

Interpretation of Water Quality Data

1. Spring phosphorus

Phosphorus is the nutrient that controls the growth of algae in most Ontario lakes. For this reason, any increase in phosphorus in a lake will tend to increase the quantity of algae that can grow.

High levels of phosphorus can lead to algal blooms that detract from recreational water quality and in some cases affects the habitat of coldwater fish species such as lake trout.

A sensitivity rating is given to each lake in Muskoka based on the lake's responsiveness to phosphorus inputs and the mobility of phosphorus within the lake's watershed. A lake can have either a low, moderate or high sensitivity to phosphorus.

Phosphorus samples are collected in the spring during a period called "spring turnover". This is the best time to sample for phosphorus because the lake is completely mixed and a water sample represents the phosphorus concentration throughout the whole lake.

By sampling spring phosphorus each year it is possible to detect a change in the nutrient status of a lake. Several years of data must be collected to first observe the normal, between-year-differences, before a trend can be identified.

Phosphorus enters a lake naturally through sediment and precipitation. Human inputs of phosphorus enter a lake primarily through surface runoff from sources such as septic system seepage, lawn fertilizer runoff, agricultural runoff and municipal wastewater.

Lakes with phosphorus concentrations below 10 micrograms per litre ($\mu\text{g/L}$) are considered oligotrophic or unenriched. Those with a phosphorus concentration falling between 11 and 20 $\mu\text{g/L}$ are termed mesotrophic or moderately enriched, while lakes with a phosphorus concentration exceeding 20 $\mu\text{g/L}$ are called eutrophic and are considered enriched.

Each lake has a threshold concentration, which is equal to the background level of phosphorus plus an additional 50%. If a lake's measured *and* modelled (value calculated using a water quality model) phosphorus concentrations over a 10-year period are greater than its threshold value, then the lake is considered "over threshold" and actions will be initiated to reduce the amount of phosphorus entering the lake from its watershed.

A lake that is over threshold can be de-listed after three consecutive phosphorus measurements are below its threshold value.

2. Secchi depth measurements

Secchi depth is a measurement of water clarity. In Muskoka, the major determinant of water clarity may be either natural colour or an increase in nutrient input from the surrounding watershed.

A lake may naturally be a brown colour due to high levels of dissolved organic carbon (DOC) that comes from the wetlands in a watershed. DOC colours lakes brown and reduces water clarity, but is not an indication of nutrient enrichment. Examples of lakes with naturally high DOC content include Brandy Lake and Tea Lake.

Water clarity can also decrease as nutrients from the surrounding watershed enter and enrich the lake, resulting in high levels of suspended sediments or algal growth.

Water clarity can change weekly or yearly as a result of weather, length of winter ice cover, shoreline development, natural seasonal trends or other impacts. However, when the primary determinant of water clarity is a function of nutrient enrichment, a long-term trend that indicates a reduction in water clarity is an indication of reduced water quality.

In general, where a lake is not coloured by DOC, the higher the secchi depth reading, the clearer the lake and the less nutrients it contains. Lakes with secchi depth measurements over five metres are considered oligotrophic or unenriched. Those with a secchi depth measurement falling between three and five metres are termed mesotrophic or moderately enriched, while lakes with a secchi depth measurement below three metres are called eutrophic and are considered enriched.

3. Temperature and dissolved oxygen measurements

Temperature is a measure of the intensity of heat stored in a volume of water. Temperature patterns affect the solubility of many chemical compounds and influences the effects of pollution on aquatic life.

Dissolved oxygen is a measure of the concentration of oxygen dissolved in water. Adequate concentrations of dissolved oxygen are necessary for the survival of fish and other aquatic organisms. Dissolved oxygen concentration is an indicator of a lake's ability to support aquatic life.

Dissolved oxygen levels above five milligrams per litre (mg/L) are considered optimal for most aquatic organisms. Most fish cannot survive if levels fall below 3 mg/L. For coldwater species, such as lake trout, a minimum of 6 mg/L is needed, along with a temperature below 10°C. Lakes with dissolved oxygen readings below 0.5 mg/L are considered anoxic.

