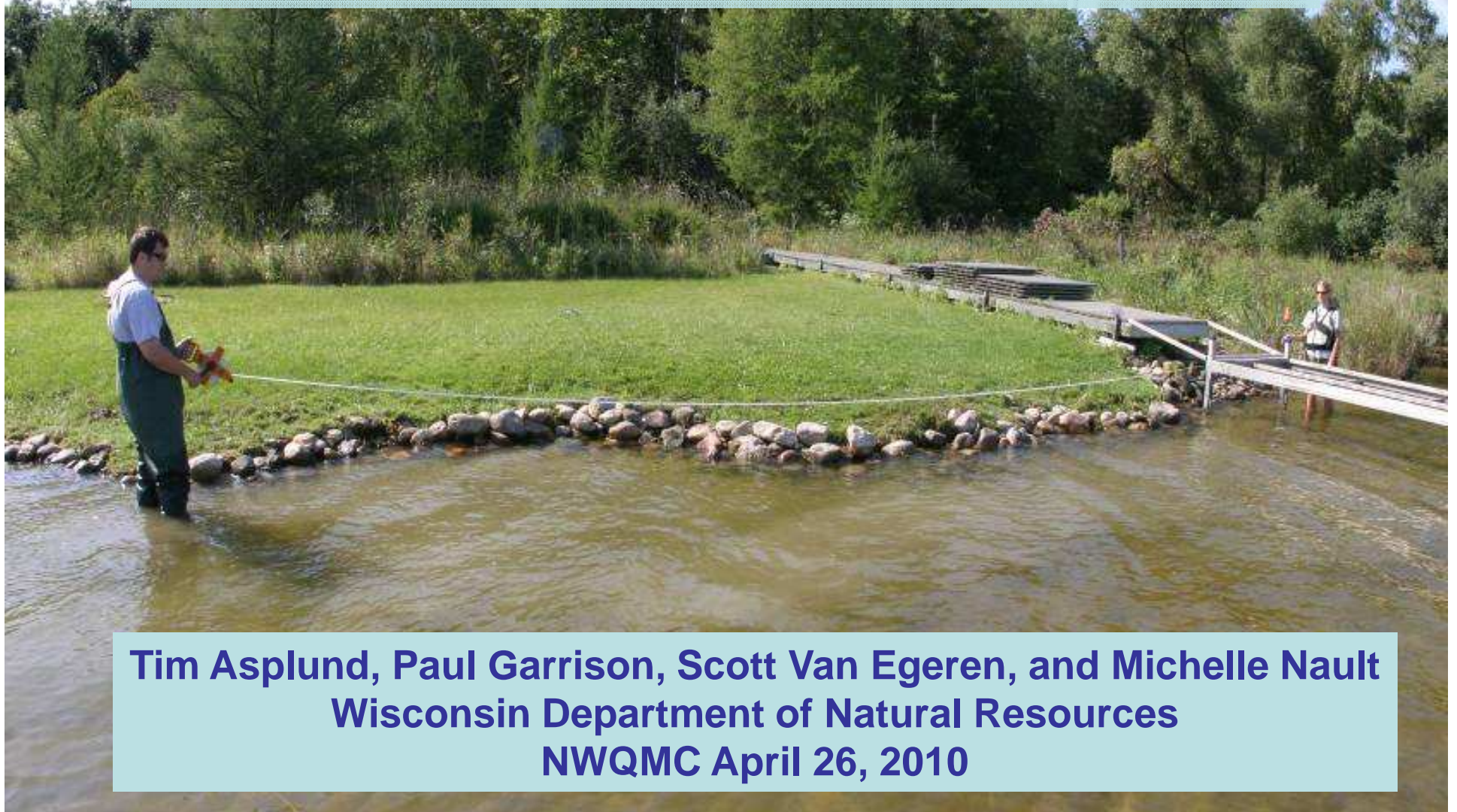


# 2007 National Lake Assessment: Wisconsin's Approach, Findings, and Opportunities

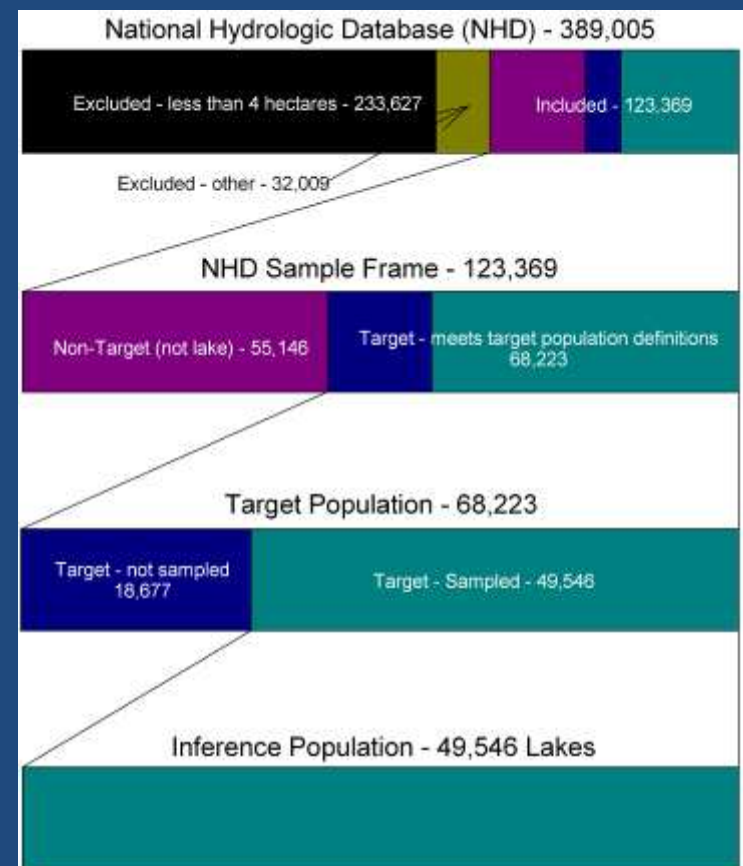


**Tim Asplund, Paul Garrison, Scott Van Egeren, and Michelle Nault**  
**Wisconsin Department of Natural Resources**  
**NWQMC April 26, 2010**



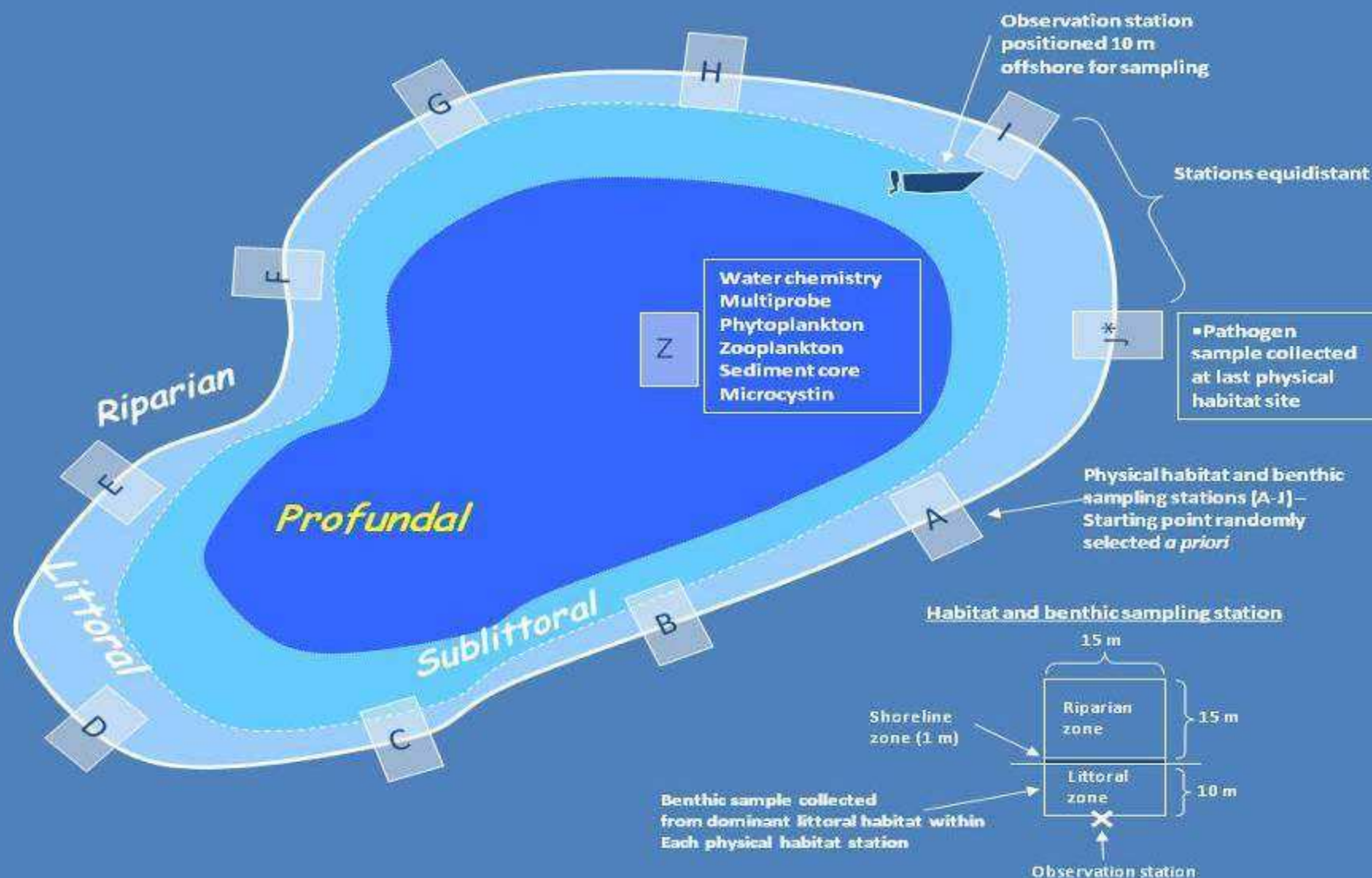
# National Lakes Assessment: Design of the Survey

- Lakes selected from National Hydrography Dataset (NHD), leveraging statistical survey methodology
  - Target lakes/reservoirs: >4 ha, >1m deep, non-saline, >0.1 ha open water
  - Stratified by size, state, and level-III ecoregion
  - 200 National Eutrophication Survey lakes revisited during the NLA sampling year to assess changes between 1972 and 2009





