

Heart Lake Snowmelt Water Chemistry (Survey: 519100)

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Heart Lake (C-P264) is a private water, owned by the Adirondack Mountain Club. While the pond is on private land, this water is easily accessed and there is a wealth of chemistry information as Heart Lake was part of the Long Term Monitoring (LTM) project for the Adirondack Lakes Survey Corporation (ALSC).

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 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 ALSC to collect weekly chemistry samples on 5 waters, including Heart Lake, analyzing selected chemical metrics.

Table 1. Selected water chemistry variables, snowmelt sampling Heart Lake, 2019.

	Air Equilibrated pH	Acid Neutralizing Capacity	Inorganic Monomeri c "toxic" Aluminum	Base Cation Surplus	BC/RCOOs-	Conductivity (umhos/cm)	Silica mg L ⁻¹	Sodium mg L ⁻¹
Date	(pH units)	(μeq/L)	(μM/L)	(μeq/L)				
3/12/19	6.88	54.1	0.19	60.8	11.8	14.7	3.9	0.63
3/26/19	6.82	43.7	-0.07	43.4	10.9	13.3	3.1	0.57
4/10/19	6.84	48.5	0.33	47.6	9.5	13.1	3.2	0.55
4/24/19	6.84	43.3	0.00	54.7	9.5	12.6	2.4	0.57
5/6/19	6.83	46.7	-0.15	54.1	10.3	12.4	2.4	0.56
5/22/19	6.82	46.1	-0.11	50.9	9.1	11.8	2.6	0.57

Heart Lake was chosen as a high pH, likely NSA brook trout water in which acidity has not been an issue, with an abundance of available chemistry information. Silica and sodium values which can be indicative of groundwater influence were also collected, and were, as one might expect, quite high in this NSA water.

The values for pH and ANC (acid neutralizing capacity) were relatively high throughout the snowmelt period here. Additional chemical metrics, 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 $2 \mu\text{M L}^{-1}$ are desirable in summer samples. Higher “toxic aluminum” values would generally be expected in spring samples, but these values remained exceptionally low throughout the spring period in Heart Lake. Preliminarily, it appears that for a water to support brook trout, BCS values should be above 15 $\mu\text{eq/L}$, 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 for brook trout survival were easily met in Heart Lake even in spring samples.

These measurements may allow us to better understand the relationship between the “spring snowmelt” and summer sample values in a variety of Adirondack waters 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