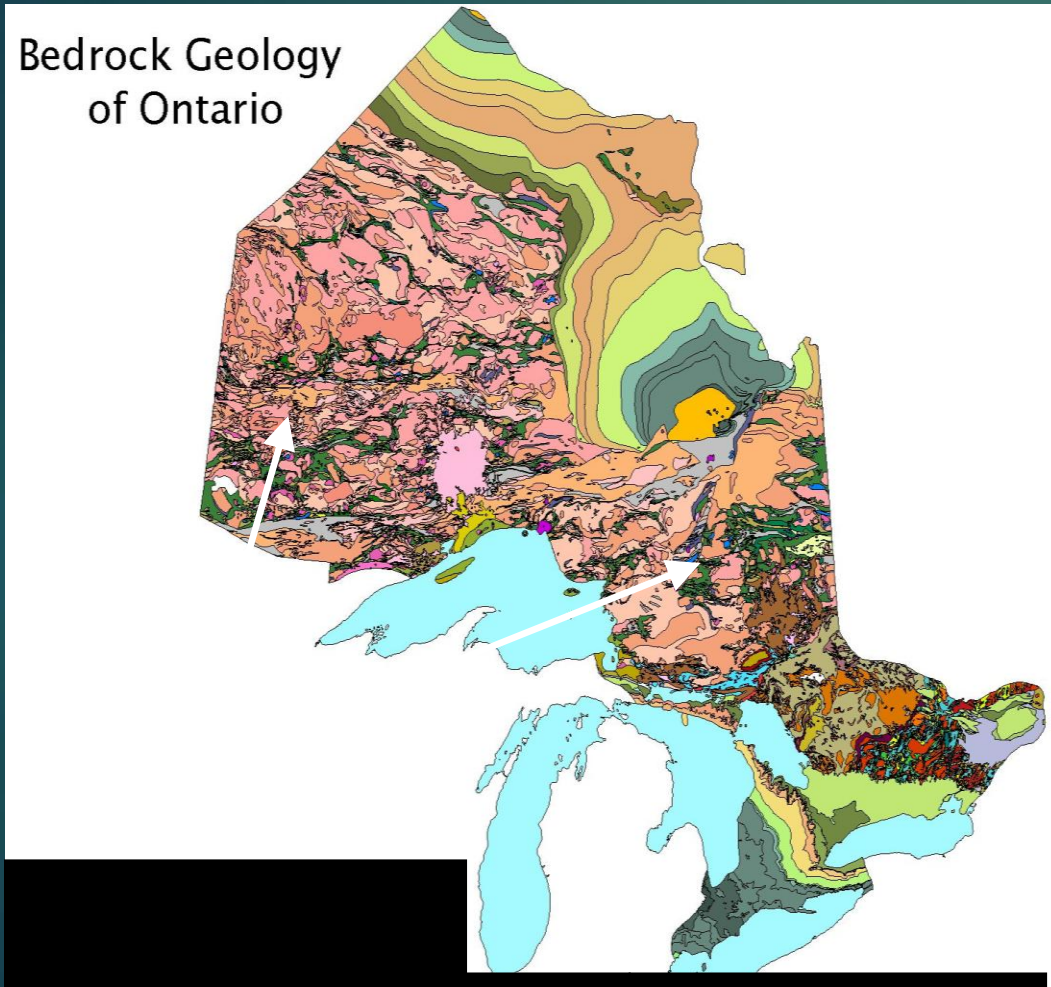


# Ontario's Inland Lakes



~260,000 lakes

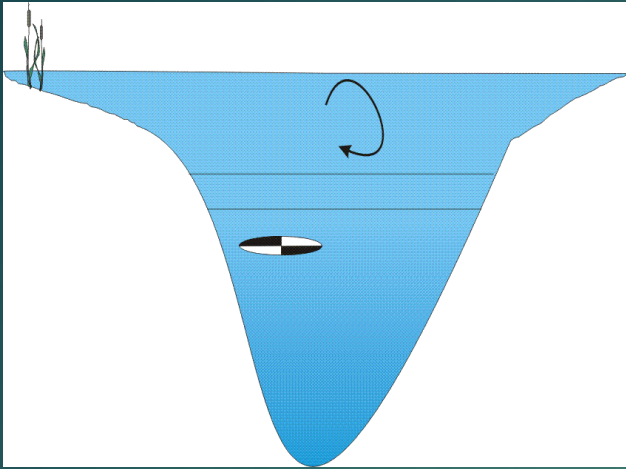
- majority on Canadian Shield
- water quality is generally good

# Phosphorus : Importance



*Aulacoseira* sp. (a diatom)

- A nutrient that is essential to aquatic systems and for organisms that inhabit them
- It is the “limiting” factor that controls the rate at which plants and algae grow
- Total Phosphorus (TP) is the sum of all forms of phosphorus in the lake water



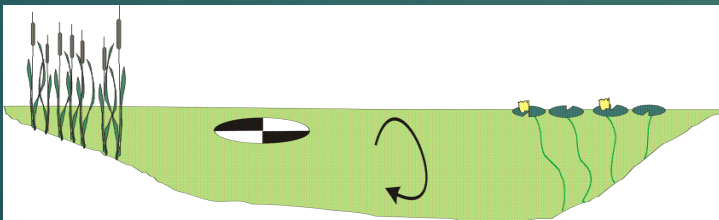
TP

Oligotrophic Lakes

10  $\mu\text{g}$

Mesotrophic Lakes

20  $\mu\text{g}$



Eutrophic Lakes

# Phosphorus : Monitoring

How it is measured?

