WHITE LAKE PRESERVATION PROJECT

WLPP INFORMATION BULLETIN

Lakeshore Capacity

July, 2018

This WLPP Bulletin provides information on the concept and approach used to define, calculate and assess lakeshore capacity. In addition, the Bulletin provides you with information on the purpose, use and importance of assessing lakeshore capacity. This concept has been applied to White Lake and relevant data is presented showing that White Lake has reached lakeshore development capacity. This result requires the attention of Municipal Councils and all those who wish to preserve the integrity of White Lake.

1. What is lakeshore capacity?[1,2] Lakeshore Capacity refers to the level of shoreline development a lake can sustain without degradation in water quality.

2. What is water quality? Water quality for this discussion focuses only on algae blooms and total phosphorous (TP), the nutrient that is the main driver of algae blooms. There are many other elements that impact water quality that are not included in the official definition of Lakeshore Capacity.

Typical of blue-green algae blooms on White Lake

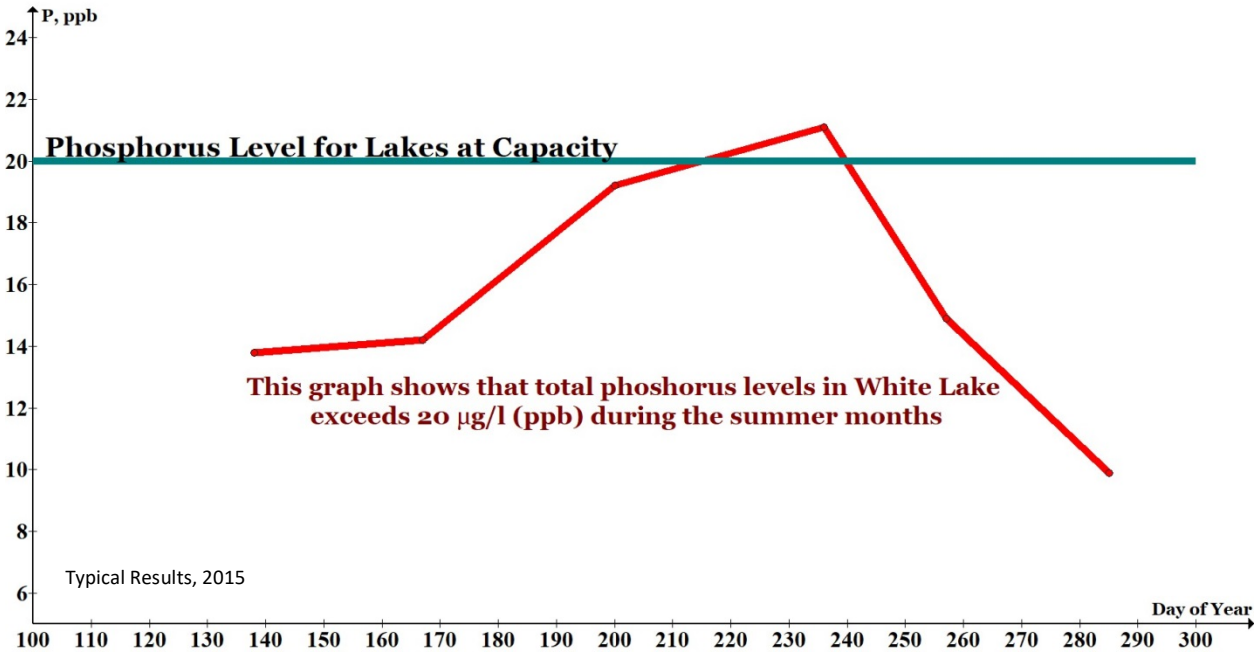
3. When is a lake at capacity? A lake is at capacity when there is a deterioration in water quality as evidenced by:

- observations of regular extensive algae blooms (blue green, toxic and non-toxic, filamentous green etc.)

