

# Paleolimnology or History in the Mucking



*Paul Garrison*  
*Bureau of Science*  
*Services*



## HOW DO YOU COLLECT SEDIMENT CORES?

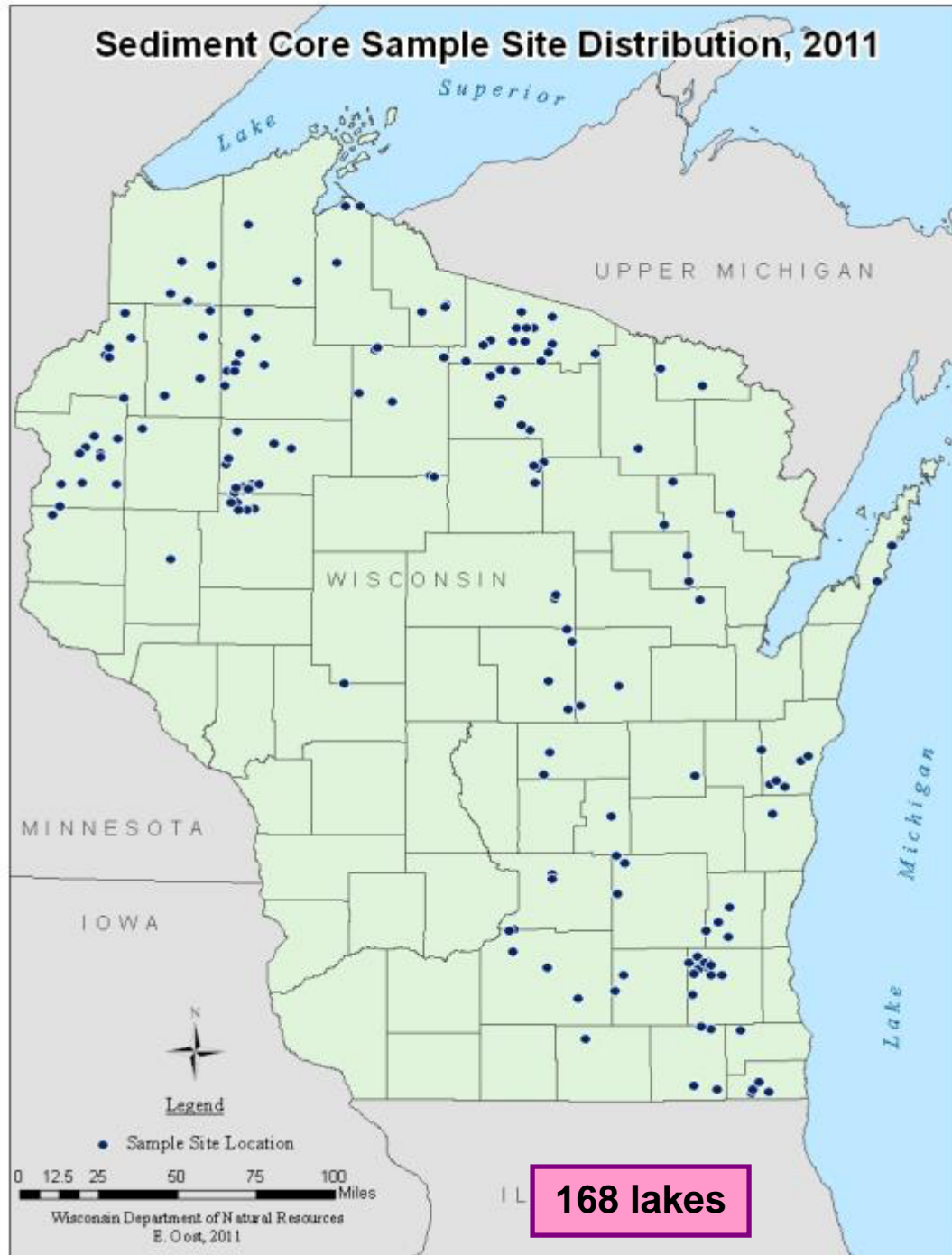


Gravity Corer



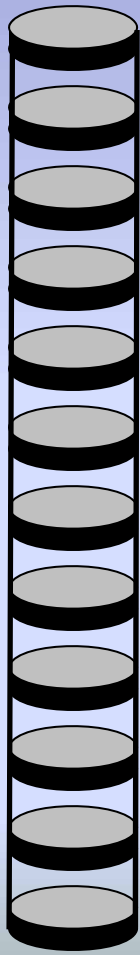
Piston Corer

# Sediment Core Sample Site Distribution, 2011



# Types of Cores

Full core



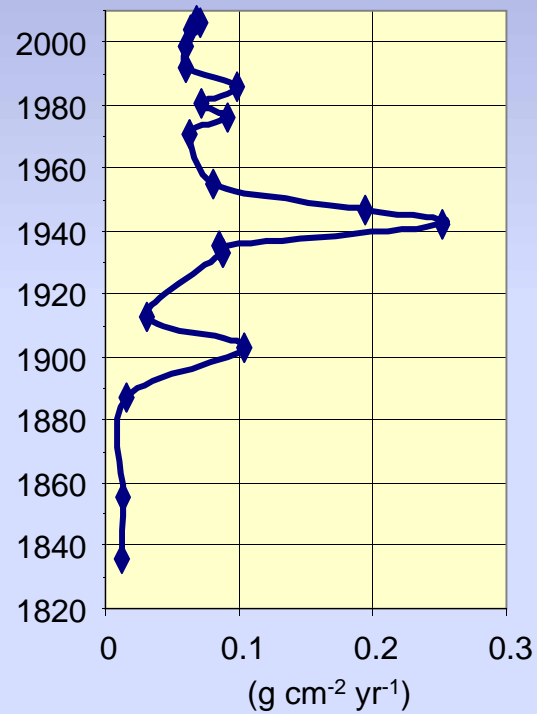
Top/Bottom



Modern

Reference

Sedimentation Rate



# WHAT INFORMATION IS RECORDED IN THE SEDIMENTS?

## •Geochemistry

- Nutrients -- phosphorus, nitrogen
