The ‘Nuts & Bolts’ of the Lake Partner Program

Anna DeSellas

Scientist, Inland Lakes Monitoring & Lake Partner Program Coordinator
Dorset Environmental Science Centre

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

(Photos: Bev Clark)

Algal blooms can:

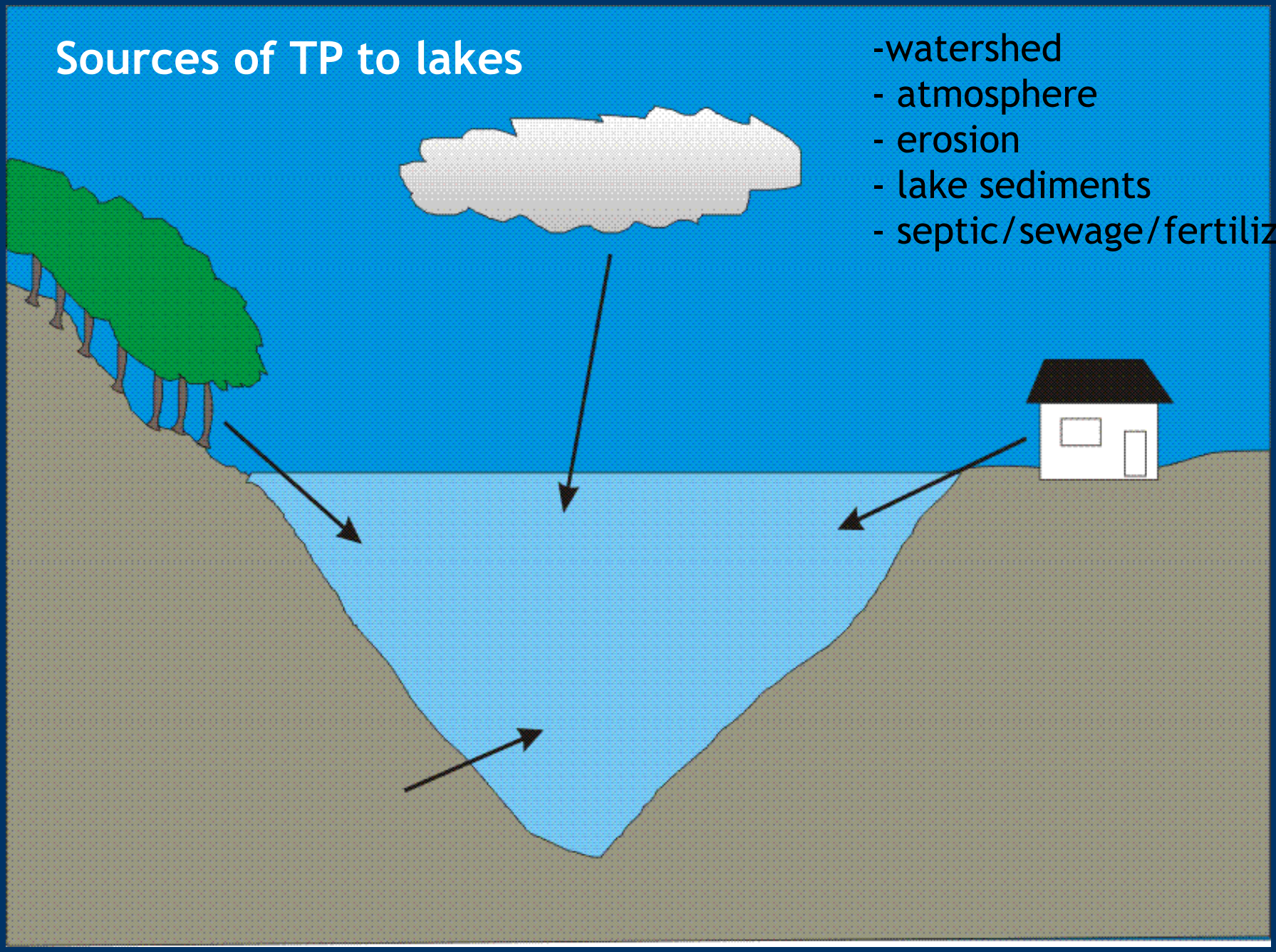
1) Reduce water clarity

