Falls Pond Chemistry Surveys (Survey #:519010, 519059, 519122)

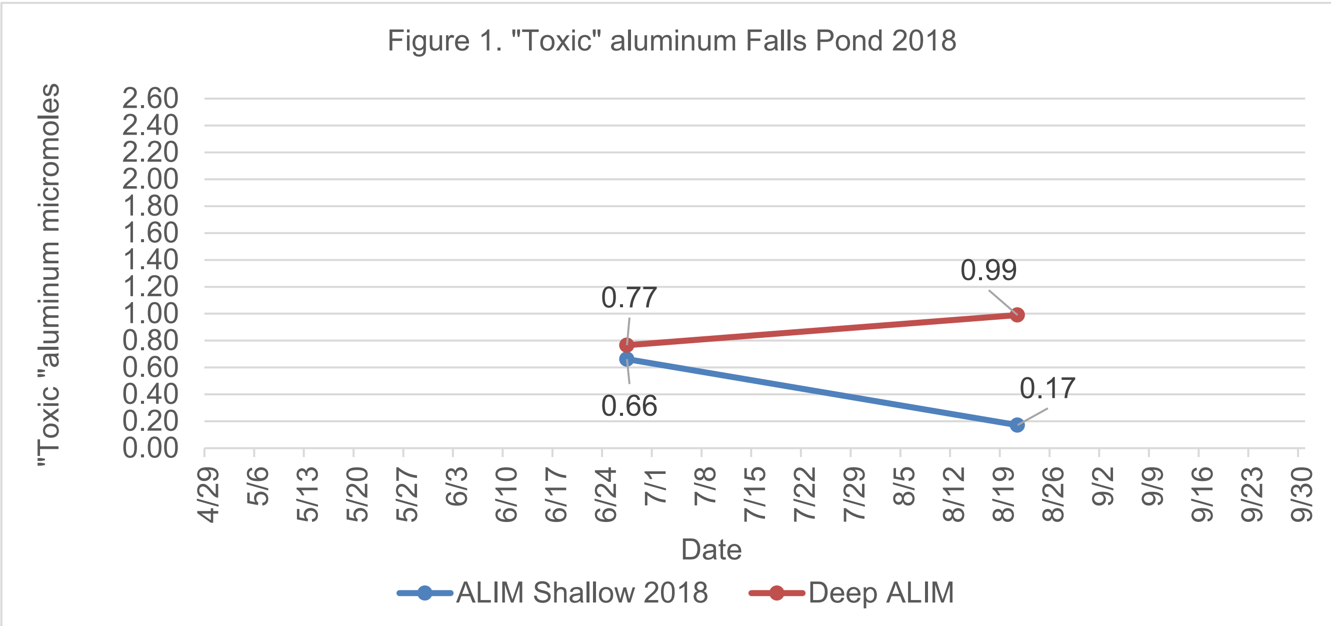
Jonathan Fieroh, Region 5 Fisheries 2/12/2020

Falls Pond (B-P885) is a remote 37-acre water located in the West Canada Lakes Wilderness in Hamilton County. The maximum depth is 25 feet, with an average depth of nine feet, and a flushing rate of 1.8 times per year. There is adequate dissolved oxygen for trout to a depth of 20 feet. Trout stocking began in 1964 but the stocking policy was cancelled following a 1984 Adirondack Lakes Survey Corporation (ALSC) survey in which only one trout was captured. Falls Pond has a fairly complex management history in that it has been limed three times, (1975, 1978,1980) with limited success. After each application the pond re-acidified rather quickly. In 2015 a fish survey (#515051) was performed, and surprisingly 32 brook trout were collected. Scale and genetic samples showed that the fish were 2-year old Temiscamie x Domestic hybrid brook trout, and thus were likely present due to stocking error. Brook trout stocking began, and 1,000 fin clipped Horn Lake strain brook trout have been stocked annually since 2016. Brook trout have since been observed by anglers, and by staff during recent chemistry surveys. Historic water chemistry values for Falls Pond and its tributaries are included in the technical brief for the 2018 surveys (tb518033, tb518086). The 2019 series of surveys continue an effort to understand the water chemistry of this recovering water which now supports a brook trout population.

