NORTH Dakota | Environmental Quality

Be Legendary.™

Contact: Watershed Management Program

Phone: 701-328-5210

December 2021

George Lake

(48.123055 N, -100.419895 W)

McHenry County

- George Lake is a small, natural lake in northern North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/georgemchenry2010.pdf).
- There is one boat ramp on George Lake on the north side of the lake.
- The George Lake watershed is about 48,000 acres of mostly agriculture and grassland/ pasture. The most common crops grown are soybeans, spring wheat and corn (Table 1).
- George Lake 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."
- George Lake is managed by the NDGF as a northern pike fishery, though there has been relatively little stocking in recent history. Northern pike and yellow perch were captured in the last sample by the NDGF in 2020.
- George Lake was previously assessed in 1995-1996 and 2005-2006 by the NDDEQ.

Figure 1. *Location of George Lake 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	41.8%	14.7%
Soybeans	*30.6%*	*1.7%*
Spring Wheat	*23.5%*	*2.0%*
Corn	*10.2%*	*n/a*
Grassland/Pasture	30.0%	55.8%
Wetlands	12.3%	21.1%
Open Water	11.5%	0.5%
Developed	3.3%	2.1%
Forest	0.8%	5.7%
Shrubland	< 0.1%	n/a

Temperature and Dissolved Oxygen

- George Lake stratifies in the summer, with warmer, well-oxygenated water in the epilimnion, and cooler, low-oxygen water near the bottom.
- Thermal stratification was only recorded in June 2021. Temperature change in the water column was 1.6 degrees Celsius (ºC), 4.8ºC, 0.2ºC, and 0.1ºC in May, June, August and October, respectively.
- Most dissolved oxygen concentrations were relatively high, except during strong stratification in June.

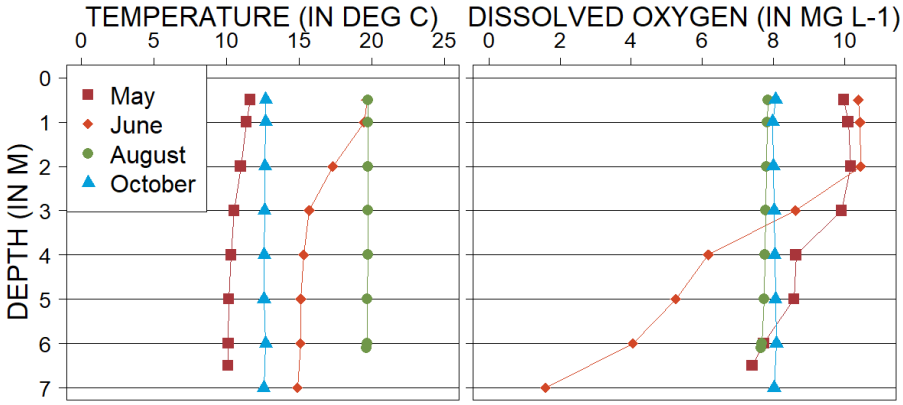

Figure 2. *2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- George Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations but low algal growth.
- Trophic state in 2021 is comparable to historical indices.
- George Lake has not had any confirmed ***harmful*** algal (cyanobacteria) blooms.

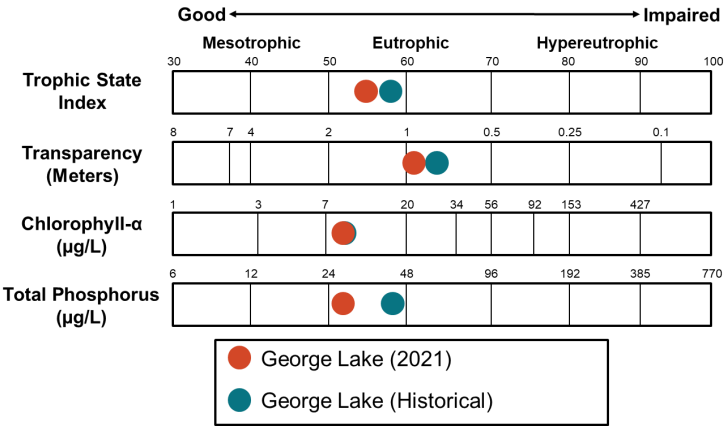

Figure 3. *Trophic state indices for 2021 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) at George Lake in 2021 was less than the historical median for the lake and less than the median for natural lakes in the Glacial Lake Deltas Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median TP concentration in 2021 was similar to the median for the lake and the median for the Ecoregion (Figure 4).
- Median concentrations of dissolved nutrients were similar to concentrations of total nutrients.
- Ammonia and nitrate-plus-nitrite were only detected in October 2021 at low concentrations.

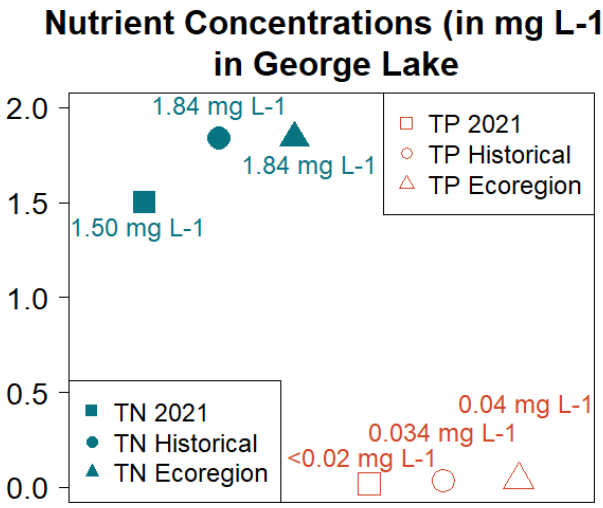

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

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

Measure	2021 Median	Historical Median	Ecoregion Median
Alkalinity	425 mg L^{-1}	416 mg L^{-1}	444 mg L^{-1}
Bicarbonate (HCO^-_3)	476 mg L^{-1}	454 mg L^{-1}	483 mg L^{-1}
Calcium (Ca^{2+})	19.7 mg L^{-1}	24.7 mg L^{-1}	25.4 mg L^{-1}
Carbonate (CO^{2-}_3)	21.5 mg L^{-1}	31 mg L^{-1}	32 mg L^{-1}
Conductivity	785 µS cm^{-1}	786 µS cm^{-1}	1,510 µS cm^{-1}
Dissolved Solids	451 mg L^{-1}	431 mg L^{-1}	993 mg L^{-1}
Magnesium (Mg^{2+})	52.4 mg L^{-1}	45.6 mg L^{-1}	84.6 mg L^{-1}
Sodium (Na^+)	82.8 mg L^{-1}	73.6 mg L^{-1}	176 mg L^{-1}
Sulfate (SO^{2-}_4)	14.3 mg L^{-1}	11 mg L^{-1}	224 mg L^{-1}

- Bicarbonate is the dominant anion in George Lake, while sodium and magnesium are co-dominant cations (Figure 5).
- Median concentrations of most cations and anions are similar to the historical median for the lake and less than the median for the Ecoregion.

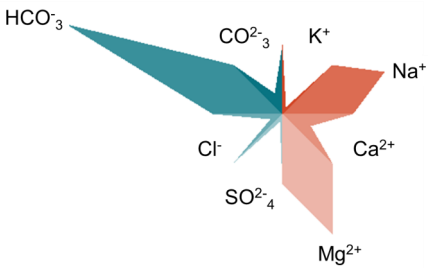

Figure 5. *Maucha diagram showing ionic balance based on 2021 data*