

Crystal Lake

2017 Water Quality Summary

Northeast Aquatic Research

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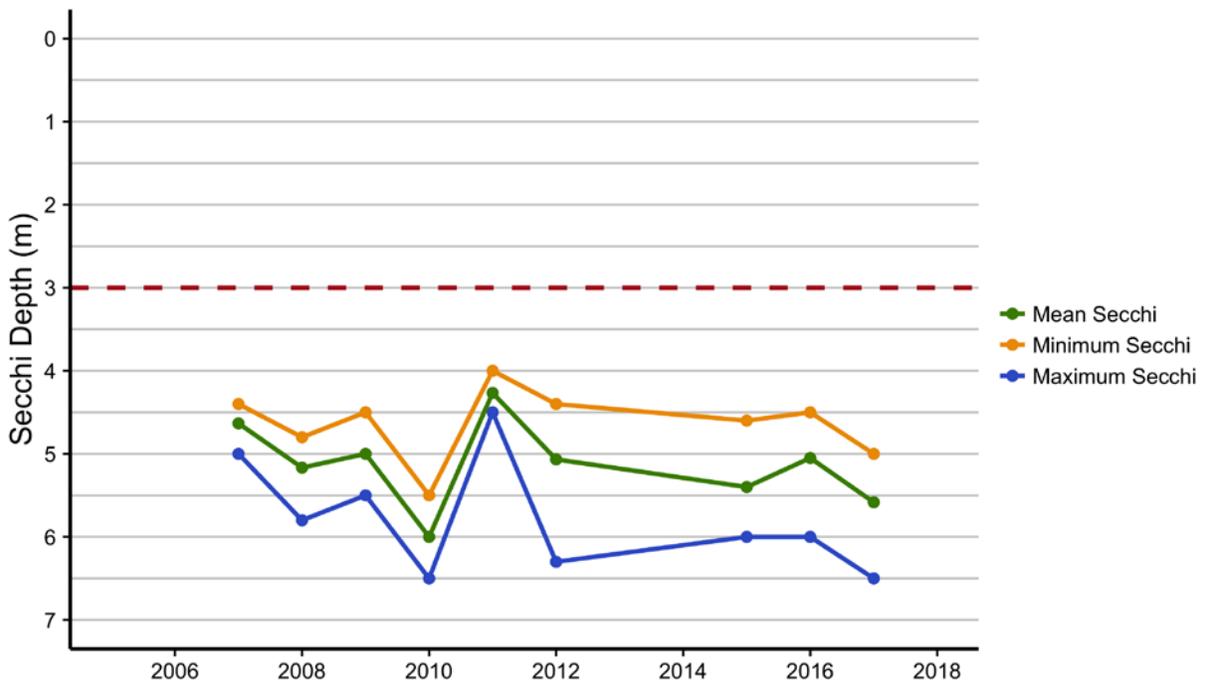
Water Clarity

The average water clarity in 2017 was better than any average clarity recorded in the lake since 2010. All Secchi disk depths recorded in 2017 were also equal to or better than the 5 meter average calculated across all previous years.

Table 1. 2017 Secchi disk depth measurements.

Date	Secchi (m)
5/17/17	6.0
6/14/17	5.5
7/19/17	5.0
8/16/17	6.5
9/13/17	5.0
10/11/17	5.5

Figure 1. Seasonal maximum, minimum, and average Secchi disk depths (m), 2006-2017.



Total Phosphorus

All total phosphorus concentrations recorded in 2017 remained at or below 10 ppb with the exception of the sample taken from the middle of the water column in October, which was 26 ppb. This high value is inexplicable based on all other values being much lower. The whole-lake average TP concentration in 2017 (7.9 ppb) was lower than the average TP concentrations recorded in any year prior (1991-2016). The average bottom water TP concentration in 2017 was also lower than any year prior.

Table 2. 2017 total phosphorus measurements.