- Spring overturn or from discrete depths depending on time of year (Lake Partner Program, 1x Secchi depth)
- Mid lake, deep spot
- Filter water through 80- $\mu\text{m}$  mesh
- Sampled directly into tubes used for analysis to 1 cm above etched line
- Refrigerated until analysis
- Analysed in a low-level phosphorus laboratory (analytical precision of 0.7  $\mu\text{g/L}$  TP)



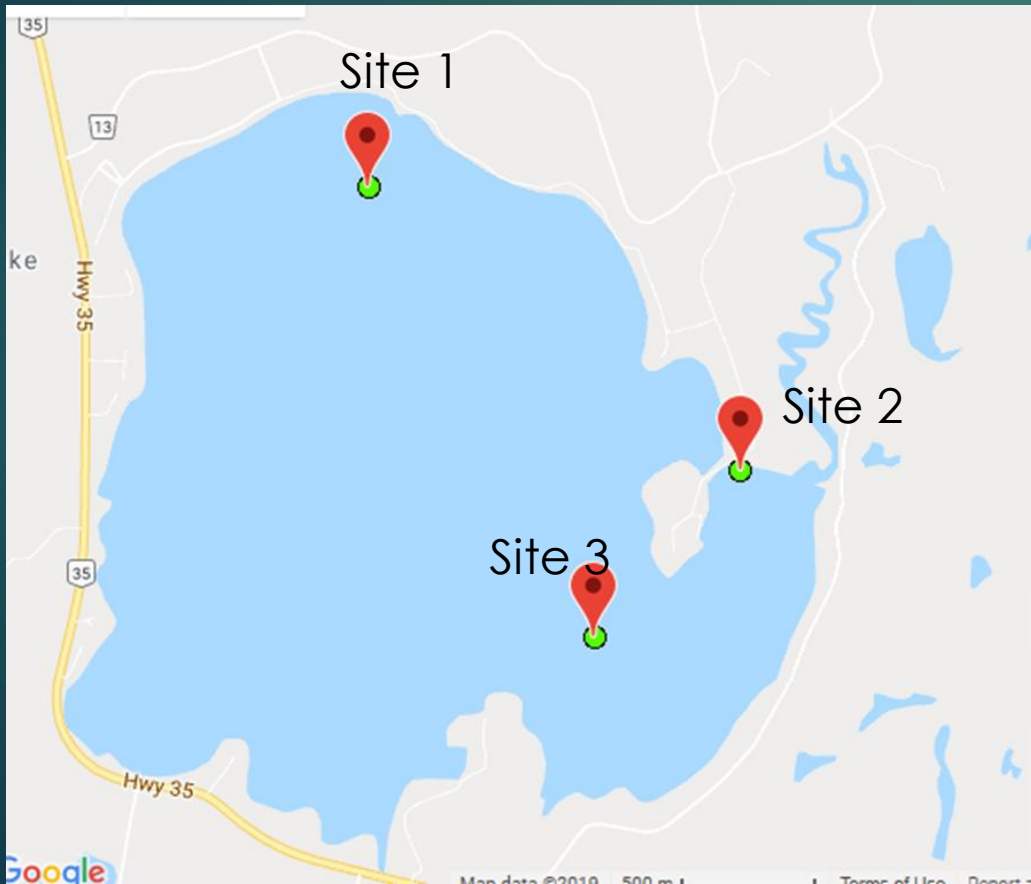


# Interpreting TP data

- ▶ Need several years of data to examine trends through time
- ▶ Most lakes do not usually show large, between-year differences
- ▶ Large differences between years: may be anomalies or attributed to large difference in rainfall
- ▶ Important to monitor TP to identify what the normal between-year differences are
- ▶ Lakes off the Shield are sampled monthly due to the seasonal differences in TP; Shield lakes tend to have stable TP concentrations throughout the summer

