

March 2019

Mitchell Lake

(47.17167 N, -100.30164 W)

Burleigh County

- Mitchell Lake is a long, narrow lake in central North Dakota (Figure 1).
- Mitchell Lake is accessible by one public boat ramp on the north end of the lake.
- The Mitchell Lake watershed is about 8,000 acres of mostly grassland/pasture and agricultural land. The most common crops grown are spring wheat, soybeans and non-alfalfa hay (Table 1).
- Mitchell Lake is a Class III fishery, which means it is “capable of supporting natural reproduction of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota.”
- The lake is no longer managed by the ND Game and Fish (listed as an inactive fishery), but was previously managed for northern pike.
- Mitchell Lake was previously assessed in 2008.

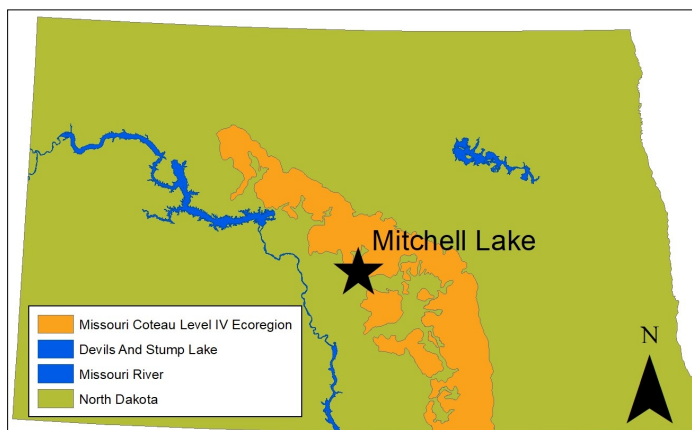


Figure 1. Location of Mitchell Lake within the state

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
Grassland/Pasture	48.9%	62.7%
Agriculture	36.1%	21.1%
Spring Wheat	38.0%	18.8%
Other Hay/Non-Alfalfa	20.5%	56.2%
Soybeans	12.2%	2.3%
Open Water	9.4%	8.7%
Wetlands	3.2%	5.1%
Developed	2.5%	2.5%

Temperature and Dissolved Oxygen

- Mitchell Lake rarely stratifies in the summer, with the majority of the water column typically well-oxygenated
- There was no thermal stratification recorded in 2016. Temperature change in the water column was 0.07 degrees Celsius (°C), 0.33°C and 0.39°C in May, July and September, respectively (Figure 2).
- All samples in 2016 showed the lake as well-oxygenated.

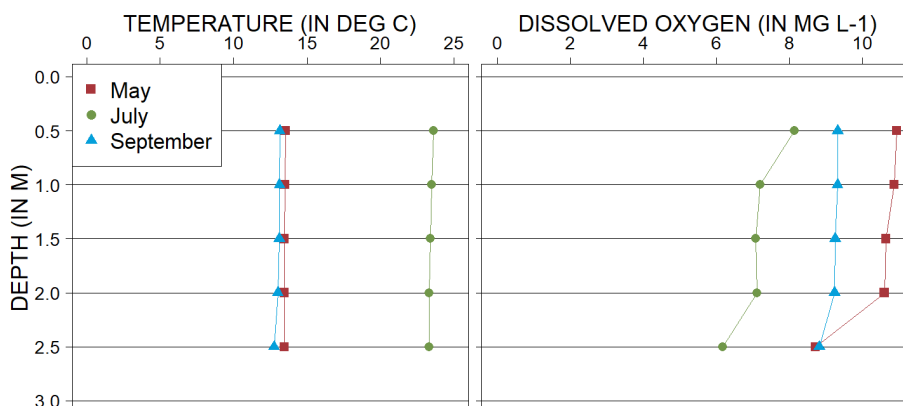


Figure 2. 2016 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Mitchell Lake is a hypereutrophic lake (Figure 3) that has relatively high nutrient concentrations with dense algal growth and high turbidity.
- Trophic state is similar to historical indices.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Mitchell Lake, but the lake does experience frequent blooms.