	4/19/17	5/17/17	6/14/17	7/19/17	8/16/17	9/13/17	10/11/17
Top	8	8	10	6	1	3	8
Middle	9	7	10	10	4	1	26
Bottom	8	8	10	8	5	4	7

Figure 2. Total phosphorus concentrations at top, middle, and bottom water depths, 2017.

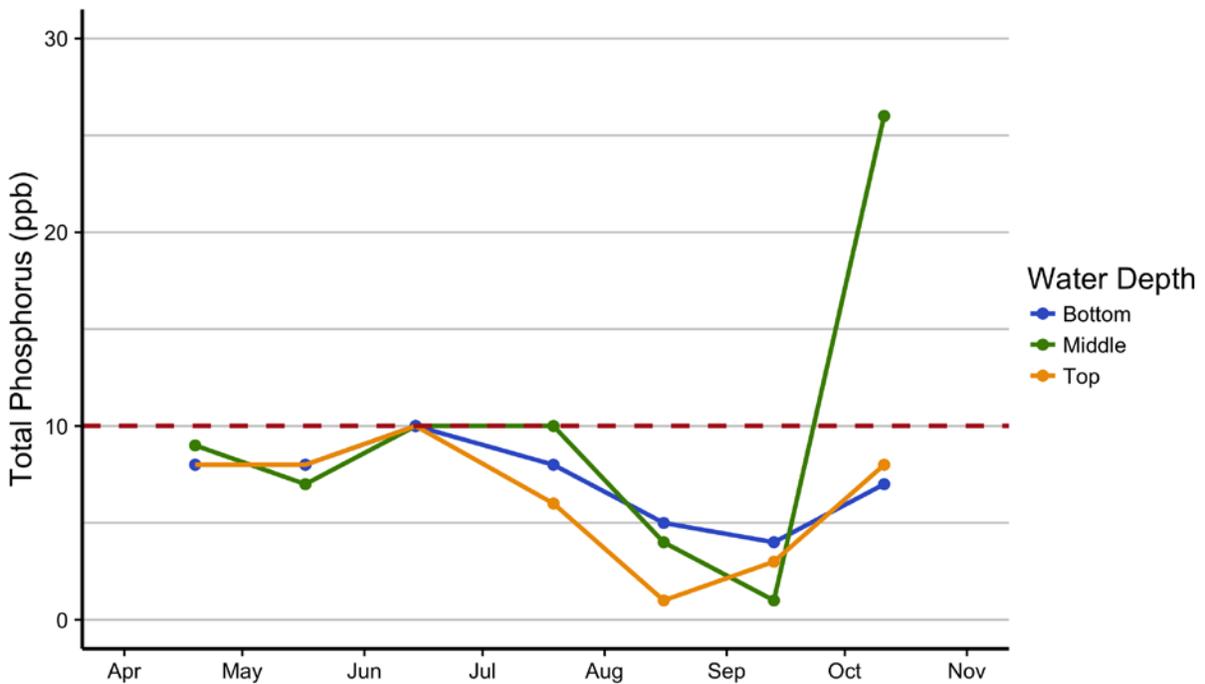
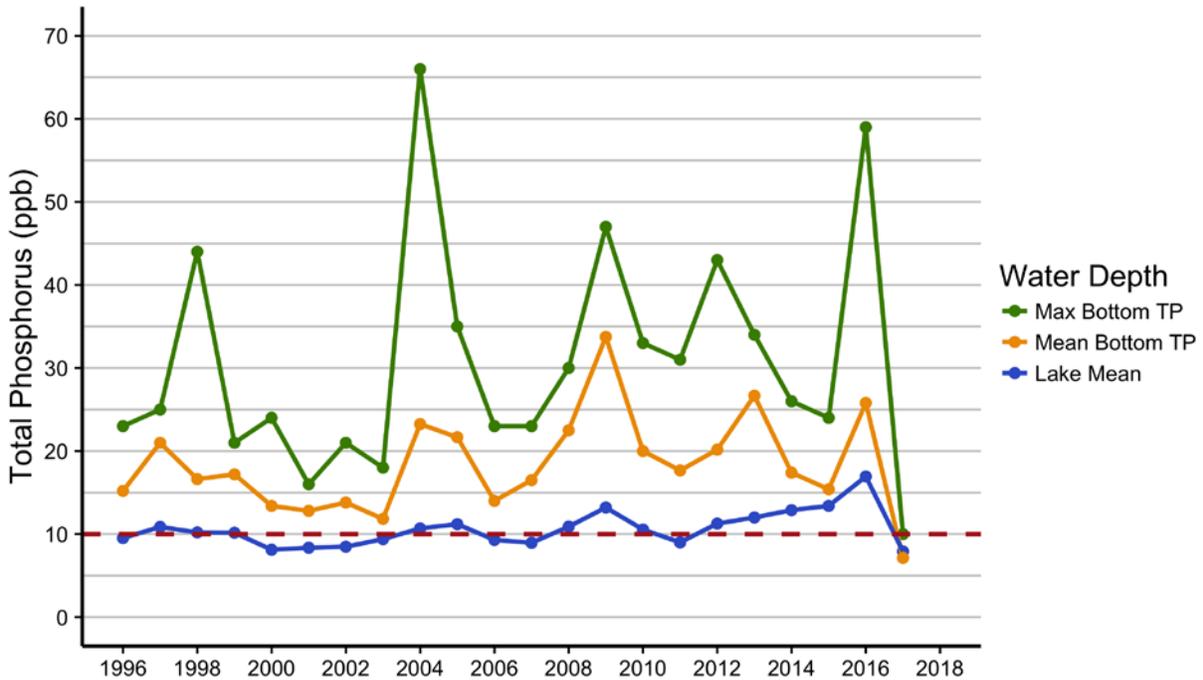


