

December 2021

Lake Metigoshe

(48.977713 N, -100.353841 W)

Bottineau County

- Lake Metigoshe is a large natural lake in northern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/metigoshe2020.pdf>).
- There are three boat ramps around Lake Metigoshe.
- The Lake Metigoshe watershed is split between the US and Canada, with the US portion dominated by forest. The most common crops grown are soybeans, corn and fallow/idle cropland (Table 1).
- Lake Metigoshe 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.”
- Lake Metigoshe is managed by the NDGF as a walleye fishery, with fingerlings and/or advanced fingerlings stocked annually. Bullhead, walleye, northern pike, bluegill, white sucker, and yellow perch were captured in the last sample by the NDGF in 2020.
- Lake Metigoshe was sampled intensively from 1992 through 2006 by the NDDEQ, but no samples were collected since.

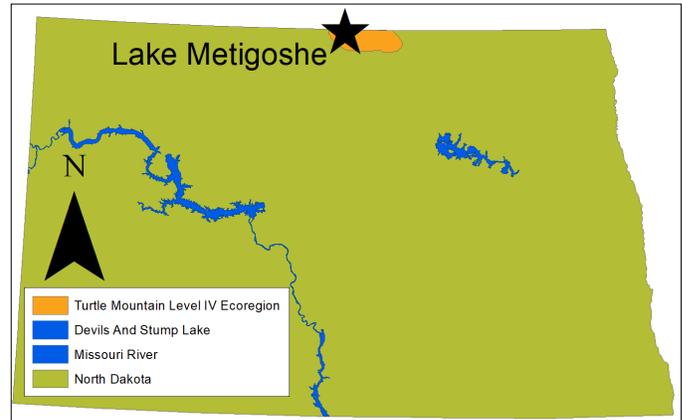


Figure 1. Location of Lake Metigoshe within the state

Table 1. Percentage of land cover in the watershed (US portion) and near the lake (NASS, 2020). Value listed of crop type represents percentage of total production

Land Cover Type	% in Watershed	% within 500 meters
Forest	49.3%	48.6%
Open Water	19.7%	11.8%
Agriculture	16.0%	11.4%
Spring Wheat	26.3%	43.9%
Fallow/Idle Cropland	24.8%	6.0%
Other Hay/Non-Alfalfa	21.0%	21.7%
Wetlands	6.6%	9.3%
Grassland/Pasture	4.2%	3.5%
Developed	4.1%	15.3%
Shrubland	< 0.1%	< 0.1%

Temperature and Dissolved Oxygen

- Lake Metigoshe commonly stratifies in the summer, with cooler, low-oxygen water accumulating in the hypolimnion.
- Thermal stratification was recorded in June and July 2021. Temperature change in the water column was 0.1 degrees Celsius (°C), 1.8°C, 2.4°C, and 0.0°C in May, June, August and October, respectively.
- Dissolved oxygen concentrations were depleted quickly during times of thermal stratification.

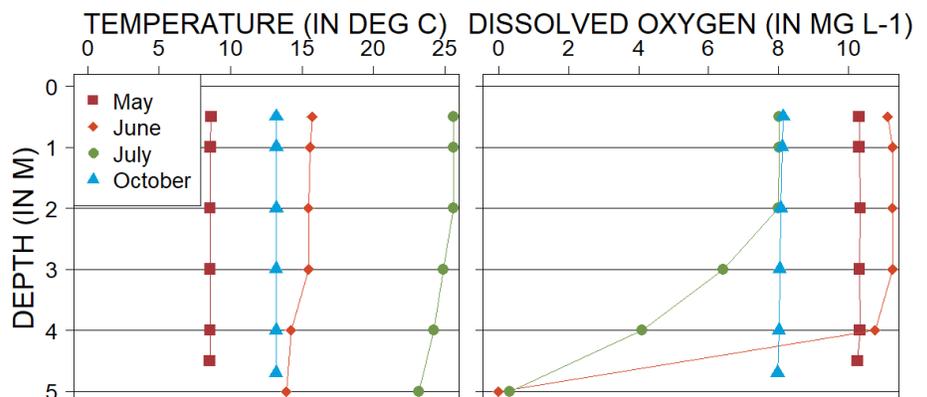


Figure 2. 2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Lake Metigoshe is a eutrophic lake (Figure 3) with relatively low nutrient concentrations, low algal growth, but moderate transparency.
- Trophic state in 2021 was comparable to historical indices.
- Lake Metigoshe has been listed as an advisory for the presence of **harmful** algal (cyanobacteria) blooms.

