NORTH Dakota | Environmental Quality

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November 2019

Wood Lake

(47.900189 N, -98.841494 W)

Benson County

- Wood Lake is a small reservoir in northwest North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/wood2005.pdf).

- There is one public, paved boat ramp on Wood Lake on the northwest side of the lake.

- The Wood Lake watershed is about 2,000 acres of mostly grassland/pasture and agriculture. The most common crops grown are spring wheat, other hay/non-alfalfa and soybeans (Table 1).

- Wood 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."

- Wood Lake is managed walleye, with fingerlings stocked most years. Muskellunge were stocked in both 2015 and 2016. Bluegill, walleye, yellow perch, northern pike, largemouth bass and white sucker were captured during the last sample by the ND Game and Fish.

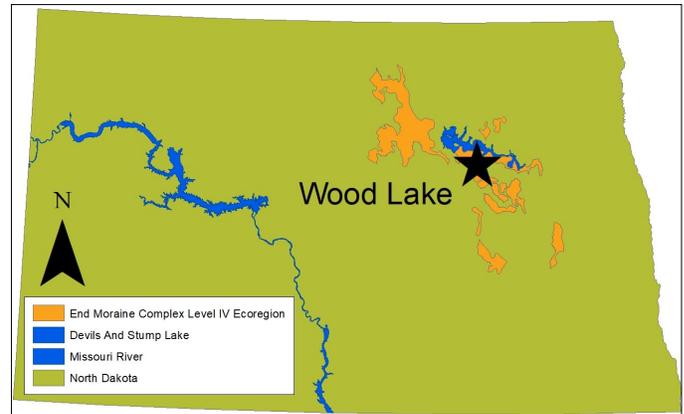- Wood Lake was previously assessed in 1996-1997.

Figure 1. Location of Wood 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
Grassland/Pasture	57.2%	34.8%
Agriculture	19.1%	2.2%
Spring Wheat	*31.0%*	*NA*
Other Hay/Non-Alfalfa	*22.3%*	*60.7%*
Soybeans	*19.8%*	*7.1%*
Open Water	7.0%	4.4%
Wetlands	6.8%	29.5%
Developed	5.5%	14.1%
Forest	3.8%	15.0%

Temperature and Dissolved Oxygen

- Wood 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 recorded at Wood Lake in spring and summer 2016. Temperature change in the water column was 4.3 degrees Celsius (ºC), 5.1ºC and 1.3ºC in May, July and September, respectively.

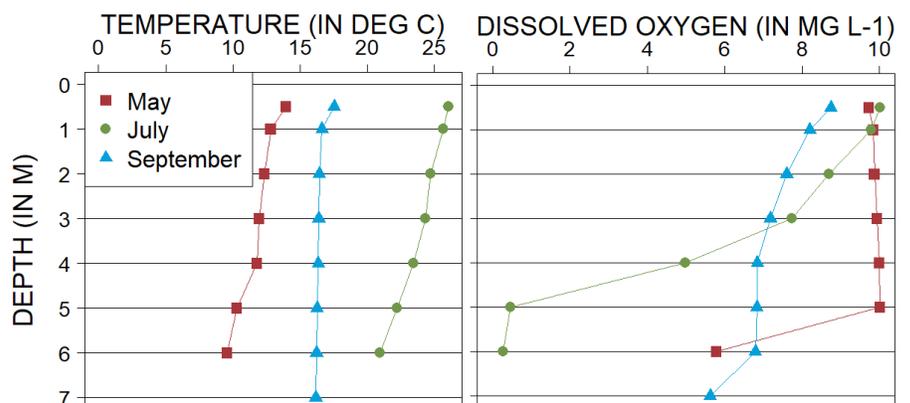- Dissolved oxygen concentrations high during all samples, but declined quickly during summer stratification.

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.

- Wood Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.

- Current trophic state is similar to historical indices.