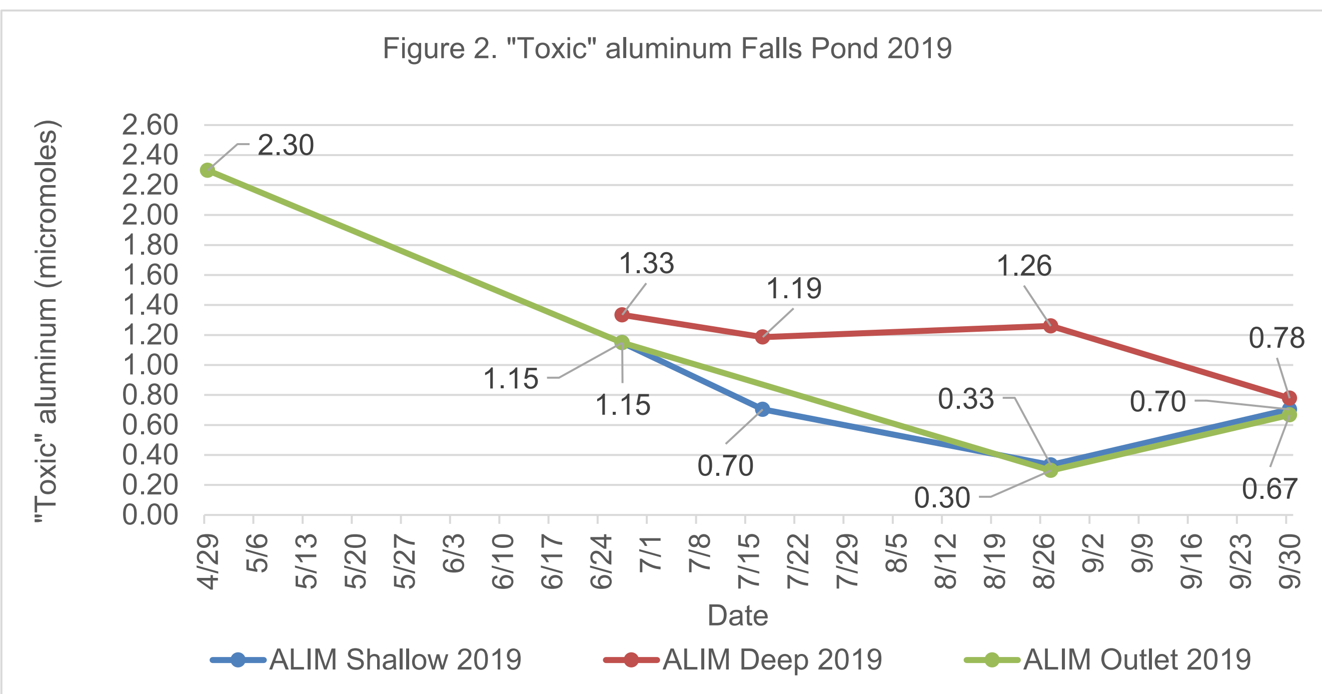
In 2019, samples were drawn from Falls Pond and advanced chemical analyses were performed by ALSC. Samples were drawn for analysis from different depths in the lake, and the outlet on multiple dates and advanced metrics were calculated. Selected Falls Pond chemistry values are shown below from two different sites (Table 1).

	Date	Depth (feet)	Air equilibrated pH (pH units)	Acid Neutralizing Capacity (µM/L)	Inorganic Monomeric "toxic" Aluminum (µM/L)	Base Cation Surplus (µeq/L)	BC/RCOOs	Conductivity (µmhos/cm)	Silica (Mg/L)
Outlet	29-Apr	0	5.25	5.9	2.3	-15.1	1.8	11.1	2.7
Outlet	27-Jun	0	5.11	2.1	1.15	-8.6	1.7	9.1	1
Outlet	27-Aug	0	5.32	5.7	0.3	-20.7	1.1	7.8	0.3
Outlet	30-Sep	0	5.51	5.9	0.67	-2	1.9	7.6	0.5
Lake	27-Jun	5	5.09	0.7	1.15	-10.9	1.7	9.6	0.9
Lake	17-Jul	5	5.23	7.3	0.7	-8.8	1.7	8.6	0.4
Lake	27-Aug	5	5.33	6.9	0.33	-21.5	1.1	7.8	0.3
Lake	30-Sep	5	5.54	4.9	0.7	-1.9	1.9	7.6	0.5
Lake	27-Jun	20	5.13	1.1	1.33	-12.6	1.9	11.2	2.5
Lake	17-Jul	12	5.06	0.4	1.22	-15.3	1.6	10.5	1.4
Lake	17-Jul	18	5.24	4.8	1.19	-12.8	1.9	11.4	2.7
Lake	17-Jul	23	5.39	9.1	1.41	-13	1.8	11.4	2.9
Lake	27-Aug	20	5.45	14.7	1.26	-29.3	1.2	10.8	2.8
Lake	30-Sep	18	5.75	12.6	0.78	-3.7	1.9	9.9	1.7

