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Trout Pond Snowmelt Water Chemistry Survey #519107:

Jonathan Fieroh, Region 5 Fisheries

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Trout Pond (B-P793) is a remote water located in the Moose River Plains Wild Forest in Hamilton County. It has a surface area of nine acres, a maximum depth of 24 feet and an average depth of 4.3 feet. Brook trout were stocked here from 1966 to 1981, but a 1981 fisheries survey caught no fish and a Cornell survey found a pH of 4.4 in 1983. Trout Pond was limed in 1983 but quickly reacidified. NYSDEC chemistry surveys using advanced chemical metrics were performed in the spring (#516005) and summer (#516019) of 2016, and the values from those surveys prompted experimental brook trout stocking which began in 2018.

Decreases in pH and increases in the concentration of Al and NO3- have been documented in surface waters draining acid-sensitive regions like the Adirondacks during periods of snowmelt, and these inputs may contribute to chronic as well as episodic acidification (Rascher,1987). However, relatively recent improvements in the acid/base chemistry of some Adirondack waters have already been documented, and some of these waters, such as Brooktrout Lake (B-P874), now contain self-sustaining brook trout populations. In an effort to assess the effects of this "spring pulse" of acidity during a period of generally improving acid/base chemistry, a multi-year project was undertaken by NYSDEC and Adirondack Lakes Survey Corporation (ALSC) to collect weekly chemistry samples on five waters, including Trout Pond, analyzing selected chemical metrics (Table 1.).

Table 1. Spring 2019 Trout Pond selected water chemistry variables, snowmelt sampling.

Date	Air Equilibrated pH (pH units)	Acid Neutralizing Capacity (µeq/L)	Inorganic Monomeric "toxic" Aluminum (µM/L)	Base Cation Surplus (µeq/L)	BC/ RCOOs-	Conductivity (µmhos/cm)	Silica mg/L	Sodium mg/L
3/7/19	5.41	4.6	2.56	-8.0	3.1	14.5	5.4	0.56
3/13/19	5.48	-6.1	3.08	-3.2	3.0	14.8	5.4	0.57
3/20/19	5.22	12.3	2.11	-15.5	3.0	14.7	4.6	0.52
3/27/19	5.28	11.0	3.11	-35.8	1.7	15.1	4.9	0.53
4/3/19	5.03	0.2	3.59	-21.4	2.7	14.5	4.4	0.50
4/11/19	4.86	-2.2	2.71	-29.9	2.5	15.3	3.9	0.45
4/18/19	5.42	10.7	2.48	-30.5	1.3	12.2	3.5	0.44
4/25/19	5.39	7.5	2.26	-4.2	2.2	11.5	3.0	0.44
5/2/19	5.29	7.2	1.89	-3.9	2.2	11.3	3.0	0.43
5/9/19	5.38	5.2	1.82	-2.2	2.3	11.0	2.6	0.48
5/16/19	5.24	6.2	1.82	-6.1	2.0	11.0	2.4	0.45
Average	5.27	5.1	2.49	-14.6	2.4	13.3	3.9	0.49

Trout Pond was chosen as a water recovering from acidity. It is being stocked experimentally, but brook trout survival has not yet been evaluated.

SPORT FISH RESTORATION

The “spring snowmelt” values for pH and ANC (acid neutralizing capacity) were consistent with an acidic water; although perhaps a bit higher than one might expect, with an average pH for the period of 5.27. Additional chemical metrics, the Base Cation Surplus (BCS) and the ratio of Base Cations to Strong Organic anions (BC/RCOOs), were calculated and give a deeper understanding regarding the ability of this water to sustain a brook trout population. The BCS may be a more useful tool for the evaluation of recovery from acidification in the presence of increasing dissolved organic carbon (DOC) than ANC does, and the BC/RCOOs helps to quantify the strength of “naturally acidic conditions”, relative to base cations, found in some Adirondack waters. Inorganic monomeric or “toxic” aluminum is directly toxic to fish and levels below 2 µM/L are desirable in summer samples. Higher “toxic aluminum” values would generally be expected in spring samples, and this was the case for Trout Pond as the average “toxic aluminum” measured 2.48 µM/L. However, it has been documented (Schofield, 1996) that brook trout fry confined at shallow depths during acidic snow melt episodes experienced high mortality rates where 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. Preliminarily, it appears that for a water to support brook trout, BCS values should be above -15 µeq/L, and the BC/RCOOs ratio should be above 1.5. However, these thresholds were calculated for use with summer samples and it is not surprising that the thresholds were exceeded in many of these spring samples. Silica and sodium levels, which can be indicative of groundwater influence were also measured.

These measurements may allow us to better understand the relationship between the “spring snowmelt” and summer sample values and to help illuminate the relationships between the spring pulse of acidity and brook trout survival.

Literature Cited:

Rascher, C.M., C.T. Driscoll, and N.E. Peters 1987. Concentration and flux of solutes from snow and forest floor during snowmelt in the West_Central Adirondack region of New York. Biogeochemistry. 3:209-224

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: 3223-337.