

Shoreline Development Capacity of Recreational Lakes in Seguin Township: Phosphorus

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Background

- Seguin Township Official Plan (OP) has policies (Section B.3.1) to guide shoreline development based on a lake's:
 - ‘threshold’ designation (50% over background)
 - sensitivity to phosphorus inputs
- Threshold and Sensitivity for lakes in Appendix 1 (OP) were estimated using a simplified phosphorus modeling approach:
 - 17 lakes
 - did not consider input from upstream lakes
 - no estimate of phosphorus loads from existing development
 - little validation with measured data



Purpose

- To develop of a watershed-based phosphorus model
 - For all lakes >10 ha
 - Considering phosphorus loads from development (existing + vacant)
 - Validated using measured data
- To update Threshold and Sensitivity designations of lakes that are scientifically-sound, consistent and defensible



Why Phosphorus?



Phosphorus limits the growth of aquatic plants in Canadian Shield lakes

- Increases in phosphorus can lead to increased growth of aquatic plants and algae
 - Taste and odour problems
 - Reduced water clarity
 - Algal toxin production
 - Oxygen depletion
- Shoreline development can increase phosphorus loads to lakes
 - Land clearance and runoff
 - Removal of shoreline vegetation
 - Septic systems

How Much Phosphorus is OK?

Threshold

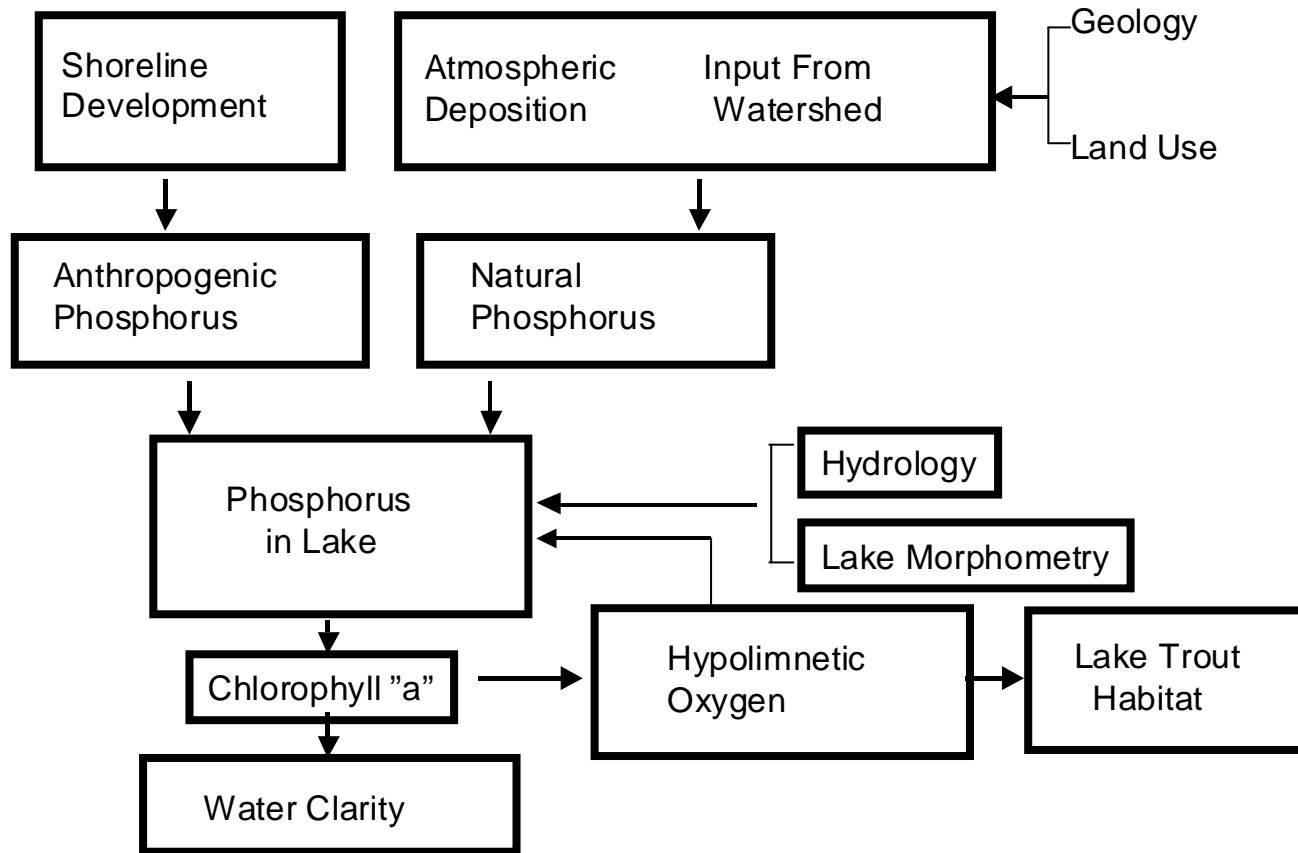
- background concentration + 50%
- maximum cap of 20 mg/L

