NORTH Dakota | Environmental Quality

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April 2019

Sather Dam

(47.6726 N, -102.8083 W)

McKenzie County

- Sather Dam is a small reservoir in northwest North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/sather2004.pdf)
- There is one paved, public boat ramp on the east side of Sather Dam.
- The Sather Dam watershed is about 4,000 acres of mostly grassland/pasture. The most common crops grown are non-alfalfa hay, barley and spring wheat (Table 1).
- Sather Dam is a Class II fishery, which are "capable of supporting natural reproduction and growth of cool water fish species (e.g., northern pike and walleye) and associated aquatic biota."
- Sather Dam is managed for largemouth bass and bluegill, though there has been no stocking reported since 2013. Only largemouth bass and bluegill were captured during the last ND Game and Fish sampling event. The Game and Fish reported a significant winterkill in 2019.
- Sather Dam was previously assessed in 2006-2007.

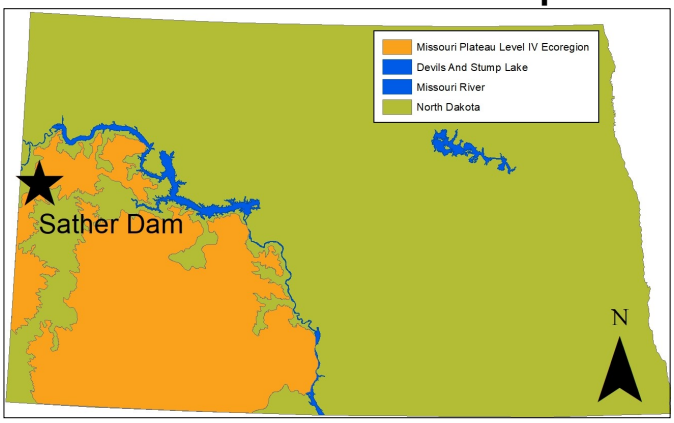

Figure 1. *Location of Sather Dam within the state*

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	75.6%	72.5%
Shrubland	10.9%	11.2%
Deciduous Forest	6.0%	5.1%
Developed	3.0%	8.3%
Agriculture	2.2%	0.5%
Other Hay/Non-Alfalfa	*44.7%*	*93.8%*
Barley	*29.6%*	*NA*
Spring Wheat	*18.3%*	*6.2%*
Wetlands	1.0%	1.3%
Open Water	0.7%	0.9%
Barren	0.6%	0.2%

Temperature and Dissolved Oxygen

- Sather 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. Temperature change in the water column was 2.24 degrees Celsius (ºC), 6.20ºC and 0.00ºC in May, July and October, respectively.
- All samples showed most of the lake as well-oxygenated, though there was some near-bottom depletion and during thermal stratification.

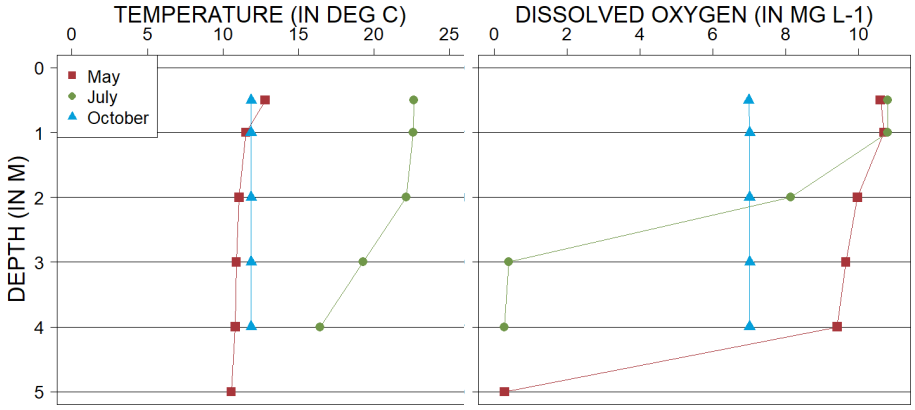

Figure 2. *2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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

