NORTH Dakota | Environmental Quality

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April 2019

Bowman-Haley Dam

(45.9856 N, -103.2583 W)

Bowman County

- Bowman-Haley Dam is a large reservoir in southwest North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/bowmanhaley2003.pdf)
- There are two public boat ramps on Bowman-Haley Dam, one near the dam and one south of the dam on the east shore.
- The Bowman-Haley Dam watershed is about 800,000 acres of mostly grassland/pasture and agricultural land. The most common crops grown are spring wheat, alfalfa and non-alfalfa hay (Table 1).
- Bowman-Haley Dam 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."
- Bowman-Haley Dam is managed for walleye, with fingerlings stocked annually. A wide variety of fish were found during the last sample by the ND Game and Fish.
- Bowman-Haley Dam was previously assessed in 1994-1995 and 2000.

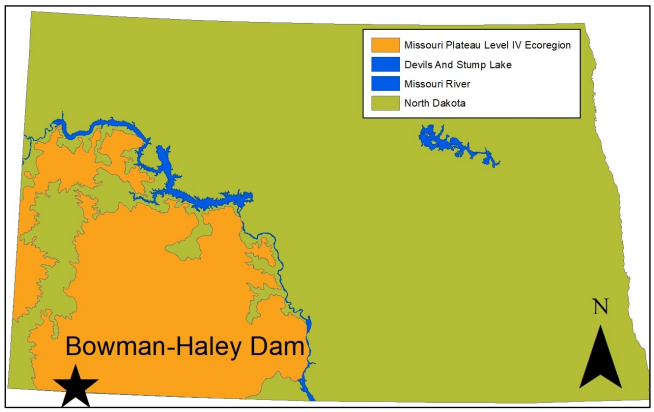

Figure 1. *Location of Bowman-Haley Dam within the state*

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	60.0%	89.7%
Agriculture	34.5%	5.0%
Spring Wheat	*30.1%*	*10.8%*
Other Hay/Non-Alfalfa	*22.4%*	*79.1%*
Alfalfa	*15.5%*	*1.8%*
Developed	3.4%	3.1%
Open Water	0.9%	1.6%
Shrubland	0.5%	< 0.1%
Wetlands	0.3%	0.5%
Forest	< 0.1%	0.2%

Temperature and Dissolved Oxygen

- Bowman-Haley 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 recorded in July 2014 in the bays. Temperature change in the water column near the dam was 0.23 degrees Celsius (ºC), 0.37ºC and 0.02ºC in May, July and October, respectively.
- All samples showed most of the lake as well-oxygenated, except during thermal stratification.

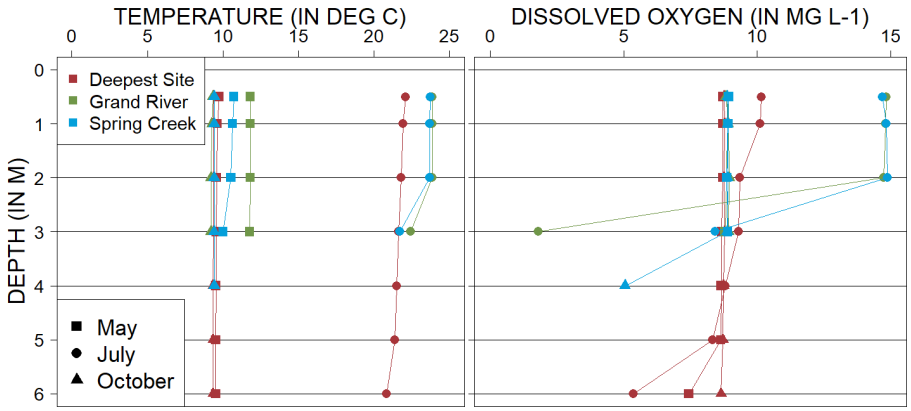

Figure 2. *2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Bowman-Haley Dam is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal growth.
- Current trophic state has declined slightly compared to historical indices.
- Bowman-Haley Dam has had regular confirmed ***harmful*** algal (cyanobacteria) blooms, last monitored in 2018.