2) Reduce deep-water oxygen

3) Produce toxins

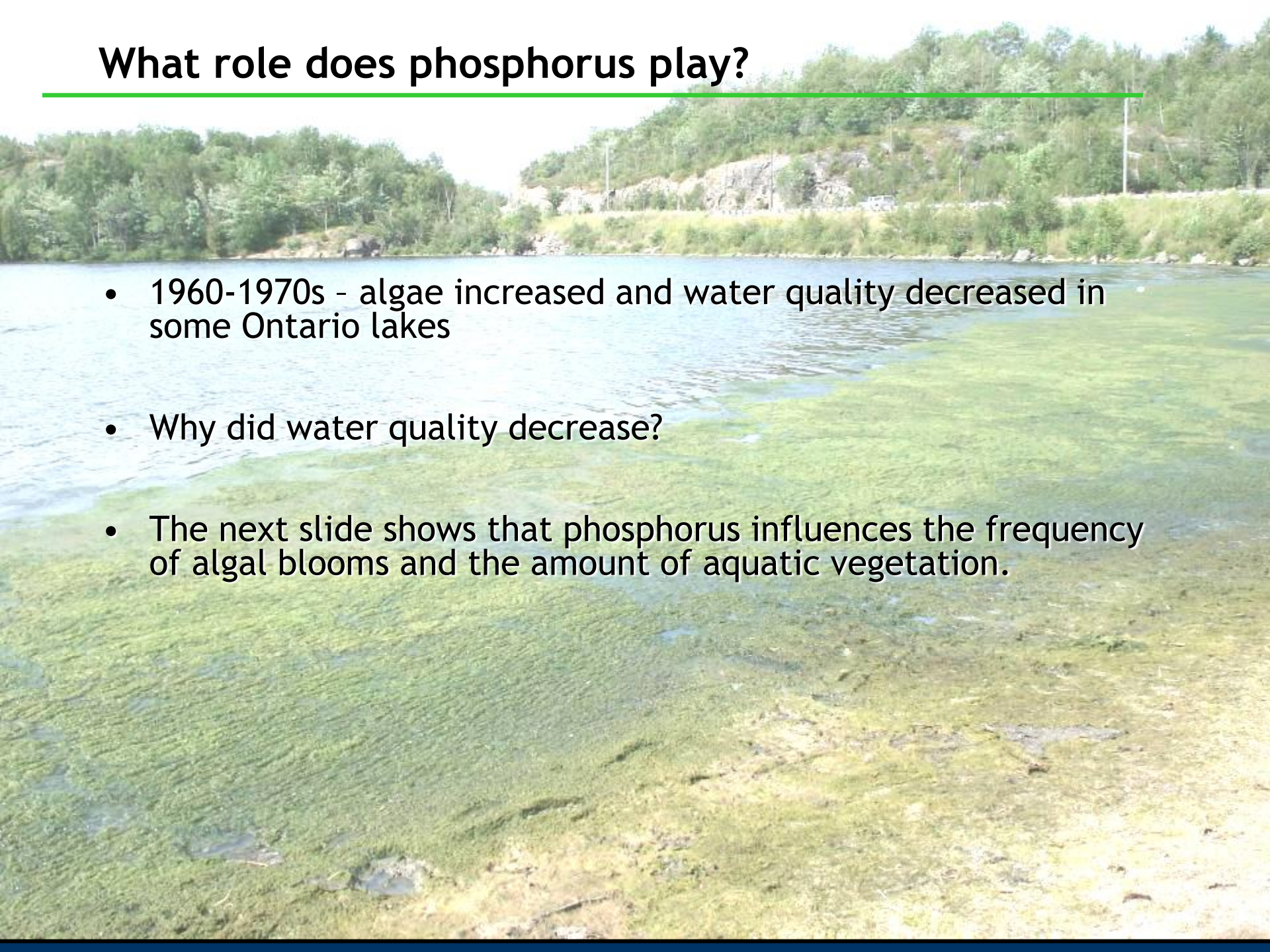
4) Cause “bad” taste and odour

Sources of TP to lakes



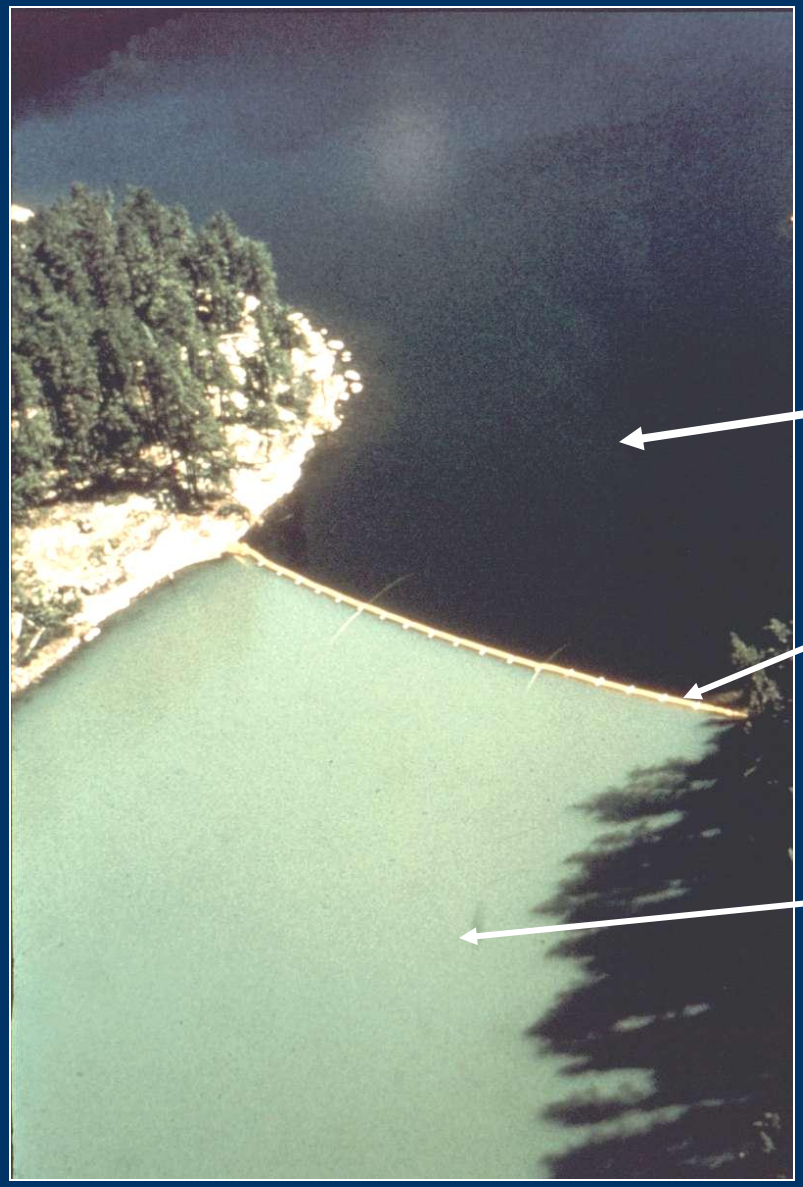
-watershed
- atmosphere
- erosion
- lake sediments
- septic/sewage/fertilizer

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.

