NORTH Dakota | Environmental Quality
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Silver Lake
(46.02345 N, -97.56973 W)

Sargent County

- Silver Lake is a natural lake in southeast North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/silversargent2005.pdf).

- There are two public, paved boat ramps on Silver Lake, one each on the north and south sides of the lake.

- The Silver Lake watershed is greater than 240,000 acres of mostly agriculture in the North Dakota portion. Agricultural production in the North Dakota portion of the watershed is dominated by corn and soybeans (Table 1).

- Silver 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."

- Silver Lake is managed for walleye, with fingerlings stocked annually. Bullhead, common carp, northern pike, walleye, white sucker and yellow perch were captured during the last sample by the ND Game and Fish in 2018.

- Silver Lake was previously assessed in 1992-1993.

Figure 1. Location of Silver 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	60.4%	45.8%
Corn	36.2%	18.6%
Soybeans	32.3%	56.7%
Fallow/Idle Cropland	25.2%	17.5%
Wetlands	18.3%	22.8%
Grassland/Pasture	15.3%	20.0%
Developed	3.2%	6.0%
Open Water	1.9%	4.7%
Forest	0.8%	0.7%
Barren	< 0.1%	NA

Temperature and Dissolved Oxygen

- Being shallow and wind-swept, Silver Lake rarely stratifies during the open-water season.

- Thermal stratification was recorded in May and July 2020. Top-to-bottom temperature changes of 2.4ºC, 0.3ºC, 1.8ºC and 0.6ºC were recorded in May, June, July and September, respectively.

- Dissolved oxygen concentrations were relatively high throughout the water column during all samples.
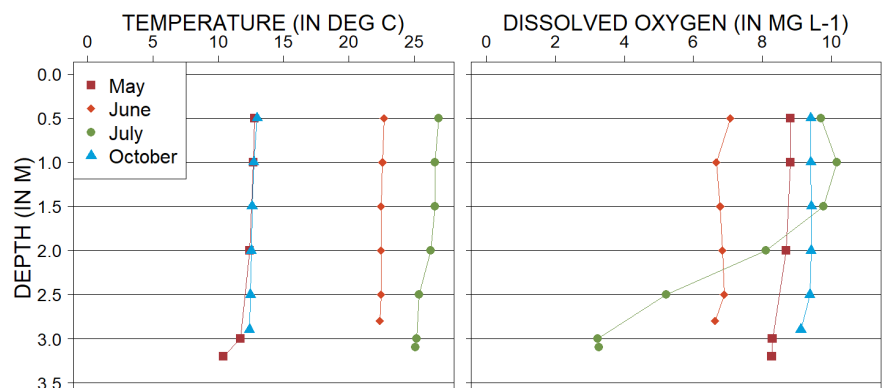

Figure 2. 2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})

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.

- Silver Lake is a eutrophic lake (Figure 3) that has relatively high nutrient concentrations and moderate algal growth.

- Current trophic state is similar to historical data.

- There have been no confirmed *harmful* algal (cyanobacteria) blooms at Silver Lake as of 2020.
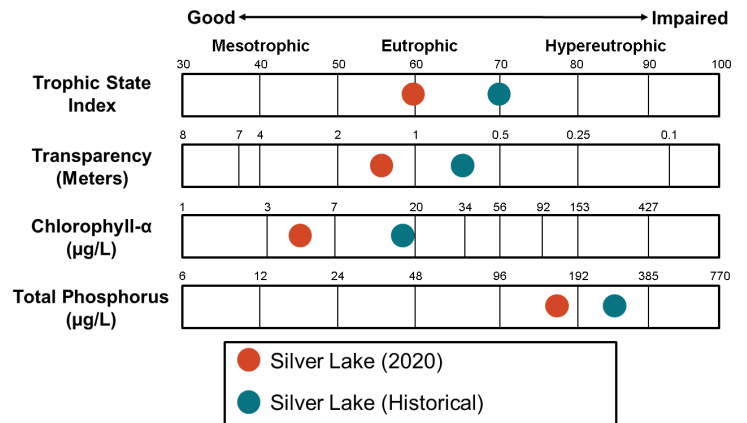

Figure 3. Trophic state indices for 2020 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was greater than the median for the Tewaukon Dead Ice Moraine Level IV Ecoregion (hereafter, Ecoregion) where Silver Lake is located (Figure 4). There is no historical TN data for Silver Lake.

- 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 during multiple samples at Silver Lake in 2020, with some concentrations being relatively high.
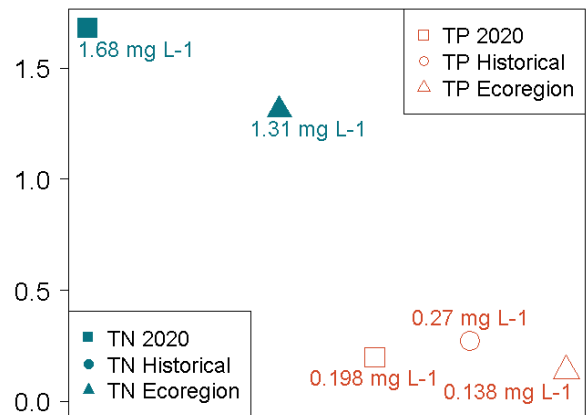

Figure 4. Median concentrations of TN and TP in mg L^{-1} compared to regional medians

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	330 mg L^{-1}	305 mg L^{-1}	287 mg L^{-1}
Bicarbonate (HCO_3^-)	399 mg L^{-1}	372 mg L^{-1}	321 mg L^{-1}
Calcium (Ca^{2+})	110 mg L^{-1}	123 mg L^{-1}	119 mg L^{-1}
Carbonate (CO_3^{2-})	6.5 mg L^{-1}	NA	10 mg L^{-1}
Conductivity	1,525 µS cm^{-1}	2,043 µS cm^{-1}	1,886 µS cm^{-1}
Dissolved Solids	1,050 mg L^{-1}	1,470 mg L^{-1}	1,410 mg L^{-1}
Magnesium (Mg^{2+})	99.2 mg L^{-1}	112 mg L^{-1}	118 mg L^{-1}
Sodium (Na^+)	99.1 mg L^{-1}	171 mg L^{-1}	89.8 mg L^{-1}
Sulfate (SO_4^{2-})	523 mg L^{-1}	782 mg L^{-1}	765 mg L^{-1}

- Sulfate and bicarbonate are the dominant anions in Silver Lake, while magnesium and calcium are the dominant cations (Figure 5).

- Median concentrations of most cations and anions are less than the historical median for the lake and less than the median for the Ecoregion.
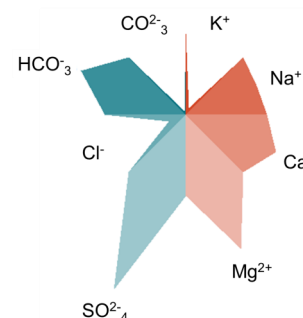

Figure 5. Maucha diagram showing ionic balance based on 2020 data