

October 2019

Renwick Dam

(48.77802 N, -97.74872 W)

Pembina County

- Renwick Dam is a reservoir in northeast North Dakota (Figure 1). See map at (<https://gf.nd.gov/gnf/maps/fishing/lakecontours/renwick2003.pdf>).
- There is one public boat ramp on Renwick Dam on the north side of the lake near the dam. Renwick Dam is the centerpiece to Icelandic State Park, a popular destination for camping and recreation in the area.
- The Renwick Dam watershed drains about 98,000 acres. Land cover in the watershed is mostly agriculture, with smaller amounts of forest and grassland/pasture. Agriculture is dominated by spring wheat, soybeans and canola (Table 1).
- Renwick Dam is a Class III, warm-water fishery, which are “capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota.”
- Renwick Dam is managed for northern pike and walleye, with some fingerlings intermittently. Yellow perch, northern pike, white sucker, black bullhead and black crappie were found during the last sample by the ND Game and Fish.
- Renwick Dam was last sampled in the 1990s.

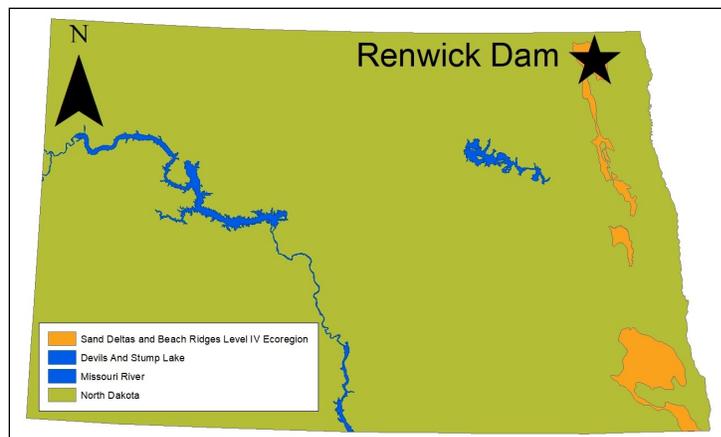


Figure 1. Location of Renwick Dam within the state

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
Agriculture	64.2%	16.1%
Canola	44.9%	NA
Spring Wheat	18.2%	6.6%
Soybeans	12.0%	23.4%
Forest	12.9%	3.1%
Grassland/Pasture	10.2%	33.5%
Wetlands	7.2%	38.0%
Developed	5.0%	6.8%
Open Water	0.5%	2.6%

Temperature and Dissolved Oxygen

- Renwick Dam 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 2016. Temperature change in the water column was 2.73 degrees Celsius (°C), 3.43°C and 1.18°C in May, July and September, respectively.
- Dissolved oxygen concentrations were relatively high at the surface, but there was some anoxic conditions near the bottom.

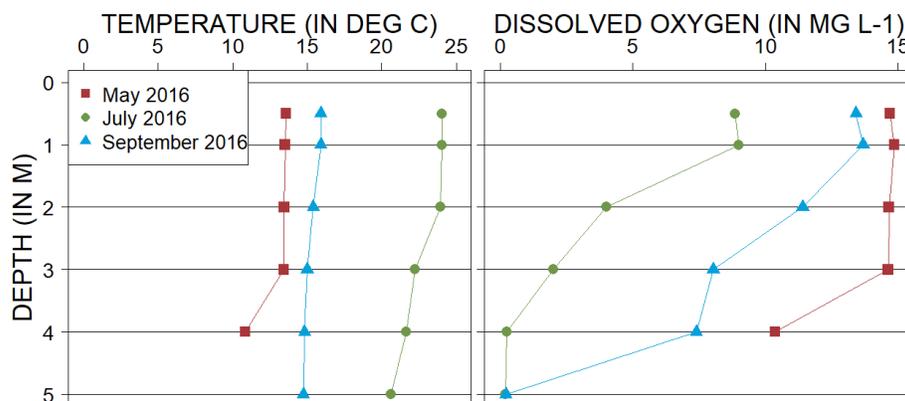


Figure 2. 2016 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L⁻¹)

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.
- Renwick Dam is a eutrophic reservoir (Figure 3) that has high nutrient concentrations and moderate algal and plant growth.
- Trophic state in 2016 was relatively similar to historical condition.
- There have been confirmed **harmful** algal (cyanobacteria) blooms at Renwick Dam.

