

February 2019

# Hooker Lake

(48.95975 N, -99.88955 W)

## Rolette County

- Hooker Lake is a small, natural lake in northern North Dakota (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/hooker2004.pdf>).
- Hooker Lake is accessible by one public boat ramp on the northwest side of the lake.
- The Hooker Lake watershed is only about 150 acres of mostly deciduous forest, open water, and grassland/pasture (Table 1). The most common crops are alfalfa and non-alfalfa hay (Table 1).
- Hooker Lake is a Class II fishery, which are “capable of supporting natural reproduction and growth of cool water fishes (e.g., northern pike and walleye) and associated aquatic biota.”
- The lake is primarily managed for rainbow trout, with fingerlings stocked annually. Rainbow trout was the only fish in the lake reported by the ND Game and Fish.
- Hooker Lake was previously sampled in 1995-1996.

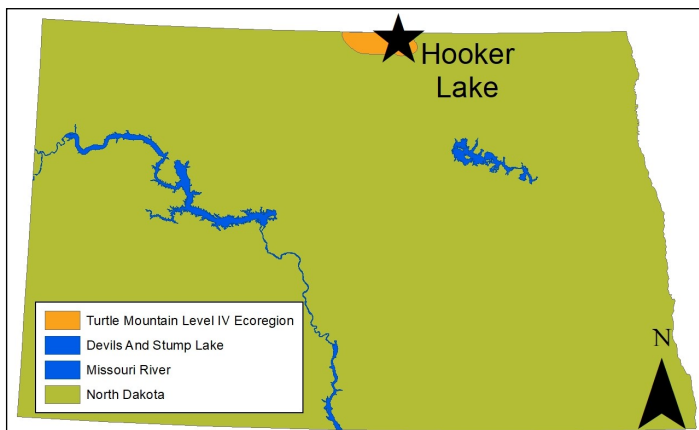


Figure 1. Location of Hooker Lake within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2014). Value listed of crop type represents percentage of total production

Land Cover Type	% in Watershed
Deciduous Forest	51.3%
Open Water	26.3%
Grassland/Pasture	16.6%
Developed	3.2%
Agriculture	2.2%
Alfalfa	56.3%
Other Hay/Non-Alfalfa	43.8%
Wetlands	0.4%

## Temperature and Dissolved Oxygen

- Hooker Lake commonly 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 thermal stratification in all samples recorded in 2015, with a temperature change of 6.07 degrees Celsius (°C), 14.58°C, 6.76°C in the May, July, and September, respectively (Figure 2).
- All samples showed low oxygen concentrations corresponding with thermal stratification.

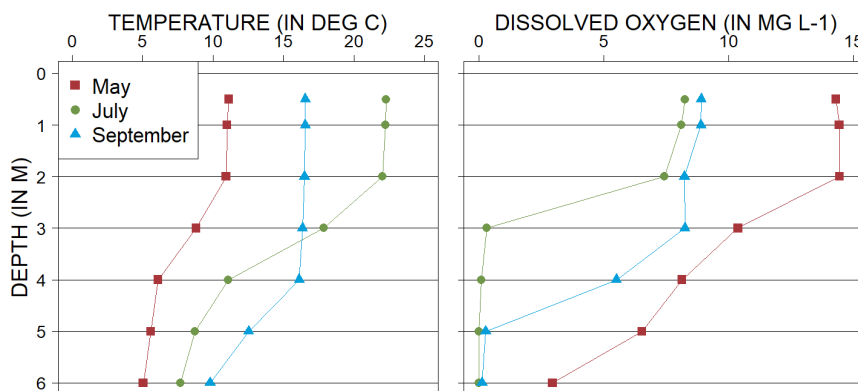


Figure 2. 2015 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L<sup>-1</sup>)

## 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.
- Hooker Lake is a eutrophic lake (Figure 3), with moderate nutrient concentrations and algal growth.
- Trophic state has decreased compared to historical indices, driven by transparency.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Hooker Lake.

