

Investigation of Northwood Lake's Water Quality Data and Increasing Cyanobacteria Blooms



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Background

Northwood Lake

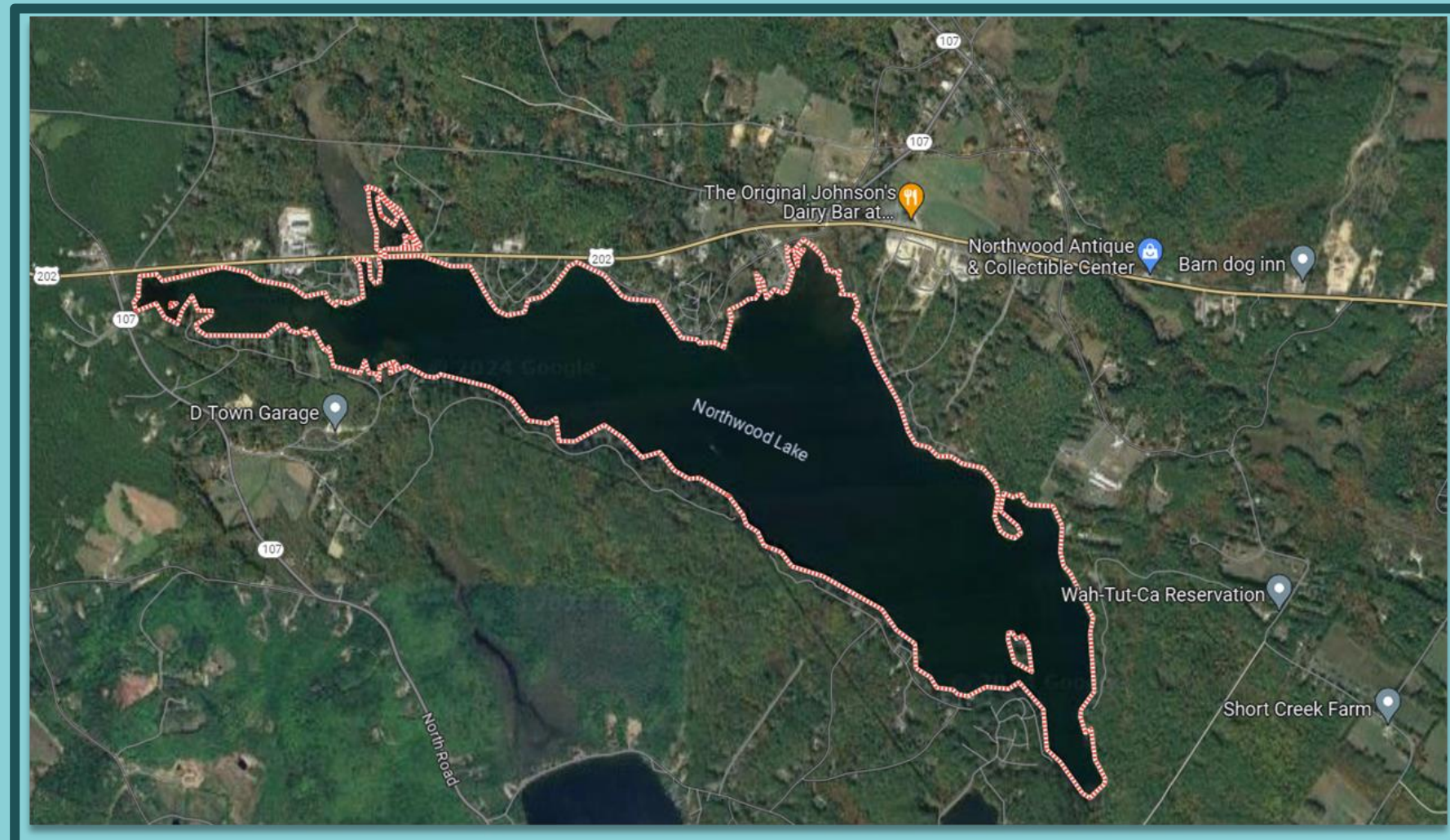


Figure 1: Satellite image of Northwood Lake

Northwood Lake is located in Rockingham and Merrimack County. The lake is a man-made, mesotrophic, 653-acre lake. Its average depth is 12ft with a max depth of 20ft. There are 4.8 miles of road frontage out of 8.12 miles of shoreline.

