

March 2019

Strawberry Lake

(48.94382 N, -100.50508 W)

Bottineau County

- Strawberry Lake is a small, natural lake in northern North Dakota (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/strawberrybottineau2010.pdf>).
- Strawberry Lake is accessible by one public boat access on the east side of the lake.
- The Strawberry Lake watershed is about 500 acres of mostly deciduous forest and open water. There is little agricultural production in the watershed (Table 1).
- Strawberry 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.”
- Strawberry Lake is managed for rainbow trout, which are stocked annually. The most recent sampling survey by the ND Game and Fish found only rainbow trout.
- Strawberry Lake was previously sampled in 1995-1996 and 2005-2006.

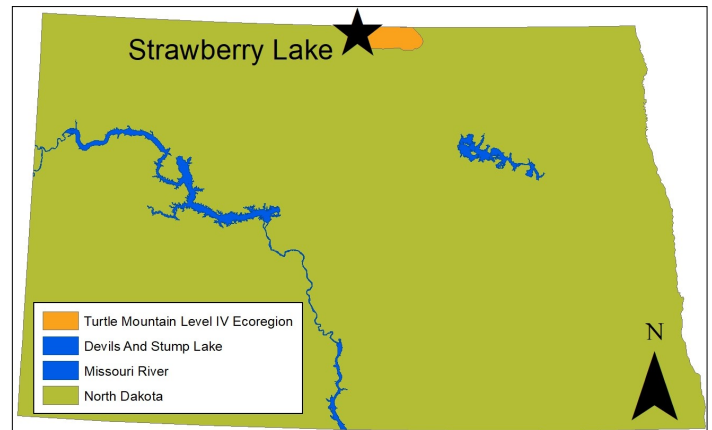


Figure 1. Location of Strawberry Lake within the state

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	% within 500 meters
Deciduous Forest	75.0%	84.1%
Open Water	17.3%	7.9%
Developed	5.3%	5.5%
Grassland/Pasture	1.3%	1.6%
Wetlands	0.9%	1.0%
Agriculture	0.1%	NA
<i>Canola</i>	50.0%	NA
<i>Other Hay/Non-Alfalfa</i>	50.0%	NA

Temperature and Dissolved Oxygen

- Strawberry 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.
- Stratification was observed during all samples in 2015, with temperature changes of 6.32 degrees Celsius (°C), 14.61°C and 4.32°C in May, June and September, respectively (Figure 2).
- All samples showed sharp declines in dissolved oxygen corresponding with thermal stratification.

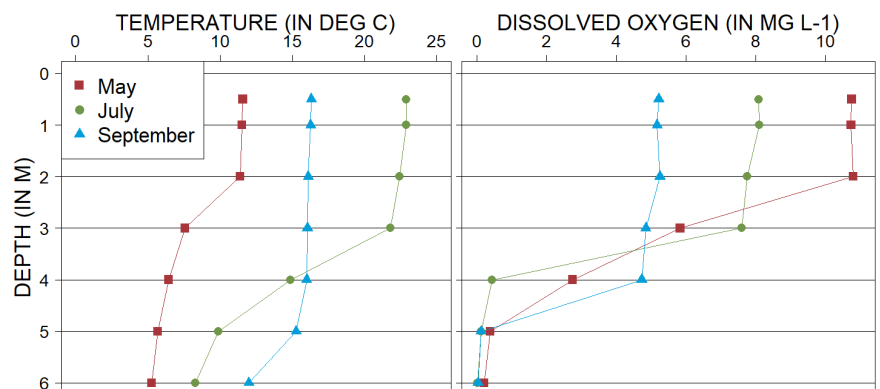


Figure 2. 2015 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L⁻¹)

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.
- Strawberry Lake is a eutrophic lake (Figure 3).
- Trophic state is relatively similar to historical indices.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Strawberry Lake.