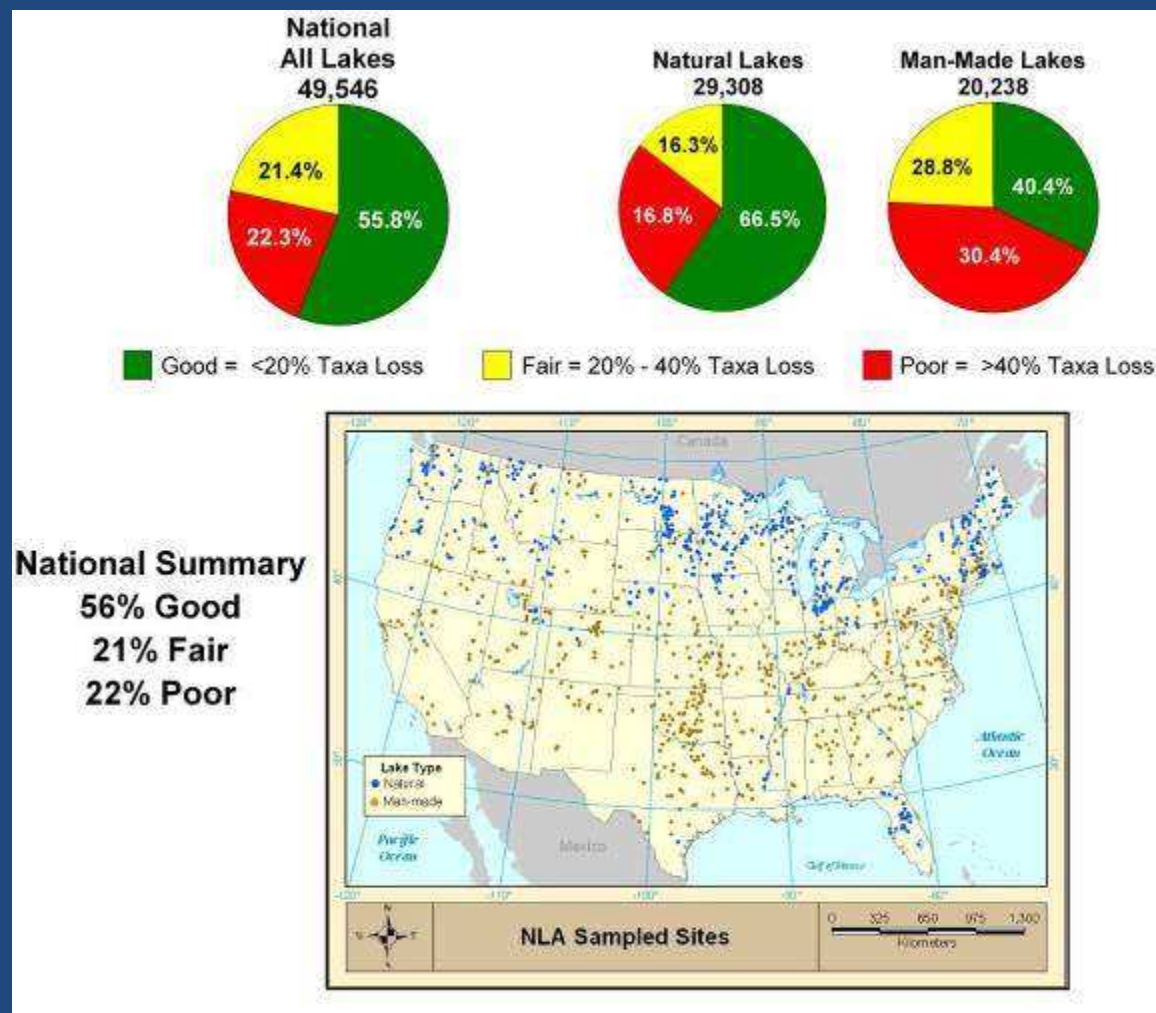
# National Lakes Assessment: Sampling Approach





# Condition of the Nation's Lakes: Biological Condition Using Taxa Loss Index

- National Summary:
  - 56% good
  - 21% fair
  - 22% poor
- Consistent national thresholds, but predicated on lake class-specific reference expectations



# Opportunities for WI lakes

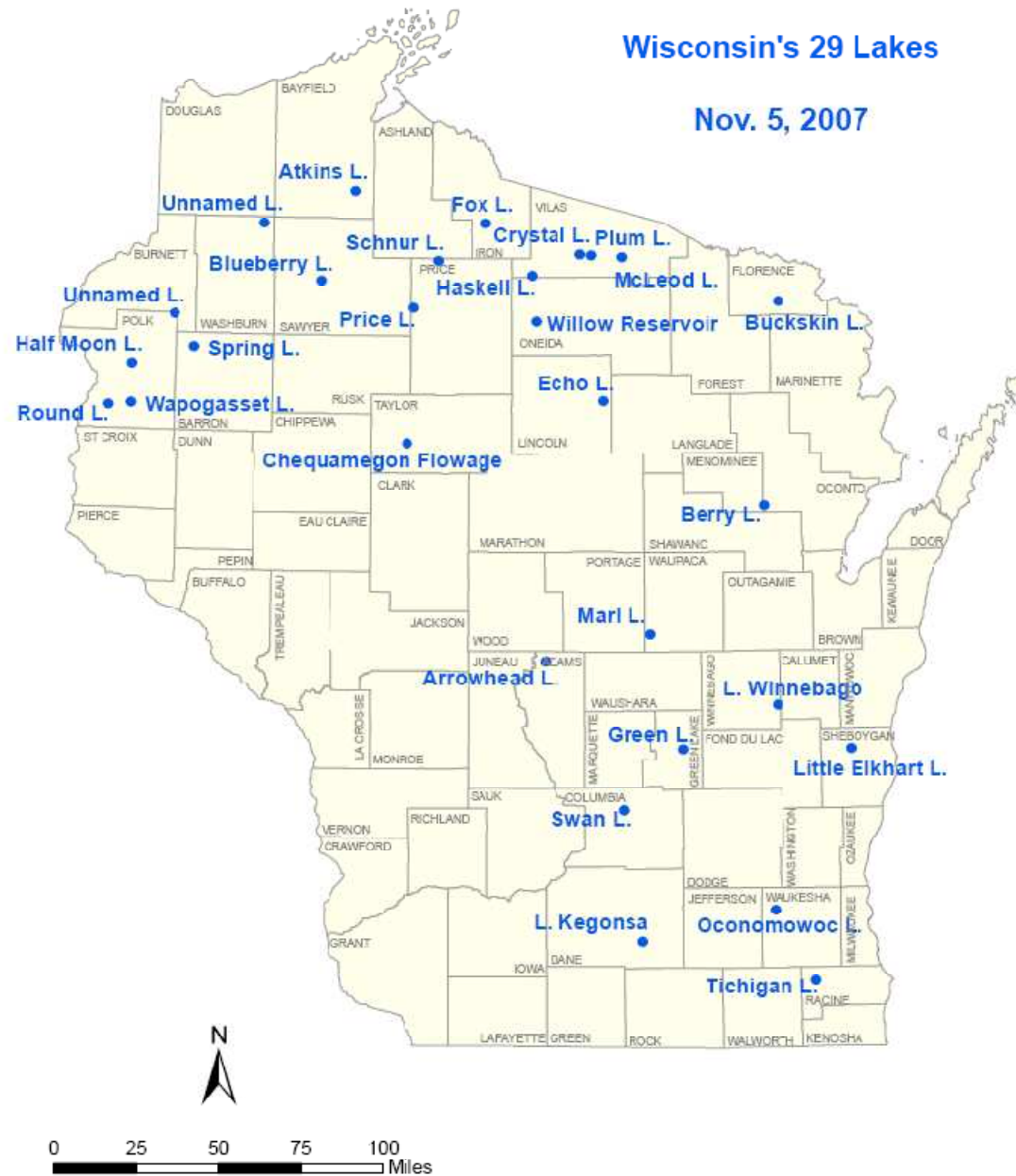
---

- ❑ Tie into existing WDNR Lakes Monitoring
- ❑ Reference point for citizen monitoring and satellite TSI
- ❑ Build up database for statewide lake assessment (reference conditions)
- ❑ Test habitat assessment protocols
- ❑ Addition of PI plant survey and reference lake sampling
- ❑ Create awareness and build partnerships