# Halls Lake

## LPP Map of Halls Lake



## Halls Lake - Phosphorus LPP Results 2007 - 2018

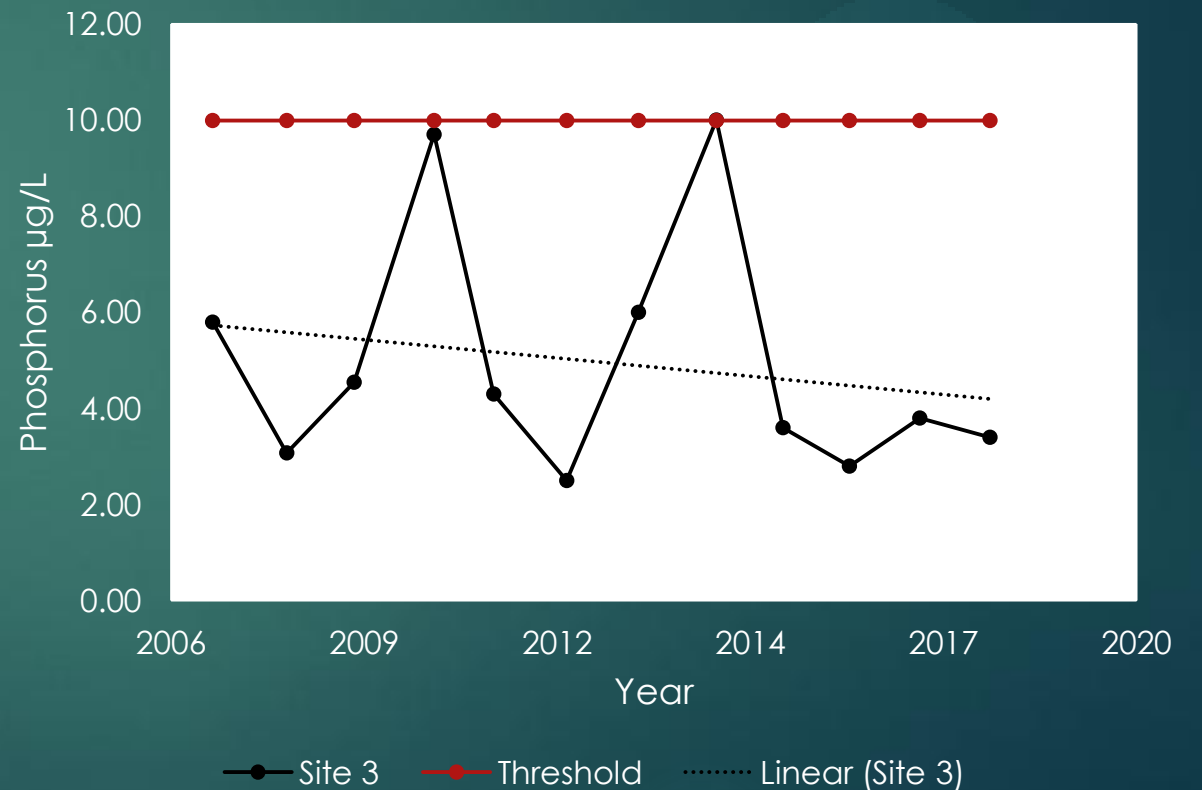


# Big Hawk Lake

LPP Map of Big Hawk Lake

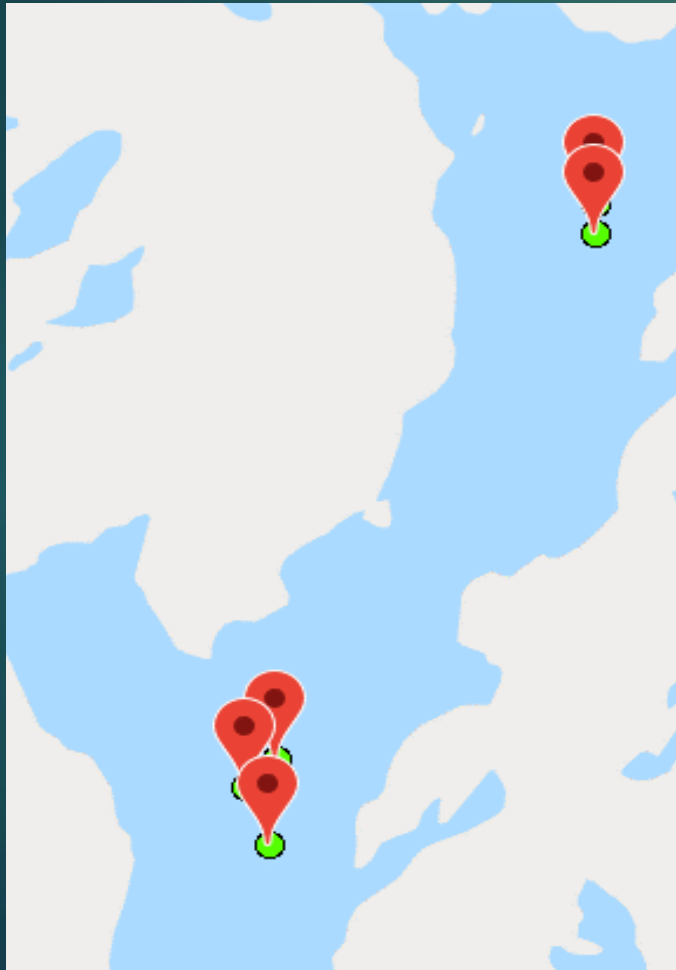


Big Hawk Lake – LPP TP 2007-2018



# Little Hawk Lake

LPP Little Hawk Lake Map