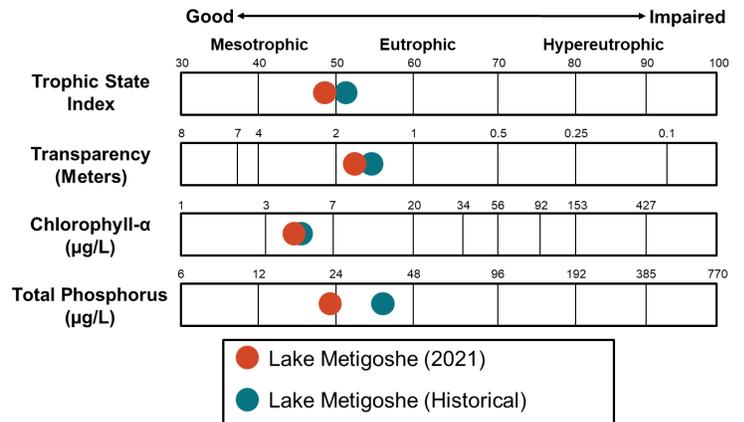


Figure 3. Trophic state indices for 2021 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) at Lake Metigoshe in 2021 was less than the historical median for the lake and the median for natural lakes in the Turtle Mountains Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median TP concentration in 2021 was less than the median for the lake and the median for the Ecoregion (Figure 4).
- Dissolved nutrient concentrations at Lake Metigoshe were slightly less than total nutrient concentrations in 2021.
- Ammonia was only detected in October of 2021 at Lake Metigoshe, while nitrate-plus-nitrite was not detected during any sample.

Nutrient Concentrations (in mg L⁻¹) in Lake Metigoshe

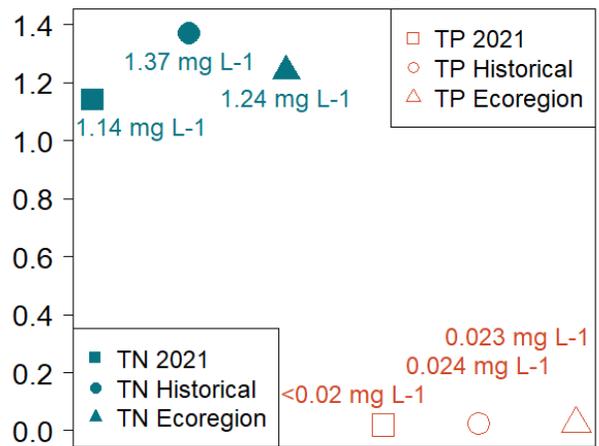


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

Table 2. Median concentrations of selected constituents for 2021 and historical samples and from all Ecoregion natural lakes.

Measure	2021 Median ¹	Historical Median ¹	Ecoregion Median
Alkalinity	251 mg L ⁻¹	274.5 mg L ⁻¹	268 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	286.5 mg L ⁻¹	296 mg L ⁻¹	301 mg L ⁻¹
Calcium (Ca ²⁺)	32.5 mg L ⁻¹	31.9 mg L ⁻¹	31.6 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	9.5 mg L ⁻¹	17.5 mg L ⁻¹	13 mg L ⁻¹
Conductivity	495 µS cm ⁻¹	563 µS cm ⁻¹	579 µS cm ⁻¹
Dissolved Solids	275 mg L ⁻¹	317 mg L ⁻¹	328 mg L ⁻¹
Magnesium (Mg ²⁺)	43.8 mg L ⁻¹	47.3 mg L ⁻¹	54.4 mg L ⁻¹
Sodium (Na ⁺)	6.2 mg L ⁻¹	7.7 mg L ⁻¹	8.1 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	27.0 mg L ⁻¹	38.3 mg L ⁻¹	43.2 mg L ⁻¹

¹Used data from the Center basin site (380612)

- Bicarbonate is the dominant anion in Lake Metigoshe, while magnesium is the dominant cations (Figure 5).
- Median concentrations of most cations and anions are less than the historical median for the lake and less than the median for the Ecoregion.

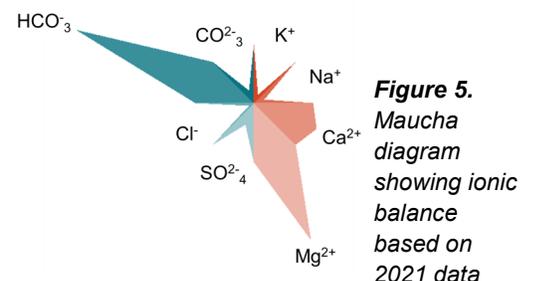


Figure 5. Maucha diagram showing ionic balance based on 2021 data