## USEPA National Lake Assessment:

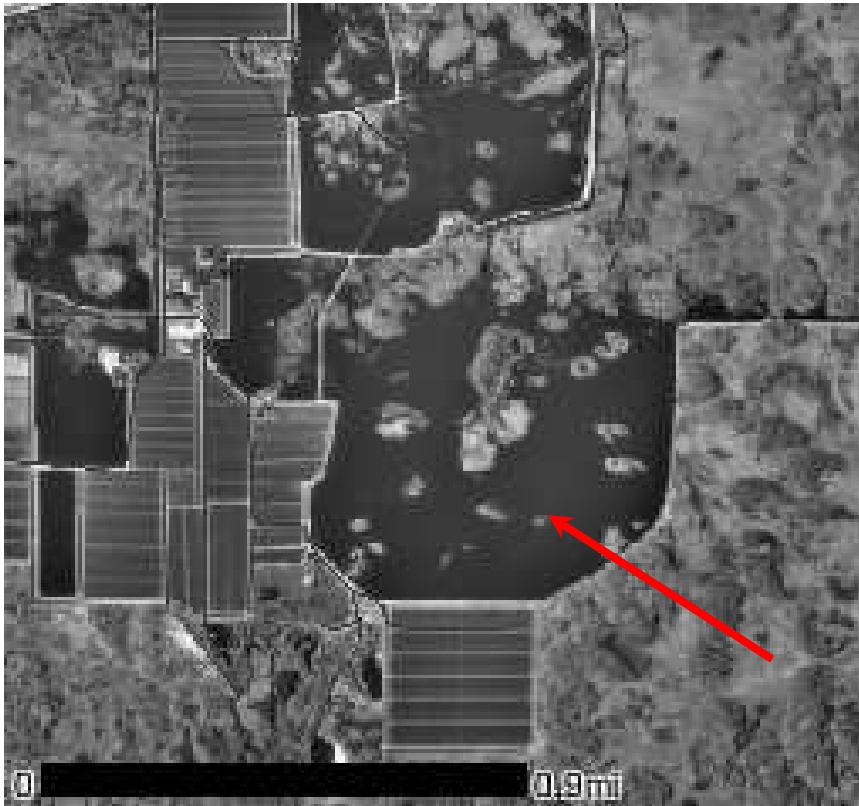
### Wisconsin's 29 Lakes

Nov. 5, 2007

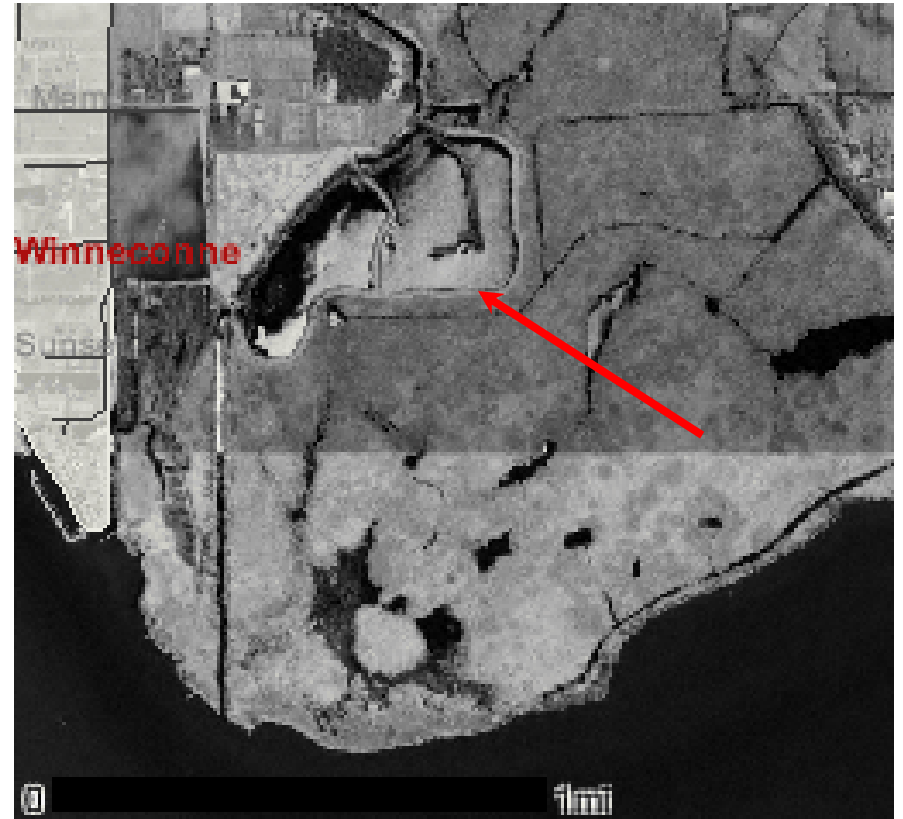


# WI Site “Recon”

## Rejects



Cranberry Bog



Dugout for waterfowl production

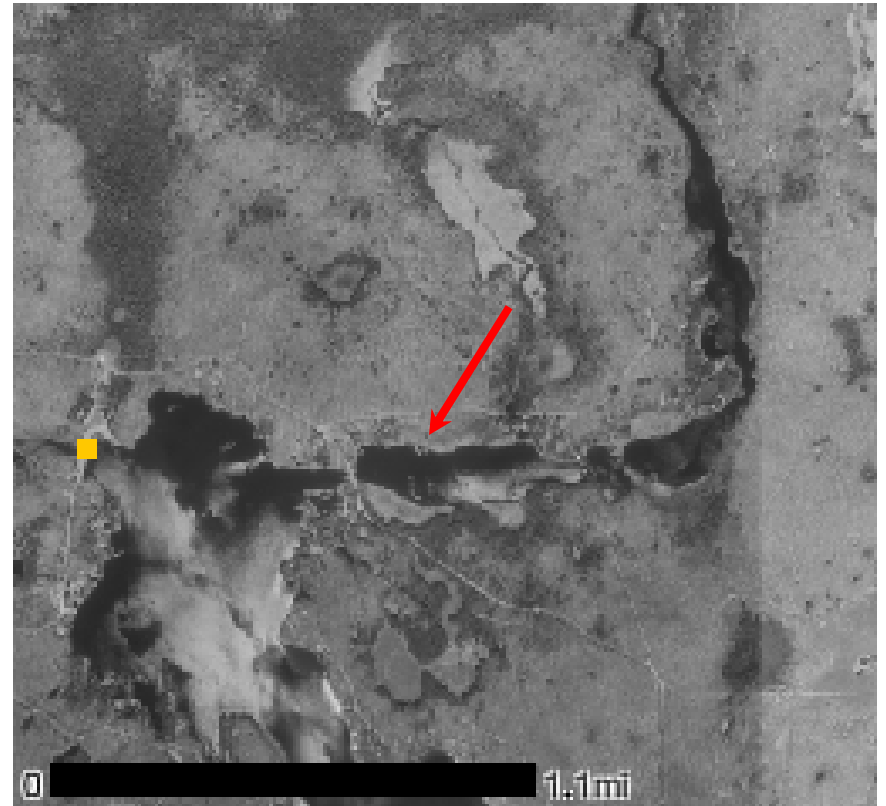
# WI Site “Recon”

Lake or wetland?



Unnamed waterbody in Polk Co.

Lake or river?



West Fork of Chippewa River



# Wisconsin's Approach

---

- ❑ USGS conducted the pelagic (index station) sampling.
- ❑ WDNR conducted the littoral habitat assessment, and collected benthic and pathogen samples.
- ❑ EPA and tribes also surveyed 8 additional lakes
- ❑ DNR Science Services analyzed sediment core (top and bottom, dating and diatoms) and zooplankton samples.
- ❑ State Laboratory of Hygiene analyzed some water chemistry and all phytoplankton samples.
- ❑ Full water chemistry, algal toxins, pathogens, and benthic invertebrates sent to centralized laboratories.

# Wisconsin Add-ons

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- Point intercept (PI) aquatic plant survey on NLA lakes, as well as reference lakes
- Additional info on shoreline habitat and human influence
- Sediment cores and water quality from additional 30+ lakes
- Mercury (Hg) sample from water column

# Aquatic Plant Surveys

- Point-intercept method (Hauxwell *et al.*, 2010)
- Species list and distributions for each lake
- Density rating for each species (1,2,3)

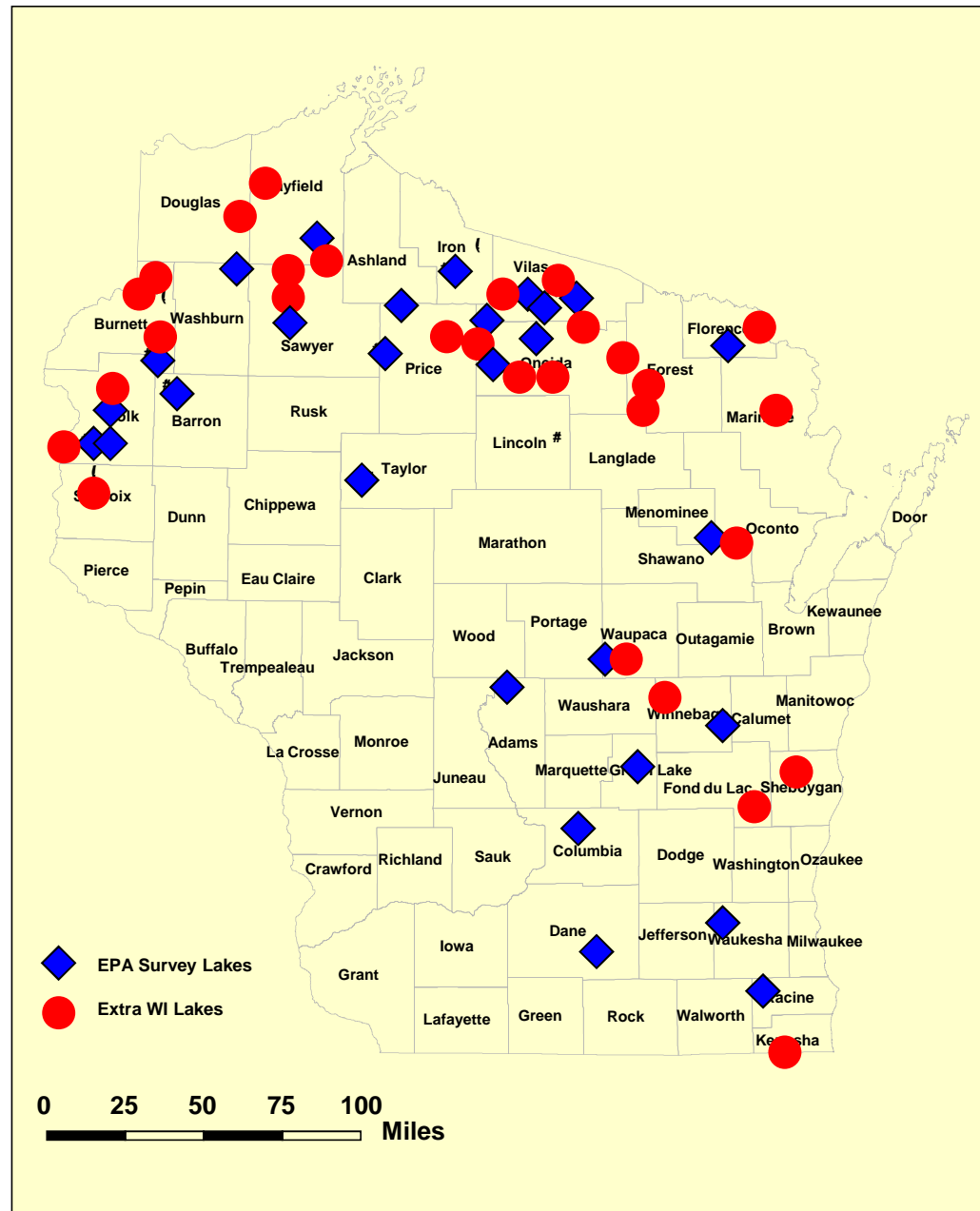


Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.



# Add-on Lakes

- Sediment Cores
- Water Quality
- Selected lakes in “under-represented” lake classes

