

Beatrice Lake

DNR Lake ID: 31-0058-00
 County: Itasca
 Major Watershed: Little Fork River
 Ecoregion: Northern Lakes and Forests
 Surface Area: 113 acres
 Maximum Depth: 29 feet
 Water Quality Data: 12 years
 Secchi Data: 23 years



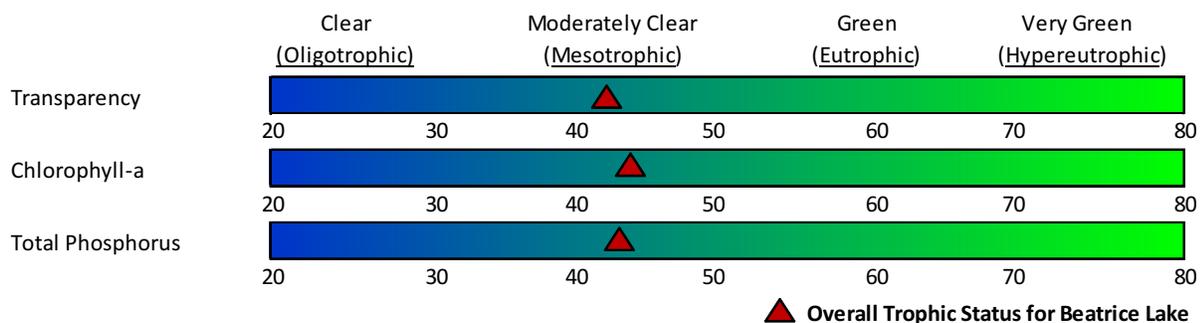
2013 Water Quality Summary

Sampling results for Beatrice Lake in 2013 were fairly close to the lake’s historical average and within expected ranges. The trophic status of Beatrice Lake is mesotrophic which is indicative of moderately clear, good quality lakes of intermediate depth, temperature and nutrient levels. Overall, Beatrice Lake water quality is good with respect to other lakes in the region, but it is clearly showing a declining trend in transparency over the past decade which is cause for concern.

Beatrice Lake Water Quality

Parameter	2013 Sampling Beatrice Lake	Historical Average Beatrice Lake	MN Northern Lakes & Forests Ecoregion
Total Phosphorus (ug/l)	17	15	14 - 27
Chlorophyll mean (ug/l)	3.8	4.0	4 - 10
Secchi Disk (feet)	11.1	11.9	8 - 15
Secchi Disk (meters)	3.4	3.6	(2.4 - 4.6)
TSI-Phosphorus	45	43	42 - 52
TSI-Chlorophyll-a	44	44	44 - 53
TSI-Secchi	42	42	38 - 47

Carlson’s Trophic Status Index (TSI)



