

April 2019

# Sibley Lake

(46.95461 N, -99.73804 W)

## Kidder County

- Sibley Lake is a popular fishing lake in central North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/sibleykidder2011.pdf>).
- There is one public, paved boat ramp on the north side of Sibley Lake.
- The Sibley Lake watershed is about 2,800 acres of mostly grassland/pasture and agricultural land (with much of the open water being made-up by the lake itself). The most common crops grown are spring wheat, barley and oats (Table 1).
- Sibley Lake is not defined in the state's water quality standards.
- Sibley Lake is managed for walleye, with fingerlings stocked biennially. Yellow perch were also found during the last sample by the ND Game and Fish.
- There is no historical data for Sibley Lake.

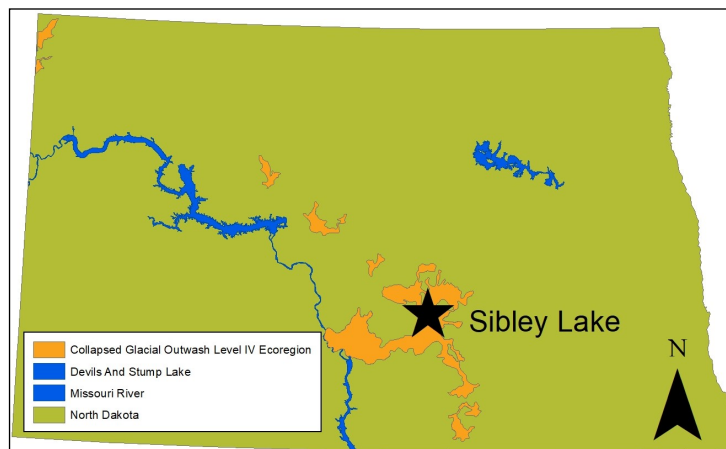


Figure 1. Location of Sibley Lake within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2015). Value listed of crop type represents percentage of total production.

Land Cover Type	% in Watershed	% within 500 meters
Open Water	42.4%	13.3%
Grassland/Pasture	34.4%	53.7%
Agriculture	17.4%	26.3%
Spring Wheat	39.0%	29.4%
Barley	12.3%	7.6%
Oats	9.6%	6.1%
Wetlands	3.1%	3.9%
Developed	2.6%	2.7%
Forest	< 0.1%	< 0.1%

## Temperature and Dissolved Oxygen

- Sibley Lake occasionally stratifies in the summer, with warm, well-oxygenated water at the top of the water column, and cold, low-oxygen water near the bottom.
- There was no thermal stratification in 2016. Temperature change in the water column was 0.78 degrees Celsius (°C), 0.83°C and 0.00°C in May, July and September, respectively.
- All samples showed most of the lake as well-oxygenated.

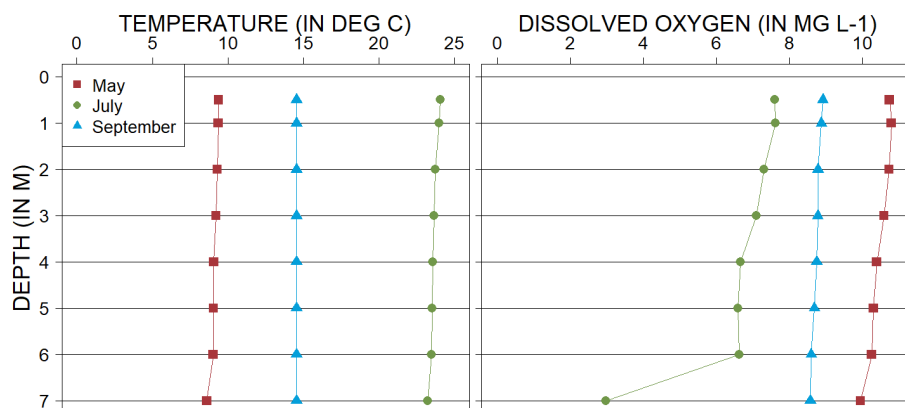


Figure 2. 2016 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ( $mg L^{-1}$ )

## Trophic State Indices

- Trophic state is a measure used by scientists to assess the condition (where lower scores indicate better water quality) of a lake using three common measures: total phosphorus (TP), Secchi disk transparency and chlorophyll-a concentration.
- Sibley Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- There is no historical trophic status for comparison.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Sibley Lake.