Watershed

- 23.29 square miles Fig 2¹
- 69.52 % forested¹
- 8.06 % developed¹
- 16.42 % wetland and grassland¹
- 6 % farmland¹
- Septic Systems¹

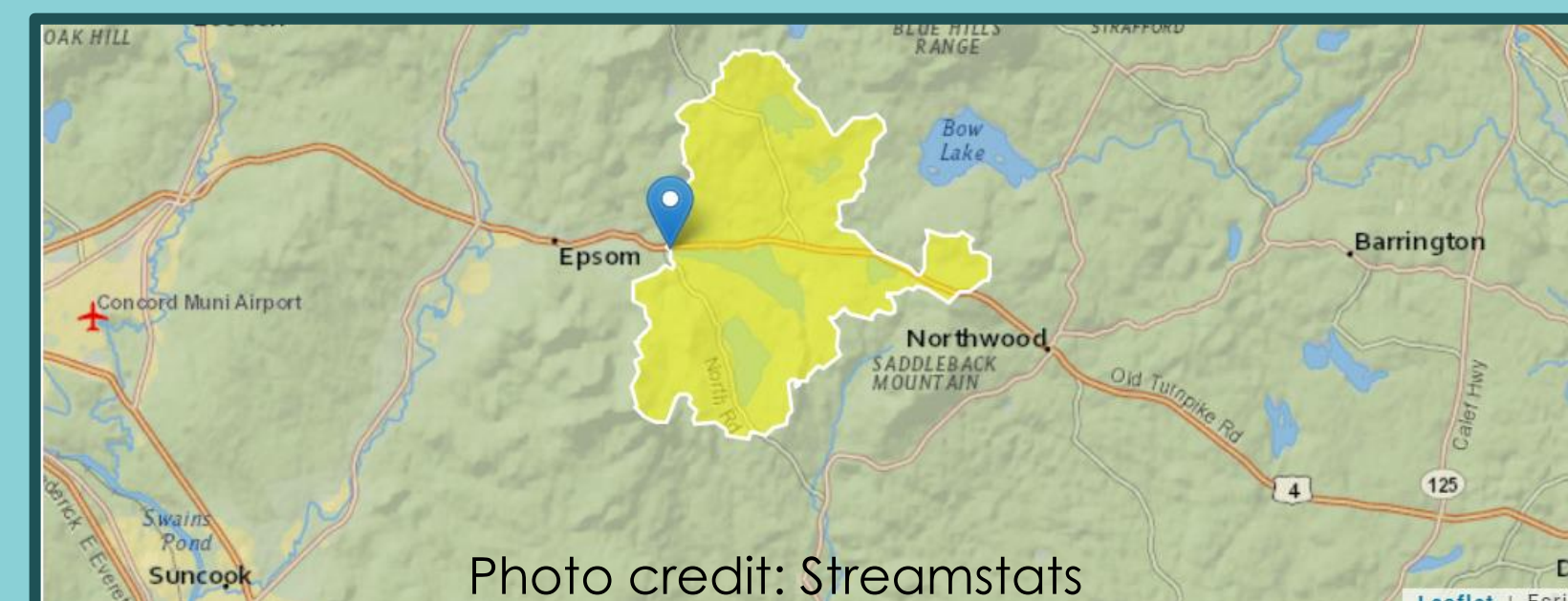


Figure 2: Watershed map of Northwood Lake

Cyanobacteria



Photo credit: NLWA

Northwood Lake has seen an increase in cyanobacteria since 2021. Some cyanobacteria can release cyanotoxins, which can be harmful to people and animals². Cyanobacteria blooms can last 1-100+ days³. They thrive in nutrient-rich, stagnant, warm water³. Figure 3 shows a bloom located on Northwood Lake.

