

April 2019

# Raleigh Reservoir

(46.3494 N, -101.3703 W)

## Grant County

- Raleigh Reservoir is a small reservoir in southwest North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/raleigh2003.pdf>)
- There is one paved, public boat ramp on the north side of Raleigh Reservoir.
- The Raleigh Reservoir watershed is about 4,400 acres of mostly grassland/pasture and agricultural land. The most common crops grown are spring wheat, corn and non-alfalfa hay (Table 1).
- Raleigh Reservoir 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.”
- Raleigh Reservoir is managed for walleye and bluegill, with intermittent stocking due to water level alterations. Walleye, yellow perch and bluegill were found during the last sample by the ND Game and Fish.
- Raleigh Reservoir was previously assessed in 2005-2006.

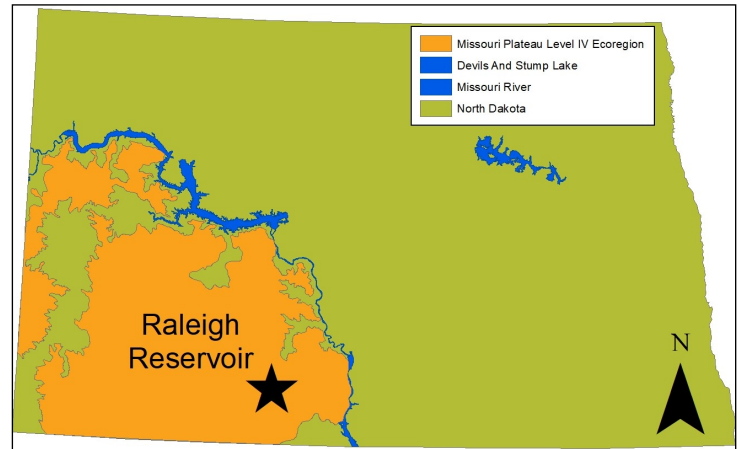


Figure 1. Location of Raleigh Reservoir within the state

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	70.7%	82.5%
Agriculture	23.8%	10.5%
Corn	33.7%	4.2%
Spring Wheat	25.3%	31.6%
Other Hay/Non-Alfalfa	22.1%	5.5%
Developed	3.5%	2.0%
Open Water	1.3%	NA
Wetlands	0.4%	1.6%
Forest	0.2%	2.0%

## Temperature and Dissolved Oxygen

- Raleigh Reservoir 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 in May and July 2014. Temperature change in the water column was 5.11 degrees Celsius (°C), 7.08°C and 0.01°C in May, July and October, respectively.
- All samples showed most of the lake as well-oxygenated, except during thermal stratification.

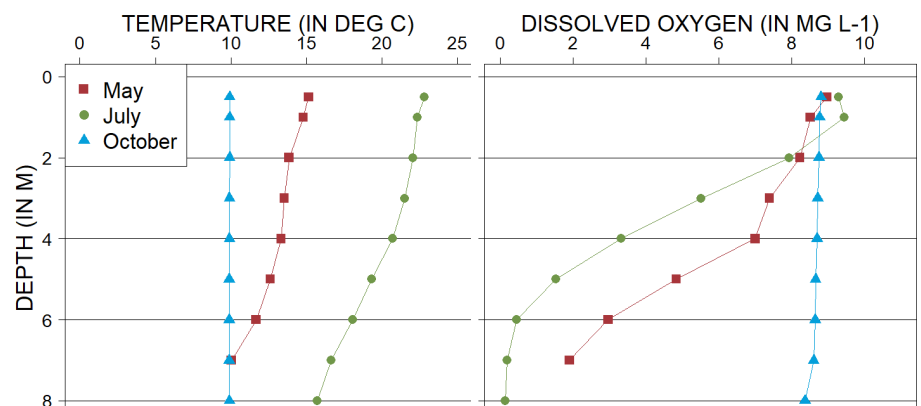


Figure 2. 2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter ( $mg L^{-1}$ )

## 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.
- Raleigh Reservoir is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- Current trophic state has improved compared to historical indices.
- There have been no confirmed **harmful** algal (cyanobacteria) blooms at Raleigh Reservoir.

