

Water Quality of Lakes in the Hastings Highlands Area



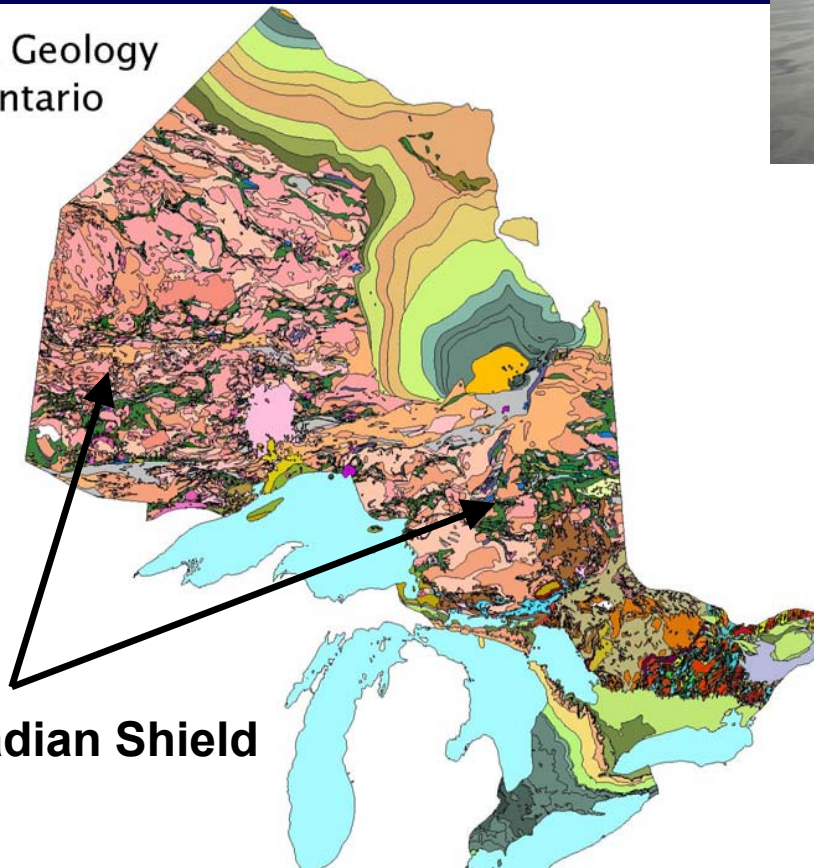
Anna DeSellas

**Scientist & Lake Partner Program Coordinator
Ontario Ministry of the Environment
Dorset Environmental Science Centre**

Ontario's Inland Lakes



Bedrock Geology
of Ontario



Canadian Shield

- ~260,000 lakes
- majority on Canadian Shield
- water quality is generally good

The economic value of clean water in Ontario



- 1.7 billion on goods related to fishing
- \$1.1 billion in resource based tourism
- commercial fisheries (~\$42.5 million)

(Multiple sources, 1998, 1999, 2002, 2003: Min. Natural Resources, Provincial Auditor of Ontario, Min. Tourism and Recreation)

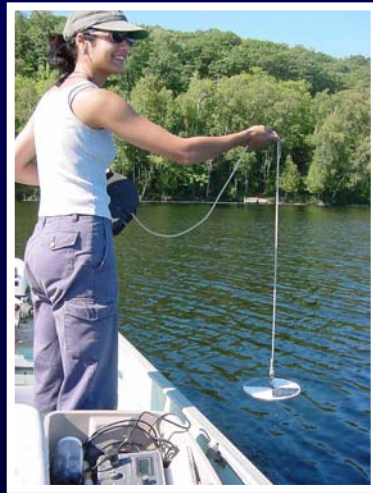
What is Water Quality?

- **One of the most important concerns of waterfront property owners**
- **Often reflects in the price of the waterfront property (↑ water quality = ↑ economic value)**
- **Makes for a more enjoyable lake experience – swimming, boating, and other recreational activities**



Lake Partner Program

Main Goal: *to protect the water quality of Ontario's inland lakes by involving citizens in a volunteer-based water quality monitoring program*



Goal #2: *Establish long-term data set of nutrients (total phosphorus) and water clarity (Secchi)*

Lake Partner Program

Total Phosphorus (TP)

- Controls the growth of algae in Ontario Lakes



Secchi transparency

- Estimation of water clarity
- Effects of invading species
- Climate change



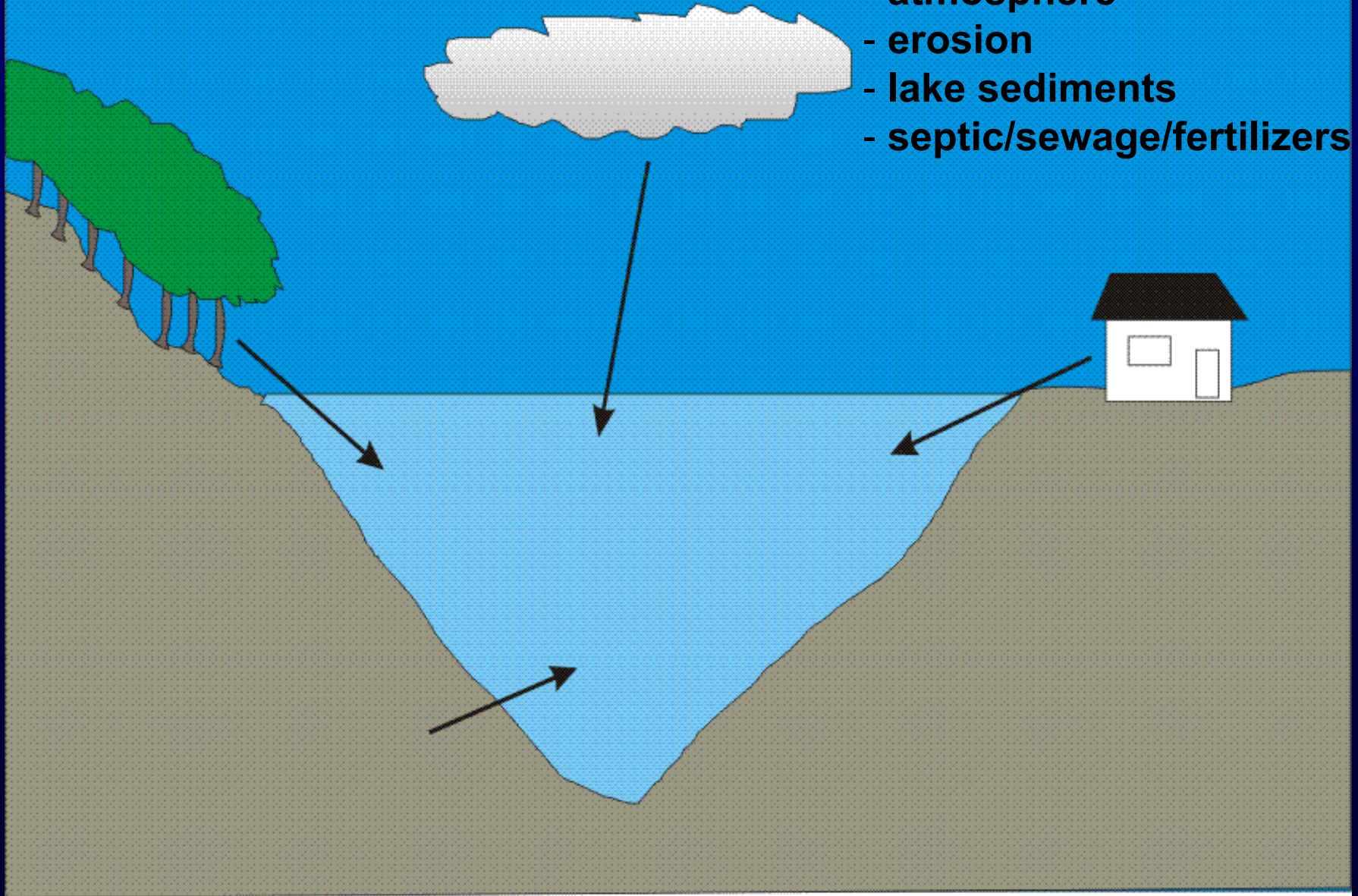
Is there a link between phosphorus and water quality?

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**

Sources of TP to lakes

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



What role does phosphorus play?

- **1960-1970's – some Ontario lakes increased in algae and decreased in water quality**
- **Why were they decreasing in quality?**
- **Questions about why the increase in algal blooms and other aquatic vegetation**

“...the water foul, frequently with a green scum of vegetable matter...”