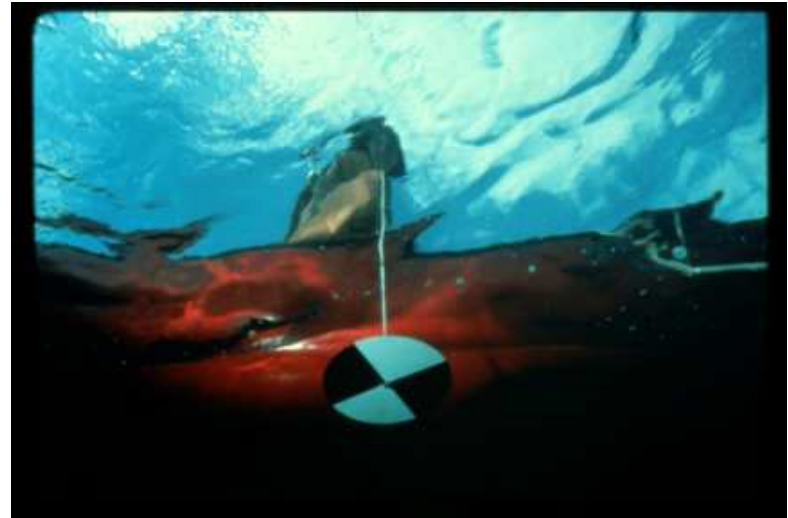




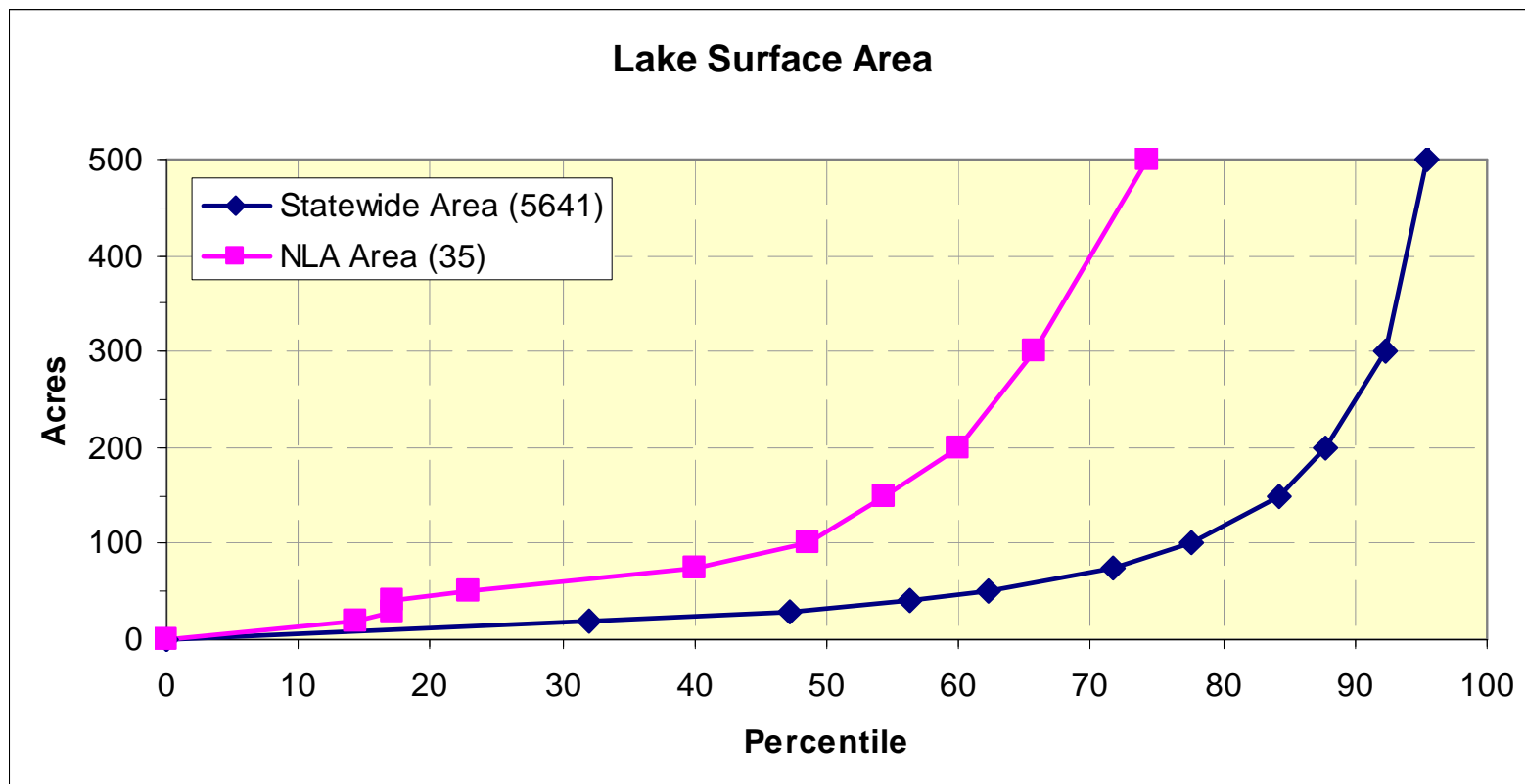
# WI Findings

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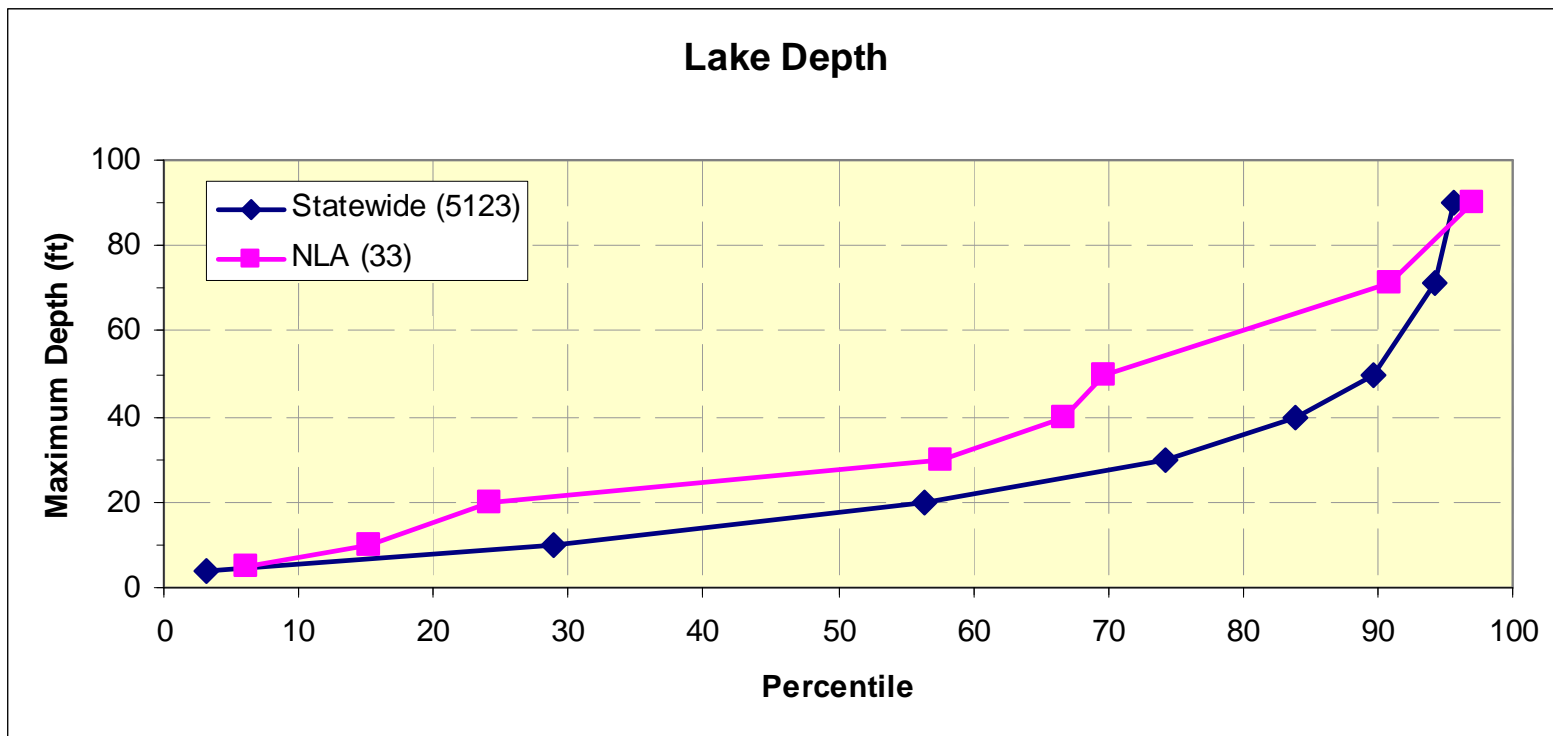
- Lake size and depth
- Water clarity
- Trophic Status
- Algal toxins (microcystin)
- Sediment cores
- Shoreland habitat and development
- Plant data