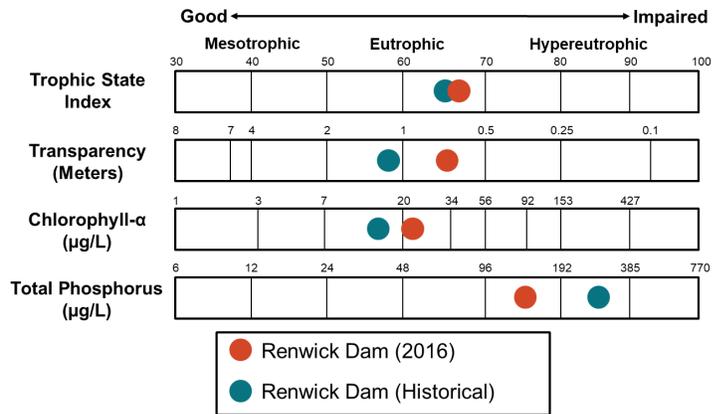


Figure 3. Trophic state indices for 2016 and historical samples

Nutrients

- Median concentration of total nitrogen (TN) in 2016 was greater than the median for the lake but less than the median for the Sand Deltas and Beach Ridges Level IV Ecoregion (hereafter, Drift Plains) where Renwick Dam is located (Figure 4).
- Median concentration of dissolved TN was less than TN.
- Median TP concentration in 2016 was greater than the median for the lake and for the Ecoregion (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Ammonia was detected in two of three samples at Renwick Dam in 2016 at low concentrations, but nitrate plus nitrite was only detected once at a very high concentration.

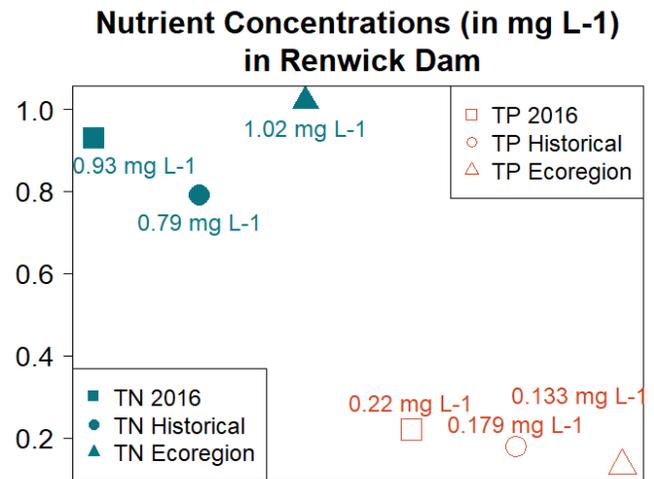


Figure 4. Median concentrations of TN and TP in mg L⁻¹ compared to regional medians

Water Chemistry

Table 2. Median concentrations of selected constituents for 2016 and historical samples and from all Ecoregion natural lakes and reservoirs.

Measure	2016 Median	Historical Median	Ecoregion Median
Alkalinity	187 mg L ⁻¹	213 mg L ⁻¹	215 mg L ⁻¹
Bicarbonate (HCO ₃ ⁻)	217 mg L ⁻¹	252 mg L ⁻¹	251 mg L ⁻¹
Calcium (Ca ²⁺)	68.8 mg L ⁻¹	65.9 mg L ⁻¹	84.5 mg L ⁻¹
Carbonate (CO ₃ ²⁻)	4 mg L ⁻¹	4 mg L ⁻¹	4 mg L ⁻¹
Conductivity	604 µS cm ⁻¹	648 mg L ⁻¹	950.5 µS cm ⁻¹
Dissolved Solids	372 mg L ⁻¹	384 mg L ⁻¹	636.5 mg L ⁻¹
Magnesium (Mg ²⁺)	20.5 mg L ⁻¹	19.9 mg L ⁻¹	49.6 mg L ⁻¹
Sodium (Na ⁺)	37.5 mg L ⁻¹	32.9 mg L ⁻¹	49 mg L ⁻¹
Sulfate (SO ₄ ²⁻)	114 mg L ⁻¹	121 mg L ⁻¹	324 mg L ⁻¹

- Sulfate and bicarbonate are co-dominant anions in Renwick Dam, while calcium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are similar to historical medians for the lake and less than the median for the Ecoregion.

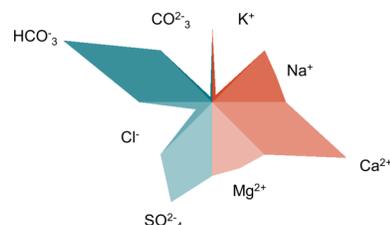


Figure 5. Maucha diagram showing ionic balance based on 2016 data