- Soil erosion--aluminum, titanium
- Urbanization--zinc, copper
- Synthetic fertilizer--uranium, cadmium
- Anoxia--iron, manganese

## •Diatoms

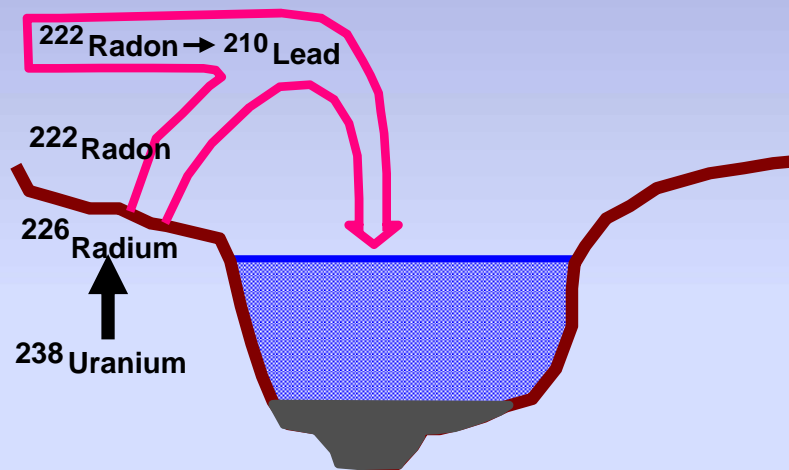
- Water quality history
  - nutrients
  - pH
- General aquatic plant growth

## •Blue-green algae

## •Plant remains

- History of macrophytes

# Lead-210 Dating

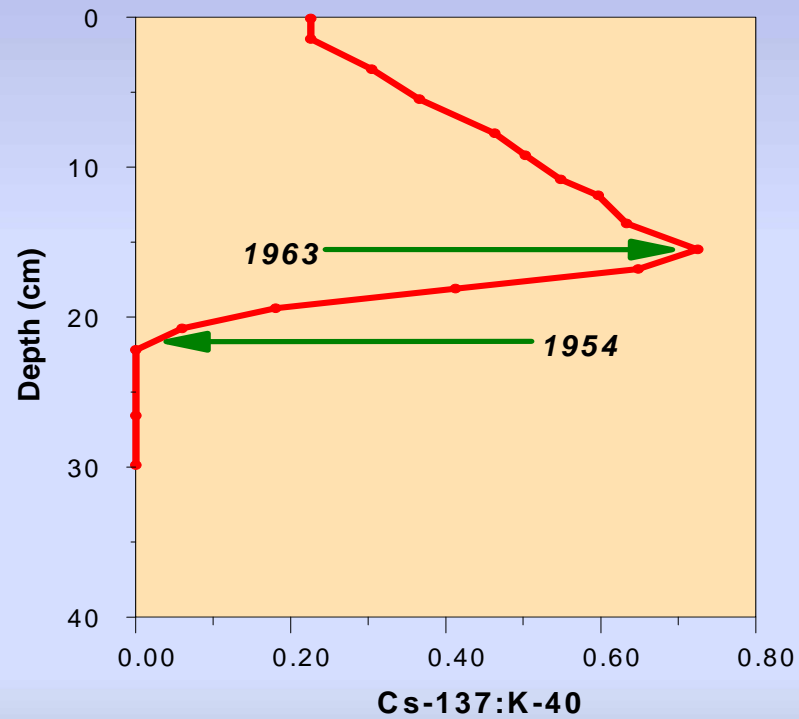


## HALF LIVES

$^{226}\text{Radium}$	1024 yr
$^{222}\text{Radon}$	3.8 days
$^{210}\text{Lead}$	22.26 yr