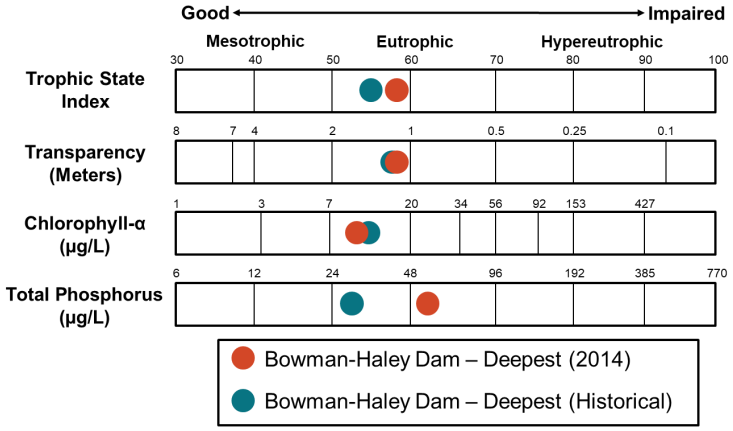

Figure 3. *Trophic state indices for 2014 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2014 was similar to the historical median and similar to the median for the Missouri Plateau Level IV Ecoregion (hereafter, Missouri Plateau) where Bowman-Haley Dam is located (Figure 4).
- Median concentration of dissolved TN was similar to TN.
- Median TP concentration in 2014 was greater than the historical median and greater than the median for the Missouri Plateau (Figure 4).
- Median concentration of dissolved phosphorus was less than TP.
- Ammonia was detected in all samples at Bowman-Haley Dam in 2014 with high concentrations found in May and October. Nitrate plus nitrite was found at all sites during two samples (May and October).

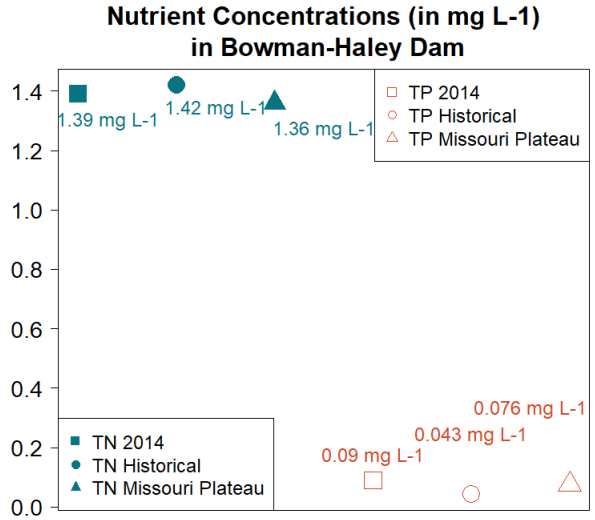

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

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

Measure	2014 Median	Historical Median	Ecoregion Median
Alkalinity	259 mg L^{-1}	317 mg L^{-1}	280 mg L^{-1}
Bicarbonate (HCO^-_3)	268 mg L^{-1}	340 mg L^{-1}	291 mg L^{-1}
Calcium (Ca^{2+})	55.7 mg L^{-1}	40.3 mg L^{-1}	49.3 mg L^{-1}
Carbonate (CO^{2-}_3)	8 mg L^{-1}	29 mg L^{-1}	19 mg L^{-1}
Conductivity	2,070 µS cm^{-1}	2,120 µS cm^{-1}	1,790 µS cm^{-1}
Dissolved Solids	1,470 mg L^{-1}	1,505 mg L^{-1}	1,270 mg L^{-1}
Magnesium (Mg^{2+})	57.5 mg L^{-1}	44.1 mg L^{-1}	62.3 mg L^{-1}
Sodium (Na^+)	351 mg L^{-1}	422 mg L^{-1}	258 mg L^{-1}
Sulfate (SO^{2-}_4)	821 mg L^{-1}	782 mg L^{-1}	681 mg L^{-1}

- Sulfate is the dominant anion in Bowman-Haley Dam, while sodium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are similar to the historical median for the lake and greater than the median for the Missouri Plateau.

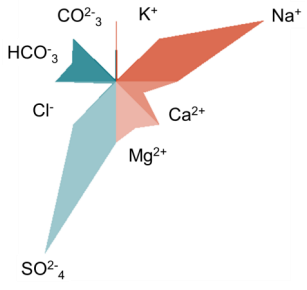

Figure 5. *Maucha diagram showing ionic balance based on 2014 data*