

December 2021

Northgate Dam

(48.923601 N, -102.270756 W)

Burke County

- Northgate Dam is a reservoir in northwestern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/northgate2020.pdf>).
- There is one paved, public boat ramp near the impoundment.
- The Northgate Dam watershed is about 72,000 acres of mostly agriculture. The most common crops grown are spring wheat, canola and soybeans (Table 1).
- Northgate Dam is a Class II fishery, which are “capable of supporting natural reproduction and growth of cool water fishes (e.g., northern pike and walleye) and associated aquatic biota.”
- Northgate Dam is managed by the NDGF as a rainbow trout and walleye fishery, with catchables of the former stocked annually. Bluegill, black crappie, rainbow trout, and walleye were captured in the last sample by the NDGF in 2020.
- Northgate Dam was last sampled in 1991-1992, 2002-2003, and 2011 by the NDDEQ.

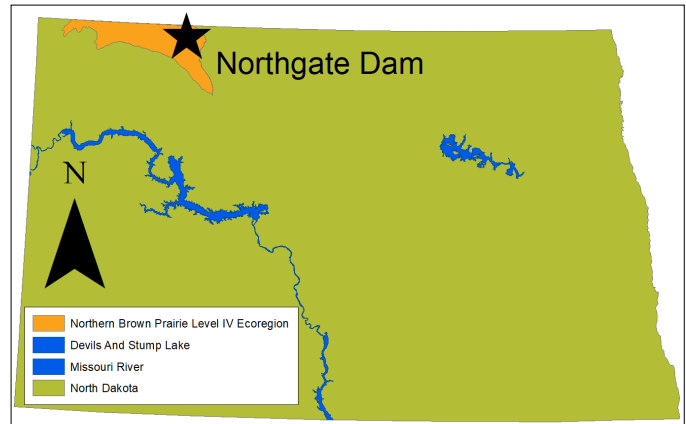


Figure 1. Location of Northgate Dam within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2020). Value listed of crop type represents percentage of total production

Land Cover Type	% in Watershed	% within 500 meters
Agriculture	70.0%	54.9%
Spring Wheat	39.1%	25.9%
Canola	20.2%	66.7%
Soybeans	13.0%	0.9%
Grassland/Pasture	15.6%	30.2%
Wetlands	7.8%	8.6%
Developed	4.0%	4.4%
Open Water	2.3%	1.8%
Barren	0.1%	< 0.1%
Shrubland	< 0.1%	n/a

Temperature and Dissolved Oxygen

- Northgate Dam commonly stratifies in the summer, with cooler, low-oxygen water in the hypolimnion.
- Thermal stratification was recorded in June and July 2021. Temperature change in the water column was 1.6 degrees Celsius (°C), 3.8°C, 5.8°C, and 0.0°C in May, June, July and October, respectively.
- Dissolved oxygen concentrations were depleted during thermal stratification, especially during strong stratification in July.

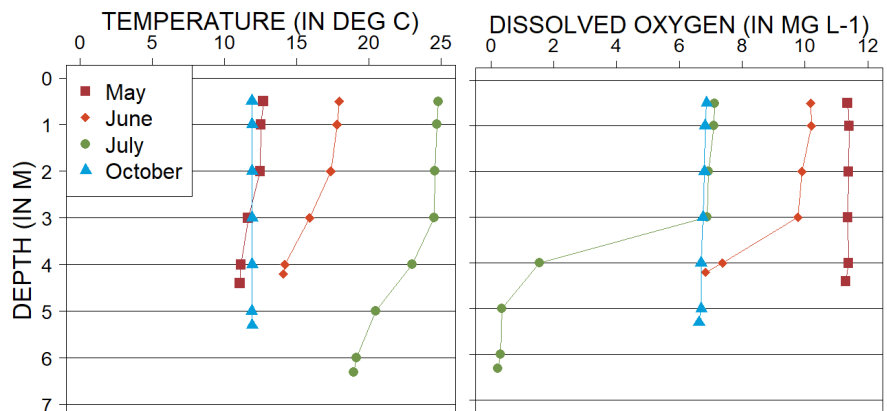


Figure 2. 2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L⁻¹)

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.
- Northgate Dam is a eutrophic reservoir (Figure 3) with relatively high nutrient concentrations, but moderate algal growth and moderate transparency.
- Trophic state in 2021 was improved compared to historical indices.
- Northgate Dam has not been listed for confirmed **harmful** algal (cyanobacteria) blooms.