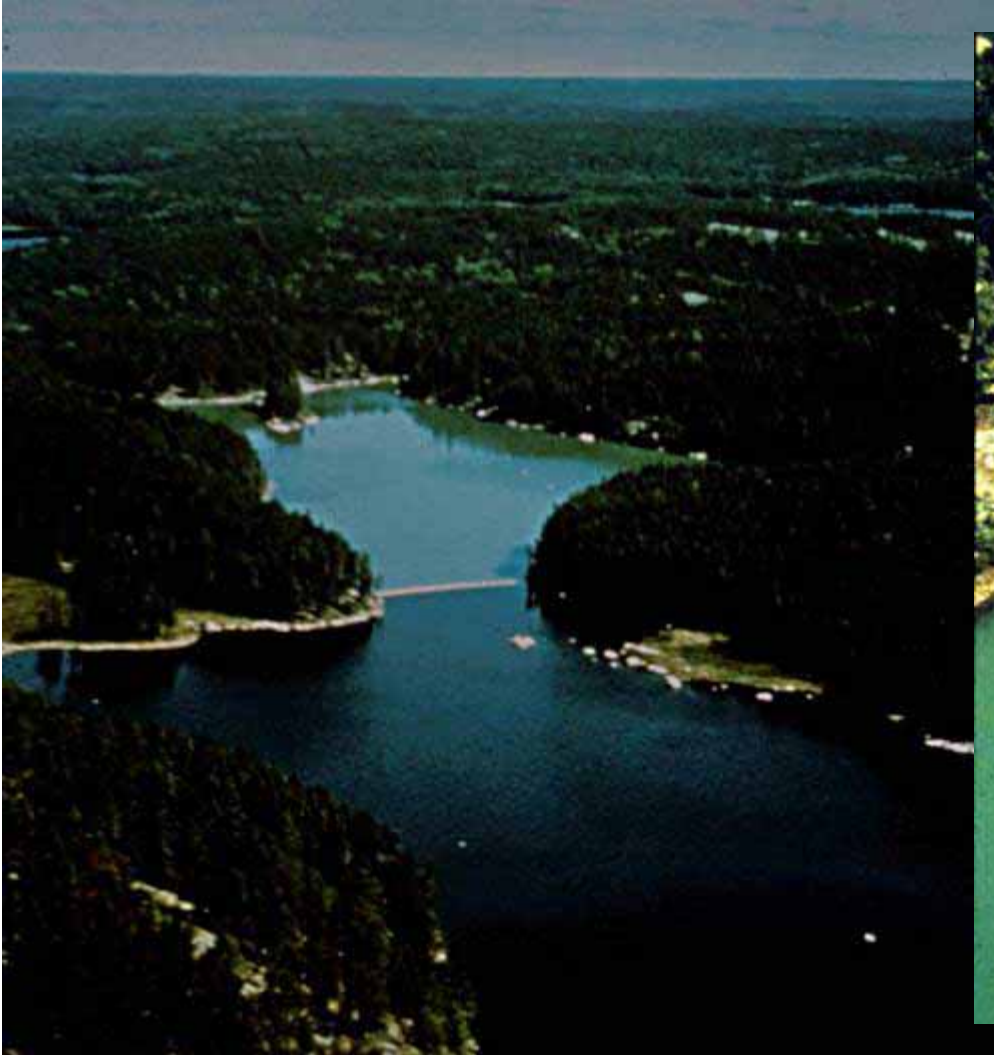
# FALLOUT FROM ATMOSPHERIC BOMB TESTING

## Cesium Dating





# WHY DO WE CARE ABOUT PHOSPHORUS?





# AGRICULTURE

Circa 1880



Circa 1910



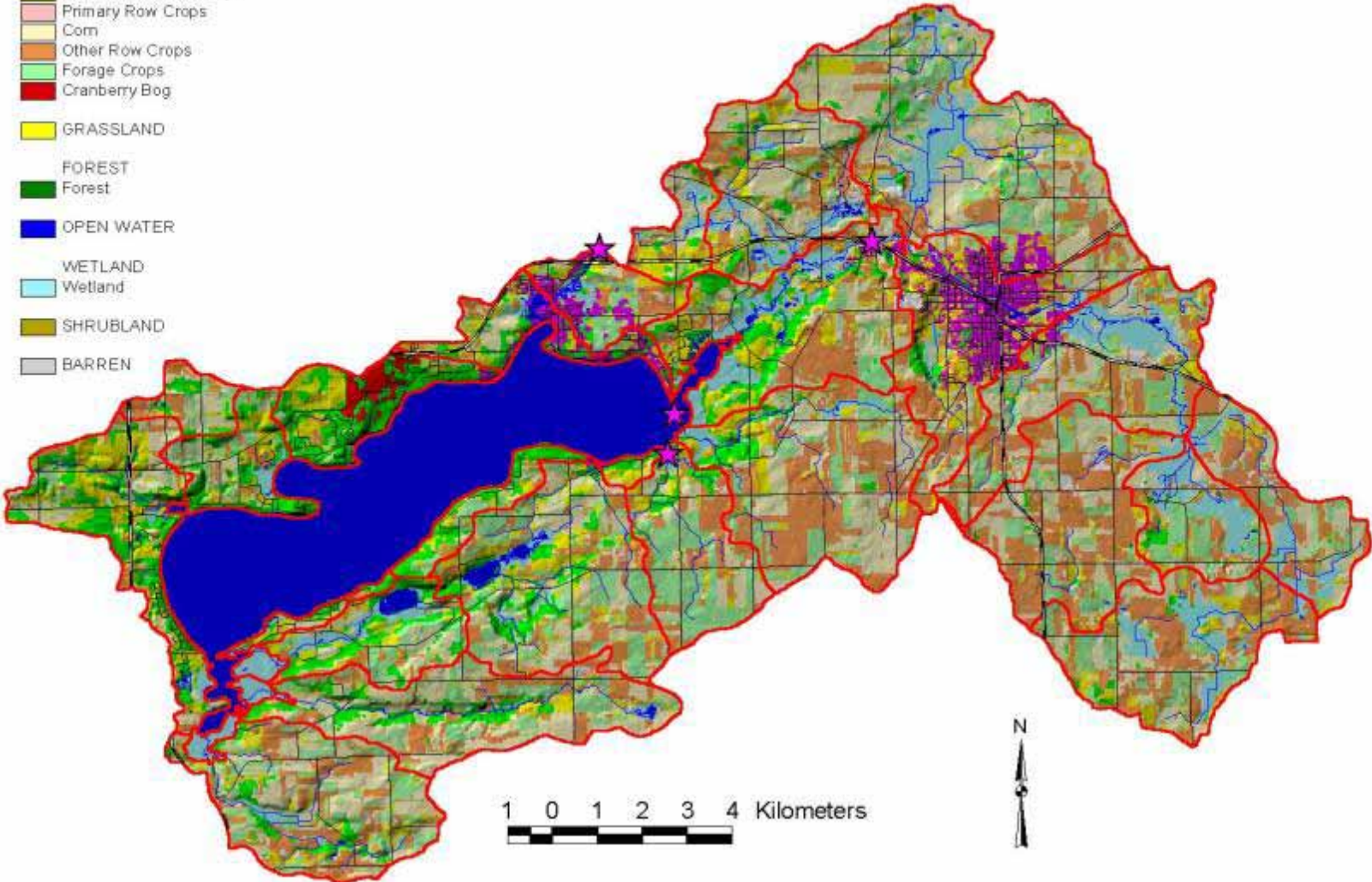






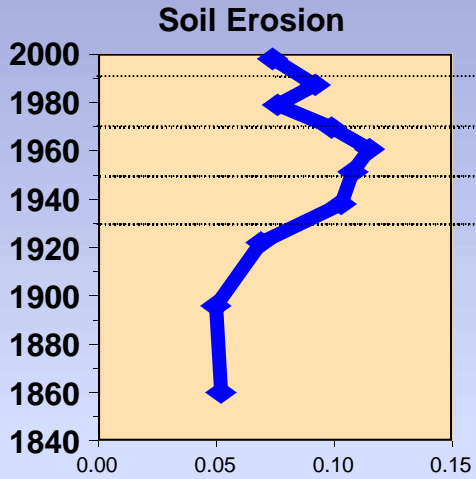
# Big Green Lake Watershed Land Cover & Hillshade (WISCLAND 1992)

- Land Cover
- URBAN/DEVELOPED
    - High Intensity
    - Low Intensity
    - Golf Course
  - AGRICULTURE
    - General Agriculture
    - Herbaceous/Field Crops
    - Primary Row Crops
    - Com
    - Other Row Crops
    - Forage Crops
    - Cranberry Bog
  - GRASSLAND
  - FOREST
    - Forest
  - OPEN WATER
  - WETLAND
    - Wetland
  - SHRUBLAND
  - BARREN

