NORTH Dakota | Environmental Quality
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December 2020

Clausen Springs Dam

(46.682814 N, -98.036336 W)

Barnes County

- Clausen Springs Dam is a small reservoir in southeast North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/clausensprings2003.pdf).
- There is one boat ramp on Clausen Springs Dam on the west side of the lake.
- The Clausen Springs Dam watershed is about 53,000 acres of mostly agriculture. The most common crops grown are soybeans, corn and fallow/idle cropland (Table 1).
- Clausen Springs Dam is a Class III fishery, which are "capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota."
- The North Dakota Game and Fish stocked the lake with walleye fingerlings in 2019, but there was no previous stocking reported in recent years. Bluegill and largemouth bass were captured in the last sample by the NDGF in 2020.
- Clausen Springs Dam was previously assessed in 1991-1992, 2005-2006 and 2019.
- In 2020, Clausen Springs Dam was sampled by Valley City State University.

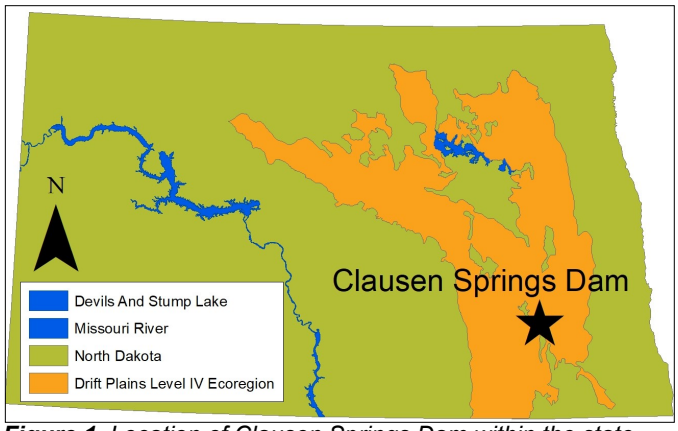

Figure 1. *Location of Clausen Springs Dam within the state*

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	64.6%	10.1%
Soybeans	*51.9%*	*4.0%*
Corn	*19.0%*	*2.2%*
Fallow/Idle Cropland	*14.7%*	*14.3%*
Grassland/Pasture	15.5%	66.2%
Wetlands	14.3%	8.7%
Developed	3.3%	6.4%
Open Water	1.9%	1.0%
Forest	0.3%	7.1%
Barren	< 0.1%	0.4%

Temperature and Dissolved Oxygen

- Clausen Springs Dam commonly stratifies in the summer, with warm, well-oxygenated water at the top of the water column, and cold, low-oxygen water near the bottom.
- There was thermal stratification recorded at most visits in 2020. Temperature change in the water column was 7.7 degrees Celsius (ºC), 5.4ºC, 3.3ºC, 4.9ºC, 2.5ºC, 1.7ºC and 0.0ºC from April through October.
- Most dissolved oxygen concentrations were relatively high, though there was widespread anoxia in July and August.

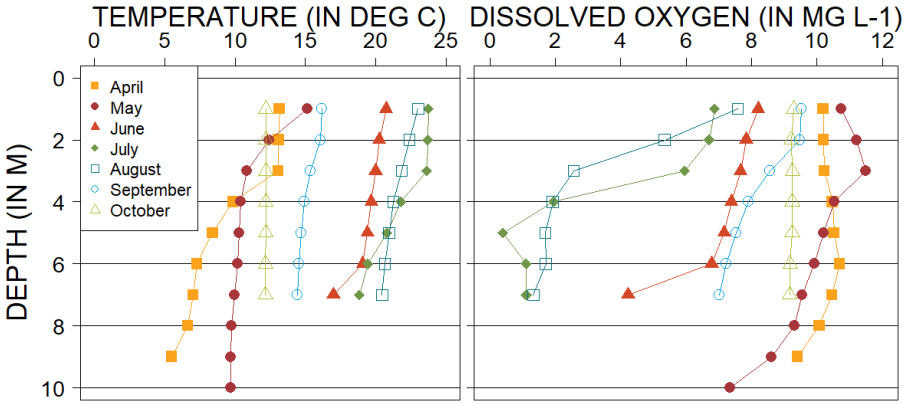

Figure 2. *2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Clausen Springs Dam is a eutrophic reservoir (Figure 3) that has high nutrient concentrations but moderate algal growth.
- Trophic state in 2020 is comparable to historical indices.
- Clausen Springs Dam has not had any confirmed ***harmful*** algal (cyanobacteria) blooms.