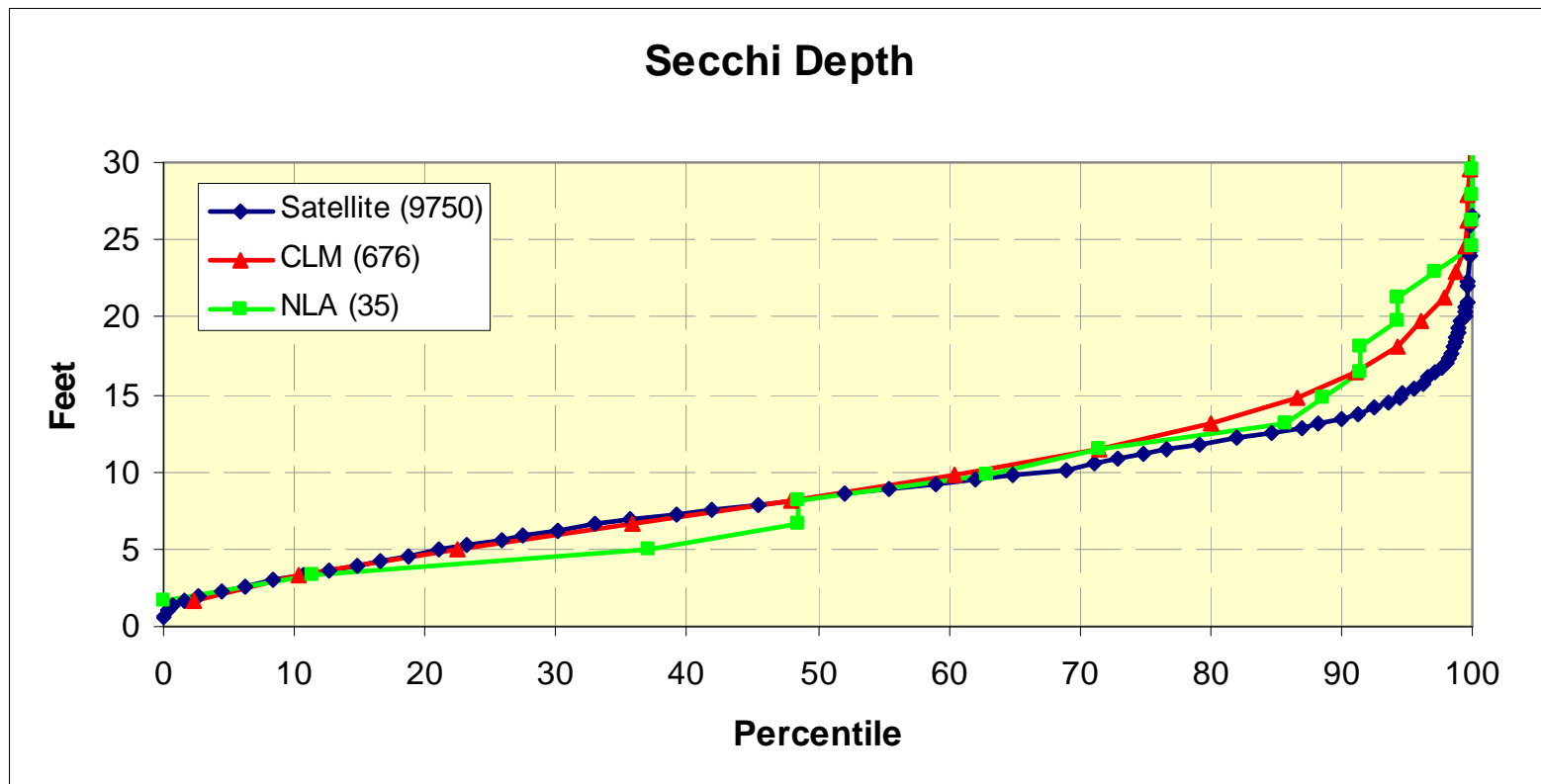
# LAKE AREA FREQUENCY DISTRIBUTION



# LAKE DEPTH FREQUENCY DISTRIBUTION

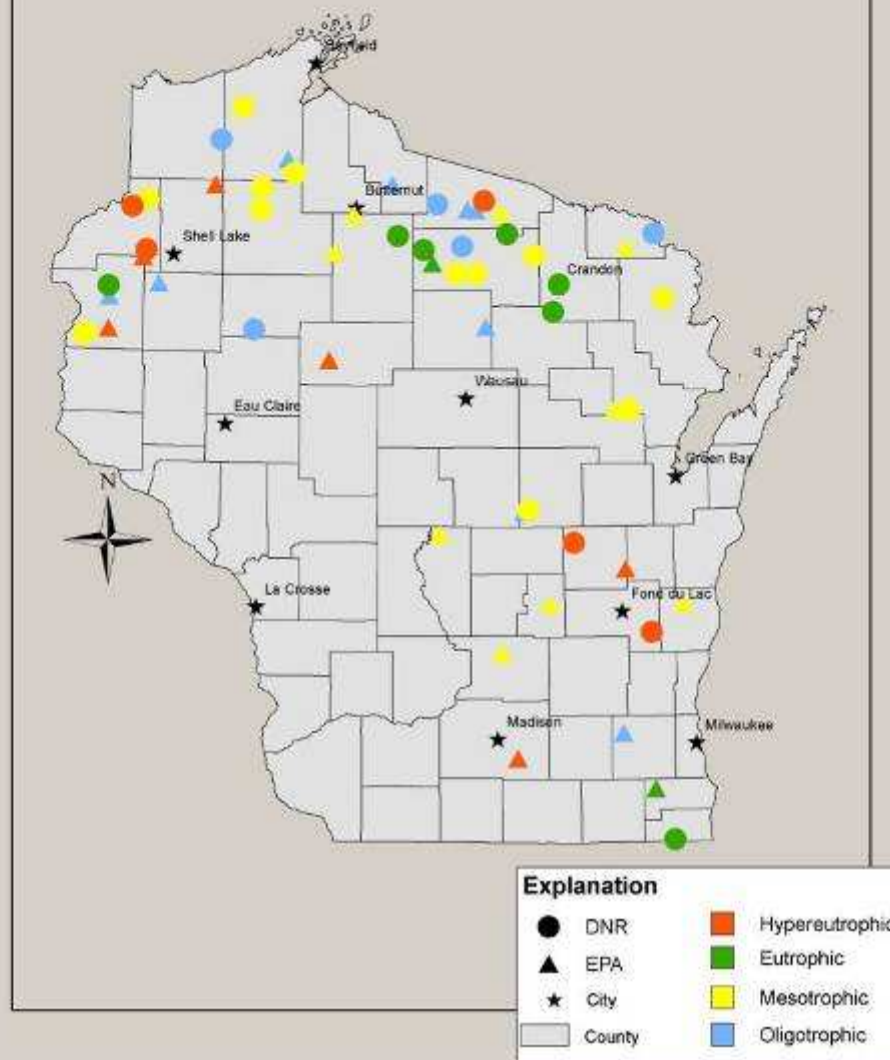


# SECCHI DEPTH FREQUENCY DISTRIBUTION





## Distribution of Total Phosphorus Classifications



# Algal toxins (Microcystin LR)

- 16 of 35 samples had detectable levels
- 15 of 33 lakes
- Highest concentration was 4.5 ug/L (well below WHO guideline for risk)
- Caution: Samples collected in the middle of the lake!



# Shoreline Habitat Assessment

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*Courtesy of Bob Korth*

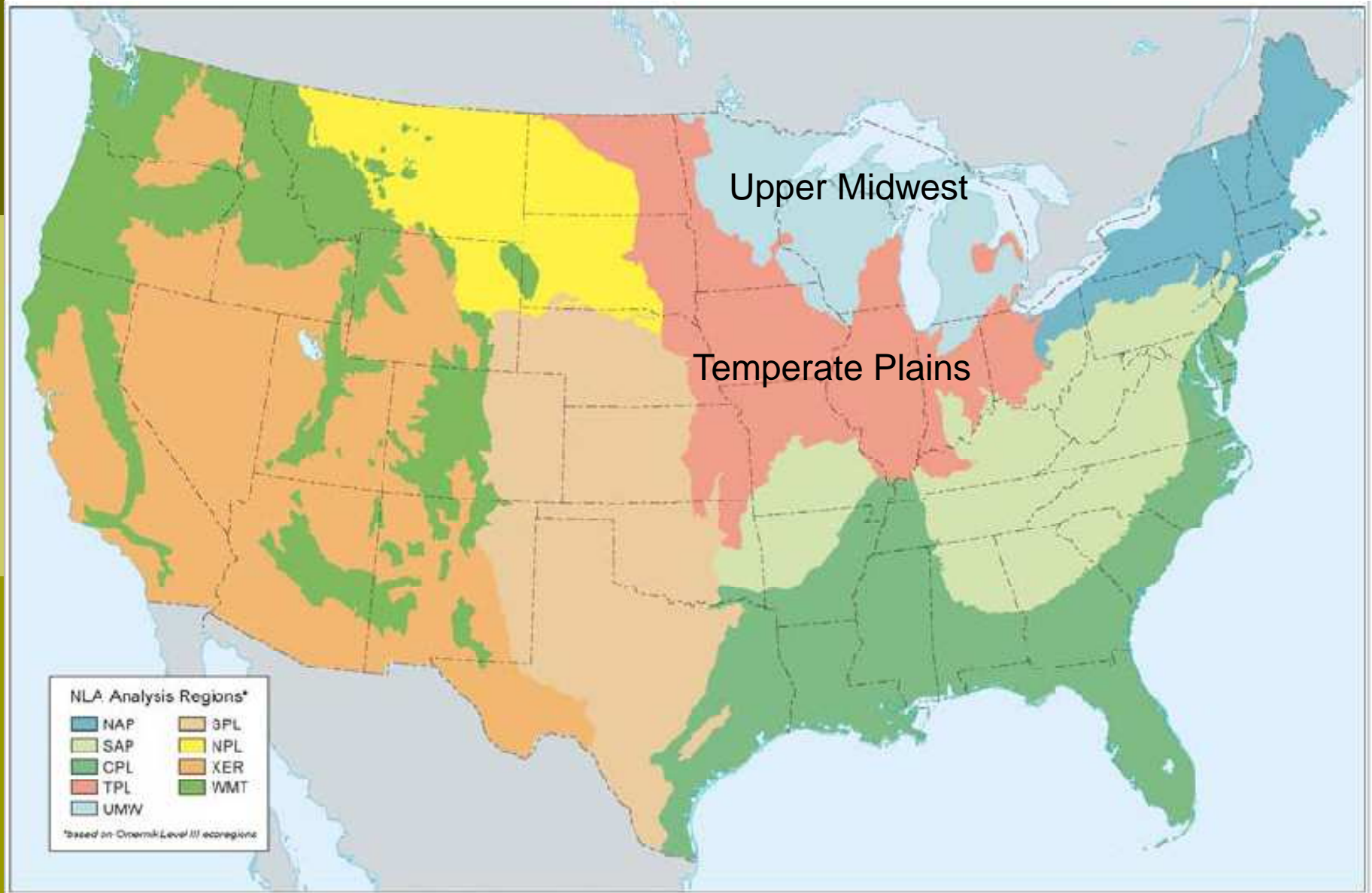
# Physical Habitat Protocol

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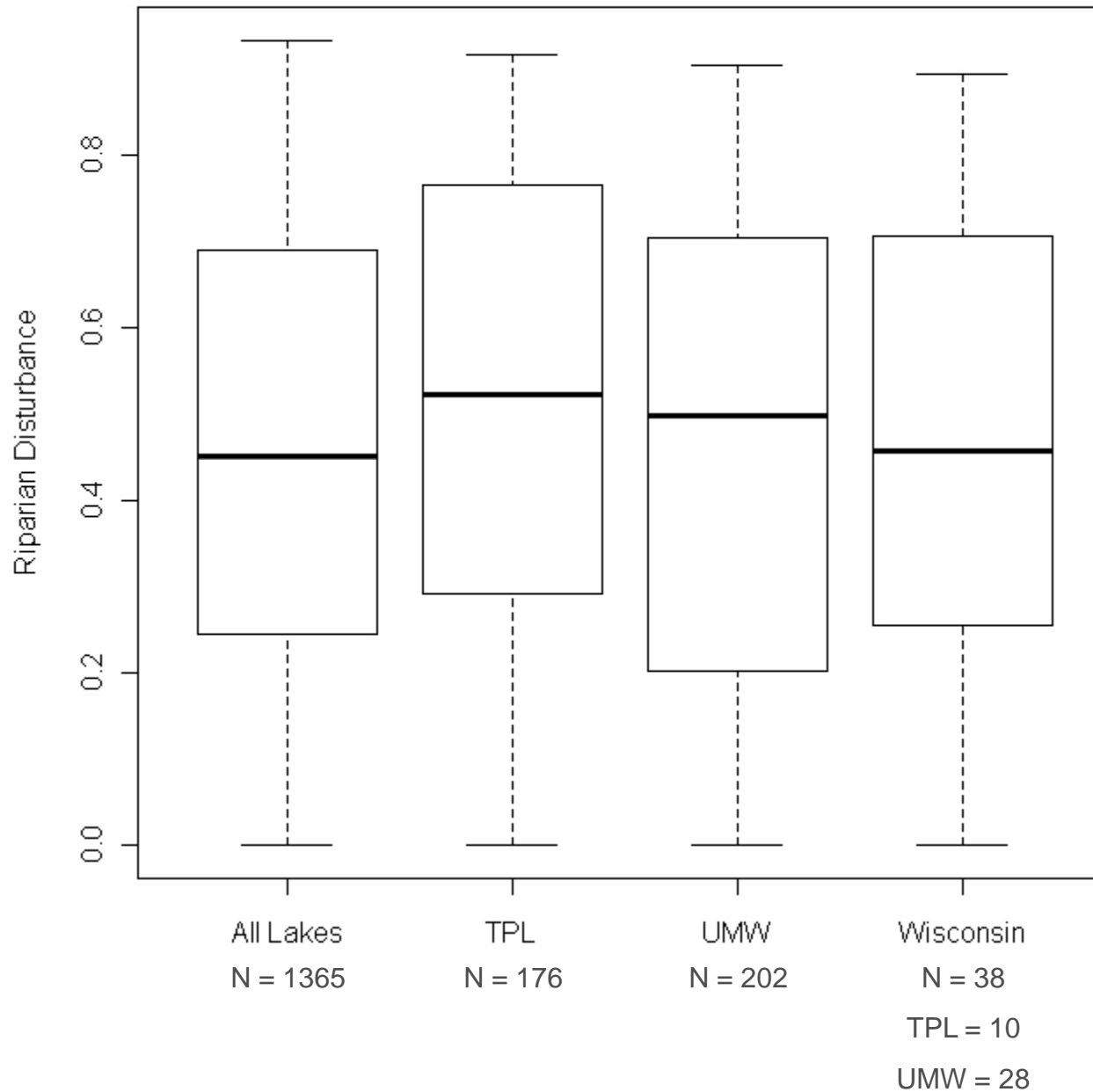
- ❑ 55 individual habitat metrics captured at each site (550/lake).
- ❑ Metrics reduced to four indices of habitat quality:
  - Human Disturbance on Lakeshores
  - Riparian Zone Integrity
  - Littoral Zone Integrity
  - Complexity of Riparian/Littoral Interface
- ❑ Disturbance index scores assessed against nationally consistent thresholds
- ❑ Riparian/littoral indices assessed against regionally-explicit reference conditions (*corrects for expected regional differences*)