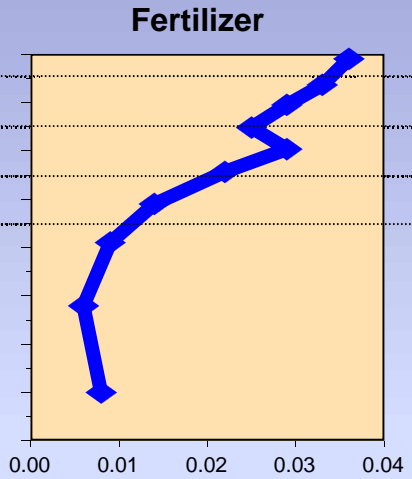


# Green Lake

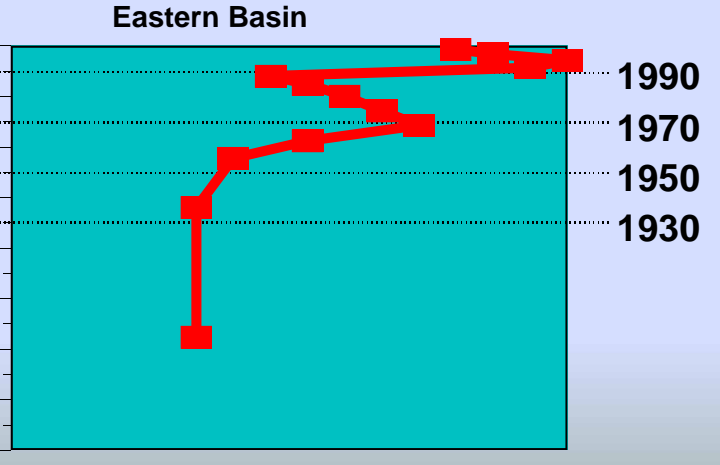
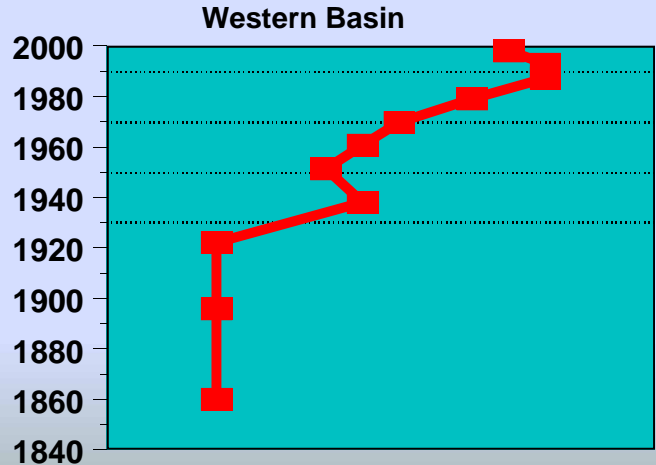
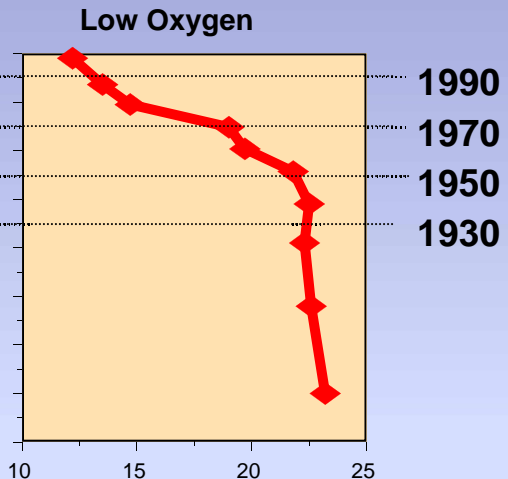
Titanium



