



Upper Mission Lake

DNR ID: 18-0242

Vitals		Physical Characteristics	
MN Lake ID:	18-0242-00	Surface area (acres):	875
Zoning Authority:	Crow Wing County	Littoral area (acres):	399
Lake Classification:	General Development (GD)	% Littoral area:	46%
Major Drainage Basin:	Upper Mississippi River	Max depth (ft):	36 (m): 11
Latitude/Longitude:	46.55416667 / -94.07250000	Mean depth (ft):	N/A
Water Body Type:	Public	Inlets / Outlets / Accesses:	1 / 1 / 1
Invasive Species	Curly-leaf pondweed, Eur. Milfoil	Lakeshed to lake area ratio:	3:1

Total Phosphorus

Upper Mission Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Upper Mission Lake from 1996-1999, 2003-2006, 2008-2010. In September, there were high phosphorus concentrations in 2005, 2006 and 2008. These could be due to internal loading or lake turnover. The majority of the data points fall into the mesotrophic and eutrophic range.

Chlorophyll *a*

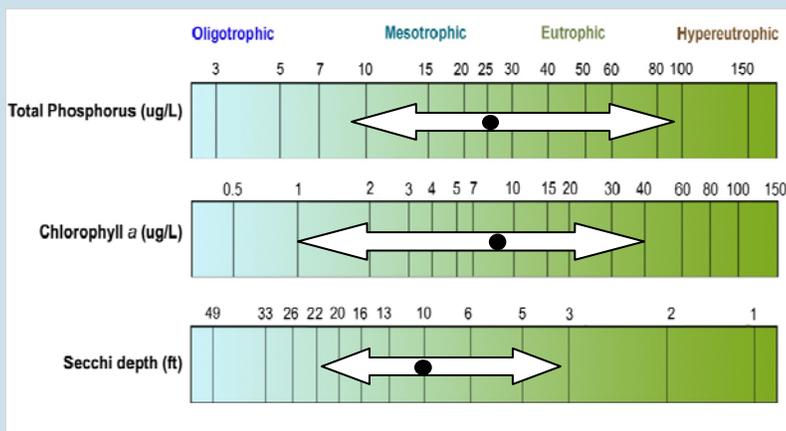
Chlorophyll *a* is the pigment that makes plants and algae green. Chlorophyll *a* is tested in lakes to determine the algae concentration or how "green" the water is. Chlorophyll *a* was evaluated in Upper Mission Lake in 1996-1999, 2003-2006, 2008-2010. Chlorophyll *a* concentrations reached 10 ug/L most years, indicating minor algae blooms.

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. An increase in particulates results in a decrease in transparency. The mean transparency ranges from 7.4 to 14.1 feet. The transparency was better than the long-term mean from 2002 to 2006, and has been lower than the long-term mean since then. Overall, Upper Mission Lake shows a significant declining trend in transparency from 2003-2011.

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 TSI for total phosphorus and chlorophyll *a* for Upper Mission Lake fall in the eutrophic range, while the transparency TSI falls into the mesotrophic range. Lakes on the mesotrophic/eutrophic border (TSI 49-51) are characteristic of moderately green water throughout the summer. The bottom of the deep areas of the lake becomes anoxic (no oxygen) during the summer.



Upper Mission Lake total phosphorus, chlorophyll *a* and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean (Primary Site 205). Figure adapted after Moore and Thornton, [Ed.]. 1988. Lake and Reservoir Restoration Guidance Manual. (Doc. No. EPA 440/5-88-002)

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