NORTH Dakota | Environmental Quality
Be Legendary.™

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December 2020

South Golden Lake

(47.57175 N, -97.63764 W)

Steele County

- South Golden Lake is a natural lake in southeast North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/goldensouth2004.pdf).
- There are two public, paved boat ramp on South Golden Lake, one each on the east and west sides of the lake.
- The South Golden Lake watershed is difficult to delineate given diverted flows in the area. Agriculture is the dominant land cover near the lake and is dominated by soybeans, corn and spring wheat.
- South Golden Lake is a Class III, warm-water fishery, which are "capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota."
- South Golden Lake is managed for walleye, with fingerlings stocked annually. Only black bullhead and walleye were captured during the last sample by the ND Game and Fish in 2019.
- South Golden Lake was previously assessed in 1991-1992, 1997-2006 and 2010.

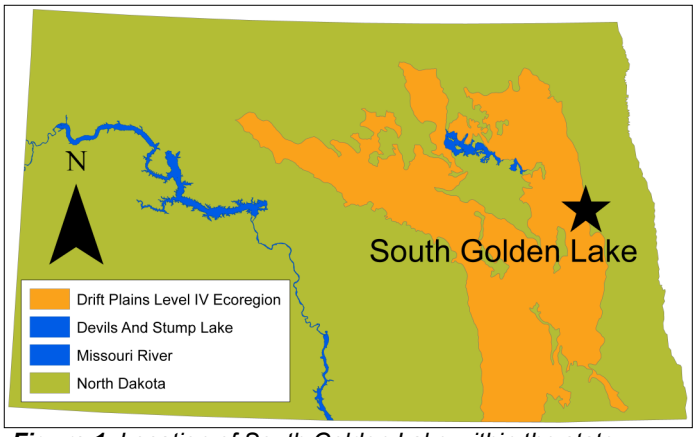

Figure 1. *Location of South Golden Lake within the state*

Table 1. *Percentage of land cover near the lake (NASS, 2019). Value listed of crop type represents percentage of total production*

Land Cover Type	% within 500 meters
Agriculture	71.4%
Soybeans	31.6%
Corn	21.2%
Spring Wheat	18.7%
Developed	9.2%
Wetlands	7.6%
Grassland/Pasture	6.2%
Open Water	5.1%
Forest	0.4%
Barren	< 0.1%

Temperature and Dissolved Oxygen

- South Golden Lake rarely stratifies during the open-water season.
- Thermal stratification was not recorded in 2020. Top-to-bottom temperature changes of 0.1ºC, 0.2ºC, 0.9ºC and 0.0ºC 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 in July with some weak stratification.

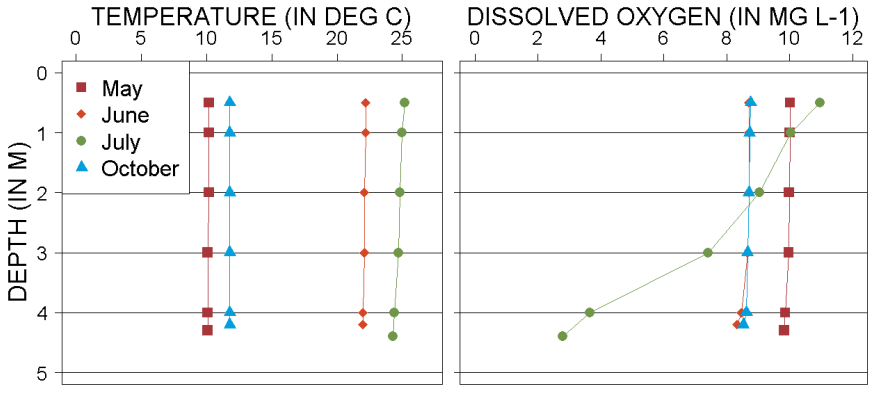

Figure 2. *2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- South Golden Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- Current trophic state is similar to historical data.
- South Golden Lake was on the state's ***warning*** list for a large harmful cyanobacteria bloom in 2020.