Sensitivity

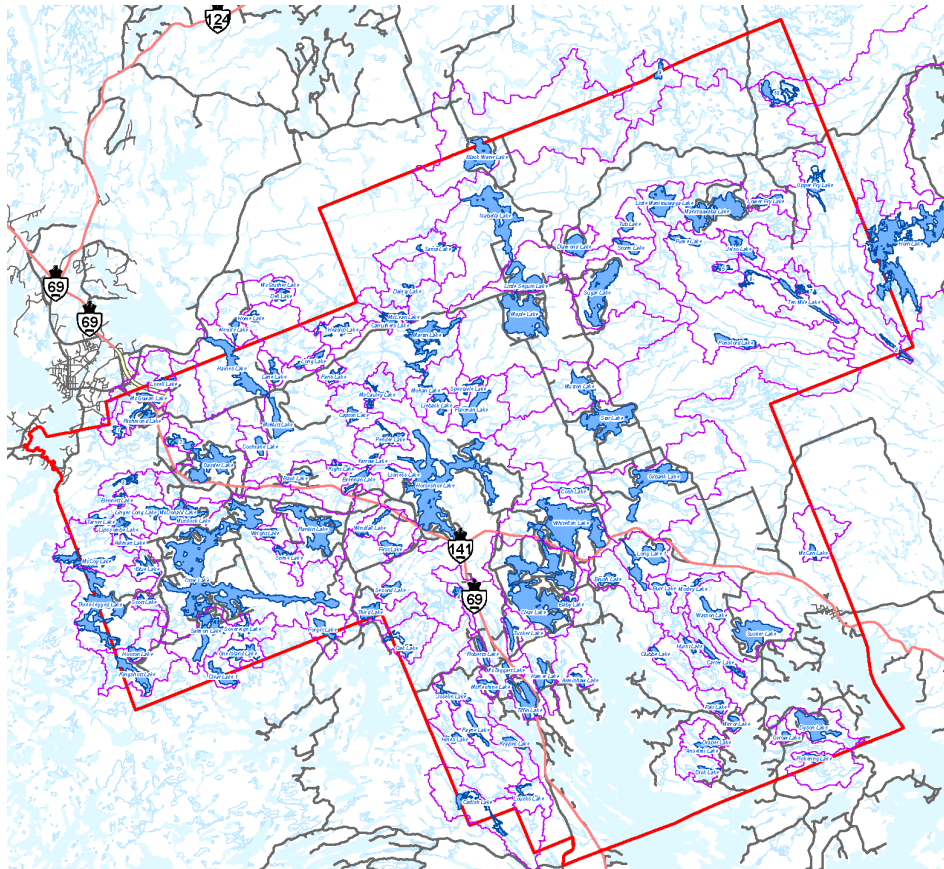
- “responsiveness”
 - standard load based on surface area
- “mobility”
 - how much phosphorus moves from the watershed to the lake
 - attenuation by soils



