

April 2019

# Makoti Lake

(47.8853 N, -101.7848 W)

## Ward County

- Makoti Lake is a large, flooded natural lake in northwest North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/makoti2014.pdf>).
- There is one primitive boat/winter access on the southwest side of Makoti Lake.
- The Makoti Lake watershed is about 10,000 acres of mostly grassland/pasture and agricultural land. The most common crops grown are spring wheat, canola, and durum wheat (Table 1).
- Makoti Lake is a Class IV fishery, which are “capable of supporting a fishery on a short-term or seasonal basis.”
- Makoti Lake is managed for northern pike, though no stocking has been done since 2012. Yellow perch and black crappie were also found during the last sample by the ND Game and Fish.
- Makoti Lake was previously assessed in 2005-2006.

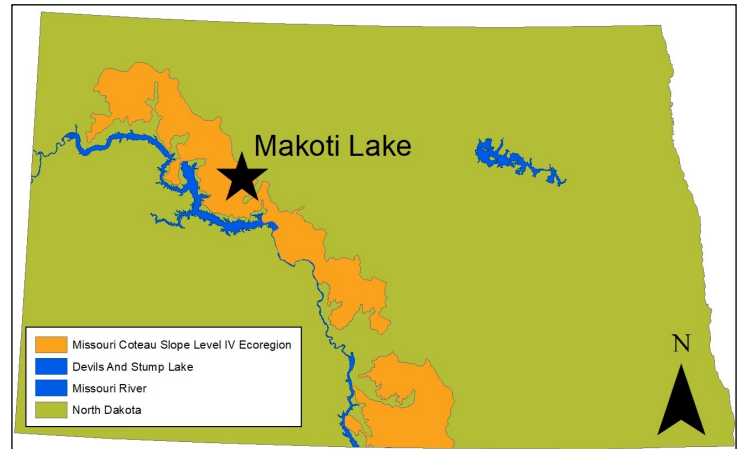


Figure 1. Location of Makoti Lake within the state

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
Agriculture	66.3%	71.0%
Spring Wheat	44.8%	45.2%
Canola	17.9%	15.8%
Durum Wheat	8.7%	10.0%
Grassland/Pasture	17.1%	10.7%
Open Water	7.2%	7.2%
Wetlands	5.0%	6.1%
Developed	4.4%	6.5%

## Temperature and Dissolved Oxygen

- Makoti Lake does stratify 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 July 2014. Temperature change in the water column was 2.90 degrees Celsius (°C) and 0.36°C in July and October, respectively.
- Profiles showed the lake as oxygen-depleted during times of thermal stratification.

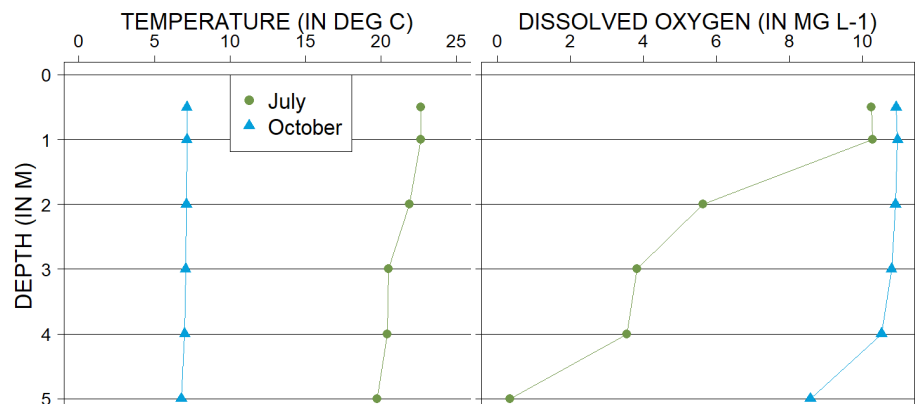


Figure 2. 2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ( $mg L^{-1}$ )

## 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.
- Makoti Lake is a hypereutrophic lake (Figure 3) that has high nutrient concentrations and dense algal growth.
- Current trophic state is improved compared to historical indices.
- There have been no confirmed *harmful* algal (cyanobacteria) blooms at Makoti Lake.

