

December 2021

Moores Lake

(46.035328 N, -98.879615 W)

Dickey County

- Moores Lake is a small natural lake in southeastern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/moores2011.pdf>).
- There is one unpaved, unmarked boat access on the north side of Moores Lake.
- The Moores Lake watershed is about 300 acres of mostly grassland/pasture. The only agriculture in the Moores Lake watershed are alfalfa, other hay/non-alfalfa and fallow/idle cropland (Table 1).
- Moores Lake is a Class III fishery, which are “capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota.”
- Moores Lake is managed by the NDGF as a northern pike and yellow perch fishery, with fingerlings of the former stocked annually. Northern pike and yellow perch were captured in the last sample by the NDGF in 2019.
- Moores Lake was last sampled in 2011 by the NDDEQ.

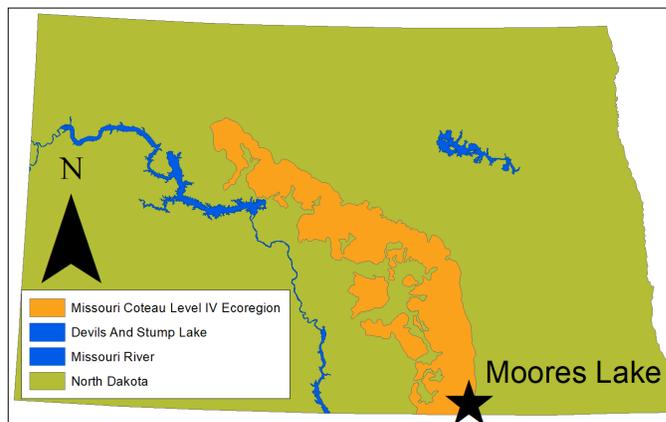


Figure 1. Location of Moores Lake within the state

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

| Land Cover Type | % in Watershed | % within 500 meters |
|-----------------------|----------------|---------------------|
| Grassland/Pasture | 79.9% | 86.4% |
| Open Water | 9.1% | 2.2% |
| Wetlands | 6.8% | 5.5% |
| Developed | 2.5% | 4.7% |
| Shrubland | 1.0% | 0.4% |
| Agriculture | 0.4% | 0.8% |
| Other Hay/Non-Alfalfa | 40.0% | 64.3% |
| Fallow/Idle Cropland | 40.0% | 14.3% |
| Alfalfa | 20.0% | 21.4% |
| Forest | 0.2% | < 0.1% |

Temperature and Dissolved Oxygen

- Moores Lake rarely stratifies in the summer due to its relatively shallow depth and it being an exposed Coteau lake.
- Thermal stratification was not recorded in 2021. Temperature change in the water column was 0.3 degrees Celsius (°C), 0.0°C, 0.0°C, and 0.5°C in May, June, August and October, respectively.
- Dissolved oxygen concentrations were high throughout the water column during all samples.

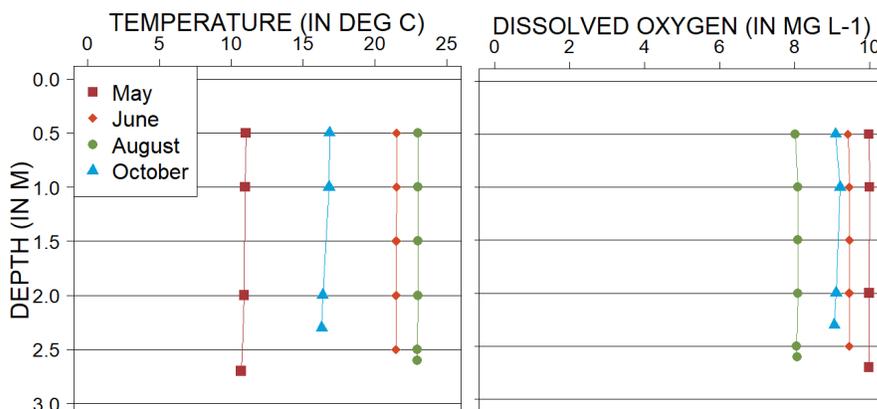


Figure 2. 2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Moores Lake is a mesotrophic lake (Figure 3) with relatively low nutrient concentrations, low algal growth, but moderate transparency.
- Trophic state in 2021 was comparable to historical indices.
- Moores Lake has not been listed for confirmed **harmful** algal (cyanobacteria) blooms.

