



# Serpent Lake

**DNR ID: 18-0090**

## Vitals

MN Lake ID:	18-0090-00
Zoning Authority:	Crow Wing County, City of Deerpark,
Lake Classification:	General Development (GD)
Major Drainage Basin:	Upper Mississippi River
Latitude/Longitude:	46.47916667/-93.91694444
Water Body Type:	Public
Invasive Species	Curly-leaf pondweed

## Physical Characteristics

Surface area (acres):	1,103
Littoral area (acres):	338
% Littoral area:	31%
Max depth (ft):	65 (m): 19.8
Mean depth (ft):	N/A
Lakeshed size (acres):	3,316
Lakeshed : lake area ratio	3:1
Inlets / Outlets / Accesses	2 / 1 / 2

## Total Phosphorus

Serpent Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Serpent Lake in 1979-1980, 2003, and 2005-2010. 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 Serpent Lake in 2003, and 2005-2010. Chlorophyll a concentrations for Serpent remained below 10 ug/L except for two data points in Sept. of 2008 and 2010, indicating clear water most of the summer.

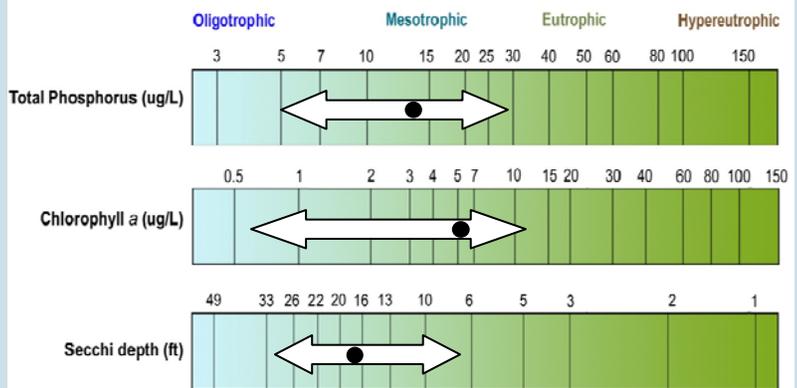
## Transparency (Secchi Depth)

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 means for Serpent Lake range from 12.7-25.5 ft. There is a gap in data from 1982-2001. In 1977-1980, Serpent Lake used to have transparency readings as high as 25-30 feet, while in the past decade, the peak transparency hasn't been above 22 feet. Site 201 shows a statistically significant declining trend in transparency from 1977 -2011 using the available data. The short-term analysis from 2002-2011 shows no trend in transparency. This means that the transparency is currently staying the same.

## 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 (42) for Serpent Lake is in the mesotrophic range. The TSI for Secchi depth was lower than that of total phosphorus and chlorophyll a.

Mesotrophic lakes are characterized by moderately clear water most of the summer.



Serpent Lake total phosphorus, chlorophyll a and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean (Sites 201 & 203). Figure adapted after Moore and Thornton, [Ed.]. 1988. Lake and Reservoir Restoration Guidance Manual. (Doc. No. EPA 440/5-88-002)