Little Hawk Lake – LPP TP 2007-2018





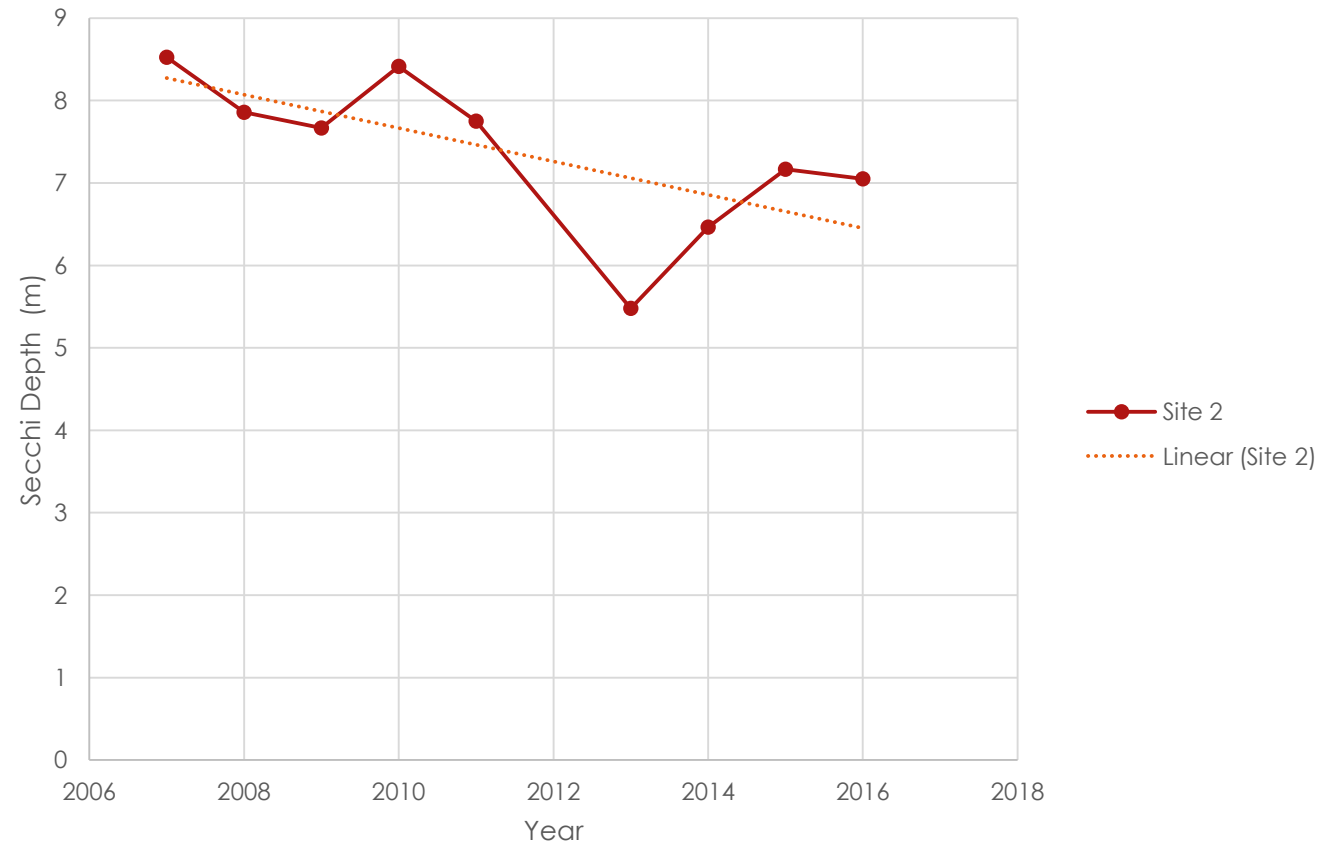
# Water Clarity

- ▶ Estimated by Secchi disk
- ▶ May be affected by nutrient input, invasive species and climate change
- ▶ Tend to see water clarity increase as TP decreases