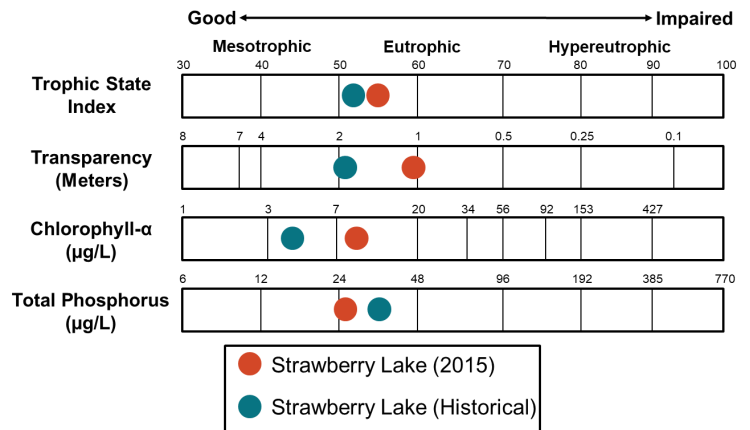


Figure 3. Trophic state indices for 2015 and historical samples

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 Strawberry Lake is located (Figure 4).
- Median concentration of dissolved TN was similar to 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 were similar to TP.
- Ammonia and nitrate plus nitrite were rarely above detection limits in Strawberry Lake in 2015.

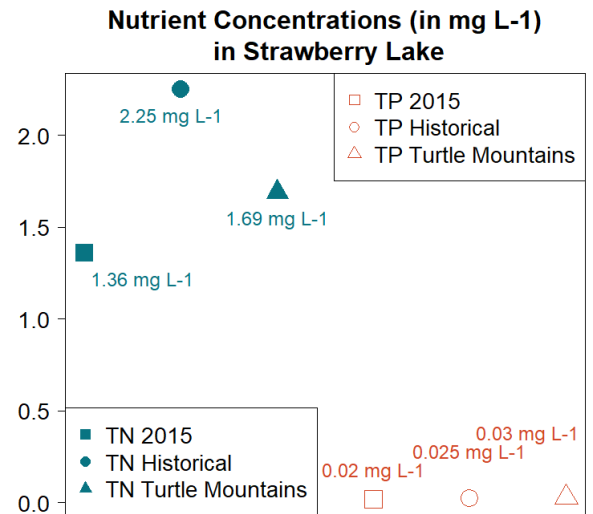


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians.

Water Chemistry

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

Measure	2015 Median ¹	Historical Median	Ecoregion Median
Alkalinity	392 mg L ⁻¹	466 mg L ⁻¹	290 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	430 mg L ⁻¹	521 mg L ⁻¹	325 mg L ⁻¹
Calcium (Ca ²⁺)	14.5 mg L ⁻¹	43.4 mg L ⁻¹	32.4 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	24 mg L ⁻¹	40 mg L ⁻¹	12 mg L ⁻¹
Conductivity	1,130 µS cm ⁻¹	2,360 µS cm ⁻¹	685 µS cm ⁻¹
Dissolved Solids	734 mg L ⁻¹	1,770 mg L ⁻¹	382 mg L ⁻¹
Magnesium (Mg ²⁺)	131 mg L ⁻¹	329 mg L ⁻¹	61.9 mg L ⁻¹
Sodium (Na ⁺)	17.2 mg L ⁻¹	47.3 mg L ⁻¹	8.9 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	266 mg L ⁻¹	1,010 mg L ⁻¹	60 mg L ⁻¹

- Bicarbonate and sulfate are co-dominant anions in Strawberry Lake, while magnesium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are lower than the historical median but greater than the Ecoregion median.

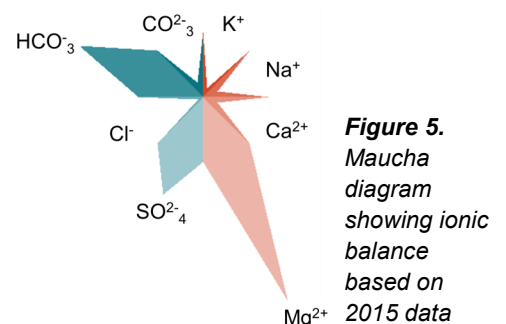


Figure 5. Maucha diagram showing ionic balance based on 2015 data