1970s – Phosphorus became important

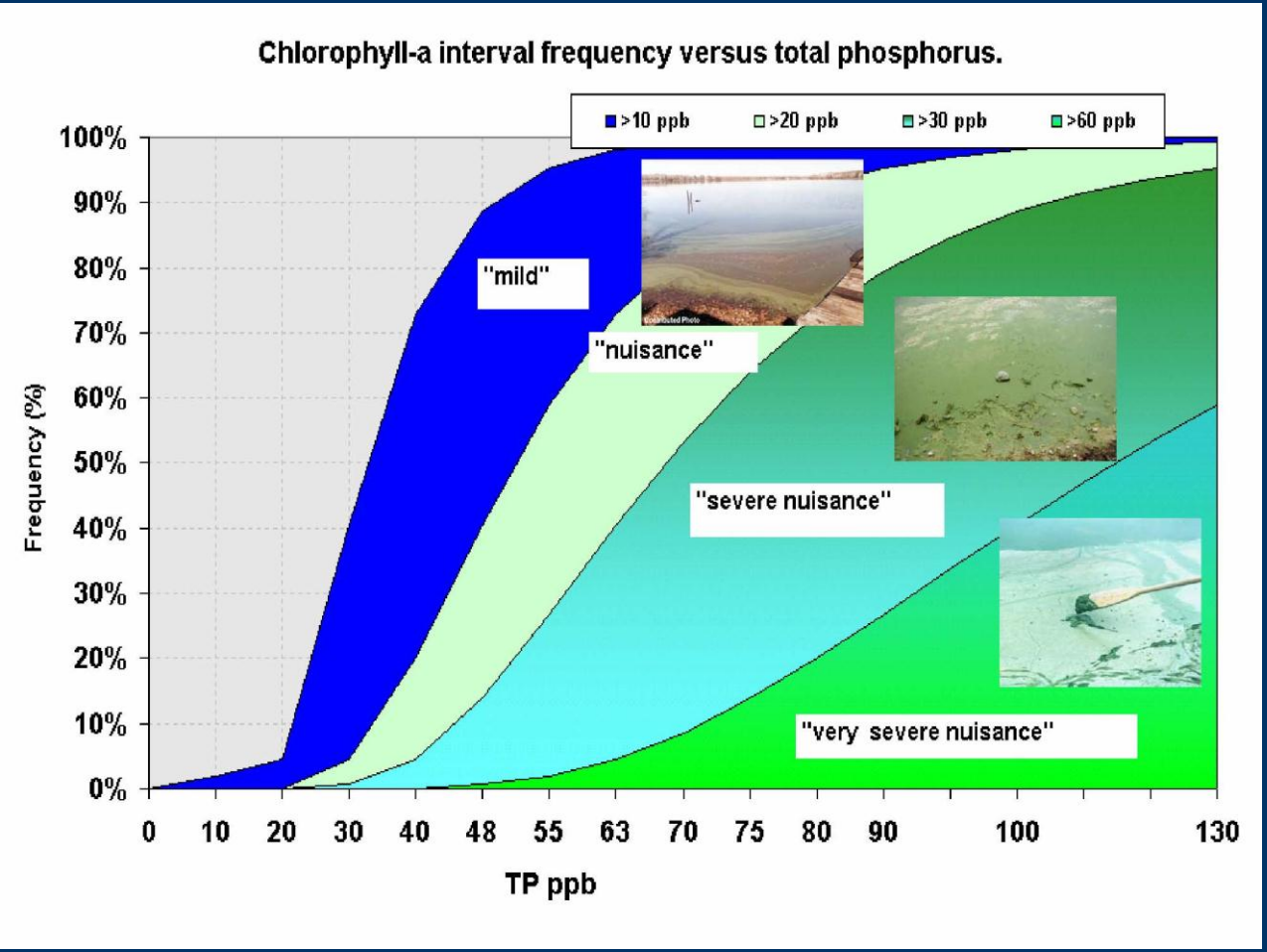


Carbon & Nitrogen only

Barrier

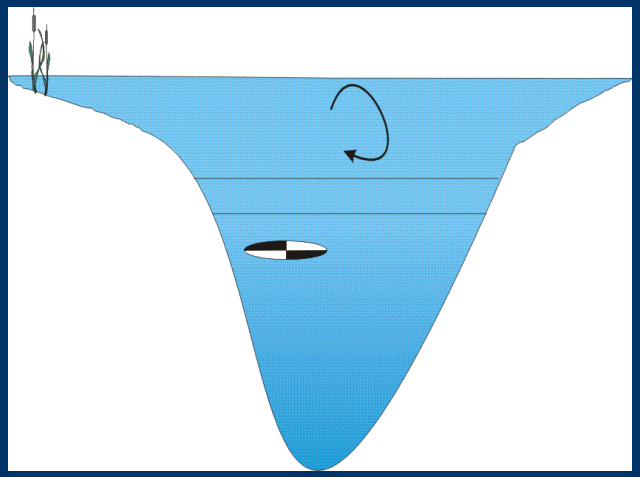
Carbon, Nitrogen
AND Phosphorus
ALGAL BLOOM!

