Environmental Services
CROW WING COUNTY
BRAINERD, MINNESOTA 56401

Crow Wing County Water Quality Factsheet Series

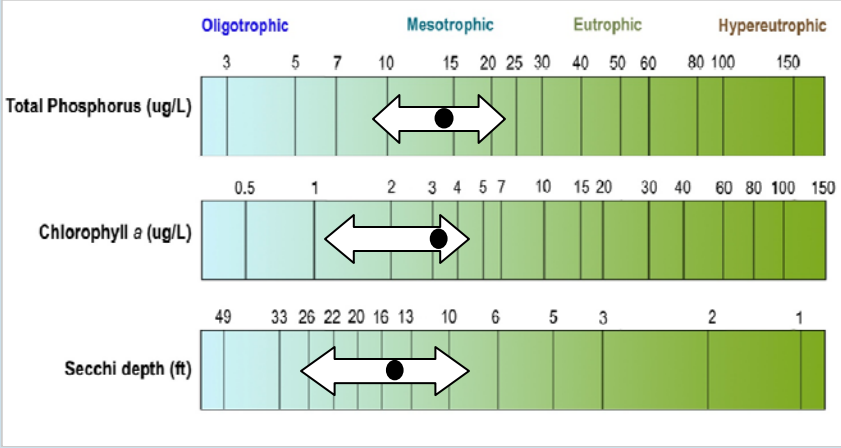
Bay Lake

DNR ID: 18-0034

Vitals		Physical Characteristics		
MN Lake ID:	18-0034-00	Surface area (acres):	2,319	
County:	Crow Wing	Littoral area (acres):	1,005	
Lake Classification:	Residential Development (RD)	% Littoral area:	43%	
Major Drainage Basin:	Upper Mississippi River	Max depth (ft):	74	(m): 22.6
Latitude/Longitude:	46.39611111/-93.85194444	Mean depth (ft):	22	(m) 6.8
Water Body Type:	Public	Lakeshed size (acres):	10,716	
Invasive Species	Eurasian Watermilfoil, Curly-leaf pondweed	Lakeshed : lake area ratio	4.6:1	
		Inlets / Outlets / Accesses	6 / 1 / 2	

Total Phosphorus
Bay Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Phos. was measured in 1988-1989, 2002 and data fell in the mesotrophic range.

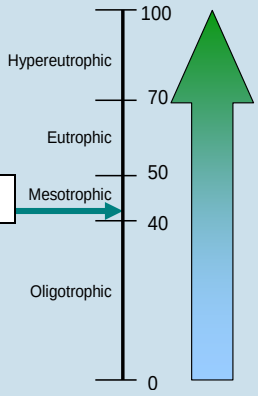
Chlorophyll *a*
Chlorophyll a is the pigment that makes plants and algae green. Chlorophyll *a* is tested in lakes to determine the algae concentration or how "green" the water is. Chlorophyll *a* was tested in 1988-1989, 2002 and concentrations were below 10 ug/L, which indicates no algae blooms throughout the summer.



Bay Lake total phosphorus, chlorophyll *a* and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean (Primary Site 203). 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. An increase in particulates results in a decrease in transparency. The annual mean transparency for Bay Lake ranges from 9.5-18.2 ft and has shown an increasing trend from 1998-2008, but a declining trend since 2009.

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 to make them directly comparable, we convert them to a trophic state index (TSI).



The mean TSI (41) for Bay Lake falls in the mesotrophic range. There is good agreement between the TSI for phosphorus (43), chlorophyll *a* (43) and transparency (38), indicating that these variables are strongly related. The TSI at both monitoring sites was nearly identical, indicating uniform water quality throughout the lake. Mesotrophic lakes (TSI 40-50) are characterized by moderately clear water most of the summer. Mesotrophic lakes are commonly found in central Minnesota and have clear water with some algal blooms in late summer. Mesotrophic lakes can be good walleye lakes.

Local association info: Bay Lake Improvement Association, blia@baylk.org, www.baylk.com