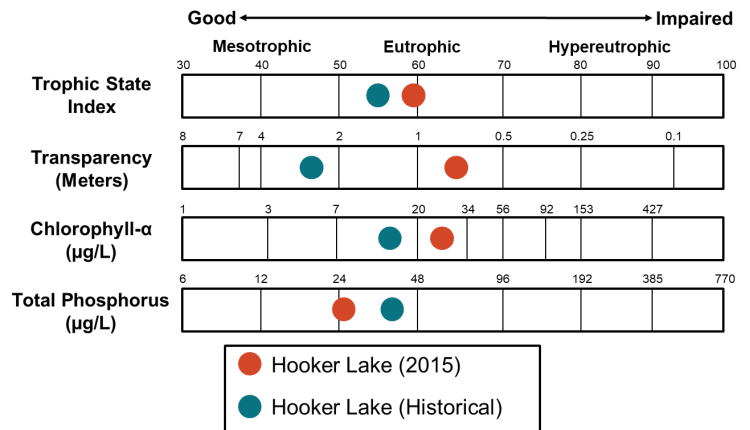


Figure 3. Trophic state indices for 2015 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) was lower in 2015 compared to the historical median and the median for the Turtle Mountains Level IV Ecoregion (Figure 1; hereafter, Turtle Mountains) where Hooker Lake is located (Figure 4).
- Median concentration of dissolved TN was slightly less than TN.
- Median TP concentration in 2015 was less than historical concentrations and the median for the Turtle Mountains (Figure 4).
- Median concentration of dissolved phosphorus was slightly less than TP.
- Ammonia and nitrate plus nitrite were rarely above detection limits in Hooker Lake during the spring sample in 2015.

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

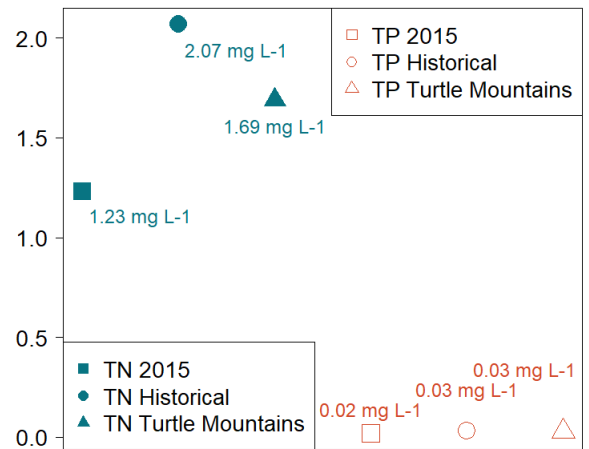


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

**Table 2.** Median concentrations of selected constituents for 2015 and historical samples and from all Turtle Mountain natural lakes.

Measure	2015 Median	Historical Median	Ecoregion Median
Alkalinity	204 mg L <sup>-1</sup>	191 mg L <sup>-1</sup>	290 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	226 mg L <sup>-1</sup>	203 mg L <sup>-1</sup>	325 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	28.4 mg L <sup>-1</sup>	21.1 mg L <sup>-1</sup>	32.4 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	11 mg L <sup>-1</sup>	15 mg L <sup>-1</sup>	12 mg L <sup>-1</sup>
Conductivity	390 µS cm <sup>-1</sup>	389 µS cm <sup>-1</sup>	685 µS cm <sup>-1</sup>
Dissolved Solids	215 mg L <sup>-1</sup>	193 mg L <sup>-1</sup>	382 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	31.9 mg L <sup>-1</sup>	31.1 mg L <sup>-1</sup>	61.9 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	4.8 mg L <sup>-1</sup>	4.8 mg L <sup>-1</sup>	8.9 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	11.8 mg L <sup>-1</sup>	11.0 mg L <sup>-1</sup>	60 mg L <sup>-1</sup>

- Bicarbonate is the dominant anion in Hooker Lake, while magnesium is the dominant cation (Figure 5).
- Median concentrations of constituents are comparable to the historical median for the lake and less than the Ecoregion median.

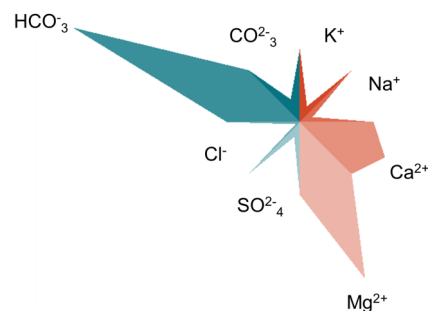


Figure 5. Maucha diagram showing ionic balance based on 2015 data