

Some Findings from Recent Six Ponds Water Quality Testing

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During the late summer of 2020 water samples were collected from six ponds (Long, Little Long, Bloody, Round, Gallows, and Halfway Ponds) in south Plymouth. Water samples from all six ponds analyzed by the SMAST laboratory of the University of Massachusetts Dartmouth. These analyses were part of an on-going testing regime conducted in a collaboration between the Town of Plymouth Department of Marine and Environmental Affairs and the SMAST program at UMass Dartmouth.

In addition, water samples from Bloody, Little Long, and Long ponds were analyzed specifically for levels of soluble salt components by Envirotech Laboratories, a state and federally certified testing laboratory in Sandwich, MA. The purpose of this latter sampling and testing was to provide a temporal comparison of levels of soluble salts in these three ponds.

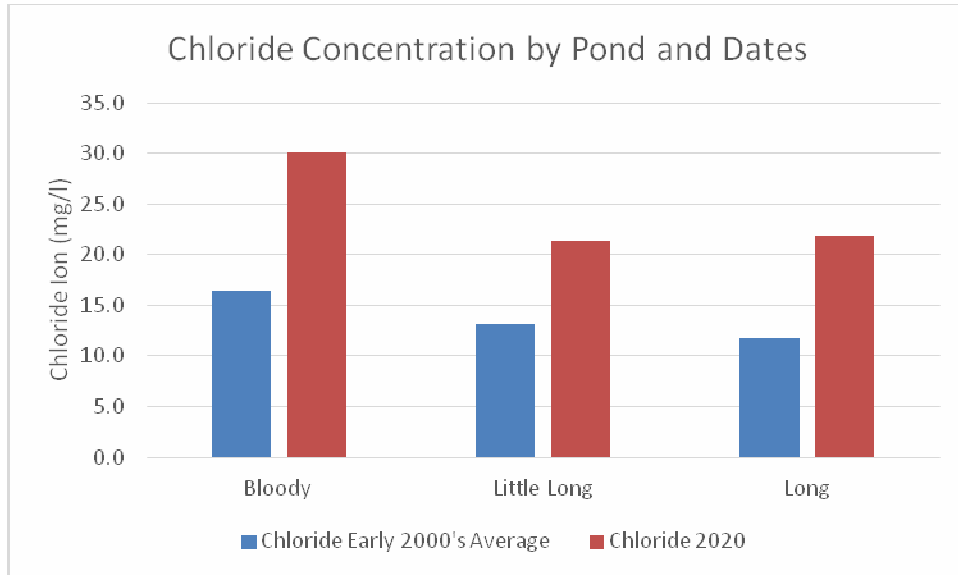
During the early 2000's extensive annual testing of the Six Ponds waters was conducted by the Six Ponds Improvement Association. Data from 2002 to 2006 had shown these three ponds to be higher in several salt ions than any of the other three ponds. The recent testing for dissolved salts conducted during September 2020 included the ions sodium (Na+), potassium (K+), calcium (Ca++), and chloride (Cl-). These ions were also included in the tests conducted annually from 2002 to 2006 on the same ponds. The results of the years 2002 to 2006 were averaged for the purposes of the comparisons in Table 1.

Table 1 – Results of Prior Tests Compared to 2020 Tests for Salt Ions in Long, Little Long, and Bloody Ponds

Pond	Chloride (Cl-)	Sodium (Na+)	Potassium (K+)	Calcium (Ca++)
	mg/l	mg/l	mg/l	mg/l
Averages 2002 to 2006				
Bloody	16.4	10.2	0.9	1.6
Little Long	13.2	8.7	0.7	1.9
Long	11.7	7.7	0.6	1.7
2020				
Bloody	30.1	16	0.9	2.2
Little Long	21.4	12	0.8	2.5
Long	21.9	12	0.7	2.4
% Change in Concentration between early 2000's and 2020				
Bloody	83%	57%	1%	40%
Little Long	63%	38%	21%	34%
Long	87%	57%	13%	45%

In all cases the concentrations of salt ions increased from the early 2000's to the sampling done in 2020 and the most notable increases were in the chloride ion concentrations, followed by the sodium, calcium, and potassium ion concentrations. While it is not uncommon to find metal ions (sodium,

potassium, and calcium) in groundwaters, as these are natural components of many minerals found in igneous rocks common to the post-glacial terrains of the Plymouth area, it should be noted that chloride and sodium constitute road salt. The finding of significantly increased chloride and sodium ions in all three ponds over time is indicative of a non-local source of these salt ions. In particular, the largest contributor to chloride concentration in northern ground and pond waters is road salt (i.e., sodium chloride). The following chart presents the clear increases over about fifteen years of the chloride ion concentration in the three ponds.



Bloody Pond is situated between Massachusetts Route 3 and Long Pond Road. The latter roadway is a one of two major highways between the Boston metropolitan area and Cape Cod and one of the most heavily traveled roadways in Massachusetts. Long Pond Road is a major local arterial roadway. In the Six Ponds neighborhood Long Pond Road is approximately coincident with the boundary between the South Coastal subbasin and the Buzzards Bay subbasin, both watersheds covering a large part of the Plymouth-Carver aquifer. Little Long and Long Ponds lie to the west of Long Pond Road and are both part of the Buzzards Bay watershed and Bloody Pond is entirely within the South Coastal watershed. Both roadways, Route 3 and Long Pond Road are heavily salted during snowfall events winter months as part of the snow removal program as are Oar and Line Road and Clark Road to the west of Long Pond Road. These chloride and sodium ion concentrations affect the condition of these ponds, and because the ponds offer a window into the underlying aquifer, the concentration of road salt ions would reasonably be thought to be increasing in the aquifer.

The Plymouth-Carver aquifer has been designated a sole source aquifer by the Environmental Protection Agency (EPA). This means it is the sole source of drinking water for the area residents. As the water quality decreases in the ponds, so does the water quality in the aquifer.

Over the coming decades the water quality will continue to be tested on a regular basis. If the salt concentrations continue to increase, either salt application to the roadways will need to be decreased or banned or the water quality will be impaired further.