

November 2020

Antelope Lake

(47.95546 N, -100.07986 W)

Pierce County

- Antelope Lake is a large natural lake in north-central North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/antelope2014.pdf>).
- There is one public, paved boat ramp on Antelope Lake on the west side of the lake.
- The Antelope Lake watershed is difficult to delineate with the nature of the lake. Land cover near the lake is dominated by agriculture, most of which being canola, spring wheat and soybeans (Table 1).
- Antelope Lake is not classified in the state's water quality standards
- Antelope Lake is managed for walleye, with fingerlings stocked in recent years. Yellow perch and walleye were captured during the last sample by the ND Game and Fish in 2019.
- The ND DEQ has no historical data on Antelope Lake.

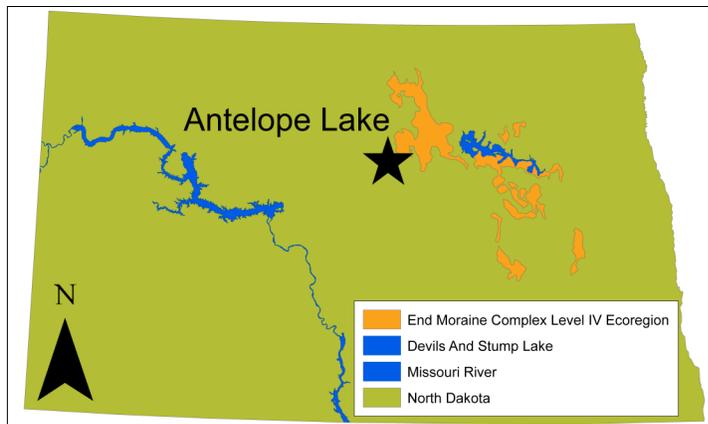


Figure 1. Location of Antelope Lake within the state

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
Grassland/Pasture	37.9%
Agriculture	34.3%
<i>Canola</i>	22.7%
<i>Soybeans</i>	22.1%
<i>Spring Wheat</i>	16.9%
Wetlands	12.0%
Open Water	8.1%
Forest	4.7%
Developed	3.0%
Shrubland	< 0.1%

Temperature and Dissolved Oxygen

- Antelope Lake occasionally stratifies in the summer being relatively deep, but is wind-swept.
- Thermal stratification was not recorded in 2020. Top-to-bottom temperature changes of 0.1°C, 0.2°C, 1.5°C and 0.0°C were recorded in May, June, August and October, respectively.
- Dissolved oxygen concentrations were relatively high throughout the water column during all samples, but did decline sharply with weak stratification in August.

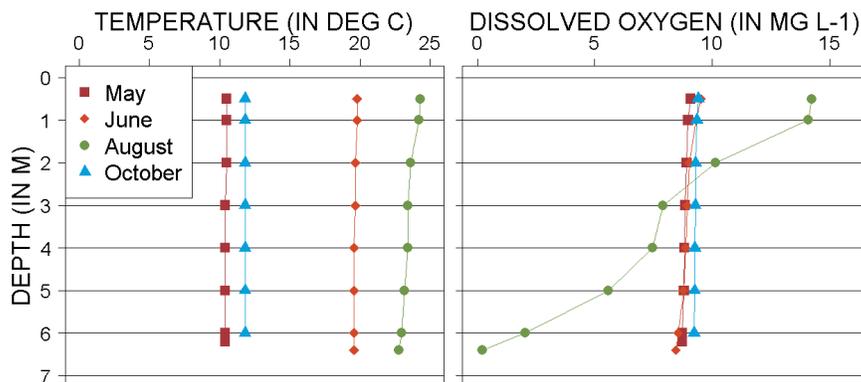


Figure 2. 2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Antelope Lake is a eutrophic lake (Figure 3) that has relatively high nutrient concentrations and moderate algal growth.
- There is no historical data for Antelope Lake.
- Antelope Lake has been posted for **harmful** algal (cyanobacteria) blooms almost annually since 2016.