- Major Joseph Delafield, LOW, 1823



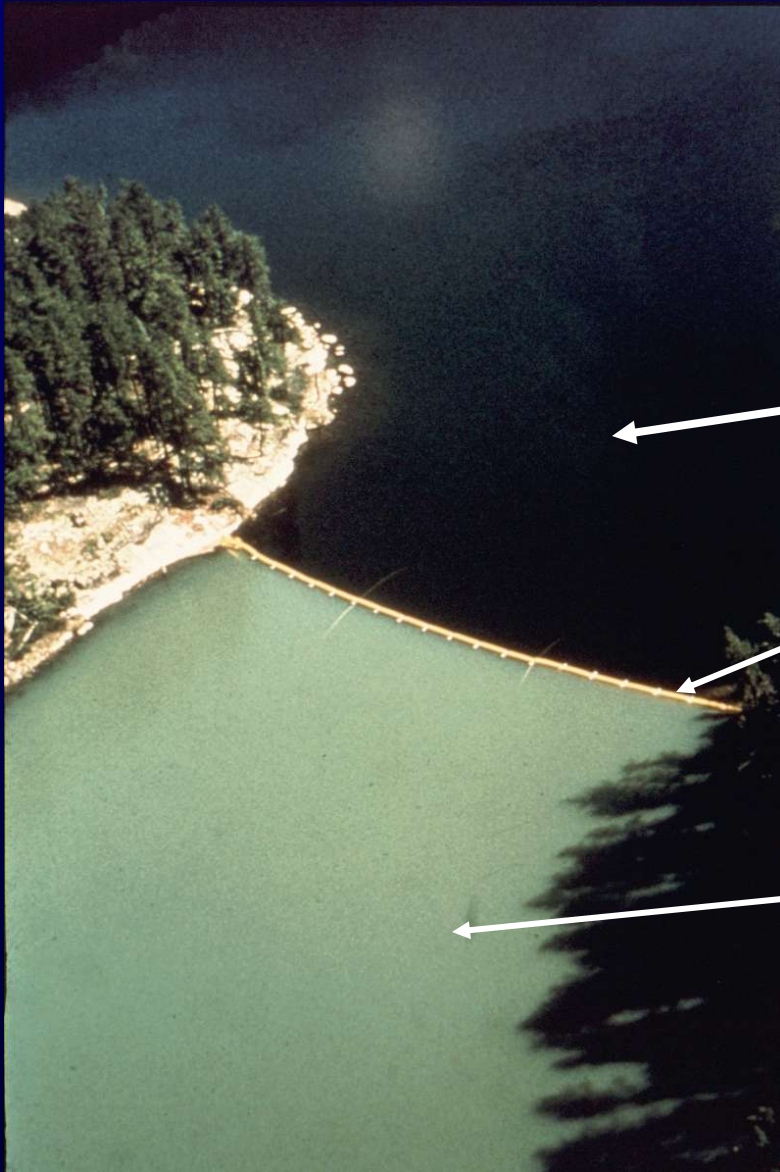
(Photos: Bev Clark)



Algal blooms:

- 1) Reduced water clarity**
- 2) Loss of deep-water oxygen**
- 3) Toxins**
- 4) Taste and odour**

The importance of phosphorus
is well established



Carbon & Nitrogen only

Barrier

Carbon, Nitrogen
AND Phosphorus

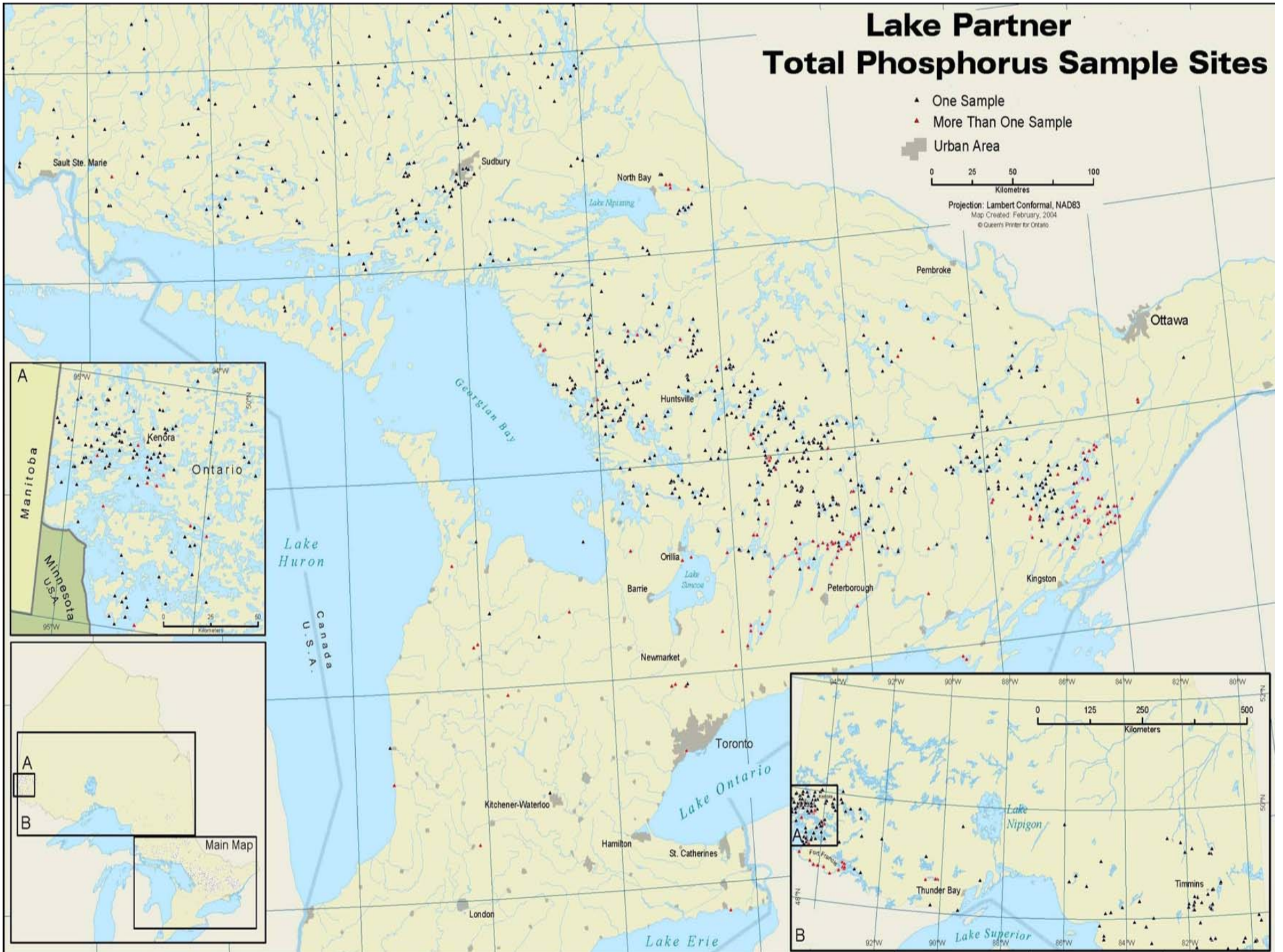
Experimental Lakes Area, NW Ontario

Lake Partner Total Phosphorus Sample Sites

- ▲ One Sample
- ▲ More Than One Sample
- Urban Area

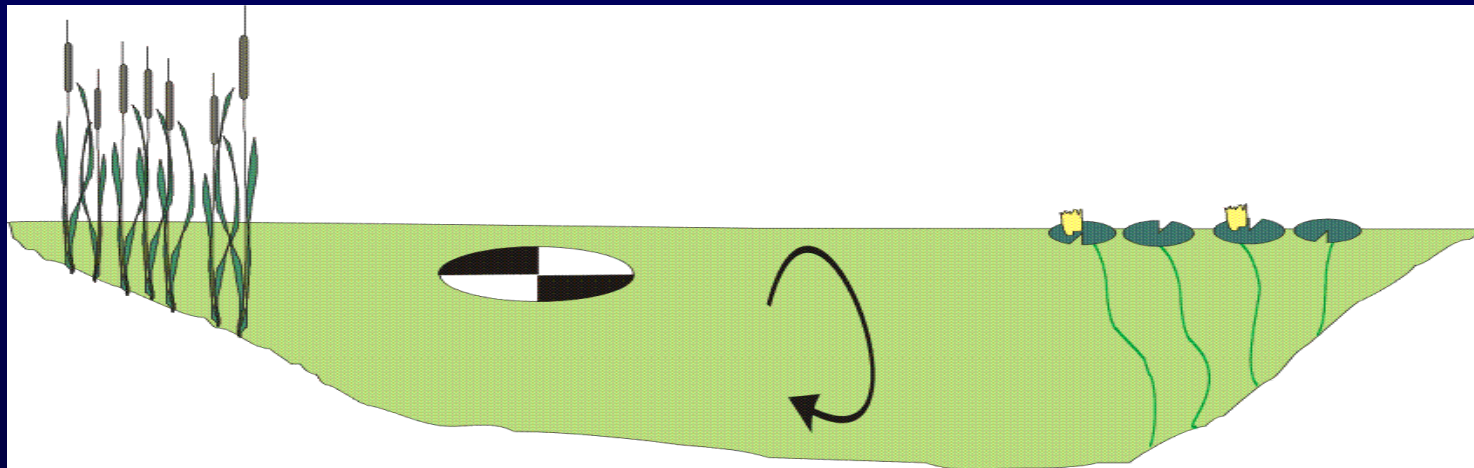
0 25 50 100
Kilometres

Projection: Lambert Conformal, NAD83
Map Created: February, 2004
© Queen's Printer for Ontario



