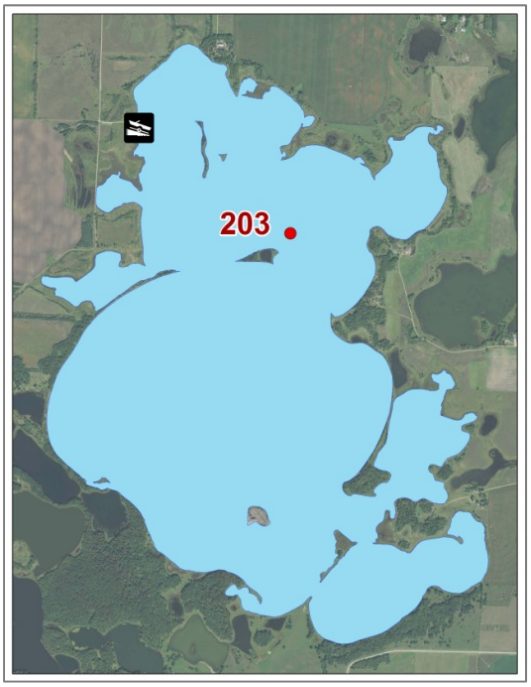
Johanna Lake

Pope County

Summary

Johanna Lake is a shallow eutrophic lake, and is on the MPCA's Impaired Waters List. Algae concentration results (chlorophyll a) show that the lake experiences algae blooms every summer. There is evidence of an improving trend in water clarity since 2007. Johanna Lake has a good amount of historical water quality monitoring data, which makes a lake evaluation like this possible. Monitoring should continue to enable future water quality analyses.



Lake Vitals

MN Lake ID:	61-0006-00
Ecoregion:	North Central Hardwood Forest
Major Watershed:	Chippewa River
Surface area (acres):	1399.25
Littoral area (acres):	1399.25
% Littoral area:	100%
Max depth:	10(ft) 3.05(m)
Aquatic Invasive Species:	None

Water Quality Characteristics

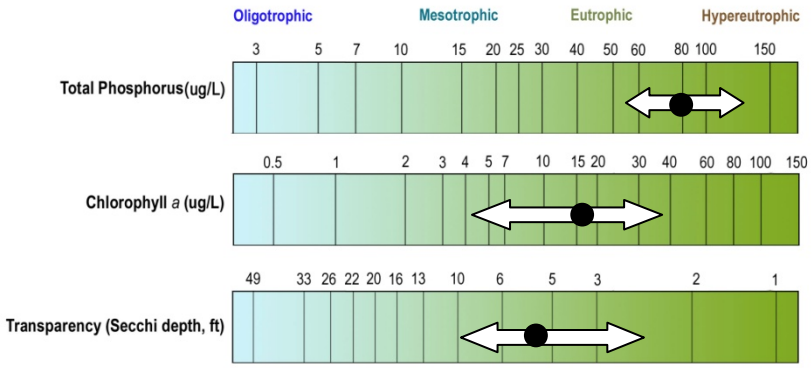
Years monitored: 2007 - 2016

Parameters	Historical	2016
Total Phosphorus Mean (ug/L):	69.0	78.5
Total Phosphorus Min (ug/L):	26	56
Total Phosphorus Max (ug/L):	312	124
Number of Observations:	56	4
Chlorophyll-a Mean (ug/L):	31.1	15.8
Chlorophyll-a Min (ug/L):	1	4.45
Chlorophyll-a Max (ug/L):	414	32
Number of Observations:	50	4
Secchi Depth Mean (ft):	5.9	5.4
Secchi Depth Min (ft):	1.5	2.6
Secchi Depth Max (ft):	12.5	10
Number of Observations:	55	4

Trophic State Index

Trophic State: Eutrophic (60)

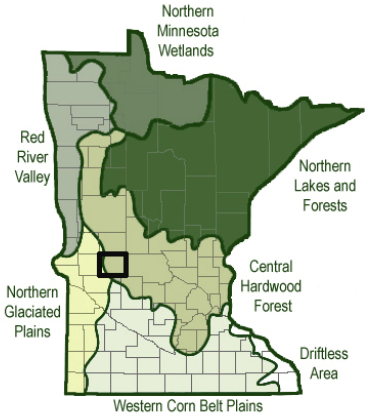
The figure below shows the minimum and maximum values with the arrows and the mean with the black dot (site 201).