[1] *Lakeshore Capacity Assessment Handbook: Protecting Water Quality in Inland Lakes on Ontario's Precambrian Shield*, May 2010, Ontario Ministries of Environment and Climate Change, Natural Resources and Forestry, and Municipal Affairs and Housing.

[2] *Lake Capacity Assessment*, July 2014, and *Protecting the Water Quality of Ontario's Inland Lakes*, Sept., 2014, Federation of Ontario Cottagers Associations, Crystal Hyatt, Dorset Environmental Science Centre, Dorset, Ontario.

- measured total phosphorous over 20 μg/L (ppb), which has been shown to be the level at which algae starts to appear regularly



4. What is the Source of phosphorous? In recreational lakes that do not have a large point source of phosphorous e.g. sewage treatment plant, and no significant agriculture along the shoreline, domestic waste from septic systems is the largest human source of phosphorous. The concentrations of phosphorous in septic waste waters as they exit the system are from 200 to 300 times higher than the concentrations which stimulate algae growth in lakes. Other sources of phosphorus in a cottage or lake setting include: fertilizers, animal feces, detergents (especially those used to wash vehicles, boats, windows and other outdoor surfaces), and contaminants from paved surfaces. Even grass clippings, and household compost can be important sources of phosphorus.

5. How does phosphorus from all of these sources get into the lake? The most important vehicle for transporting phosphorus to the lake is storm water run-off.

6. How can we slow the rate of contaminated storm water reaching the Lake? Anything that impedes the rate of storm water run-off helps protect the lake from excessive phosphorus loading. Especially Important are:

- substantial building setbacks (30 meters plus)
- buffers of natural vegetation along the shoreline; e.g. 15 meters minimum (lawns do little to impede the rate of storm water flow)
- limiting hard surfaces near the water; e.g. boat launches, boat houses, parking lots, etc.

Before and After Shoreline Restoration

7. How does phosphorous get into the lake from septic systems? Domestic septic systems do not filter out phosphorous, not even the most modern systems. Phosphorous migrates from septic systems to lakes. The amount and the time it takes varies according to:

- design and maintenance of system (the newer the better)
- distance from the water (the farther the better)
- soil type (certain soils are more effective than others in holding back the phosphorous)
- characteristics of underlying rock
- slope of the land to the water (impacts storm water run-off)
- vegetation between the septic system and the water (grass is not effective)

8. Can we determine how much more development can take place on a lake before it will be "at capacity"? Calculations can be carried out to estimate how much more development might be possible before water quality starts to deteriorate. This is done using the Lakeshore Capacity Model.

9. What is the Lakeshore Capacity Model (LCM)? This is a computer model developed by the Ministries of the Environment, Natural Resources and Municipal Affairs and Housing.

10. What are the steps in modelling?

1. ***Estimate the pre-development load of phosphorous*** for a watershed i.e. how much phosphorous was in the watershed/lake before buildings started to appear on the Lake.
2. Factor into the model the current figures for development[3] to arrive at an ***estimate of the current load of phosphorous*** in the Lake.
3. Compare the ***estimated current load*** of phosphorous to the ***measured current load of phosphorous*** in the lake. For the modelling to be valid the estimated and measured levels of phosphorous must be within 20% of each other.

11. What does the Lakeshore Capacity Model do?

Lakeshore Capacity Modelling is designed to be a preventative tool, to give planners an idea of how much more development can take place before the lake reaches background Total Phosphorous plus

[3] Type of shoreline residence (seasonal, extended seasonal, permanent), resorts, trailer parks, campgrounds (tent trailer and RV parks, youth camps), vacant lots of record.

50%. If concentrations approach the cap of 20 μg/L it is more likely that the level of phosphorous will rise to the point where blooms occur regularly.