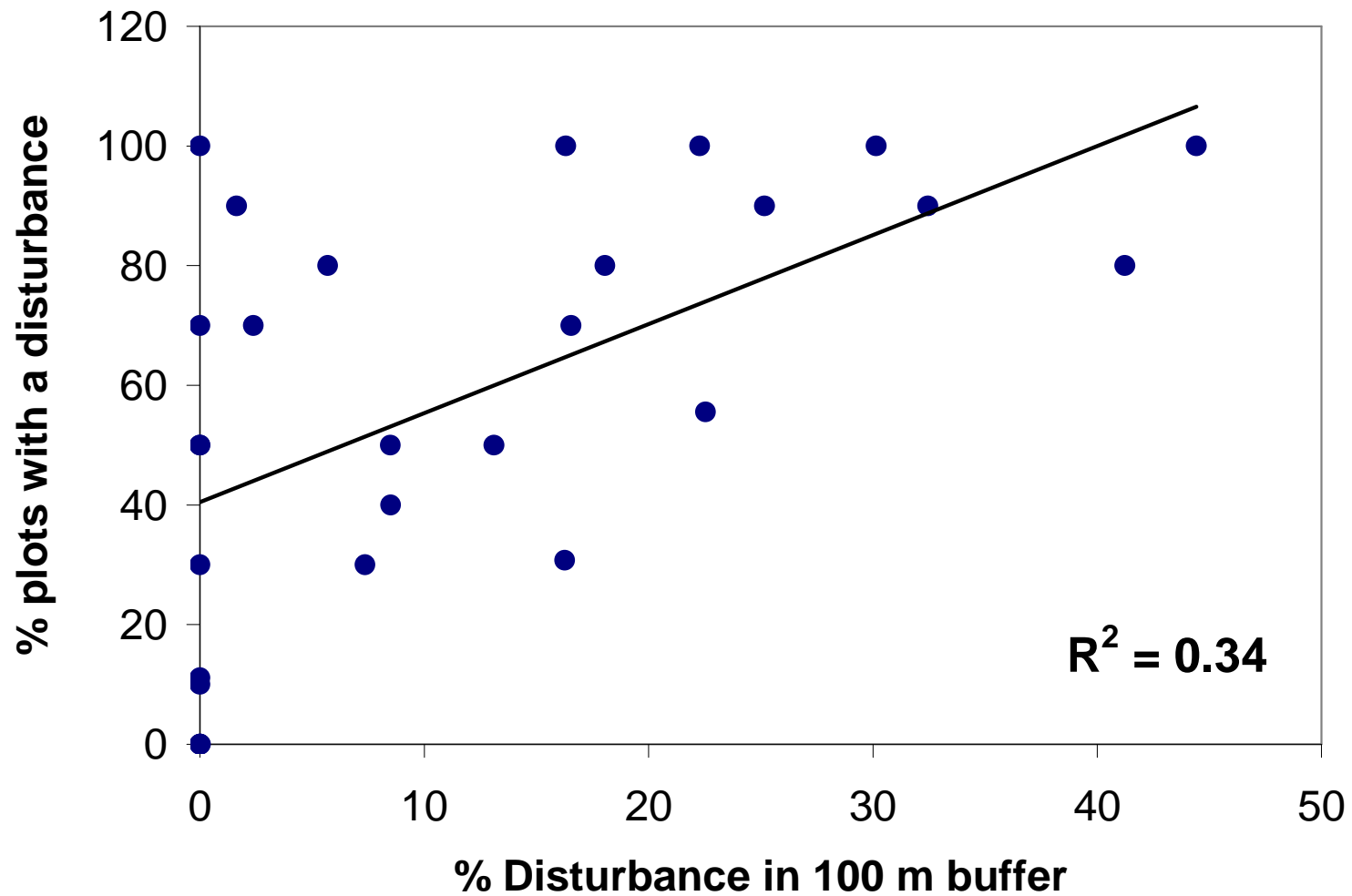
# Two Ecoregions



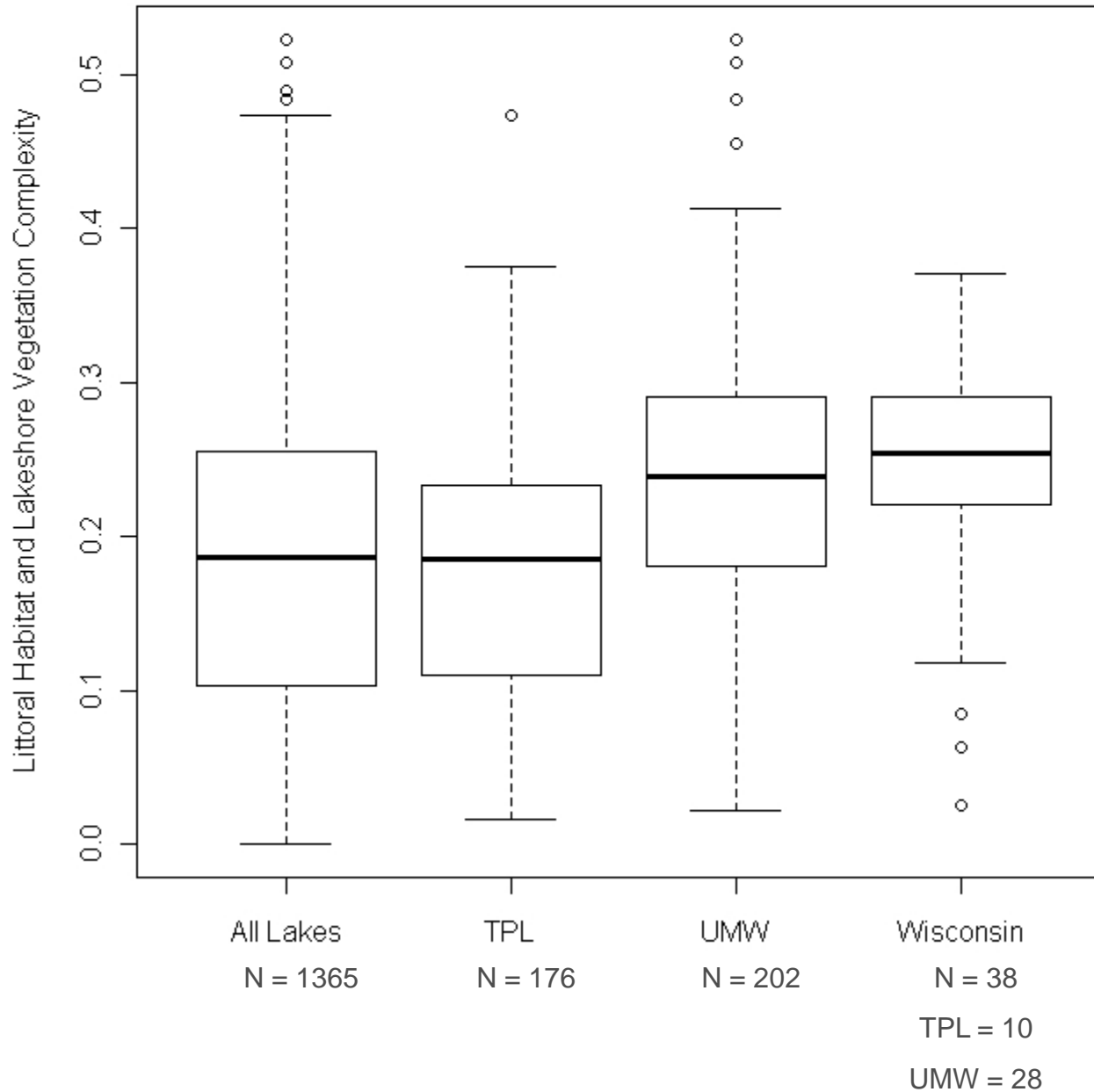
# Shoreline Disturbance



# Measuring disturbance: GIS vs field survey

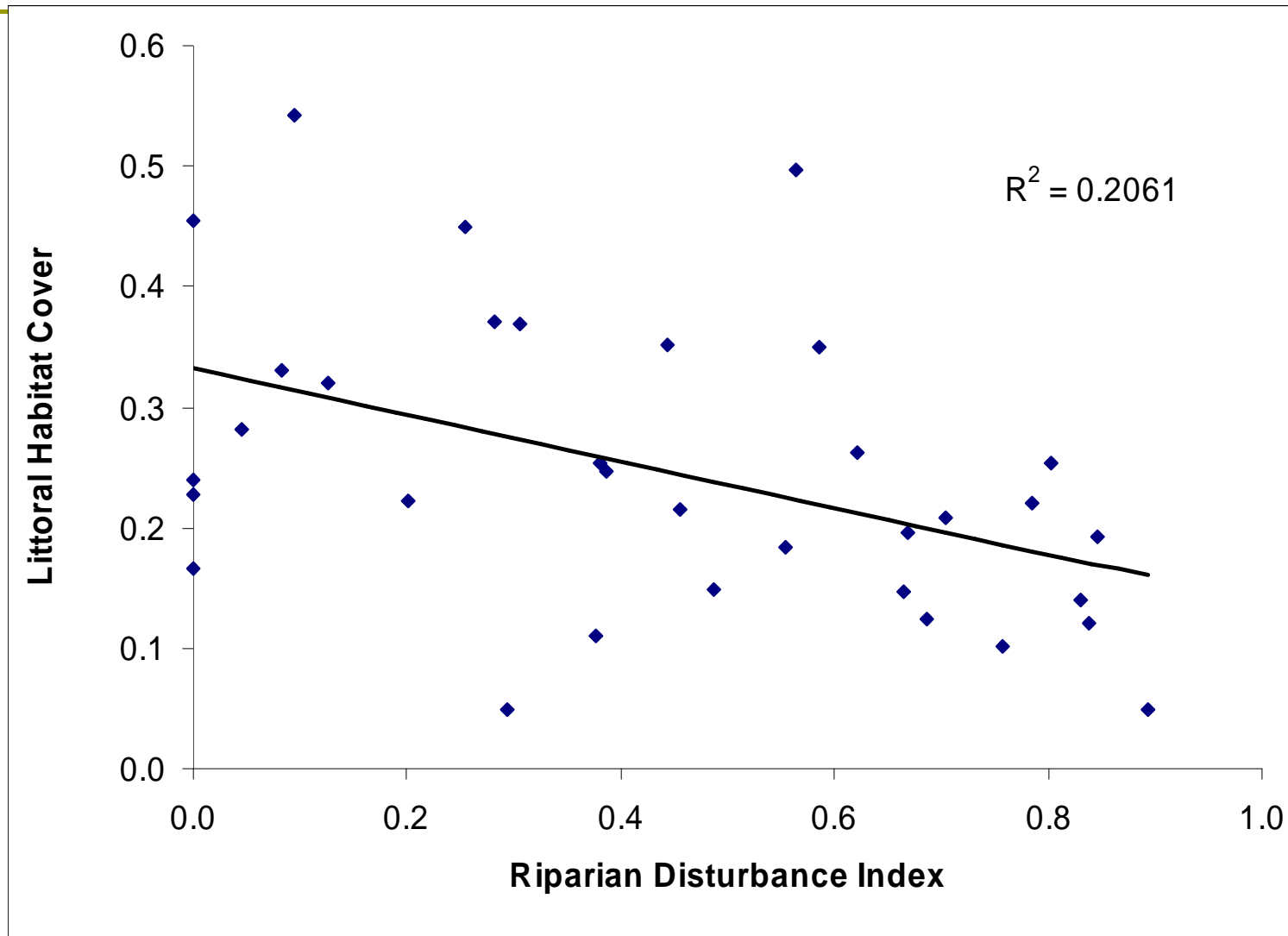


# Shoreland and Shallows

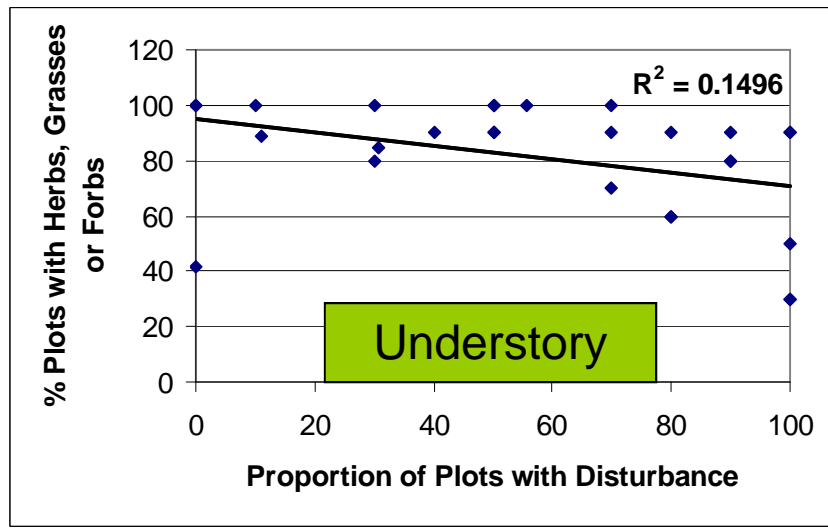
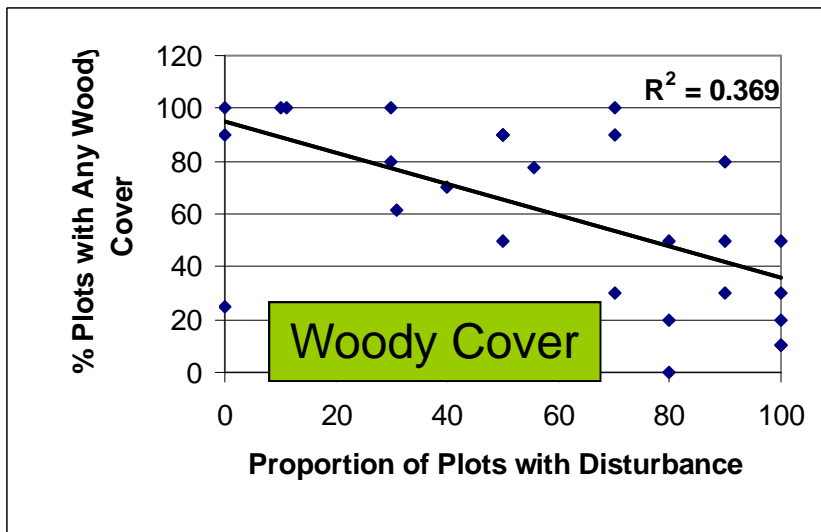
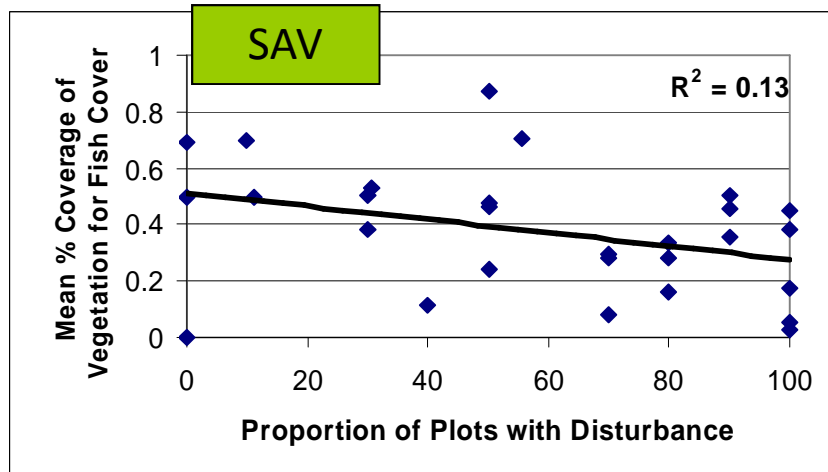
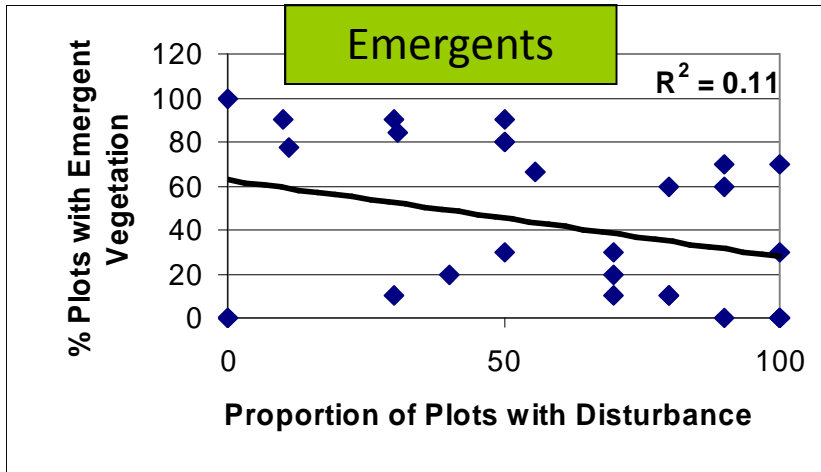




