NORTH Dakota | Environmental Quality

Be Legendary.™

Contact: Watershed Management Program

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Larson Lake

(46.427398 N, -102.514161 W)

Hettinger County

- Larson Lake is a small natural lake in southwest North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/larsonhettinger2009.pdf)
- There is one public boat ramp on the north side of Larson Lake.
- The Larson Lake watershed is about 19,500 acres of mostly grassland/pasture and agricultural land. The most common crops grown are spring wheat, other hay/non-alfalfa and corn (Table 1).
- Larson 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."
- Larson Lake is managed for northern pike and yellow perch, with fish stocked intermittently. Northern pike and yellow perch were the only species found during the last sample by the ND Game and Fish.
- Larson Lake was previously assessed in 2002-2003.

Figure 1. *Location of Larson Lake 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
Agriculture	61.3%	40.7%
Spring Wheat	*57.6%*	*36.4%*
Other Hay/Non-Alfalfa	*18.0%*	*26.3%*
Corn	*8.1%*	*5.2%*
Grassland/Pasture	33.2%	42.4%
Developed	4.0%	6.7%
Open Water	0.7%	6.8%
Wetlands	0.7%	2.4%
Forest	0.2%	0.8%

Temperature and Dissolved Oxygen

- Larson Lake can stratify 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 2.68 degrees Celsius (ºC), 1.92ºC and 0.01ºC in May, July and October, respectively.
- All samples showed most of the lake as well-oxygenated, except during summer thermal stratification.

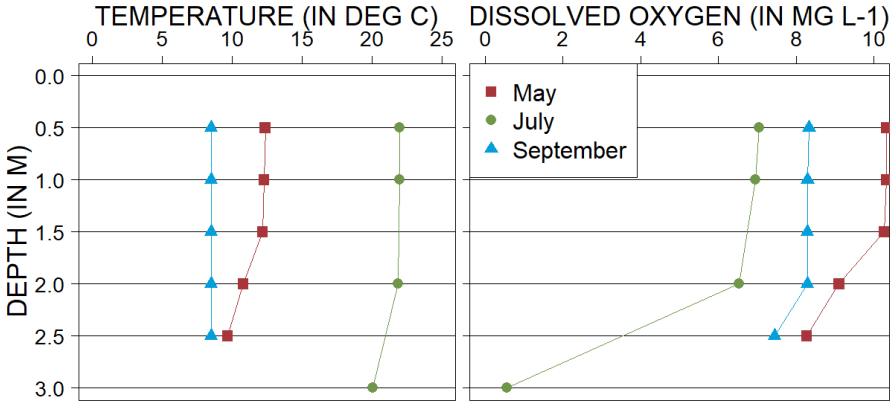

Figure 2. *2014 profiles of temperature (left) and dissolved oxygen (right) in milligrams per liter (mg L^{-1})*

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.
- Larson Lake is a hypereutrophic lake (Figure 3) that has high nutrient concentrations and dense algal growth.
- Current trophic state is similar to historical indices.
- Larson Lake experiences frequent ***harmful*** algal (cyanobacteria) blooms.

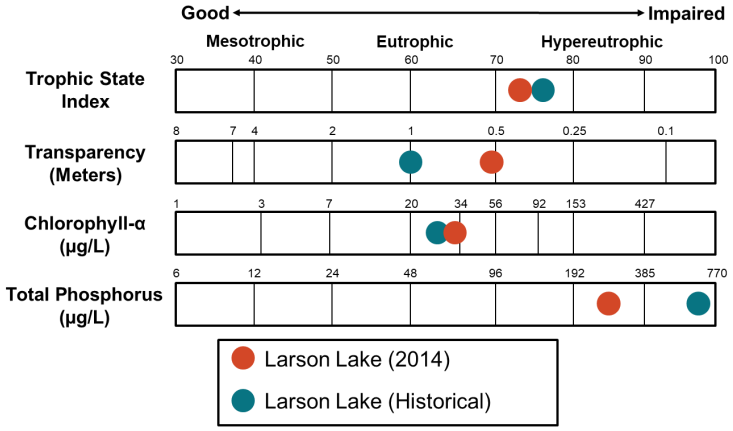

Figure 3. *Trophic state indices for 2014 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2014 was slightly less than the historical median but greater than the median for the Missouri Plateau Level IV Ecoregion (hereafter, Missouri Plateau) where Larson Lake is located (Figure 4). Larson Lake is the only monitored natural lake in the Ecoregion, so it is compared here to reservoirs.
- Median concentration of dissolved TN was less than TN.
- Median TP concentration in 2014 was much less than the historical median but 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 low concentrations in 2014 at Larson Lake, while nitrate-plus detected once.

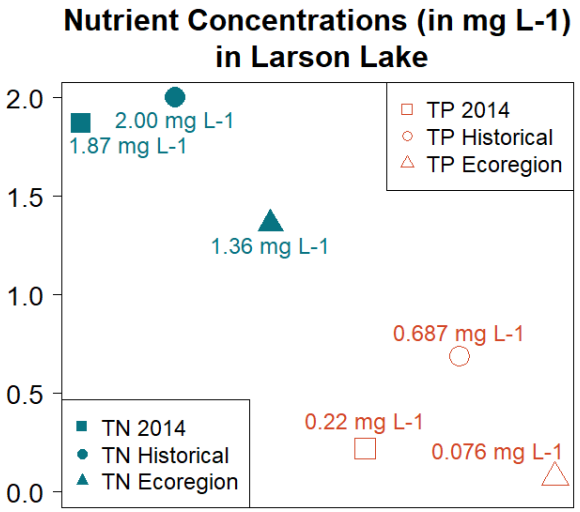

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

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	401 mg L^{-1}	572 mg L^{-1}	280 mg L^{-1}
Bicarbonate (HCO^-_3)	450 mg L^{-1}	478 mg L^{-1}	291 mg L^{-1}
Calcium (Ca^{2+})	33.2 mg L^{-1}	41.4 mg L^{-1}	49.3 mg L^{-1}
Carbonate (CO^{2-}_3)	14 mg L^{-1}	78 mg L^{-1}	19 mg L^{-1}
Conductivity	1,360 µS cm^{-1}	1,950 µS cm^{-1}	1,790 µS cm^{-1}
Dissolved Solids	895 mg L^{-1}	1,350 mg L^{-1}	1,270 mg L^{-1}
Magnesium (Mg^{2+})	43.7 mg L^{-1}	59.1 mg L^{-1}	62.3 mg L^{-1}
Sodium (Na^+)	218 mg L^{-1}	340 mg L^{-1}	258 mg L^{-1}
Sulfate (SO^{2-}_4)	298 mg L^{-1}	527 mg L^{-1}	681 mg L^{-1}

- Bicarbonate and sulfate are co-dominant anions in Larson Lake, while sodium is the dominant cation (Figure 5).
- Median concentrations of most cations and anions are less than the historical median for the lake and less than the median for the Missouri Plateau.

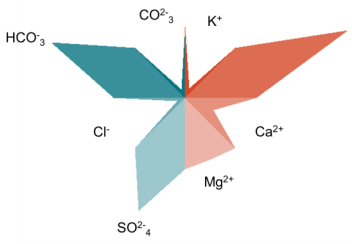

Figure 5. *Maucha diagram showing ionic balance based on 2014 data*