

June 2020

# Coldwater Lake

(46.011740 N, -99.069792 W)

## McIntosh County

- Coldwater Lake is a large natural lake in southeast North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/coldwater2004.pdf>).
- There is one public, paved boat ramp on Coldwater Lake on the east side of the lake.
- The Coldwater Lake watershed is about 30,000 acres of mostly grassland/pasture and agriculture (Table 1). Agricultural production in the watershed is dominated by other hay/non-alfalfa, spring wheat and corn.
- Coldwater Lake is a Class III, warm-water fishery, which are “capable of supporting natural reproduction and growth of cool water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota.”
- Coldwater Lake is managed for walleye, with fingerlings stocked annually. Yellow perch, walleye and northern pike were captured during the last sample by the ND Game and Fish.
- Coldwater Lake was previously assessed in 2005-2006.

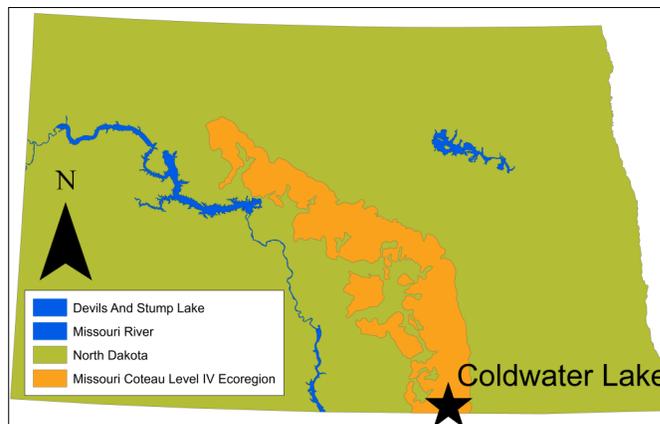


Figure 1. Location of Coldwater Lake within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2018). Value listed of crop type represents percentage of total production

| Land Cover Type       | % in Watershed | % within 500 meters |
|-----------------------|----------------|---------------------|
| Grassland/Pasture     | 59.0%          | 39.2%               |
| Agriculture           | 21.6%          | 43.2%               |
| Other Hay/Non-Alfalfa | 33.8%          | 45.4%               |
| Spring Wheat          | 24.7%          | 25.4%               |
| Corn                  | 16.6%          | 15.0%               |
| Open Water            | 14.7%          | 12.7%               |
| Developed             | 2.7%           | 2.8%                |
| Wetlands              | 1.3%           | 1.9%                |
| Shrubland             | 0.7%           | 0.2%                |
| Forest                | 0.1%           | < 0.1%              |

## Temperature and Dissolved Oxygen

- Coldwater Lake regularly stratifies in the summer being relatively deep.
- Thermal stratification was recorded in September 2019. Top-to-bottom temperature changes of 0.0°C, 0.9°C and 2.5°C were recorded in May, July and September, respectively.
- Dissolved oxygen concentrations were relatively high throughout the water column during all samples, but did decline sharply in the hypolimnion in September.

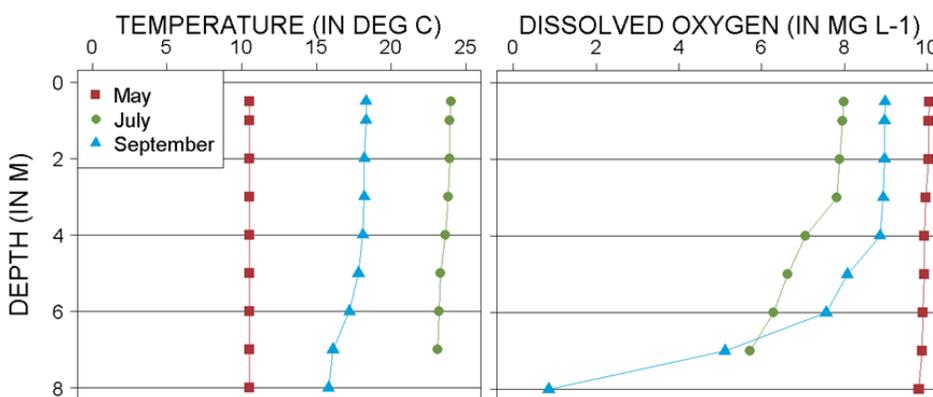


Figure 2. 2019 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ( $mg L^{-1}$ )

## 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.
- Coldwater Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- Current trophic state is similar to historical data.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Coldwater Lake as of 2019.

