Environmental Services
CROW WING COUNTY
BRAINERD, MINNESOTA 56401

Crow Wing County Water Quality Factsheet Series

Lower Cullen Lake

DNR ID: 18-0403

Vitals		Physical Characteristics		
MN Lake ID:	18-0403-00	Surface area (acres):	560	
Zoning Authority:	Cities of Nisswa & Pequot Lakes	Littoral area (acres):	236	
Lake Classification:	General Development (RD)	% Littoral area:	42%	
Major Drainage Basin:	Upper Mississippi River	Max depth (ft):	39	(m): 12
Latitude/Longitude:	46.392798 / -93.915253	Mean depth (ft):	N/A	
Water Body Type:	Public	Inlets / Outlets / Accesses:	1 / 1 / 1	
Invasive Species	None	Lakeshed to lake area ratio:	2:1	

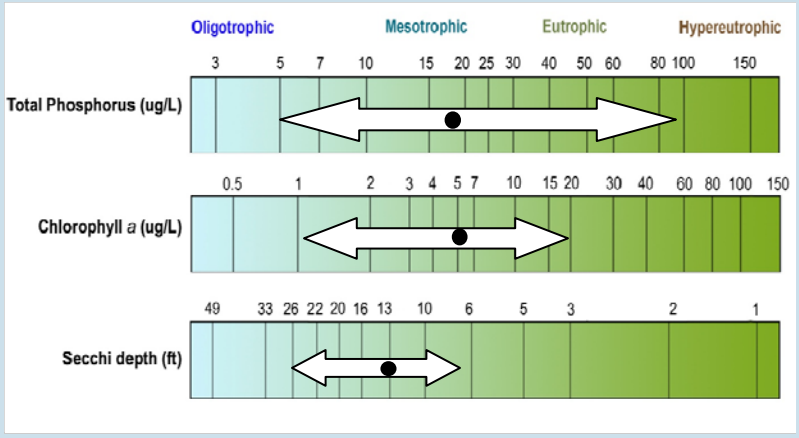
Total Phosphorus

Lower Cullen Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Lower Cullen Lake in 1991, 1995-2008. The data do not indicate much seasonal variability. The majority of the data points fall into the mesotrophic range.

Chlorophyll *a*

Chlorophyll a is the pigment that makes plants and algae green. Chlorophyll *a* is tested in lakes to determine the algae concentration or how "green" the water is. Chlorophyll *a* was evaluated in Lower Cullen Lake in 1991, 1995, 1997-2008. Chlorophyll *a* concentrations exceeded 10 ug/L in some years, indicating algae blooms.

The primary sampling location shows a possible increasing trend in total phosphorus and chlorophyll *a*. In particular, the maximums are increasing over the years.



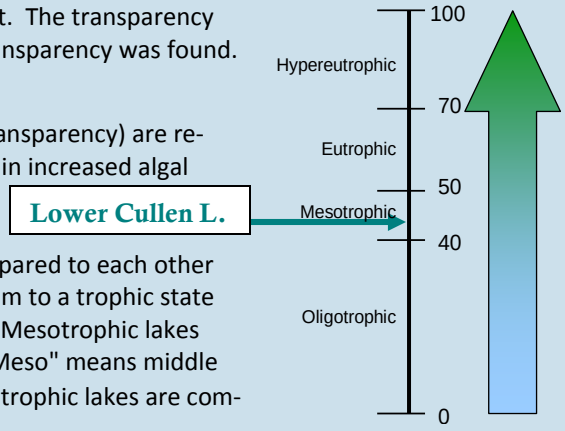
Lower Cullen Lake total phosphorus, chlorophyll *a* and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean (Primary Site 202). Figure adapted after Moore and Thornton, [Ed.]. 1988. Lake and Reservoir Restoration Guidance Manual. (Doc. No. EPA 440/5-88-002)

Transparency (Secchi Depth)

Transparency is how easily light can pass through a substance. In lakes, it is how deep sunlight penetrates through the water. Plants and algae need sunlight to grow, so they are only able to grow in areas of lakes where the sun penetrates. Water transparency depends on the amount of particles in the water. For the two sampling sites that had more than 20 transparency data points, the mean transparency ranges from 9.6 to 19.9 feet. The transparency throughout the lake appears to be relatively uniform. No significant trend in transparency was found.

Trophic State Index (TSI)

Phosphorus (nutrients), chlorophyll *a* (algae concentration) and Secchi depth (transparency) are related. As phosphorus increases, there is more food available for algae, resulting in increased algal concentrations. When algal concentrations increase, the water becomes less transparent and the Secchi depth decreases. The results from these three measurements cover different units and ranges and thus cannot be directly compared to each other or averaged. In order to standardize these three measurements, we convert them to a trophic state index (TSI). The mean TSI for Lower Cullen Lake falls in the mesotrophic range. Mesotrophic lakes (TSI 40-50) are characterized by moderately clear water most of the summer. "Meso" means middle or mid; therefore, mesotrophic means a medium amount of productivity. Mesotrophic lakes are commonly found in central Minnesota and have clear water with algal blooms in late summer. They are also good for walleye fishing.



Local association info: Cullen Lakes Association, www.cullenlakes.org