

December 2021

Clark Lake

(47.176716 N, -99.415601 W)

Stutsman County

- Clark Lake is a large, natural lake in eastern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/clark2005.pdf>).
- There is one boat ramp on Clark Lake on the north side of the lake.
- The Clark Lake watershed is nearly 2,000 acres of mostly grassland/pasture. The most common forms of agriculture are fallow/idle cropland, alfalfa and other hay/non-alfalfa (Table 1).
- Clark 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.”
- Clark Lake is managed by the NDGF as a walleye fishery, with fingerlings stocked annually. Walleye, northern pike and yellow perch were captured in the last sample by the NDGF in 2019.
- Clark Lake was previously assessed in 2008 by the NDDEQ.

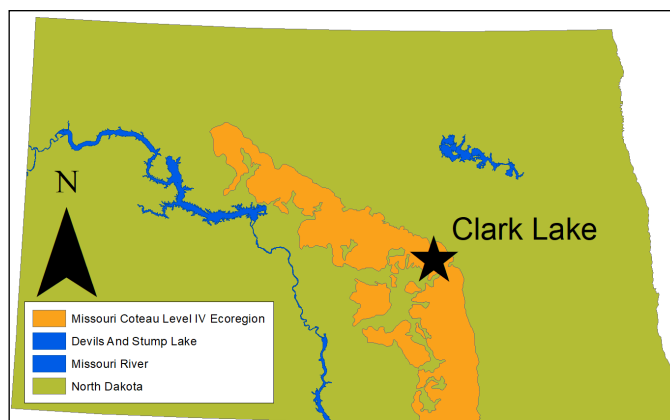


Figure 1. Location of Clark Lake within the state

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	62.1%	45.3%
Open Water	15.7%	12.7%
Agriculture	13.8%	26.6%
Fallow/Idle Cropland	80.1%	84.1%
Alfalfa	15.7%	7.0%
Other Hay/Non-Alfalfa	3.2%	7.8%
Wetlands	6.1%	11.3%
Developed	2.3%	3.7%

Temperature and Dissolved Oxygen

- Clark Lake rarely stratifies in the summer, and remains well-mixed throughout the open-water season.
- There was no thermal stratification recorded in 2021. Temperature change in the water column was 0.1 degrees Celsius (°C), 1.5°C, 0.1°C, and 0.7°C in May, June, July and October, respectively.
- Most dissolved oxygen concentrations were relatively high.

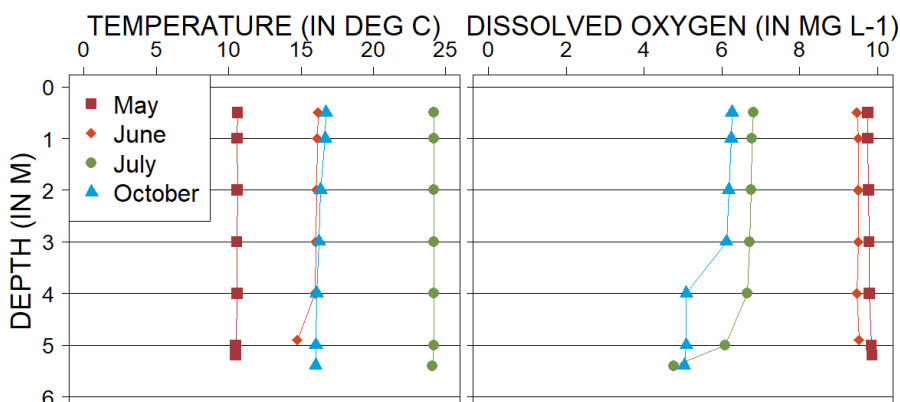


Figure 2. 2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L⁻¹)

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.
- Clark Lake is a mesotrophic lake (Figure 3) that has moderate nutrient concentrations but low algal growth.
- Trophic state in 2021 is improved compared to historical indices.
- Clark Lake has not had any confirmed *harmful* algal (cyanobacteria) blooms.