12. What are the objectives of performing a lakeshore capacity assessment?

- Keep the level of phosphorous in lakes below the modeled (or estimated) predevelopment level plus 50% e.g. a lake with a modeled predevelopment Total phosphorous concentration of 10 μg/L (ppb) would have a water quality objective of not exceeding 15 μg/L(ppb)
- Arrive at an estimate of how much more development and what kind can occur before the water quality objective is exceeded
  Note: Lakes should not be developed past 20 μg/L. If a lake has a background of 18 μg/L it cannot be developed to 27 μg/L (background + 50%). If a model cannot work for a given lake the fall back objective is not to exceed a phosphorus concentration of 20 μg/L (ppb).

Modeled predevelopment level plus 50% for White Lake is about 16.5 μg/L, a level frequently exceeded for White Lake.

13. When is a good time to carry out a Lakeshore Capacity Model calculation?

The provincial government advises carrying out a Lakeshore Capacity:

- When developing or updating official plans[4]
- If significant improvements to road access to a lake are being considered, or have occurred increasing the use of residences from seasonal or extended seasonal to permanent
- If development is being considered within 300 meters of a lake or a permanently flowing stream within its watershed
- If significant unusually large amounts of development are proposed for a lake beyond the 300 meter boundary
- If water quality problems are noted i.e. elevated levels of phosphorous, loss of water clarity, or algal blooms are noted
- If cottagers or year-round residents raise concerns about the effects of development on water quality

Modelling for White Lake was carried out as part of an Ontario Municipal Board Hearing

14. What information is used in the Lakeshore Capacity Model?

- lake surface area
- catchment or watershed area
- whether or not the bottom layer of water in the lake (hypolimnion) is depleted of oxygen (anoxic)
- percent forest and wetland in the watershed
- the number and types of shoreline developments[5] within 300 meters of the water
- the depth of runoff from the area under consideration (areal runoff)
- concentration of phosphorous in precipitation
- observed or measured total phosphorous concentrations to evaluate the model's performance

Development figures for White Lake were obtained from Municipal Tax Records

[4] Official Plans are required by the Province to be in place for each municipality. They are to reflect the Provincial Policy Statement and contain policies to guide Councils on how land in a municipality should be used.

[5] Type of shoreline residence (seasonal, extended seasonal, permanent), resorts, trailer parks, campgrounds (tent trailer and RV parks, youth camps), vacant lots of record

15. How are the results of the model used?
The Province of Ontario recommends that the results of Lakeshore Capacity Assessments be incorporated into the Official Plans.

16. What about White Lake; is it at capacity now? Measurements of phosphorus concentrations above 20 μg/L (ppb) have been recorded ***and*** blue green and green algae blooms observed; both are criteria meant to be avoided by the Provincial Water Quality Objective (The Blue Book). The detailed model calculations described above have been completed (by an external consultant) and also show that White Lake is at capacity.

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A report by Hutchinson from 2014[6] indicated that capacity tools have been used as a part of the approach for managing shoreline development by the District Municipality of Muskoka, Seguin Township, City of Elliot Lake and City of Kenora (Black Sturgeon Lake) to determine the maximum amount of development that could occur on a lake without exceeding certain attributes, one of them being levels of phosphorous.

Closer to this part of Ontario Tay Valley Township[7] has used the Lakeshore Capacity Assessment to determine that Silver Lake has reached capacity meaning no new waterfront lots will be created. For all warm water lakes in the Township and Big Rideau Lake creation of 3 or more new lots within 300 meters of the lake will require an Environmental Impact Assessment.

Townships which have used the modelling approach also use a variety of tools which are generally described as "Best Practices" in an effort to prevent erosion, protect the riparian zone and limit the migration of phosphorous to water. Best practices will be the subject of a future WLPP Information Bulletin.

[6] Review and Analysis of Existing Approaches for Managing Shoreline Development on Inland Lakes, 2014, Hutchinson Environmental Sciences Ltd, prepared for the Ontario Ministry of the Environment and Climate Change
[7] Tay Valley Township Official Plan, § 2.24 Water Quality and Quantity; § 2.24.1 Lake Capacity, p. 58.