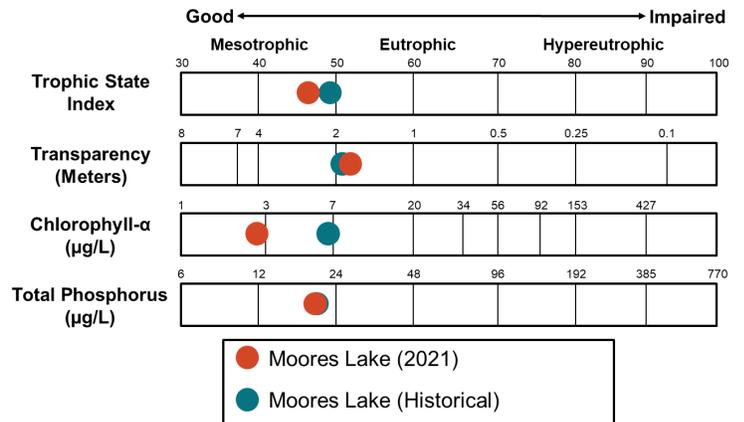


Figure 3. Trophic state indices for 2021 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) at Moores Lake in 2021 was slightly greater than the historical median for the lake but much less than the median for natural lakes in the Missouri Coteau Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median TP concentration in 2021 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- Median concentrations of dissolved nutrients were similar to concentrations of total nutrients.
- Neither ammonia or nitrate-plus-nitrite were detected at Moores Lake in 2021.

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

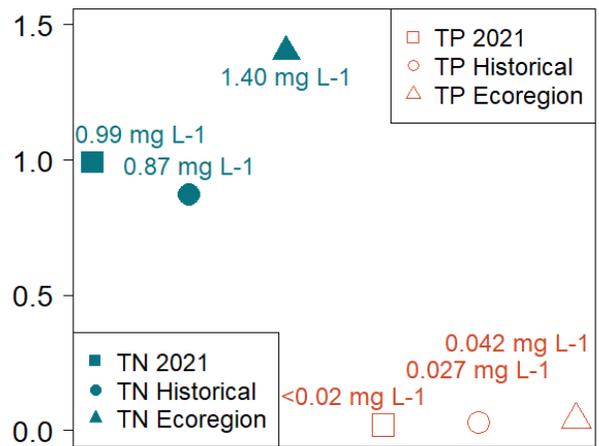


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

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

| Measure | 2021 Median | Historical Median | Ecoregion Median |
|--|---------------------------|---------------------------|---------------------------|
| Alkalinity | 232 mg L ⁻¹ | 229 mg L ⁻¹ | 318.5 mg L ⁻¹ |
| Bicarbonate (HCO ₃ ⁻) | 264.5 mg L ⁻¹ | 260 mg L ⁻¹ | 333.5 mg L ⁻¹ |
| Calcium (Ca ²⁺) | 54.0 mg L ⁻¹ | 85.6 mg L ⁻¹ | 41.2 mg L ⁻¹ |
| Carbonate (CO ₃ ²⁻) | 8.5 mg L ⁻¹ | 7 mg L ⁻¹ | 26.5 mg L ⁻¹ |
| Conductivity | 1,195 µS cm ⁻¹ | 1,090 µS cm ⁻¹ | 1,340 µS cm ⁻¹ |
| Dissolved Solids | 817 mg L ⁻¹ | 784 mg L ⁻¹ | 877 mg L ⁻¹ |
| Magnesium (Mg ²⁺) | 116 mg L ⁻¹ | 96.8 mg L ⁻¹ | 91.3 mg L ⁻¹ |
| Sodium (Na ⁺) | 49.1 mg L ⁻¹ | 39.5 mg L ⁻¹ | 127 mg L ⁻¹ |
| Sulfate (SO ₄ ²⁻) | 443.5 mg L ⁻¹ | 403 mg L ⁻¹ | 391.5 mg L ⁻¹ |

- Sulfate is the dominant anion in Moores Lake, while magnesium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are comparable to the historical median for the lake but less than the median for the Ecoregion.

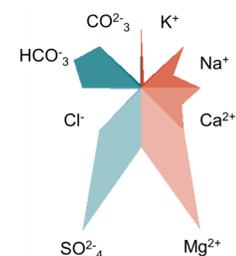


Figure 5. Maucha diagram showing ionic balance based on 2021 data