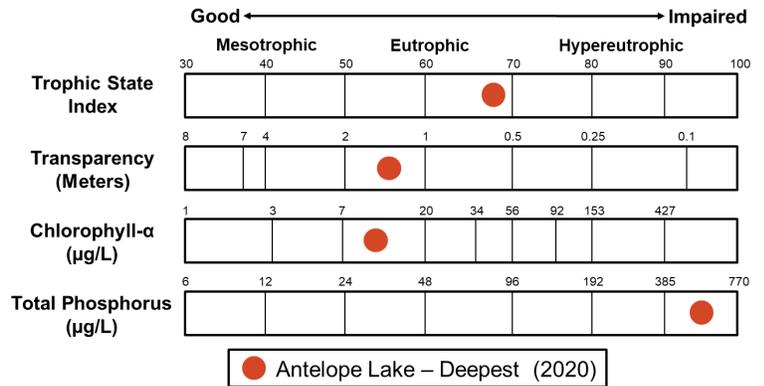


Figure 3. Trophic state indices for 2020 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was similar between the two sites, but were much greater than the Drift Plains and End Moraine Complex Level IV Ecoregions (hereafter, Ecoregions) where Antelope Lake is located (Figure 4).
- Median concentration of dissolved TN was less than TN.
- Median total phosphorus (TP) concentration in 2020 was similar between the two sites at the lake and much greater than the median for the Ecoregions (Figure 4).
- Median concentration of dissolved phosphorus was less than to TP.
- Ammonia and nitrate-plus-nitrite at Antelope Lake in 2020 were found in most samples at relatively high concentrations.

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

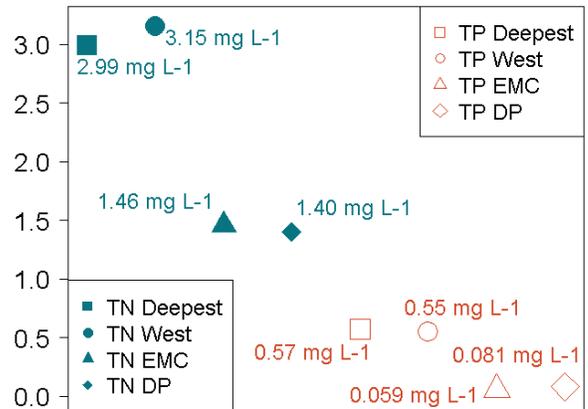


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

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

Measure	Deepest Median	EMC Hist. Median	West Basin Median	DP Hist. Median
Alkalinity	1,090 mg L ⁻¹	272 mg L ⁻¹	1,090 mg L ⁻¹	249 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	1,075 mg L ⁻¹	309.5 mg L ⁻¹	1,060 mg L ⁻¹	283.5 mg L ⁻¹
Calcium (Ca ²⁺)	18.4 mg L ⁻¹	37.6 mg L ⁻¹	18.6 mg L ⁻¹	47.8 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	145 mg L ⁻¹	12 mg L ⁻¹	154 mg L ⁻¹	17.5 mg L ⁻¹
Conductivity	3,805 µS cm ⁻¹	1,675 µS cm ⁻¹	3,800 µS cm ⁻¹	1,395 µS cm ⁻¹
Dissolved Solids	2,565 mg L ⁻¹	1,150 mg L ⁻¹	2,575 mg L ⁻¹	1,070 mg L ⁻¹
Magnesium (Mg ²⁺)	63.3 mg L ⁻¹	102 mg L ⁻¹	64.4 mg L ⁻¹	88.4 mg L ⁻¹
Sodium (Na ⁺)	819 mg L ⁻¹	219 mg L ⁻¹	811.5 mg L ⁻¹	117 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	808 mg L ⁻¹	592 mg L ⁻¹	815 mg L ⁻¹	587.5 mg L ⁻¹

- Sulfate is the dominant anion in Antelope Lake, while magnesium is the dominant cation (Figure 5).
- Antelope Lake has higher concentrations of sodium and sulfate than the Ecoregion average, while concentrations of calcium and magnesium are lower (Table 2).

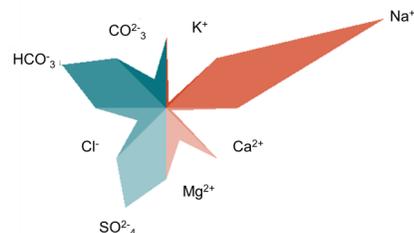


Figure 5. Maucha diagram showing ionic balance based on 2020 data