NORTH Dakota | Environmental Quality

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April 2019

Smishek Lake

(48.6256 N, -102.6520 W)

Burke County

- Smishek Lake is a popular (enhanced) natural lake in northwest North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/smishek2003.pdf).
- There is one paved, public boat ramp on the southwest side of Smishek Lake.
- The Smishek Lake watershed is about 24,000 acres of mostly grassland/pasture and agricultural land. The most common crops grown are durum wheat and non-alfalfa hay (Table 1).
- Smishek Lake is a Class II fishery, which are "capable of supporting natural reproduction and growth of cool water fishes (e.g., northern pike and walleye) and associated aquatic biota."
- Smishek Lake is managed for walleye, with fingerlings stocked annually. Yellow perch, northern pike, bluegill and white sucker were also found during the last sample by the ND Game and Fish.
- Smishek Lake was previously assessed in 1992 -1993 and 2009.

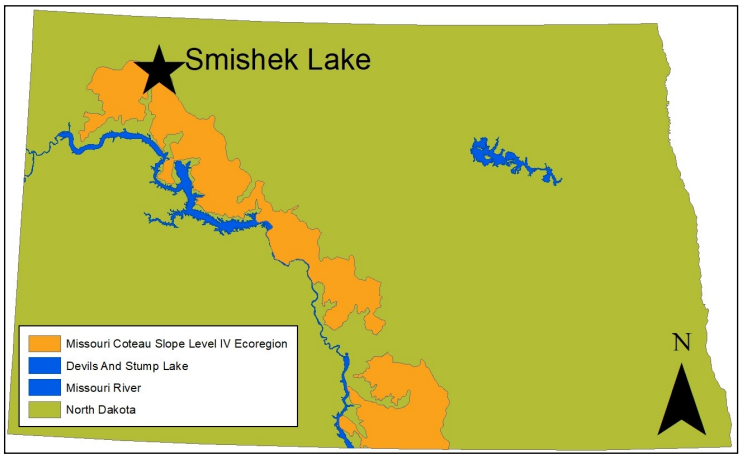

Figure 1. *Location of Smishek Lake within the state*

Table 1. *Percentage of land cover in the watershed and near the lake (NASS, 2013). Value listed of crop type represents percentage of total production*

Land Cover Type	% in Watershed	% within 500 meters
Grassland/Pasture	64.1%	67.7%
Agriculture	24.7%	18.0%
Other Hay/Non-Alfalfa	*24.9%*	*59.8%*
Durum Wheat	*17.6%*	*4.3%*
Fallow/Idle Cropland	*16.6%*	*3.0%*
Developed	3.5%	5.4%
Wetlands	3.3%	2.0%
Open Water	2.9%	6.4%
Forest	1.5%	0.4%

Temperature and Dissolved Oxygen

- Smishek Lake commonly stratifies in the summer, with warm, well-oxygenated water at the top of the water column, and cold, low-oxygen water near the bottom.
- There was thermal stratification in May and July of 2014. Temperature change in the water column was 2.87 degrees Celsius (ºC), 7.34ºC and 0.69ºC in May, July and September, respectively.
- All samples showed most of the lake as well-oxygenated, except near the bottom during thermal stratification.

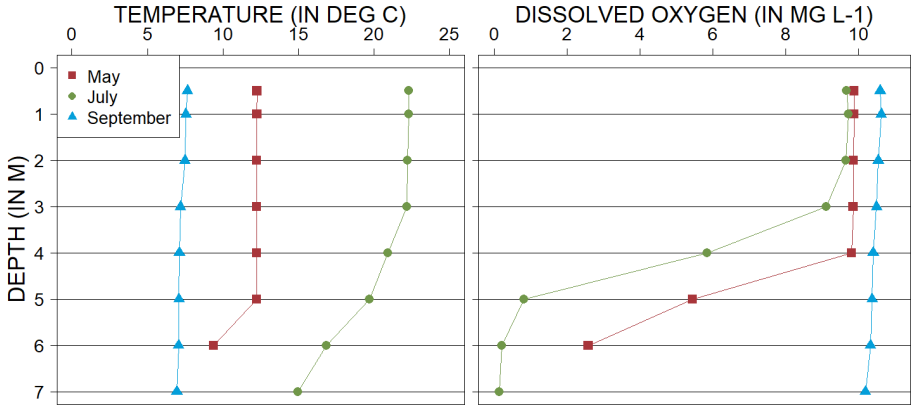

Figure 2. *2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Smishek Lake is a mesotrophic lake (Figure 3) that has relatively low nutrient concentrations and moderate algal growth.
- Current trophic state is similar to historical indices.
- There have been no confirmed ***harmful*** algal (cyanobacteria) blooms at Smishek Lake.