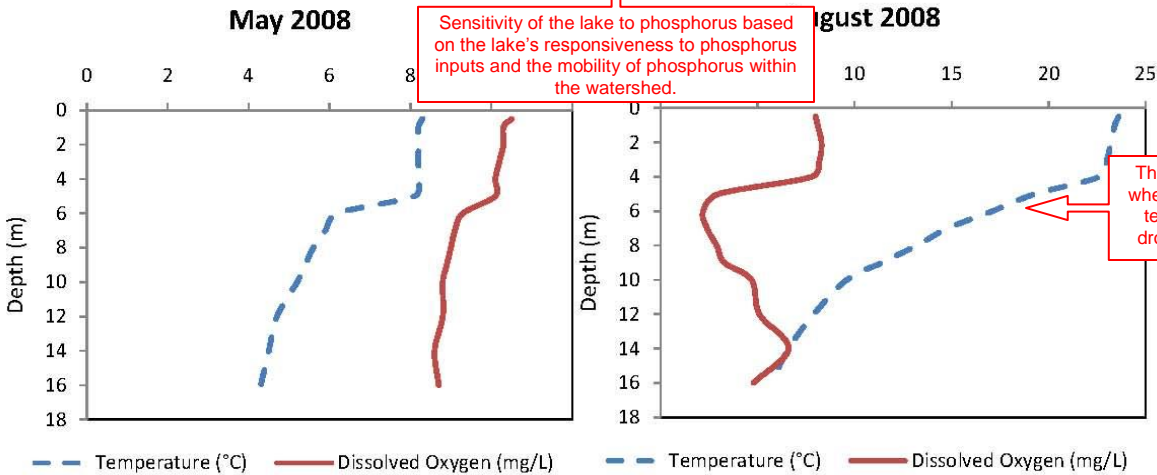
Sample Lake Data Sheet

South Muldrew Lake

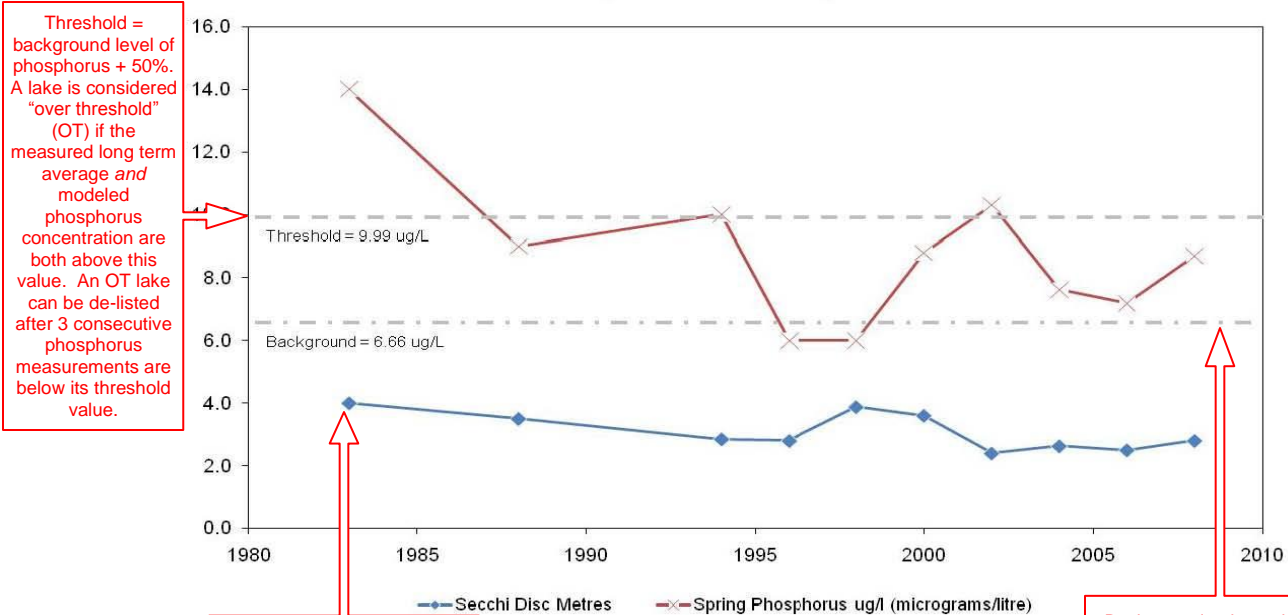
Municipality:	Gravenhurst	Watershed:	Morrison Lake
Surface Area:	2.7 km ²	Watershed Area (excluding lake):	13.3 km ²
Maximum Depth:	18 m	Cold Water Fishery?	No
Wetland Area:	6.62 %	Secchi Depth (10-year average):	2.8 m
Phosphorus (10-year average 1999-2008):	8.5 µg/L	Sensitivity:	Moderate

Current 10-year average for phosphorus. This value should remain below the Threshold Value shown on the graph below.

A cold water fishery is a lake that is managed by the Ministry of Natural Resources for Lake trout habitat.



South Muldrew Lake Long Term Monitoring Data



Phosphorus and Secchi depth measurements over time. An increase in phosphorus usually results in a decrease in Secchi depth and vice versa.

Background = the estimated concentration of phosphorus from natural sources i.e. the concentration of phosphorus present if there was no development on the lake.