

June 2024

## Lake Tschida - Heart Butte Reservoir

(46.59561 N, -101.81664 W)  
Oliver County

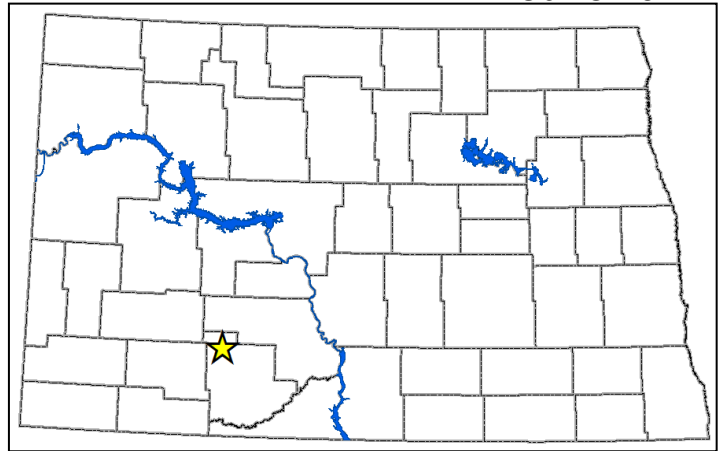


Figure 1. Location of Lake Tschida within the state

- Lake Tschida is a lake in southwestern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/heartbutteoverview2020.pdf>)
- There are 10 public boat ramps located on Lake Tschida. See locations at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/heartbutteoverview2020.pdf>)
- The Lake Tschida watershed drains about 37,000 acres. Land cover in the watershed is largely comprised of rangeland. Agricultural land is also dominant in the area. Cropland is dominated by wheat, corn, and sunflower (Table 1).
- Lake Tschida is a Class II, cool-water fishery, which are “capable of supporting natural reproduction and growth of cool water fishes (e.g., walleye and northern pike) and associated aquatic biota.”
- Lake Tschida is managed for walleye, black crappie, and yellow perch. Multiple fish species were found during the last survey by the ND Game and Fish (2023). See survey report at (<https://gfappspublic.nd.gov/wheretofish/SurveyReport.aspx?Lake=160>).

Table 1. Percentage of land cover in the watershed and near the lake (NASSCDL, 2021). Value listed of crop type represents percentage of total production

Land Cover Type	% in Watershed	% within 500 meters
Agriculture	24.9 %	5.0 %
Wheat	10.9 %	1.5 %
Corn	4.6 %	1.6 %
Sunflower	3.2 %	<1 %
Trees	2.0 %	5.0%
Rangeland	54.8 %	77.6 %
Water	10.3 %	7.0 %
Bare	2.8 %	5.4 %

## Temperature and Dissolved Oxygen

- Lake Tschida stayed stratified throughout the sampling season, with warm, well-oxygenated water at the top of the water column, and cold, low-oxygen water near the bottom.
- Thermal stratification took place in May, June, and July. The greatest temperature change in the water column during these months was 2.8 degrees Celsius (°C), 5.4°C, and 4.5°C (Figure 2).
- Dissolved oxygen concentrations were relatively high at the surface, but there was some anoxic conditions near the bottom (Figure 2).

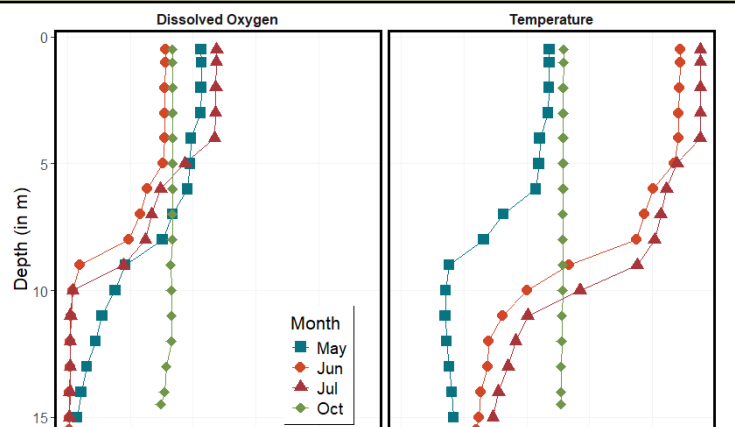


Figure 2. 2023 profiles of dissolved oxygen (left) in milligrams per liter ( $mg L^{-1}$ ) and temperature (right) in degrees Celsius.