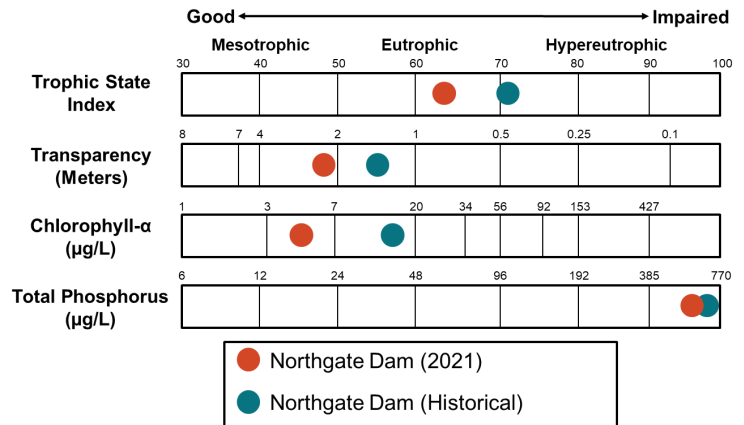


Figure 3. Trophic state indices for 2021 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) at Northgate Dam in 2021 was greater than the historical median for the lake but less than the median for reservoirs in the Northern Dark Brown Prairie Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median TP concentration at Northgate Dam in 2021 was less than the median for the lake but much greater than the median for the Ecoregion (Figure 4).
- Median concentrations of dissolved nutrients at Northgate Dam in 2021 were comparable to concentrations of total nutrients.
- Ammonia and nitrate-plus-nitrite were detected at Northgate Dam during most samples in 2021, but most concentrations were relatively low.

Nutrient Concentrations (in mg L⁻¹) in Northgate Dam

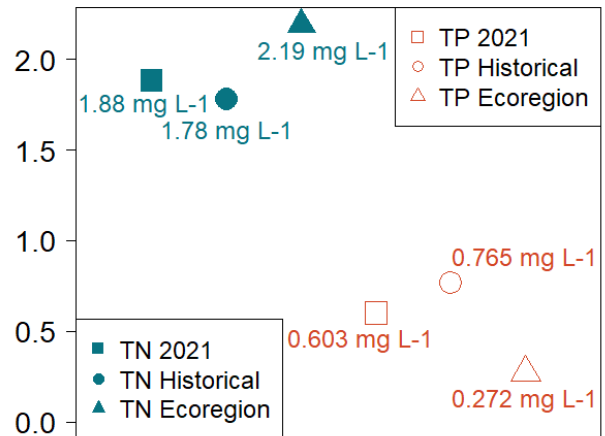


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

Table 2. Median concentrations of selected constituents for 2021 and historical samples and from all Ecoregion reservoirs.

Measure	2021 Median	Historical Median	Ecoregion Median
Alkalinity	347.5 mg L ⁻¹	256 mg L ⁻¹	299.5 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	407.5 mg L ⁻¹	310 mg L ⁻¹	346 mg L ⁻¹
Calcium (Ca ²⁺)	68.5 mg L ⁻¹	46.7 mg L ⁻¹	56.8 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	13.5 mg L ⁻¹	2 mg L ⁻¹	5 mg L ⁻¹
Conductivity	1,565 µS cm ⁻¹	795 µS cm ⁻¹	1,460 µS cm ⁻¹
Dissolved Solids	1,064 mg L ⁻¹	488 mg L ⁻¹	998.5 mg L ⁻¹
Magnesium (Mg ²⁺)	70.9 mg L ⁻¹	31.8 mg L ⁻¹	49.7 mg L ⁻¹
Sodium (Na ⁺)	169 mg L ⁻¹	69.5 mg L ⁻¹	197 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	481 mg L ⁻¹	152 mg L ⁻¹	440 mg L ⁻¹

- Sulfate and bicarbonate are co-dominant anions in Northgate Dam, while sodium and magnesium are co-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.

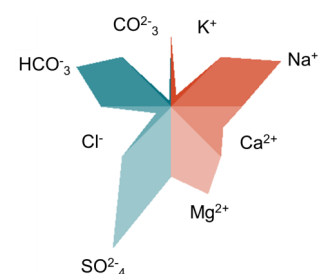


Figure 5. Maucha diagram showing ionic balance based on 2021 data