Experimental Lakes Area, NW Ontario



- 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.

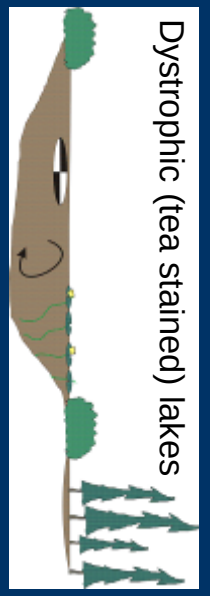


TP

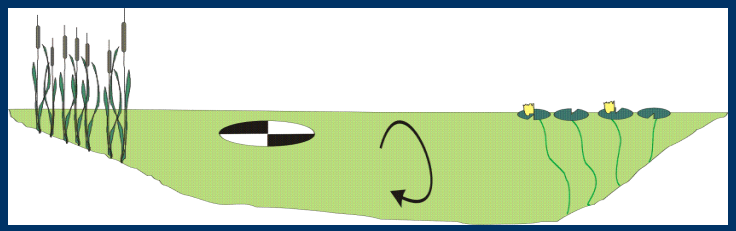
Oligotrophic Lakes

10 µg

Mesotrophic Lakes



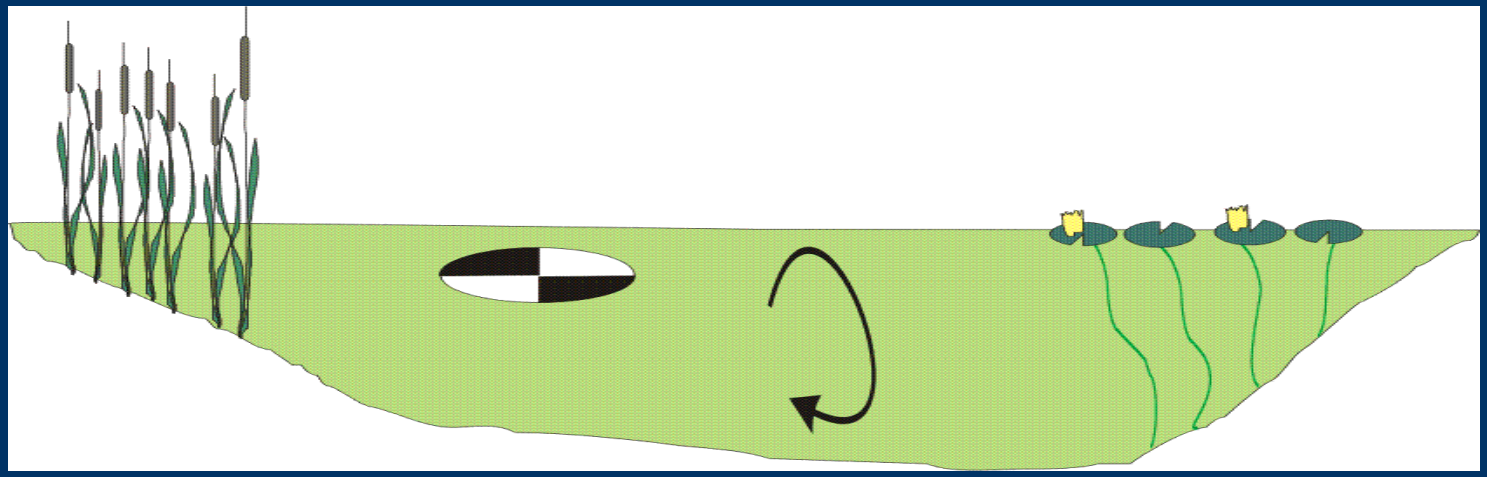
20 µg



Eutrophic Lakes

Different types of lakes

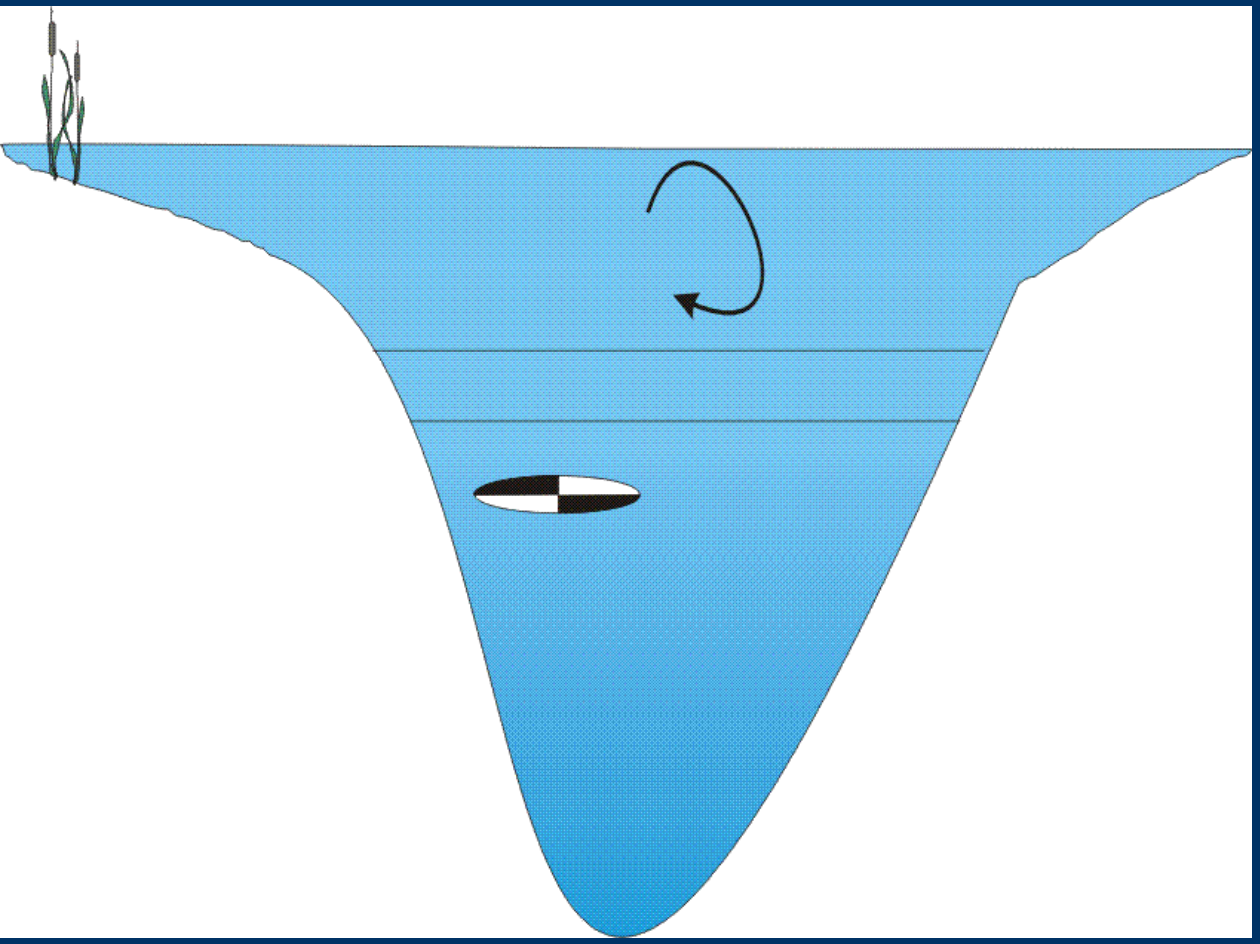
Shallow, productive (warm water) lakes



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

Different types of lakes

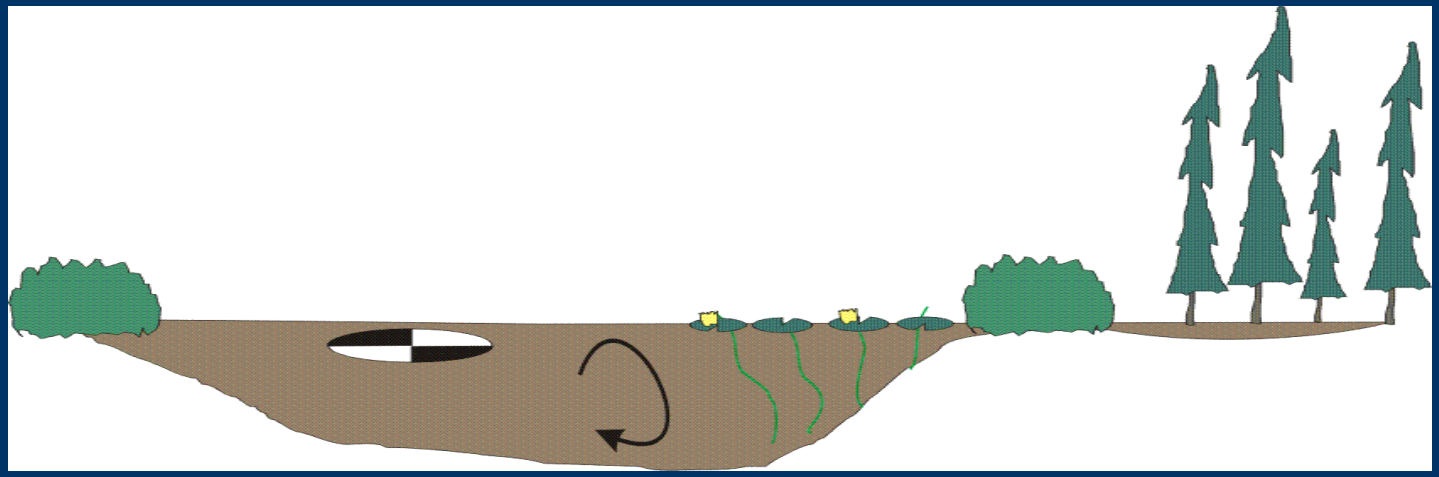
Deep, unproductive (cold water) lakes