- Wood Lake has had reported but not confirmed *harmful* algal (cyanobacteria) blooms.
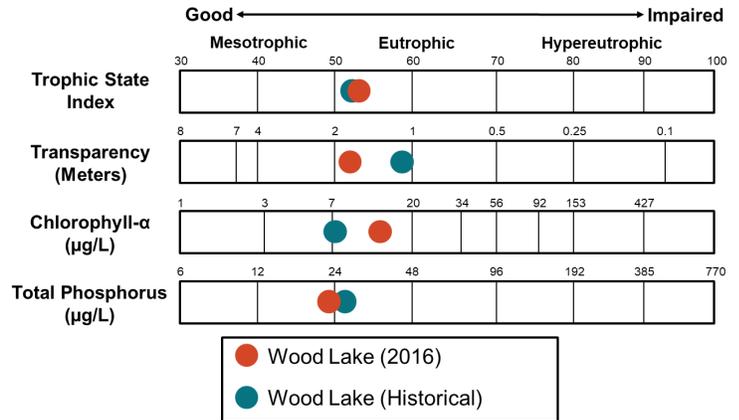
Figure 3. Trophic state indices for 2016 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2016 was greater than the historical median for the lake. There is very little historical data for the End Moraine Complex Level IV Ecoregion, as Wood Lake is one of the few natural lakes monitored in the Ecoregion.

- Median concentration of dissolved TN was less than TN.

- Median TP concentration in 2016 was slightly greater than the historical median for the lake (Figure 4).

- Median concentration of dissolved phosphorus was slightly less than TP.

- Ammonia was detected at a moderate concentration in the fall of 2016 at Wood Lake, while nitrate-plus-nitrite was not detected during any sample.
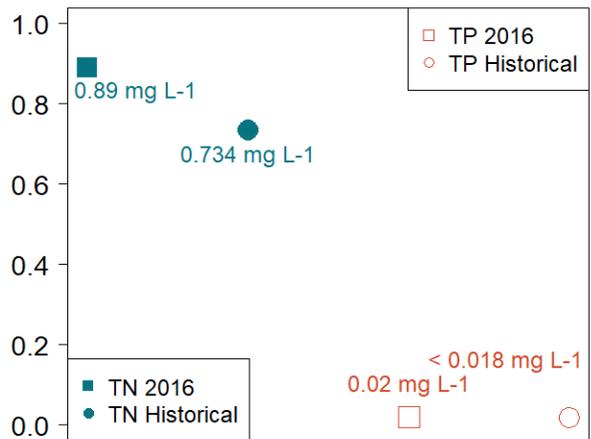
Nutrient Concentrations (in mg L-1) in Wood Lake

- TP 2016
- TP Historical
- TN 2016
- TN Historical

0.89 mg L-1
0.734 mg L-1
< 0.018 mg L-1
0.02 mg L-1

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 from the lake

Measure	2016 Median	Historical Median
Alkalinity	179 mg L^{-1}	221 mg L^{-1}
Bicarbonate (HCO^-_3)	215 mg L^{-1}	247 mg L^{-1}
Calcium (Ca^{2+})	31.8 mg L^{-1}	32.6 mg L^{-1}
Carbonate (CO^{2-}_3)	4 mg L^{-1}	11 mg L^{-1}
Conductivity	389 µS cm^{-1}	432 µS cm^{-1}
Dissolved Solids	216 mg L^{-1}	237 mg L^{-1}
Magnesium (Mg^{2+})	26.2 mg L^{-1}	32.5 mg L^{-1}
Sodium (Na^+)	10.7 mg L^{-1}	8.6 mg L^{-1}
Sulfate (SO^{2-}_4)	25.7 mg L^{-1}	18 mg L^{-1}

- Bicarbonate is the dominant anion in Wood Lake, while calcium and magnesium are the dominant cations (Figure 5).

- Median concentrations of most cations and anions are comparable to the historical median for the lake.

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