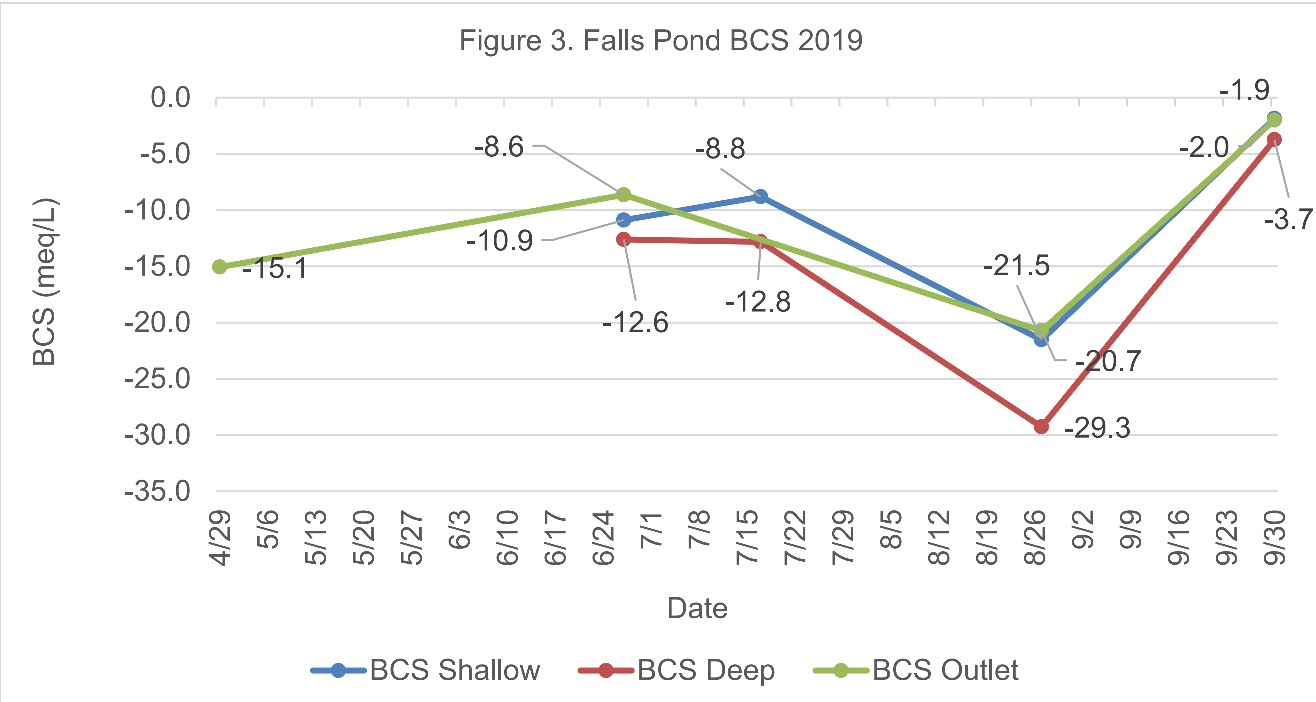
It was noted in the 2018 chemistry surveys that the levels of inorganic monomeric or “toxic” aluminum (ALIM), which can directly affect fish survival, appeared to increase in hypolimnetic waters. However, while the decline in ALIM values following an acidic pulse during spring snowmelt is evident in the shallower water, ALIM levels appear to increase in deeper waters in the summer (Figure1.).



ALIM levels in the late August hypolimnion appear to be a bit higher in 2019 than in 2018 (Figure 2.). The 2019 Base Cation Surplus (BCS) levels in Falls Pond appear to follow the same pattern throughout the sampling season in the outlet, the shallow water and the deep water (Figure 3.). A pattern quite different from that noted in Deep Lake (#519009, #510058, #519121) in which late summer BCS values were depressed.



The advanced metrics, Base Cation Surplus (BCS) and the ratio of Base Cations to Strong Organic anions (BC/RCOOs), give a deeper understanding regarding the ability to sustain a brook trout population. Preliminarily, it appears that for a water to support brook trout, BCS values should be above negative 15 µeq/L, and the BC/RCOOs ratio should be above 1.5. The stocking thresholds for the advanced metrics were again surpassed in all but the late August samples.



Recent research (Baldigo et. al. 2019), furthers our knowledge of the toxic effects of various ALIM levels on caged brook trout in streams. They found (in 30 d toxicity tests) mortality of juvenile brook trout was negligible below (medians of) 1 µM/L of ALIM, was 20% at 1-2 µM/L, was 20-50% at 2-4 µM/L, and was 90-100% above 4 µM/L.

It has also been documented (Schofield, 1996) that brook trout fry confined at shallow depths during acidic snow melt episodes experienced high mortality rates when fry at greater depths did not. Additionally, it was observed that young brook trout avoided lethally acidic near shore water by moving to greater depths. It is well known that brook trout will seek cooler water during periods of rising surface water temperatures. However, despite the generally marginal nature of the acid/base chemistry at certain depths, certain times of year, a brook trout population is currently surviving here. These chemistry values provide valuable insight for other recovering waters, but more study is needed.

Baldigo, B.P., S. George, G.B. Lawrence and E.A. Paul 2019. Acidification Impacts and Goals for Gauging Recovery of Brook Trout Populations and Fish Communities in Streams of the Western Adirondack Mountains, New York, USA. Trans. Am. Fish. Soc., 148, 19 pp.

Schofield C.L. and Keleher C. 1996. Comparison of Brook Trout Reproductive Success and Recruitment in an Acidic Adirondack Lake Following Whole Lake Liming and Watershed Liming. Biogeochemistry. 32 3: 323-337.