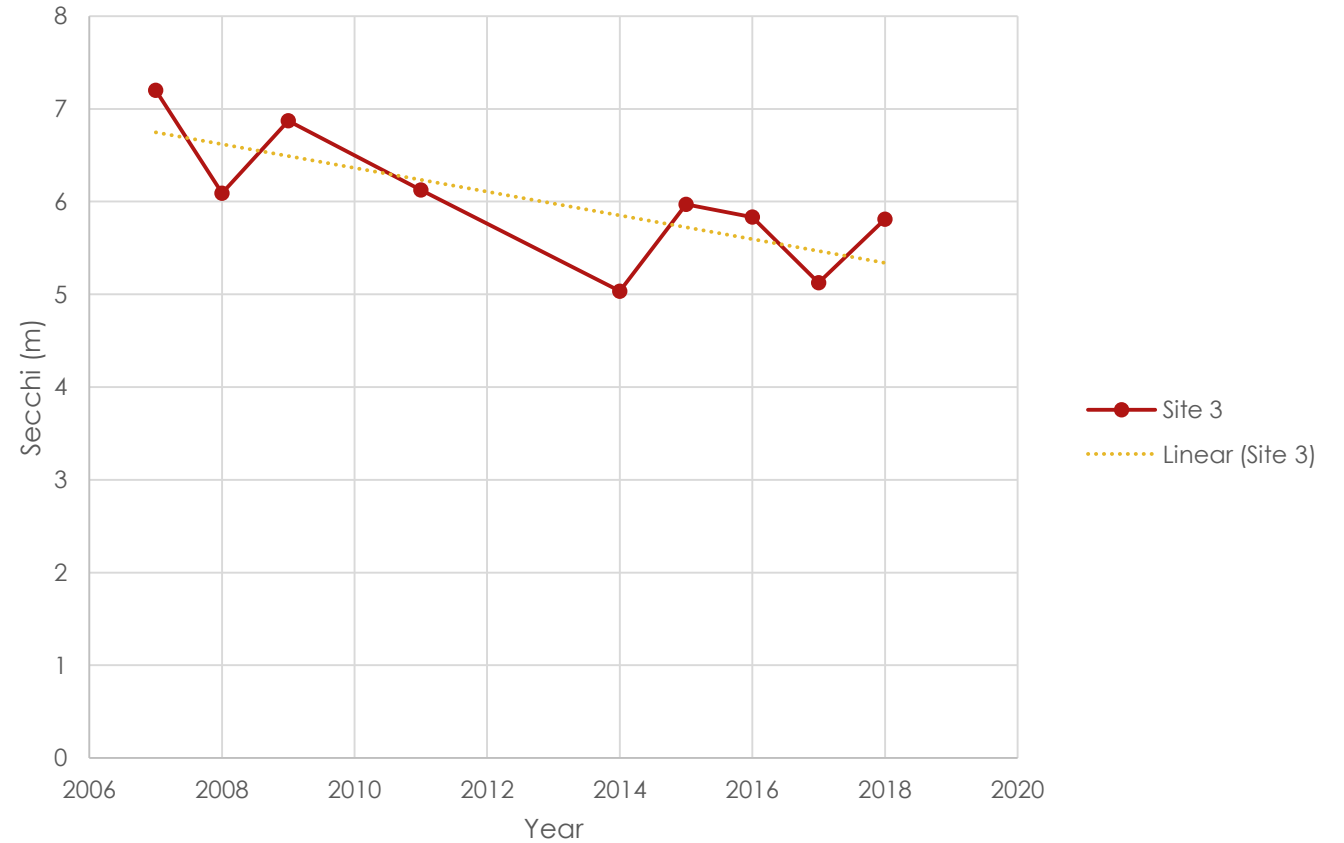
# Secchi Reading: Halls Lake

Halls Lake - Secchi Depth LPP Results 1991 - 2016



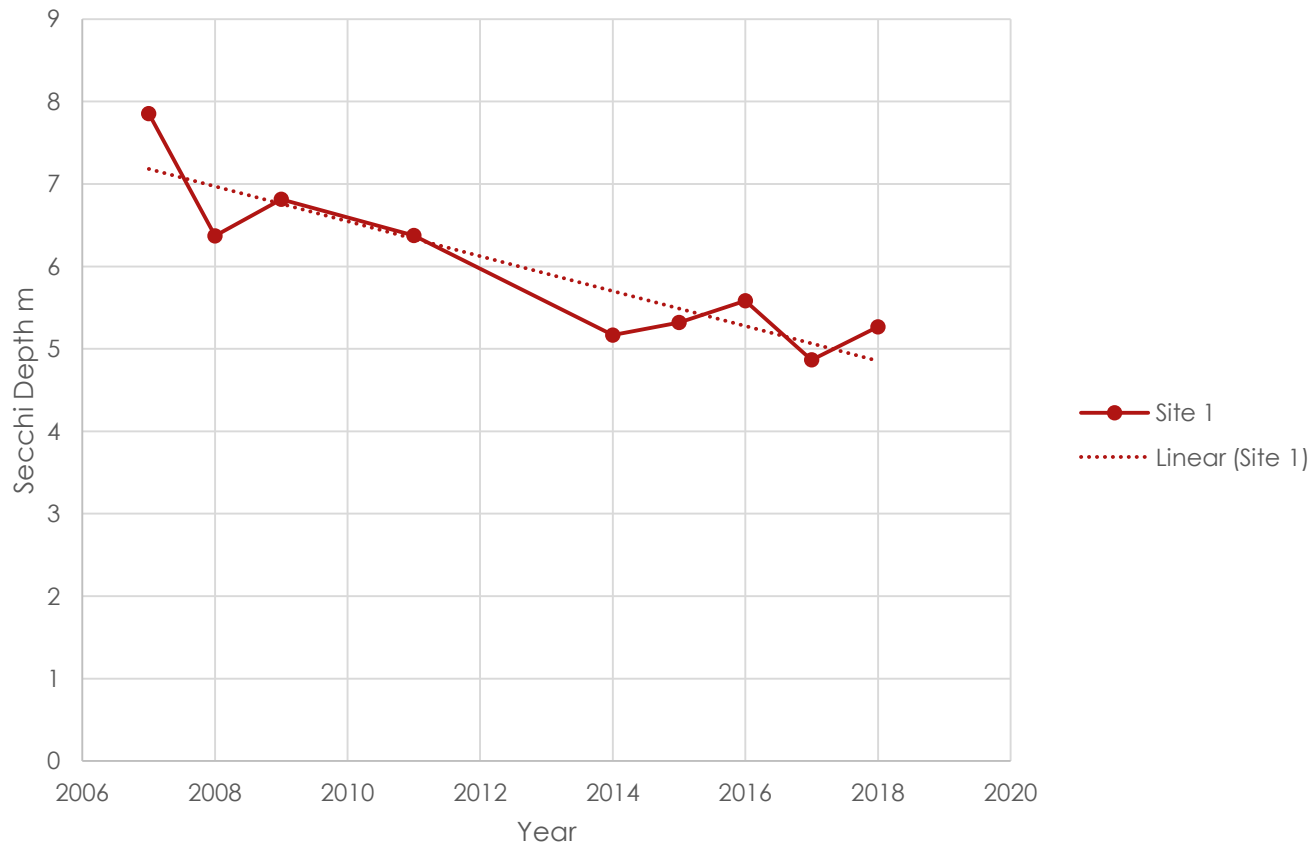
# Secchi Reading: Big Hawk Lake

Big Hawk Lake - Secchi Depth LPP Results 1992 - 2018



# Secchi Reading: Little Hawk

Little Hawk Lake - Secchi Depth LPP Results 1992 - 2018



# Calcium : Importance

- Required (to some degree) by all living organisms
- Water fleas (crustacean zooplankton) are very sensitive to declining levels
- Water fleas use Ca to make their carapaces
- Lakes get Ca from the watershed soils, but...