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

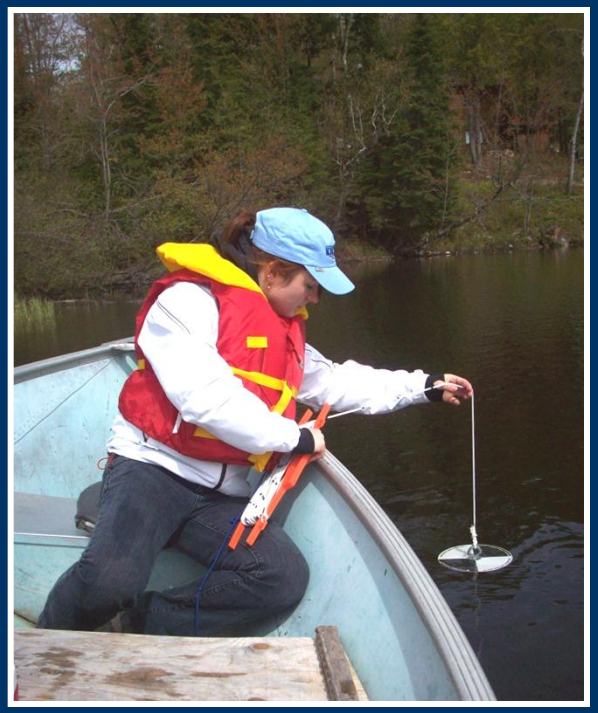
Different types of lakes

Dystrophic (tea stained) lakes



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

Lake Partner Program Objectives



1) protect the water quality of Ontario's inland lakes by involving the public in a volunteer-based water quality monitoring program;

2) 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

1960s-70s

-Algae ↑

-Water clarity ↓

- Overall water quality ↓

1970s-1980s

- volunteer lake stewards

- chlorophyll-a and water clarity (Secchi)

- MOE Toronto office

1996