Different types of lakes

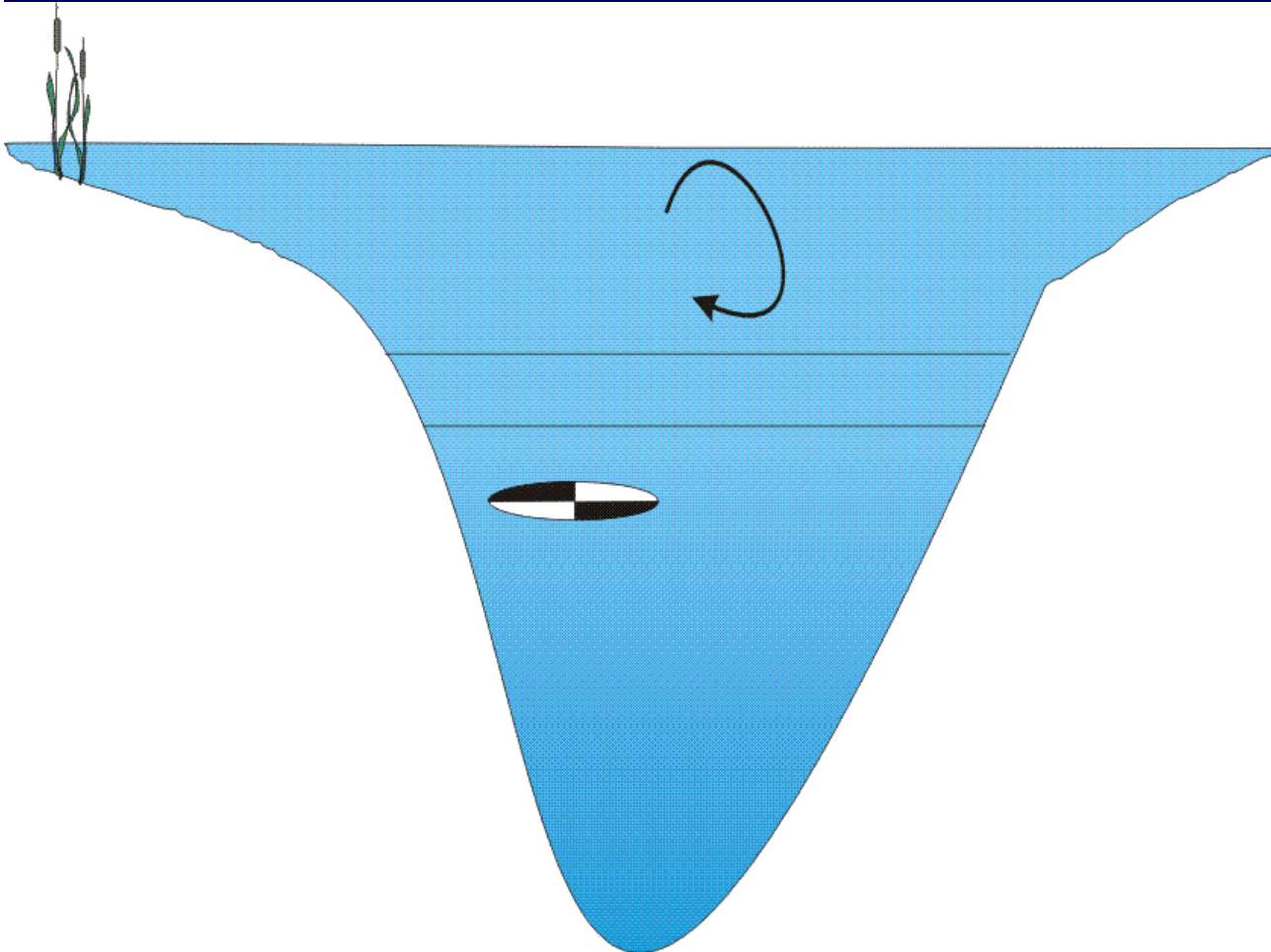
Shallow, productive (warm water) lakes



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

Different types of lakes

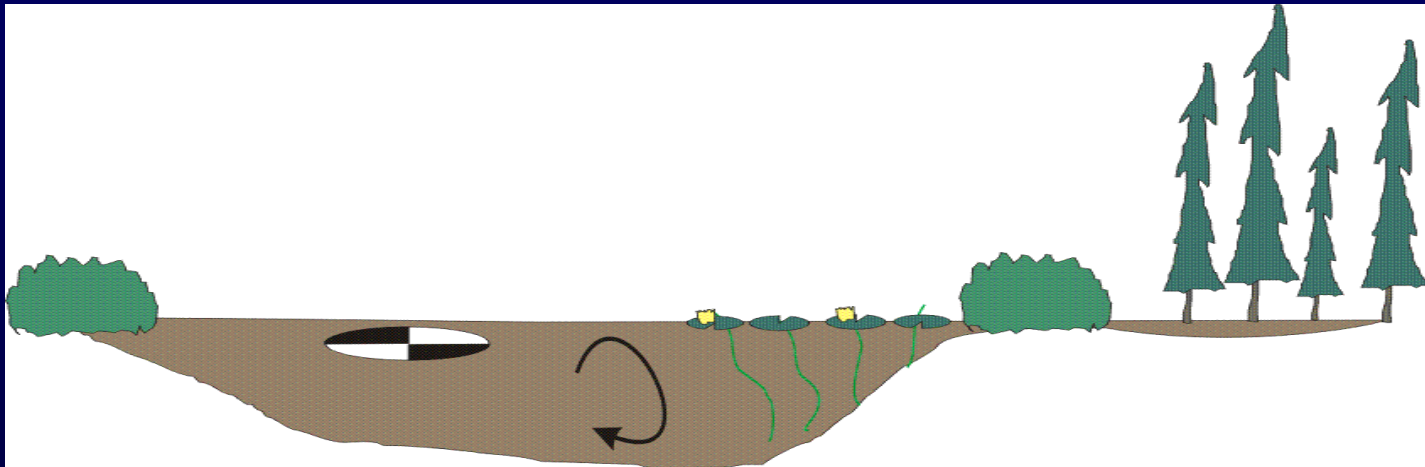
Deep, unproductive (cold water) lakes



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

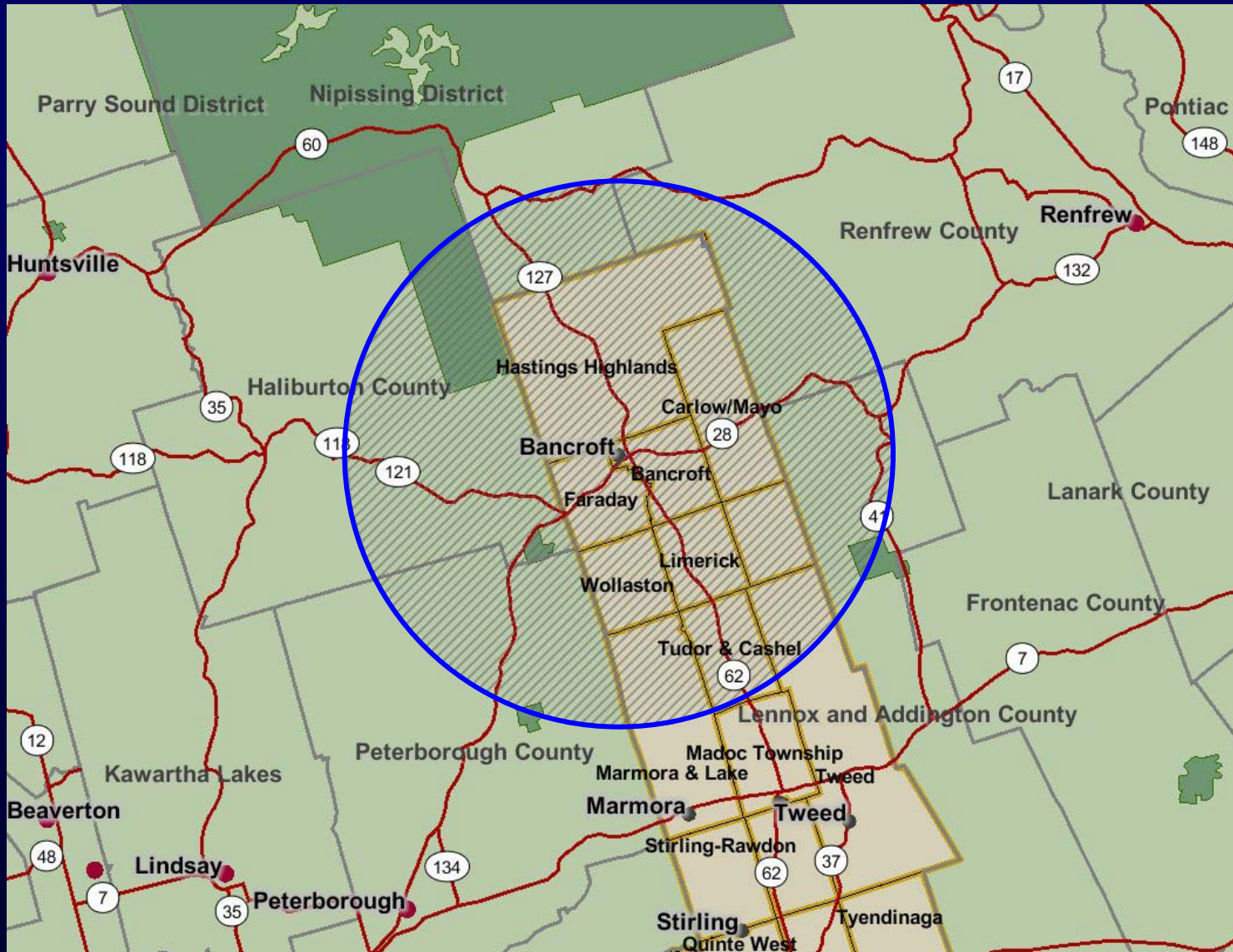
Different types of lakes

Dystrophic (tea stained) lakes



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

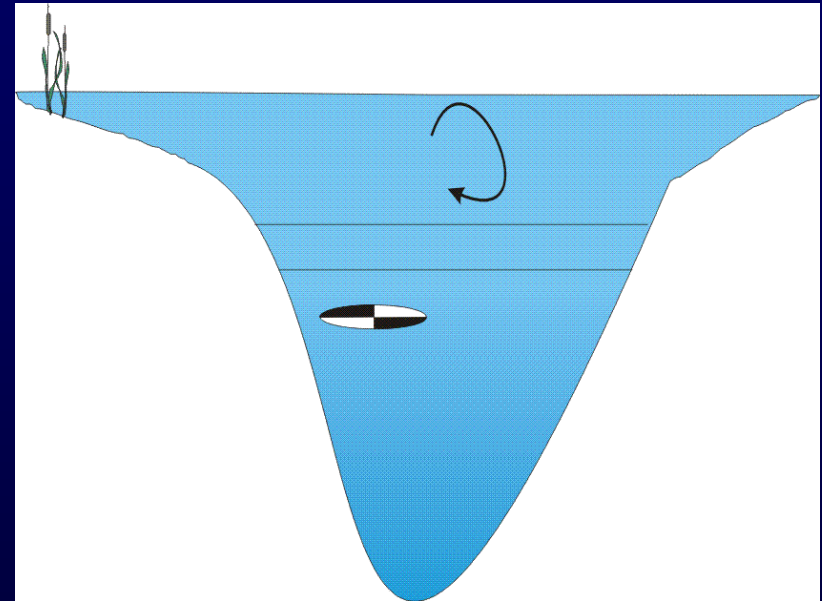
Lakes in a 50 km radius around Bancroft



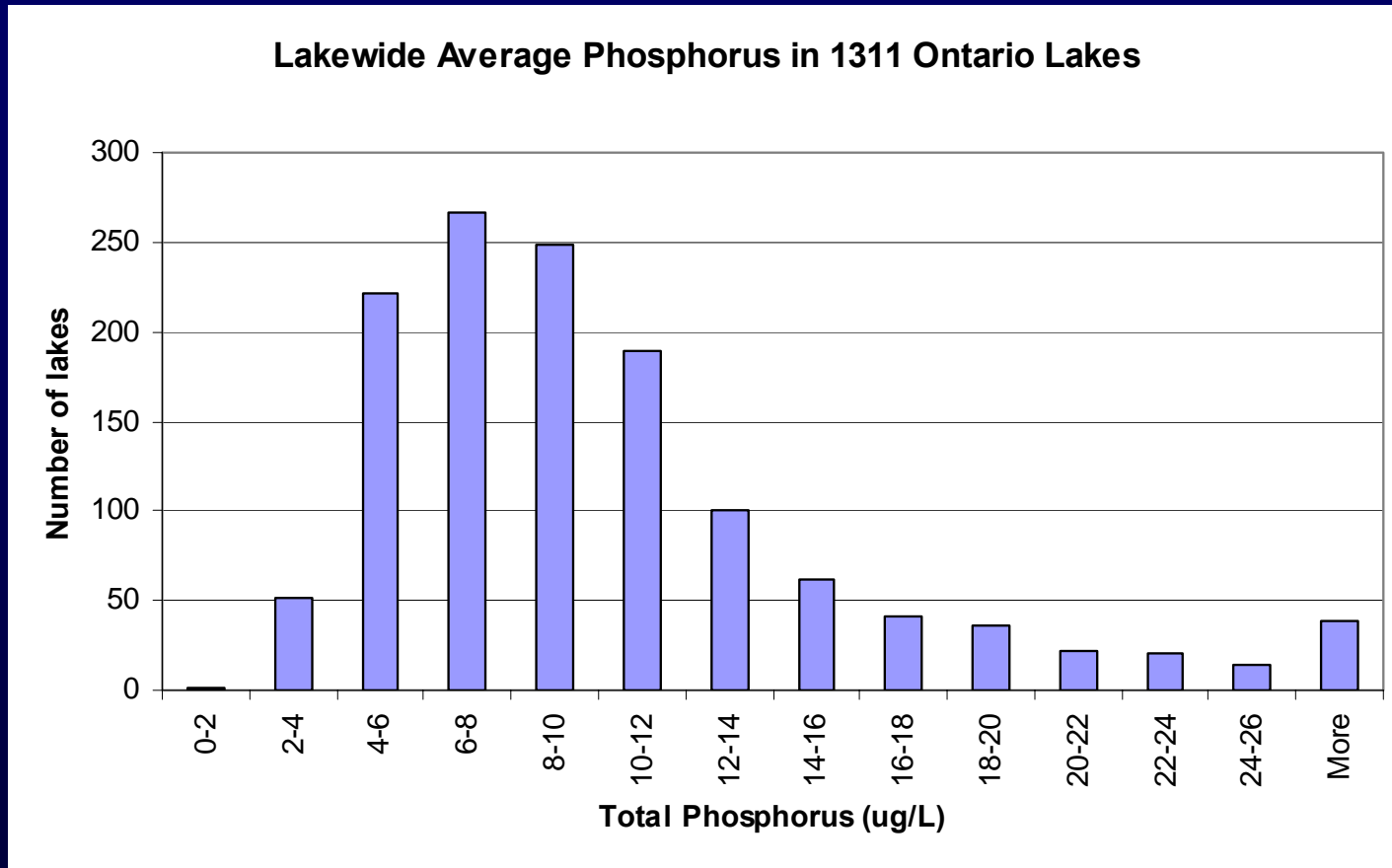