# We affect the shallow water habitat.



# Human Influences on Habitat



Proportion of Habitat Plots with Disturbance (%)

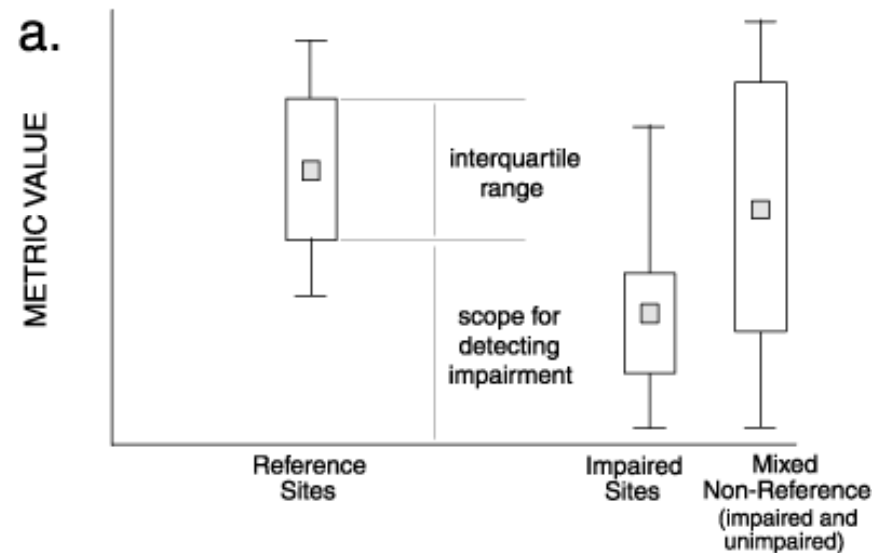
# Drought in northern Wisconsin

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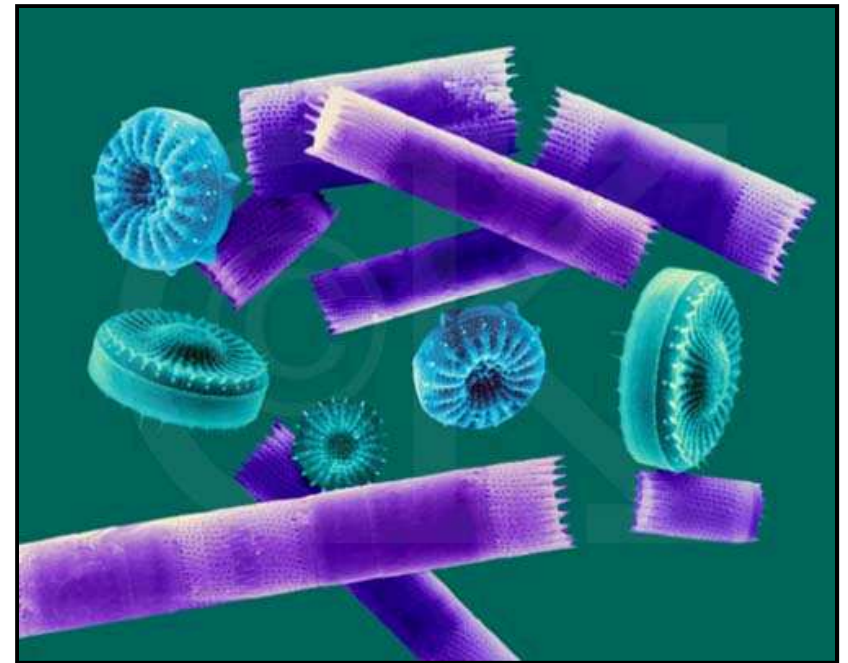


# Statewide Lake Assessment

- Reference TSI conditions for WI lakes (sediment core dataset)
- Reference lakes for aquatic plants and development of impairment metrics
- Methodologies for statewide AIS monitoring

