Water Quality Testing Report, 2020

Very Brief Summary;

The pond is in good shape. Phosphorus levels were low in the upper and middle levels of the pond in 2020, better than in 2019. Due to the drought, the bottom layer of the pond at the deep spot was starved for oxygen, resulting in higher phosphorus levels, and greater acidity, all detrimental for aquatic life. But things are expected to revert to normal if weather returns to the normal range. Overall, the pond's condition has been stable on average over the years, with some year-to-year variation.

Major Potential Threats to Water Quality

The Bearcamp Pond Association participates in the Volunteer Lake Assessment Program (VLAP) of New Hampshire's Department of Environmental Services (DES). The purpose of VLAP is to monitor water quality trends in NH lakes, ponds, and streams across the state and over time to help identify sources of pollution that are degrading our waterways and identify remediation steps to halt or reverse the degradation.

The main long term threat to our lakes and ponds is the process of eutrophication, caused by excess nutrients, especially phosphorus, that lead to excessive growth of algae and rooted plants. Algae growth reduces water clarity and ultimately can make it murky. It also reduces dissolved oxygen in the water needed by fish. Excess phosphorus also contributes to the growth of cyanobacteria, formally known as blue-green algae due to its appearance. While normally harmless, cyanobacteria can "bloom" into an unsightly, smelly mess that can be toxic to humans and wildlife. The main sources of current phosphorus pollution are from fertilizer and animal (including human) waste which reaches waterways due to inadequate septic and sewage treatment systems, erosion, and storm run-off.

Another potential threat to our lakes is acid rain due to emissions of sulfur dioxide and nitrogen compounds by the burning of coal and other fossil fuels in power plants and motor vehicle engines. Fortunately, the acid rain problem has become less severe in the U.S. in recent years due to less burning of coal, but the problem still persists. If our lakes become too

acidic it is harmful to many forms of aquatic wildlife.

A third long-term threat is the prospect of excessive salinity due to the use of road salt, which eventually leaches into our streams and lakes. Salinity can kill native plant and animal species, disturbing ecosystems and leading to more rapid eutrophication and opening ecological niches for undesirable invasive species. Although salinity is not an immediate threat to most of our waterways, there is the potential of a gradual increase over the years which would be difficult to reverse, especially if increased use of road salt and increased development near lakes results in greater run-off into our lakes.

Summary of changes from 2019 to 2020:

2020 was an unusual year due to drought conditions in the spring and summer. This had both positive and negative effects. On the good side, fewer nutrients and dissolved organic matter than usual were flushed from surrounding areas into the pond, causing water clarity to increase, phosphorus levels to decrease, and water color to be cut in half in the upper and middle levels of the pond. But the lack of water flowing through the pond also caused more nutrients to sink to the bottom and resulted in less mixing of the pond's layers than usual. This caused the bottom layer of the pond to have higher phosphorus levels, lower dissolved oxygen, and greater acidity, all detrimental to aquatic life. If rainfall returns to normal levels, we are likely to revert back to more normal pond conditions.

Detailed Reporting:

In order to assess the above risks, DES, with our assistance, makes the following measurements:

Phosphorus: Using the NH Public Health Laboratories, DES measures the level of phosphorus, the nutrient which is the biggest threat to water quality, from water samples that we gather from 6 places:

(1) (pre-inlet) in the Bearcamp River which feeds the pond where is passes under the bridge on Middle Road
(2) (inlet) further downstream where the Bearcamp River becomes the inlet

to the pond, at the bend of the inlet near Mary Hillsgrove's house
(3, 4, and 5) from the upper, middle, and lower levels of the pond at the deepest spot in the pond, and
(6) (outlet) in the outlet of the pond, the continuation of the Bearcamp River below the dam on the Bryant's property on Bearcamp Pond Road.

2020 results:

Phosphorus levels in the upper and middle levels of the pond and the outlet were low in 2020. Inlet phosphorus level was slightly elevated in August, but because of low water flow, that still means that less phosphorus was entering the pond. Phosphorus in the bottom layer of the pond was elevated in August, probably due to the release of phosphorus in bottom sediments due to usually low dissolved oxygen.

Chlorophyll-A: VLAP measures the amount of chlorophyll-A, an indication of algae levels in the pond, in an "integrated sample" we collect, which consists of a column of water from the middle level of the pond to the surface. Chlorophyll-A was low in July and slightly elevated in August, following the normal seasonal pattern.

Apparent color: VLAP measures the apparent color of the lake's upper level, which can be influenced by decaying organic matter or metals in the soil, and is often associated with eutrophic waters. In 2020 the apparent color was lightly tea-colored, much lighter than in 2019.

Transparency: We measure transparency by lowering a disk with contrasting colors into the water at the deep spot of the lake until it no longer can be seen. Transparency is reduced by algae, color, and particulate matter in the water. Transparency was average in July and better than average in August, both far better than in 2019.

Turbidity: Turbidity is the degree to which water loses its transparency due to suspended particulars such as clay, silt, and algae. Turbidity levels were low in all 5 of the water samples we collected (pre-inlet, inlet, outlet, and the upper and middle level samples at the deep spot). Turbidity in the bottom level was slightly elevated, probably due to increased formation of organic compounds due to low dissolved oxygen.

pH: The level of acidity in the pond is measured by its pH. The pre-inlet and upper level pH levels were in the desirable range. Inlet and outlet pH were slightly lower than desirable, this year was in the desirable range with little change from last year. The upper level of the lake was at the lower end of the desirable range, slightly worse than last year, and the outlet pH was also borderline, similar to last year. The main concern is that the middle and lower levels of the pond were slightly acidic and potentially critical for aquatic life.

Chloride/Conductivity: These are measures of salinity. The pond continues to have very low chloride levels and no problems due to salinity.

Summary: The long term trend is that the pond's condition has remained generally stable since the measurement program began, with moderate fluctuations from year to year due to changing weather conditions.

NOTE: The Volunteer Water Testing program is not for the purpose of determining whether the pond waters are safe for swimming and other recreation purposes. Testing for health purposes is done by the DES Beach Inspection Program using state collected samples. They measure E. coli concentrations only. The pond has consistently done well on these tests, showing very low risk to human health from bacterial contamination.