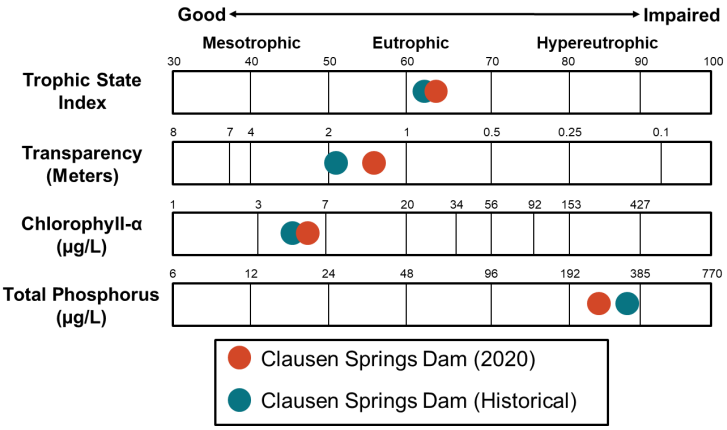

Figure 3. *Trophic state indices for 2020 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was greater than the historical median for the lake and slightly greater than the median for reservoirs in the Drift Plains Level IV Ecoregion (hereafter, Ecoregion) where Clausen Springs Dam is located (Figure 4).
- Median TP concentration in 2020 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- There were no samples collected in 2020 for dissolved nutrients.
- Ammonia was detected at low concentrations in only three samples in 2020 at Clausen Springs Dam, while nitrate-plus-nitrite was detected during most samples at moderate to high concentrations.

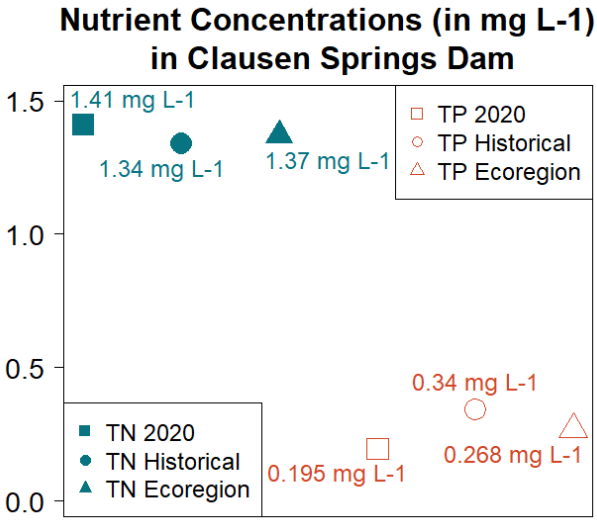

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

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

Measure	2020 Median	Historical Median	Ecoregion Median
Alkalinity	350.5 mg L^{-1}	345 mg L^{-1}	328 mg L^{-1}
Bicarbonate (HCO^-_3)	417 mg L^{-1}	410 mg L^{-1}	364 mg L^{-1}
Calcium (Ca^{2+})	82.5 mg L^{-1}	71.9 mg L^{-1}	73 mg L^{-1}
Carbonate (CO^{2-}_3)	< 1 mg L^{-1}	10.5 mg L^{-1}	16 mg L^{-1}
Conductivity	1,545 µS cm^{-1}	1,255 µS cm^{-1}	1,180 µS cm^{-1}
Dissolved Solids	1,022 mg L^{-1}	785.5 mg L^{-1}	788.5 mg L^{-1}
Magnesium (Mg^{2+})	73.2 mg L^{-1}	52.8 mg L^{-1}	53.7 mg L^{-1}
Sodium (Na^+)	161 mg L^{-1}	133 mg L^{-1}	114 mg L^{-1}
Sulfate (SO^{2-}_4)	415 mg L^{-1}	252.5 mg L^{-1}	292 mg L^{-1}

- Sulfate and bicarbonate are the dominant anions in Clausen Springs Dam, while sodium, 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 and greater than the median for the Ecoregion.

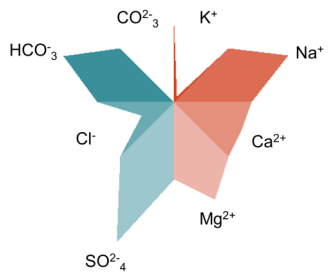

Figure 5. *Maucha diagram showing ionic balance based on 2020 data*