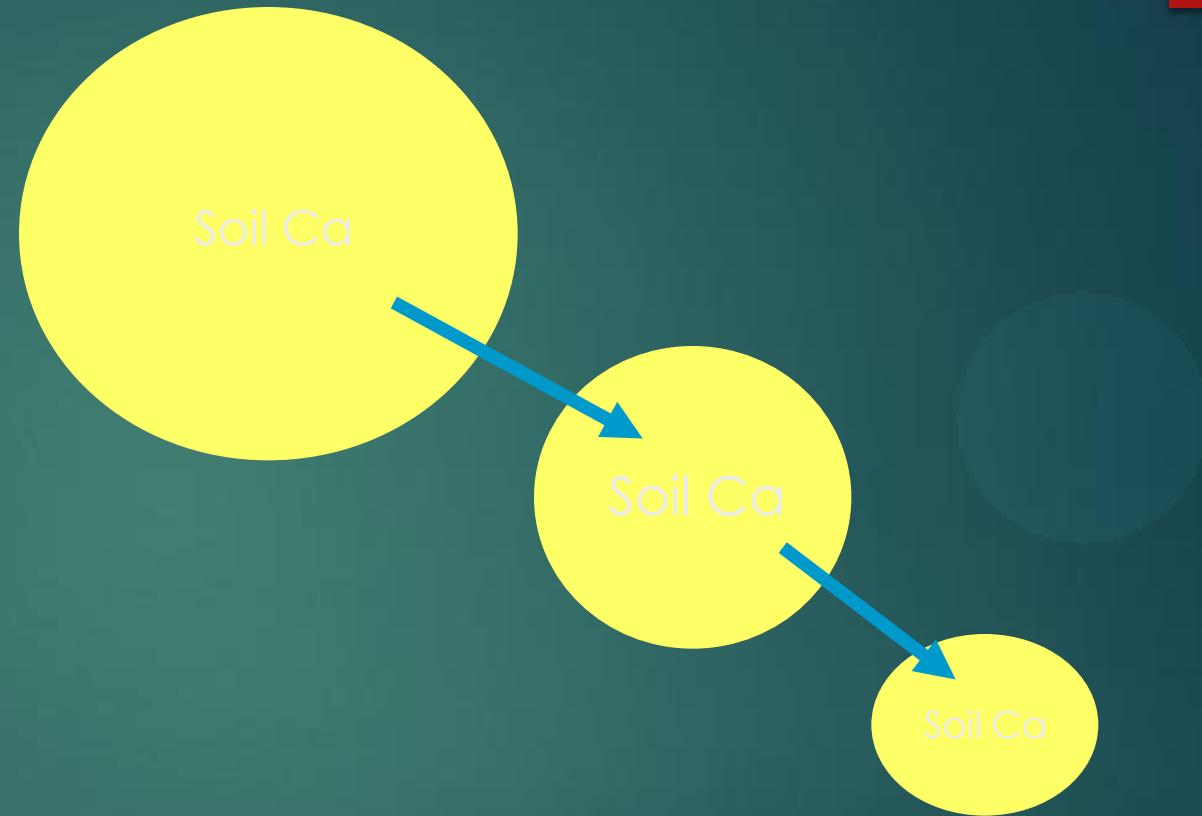




# Calcium : Why is it declining

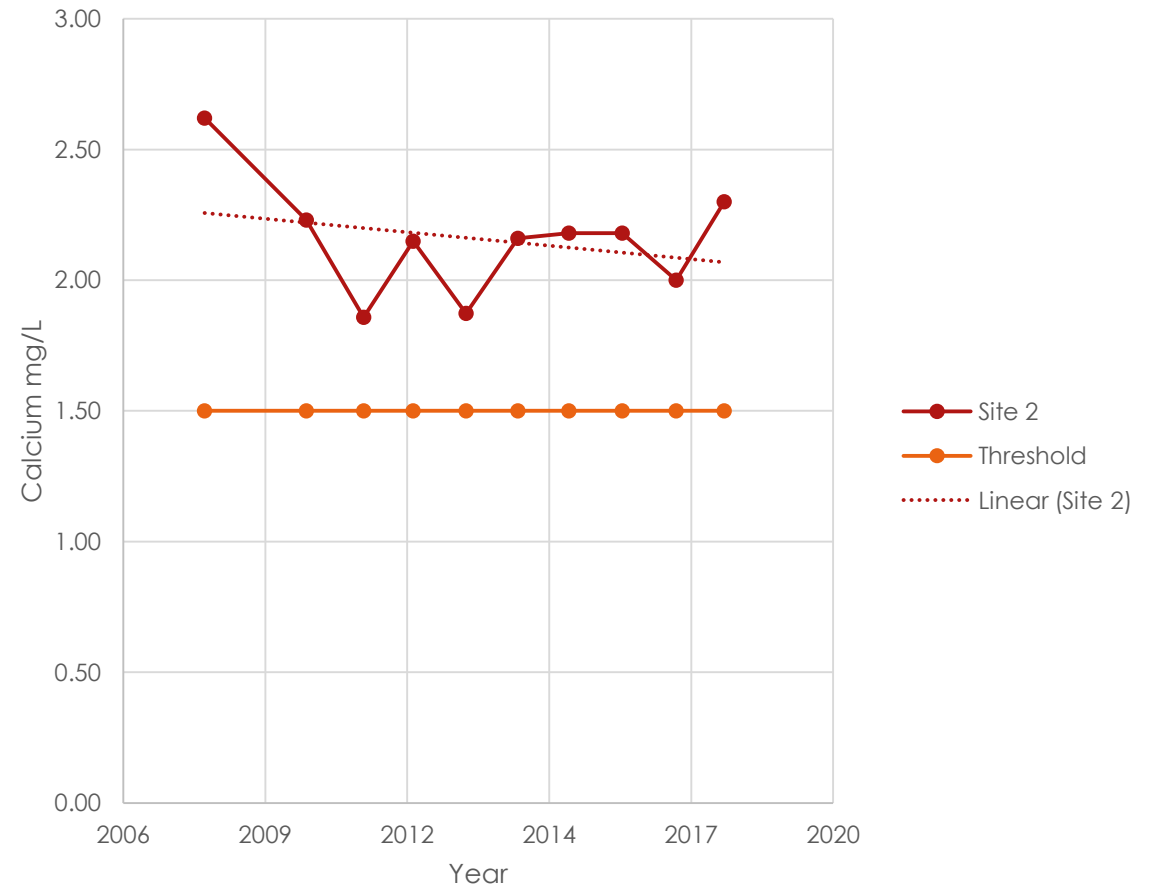
Largely due to:

- Acid deposition
- Biomass loss through timber harvesting
- Soil calcium reserves are being depleted in eastern North American and Europe



