NORTH Dakota | Environmental Quality

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March 2019

Hurdsfield-Tuffy Lake

(47.45612 N, -99.86443 W)

Wells County

- Hurdsfield-Tuffy Lake is a large lake in central North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/hurdsfieldtuffy2012.pdf).
- Hurdsfield-Tuffy Lake is accessible by one public boat ramp on the south end of the lake.
- The Hurdsfield-Tuffy Lake watershed is about 8,000 acres of mostly agricultural land, grassland/pasture and open water. The most common crops grown are spring wheat, soybeans and corn (Table 1).
- Hurdsfield-Tuffy Lake is not classified in the North Dakota water quality standards.
- The lake is primarily managed for walleye, with fingerlings stocked annually. Yellow perch were also found in the lake during the last sampling event by the ND Game and Fish.
- There is no historical water quality data for Hurdsfield-Tuffy Lake.

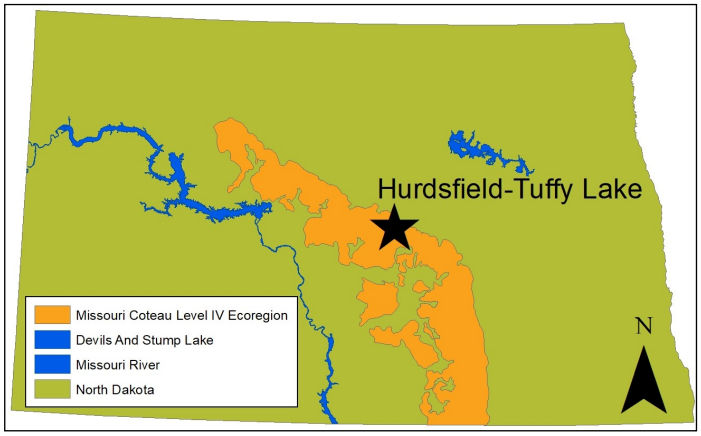

Figure 1. *Location of Hurdsfield-Tuffy Lake within the state*

Table 1. *Percentage of land cover in the watershed and near the lake (NASS, 2015). Value listed of crop type represents percentage of total production.*

Land Cover Type	% in Watershed	% within 500 meters
Agriculture	37.0%	47.6%
Spring Wheat	*54.5%*	*45.3%*
Soybeans	*20.6%*	*29.6%*
Corn	*8.9%*	*3.1%*
Grassland/Pasture	30.4%	26.2%
Open Water	22.5%	13.8%
Wetlands	5.9%	7.8%
Developed	4.1%	4.2%
Forest	0.1%	0.4%

Temperature and Dissolved Oxygen

- Hurdsfield-Tuffy Lake does stratify in the summer, with the majority of the water column typically well-oxygenated
- There was thermal stratification recorded in July of 2016. Temperature change in the water column was 2.67 degrees Celsius (ºC) in July, with changes of 0.64ºC and 0.08ºC in May and September, respectively (Figure 2).
- All samples in 2016 showed the lake as well-oxygenated, except during stratification in July.

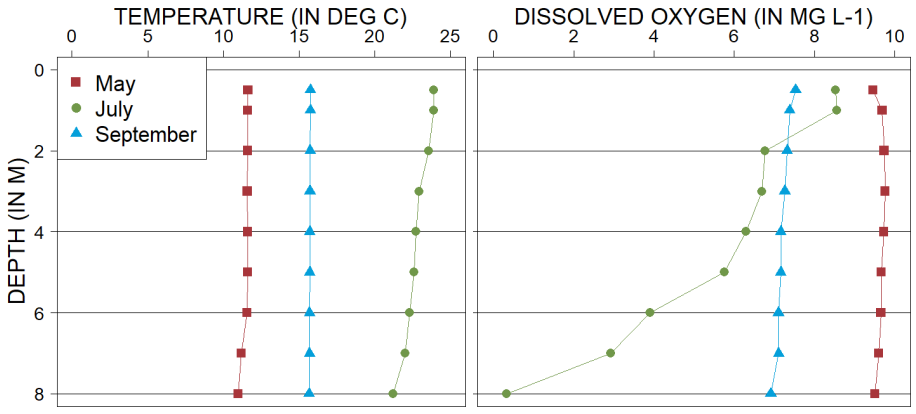

Figure 2. *2016 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Hurdsfield-Tuffy Lake is a eutrophic lake (Figure 3) that has relatively high nutrient concentrations but moderate algal growth.
- NDDoH has no historical trophic state data at the lake.
- There have been no confirmed ***harmful*** algal (cyanobacteria) blooms at Hurdsfield-Tuffy Lake, but NDDoH has investigated several reports.