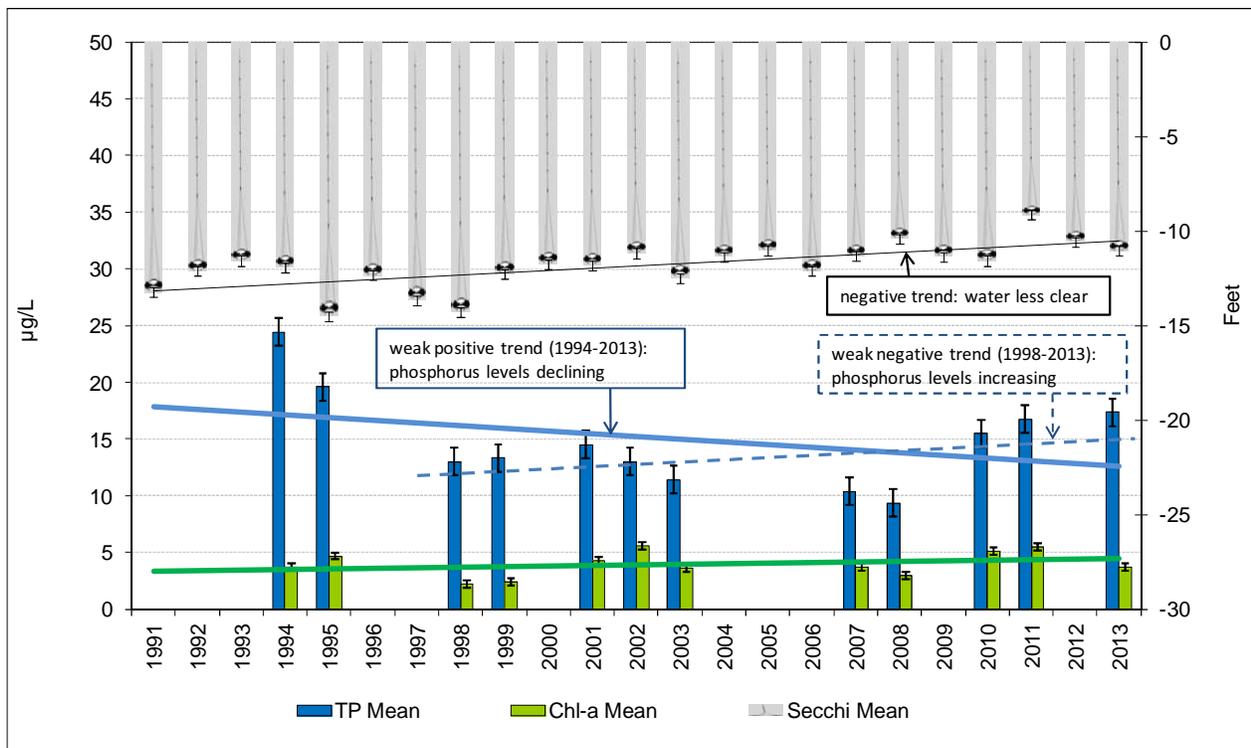
Note: Trophic State Indices (TSIs) are an attempt to provide a single quantitative index for the purpose of classifying and ranking lakes, most often from the standpoint of assessing water quality. TSIs ranges from clear lakes, low in nutrients (oligotrophic), to green lakes, with very high nutrient levels (hypereutrophic).

Historical Water Quality Summary

The 23 years of secchi data for Beatrice Lake show a “significant” negative trend since 1991. This means lake is not as clear as it has been in the past and its clarity is continuing to get worse.

MPCA reports: *The median transparency for Beatrice Lake from 1981 to 2011 decreased by 0.64 feet per decade and is evidence for a long-term negative trend. A plausible range for the long-term trend is between no trend and a decrease of 1.36 feet per decade.*

Beatrice Lake’s twelve years of historical data for total phosphorus and chlorophyll-a would suggest there has been a decrease in phosphorus and chlorophyll-a concentrations since 1994, but that is strongly influenced by the poor water quality years of 1994-95. When we look at the shorter time period (1998-2013) there is indication of an increase in phosphorus and chlorophyll-a levels but there is no definite trend (variability in data is currently inconclusive) and further monitoring is required to confirm if there is a declining trend in water quality for Beatrice Lake.



Note: For detecting trends, a minimum of 8-10 years of data with 4 or more readings per season are recommended. Minimum confidence accepted by the MPCA is 90%. This means that there is a 90% chance that the data are showing a true trend and a 10% chance that the trend is a random result of the data.

Summary

Beatrice Lake is showing a significant trend in loss of water clarity, which raises concern that the lake’s water quality is declining. Trend analysis for phosphorus and chlorophyll-a data, which have been collected more sporadically, is inconclusive at this time as to whether or not water quality is declining but there are indications that levels have been increasing since 1998. In addition to data collected on the lake, the Lake Water Quality Sensitivity Analysis Report (Reed, 2004) states that Beatrice Lake is limited in its ability to assimilate nutrients entering the lake and based on predictive modeling, development has a greater potential for impacting lake water quality in comparison to deeper lakes or those with outlets. Although it

is unclear at this time whether or not the decline in transparency is linked to development, knowing the lake's susceptibility to impacts should spur community education and awareness efforts to encourage better land management and the protection of Beatrice Lake's future.

Recommendations

Transparency monitoring at site 203 should be continued annually. It is important to continue transparency monitoring weekly or at least bimonthly every year to enable year-to-year comparisons and determine if the negative trend in clarity continues. It is also recommended that phosphorus and chlorophyll-a monitoring continue at site 203 every year to track future water quality trends and confirm whether or not the decline in water clarity is a result of increased phosphorus and/or algae levels in the lake. Land owners should be made aware of the declining trend in water clarity and worked with to reduce runoff and encouraged to have their septic systems inspected and upgraded if needed.