County of Hastings GIS Section, 2008. www.hastingsnavigator.ca

What type of lakes are in the Hastings Highlands area?

- **Slow weathering Precambrian bedrock of Canadian Shield**
- **“Land of Lakes and Rivers”**
(Heritage Atlas of Hastings County)
- **Many deep, cool water lakes**
- **Oligotrophic to borderline mesotrophic – low in nutrients**
- **Relatively populated lakes, many are used for recreation**

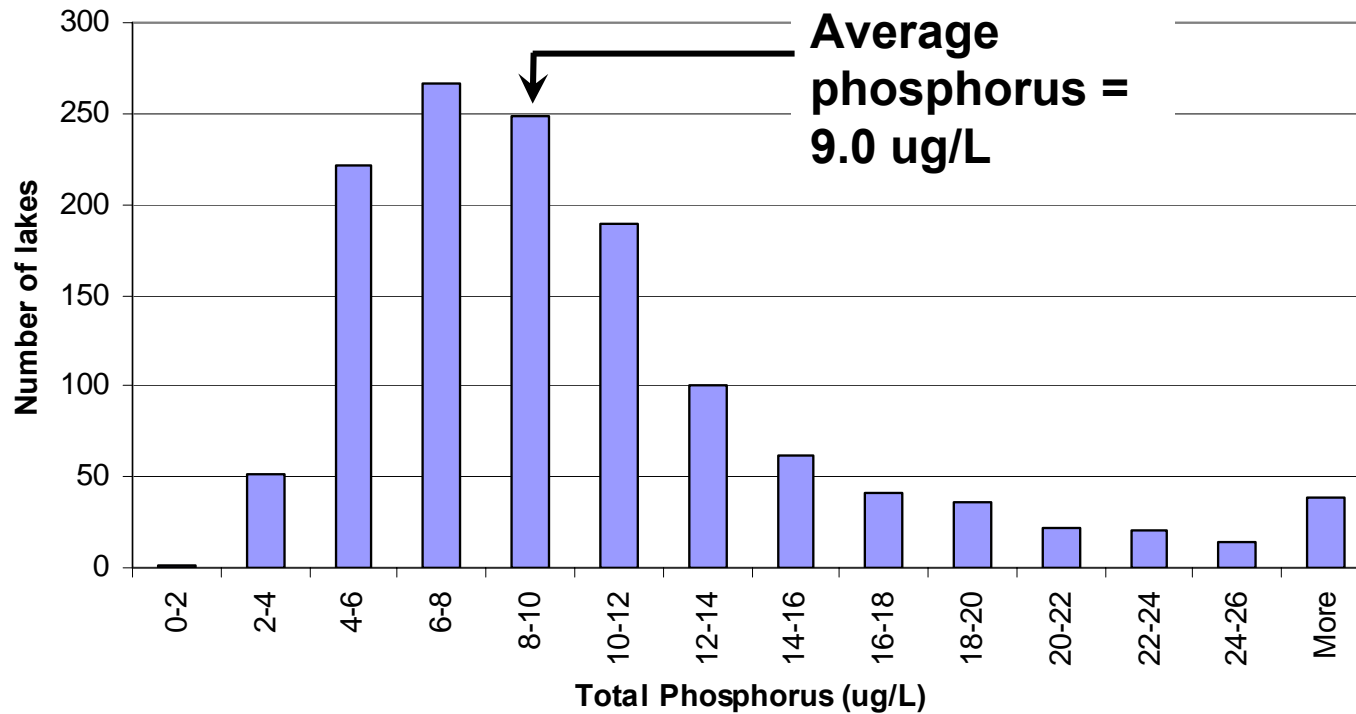


Distribution of phosphorous concentrations in Ontario Lakes



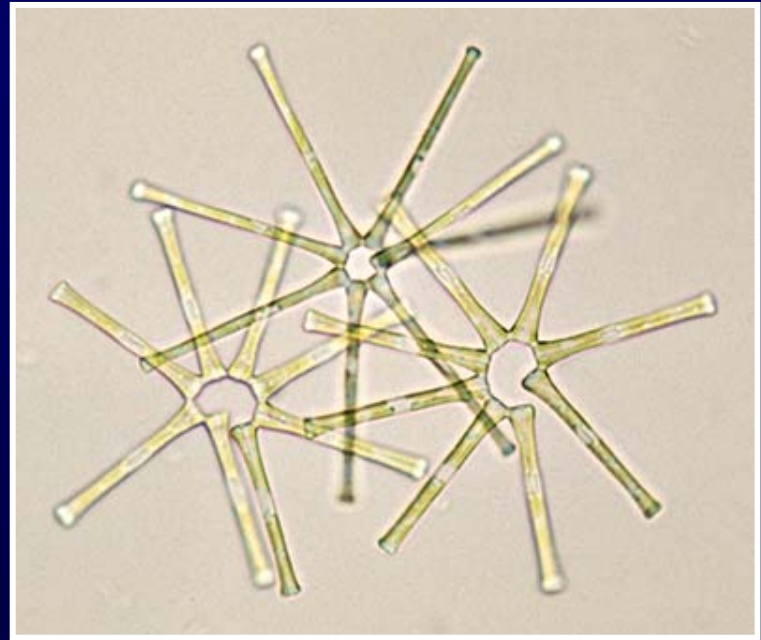
Distribution of phosphorous concentrations in Ontario Lakes

