

November 2020

Moon Lake

(46.85653 N, -98.15741 W)

Barnes County

- Moon Lake is a small natural lake in southeast North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/Moon2004.pdf>).
- There is one public, paved boat ramp on Moon Lake on the northwest side of the lake.
- The Moon Lake watershed is difficult to delineate considering the dynamic nature of the water table. Land cover surrounding Moon Lake is dominated by agriculture and grassland/pasture, with the former dominated by corn and soybeans (Table 1).
- Moon Lake is a Class II, cool-water fishery, which are “capable of supporting natural reproduction and growth of cool water fishes (e.g., northern pike and walleye) and associated aquatic biota.”
- Moon Lake is managed for walleye and trout, with fingerlings stocked annually. Yellow perch, walleye, smallmouth bass and rainbow trout were captured during the last sample by the ND Game and Fish.
- Moon Lake was previously assessed in 2005-2008.

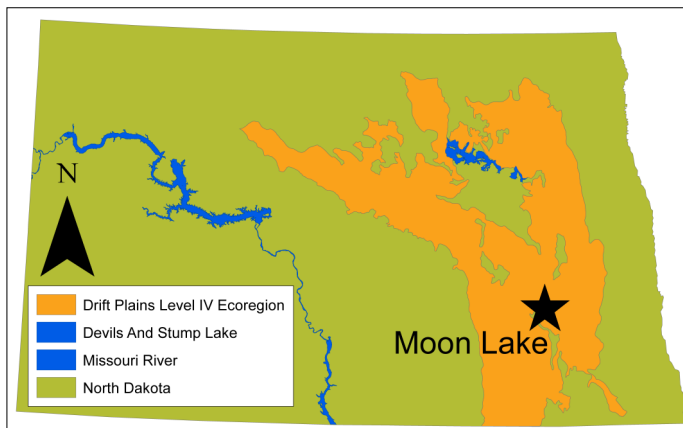


Figure 1. Location of Moon Lake within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2019). Value listed of crop type represents percentage of total production

Land Cover Type	% within 500 meters
Agriculture	40.5%
Soybeans	49.0%
Corn	25.4%
Spring Wheat	15.4%
Grassland/Pasture	30.8%
Open Water	11.6%
Wetlands	11.5%
Developed	3.9%
Forest	1.8%

Temperature and Dissolved Oxygen

- Moon Lake regularly stratifies in the summer.
- Thermal stratification was recorded through most of the year 2020. Top-to-bottom temperature changes of 14.4°C, 17.5°C, 19.3°C and 0.2°C were recorded in May, July and September, respectively.
- Dissolved oxygen concentrations were relatively high near the surface during all samples, but did decline sharply in the hypolimnion with thermal stratification.

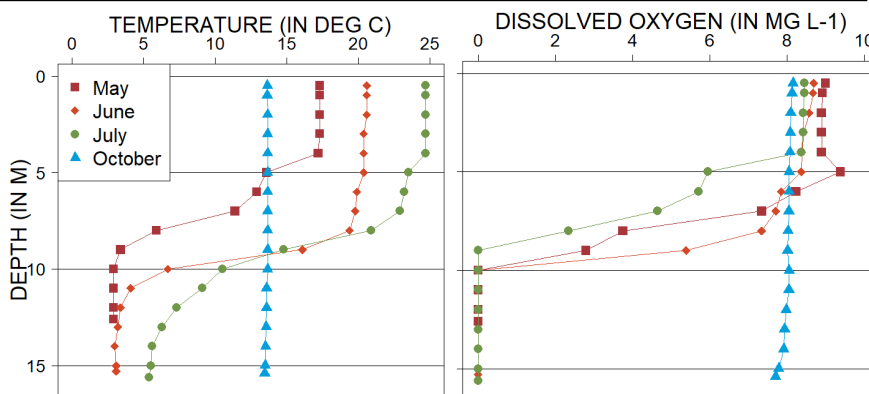


Figure 2. 2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Moon Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- Current trophic state has improved compared to historical data, driven by improvements in chlorophyll-a and total phosphorus concentrations.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Moon Lake as of 2020.