Lakeshore Capacity Model



Watershed-Based Phosphorus Model for Seguin Township Lakes



January 2009 Model

- 125 lakes >10 ha
- physical data (surface area, watershed area, land cover, wetland area)
- hydrological data (connectivity between lakes)
- existing shoreline development and vacant lots
- commercial recreational land uses (campgrounds, tent/trailer, parks, resorts)

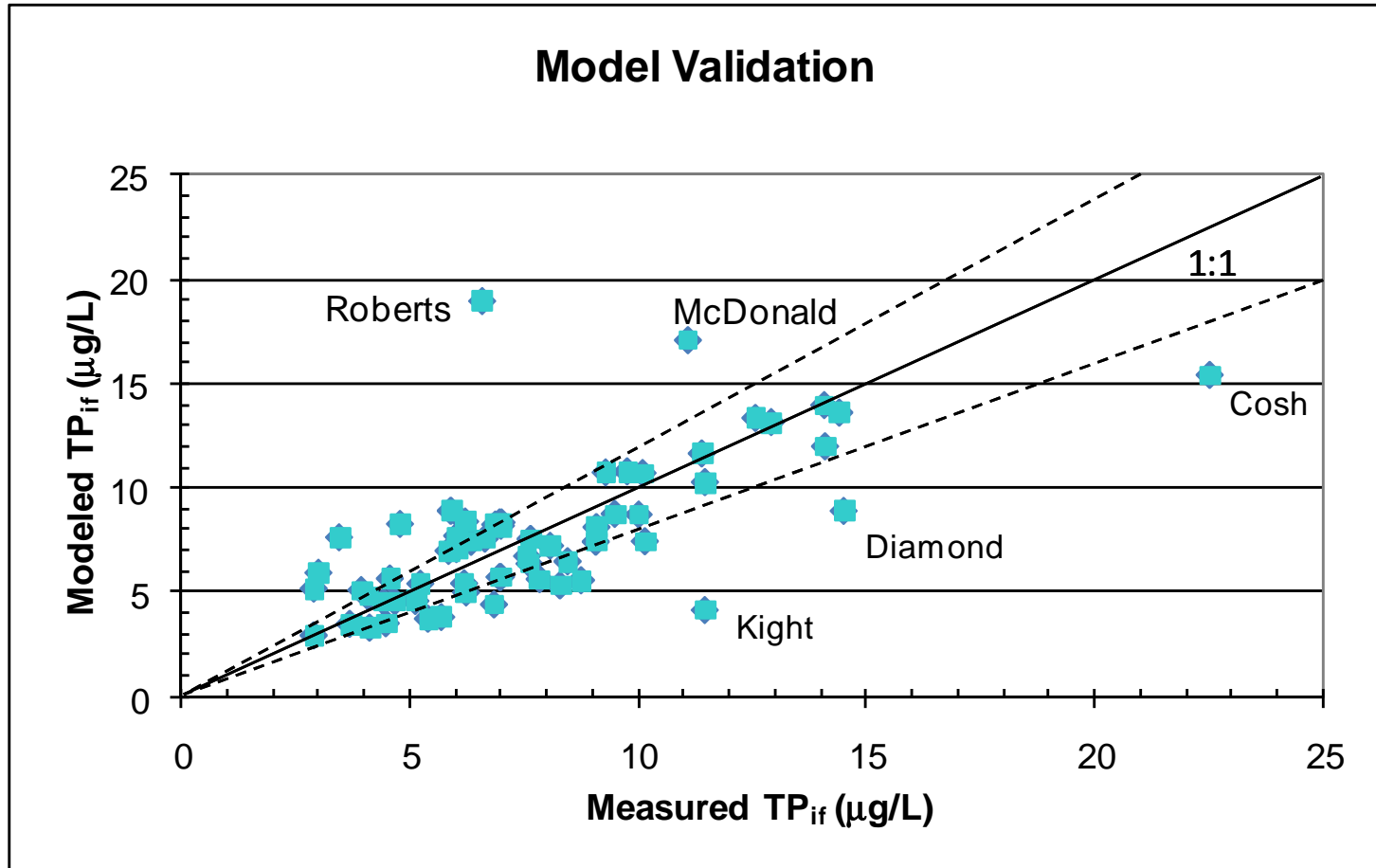


2009 Model Updates

- 128 lakes
- Watershed adjustments (Hwy. 400)
- Updated shoreline lot #s and occupancy rates
- Improved validation and calibration
 - Measured P data for 61 lakes including 2009 (Sequin Twp. Monitoring Program)
- Re-evaluation of Threshold and Sensitivity

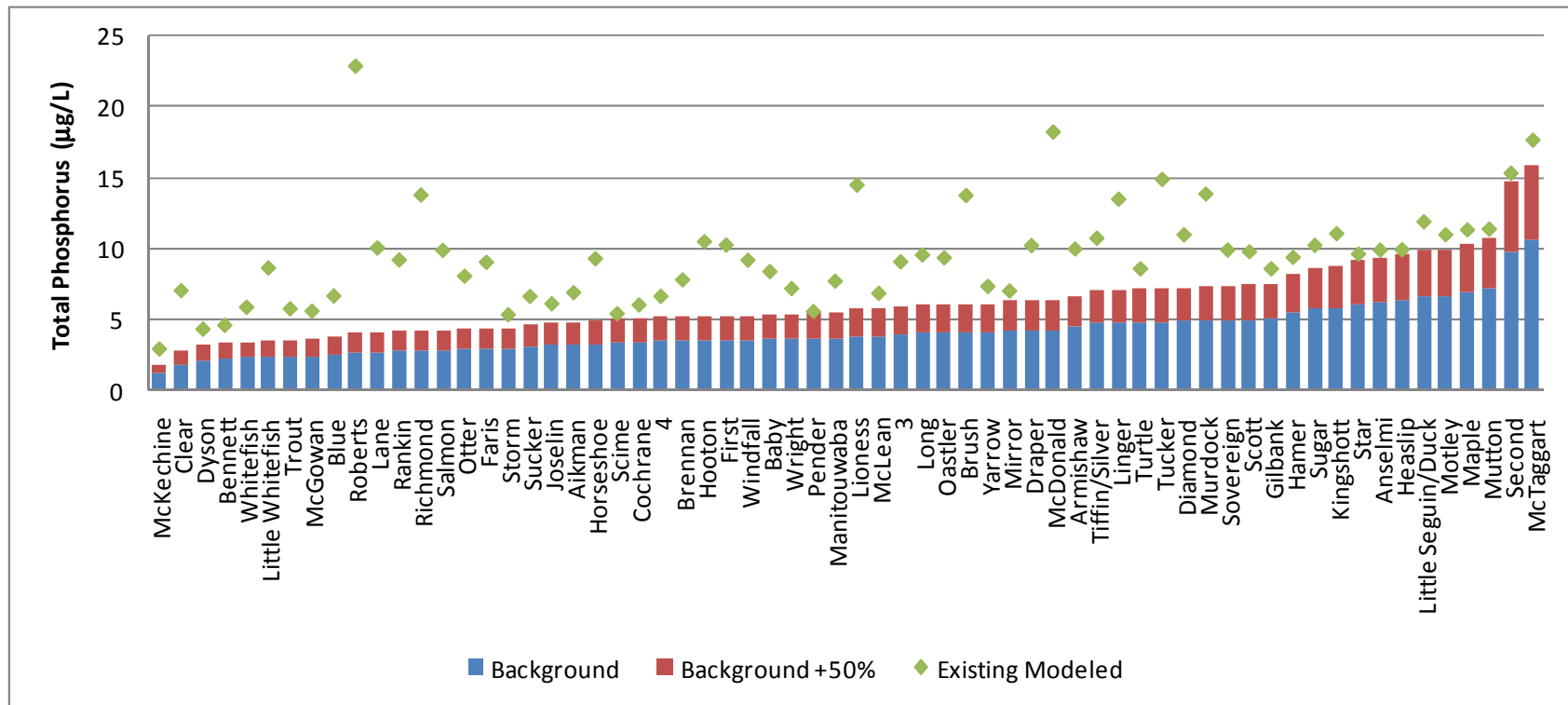


Modeled and Measured Phosphorus (61 lakes)