Lakes in a 50 km radius around Bancroft, ON



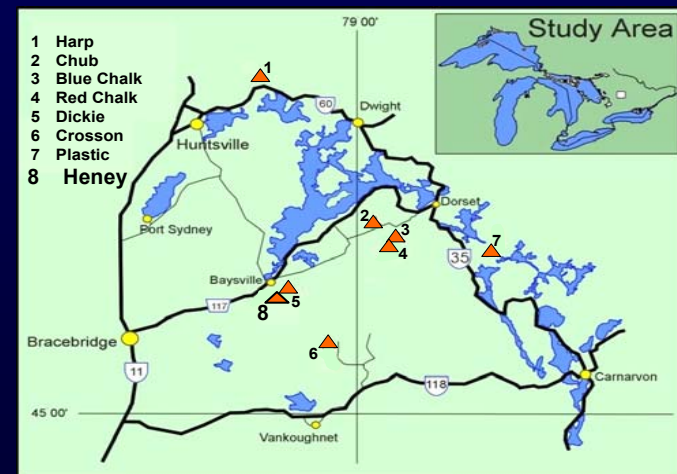
Low levels of phosphorus equals..

- **Low levels of aquatic vegetation**
- **Infrequent algal blooms**



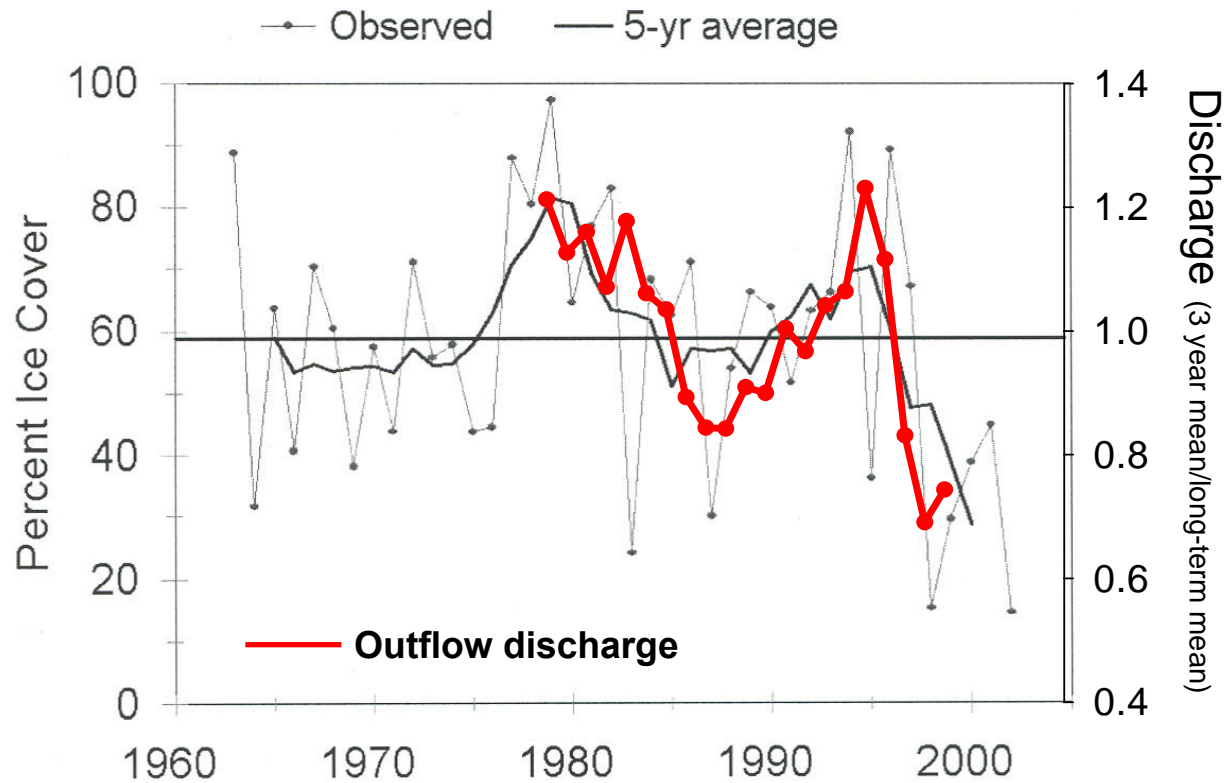
Dorset Environmental Science Centre (DESC), Ontario, Canada

- headwater systems
- SA < 100 ha
- presently oligotrophic to borderline mesotrophic
- sampled (at least) monthly during the ice-free season from late 1976 onward
- suite of environmental variables