Figure 3: Cyanobacteria bloom on Northwood Lake

Phosphorus and Chloride

Phosphorus is a limiting nutrient in NH lakes⁴. Aquatic plants and algae depend on it to grow⁴. However, having too much phosphorus can lead to eutrophication⁴. High chloride levels (>230mg/L) can lead to the death of planktonic crustaceans which consumes algae which results in an increase in the growth and population of cyanobacteria⁵

Data Analysis and Discussion

Phosphorus

Phosphorus levels have increased from 0.005 mg/L to 0.893 mg/L (fig 4,5), this increase is primarily driven by the Horse Farm location (fig 5), with concentrations ranging from 0.009 mg/L to 0.893 mg/L. NHDES has set the limit for phosphorus in a mesotrophic lake to be 0.012 mg/L, represented by the red line in (fig 4 and 5). The average in Northwood Lake is 0.024 mg/L⁴. Levels over the limit can lead to increased plant and algae growth including cyanobacteria⁴. A study done on Lake Okeechobee determined that there is a maximum risk of a bloom when levels exceed 0.06 mg/L⁷ In ten years the predicted level will rise to 0.029 mg/L this prediction is achieved by using the slope of the two graphs combined.

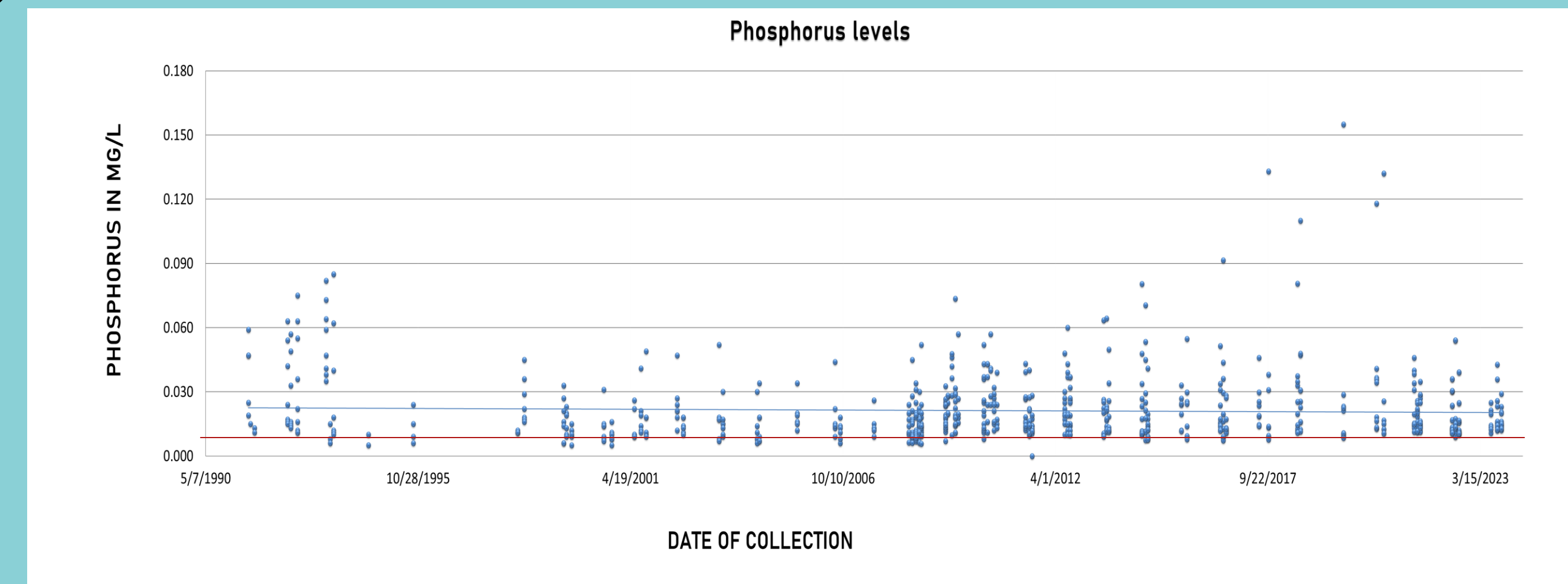


Figure 4: Phosphorus for Northwood Lake excluding Horse Farm

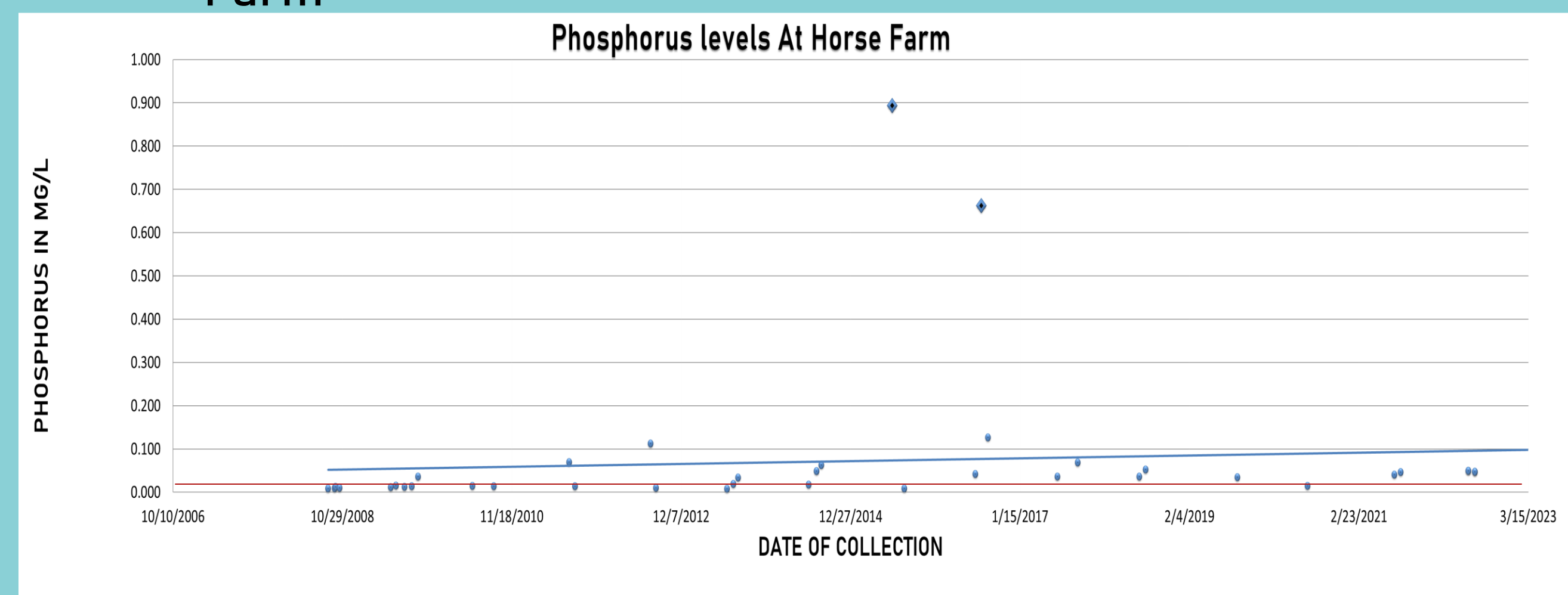


Figure 5: Horse Farm data for phosphorus on Northwood Lake

Chloride

Chloride levels range from 3 mg/L to 110 mg/L (Figures 6 and 7) with some locations decreasing including Flat Meadow Brook Inlet (Fig 7). NHDES has set the limit for chloride at 230 mg/L, and if chronically kept at or above can lead to fish and plant death⁴. Northwood Lake is projected to hit this limit in 70 to 80 years. Flat Meadow Brook could be seeing a reduction in chloride levels (8mg/L) due to there being a marsh further up the brook. A marsh can help with water quality⁶, this is because they help to remove pollutants like chloride and phosphorus⁶. They can do this by sediment trapping, nutrient removal, and chemical detoxification⁶. As much as 90% of sediments that are present in runoff may be removed when that runoff passes through a wetland⁶.