- volunteer lake stewards

- partnerships with FOCA, DMM, LOWDPOA

- TP (low precision) and water clarity

2001

- precise TP analysis and duplicates

-Volunteer numbers continued to increased

Parameters measured (2002-present)

Total Phosphorus (TP)

- Controls the growth of algae in Ontario Lakes

On Shield Lakes: spring turnover [TP] in May

Off Shield Lakes: monthly [TP]

Deep spot, 1x Secchi depth

Secchi transparency

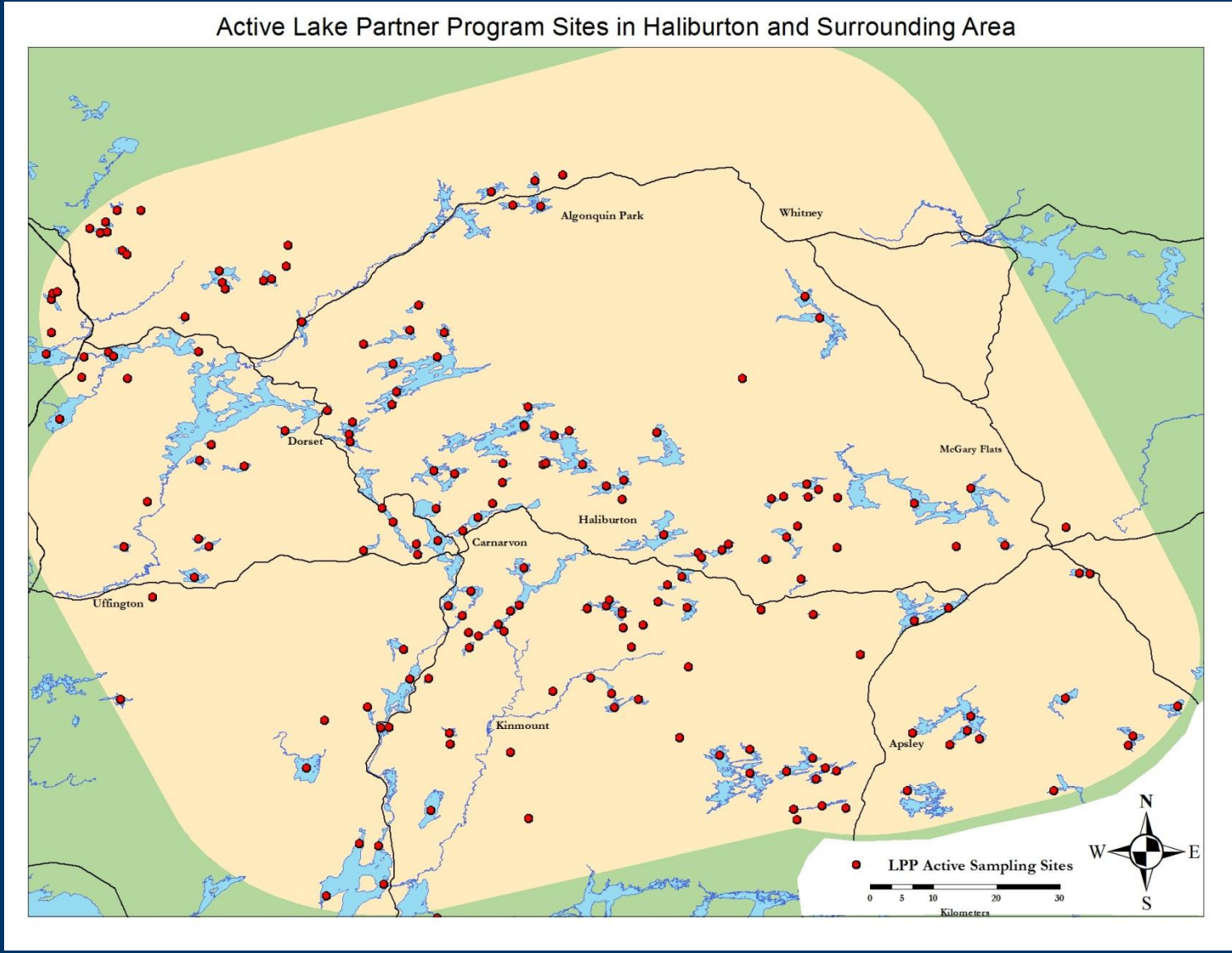
- Estimation of water clarity
- DOC often masks TP/algal relationship
- Useful to detect changes resulting from 'other' stressors