Uranium



Manganese



Increasing Phosphorus Concentrations





# SHORELAND DEVELOPMENT



**circa 1940**

**2009**

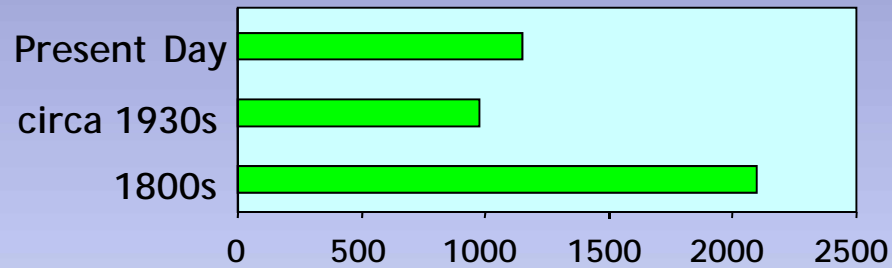




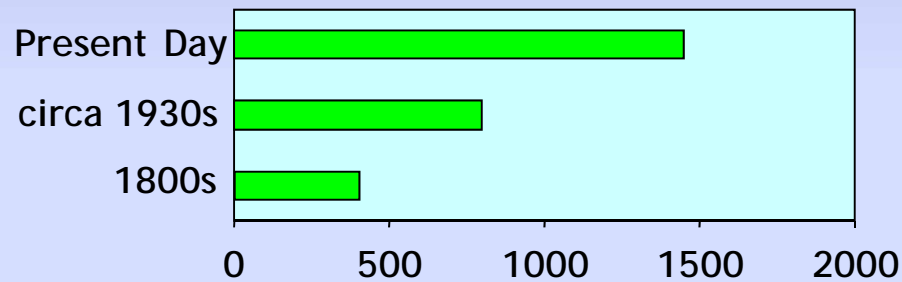
**Little  
Bearskin  
Lake** ★

# Little Bearskin Lake

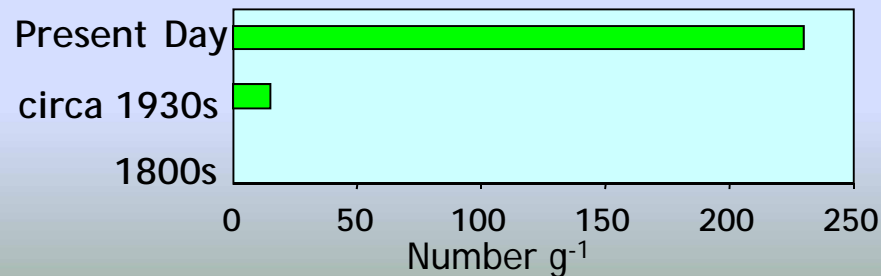
## FERNLEAF PONDWEED



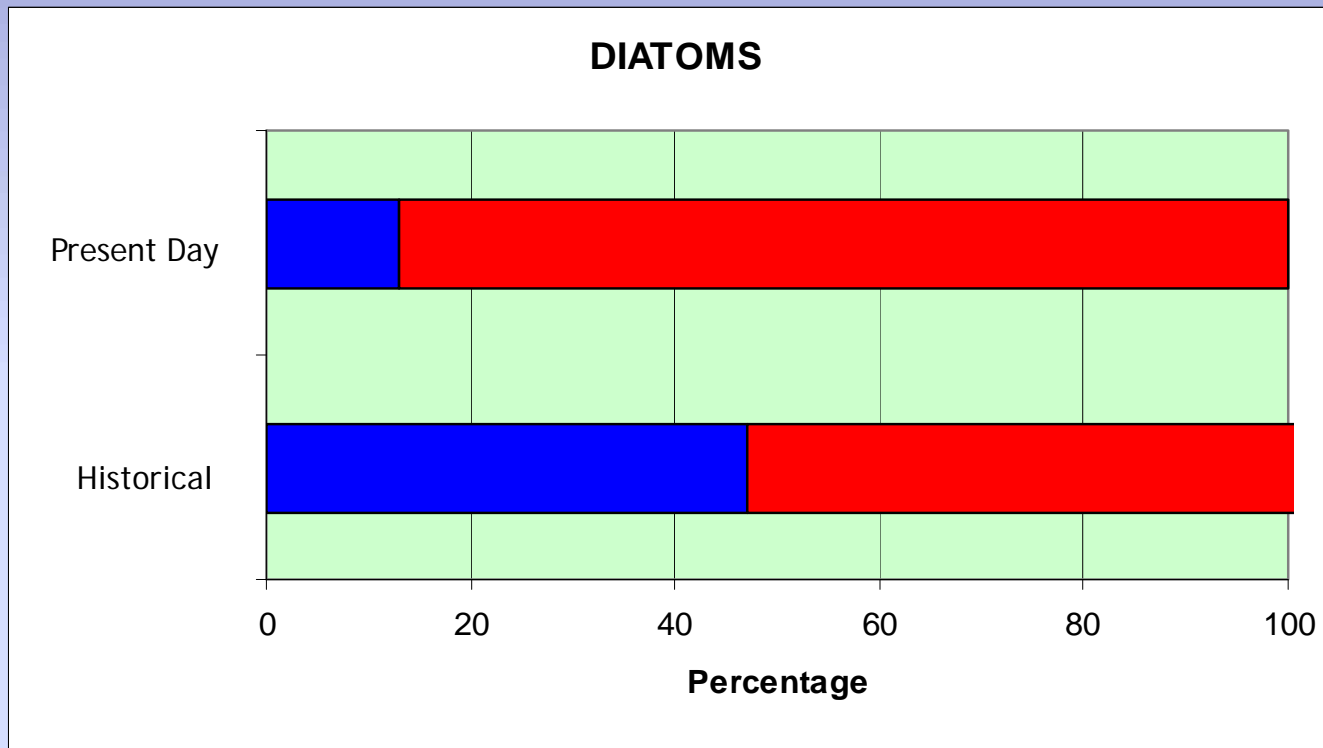
## COONTAIL



## LARGE LEAVED PONDWEED



# Little Bearskin Lake



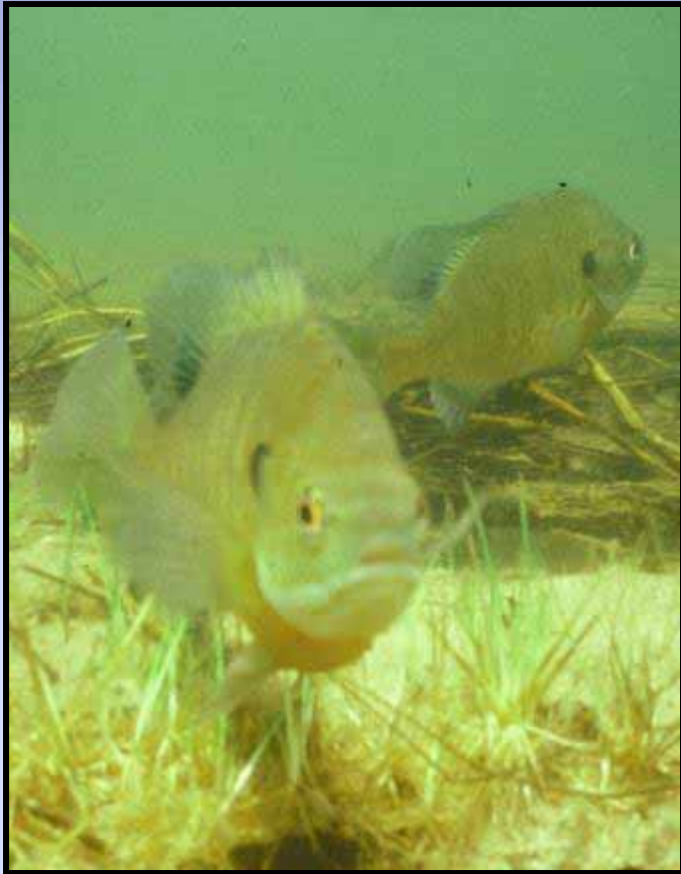
Open-water



Macrophyte



# Shift in the ratio of isoetids to elodeids



1930s: 50/50

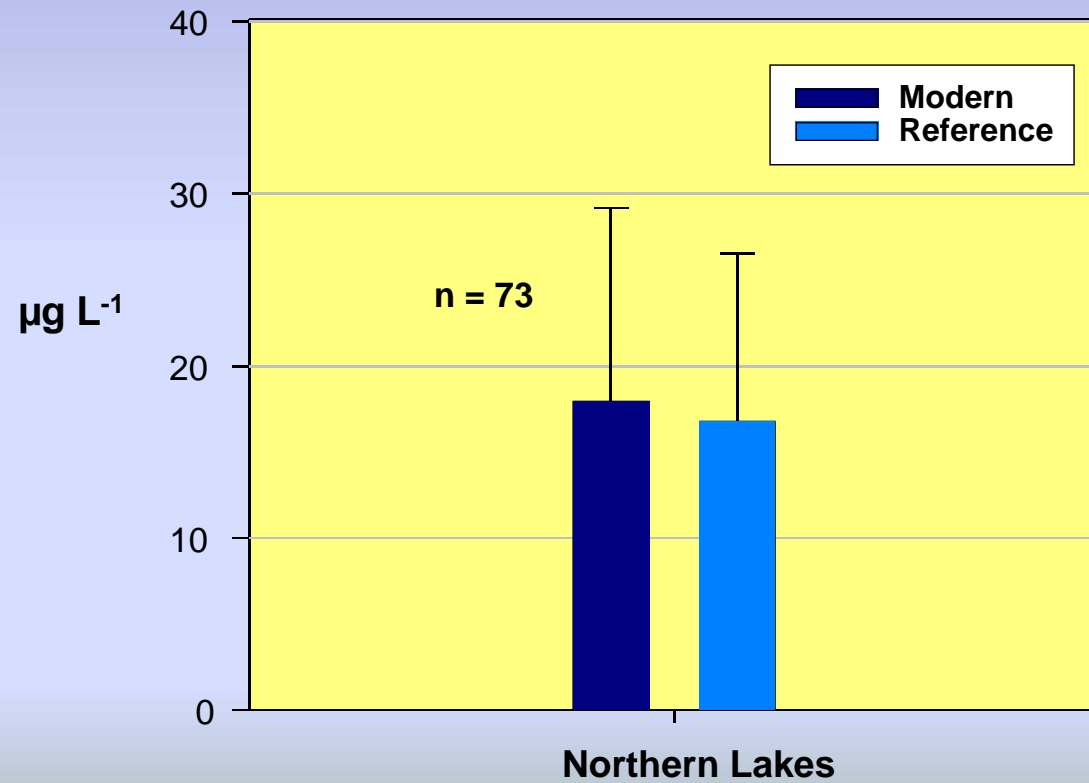
2000s: 30/70

Susan Borman and Ray Newman-U. of Minnesota