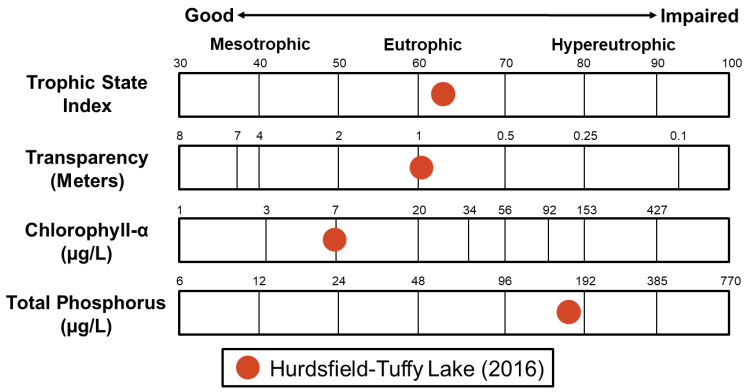

Figure 3. *Trophic state indices for 2016 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) was greater in 2016 compared to the historical median for the Missouri Coteau Level IV Ecoregion (hereafter, Missouri Coteau) where Hurdsfield-Tuffy Lake is located (Figure 4).
- Median concentration of dissolved TN was similar to TN.
- Median TP concentration in 2016 was greater than the median for the Missouri Coteau (Figure 4).
- Median concentration of dissolved phosphorus was similar to TP.
- Ammonia and nitrate plus nitrite were detected in most samples in 2016, with relatively high concentrations of ammonia found in two of three samples.

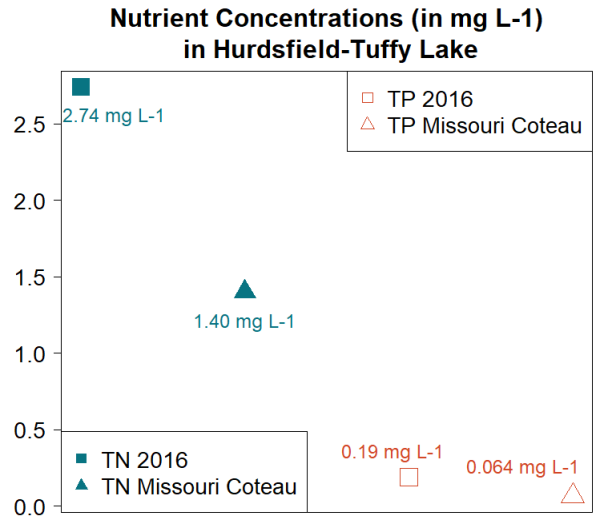

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

Table 2. *Median concentrations of selected constituents for 2016 and historical samples and from all Missouri Coteau lakes.*

Measure	2016 Median	Ecoregion Median
Alkalinity	447 mg L^{-1}	274 mg L^{-1}
Bicarbonate (HCO^-_3)	487 mg L^{-1}	289 mg L^{-1}
Calcium (Ca^{2+})	69.4 mg L^{-1}	39.8 mg L^{-1}
Carbonate (CO^{2-}_3)	29 mg L^{-1}	21 mg L^{-1}
Conductivity	2,750 µS cm^{-1}	1,010 µS cm^{-1}
Dissolved Solids	2,070 mg L^{-1}	642 mg L^{-1}
Magnesium (Mg^{2+})	188 mg L^{-1}	72.4 mg L^{-1}
Sodium (Na^+)	328 mg L^{-1}	62 mg L^{-1}
Sulfate (SO^{2-}_4)	1,140 mg L^{-1}	239 mg L^{-1}

- Sulfate was the dominant anion in Hurdsfield-Tuffy Lake, while sodium and magnesium were co-dominant cations (Figure 5).
- Median concentrations of most cations and anions are greater than the median concentration for the Missouri Coteau.

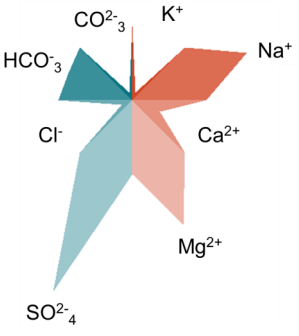

Figure 5. *Maucha diagram showing ionic balance based on 2016 data*