



# Whitefish Lake

**DNR ID: 18-0310**

## Vitals

MN Lake ID:	18-0310-00
Zoning Authority:	Crow Wing County, Crosslake, Manhattan Beach
Lake Classification:	General Development (GD)
Major Drainage Basin:	Pine River Watershed
Latitude/Longitude:	46.68916667/-94.21333333
Water Body Type:	Public
Invasive Species	Curly-leaf pondweed

## Physical Characteristics

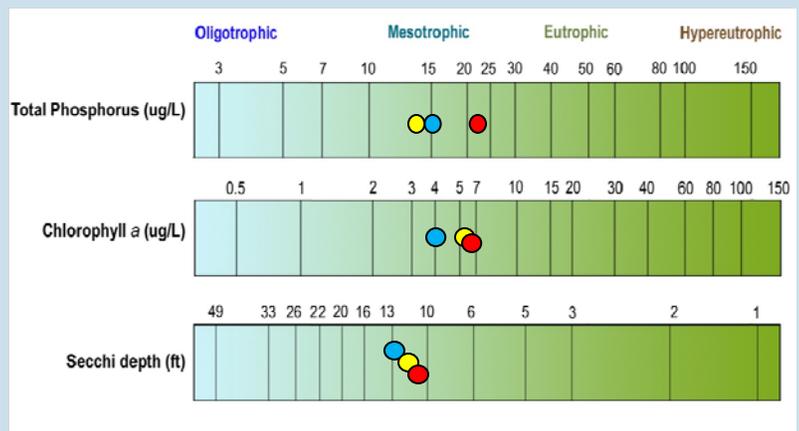
Surface area (acres):	7,715
Littoral area (acres):	2,713
% Littoral area:	28%
Max depth (ft):	138 (m): 42
Mean depth (ft):	N/A
Lakeshed size (acres):	13,277
Lakeshed : lake area ratio	2:1
Inlets / Outlets / Accesses	3 primary / 1 / 7

## Total Phosphorus

Whitefish Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Whitefish Lake at both sites from 2003-2011. Upper Whitefish has consistently higher phosphorus concentrations than Lower Whitefish, due to the Pine River inlet to Upper Whitefish. The Pine River carries nutrients and sediment from upstream in the watershed.

## 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 for both sites of Whitefish Lake in 2003-2011. Chlorophyll *a* concentrations reached 10 µg/L four times in Upper Whitefish Lake and two times in Lower Whitefish, indicating mild algae blooms.



Whitefish Lake total phosphorus, chlorophyll *a* and transparency historical ranges. The colored dots represent the historical mean for each site (Upper WF = red, Middle WF = yellow, Lower WF = blue). 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. Upper Whitefish had lower mean transparencies than Lower Whitefish. This pattern could be due to the fact that the Pine River drains into Upper Whitefish, bringing a cumulative phosphorus load from the watershed. The annual means for Whitefish Lake range from 6.9-16.7 ft. Lower Whitefish Lake shows a statistically significant declining long-term trend in transparency. The transparency has declined an average of approximately 2 feet since 1990. In the last decade, from 2000-2011, there is no trend. Upper Whitefish shows no long-term trend.

## 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 Whitefish Lake is in the mesotrophic range (upper whitefish = 47, lower whitefish = 42). Mesotrophic lakes are characterized by moderately clear water most of the summer.