Bi-weekly, May-Oct

Calcium (since 2008)

- Declining concentrations in many Ontario shield lakes (~80% < 10mg/L)
- Some daphniids and other crustaceans sensitive to decline

Program Extent - CHA Region



Lake Partner Program Sampling Protocol

① Sample kit
(arrives in winter)

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

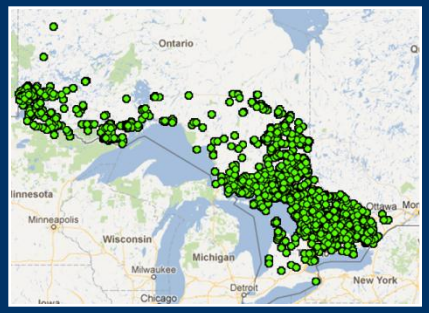
④ Filter with 80-µm mesh

⑤ Fill 2 glass tubes on site

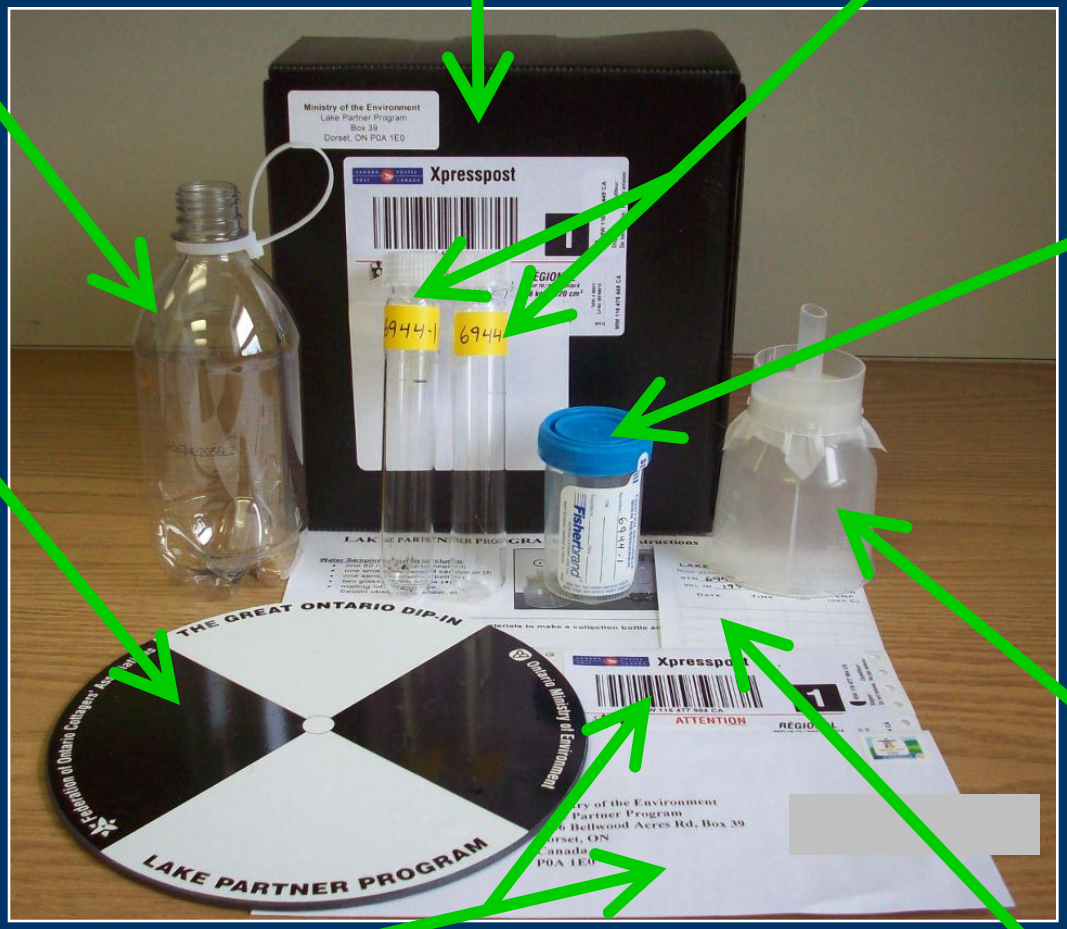
⑥ Fill plastic jar

⑦ Affix return postage and mail to DESC

⑧ Analysis at DESC chemistry lab



⑨ Data posted online after QA/QC



Plastic sampling bottle

Shipping box

Duplicate glass TP tubes with etched line at 35 mL

Plastic jar for Ca analysis (and contingency)

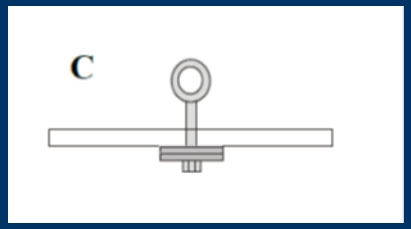
Secchi Disk

Funnel with filter mesh (80 µm)

Return envelope and postage

Secchi disk recording sheet and instructions

A note about sampling equipment



There are a few things the volunteer must provide:

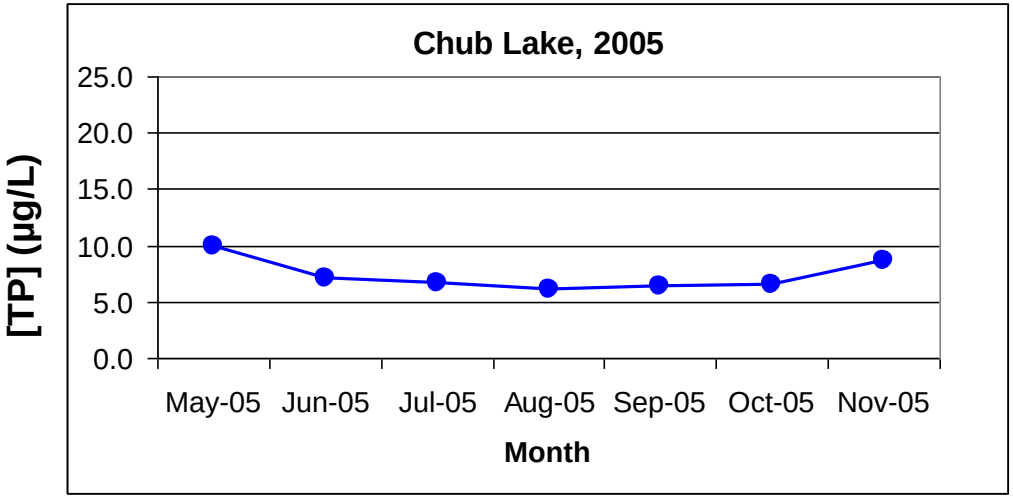
- Large washers, nut, eyebolt for Secchi Disk;
- Anti-stretch rope (max 10 m; marked every 10 cm);
- Weight for sample bottle: 900 g (2 lbs) is enough to provide negative buoyancy (to avoid biasing the sample to surface water).

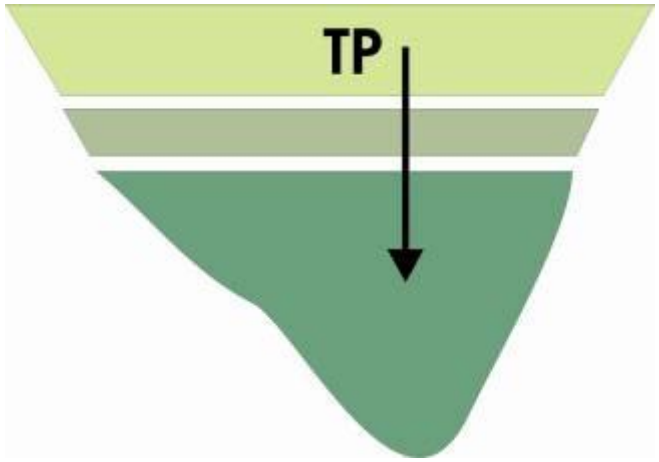
Other considerations…

Canadian Shield

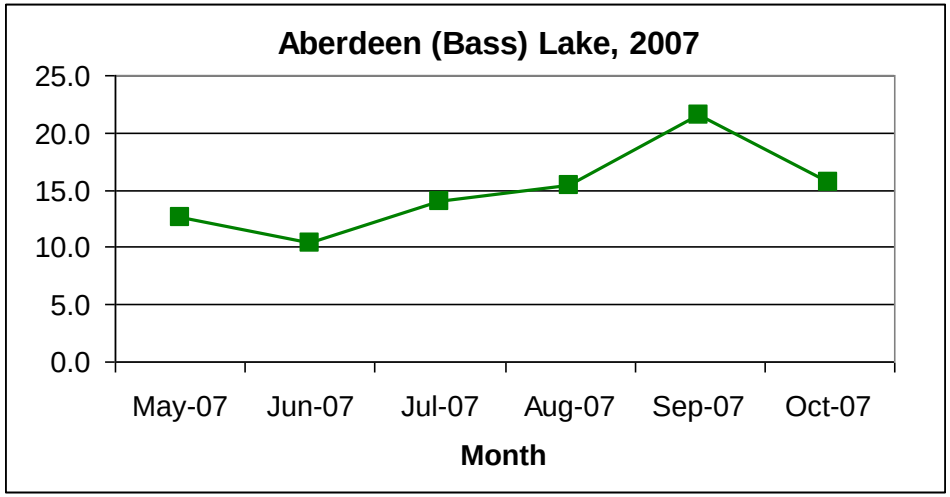
- Why do we sample in the spring only in most Shield lakes?

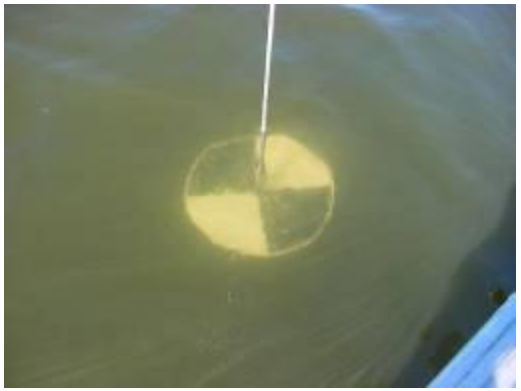
On-Shield vs. Off-Shield monthly TP trends





ON SHIELD





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)

R. Ingram

OFF SHIELD

- Monthly sampling
- Generally they are susceptible to algal blooms

T. Sellers

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!
http://foca.on.ca/lake-partner-program-sampling-assistance/