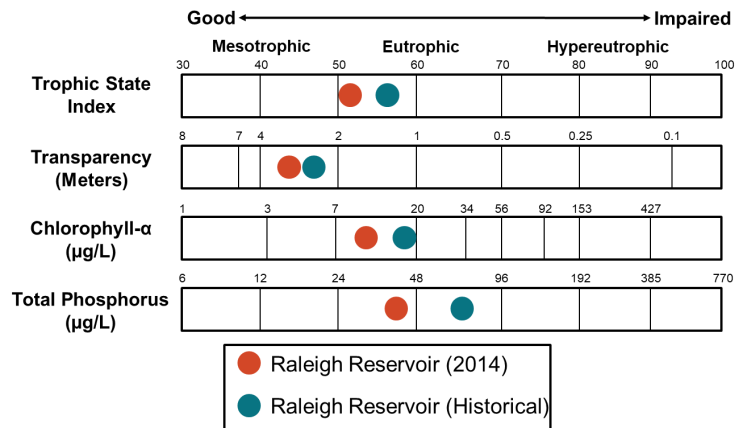


Figure 3. Trophic state indices for 2014 and historical samples

## Nutrients

- Median concentration of total nitrogen (TN) in 2014 was less than the historical median and less than the median for the Missouri Plateau Level IV Ecoregion (hereafter, Missouri Plateau) where Raleigh Reservoir is located (Figure 4).
- Median concentration of dissolved TN was slightly less than TN.
- Median TP concentration in 2014 was less than the historical median and less than the median for the Missouri Plateau (Figure 4).
- Median concentration of dissolved phosphorus was slightly less than TP.
- Ammonia was detected twice at low concentrations in Raleigh Reservoir in 2014, while there were no detections of nitrate plus nitrite.

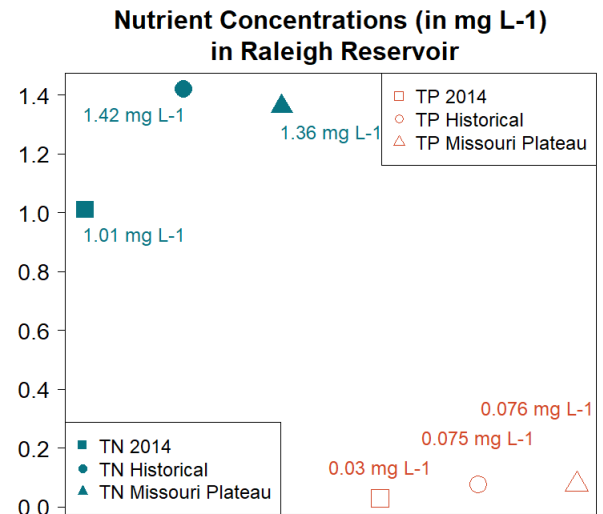


Figure 4. Median concentrations of TN and TP in mg L<sup>-1</sup> compared to regional medians

## Water Chemistry

Table 2. Median concentrations of selected constituents for 2014 and historical samples and from all Missouri Plateau reservoirs.

Measure	2014 Median	Historical Median	Ecoregion Median
Alkalinity	227 mg L <sup>-1</sup>	214 mg L <sup>-1</sup>	280 mg L <sup>-1</sup>
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> )	277 mg L <sup>-1</sup>	228 mg L <sup>-1</sup>	291 mg L <sup>-1</sup>
Calcium (Ca <sup>2+</sup> )	112 mg L <sup>-1</sup>	95.7 mg L <sup>-1</sup>	49.3 mg L <sup>-1</sup>
Carbonate (CO <sub>3</sub> <sup>2-</sup> )	5 mg L <sup>-1</sup>	15.5 mg L <sup>-1</sup>	19 mg L <sup>-1</sup>
Conductivity	1,540 µS cm <sup>-1</sup>	1,655 µS cm <sup>-1</sup>	1,790 µS cm <sup>-1</sup>
Dissolved Solids	1,150 mg L <sup>-1</sup>	1,245 mg L <sup>-1</sup>	1,270 mg L <sup>-1</sup>
Magnesium (Mg <sup>2+</sup> )	130 mg L <sup>-1</sup>	145 mg L <sup>-1</sup>	62.3 mg L <sup>-1</sup>
Sodium (Na <sup>+</sup> )	65.7 mg L <sup>-1</sup>	86.2 mg L <sup>-1</sup>	258 mg L <sup>-1</sup>
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	676 mg L <sup>-1</sup>	751 mg L <sup>-1</sup>	681 mg L <sup>-1</sup>

- Sulfate is the dominant anion in Raleigh Reservoir, while calcium and magnesium are co-dominant cations (Figure 5).
- Median concentrations of most cations and anions are similar to the historical median for the lake and less than the median for the Missouri Plateau.

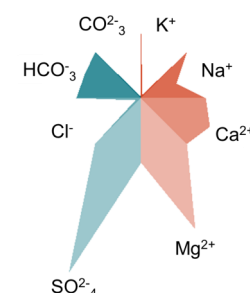


Figure 5. Maucha diagram showing ionic balance based on 2014 data