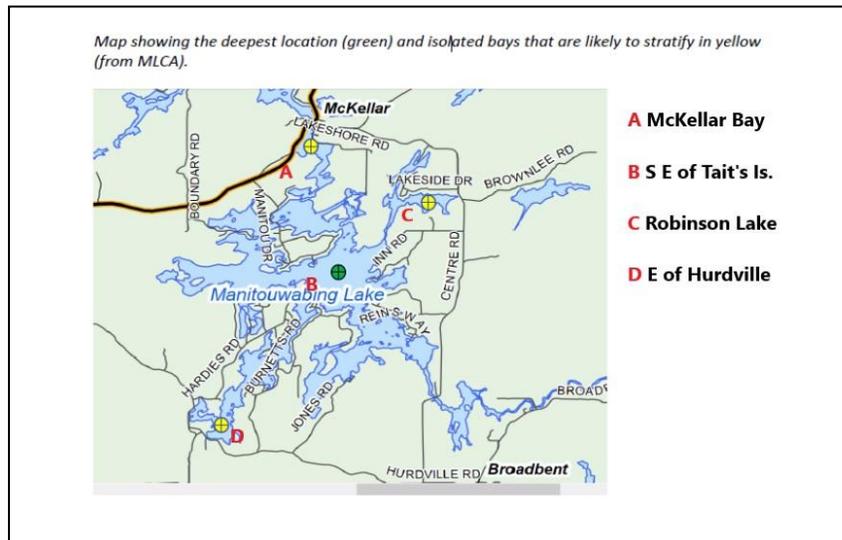


Deep Water Testing of Dissolved Oxygen (DO) 2020



In Manitowabing Lake – State of the Basin Review 2018, by Bev Clark states:

“In areas where the bottom waters have their oxygen concentrations reduced to below 1mg/L (this is called anoxia) in late summer there can be phosphorus released from the sediments into the bottom waters. In some cases, this phosphorus can be available to support algal blooms in the mixed, warmer surface water. For this reason, there is merit to measuring dissolved oxygen profiles in the lake for those areas that are deep enough to stratify (the process where warm surface water cannot mix with cold bottom water). In most cases the water needs to be about 7-8 m deep or deeper before this can occur. Shallower areas mix completely to the bottom. In stratified areas, the cold bottom water cannot have its oxygen replenished from the surface such that when oxygen is consumed by bacteria the loss of oxygen cannot be reversed until the lake turns over again in the fall. Under these circumstances there may be phosphorus that enters the cold bottom water from the sediments. If this phosphorus ends up being entrained into the warmer surface water in sufficient quantities, it can help to support algal blooms under the right conditions.

Areas in Manitowabing where this may occur are shown in yellow on the map below and these areas could be assessed with oxygen/temperature profiles on or 14 days either side of Sept 01. Any additional areas that may stratify could be confirmed in the initial years of monitoring.”

A recommendation in the GBBR report received in late September of 2020 was to “Conduct late summer monitoring of dissolved oxygen in the deepest location and in isolated bays where depths are greater than 7-8m.” (Katrina Krievins, Manitowabing Lake Environment Report 2020, p.iii)

These areas referred to in the 2018 report, and now marked A, B, C and D were sampled in the fall of 2020 using a device for deep water sampling called a ‘Bacon bomb sampler’ by Fisher Scientific Co. Unique markers were inserted into the rope holding the sampler at lake level for the various locations for later depth calculation. Samples in McKellar Bay (A) and SE of Tait’s Is. (B) were murky with floating particulates. The sample in Robinson Lake (C) was black with no visible particulates. The sample E. of Hurdville (D) was a muddy pinkish milk chocolate brown.

Date	Time	Location on Manitouwabing Lake	Secchi depth	DO Measurement Depth	Temperature @ DO measurement depth	Dissolved Oxygen mg/L
Oct 9 2020	4:03 PM	A McKellar Bay	3 m	19 m.	12.7 ⁰ C	7.84
Oct 10 2020	12:10 PM	B SE of Tait's Is.	2.42 m	27.7 m.	9.3 ⁰ C	6.13
Oct 10 2020	12:50 PM	C Robinson Lake	2.33 m	16.2 m.	8.3 ⁰ C	3.59
Oct 10 2020	11:00 AM	D E of Hurdville	1.43 m	6.16 m.	11.9 ⁰ C	5.26

What is the significance of the results of these dissolved oxygen (DO) measurements in the deepest parts of Manitouwabing Lake? The results indicate that the DO is not in the low range that could lead to release of phosphorus from sediments into the bottom waters, as discussed by Bev Clark.

A discussion about oxygen levels in Loon Lake (U.S.) indicates that “dissolved oxygen levels below 4 mg/liter are too low to sustain warm water fish like bluegill, bass and pike and production for most fish begins to drop when oxygen levels fall below 5 mg/liter. Oxygen also is needed by virtually all algae and all macrophytes, and for many chemical reactions that are important to lake functioning.”¹

Another article states that “once dissolved oxygen levels drop below 2mg/l, the water is described as **hypoxic**. As it approaches 0mg/l, it becomes **anoxic**. A **dead zone** is an area within a lake that is either hypoxic or anoxic, and in which few organisms can survive. Oxygen-consuming organisms within dead zones either suffocate or leave the area. According to the Michigan water quality standards, a minimum oxygen concentration of 7mg/l is needed for cold-water fish and minimum of 5 mg/l is needed for warm water fish (MDEQ, 1994).”²

The two DO measurements taken at Secchi depth (McKellar Bay and Jones Bay) were 8.91 and 9.53 mg/L respectively. The DO measurements taken this fall indicate that there is sufficient oxygen to sustain aquatic life in Manitouwabing Lake.

Samples for phosphorus and calcium were collected at sites A, C and D and will be sent for analysis.

¹(<https://loonlakesteubenny.com/lake-technical/general-information/dissolved-oxygen/the-importance-of-dissolved-oxygen/#:~:text=Dissolved%20oxygen%20is%20one%20of%20the%20most%20important,of%20supporting%20many%20different%20kinds%20of%20aquatic%20organisms.>)

²<https://www.michiganseagrant.org/lessons/lessons/by-broad-concept/physical-science/dissolved-oxygen-and-lake-stratification/>