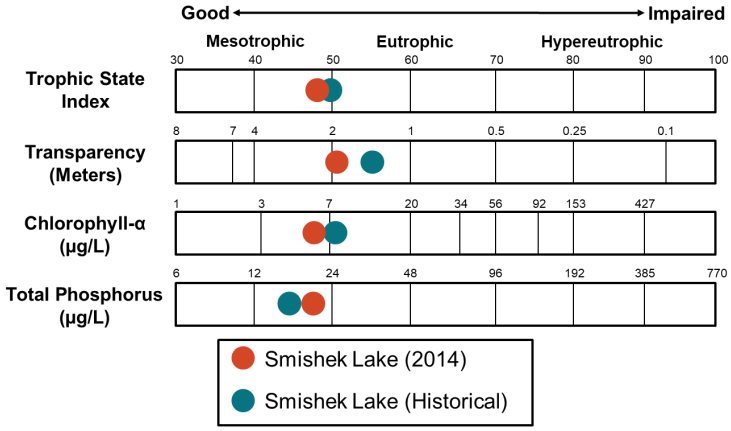

Figure 3. *Trophic state indices for 2014 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2014 was similar to the historical median and less than the median for the Missouri Coteau Slope Level IV Ecoregion (hereafter, Coteau Slope) where Smishek Lake is located (Figure 4).
- Median concentration of dissolved TN was slightly less than TN.
- Median TP concentration in 2014 was similar to the historical median and less than the median for the Coteau Slope (Figure 4).
- Median concentration of dissolved phosphorus was slightly less than TP.
- Ammonia was detected twice in Smishek Lake in 2014, while there were no detections of nitrate plus nitrite.

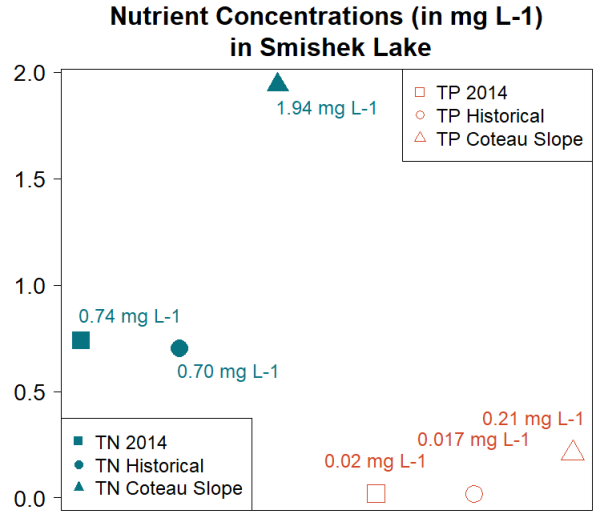

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

Table 2. *Median concentrations of selected constituents for 2014 and historical samples and from all Coteau Slope lakes.*

Measure	2014 Median	Historical Median	Ecoregion Median
Alkalinity	311 mg L^{-1}	374 mg L^{-1}	380 mg L^{-1}
Bicarbonate (HCO^-_3)	350 mg L^{-1}	415 mg L^{-1}	408 mg L^{-1}
Calcium (Ca^{2+})	58.2 mg L^{-1}	33.7 mg L^{-1}	38.8 mg L^{-1}
Carbonate (CO^{2-}_3)	15 mg L^{-1}	23 mg L^{-1}	28.5 mg L^{-1}
Conductivity	1,290 µS cm^{-1}	1,608 µS cm^{-1}	1,405 µS cm^{-1}
Dissolved Solids	875 mg L^{-1}	1,045 mg L^{-1}	961 mg L^{-1}
Magnesium (Mg^{2+})	64.9 mg L^{-1}	74.2 mg L^{-1}	74.8 mg L^{-1}
Sodium (Na^+)	148 mg L^{-1}	236 mg L^{-1}	155 mg L^{-1}
Sulfate (SO^{2-}_4)	395 mg L^{-1}	476 mg L^{-1}	385 mg L^{-1}

- Sulfate and bicarbonate are co-dominant anions in Smishek Lake, while sodium and magnesium are co-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 Coteau Slope.

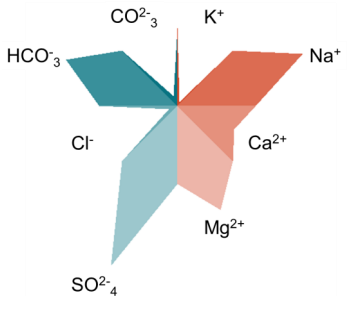

Figure 5. *Maucha diagram showing ionic balance based on 2014 data*