NORTH Dakota | Environmental Quality

Be Legendary.™

Contact: Watershed Management Program

Phone: 701-328-5210

November 2020

Brewer Lake

(47.0983 N, -97.41254 W)

Cass County

- Brewer Lake is a small reservoir in eastern North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/brewer2004.pdf).
- There is one public, paved boat ramp on Brewer Lake on the west side of the lake.
- The Brewer Lake watershed is about 6,200 acres of mostly agriculture. Agricultural production in the watershed is dominated by spring wheat, soybeans and corn (Table 1).
- Brewer 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."
- Brewer Lake is managed as a bluegill and largemouth bass fishery, though fingerlings of walleye are stocked intermittently. Largemouth bass and bluegill were the only species captured during the last sample by the ND Game and Fish in 2019.
- Brewer Lake was previously assessed in 1991-1992, 1994 and 2004-2005.

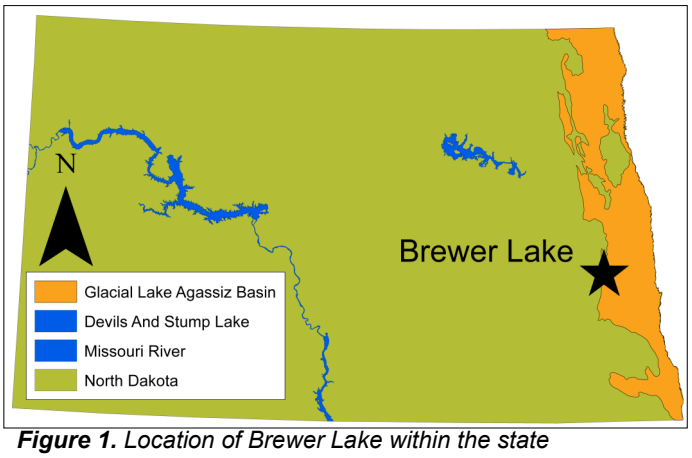

Figure 1. *Location of Brewer Lake within the state*

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	% in Watershed	% within 500 meters
Agriculture	73.1%	21.4%
Corn	52.1%	49.8%
Soybeans	28.9%	2.2%
Spring Wheat	7.9%	36.7%
Grassland/Pasture	14.2%	49.6%
Wetlands	5.3%	16.2%
Developed	3.6%	5.1%
Open Water	2.0%	1.0%
Forest	1.9%	6.6%
Shrubland	< 0.1%	< 0.1%

Temperature and Dissolved Oxygen

- Brewer Lake will stratify in the summer.
- Thermal stratification was recorded in June and July 2020. Top-to-bottom temperature changes of 1.4ºC, 3.7ºC, 5.7ºC and 0.1ºC were recorded in May, June, July and October, respectively.
- Dissolved oxygen concentrations were relatively high throughout the water column during all samples, but did decline sharply in the hypolimnion in July.

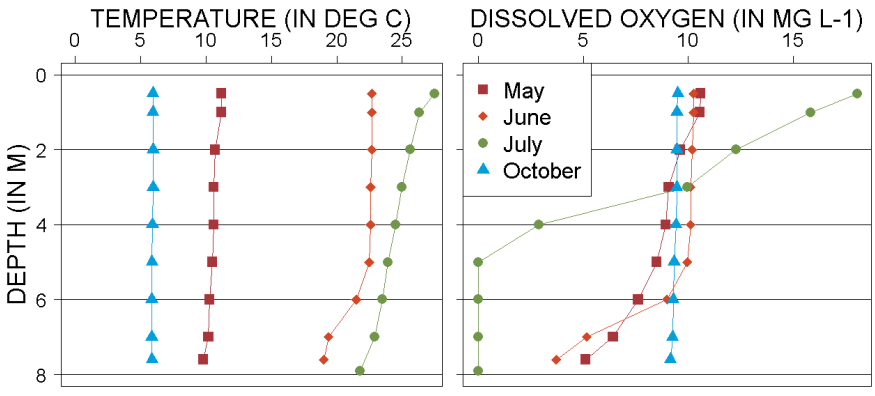

Figure 2. *2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Brewer 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 Brewer Lake as of 2020.