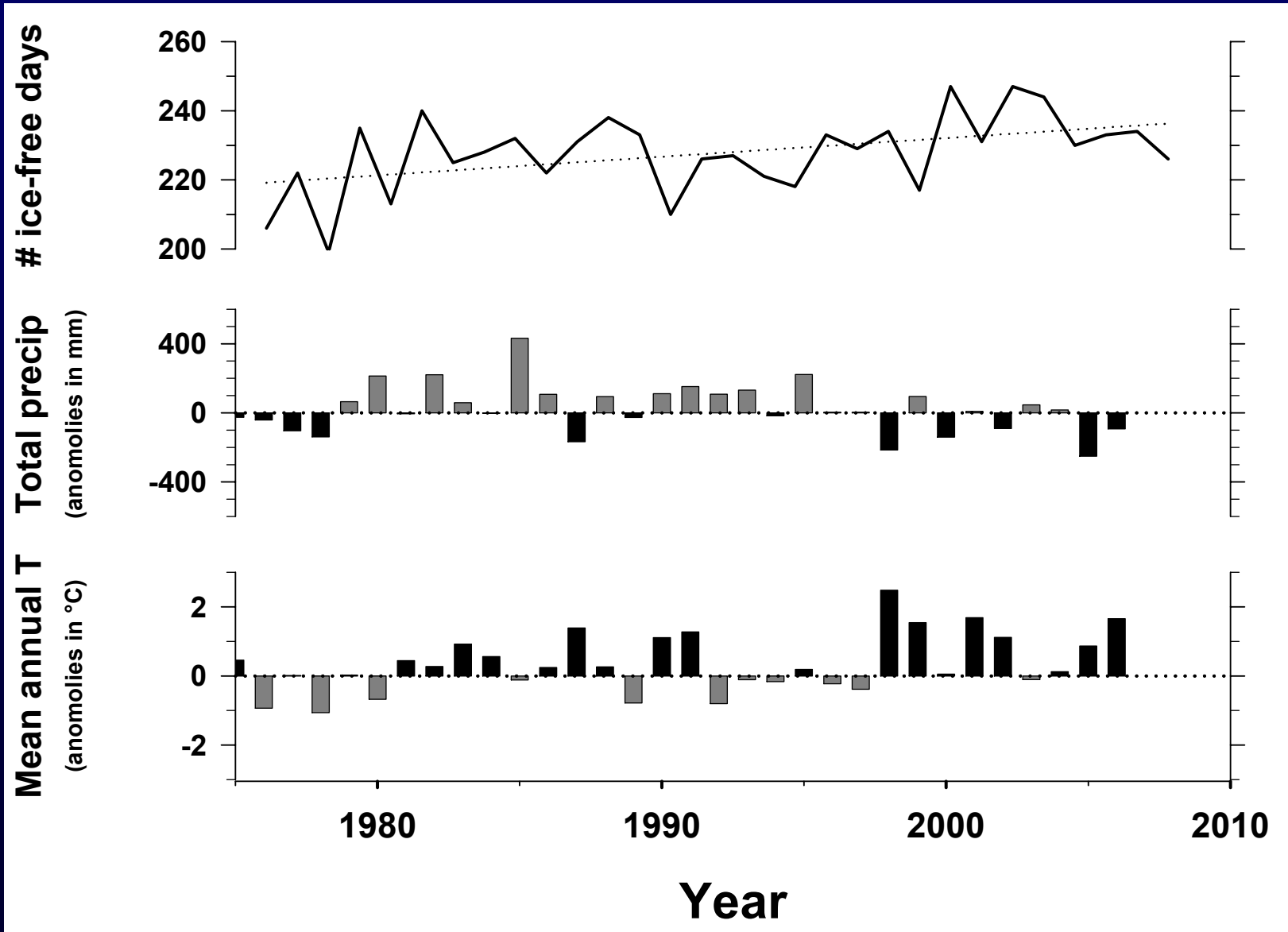


The effects of climate warming on phosphorus in lakes

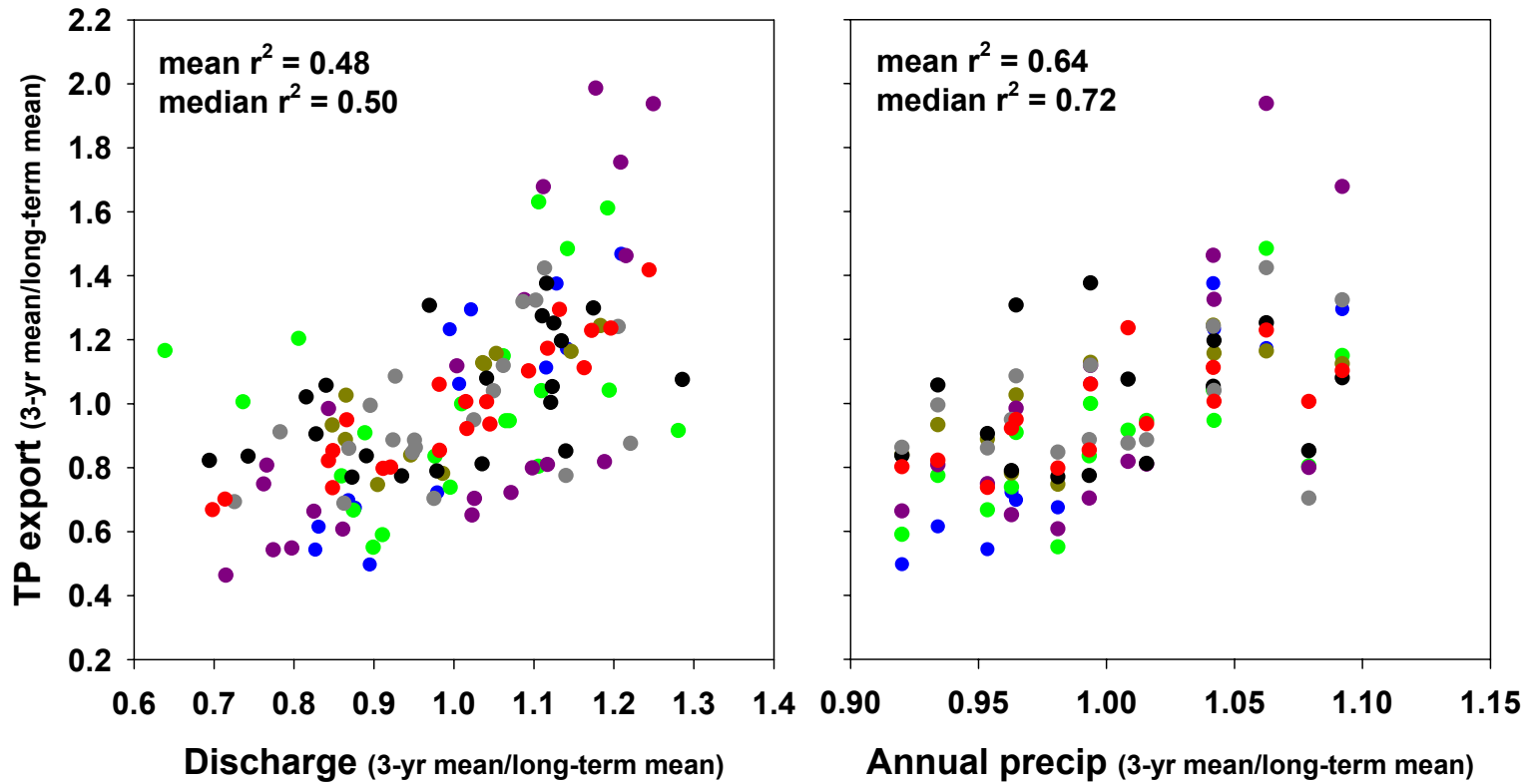
Decline in Great Lakes ice cover



Wetter & drier; Warmer & Colder. Increase in length of ice-free season

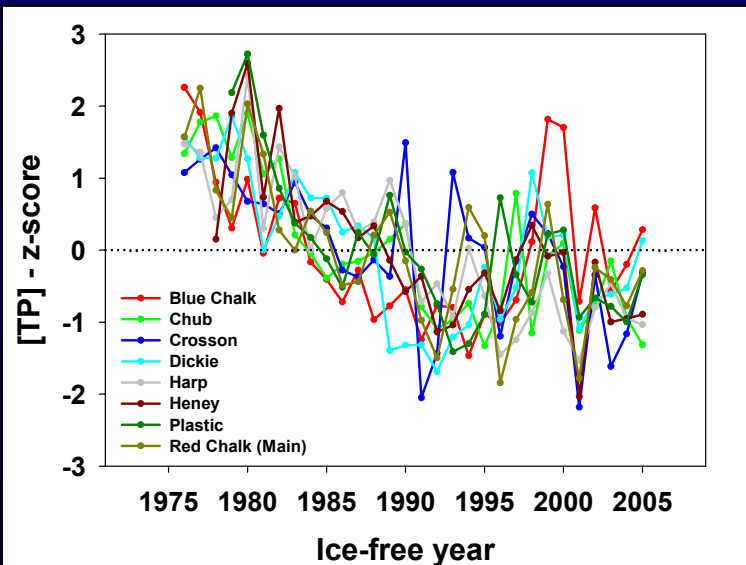


The amount of phosphorus entering lakes is controlled, in part, by climate

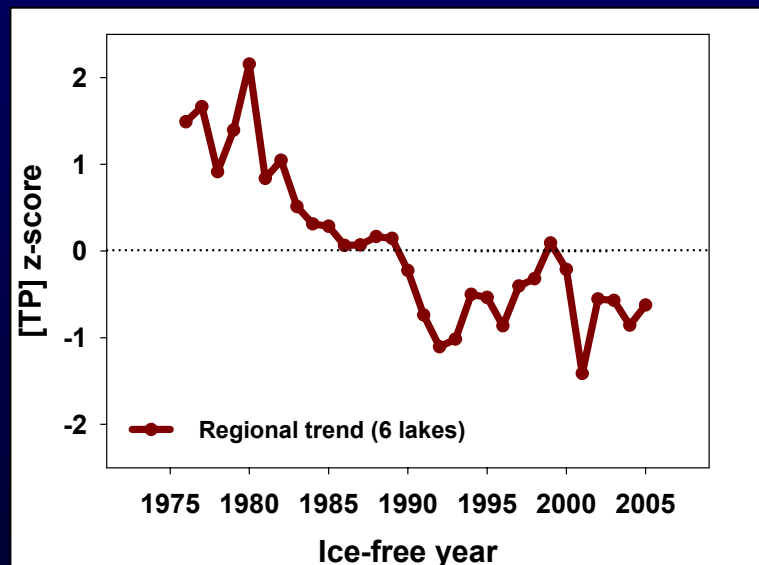


Long-term declines in [TP] – DESC ‘A’ Lakes

Relative trends



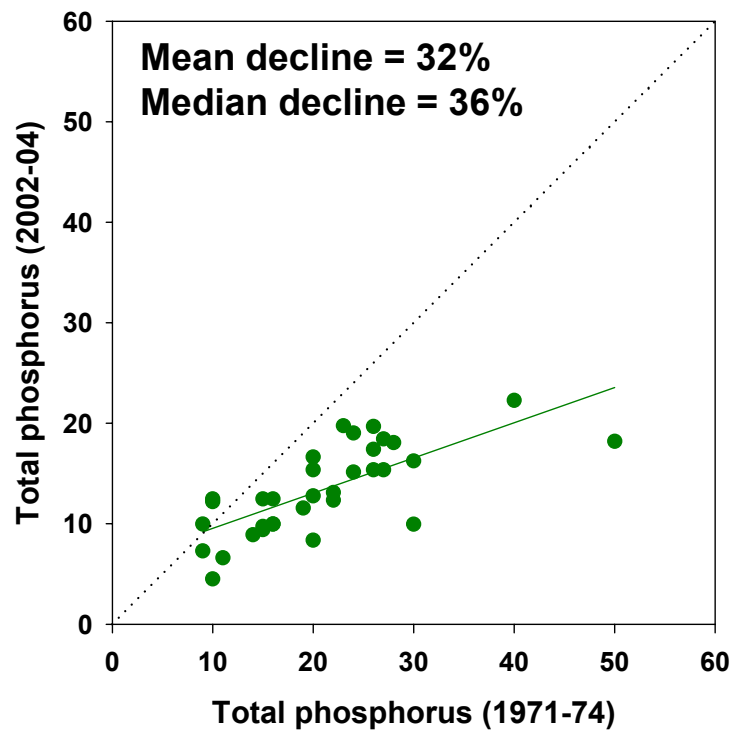
Regional trend



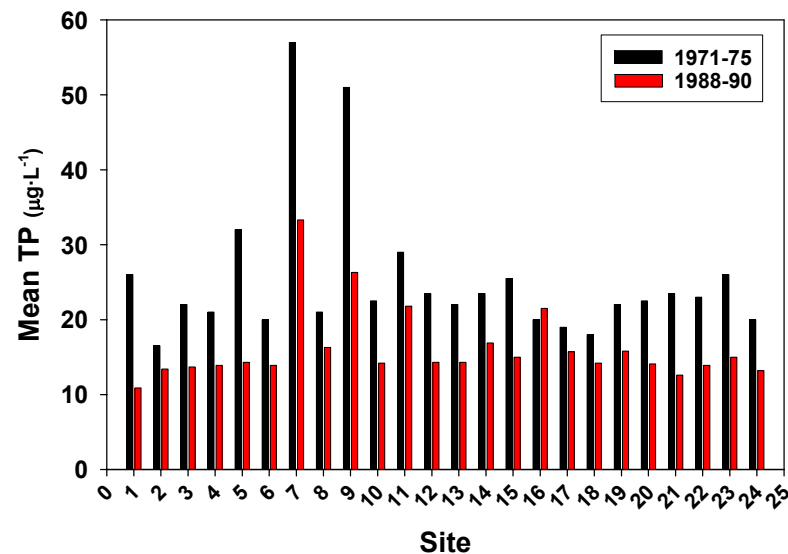
Average decline in TP = 28%

Muskoka and beyond...

