

Cottonwood Lake

(47.87787 N, -100.67268 W)

McHenry County

- Cottonwood Lake is a natural lake in north-central North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/cottonwoodmchenry2005.pdf>).
- There is one public boat ramp on Cottonwood Lake on the west side of the lake.
- The Cottonwood Lake watershed is about 7,300 acres of mostly agricultural land and grassland/pasture. The most common crops grown are spring wheat, corn and soybeans (Table 1).
- Cottonwood 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.”
- Cottonwood Lake is managed for walleye, with fingerlings stocked biennially. Walleye, yellow perch and northern pike were found during the last sample by the ND Game and Fish.
- Cottonwood Lake was previously assessed in 2005-2006.

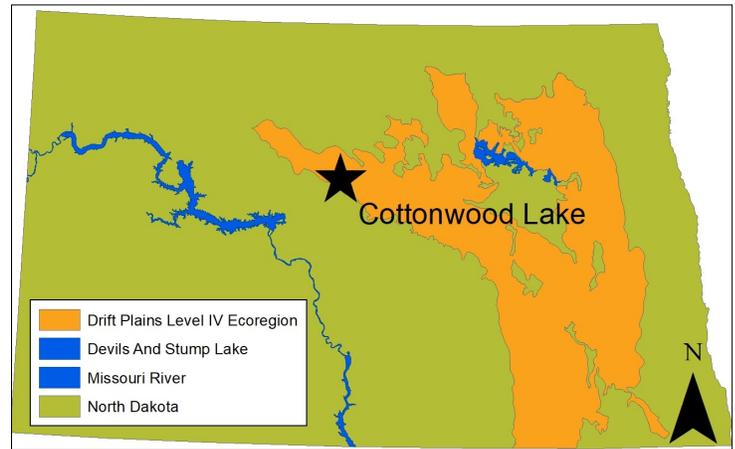


Figure 1. Location of Cottonwood Lake within the state

Table 1. Percentage of land cover in the watershed and near the lake (NASS, 2017). Value listed of crop type represents percentage of total production

Land Cover Type	% in Watershed	% within 500 meters
Agriculture	43.3%	16.5%
Soybeans	56.4%	2.0%
Spring Wheat	21.3%	4.4%
Corn	7.6%	18.4%
Grassland/Pasture	36.9%	48.7%
Wetlands	6.4%	21.3%
Developed	4.7%	7.2%
Forest	4.6%	0.4%
Open Water	4.2%	5.9%

Temperature and Dissolved Oxygen

- Cottonwood Lake occasionally 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 July 2018. Temperature change in the water column was 0.91 degrees Celsius (°C), 1.69°C and 0.00°C in May, July and September, respectively.
- Dissolved oxygen concentrations were relatively high, though there was some anoxia near the bottom in May and July.

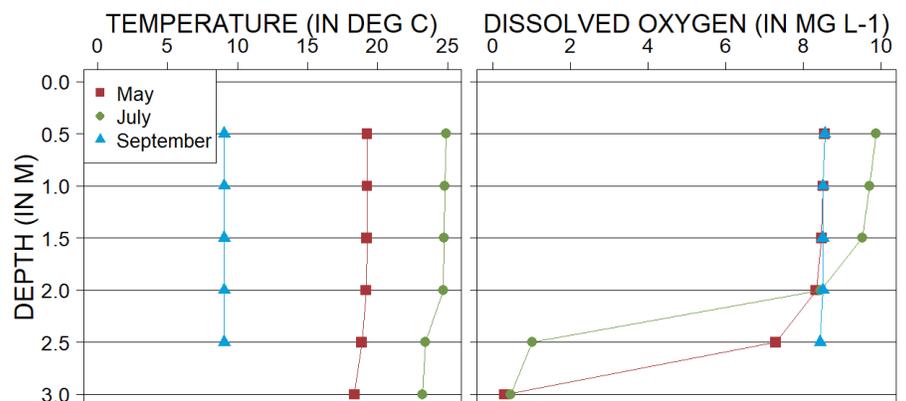


Figure 2. 2018 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ($mg L^{-1}$)

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.
- Cottonwood Lake is a eutrophic lake (Figure 3) that has high nutrient concentrations and dense algal and plant growth.
- Current trophic state is similar to historical indices.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Cottonwood Lake.