Threshold Phosphorus Concentration

- 50% over background to a maximum of 20 µg/L
 - Modeled Over Threshold = 64 lakes



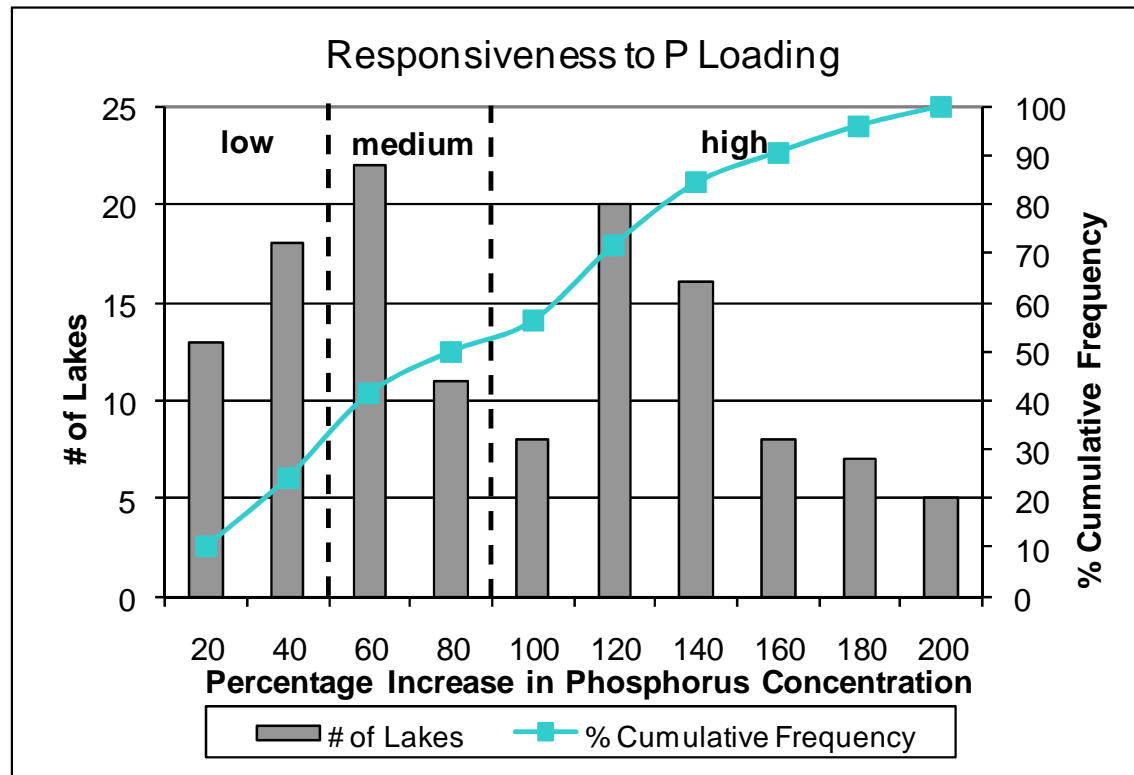
Over Threshold Lakes

- Requires that both **Measured** and **Modeled** phosphorus > background + 50%
- 31 lakes in Seguin Township are Over Threshold
- No additional development is allowed if these lakes have a 'high' sensitivity to phosphorus inputs
- Can sustain additional shoreline development if they have 'moderate' or 'low' sensitivity subject to strict guidelines
- Sensitivity depends on:
 - responsiveness
 - mobility