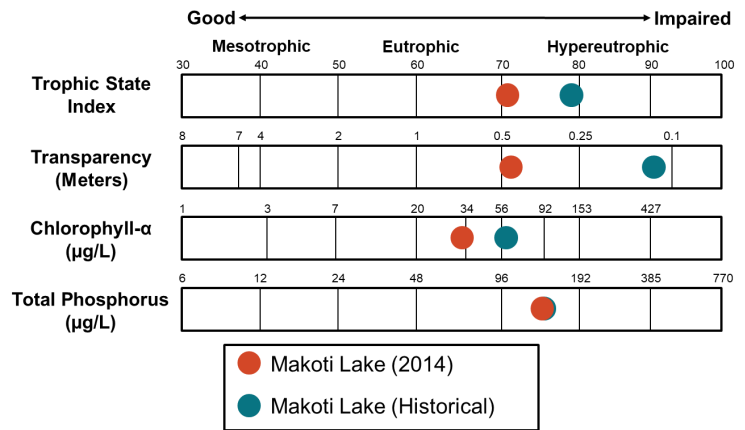


Figure 3. Trophic state indices for 2014 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) in 2014 was less than the historical median but similar to the median for the Missouri Coteau Slope Level IV Ecoregion (hereafter, Coteau Slope) where Makoti 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 at low concentrations during all samples at Makoti Lake in 2014, while there was one detection of nitrate plus nitrite.

Nutrient Concentrations (in mg L<sup>-1</sup>)  
in Makoti Lake

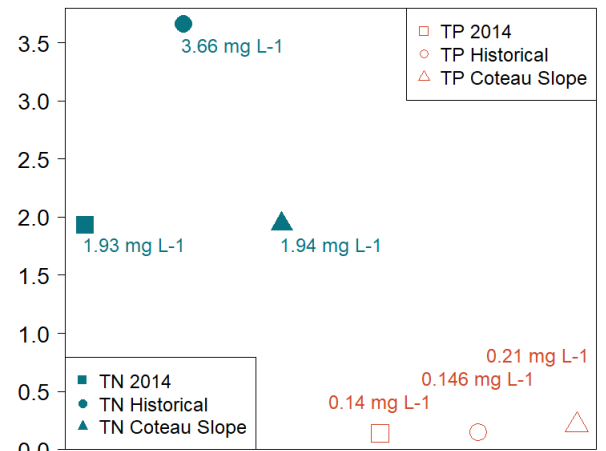


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

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

Measure	2014 Median	Historical Median	Ecoregion Median
Alkalinity	403 mg L <sup>-1</sup>	604 mg L <sup>-1</sup>	380 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	425 mg L <sup>-1</sup>	504 mg L <sup>-1</sup>	408 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	47.4 mg L <sup>-1</sup>	26.8 mg L <sup>-1</sup>	38.8 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	32 mg L <sup>-1</sup>	106 mg L <sup>-1</sup>	28.5 mg L <sup>-1</sup>
Conductivity	1,320 µS cm <sup>-1</sup>	2,455 µS cm <sup>-1</sup>	1,405 µS cm <sup>-1</sup>
Dissolved Solids	874 mg L <sup>-1</sup>	1,800 mg L <sup>-1</sup>	961 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	92.1 mg L <sup>-1</sup>	194 mg L <sup>-1</sup>	74.8 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	112 mg L <sup>-1</sup>	277 mg L <sup>-1</sup>	155 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	314 mg L <sup>-1</sup>	829 mg L <sup>-1</sup>	385 mg L <sup>-1</sup>

- Sulfate and bicarbonate are co-dominant anions in Makoti 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 but similar to the median for the Coteau Slope.

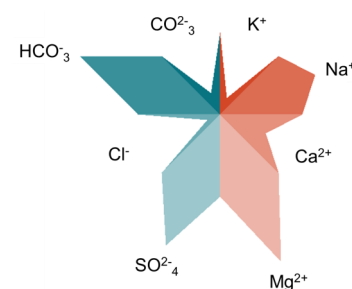


Figure 5. Maucha diagram showing ionic balance based on 2014 data