

December 2021

# Hehn-Schaffer Lake

(46.682619 N, -99.132497 W)

## Stutsman County

- Hehn-Schaffer Lake is a large, natural lake in eastern North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/hehnschaffer2011.pdf>).
- There is one boat ramp on Hehn-Schaffer Lake on the northwest side of the lake.
- The Hehn-Schaffer Lake watershed is about 6,300 acres of mostly agriculture. The most common crops grown are soybeans, with a substantial portion as fallow/idle cropland (Table 1).
- Hehn-Schaffer 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.”
- The lake is managed by the NDGF as a walleye and northern pike fishery, with fingerlings of one (or both) stocked annually. Walleye, northern pike and yellow perch were captured in the last sample by the NDGF in 2020.
- Hehn-Schaffer Lake was previously assessed in 2011 by the NDDEQ.

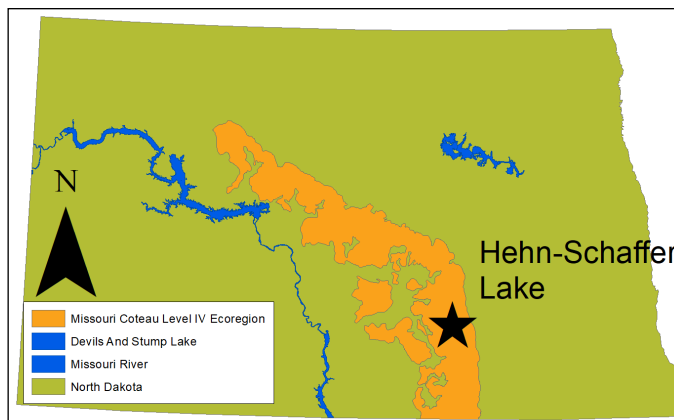


Figure 1. Location of Hehn-Schaffer Lake within the state

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	52.9%	65.3%
Soybeans	52.1%	73.1%
Fallow/Idle Cropland	36.7%	8.2%
Other Hay/Non-Alfalfa	5.2%	2.0%
Grassland/Pasture	20.2%	10.3%
Open Water	17.7%	12.3%
Wetlands	6.8%	9.1%
Developed	1.6%	2.8%
Barren	< 0.1%	< 0.1%
Forest	< 0.1%	< 0.1%

## Temperature and Dissolved Oxygen

- Hehn-Schaffer Lake rarely stratifies in the summer, and remains well-mixed throughout the open-water season.
- There was no thermal stratification recorded in 2021. Temperature change in the water column was 0.5 degrees Celsius (°C), 1.4°C, 0.8°C, and 0.3°C in May, June, August and October, respectively.
- Most dissolved oxygen concentrations were relatively high, though there was some depletion in August.

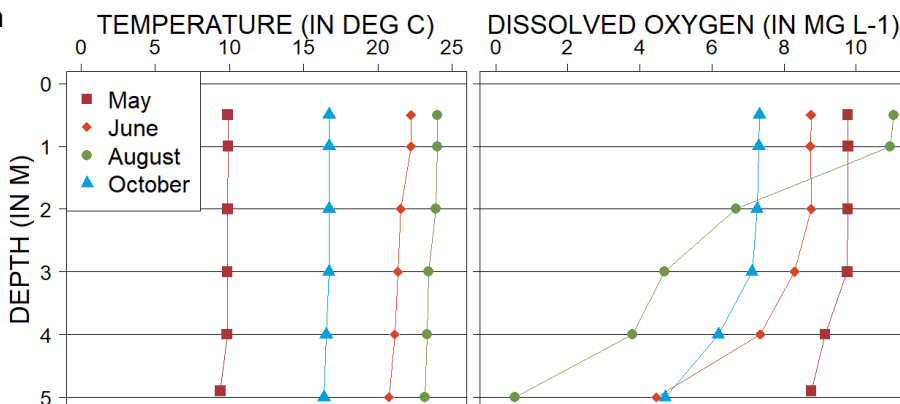


Figure 2. 2021 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ( $mg L^{-1}$ )

## 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.
- Hehn-Schaffer Lake is a eutrophic lake (Figure 3) that has relatively high nutrient concentrations but moderate algal growth.
- Trophic state in 2021 improved compared to historical indices.
- Hehn-Schaffer Lake has not had any confirmed **harmful** algal (cyanobacteria) blooms.

