NORTH Dakota | Environmental Quality
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June 2020

Blumhardt Lake
(46.133221 N, -99.133221 W)

McIntosh County

- Blumhardt Lake is a small reservoir in southeast North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/blumhardt2003.pdf).

- There is one public, paved boat ramp on Blumhardt Lake on the southwest side of the lake.

- The Blumhardt Lake watershed is 435 acres of mostly grassland/pasture (Table 1).

- Blumhardt 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."

- Blumhardt Lake is managed for trout, with catchable rainbow and/or brown trout stocked annually. Only rainbow trout were captured during the last sample by the ND Game and Fish.

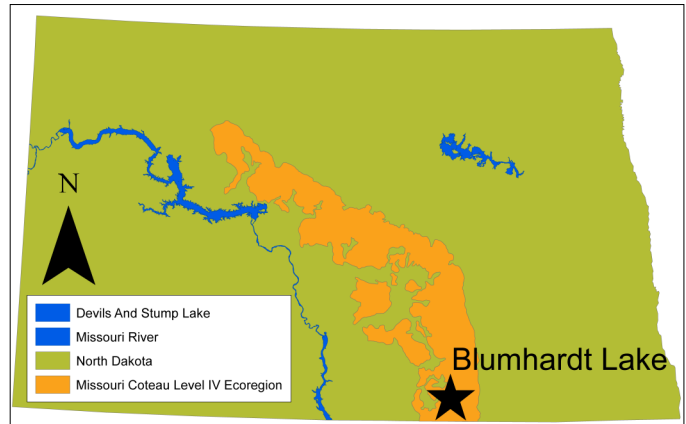- Blumhardt Lake was previously assessed in 2005-2008.

Figure 1. Location of Blumhardt 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	89.2%	44.4%
Open Water	4.3%	2.0%
Agriculture	2.0%	47.0%
Other Hay/Non-Alfalfa	*65.0%*	*12.3%*
Soybeans	*17.5%*	*87.2%*
Alfalfa	*12.5%*	*NA*
Shrubland	1.9%	0.7%
Developed	1.6%	5.0%
Wetlands	0.9%	0.9%

Temperature and Dissolved Oxygen

- Blumhardt Lake regularly stratifies in the summer being small and well-protected.

- Thermal stratification was recorded during all samples in 2019. Top-to-bottom temperature changes of 3.3ºC, 8.2ºC and 2.8ºC 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 during all samples.
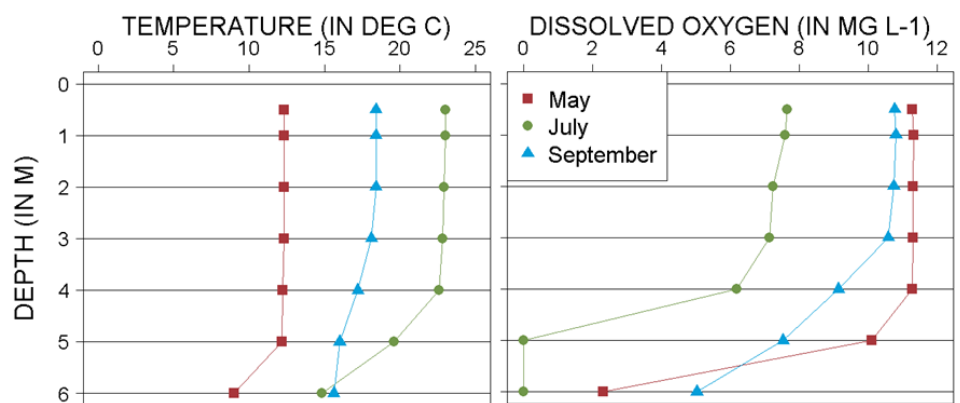

Figure 2. 2019 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})

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.

- Blumhardt Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.

- Current trophic state is similar to historical data.