## 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 Tschida is a eutrophic lake (Figure 3) that has high nutrient concentrations and moderate algal and plant growth.
- Trophic state in 2023 was relatively similar to historical condition.
- There have been confirmed **harmful** algal (cyanobacteria) blooms at Lake Tschida.

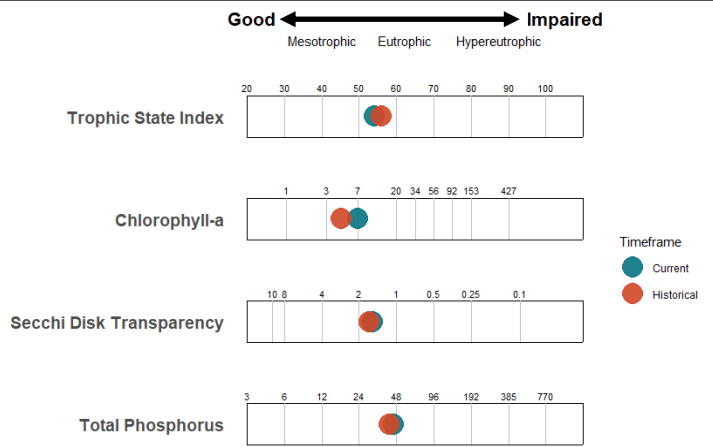


Figure 3. Trophic state indices for 2023 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) in 2023 was greater than the historical median but less than the median for the Missouri Plateau Level IV Ecoregion where Lake Tschida is located (Figure 4).
- 2023 median concentration of dissolved TN was greater than TN.
- Median TP concentration in 2023 was greater than the historical and ecoregion medians (Figure 4).
- 2023 median concentration of dissolved phosphorus was less than TP.
- Ammonia and nitrate + nitrate were found above their detection limit of 0.03 mg/L during the 2023 sampling season.

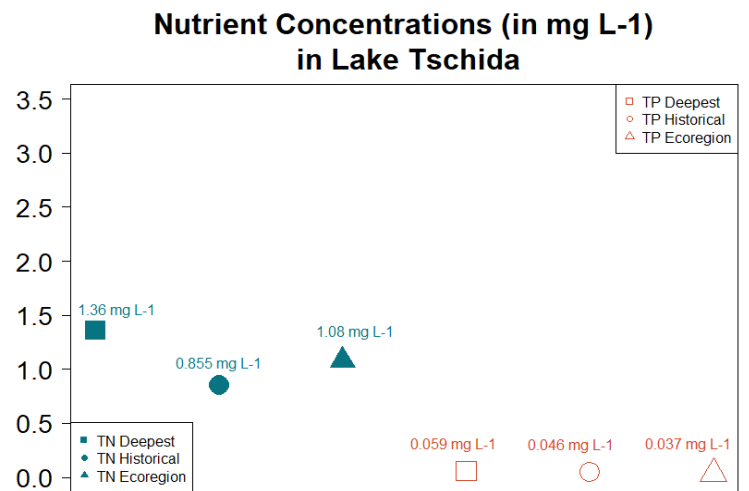


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

**Table 2.** Median concentrations of selected constituents for 2023 and historical samples and from all Ecoregion natural lakes and reservoirs.

Measure	2023 Median	Historical Median	Ecoregion Median
Alkalinity	213 mg L <sup>-1</sup>	255 mg L <sup>-1</sup>	201 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	239 mg L <sup>-1</sup>	277 mg L <sup>-1</sup>	217 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	74.4 mg L <sup>-1</sup>	75.4 mg L <sup>-1</sup>	47.5 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	9 mg L <sup>-1</sup>	9 mg L <sup>-1</sup>	11 mg L <sup>-1</sup>
Conductivity	1680 μS cm <sup>-1</sup>	1505 μS cm <sup>-1</sup>	823.5 μS cm <sup>-1</sup>
Dissolved Solids	1045 mg L <sup>-1</sup>	1180 mg L <sup>-1</sup>	521.5 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	61.25 mg L <sup>-1</sup>	62.4 mg L <sup>-1</sup>	24.7 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	187 mg L <sup>-1</sup>	214 mg L <sup>-1</sup>	94.4 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	572 mg L <sup>-1</sup>	638 mg L <sup>-1</sup>	206 mg L <sup>-1</sup>

- Sulfate is the dominant anion in Lake Tschida (Heart Butte Reservoir), while sodium is the dominant cation (Table 2).
- 2023 median concentrations of most cations and anions are similar to the historical medians for the lake and greater than the ecoregion medians (Table 2).