Recreational lakes survey - MOE



Lake Nipissing



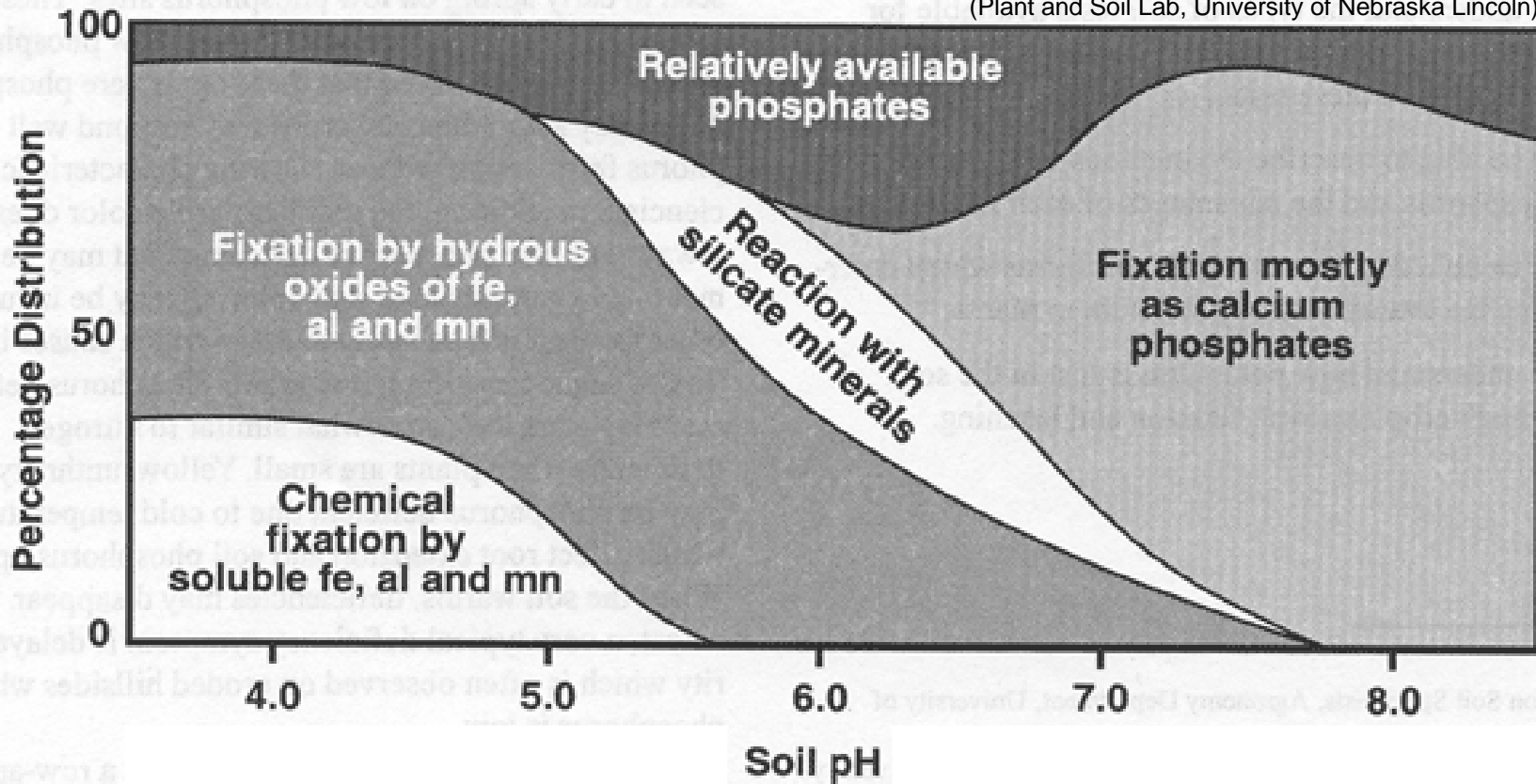
Mean decline = 34%
Median decline = 36%

Why are the phosphorus levels down?

- Declines in phosphorus since 1970s in studied lakes
- Reductions in phosphorus in detergents
- Climate change = increase in extreme weather events such as drought
- Less phosphorus entering lakes through the watershed
- Acid rain and its effect on soil pH

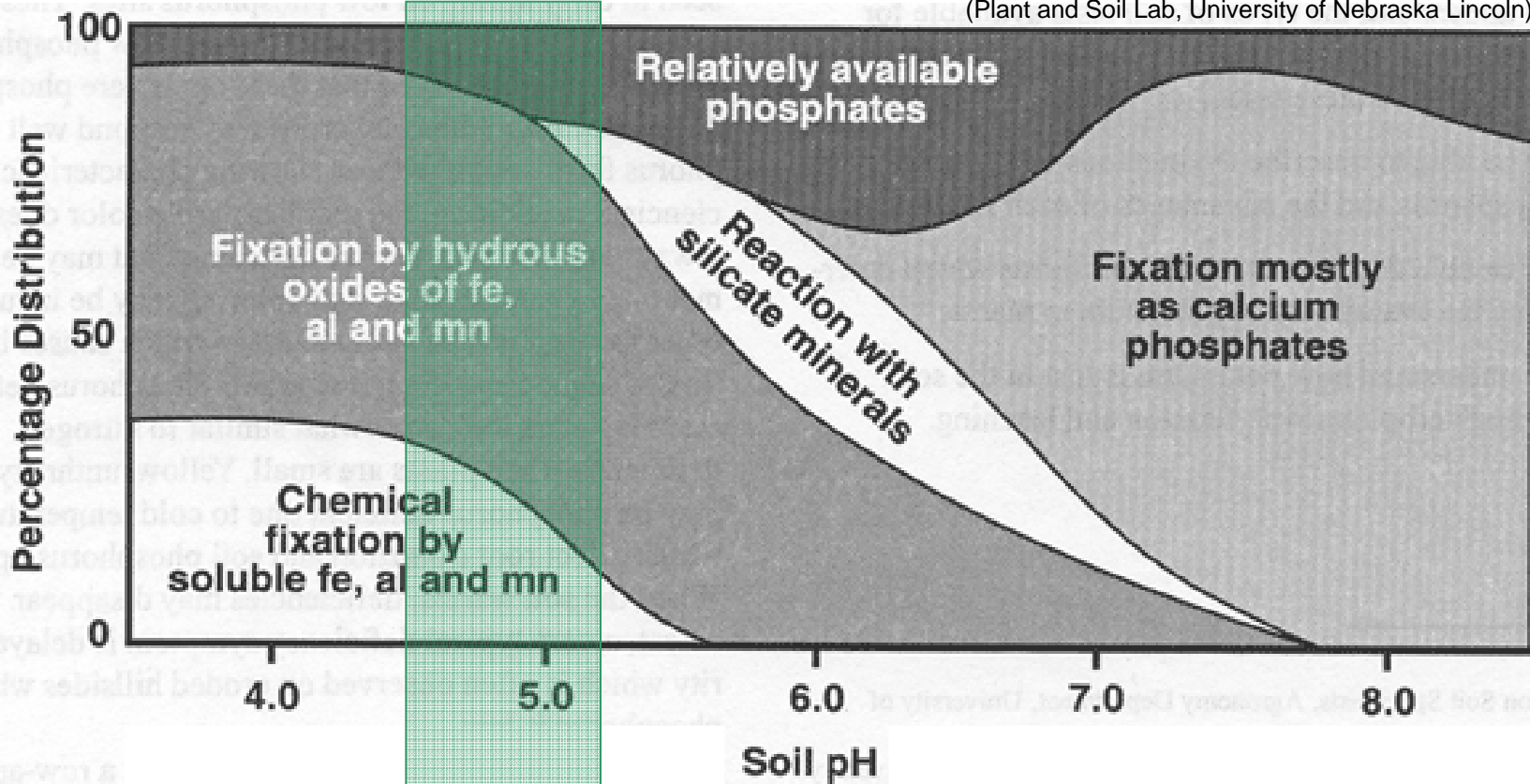
Acid rain and its effects on soil pH?

(Plant and Soil Lab, University of Nebraska Lincoln)



Acid rain and its effects on soil pH?