Figure 3. Lake mean, bottom mean, and bottom maximum total phosphorus concentrations, 1996-2017.



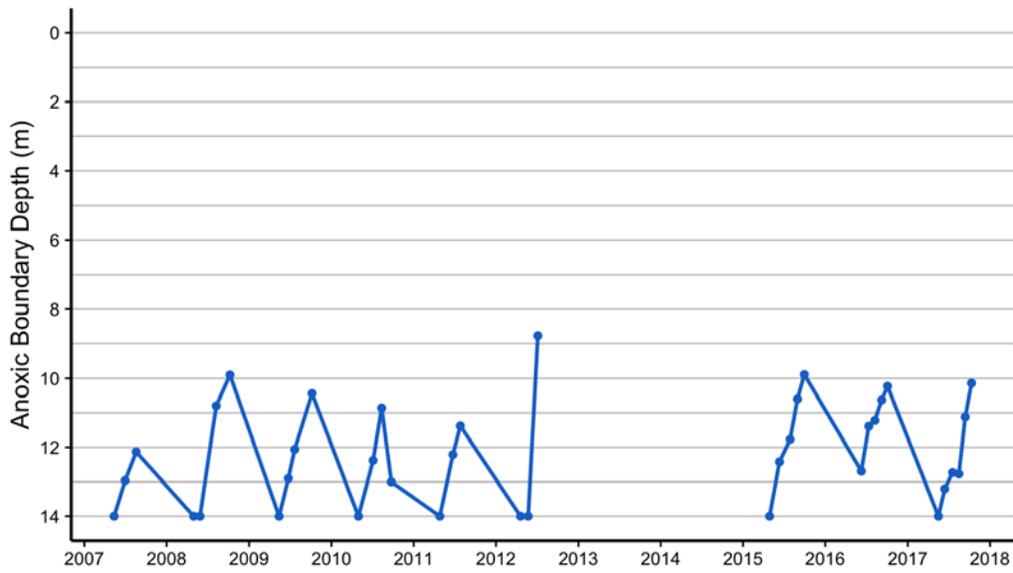
Anoxic Boundary

Water beneath the anoxic boundary has less than 1 mg/L of dissolved oxygen. Water that is anoxic (devoid of oxygen) is not suitable for fish or other aerobic aquatic organisms. This anoxic water can rise in the water column and be a cause for concern. In 2017, the maximum recorded anoxic boundary was 10.14 meters from the surface, which is similar to the maximum anoxic boundaries recorded in recent years. Ideally, monthly sampling should begin while the bottom waters are still oxygenated and continue until oxygen returns to the bottom waters in the late fall. This helps to determine the length of anoxia and ensure that oxygen is present in the bottom waters during the winter months.

Table 3. Anoxic boundary locations in 2017.

Date	Anoxic Boundary (m)
5/17/17	14.0
6/14/17	13.2
7/19/17	12.73
8/16/17	12.77
9/13/17	11.12
10/11/17	10.14

Figure 4. Anoxic boundary record, 2007-2017.

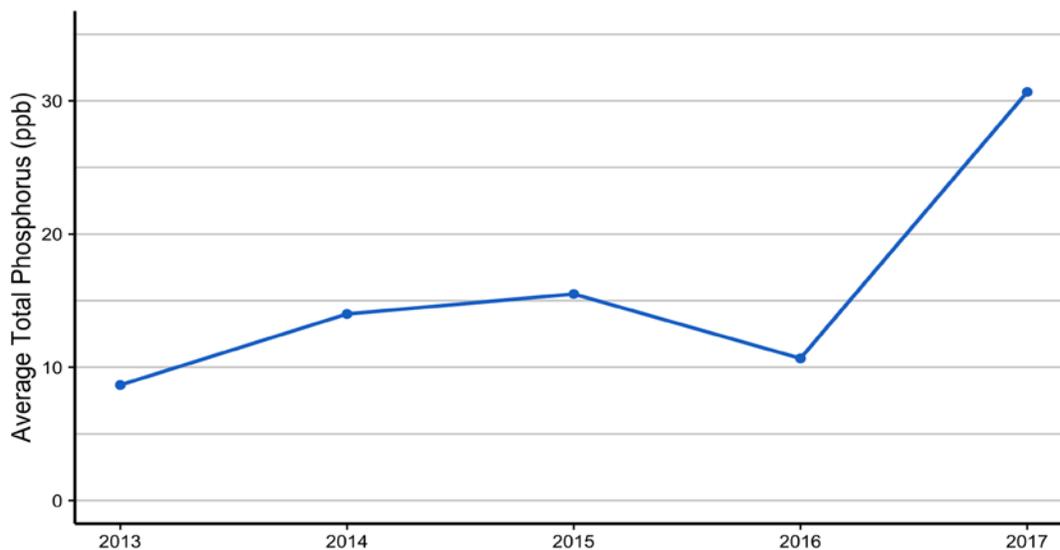


Aborn Brook Nutrients

Total Phosphorus

The yearly average total phosphorus concentrations in Aborn Brook from 2013 through 2016 were low, ranging from 11 ppb to 16 ppb. In 2017, TP in April and July were similar to concentrations seen in the previous four years, with values of 10 ppb and 19 ppb respectively. However, TP in October was 63 ppb, much higher than any TP concentration recorded in the previous four years of sampling. Continued monitoring of Aborn Brook is necessary to determine whether high TP concentrations are an ongoing issue.