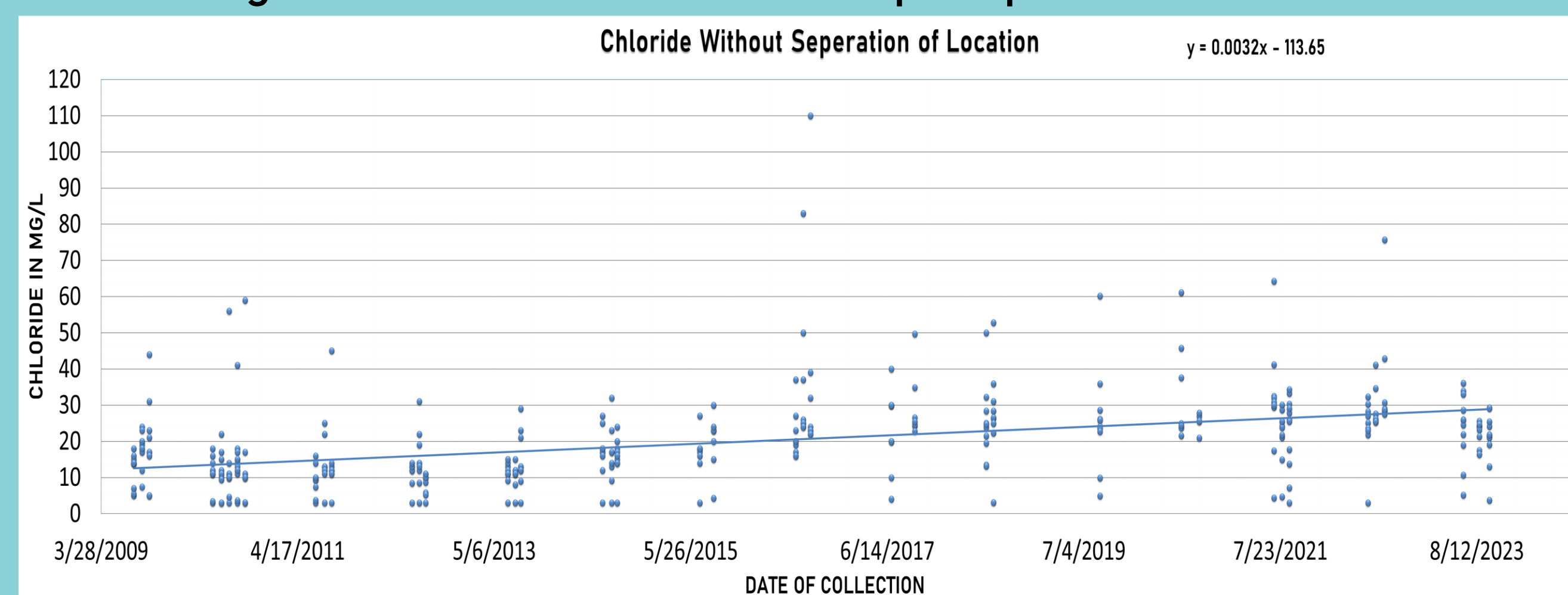


Figure 6: Chloride levels for the whole of Northwood Lake

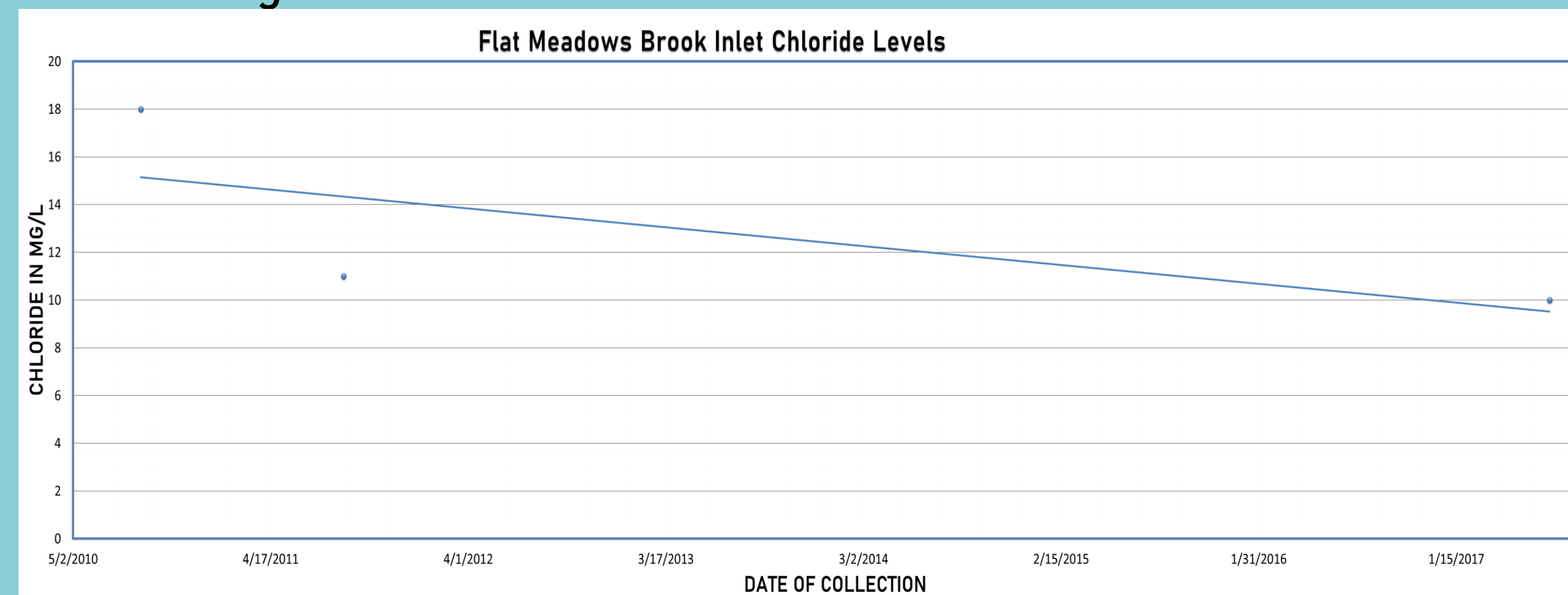


Figure 7: Chloride data for Flat Meadow Brook on Northwood Lake

Conclusion

Northwood Lake is a 653-acre mesotrophic Lake. Phosphorus is a limiting nutrient in NH lakes and can lead to an increase in plant and algae growth. Chloride contamination can lead to the death of planktonic crustations which consume cyanobacteria and other algae which results in an increase in blooms. Cyanobacteria is known to increase in concentration when chloride increases⁸. The lake also has an average phosphorus that's above NHDES's limit and a chloride level that will reach NHDES's limit in the next 70 to 80 years. Cyanobacteria could be increasing due to the increase in phosphorus and chloride.

Acknowledgments

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References

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