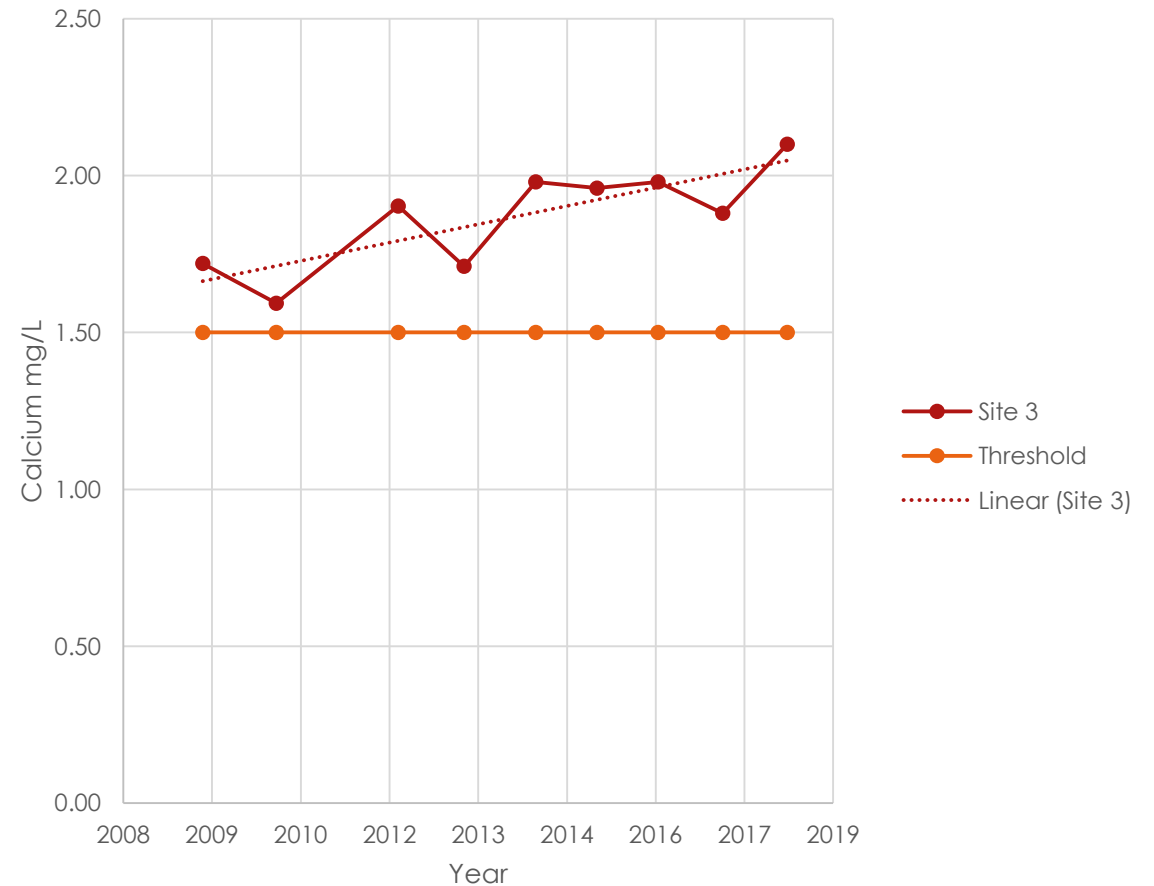
# Calcium: Halls Lake

Halls Lake - Calcium LPP Results 2008 - 2018



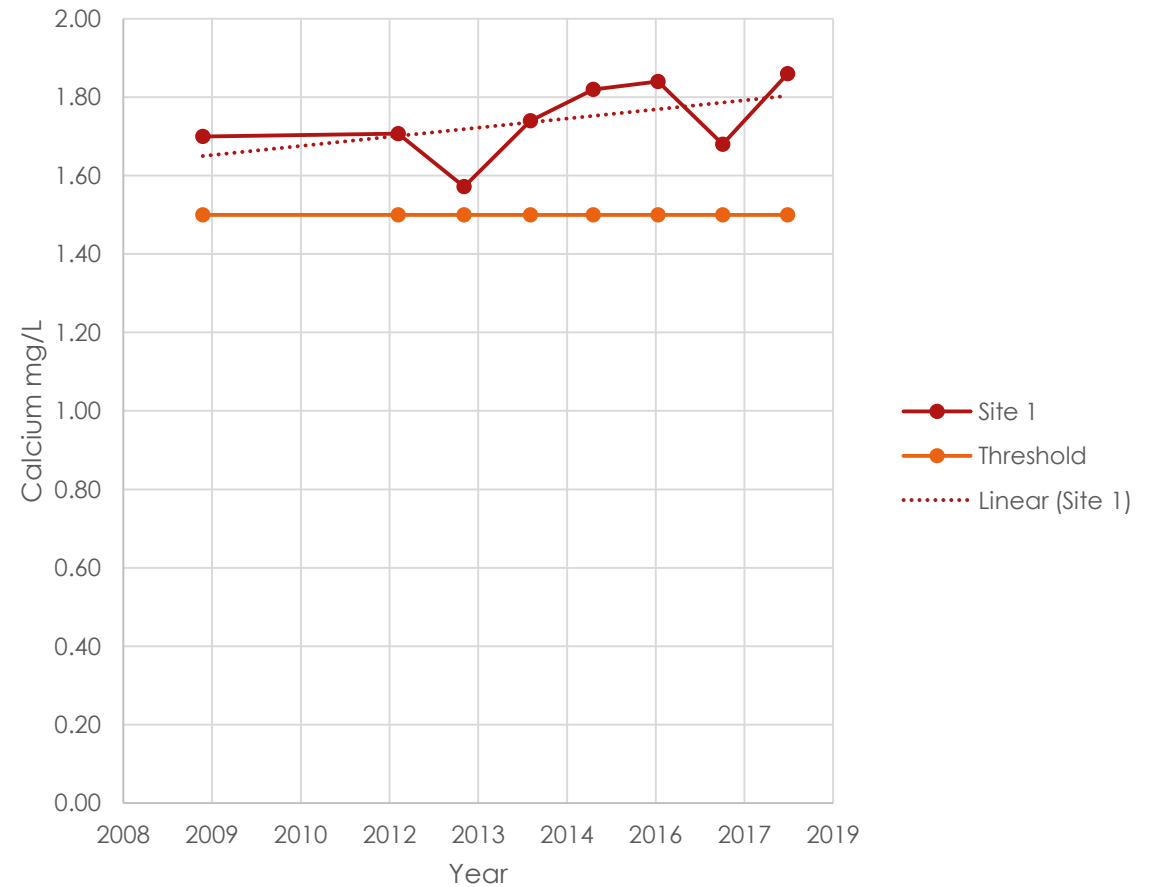
# Calcium: Big Hawk Lake

Big Hawk Lake - Calcium LPP Results 2008 - 2018



# Calcium: Little Hawk Lake

Little Hawk Lake - Calcium LPP Results 2009-2018



# Haliburton Lakes

83 active lakes

TP: Average TP: 7.5 µg/L  
86 % of the lakes TP < 10 µg/L;  
13 % of lakes between 10-20 µg/L;  
1 % > 20 µg/L  
Most lakes have a stable trend

Secchi: Average 4.9 m  
Most lakes show trend  
of stable to slight  
decrease in water  
clarity

Ca: Average: 7.6 mg/L;  
< 2 % have <1.5 mg;  
Variable trends across  
Haliburton



# What are Algae?

- ▶ Small, mostly microscopic plants
- ▶ In all water bodies – important food source for aquatic animals
- ▶ Free floating, some attached to rocks, lake bottoms, etc.
- ▶ Many different species
- ▶ Require nutrients (such as phosphorus) and light to grow; grow better under warm conditions

