NORTH Dakota | Environmental Quality

Be Legendary.™

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June 2024

North Lemmon Lake

(46.0107 N, -102.16027 W)

Adams County

- North Lemmon Lake is a Lake in southwestern North Dakota (Figure 1). See map at (https://gf.nd.gov/gnf/maps/fishing/lakecontours/northlemmon2021.pdf)
- There is one public boat ramp on North Lemmon Lake on the northwest side of the lake.
- The North Lemmon Lake watershed drains about 31,300 acres. Land cover in the watershed is majority rangeland. Agriculture is also dominant in the area and comprised largely of corn, wheat, and sunflower (Table 1).
- North Lemmon Lake is a Class I, cold-water fishery, which are "capable of supporting growth of cold water fishes (e.g., salmonids) and associated aquatic biota."
- North Lake Lemmon is managed for rainbow trout, brown trout, and walleye. The lake was last stocked in 2021 with these species. Yellow perch, largemouth bass, bluegill, walleye, hybrid sunfish, and green sunfish were found during the last survey by the ND Game and Fish (2023).
- North Lake Lemmon was last sampled in 2006.

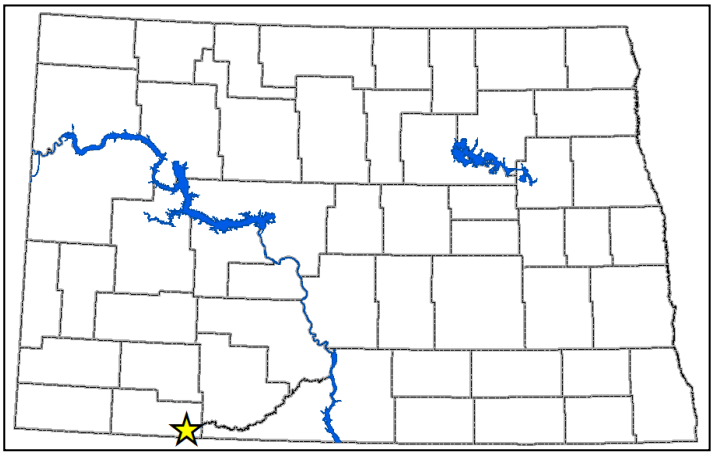

Figure 1. *Location of North Lemmon Lake within the state*

Table 1. *Percentage of land cover in the watershed and near the lake (NASSCDL, 2021). Value listed of crop type represents percentage of total production*

Land Cover Type	% in Watershed	% within 500 meters
Agriculture	32.1%	4.4%
Corn	*8.2%*	*<1.0%*
Wheat	*9.5%*	*<1.0%*
Sunflower	*5.3%*	*3.6%*
Trees	<1.0%	<1.0%
Rangeland	63.0%	86.3%
Water	1.6%	3.9%
Bare	2.8%	4.8%

Temperature and Dissolved Oxygen

- North Lemmon Lake stayed stratified throughout most of the sampling season, with warm, well-oxygenated water at the top of the water column, and cold, low-oxygen water near the bottom.
- Thermal stratification took place in May, June, and August. The greatest temperature change in the water column during these months was 1.5 degrees Celsius (ºC), 5.5ºC, and 4.0ºC (Figure 2).
- Dissolved oxygen concentrations were relatively high at the surface, but there was some anoxic conditions near the bottom (Figure 2).

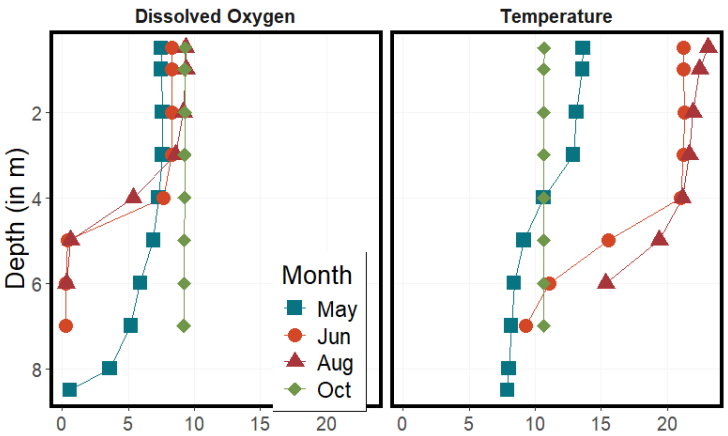

Figure 2. *2023 profiles of dissolved oxygen (left) in milligrams per liter (mg L^{-1}) and temperature (right) in degrees Celsius.*