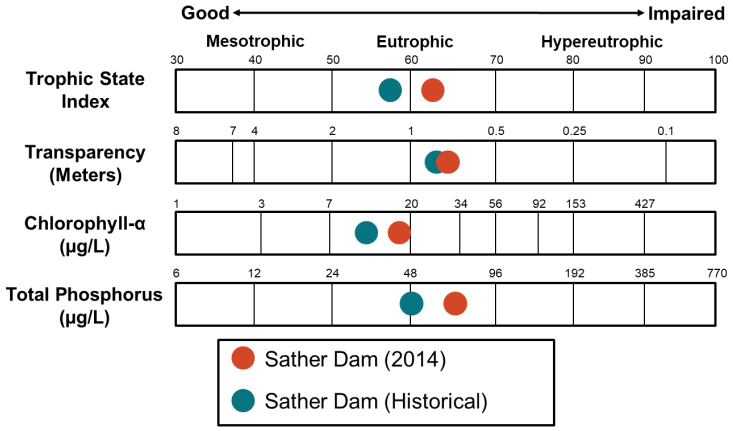

Figure 3. *Trophic state indices for 2014 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2014 were similar to the historical median and similar to the median for the Missouri Plateau Level IV Ecoregion (hereafter, Missouri Plateau) where Sather Dam is located (Figure 4).
- Median concentration of dissolved TN was slightly less than TN.
- Median TP concentration in 2014 was similar to the historical median but 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 Sather Dam in 2014, while nitrate plus nitrate was not detected.

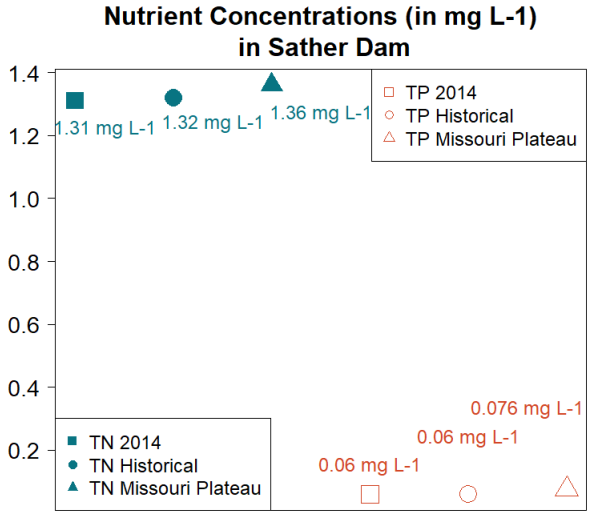

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

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	228 mg L^{-1}	224 mg L^{-1}	280 mg L^{-1}
Bicarbonate (HCO^-_3)	256 mg L^{-1}	240 mg L^{-1}	291 mg L^{-1}
Calcium (Ca^{2+})	28.9 mg L^{-1}	16.7 mg L^{-1}	49.3 mg L^{-1}
Carbonate (CO^{2-}_3)	5 mg L^{-1}	18 mg L^{-1}	19 mg L^{-1}
Conductivity	1,260 µS cm^{-1}	781 µS cm^{-1}	1,790 µS cm^{-1}
Dissolved Solids	839 mg L^{-1}	487 mg L^{-1}	1,270 mg L^{-1}
Magnesium (Mg^{2+})	22.0 mg L^{-1}	11.4 mg L^{-1}	62.3 mg L^{-1}
Sodium (Na^+)	219 mg L^{-1}	168 mg L^{-1}	258 mg L^{-1}
Sulfate (SO^{2-}_4)	406 mg L^{-1}	186 mg L^{-1}	681 mg L^{-1}

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

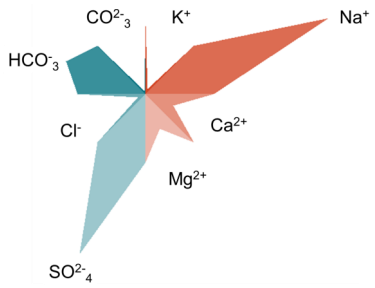

Figure 5. *Maucha diagram showing ionic balance based on 2014 data*