NORTH Dakota | Environmental Quality
Be Legendary.™

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

December 2019

Crystal Springs Lake

(46.878191 N, -99.447809 W)

Kidder and Stutsman Counties

- Crystal Springs Lake is a small natural lake in central North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/crystalsprings2005.pdf).
- There is one public, paved boat ramp on Crystal Springs Lake on the west side of the lake.
- The Crystal Springs Lake watershed is about 700 acres of mostly grassland/pasture, open water and agriculture. The most common crops grown are spring wheat, other hay/non-alfalfa and peas (Table 1).
- Crystal Springs 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."
- Crystal Springs Lake is managed for walleye, with fingerlings of each stocked annually. Walleye, bullhead species, yellow perch, northern pike, golden shiner and white sucker were captured during the last sample by the ND Game and Fish.
- Crystal Springs Lake was previously assessed in 2008.

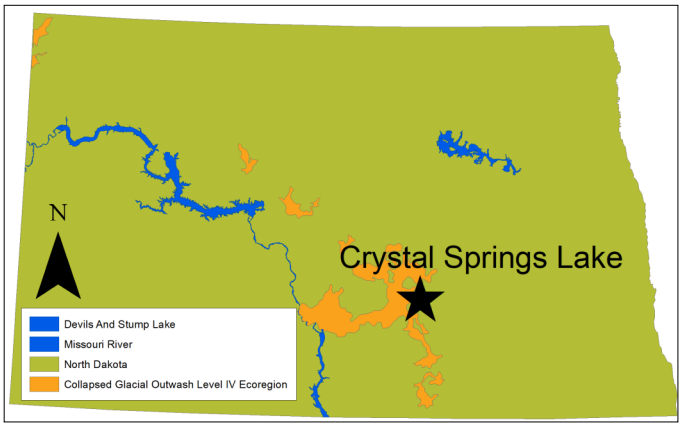

Figure 1. *Location of Crystal Springs Lake within the state*

Table 1. *Percentage of land cover in the watershed and near the lake (NASS, 2018). Value listed of crop type represents percentage of total production*

Land Cover Type	% in Watershed	% within 500 meters
Grassland/Pasture	36.4%	46.9%
Open Water	29.0%	17.7%
Agriculture	18.6%	14.3%
Spring Wheat	*42.2%*	*16.1%*
Other Hay/Non-Alfalfa	*24.2%*	*39.5%*
Peas	*12.9%*	*6.6%*
Developed	12.5%	15.2%
Wetlands	3.0%	5.3%
Forest	0.6%	0.6%
Shrubland	< 0.1%	< 0.1%

Temperature and Dissolved Oxygen

- Crystal Springs Lake rarely stratifies in the summer due to a being a shallow, wind-swept lake.
- There was no thermal stratification recorded in 2019. There was no temperature change during any profile recorded in 2019.
- Dissolved oxygen concentrations were relatively high throughout the water column during all samples.

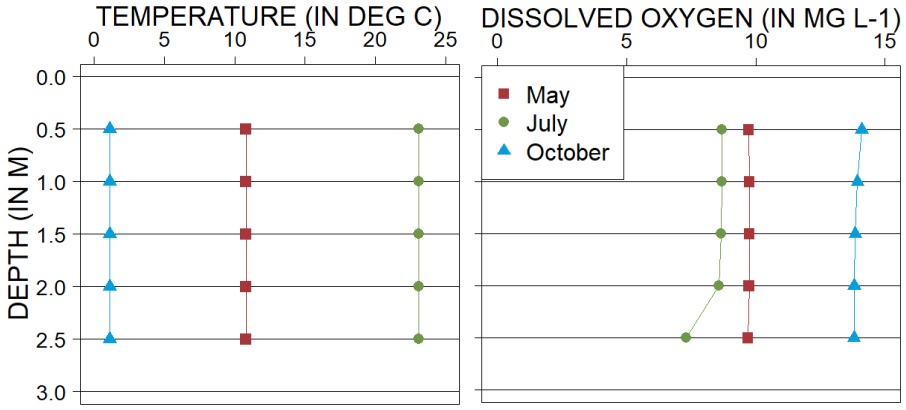

Figure 2. *2019 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Crystal Springs Lake is a mesotrophic lake (Figure 3) that has low to moderate nutrient concentrations and moderate algal growth.
- Current trophic state has improved slightly compared to historical data.
- Crystal Springs Lake has not had any confirmed ***harmful*** algal (cyanobacteria) blooms.

