NORTH Dakota | Environmental Quality
Be Legendary.™

Contact: Watershed Management Program
Phone: 701-328-5210

November 2020

Sprague Lake

(46.01814 N, -97.54516 W)

Sargent County

- Sprague Lake is a large natural lake in southeast North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/sprague2005.pdf).
- There is one public, paved boat ramp on Sprague Lake on the east side of the lake.
- The Sprague Lake watershed is about 23,000 acres of mostly agriculture in the North Dakota portion. Agricultural production in the North Dakota portion of the watershed is dominated by soybeans and corn (Table 1).
- Sprague 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."
- Sprague Lake is managed for walleye, with fingerlings stocked annually. Black bullhead, common carp, walleye, white sucker, black crappie, northern pike, quillback and yellow perch were captured during the last sample by the ND Game and Fish in 2018.
- Sprague Lake was previously assessed in 2010.

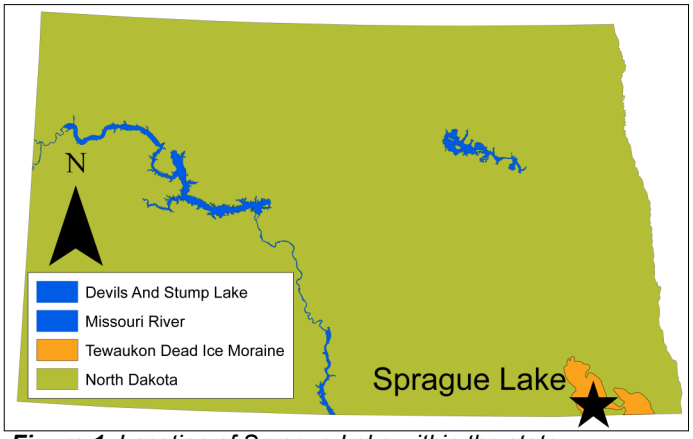

Figure 1. *Location of Sprague Lake within the state*

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	63.7%	15.3%
Soybeans	39.0%	38.2%
Corn	32.4%	13.5%
Fallow/Idle Cropland	18.9%	37.6%
Grassland/Pasture	21.0%	25.6%
Wetlands	9.3%	49.6%
Developed	3.0%	3.9%
Open Water	2.0%	5.1%
Forest	0.8%	0.3%
Barren	< 0.1%	NA

Temperature and Dissolved Oxygen

- Being large, shallow and wind-swept, Sprague Lake is generally well-mixed during the open-water season.
- Thermal stratification was recorded in May and July 2020. Top-to-bottom temperature changes of 3.0ºC, 0.3ºC, 1.8ºC and 0.3ºC were recorded in May, June, July and September, respectively.
- Dissolved oxygen concentrations were relatively high throughout the water column during all samples.

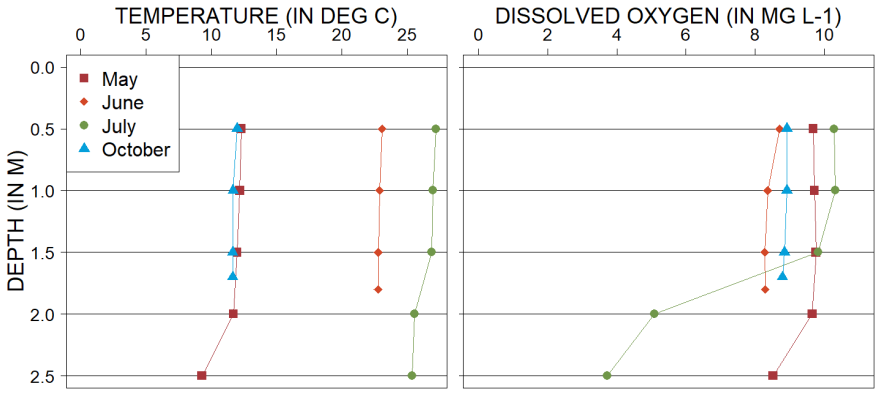

Figure 2. *2020 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Sprague 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 Sprague Lake as of 2020.