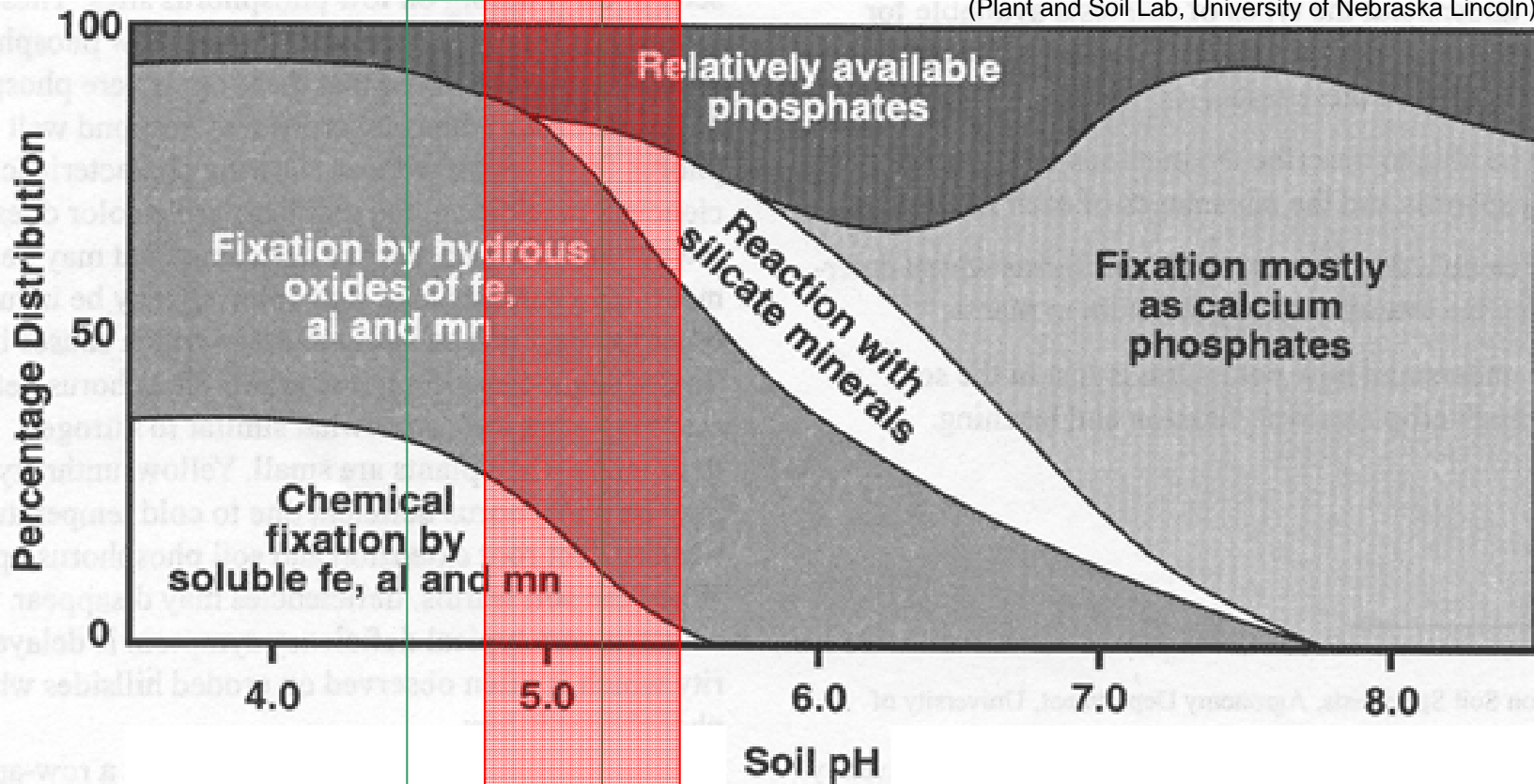
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2005
Plastic Harp

Acid rain and its effects on soil pH?

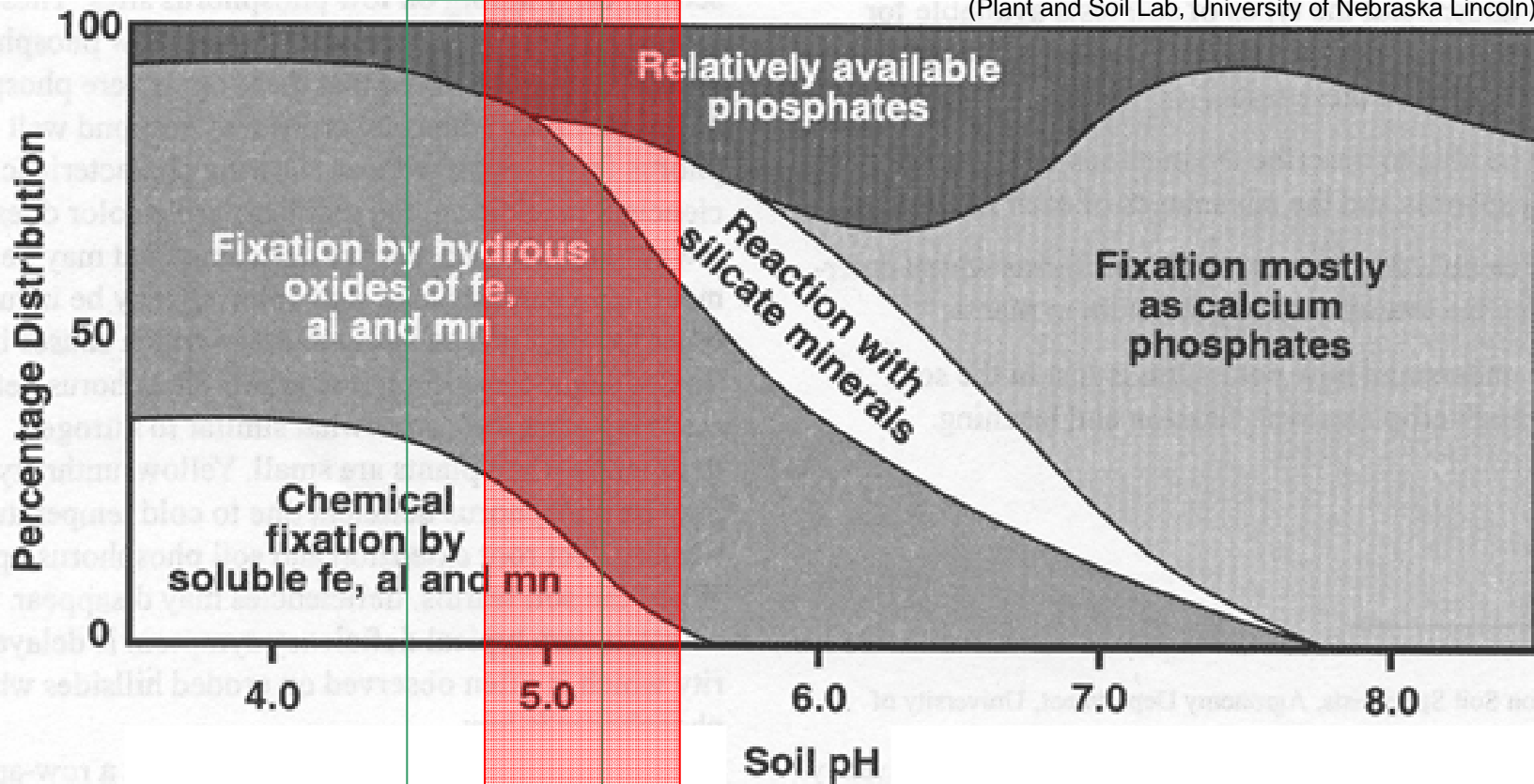
(Plant and Soil Lab, University of Nebraska Lincoln)



2005 ← 1986

What does the future hold: Soil pH?

(Plant and Soil Lab, University of Nebraska Lincoln)



2005 ← 1986

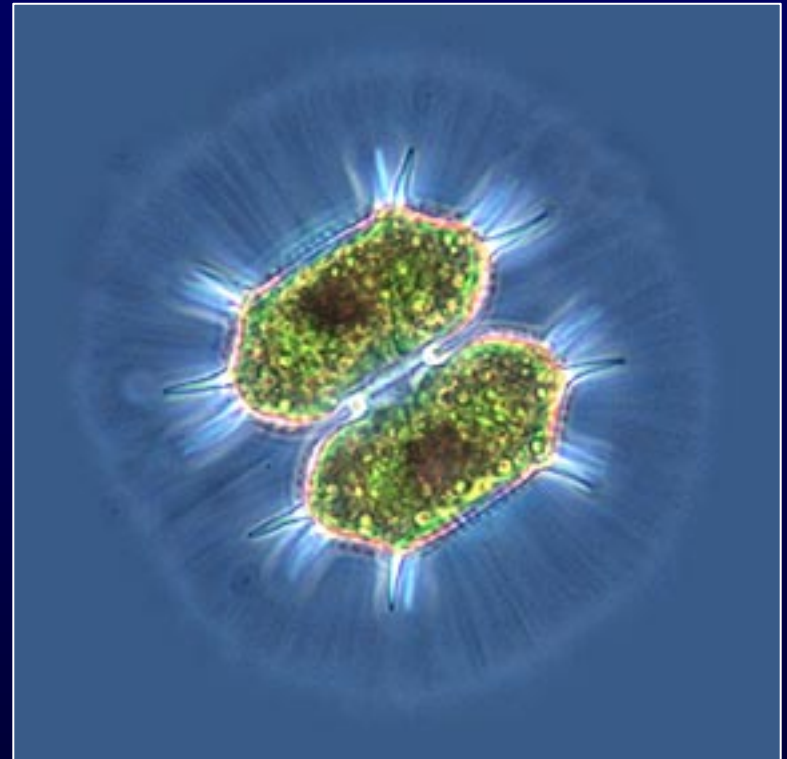
2020? 2050? ← 2020? 2050?

Why are the phosphorus levels down?

- Declines in phosphorus since 1970s in studied lakes
- Reductions in phosphorus in detergents
- Climate change = increase in extreme weather events such as drought
- Less phosphorus entering lakes through the watershed
- Acid rain and its effect on soil pH
- We don't know what will happen in the future

There are no excuses for giving up the good fight

- Relative impacts by land and business owners, cottagers, are still important – ongoing vigilance is needed.
- Leave the shoreline natural or plant and maintain a buffer zone of native vegetation
- Eliminate fertilizers and pesticides
- Maintain septic and pump on a regular basis



Thank you!

