





# The 'Nuts & Bolts' of the Lake Partner Program

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### Phosphorus and water quality



Aulacoseira sp. (a diatom)

#### Phosphorus:

- 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

### In excess quantities, phosphorus can contribute to algal blooms





Algal blooms can: 1) Reduce water clarity 2) Reduce deep-water oxygen 3) Produce toxins 4) Cause "bad" taste and odour



### What role does phosphorus play?

- 1960-1970s algae increased and water quality decreased in some Ontario lakes
- Why did water quality decrease?
- The next slide shows that phosphorus influences the frequency of algal blooms and the amount of aquatic vegetation.



**Experimental Lakes Area, NW Ontario** 



Chlorophyll-a interval frequency versus total phosphorus.

- In Ontario, we frequently manage our lakes based on phosphorus
- We know that as phosphorus increases, the frequency of nuisance algal blooms increase

The main thing that separates lakes with respect to their "character" is nutrients, especially phosphorus.

### **Oligotrophic Lakes**

Mesotrophic Lakes

20 µg

10 µg

TΡ

### Eutrophic Lakes





### Different types of lakes

#### Shallow, productive (warm water) lakes



- mixed to bottom
- productive (fish etc.)
- more algal blooms
- off shield lakes

### Different types of lakes

#### Deep, unproductive (cold water) lakes



- stratified in summer
- unproductive
- clear water
- no algal blooms
- shield lakes
- lake trout lakes

### Different types of lakes

### Dystrophic (tea stained) lakes



- different "chemistry"
- high DOC
- carbon from watershed
- mostly shallow
- poor light penetration
- usually no algal blooms

# Lake Partner Program Objectives



- protect the water quality of Ontario's inland lakes by involving the public in a volunteer-based water quality monitoring program;
- to maintain a database of nutrients (total phosphorus) and water clarity (Secchi transparency) (and calcium since 2008);
- 3) to help volunteers...
  - a) define the trophic status of their lakes;
  - b) 'normal' between-year trends in phosphorus and water clarity

# **People Involved**

- Currently coordinator (Anna DeSellas), Assistant Coordinator (Christie Davies), and one university co-op student (shared with another program) each summer and fall
- Volunteers (>600) and Science Partners (~15) collect water samples and data
- Chemistry staff at DESC perform analyses
- Important partner, Federation of Ontario Cottagers' Associations (FOCA) contributes through promotion, education and stewardship



# Timeline

Eutrophication became an important water quality issue	MOE started the Self-Help Program	MOE's Lake Partner Program evolved Lak Progra	Lake Part Program o 21 <sup>st</sup> cent am moved to Dorset	tner of the cury
1960s-70s	1970s-1980s	1996	2001	2012
-Algae ↑ -Water clarity ↓ - Overall water quality ↓	<ul> <li>volunteer lake stewards</li> <li>chlorophyll-a and water clarity (Secchi)</li> <li>MOE Toronto office</li> </ul>	<ul> <li>volunteer lake stewards</li> <li>partnerships with FOCA, DMM, LOWDPOA</li> <li>TP (low precision) and water clarity</li> </ul>	<ul> <li>precise TP analysis and duplicates</li> <li>Volunteer numbers continu to increased</li> </ul>	ed

# Parameters measured (2002-present)

Total Phosphorus (TP)	Secchi transparency	Calcium (since 2008)
<ul> <li>Controls the growth of algae in Ontario Lakes</li> <li>Image: Image: Image:</li></ul>	<ul> <li>Estimation of water clarity</li> <li>DOC often masks TP/algal relationship</li> <li>Useful to detect changes resulting from 'other' stressors</li> </ul>	<text><text></text></text>
Deep spot, 1x Secchi depth	Bi-weekly, May-Oct	15

# **Program Extent - CHA Region**





(1) Sample kit (arrives in winter)



9 Data posted online after QA/QC



2 In May, Measure and Record Secchi depth at deep spot



3 Rinse 2x with filtered lake water, obtain an integrated water sample, 1x Secchi depth to surface



④ Filter with 80-µm mesh

Lake Partner Program Sampling Protocol



8 Analysis at DESC chemistry lab





6 Fill plastic jar



(5) Fill 2 glass tubes on site



Return envelope and postage

Secchi disk recording sheet and instructions

## A note about sampling equipment



There are a few things the volunteer must provide:

- Large washers, nut, eyebolt for Secchi Disk;
- Anti-stretch rope (max 10 m; marked every 10 cm);
- Weight for sample bottle: 900 g (2 lbs) is enough to provide negative buoyancy (to avoid biasing the sample to surface water).





# Other considerations...



## Canadian Shield

• Why do we sample in the spring only in most Shield lakes?

# On-Shield vs. Off-Shield monthly TP trends







#### **OFF SHIELD**

## Spring vs Monthly sampling

#### **ON SHIELD**

- Spring sampling
- Shield lakes with blooms monthly (these are rare)
- Shield lakes in northwestern Ontario - monthly (higher TP)



#### **OFF SHIELD**

- Monthly sampling
- Generally they are susceptible to algal blooms



Join the Ministry of Environment's Lake Partner Program!

Web: www.desc.ca/programs/lpp Email: lakepartner@ontario.ca Phone (toll free): 1-800-470-8322 Outside Ontario: 705-766-1294



Visit FOCA's website and watch their great training video! <u>http://foca.on.ca/lake-partner-program-sampling-assistance/</u>