# CHANGE IN PHOSPHORUS

## SUMMER PHOSPHORUS





# WETLAND LOSS



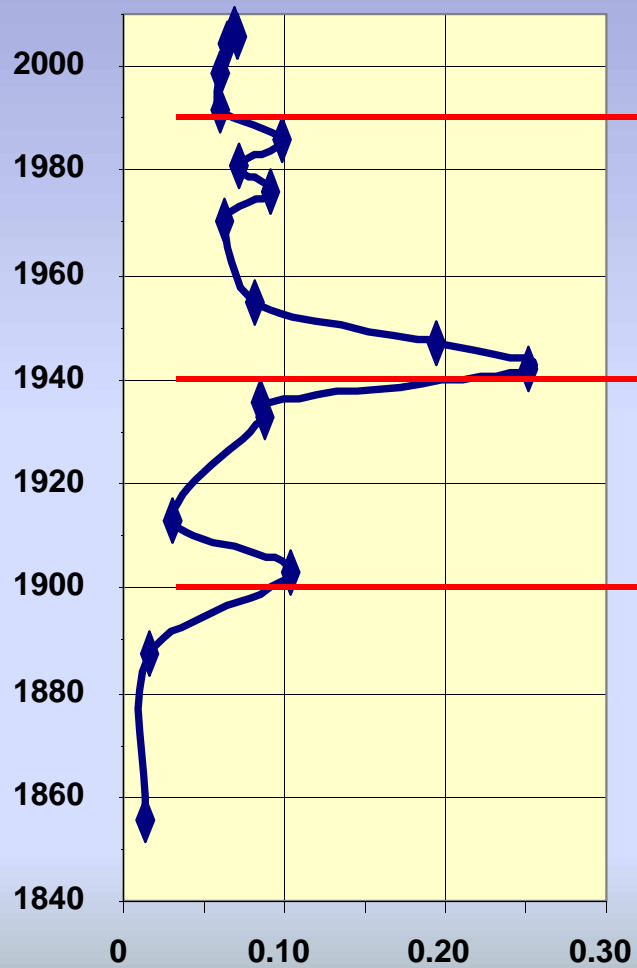
1940



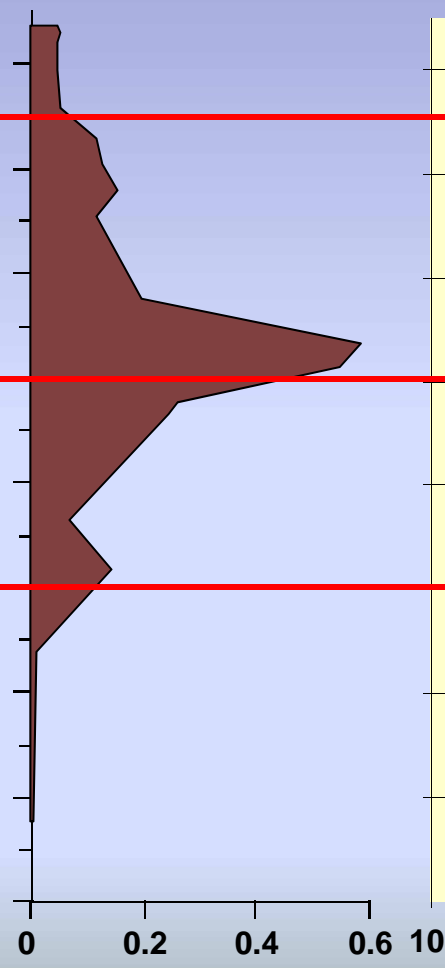
1950



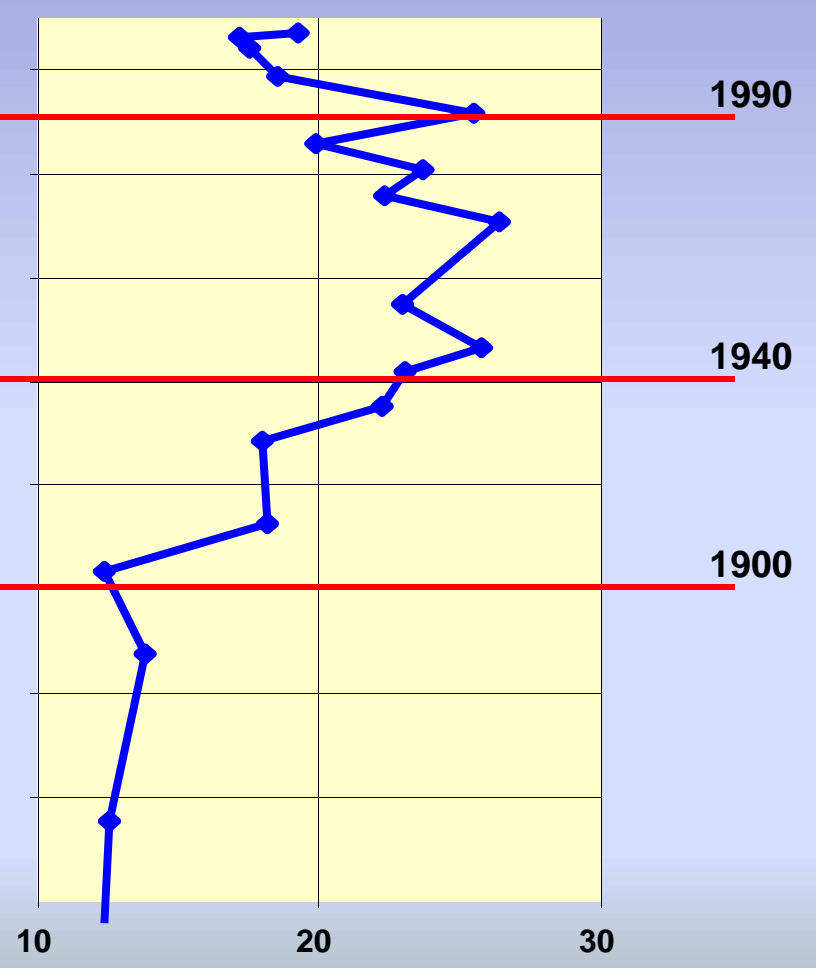
### Sedimentation Rate



### Titanium Soil Erosion



### Phosphorus





# LAKETIDES

Winter 2007



## Paleolimnology History in the Mucking

*Lake folks often get into lively discussions over what the lake used to be like...more plants, fewer plants, clear water; murky water... Is there any way to really know for sure? Well, the answer is yes! In fact we can have a good idea of what lakes used to be like hundreds of years ago with a science called Paleolimnology.*

Winter 2008

## Paleolimnology A Reflection of Our History

*An article in Lake Tides (vol. 32, no. 1), "Paleolimnology: History in the Mucking," discussed how sediment cores are taken and utilized to understand past changes in lakes. This article will take us on a historical journey that links changes on the landscape with environmental impacts to our lakes, which are revealed in the lake sediments.*

on the land. The opening of the forest allowed large amounts of sediments and nutrients to be exported from the land to the water.

Major events in the history of our country, like World War II, had definite impacts on our lakes. World War II marked another period in which agricultural practices intensified. To

# QUESTIONS?

