levels – by state, county, one-mile grids, or by individual well – and see how water quality varies by location.

CSI's database is used by local government agencies and researchers to understand and manage local water resources. Within the past year, the site has been cited in peer-reviewed



articles about *E.coli* in roadside ditches, and quantifying brine sources, in addition to being used as part of Cornell's Cayuga Lake Modeling Project, and by Tompkins County Soil & Water Conservation District to understand storm water flow. Do you know other projects that are using local water quality data? Do you want to use the database but don't know where to start? Write to us at info@communityscience.org

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