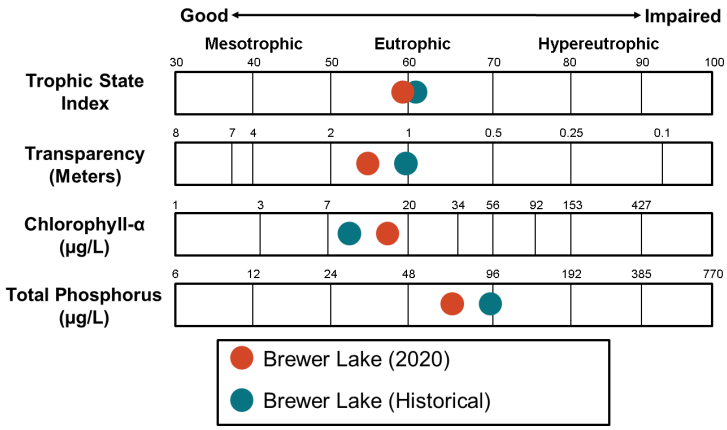

Figure 3. *Trophic state indices for 2020 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was similar to the historical median for the lake but greater than the median for the Glacial Lake Agassiz Basin Level IV Ecoregion (hereafter, Ecoregion) where Brewer 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 but greater than the median for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Ammonia and nitrate-plus-nitrite were detected at Brewer Lake in October 2020, but were not detected in any other samples.

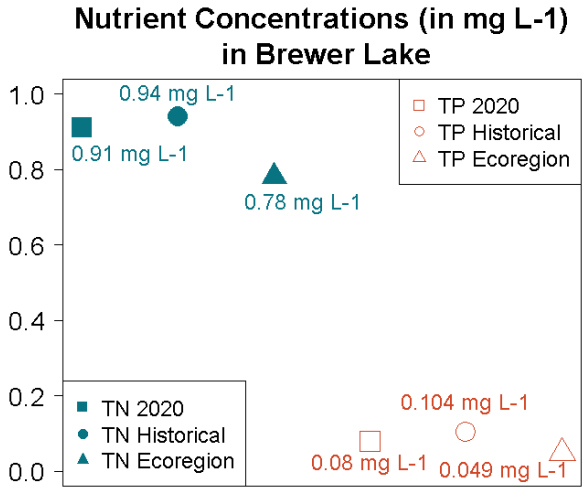

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

Table 2. *Median concentrations of selected constituents for 2020 and historical samples and from all Ecoregion man-made lakes.*

Measure	2020 Median	Historical Median	Ecoregion Median
Alkalinity	215 mg L^{-1}	193.5 mg L^{-1}	223.5 mg L^{-1}
Bicarbonate (HCO^-_3)	256.5 mg L^{-1}	216 mg L^{-1}	260.5 mg L^{-1}
Calcium (Ca^{2+})	70.1 mg L^{-1}	57 mg L^{-1}	72.3 mg L^{-1}
Carbonate (CO^{2-}_3)	5.5 mg L^{-1}	7 mg L^{-1}	8 mg L^{-1}
Conductivity	642 µS cm^{-1}	599 µS cm^{-1}	855 µS cm^{-1}
Dissolved Solids	394 mg L^{-1}	362 mg L^{-1}	513.5 mg L^{-1}
Magnesium (Mg^{2+})	34.2 mg L^{-1}	30.7 mg L^{-1}	35.5 mg L^{-1}
Sodium (Na^+)	14.2 mg L^{-1}	18.5 mg L^{-1}	45.1 mg L^{-1}
Sulfate (SO^{2-}_4)	134 mg L^{-1}	128 mg L^{-1}	190.5 mg L^{-1}

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

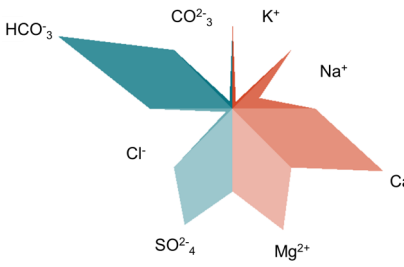

Figure 5. *Maucha diagram showing ionic balance based on 2020 data*