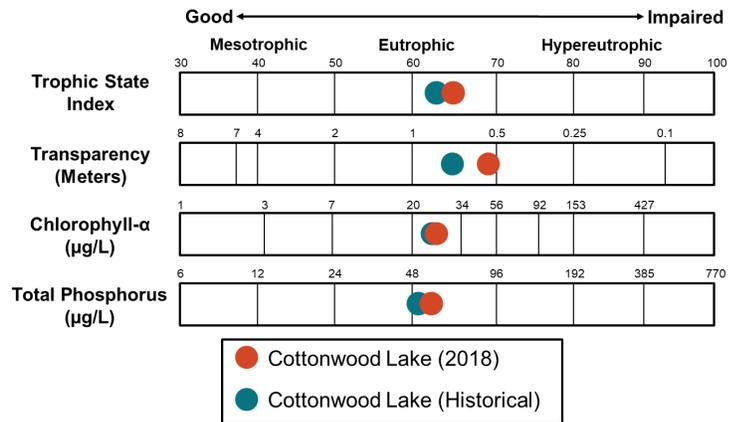


Figure 3. Trophic state indices for 2018 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2018 was less than the historical median for the lake but similar to the median for the Drift Plains Level IV Ecoregion (hereafter, Drift Plains) where Cottonwood Lake is located (Figure 4).
- Median concentration of dissolved TN was similar to TN.
- Median TP concentration in 2018 was similar to the median for the lake but less than the median for the Drift Plains (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Neither ammonia nor nitrate plus nitrite were detected in Cottonwood Lake in 2018.

Nutrient Concentrations (in mg L⁻¹) in Cottonwood Lake

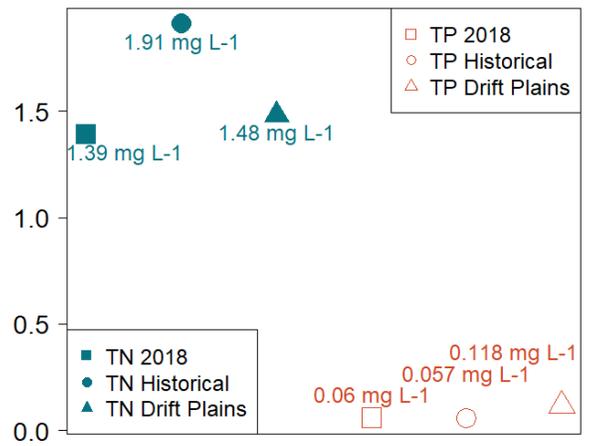


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

Table 2. Median concentrations of selected constituents for 2018 and historical samples and from all Drift Plains natural lakes.

Measure	2018 Median	Historical Median	Ecoregion Median
Alkalinity	329 mg L ⁻¹	321 mg L ⁻¹	237 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	345 mg L ⁻¹	301 mg L ⁻¹	269 mg L ⁻¹
Calcium (Ca ²⁺)	46 mg L ⁻¹	39.7 mg L ⁻¹	62.7 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	25 mg L ⁻¹	44.5 mg L ⁻¹	17 mg L ⁻¹
Conductivity	1,850 µS cm ⁻¹	1,670 µS cm ⁻¹	1,284 µS cm ⁻¹
Dissolved Solids	1,340 mg L ⁻¹	1,265 mg L ⁻¹	1,080 mg L ⁻¹
Magnesium (Mg ²⁺)	109 mg L ⁻¹	78.7 mg L ⁻¹	91.1 mg L ⁻¹
Sodium (Na ⁺)	269 mg L ⁻¹	327 mg L ⁻¹	112 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	684 mg L ⁻¹	591 mg L ⁻¹	600 mg L ⁻¹

- Sulfate is the dominant anion in Cottonwood Lake, while magnesium and sodium are co-dominant cations (Figure 5).
- Median concentrations of most cations and anions are greater than the historical median for the lake and greater than the median for the Drift Plains.

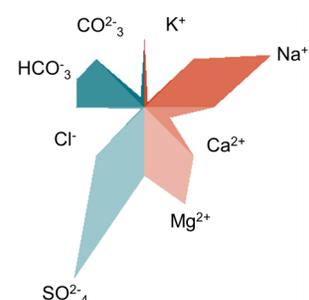


Figure 5. Maucha diagram showing ionic balance based on 2018 data