

Portage, Crooked, Sugar, & Hanks Lakes

Vitals

MN Lake ID:	18-0050-00, 18-0044-00 18-0041-01, 18-0041-02
Zoning Authority:	Crow Wing County
Lake Classification:	Recreational Development (RD)
Major Drainage Basin:	Upper Mississippi River
Latitude/Longitude:	46.35416667 / -93.91694444
Invasive Species:	None
Lakeshed to lake area ratio:	3:1

Physical Characteristics

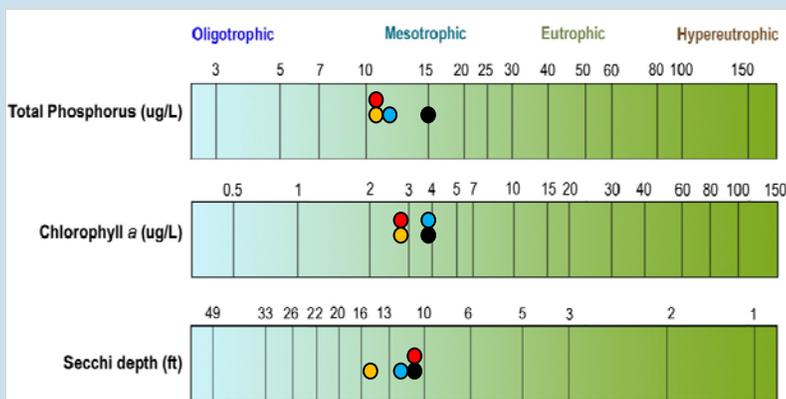
Surface area (acres):	Portage = 358 Crooked = 358 Hanks = 164
Littoral area (acres / %):	Portage = 116 (40%) Crooked = 187 (52%) Hanks = 48 (29%)
Max depth (ft):	Portage = 37 feet (11.3 m) Crooked = 72 feet (22 m) Hanks = 45 feet (13.7 m)
Inlets / Outlets / Accesses:	2 / 3 / 1 (all lakes combined)

Total Phosphorus

Portage, Crooked, Sugar, & Hanks Lakes are phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in these lakes on the same dates in 2008-2011. Portage Lake has consistently the highest phosphorus, while Hanks has consistently the lowest. All the lakes are fairly similar, however.

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 all four lakes on the same dates from 2008-2011. Portage, Crooked and Sugar Bay reached 10 ug/L once each, indicating minor algae blooms. Hanks never reached 10 ug/L in the years monitored.



Portage, Crooked, Sugar, & Hanks Lakes total phosphorus, chlorophyll *a* and transparency historical ranges. The dot represents the historical mean for each primary site (black = Portage, yellow = Crooked, blue = Sugar, red = Hanks). 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 between all lakes ranges from 10 to 18 feet. The transparency is very similar for all four lakes, while Crooked Lake is consistently the highest. This makes sense because Crooked Lake is the deepest lake of the four. The lakes follow the same ups and downs, showing some seasonal variability. All of these lakes show an improving trend in transparency.

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 the Portage lake chain falls on the border between mesotrophic and oligotrophic (39-41). Lakes on the oligotrophic/mesotrophic border are characteristic of clear water throughout the summer and are excellent for recreation.

Portage, Crooked, Sugar, Hanks L.