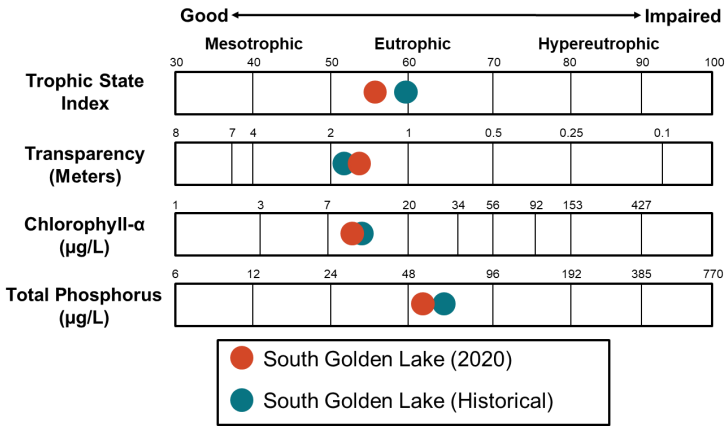

Figure 3. *Trophic state indices for 2020 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was less than the historical median for the lake and less than the median for the Drift Plains Level IV Ecoregion (hereafter, Ecoregion) where South Golden Lake is located (Figure 4).
- Median concentration of dissolved TN was less than TN.
- Median total phosphorus (TP) concentration in 2020 was similar to the median for the lake and less than the median for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Ammonia was not detected at South Golden Lake in 2020, while nitrate-plus-nitrite was detected only once.

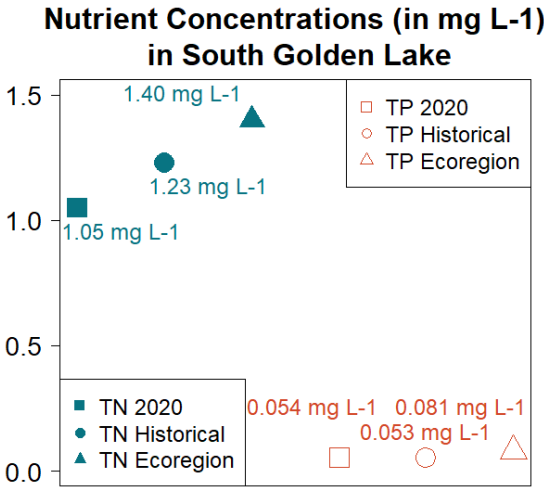

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

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

Measure	2020 Median	Historical Median	Ecoregion Median
Alkalinity	247 mg L^{-1}	205 mg L^{-1}	249 mg L^{-1}
Bicarbonate (HCO^-_3)	280.5 mg L^{-1}	227.5 mg L^{-1}	283.5 mg L^{-1}
Calcium (Ca^{2+})	106.5 mg L^{-1}	96.6 mg L^{-1}	47.8 mg L^{-1}
Carbonate (CO^{2-}_3)	12 mg L^{-1}	7 mg L^{-1}	17.5 mg L^{-1}
Conductivity	1,370 µS cm^{-1}	1,280 µS cm^{-1}	1,395 µS cm^{-1}
Dissolved Solids	972 mg L^{-1}	1,010 mg L^{-1}	1,070 mg L^{-1}
Magnesium (Mg^{2+})	83.4 mg L^{-1}	89.6 mg L^{-1}	88.4 mg L^{-1}
Sodium (Na^+)	90.8 mg L^{-1}	106.5 mg L^{-1}	117 mg L^{-1}
Sulfate (SO^{2-}_4)	502 mg L^{-1}	573 mg L^{-1}	587.5 mg L^{-1}

- Sulfate is the dominant anion in South Golden Lake, while magnesium, calcium and sodium are the dominant cations (Figure 5).
- Median concentrations of most cations and anions are similar to the historical median for the lake but less than median concentrations for most analytes for the Ecoregion.

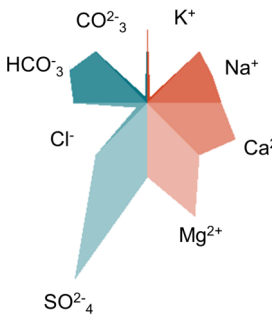

Figure 5. *Maucha diagram showing ionic balance based on 2020 data*