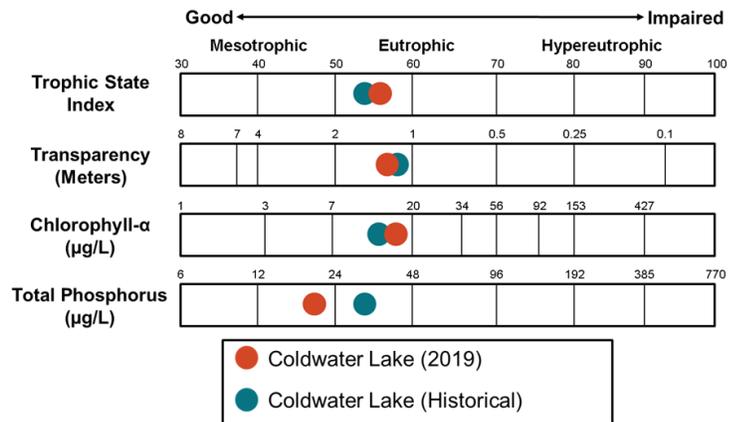


Figure 3. Trophic state indices for 2019 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) in 2019 was similar to the historical median for the lake and similar to the median for the Missouri Coteau Level IV Ecoregion (hereafter, Ecoregion) where Coldwater Lake is located (Figure 4).
- Median concentration of dissolved TN was less than TN.
- Median total phosphorus (TP) concentration in 2019 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was similar to TP.
- Neither ammonia nor nitrate-plus-nitrite were detected at Coldwater Lake in 2019.

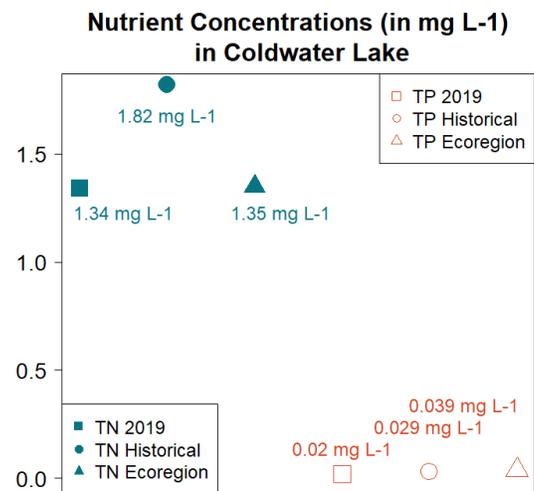


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

**Table 2.** Median concentrations of selected constituents for 2019 and historical samples and from all Ecoregion natural lakes.

| Measure                                      | 2019 Median               | Historical Median         | Ecoregion Median          |
|--|---------------------------|---------------------------|---------------------------|
| Alkalinity                                   | 311 mg L <sup>-1</sup>    | 328 mg L <sup>-1</sup>    | 312 mg L <sup>-1</sup>    |
| Bicarbonate (HCO <sub>3</sub> <sup>-</sup> ) | 335 mg L <sup>-1</sup>    | 294 mg L <sup>-1</sup>    | 328 mg L <sup>-1</sup>    |
| Calcium (Ca <sup>2+</sup> )                  | 50.8 mg L <sup>-1</sup>   | 38.0 mg L <sup>-1</sup>   | 38.8 mg L <sup>-1</sup>   |
| Carbonate (CO <sub>3</sub> <sup>2-</sup> )   | 23 mg L <sup>-1</sup>     | 51 mg L <sup>-1</sup>     | 26 mg L <sup>-1</sup>     |
| Conductivity                                 | 1,680 µS cm <sup>-1</sup> | 2,075 µS cm <sup>-1</sup> | 1,180 µS cm <sup>-1</sup> |
| Dissolved Solids                             | 1,200 mg L <sup>-1</sup>  | 1,510 mg L <sup>-1</sup>  | 784 mg L <sup>-1</sup>    |
| Magnesium (Mg <sup>2+</sup> )                | 172 mg L <sup>-1</sup>    | 209.5 mg L <sup>-1</sup>  | 81.9 mg L <sup>-1</sup>   |
| Sodium (Na <sup>+</sup> )                    | 84.5 mg L <sup>-1</sup>   | 120.5 mg L <sup>-1</sup>  | 118 mg L <sup>-1</sup>    |
| Sulfate (SO <sub>4</sub> <sup>2-</sup> )     | 636 mg L <sup>-1</sup>    | 895 mg L <sup>-1</sup>    | 364 mg L <sup>-1</sup>    |

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

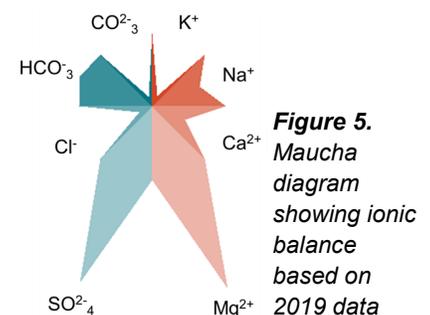


Figure 5. Maucha diagram showing ionic balance based on 2019 data