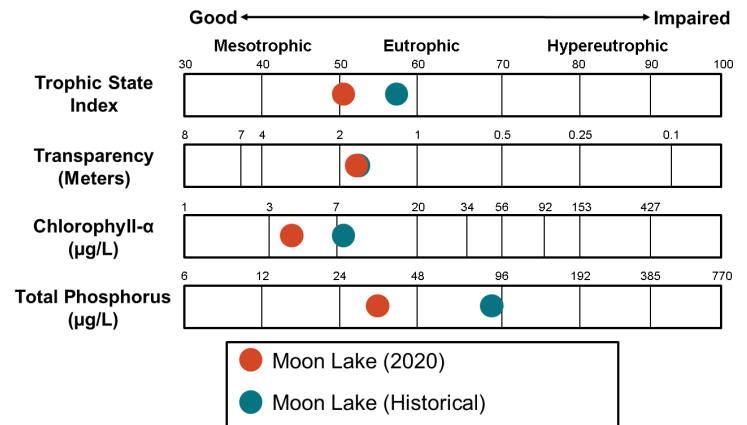


Figure 3. Trophic state indices for 2020 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was less than the historical median for the lake and similar to the median for the Drift Plains Level IV Ecoregion (hereafter, Ecoregion) where Moon Lake is located (Figure 4).
- Median concentration of dissolved TN was less than TN.
- Median total phosphorus (TP) concentration in 2020 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Ammonia was detected at Moon Lake twice in 2020 at moderate concentrations, while nitrate-plus-nitrite was not detected in any samples.

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

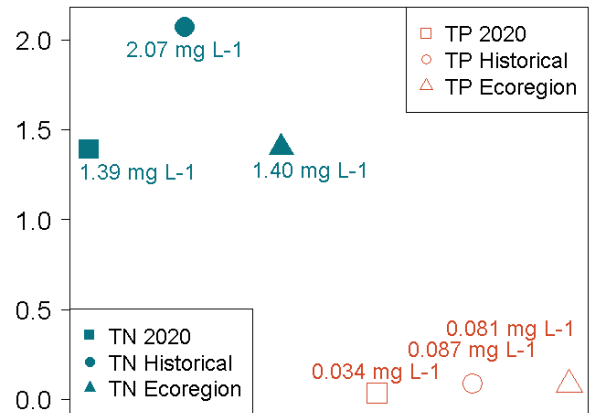


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

Table 2. Median concentrations of selected constituents for 2020 and historical samples and from all Ecoregion natural lakes.

Measure	2020 Median	Historical Median	Ecoregion Median
Alkalinity	561.5 mg L ⁻¹	693 mg L ⁻¹	249 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	592.5 mg L ⁻¹	607 mg L ⁻¹	283.5 mg L ⁻¹
Calcium (Ca ²⁺)	23.3 mg L ⁻¹	26.8 mg L ⁻¹	47.8 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	45.5 mg L ⁻¹	102 mg L ⁻¹	17.5 mg L ⁻¹
Conductivity	4,060 µS cm ⁻¹	5,220 µS cm ⁻¹	1,395 µS cm ⁻¹
Dissolved Solids	2,875 mg L ⁻¹	3,910 mg L ⁻¹	1,070 mg L ⁻¹
Magnesium (Mg ²⁺)	164.5 mg L ⁻¹	211 mg L ⁻¹	88.4 mg L ⁻¹
Sodium (Na ⁺)	636.5 mg L ⁻¹	891 mg L ⁻¹	117 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	1,350 mg L ⁻¹	1,870 mg L ⁻¹	587.5 mg L ⁻¹

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

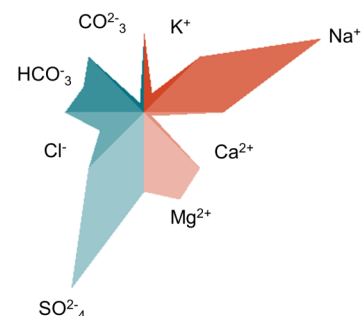


Figure 5. Maucha diagram showing ionic balance based on 2020 data