- Blumhardt Lake was on the state's advisory list in 2019 for continuous confirmed **harmful** algal (cyanobacteria) blooms.
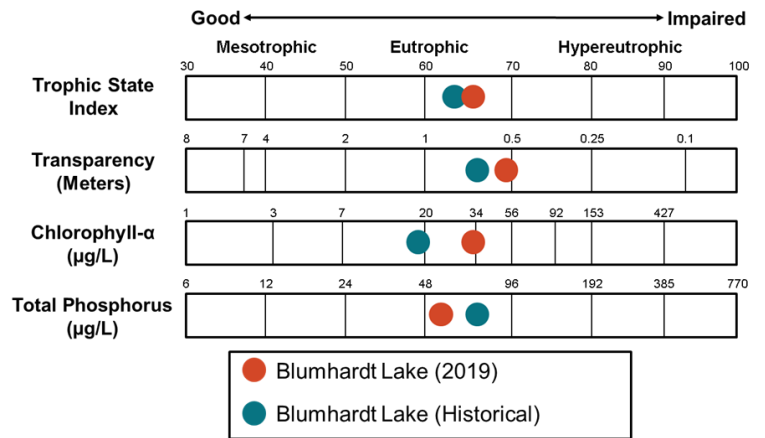

Figure 3. Trophic state indices for 2019 and historical samples

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 Blumhardt Lake is located (Figure 4).

- Median concentration of dissolved TN was less than TN.

- Median 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 much less than TP.

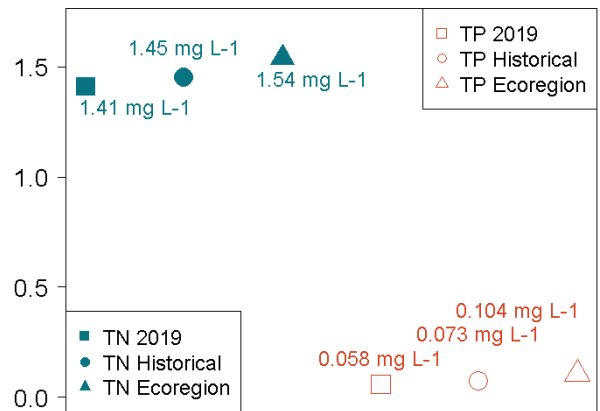- Neither ammonia nor nitrate-plus-nitrite were detected at Blumhardt Lake in 2019.

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 2019 and historical samples and from all Ecoregion natural lakes.

Measure	2019 Median	Historical Median	Ecoregion Median
Alkalinity	232 mg L^{-1}	221 mg L^{-1}	219 mg L^{-1}
Bicarbonate (HCO^-_3)	260 mg L^{-1}	245 mg L^{-1}	244 mg L^{-1}
Calcium (Ca^{2+})	61.7 mg L^{-1}	51.7 mg L^{-1}	49.8 mg L^{-1}
Carbonate (CO^{2-}_3)	13 mg L^{-1}	17 mg L^{-1}	5 mg L^{-1}
Conductivity	1,110 µS cm^{-1}	977 µS cm^{-1}	962 µS cm^{-1}
Dissolved Solids	755 mg L^{-1}	621 mg L^{-1}	614 mg L^{-1}
Magnesium (Mg^{2+})	99.5 mg L^{-1}	80.2 mg L^{-1}	75.6 mg L^{-1}
Sodium (Na^+)	38.7 mg L^{-1}	34 mg L^{-1}	33.9 mg L^{-1}
Sulfate (SO^{2-}_4)	367 mg L^{-1}	290 mg L^{-1}	272.5 mg L^{-1}

- Sulfate is the dominant anion in Blumhardt 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 and less than the median for the Ecoregion.
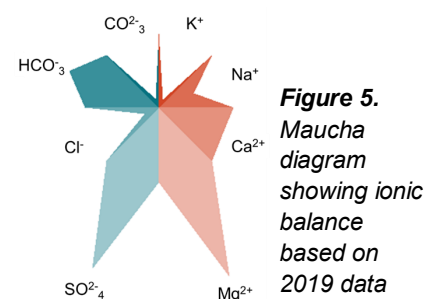

Figure 5.

Maucha diagram showing ionic balance based on 2019 data