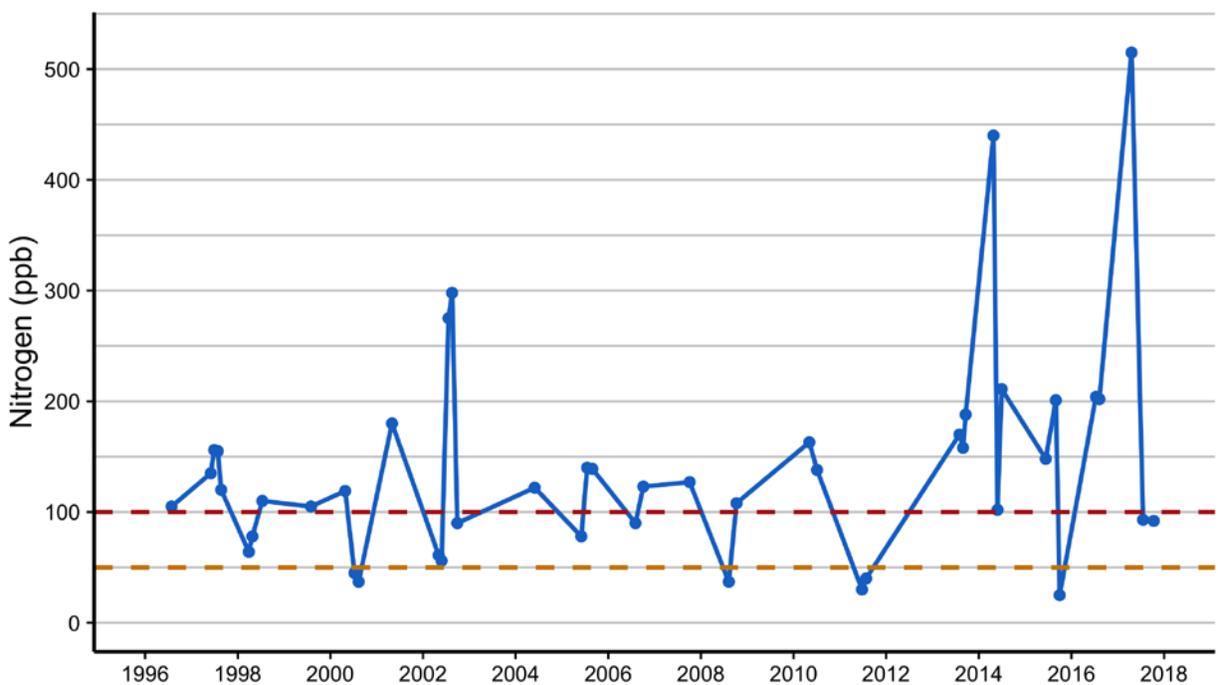
Figure 4. Aborn Brook total phosphorus (ppb) record – annual means.



Nitrate-Nitrogen

Aborn Brook had relatively high Nitrate (NO_x) concentrations in 2017, all samples exceeding the 50 ppb threshold of concern. The July and October samples remained just below the 100 ppb cap used to denote watershed nitrogen loading. However, the April sample of 515 ppb is the highest concentration of NO_x recorded in Aborn Brook since sampling began in 1996. It is possible that this high concentration is a result of contamination in the sample. Continued regular monitoring of the brook will help determine whether high NO_x concentrations are an ongoing issue. Elevated NO_x levels may be indicative of human or animal waste, such as fertilizers or failing septic systems. NO_x nitrogen is readily available for plants and algae to use for growth, so elevated NO_x levels could lead to increased plant and algae growth in the lake.

Figure 5. Aborn Brook nitrate (NO_x) record (ppb).



Recommendations for 2018

- Lake data in 2017 was mostly all excellent indicating that Crystal Lake had water quality equal to or better than most prior years.
- Aborn Brook nitrate appears to be increasing with the last few years showing high runoff values.
- Monitoring protocol appears adequate at this time with two exceptions:
 - Dissolved oxygen profiles should be collected through to the end of season as marked by fully replenished oxygen to the bottom. Last profile of the season has traditionally shown half the water column to be still anoxic.
 - Aborn Brook is showing elevated phosphorus and nitrate levels which should be further investigated, either by more frequent sampling during the year or upstream sampling on same occasions that the brook is sampled at the lake.