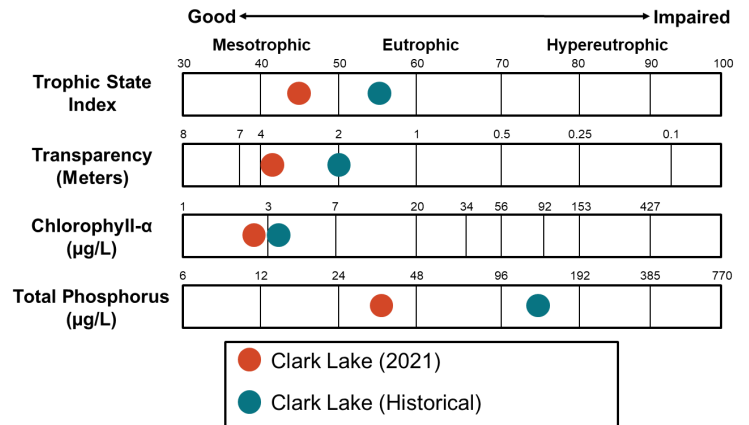


Figure 3. Trophic state indices for 2021 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) at Clark Lake in 2021 was less than the historical median for the lake but greater than the median for natural lakes in the Missouri Coteau Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median total phosphorus (TP) concentration in 2021 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- There were no samples collected in 2021 for dissolved nutrients.
- Ammonia and nitrate-plus-nitrite were detected at Clark Lake in 2021 at relatively low concentrations, though there were no detections in May or June.

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

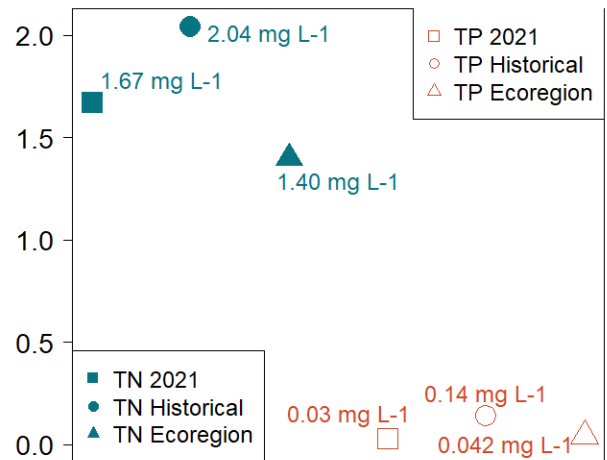


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

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	384 mg L ⁻¹	418 mg L ⁻¹	318.5 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	408 mg L ⁻¹	414 mg L ⁻¹	333.5 mg L ⁻¹
Calcium (Ca ²⁺)	33.3 mg L ⁻¹	52.2 mg L ⁻¹	41.2 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	30 mg L ⁻¹	47 mg L ⁻¹	26.5 mg L ⁻¹
Conductivity	2,500 µS cm ⁻¹	2,795 µS cm ⁻¹	1,340 µS cm ⁻¹
Dissolved Solids	1,860 mg L ⁻¹	2,075 mg L ⁻¹	877 mg L ⁻¹
Magnesium (Mg ²⁺)	194 mg L ⁻¹	193.5 mg L ⁻¹	91.3 mg L ⁻¹
Sodium (Na ⁺)	263 mg L ⁻¹	294.5 mg L ⁻¹	127 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	1,010 mg L ⁻¹	1,140 mg L ⁻¹	391.5 mg L ⁻¹

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

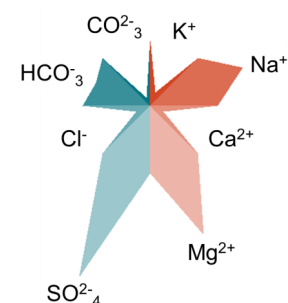


Figure 5. Maucha diagram showing ionic balance based on 2021 data