Ecoregion Comparisons

(Primary site only. Comparisons are based on interquartile range, 25th - 75th percentile, for ecoregion reference lakes)

Ecoregion:	North Central Hardwood Forest
Total Phosphorus:	Above Expected Range, which means poorer than expected
Chlorophyll-a:	Above Expected Range, which means poorer than expected
Secchi Depth:	Within Expected Range



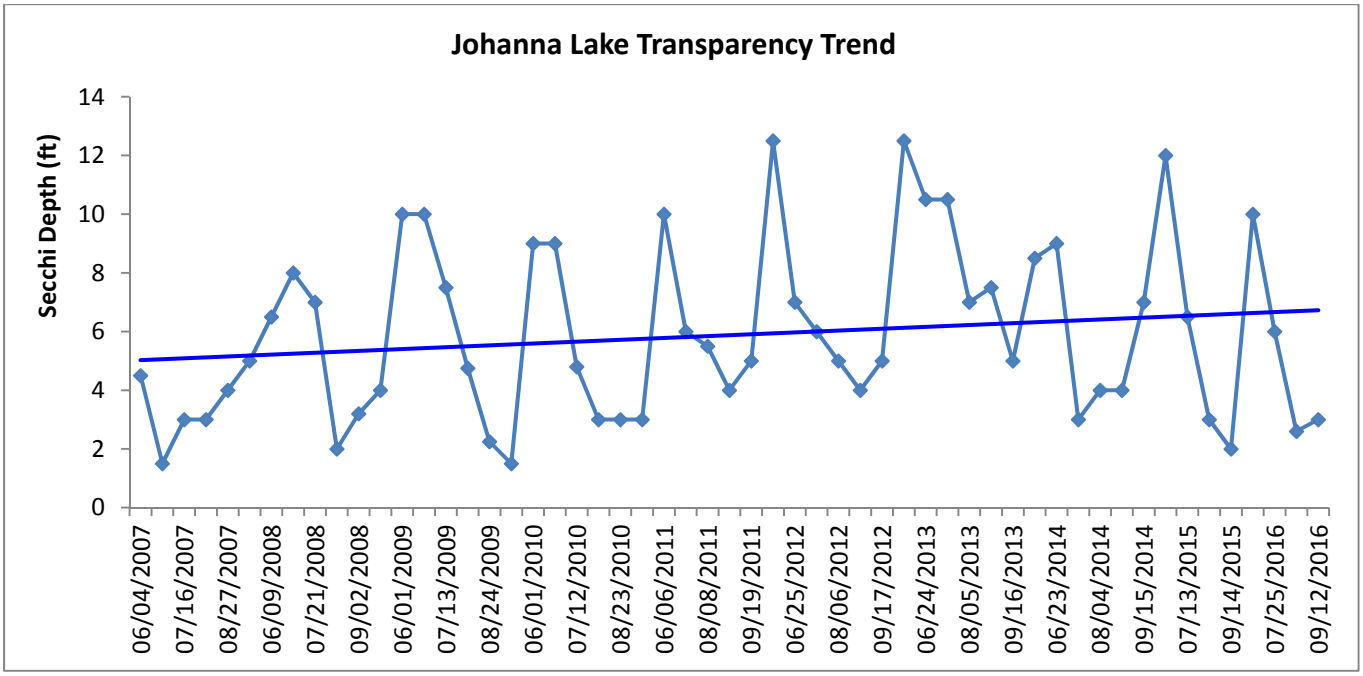
Trend Analysis Report

In assessing water quality, agencies and other lake data users want to know if the amount of algae has been changing over time. Scientists test hypotheses using statistics, and the hypothesis used in a trend analysis is that no trend exists. In other words, we begin with the assumption that there is no trend. We collect data and use statistics to determine the probability of collecting our data if this hypothesis of no trend is indeed true. The output from a statistical test is called the probability value (or p-value for short) of collecting data given the hypothesis of no trend is true. The smaller this probability value, the more likely the null hypothesis of no trend can be rejected. The MPCA has set the acceptable p-value to be less than 10%. In other words, if $p < 0.10$ we reject the hypothesis of no trend and accept that a trend likely exists. Another way to think of this is to say that there is in reality an existing trend, there is a 90% chance we would have collected the data we collected and that a 10% chance that the trend is a random result of the data. For detecting trends, a minimum of 8-10 years of data with four or more readings per season are recommended by the MPCA. Where data does not cover at least eight years or where there are only few samples within a year, trends can be misidentified because there can be different wet years and dry years, water levels, weather, and etc., that affect the water quality naturally.

Johanna Lake had enough data to perform a trend analysis for all three parameters (Table 1). The data was analyzed using the Mann Kendall Trend Analysis.

Table 1. Trend analysis for Johanna Lake.

Lake Site	Parameter	Date Range	Trend
203	Transparency	2007-2016	Improving (95%)
203	Total Phosphorus	2007-2016	No Trend
203	Chlorophyll-a	2007-2011, 2013-2016	No Trend



Johanna Lake shows evidence an improving trend in water transparency. Transparency monitoring should continue so that this trend can be tracked in future years.