# Algal Blooms

- ▶ A “bloom” is the excessive growth of one or more species of algae (including blue-green algae)
- ▶ Can impact the appearance of water, result in unpleasant tastes and odours, reduce water clarity, deplete oxygen levels, may produce toxins (blue-green algae)
- ▶ Least likely in deep lakes with low TP



# Different Types of Blooms

Filamentous Green Algae



▶ Golden Algae (Chrysophytes)



# Blue – green algae (cyanobacteria)

## What are Cyanobacteria?

- ▶ Bacteria that have inhabited the earth for over 2 billion years
- ▶ Some can form toxins which are formed at all stages of its growth; toxins released to surrounding water
- ▶ Toxins can affect health of humans, livestock and household pets
- ▶ Symptoms can include: fever, diarrhea, abdominal pain, nausea, and vomiting
- ▶ External contact with algae may cause itchy, irritated eyes and skin

## Causes

- ▶ Sufficiently high levels of nutrients (water or sediments)
- ▶ Calm weather
- ▶ Strong sunlight
- ▶ High air and water temperatures
- ▶ Relatively shallow water

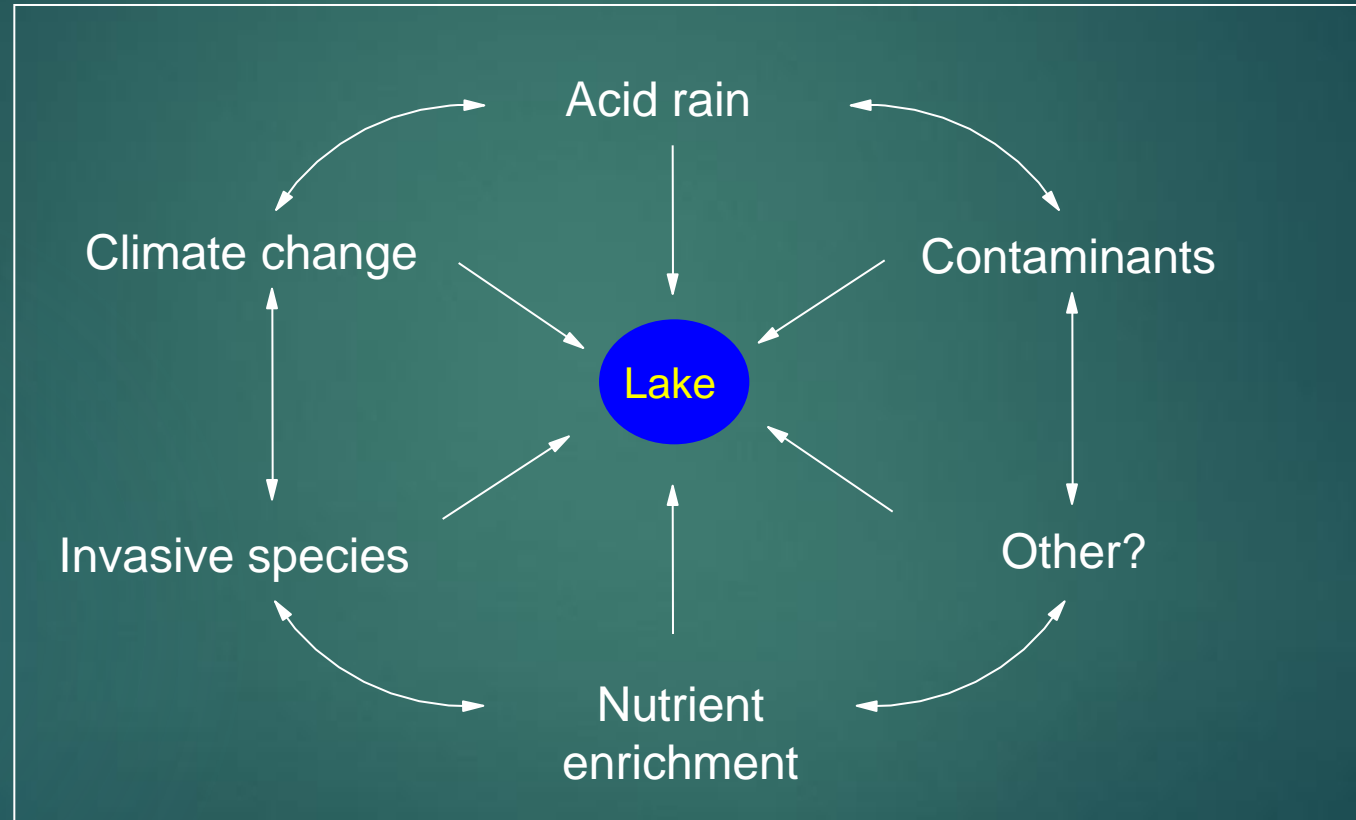
# Fact sheets

- ▶ Blue-Green Algae Fact Sheets
  - ▶ <https://www.ontario.ca/page/blue-green-algae>
  - ▶ Algae in Muskoka: [www.muskokawatershed.ca](http://www.muskokawatershed.ca)

BLOOM REPORTS: TO MECP District office or Spills Action Centre 1-800-268-6060



# Threats to water quality of inland lakes



# What can you do?

- ▶ Keep your shoreline as natural as possible!
- ▶ Contact local authorities for advice, mitigation techniques and potential permits when alterations are necessary
- ▶ Avoid using fertilizers, herbicides and pesticides
- ▶ Use soaps and detergents low in phosphates
- ▶ Maintain your septic system
- ▶ Be part of the solution and participate in community projects to help the environment: e.g. <https://friendsofthemuskokawatershed.org/hauling-ash-to-solve-ecological-osteoporosis/> - this project is to help calcium decline in the Muskoka area!
- ▶ Keep up-to-date with environmental emerging issues (e.g. microplastics) and do what you can to mitigate the problem
- ▶ Don't be a climate change denier!



GOOD



3

4

6

7

5

8

1

9

2

10