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.
- North Lemmon Lake is a eutrophic lake (Figure 3) that has moderate nutrient concentrations and moderate algal/plant growth.
- Trophic state in 2023 was a bit higher than the

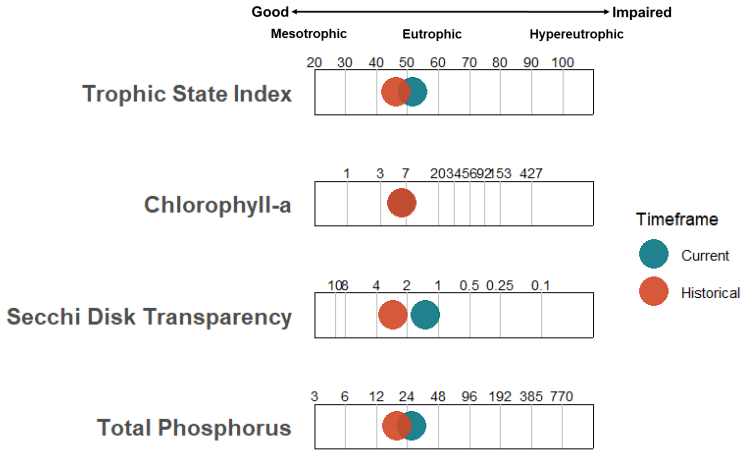

Figure 3. *Trophic state indices for 2023 and historical samples*

Nutrients

- Median concentration of total nitrogen (TN) in 2023 was less than the historical median for the lake and the Missouri Plateau Level IV Ecoregion were North Lemmon Lake is located (Figure 4).
- 2023 median concentration of dissolved TN was less than TN.
- Median TP concentration in 2023 was less than the historical and ecoregion medians (Figure 4).
- 2023 median concentration of dissolved phosphorus was less than TP.
- Nitrate + nitrate was found above the detection limit of 0.03 mg/L during the October sampling event.

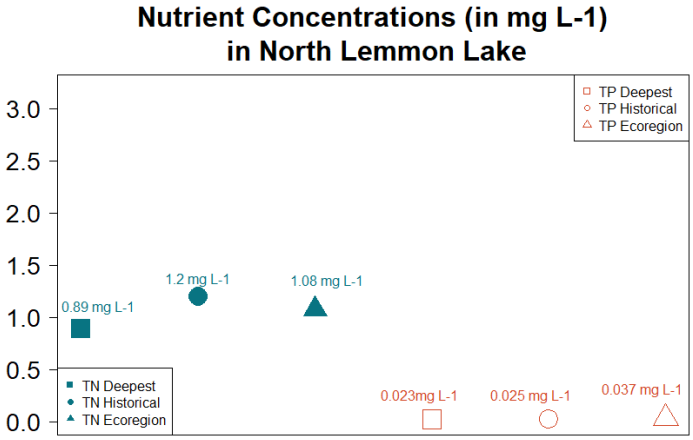

Figure 4. *Median concentrations of TN and TP in mg L^{-1} compared to regional medians*

Water Chemistry

Table 2. *Median concentrations of selected constituents for 2023 and historical samples and from all Ecoregion natural lakes and reservoirs.*

Measure	2023 Median	Historical Median	Ecoregion Median
Alkalinity	301.5 mg L^{-1}	303 mg L^{-1}	201 mg L^{-1}
Bicarbonate (HCO^{-}_3)	330 mg L^{-1}	330 mg L^{-1}	217 mg L^{-1}
Calcium (Ca^{2+})	23.85 mg L^{-1}	22.9 mg L^{-1}	47.5 mg L^{-1}
Carbonate (CO^{2-}_3)	19 mg L^{-1}	19 mg L^{-1}	11 mg L^{-1}
Conductivity	555 µS cm^{-1}	562.5µS cm^{-1}	823.5 µS cm^{-1}
Dissolved Solids	304.5 mg L^{-1}	308 mg L^{-1}	521.5 mg L^{-1}
Magnesium (Mg^{2+})	47.05 mg L^{-1}	47.45 mg L^{-1}	24.7 mg L^{-1}
Sodium (Na^{+})	27.85 mg L^{-1}	28.35 mg L^{-1}	94.4 mg L^{-1}
Sulfate (SO^{2-}_4)	9.31 mg L^{-1}	11.26 mg L^{-1}	206 mg L^{-1}

- Bicarbonate is the dominant anion in North Lemmon Lake, while magnesium is the dominant cation (Table 2).
- 2023 median concentrations of most cations and anions are similar to historical medians for the lake and differ from the ecoregion medians (Table 2).

Figure 5. *Photo at the deepest point on North Lemmon Lake during the August sampling event. Taken by Emily Brazil.*