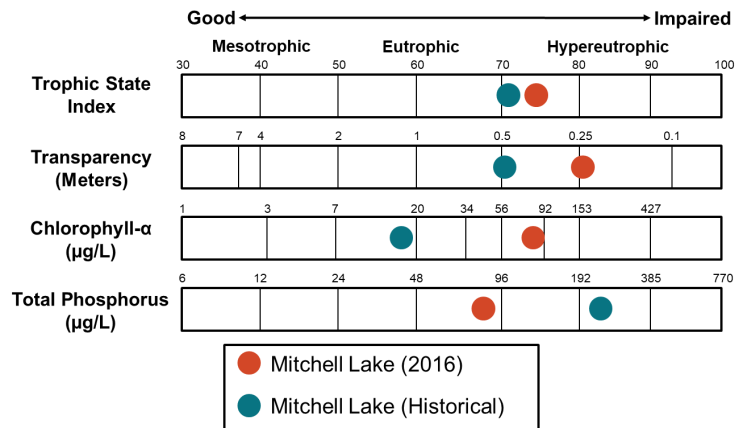


Figure 3. Trophic state indices for 2016 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2016 was less than the historical median but greater than the median for the Missouri Coteau Level IV Ecoregion (hereafter, Missouri Coteau) where Mitchell Lake is located (Figure 4).
- Median concentration of dissolved TN was much less than TN.
- Median TP concentration in 2016 was less than the historical concentration but greater than the median for the Missouri Coteau (Figure 4).
- Median concentration of dissolved phosphorus was much less than TP.
- Ammonia and nitrate plus nitrite were rarely above detection limits in Mitchell Lake in 2016.

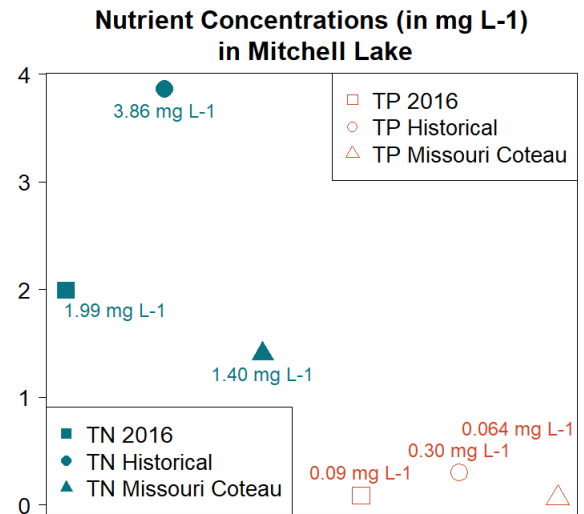


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

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

Measure	2016 Median	Historical Median	Ecoregion Median
Alkalinity	441 mg L ⁻¹	807 mg L ⁻¹	274 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	462 mg L ⁻¹	754 mg L ⁻¹	289 mg L ⁻¹
Calcium (Ca ²⁺)	28.7 mg L ⁻¹	23.3 mg L ⁻¹	39.8 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	38 mg L ⁻¹	113 mg L ⁻¹	21 mg L ⁻¹
Conductivity	1,890 µS cm ⁻¹	3,320 µS cm ⁻¹	1,010 µS cm ⁻¹
Dissolved Solids	1,310 mg L ⁻¹	2,370 mg L ⁻¹	642 mg L ⁻¹
Magnesium (Mg ²⁺)	99.2 mg L ⁻¹	111 mg L ⁻¹	72.4 mg L ⁻¹
Sodium (Na ⁺)	288 mg L ⁻¹	629 mg L ⁻¹	62 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	593 mg L ⁻¹	1,043 mg L ⁻¹	239 mg L ⁻¹

- Sulfate is the dominant anion in Mitchell Lake (although bicarbonate is relatively high), while sodium is the dominant cation (with magnesium being relatively high) (Figure 5).
- Median concentrations of most cations and anions are lower than the historical median for the lake but greater than median concentrations for the Missouri Coteau.

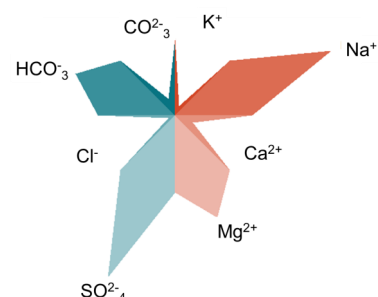


Figure 5. Maucha diagram showing ionic balance based on 2016 data