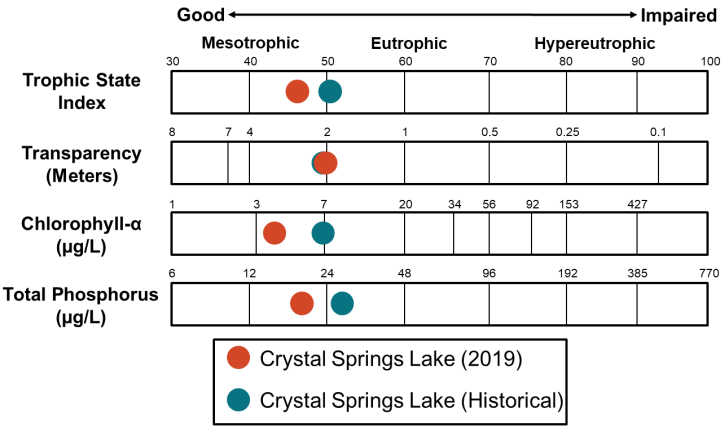

Figure 3. *Trophic state indices for 2019 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2019 was less than the historical median for the lake and much less than the median for the Collapsed Glacial Outwash Level IV Ecoregion (hereafter, Ecoregion) where Crystal Springs Lake is located (Figure 4).
- Median concentration of dissolved TN was slightly less than TN.
- Median TP concentration in 2019 was less than the median for the lake and less than the median for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was similar to TP.
- Neither ammonia nor nitrate-plus-nitrite were detected at Crystal Springs Lake in 2019.

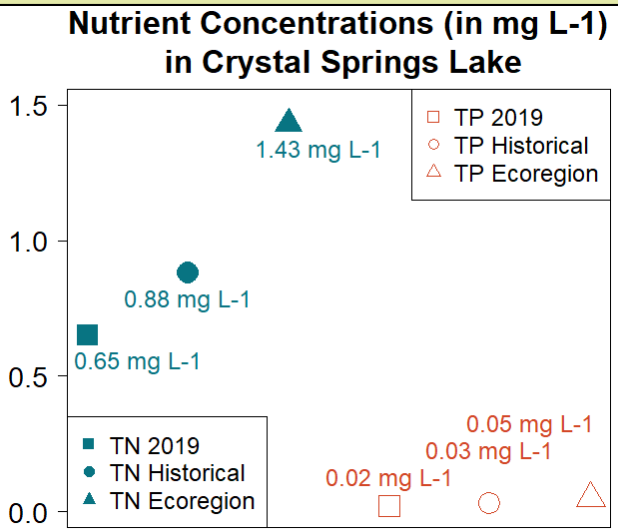

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

Table 2. *Median concentrations of selected constituents for 2019 and historical samples and from all Ecoregion natural lakes.*

Measure	2019 Median	Historical Median	Ecoregion Median
Alkalinity	200 mg L^{-1}	198 mg L^{-1}	464 mg L^{-1}
Bicarbonate (HCO^-_3)	240 mg L^{-1}	198 mg L^{-1}	463 mg L^{-1}
Calcium (Ca^{2+})	27.4 mg L^{-1}	23.4 mg L^{-1}	26.1 mg L^{-1}
Carbonate (CO^{2-}_3)	4 mg L^{-1}	21.5 mg L^{-1}	56 mg L^{-1}
Conductivity	620 µS cm^{-1}	728 µS cm^{-1}	1,760 µS cm^{-1}
Dissolved Solids	364 mg L^{-1}	442 mg L^{-1}	1,240 mg L^{-1}
Magnesium (Mg^{2+})	40.7 mg L^{-1}	50.8 mg L^{-1}	86.7 mg L^{-1}
Sodium (Na^+)	37.7 mg L^{-1}	52.3 mg L^{-1}	164 mg L^{-1}
Sulfate (SO^{2-}_4)	121 mg L^{-1}	170 mg L^{-1}	547 mg L^{-1}

- Bicarbonate is the dominant anion in Crystal Springs Lake, while magnesium is the dominant cation (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.

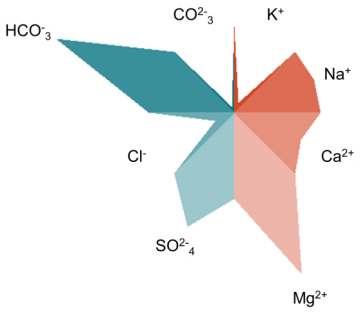

Figure 5. *Maucha diagram showing ionic balance based on 2019 data*