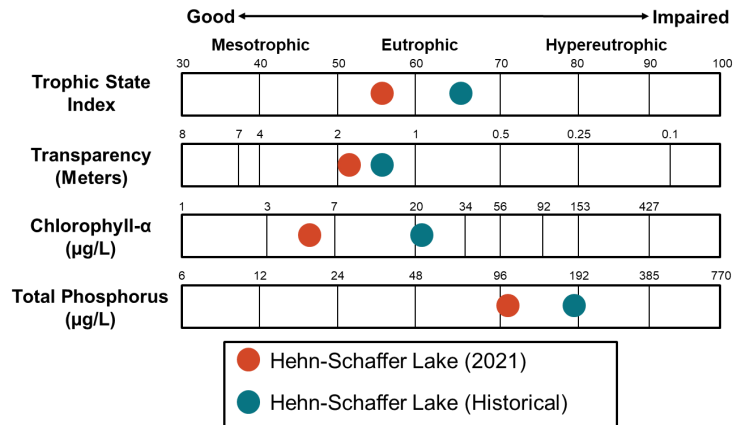


Figure 3. Trophic state indices for 2021 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) at Hehn-Schaffer Lake in 2021 was slightly greater than the historical median for the lake and greater than the median for natural lakes in the Missouri Coteau Level IV Ecoregion (hereafter, Ecoregion) (Figure 4).
- Median total phosphorus (TP) concentration in 2021 was less than the historical median for the lake but greater than the median for the Ecoregion (Figure 4).
- Dissolved nutrient concentrations were relatively similar to total nutrient concentrations in 2021.
- Ammonia and nitrate-plus-nitrite were only detected in October at Hehn-Schaffer Lake, and were found in relatively low concentrations.

### Nutrient Concentrations (in mg L<sup>-1</sup>) in Hehn-Schaffer Lake

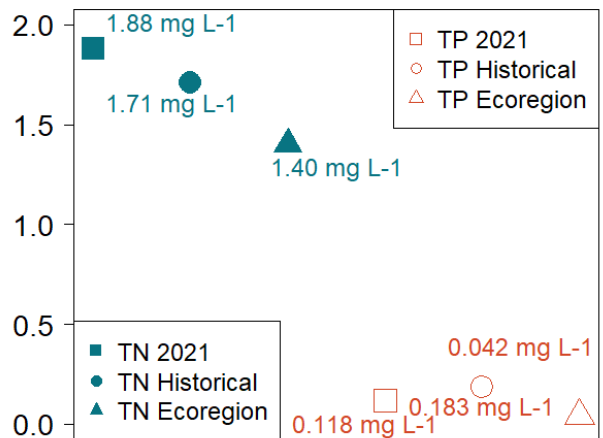


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

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

Measure	2021 Median	Historical Median	Ecoregion Median
Alkalinity	450.5 mg L <sup>-1</sup>	327 mg L <sup>-1</sup>	318.5 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	500 mg L <sup>-1</sup>	375 mg L <sup>-1</sup>	333.5 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	42.8 mg L <sup>-1</sup>	56.9 mg L <sup>-1</sup>	41.2 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	27.5 mg L <sup>-1</sup>	21 mg L <sup>-1</sup>	26.5 mg L <sup>-1</sup>
Conductivity	1,390 µS cm <sup>-1</sup>	953 µS cm <sup>-1</sup>	1,340 µS cm <sup>-1</sup>
Dissolved Solids	910.5 mg L <sup>-1</sup>	613 mg L <sup>-1</sup>	877 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	82.8 mg L <sup>-1</sup>	58.2 mg L <sup>-1</sup>	91.3 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	150 mg L <sup>-1</sup>	89.9 mg L <sup>-1</sup>	127 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	315 mg L <sup>-1</sup>	180 mg L <sup>-1</sup>	391.5 mg L <sup>-1</sup>

- Sulfate and bicarbonate are the dominant anions in Hehn-Schaffer Lake, while sodium and magnesium are the dominant cations (Figure 5).
- Median concentrations of most cations and anions are greater than the historical median for the lake and comparable to the median for the Ecoregion.

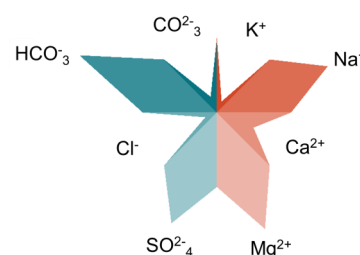


Figure 5. Maucha diagram showing ionic balance based on 2021 data