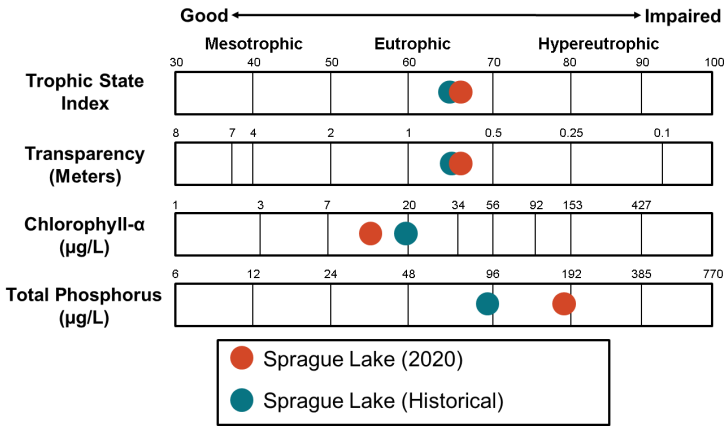

Figure 3. *Trophic state indices for 2020 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2020 was greater than the historical median for the lake and less than the median for the Tewaukon Dead Ice Moraine Level IV Ecoregion (hereafter, Ecoregion) where Sprague Lake is located (Figure 4).
- Median concentration of dissolved TN was similar to TN.
- Median total phosphorus (TP) concentration in 2020 was greater than the median for the lake and 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 at during most samples Sprague Lake in 2020, with some high concentrations.

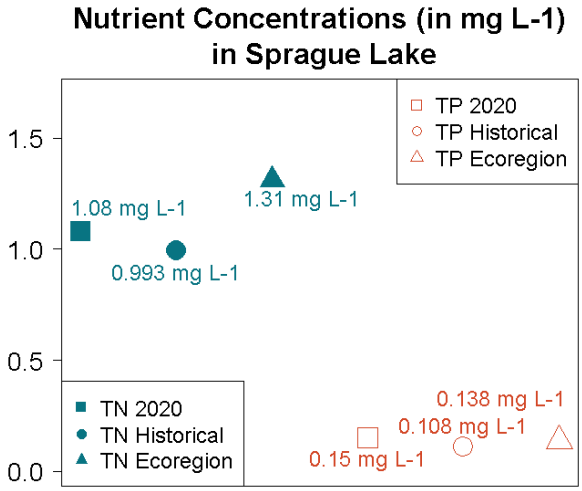

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

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

Measure	2020 Median	Historical Median	Ecoregion Median
Alkalinity	242 mg L^{-1}	210 mg L^{-1}	287 mg L^{-1}
Bicarbonate (HCO^-_3)	291 mg L^{-1}	239 mg L^{-1}	321 mg L^{-1}
Calcium (Ca^{2+})	176 mg L^{-1}	209 mg L^{-1}	119 mg L^{-1}
Carbonate (CO^{2-}_3)	3 mg L^{-1}	9 mg L^{-1}	10 mg L^{-1}
Conductivity	1,710 µS cm^{-1}	1,990 µS cm^{-1}	1,886 µS cm^{-1}
Dissolved Solids	1,320 mg L^{-1}	1,620 mg L^{-1}	1,410 mg L^{-1}
Magnesium (Mg^{2+})	119.5 mg L^{-1}	161 mg L^{-1}	118 mg L^{-1}
Sodium (Na^+)	63.5 mg L^{-1}	80.8 mg L^{-1}	89.8 mg L^{-1}
Sulfate (SO^{2-}_4)	787.5 mg L^{-1}	1,020 mg L^{-1}	765 mg L^{-1}

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

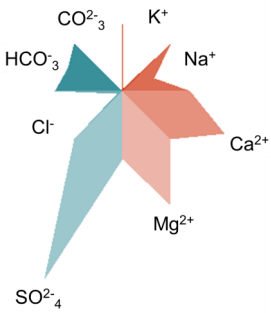

Figure 5. *Maucha diagram showing ionic balance based on 2020 data*