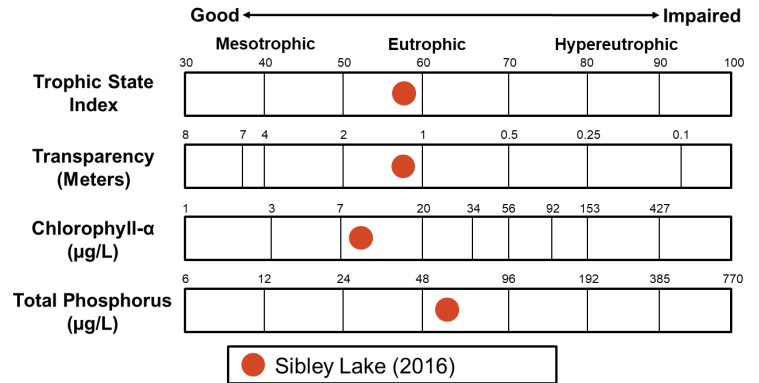


Figure 3. Trophic state indices for 2016 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) in 2016 was greater than the median for the Collapsed Glacial Outwash Level IV Ecoregion (hereafter, Glacial Outwash) where Sibley Lake is located (Figure 4).
- Median concentration of dissolved TN was similar to TN.
- Median TP concentration in 2016 was slightly less than the median for the Glacial Outwash (Figure 4).
- Median concentration of dissolved phosphorus was slightly less than TP.
- Ammonia was detected twice at Sibley Lake in 2016, with one detection of nitrate plus nitrite.

Nutrient Concentrations (in mg L<sup>-1</sup>)  
in Sibley Lake

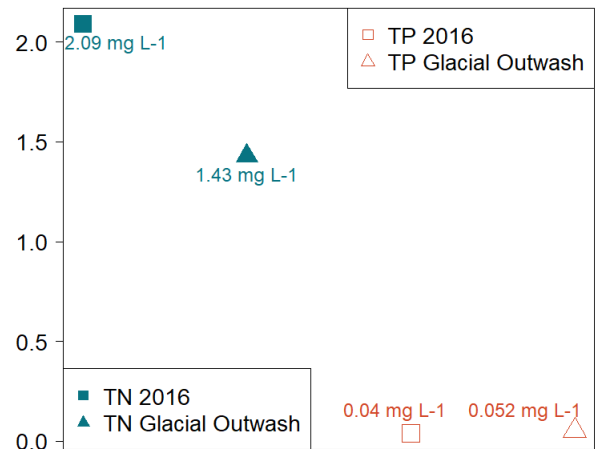


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

Table 2. Median concentrations of selected constituents for 2016 and historical samples and from all Glacial Outwash lakes.

Measure	2016 Median	Ecoregion Median
Alkalinity	733 mg L <sup>-1</sup>	466 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	742 mg L <sup>-1</sup>	464 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	12.1 mg L <sup>-1</sup>	25.3 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	77 mg L <sup>-1</sup>	58 mg L <sup>-1</sup>
Conductivity	3,070 µS cm <sup>-1</sup>	1,770 µS cm <sup>-1</sup>
Dissolved Solids	2,150 mg L <sup>-1</sup>	1,240 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	72.3 mg L <sup>-1</sup>	88 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	609 mg L <sup>-1</sup>	163 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	874 mg L <sup>-1</sup>	554 mg L <sup>-1</sup>

- Sulfate is the dominant anion in Sibley Lake (though bicarbonate is proportionally high as well), while sodium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are greater than the median for the Glacial Outwash.

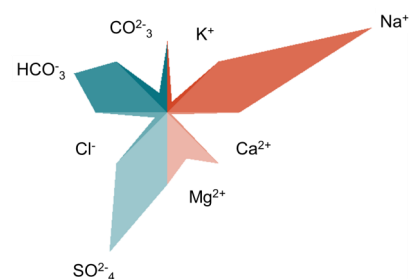


Figure 5. Maucha diagram showing ionic balance based on 2016 data