



# Borden Lake

**DNR ID: 18-0020**

Vitals		Physical Characteristics	
MN Lake ID:	18-0020-00	Surface area (acres):	1,012
Zoning Authority:	Crow Wing County	Littoral area (acres):	304
Lake Classification:	General Development (GD)	% Littoral area:	30%
Major Drainage Basin:	Upper Mississippi River	Max depth (ft):	84 (m): 25.6
Latitude/Longitude:	46.30959871/-93.84815468	Mean depth (ft):	NA
Water Body Type:	Public	Lakeshed size (acres):	7,533
Invasive Species	None documented	Lakeshed : lake area ratio	7:1
		Inlets / Outlets / Accesses	3 / 1 / 1

## Total Phosphorus

Borden Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Borden Lake in 2001, 2004, 2006, and 2009. The data indicate a slight increase in phosphorus toward the end of the summer.

## Chlorophyll *a*

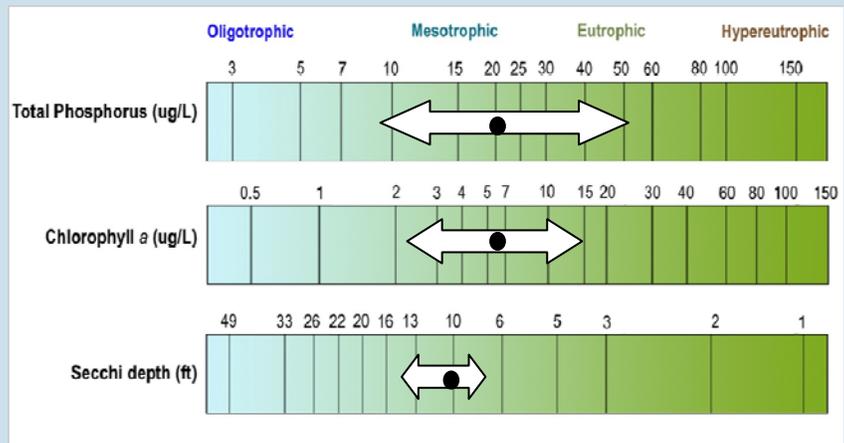
Chlorophyll *a* is the pigment that makes plants and algae green. Chlorophyll *a* is tested in lakes to determine the algae concentration or how "green" the water is. Chlorophyll *a* was evaluated in Borden Lake in 2001, 2004, 2006, and 2009. Chlorophyll *a* concentrations in Borden Lake Bay reached 10 ug/L toward the end of the summer, indicating mild 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. Borden Lake transparency appears to have remained relatively consistent since 2003. The annual means for Borden Lake range from 8.4-10.4 ft.

## 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 for Borden Lake falls in the mesotrophic range. There is good agreement between the TSI for phosphorus (46), chlorophyll *a* (47) and transparency (45). 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 some algal blooms in late summer.



Borden Lake total phosphorus, chlorophyll *a* and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean (Primary Site 201). Figure adapted after Moore and Thornton, [Ed.]. 1988. Lake and Reservoir Restoration Guidance Manual. (Doc. No. EPA 440/5-88-002)