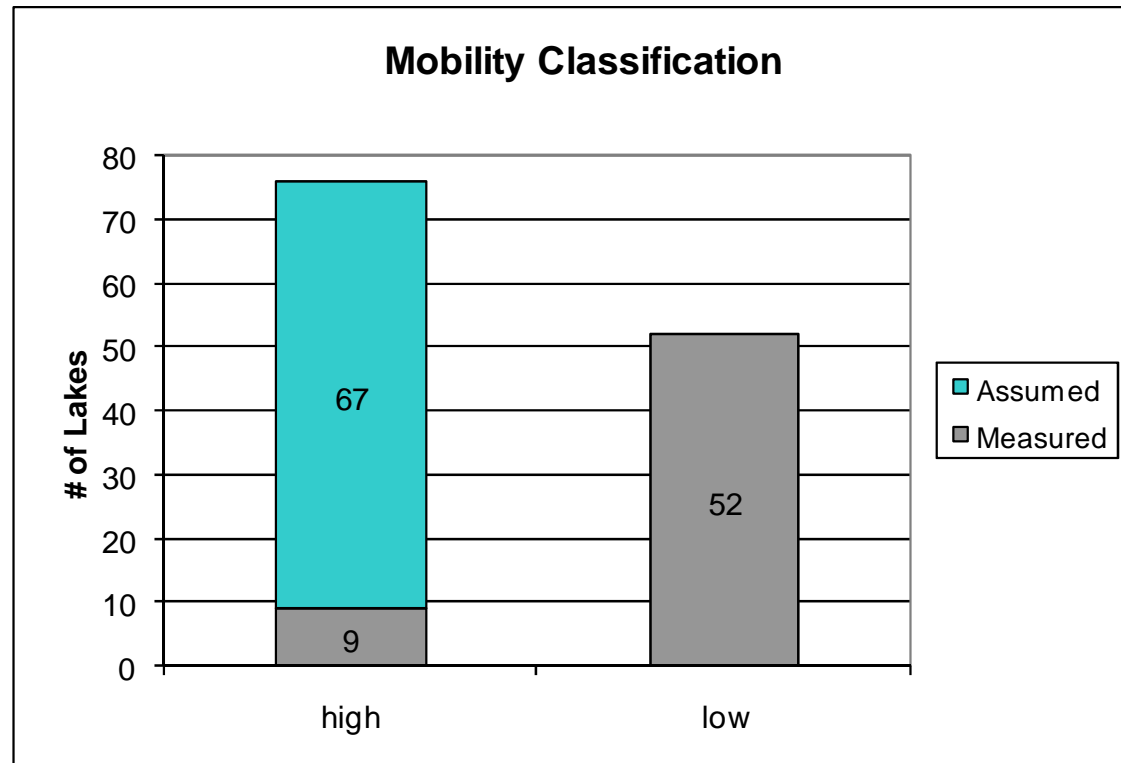
Responsiveness

- Response of a lake to a standard load of phosphorus
 - Change in phosphorus concentration



Mobility

- How much phosphorus moves to the lake?
 - Attenuation by soils



Sensitivity

- Responsiveness and Mobility

Responsiveness	Mobility	
	High	Low
High	High Sensitivity (34)	Moderate Sensitivity (30)
Moderate	Moderate Sensitivity (24)	Moderate Sensitivity (9)
Low	Moderate Sensitivity (38)	Low Sensitivity (13)



Summary

- 128 lakes modeled
- Validated with measured data from 61 lakes
- 31 lakes classified as Over Threshold (OT) for phosphorus
- 6 lakes (Baby, Blue, Clear, Lane, McDonald and Roberts) are OT and have 'high' sensitivity
 - No additional development



Recommendations

- Seguin Township Monitoring Program continue to collect data:
 - Spring overturn phosphorus concentrations (~60 lakes, ½ monitored each year)
 - Supporting information (dissolved oxygen, temperature profiles, lake depth)
- Schedule 1 of the OP be amended to reflect results of the updated phosphorus model
 - threshold and sensitivity designations
- Update the model and threshold/sensitivity designations in ~ 5 years



Thank You

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