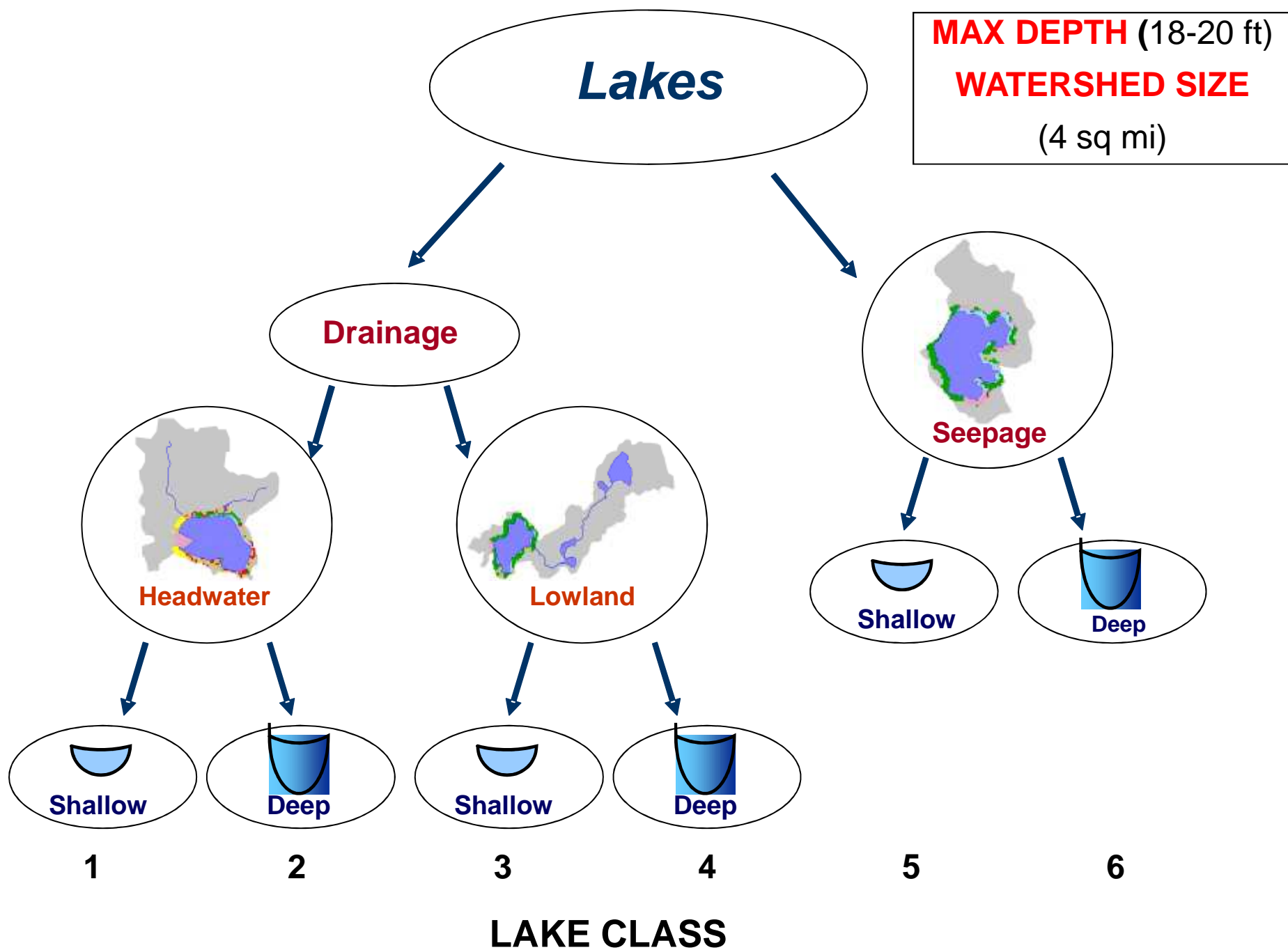


# REFERENCE CONDITIONS



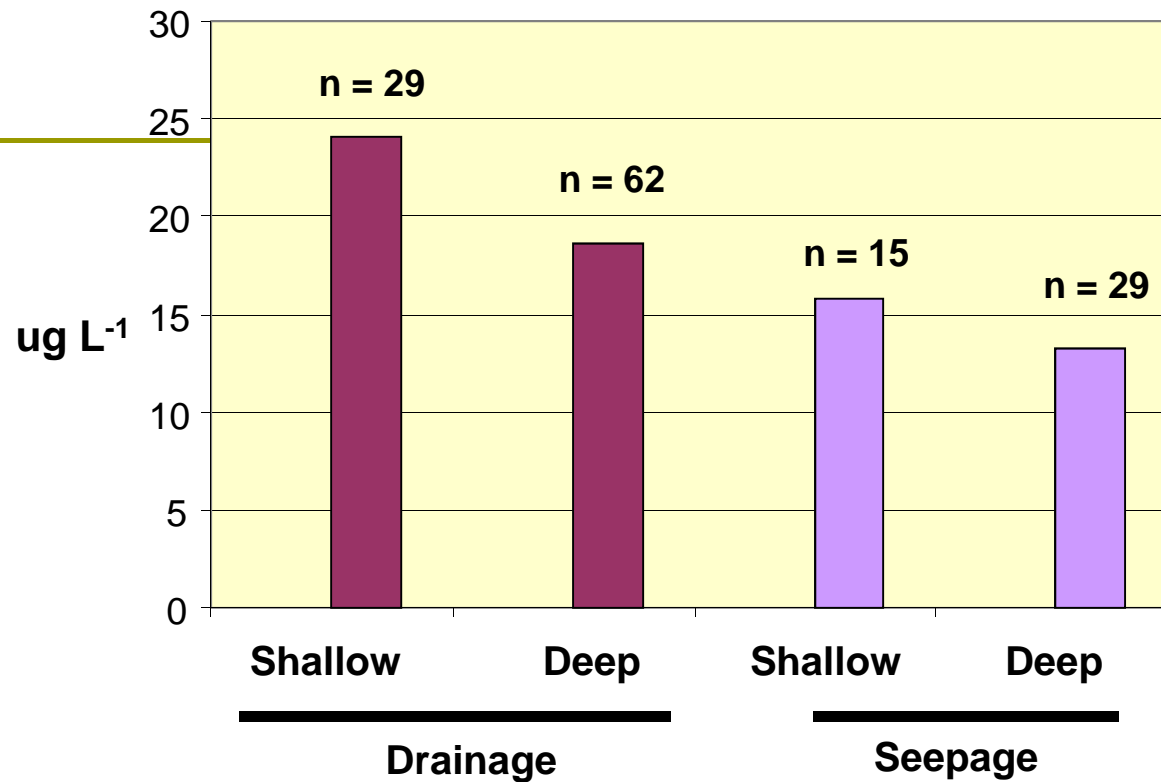
- Used NLA draw to choose add'l lakes
- Top and bottom sediment cores
- Diatom analysis and water quality







## Reference Conditions: Summer Phosphorus

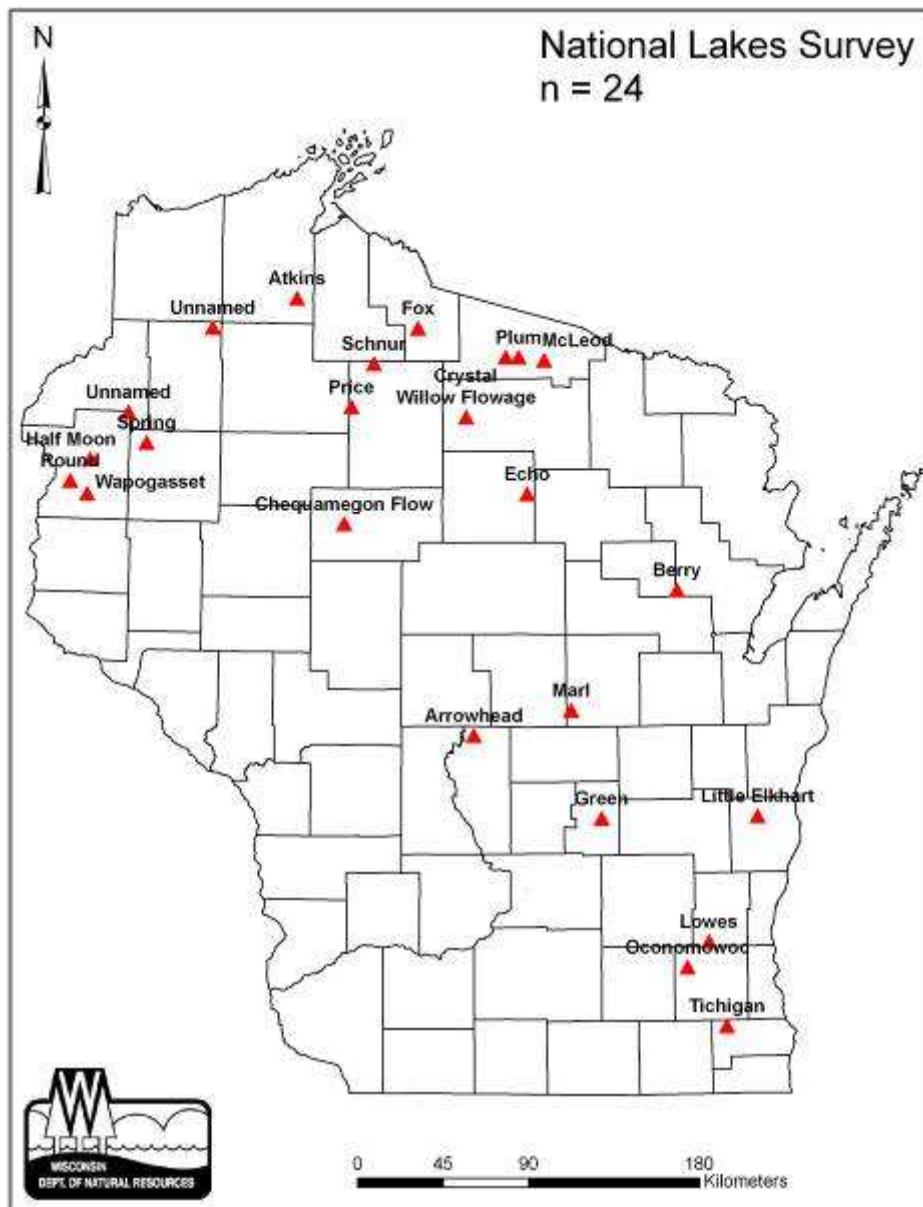


CLASS	Phosphorus (ug/L)
<i>Drainage Lakes</i>	
1,3 (Shallow)	24
2,4 (Deep)	19
<i>Seepage Lakes</i>	
5 (Shallow)	16
6 (Deep)	13

# TSI Thresholds By Natural Lake Community

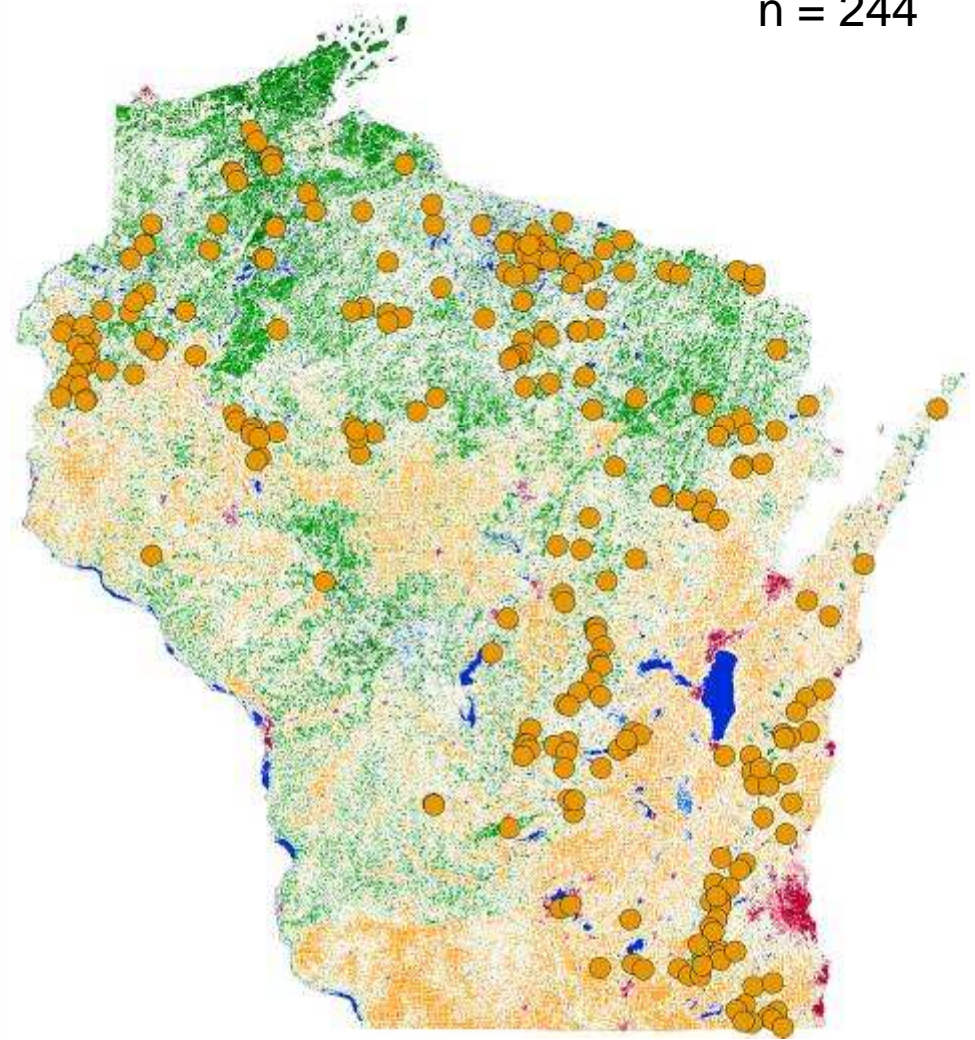
Condition Level	Shallow			Deep			
	Headwater	Lowland	Seepage	Headwater	Lowland	Seepage	Two-Story
<i>Excellent</i>	< 45	< 49	< 39	< 47	< 46	< 44	< 44
<i>Good</i>	45 – 57	49 – 59	39 – 54	47 – 54	46 – 53	44 – 52	44 – 47
<i>Fair</i>	58 – 70	60 – 70	55 – 70	55 – 62	54 – 62	53 – 62	48 – 52
<i>Poor</i>	≥ 71	≥ 71	≥ 71	≥ 63	≥ 63	≥ 63	≥ 53

# Lakes Surveyed for Aquatic Plants



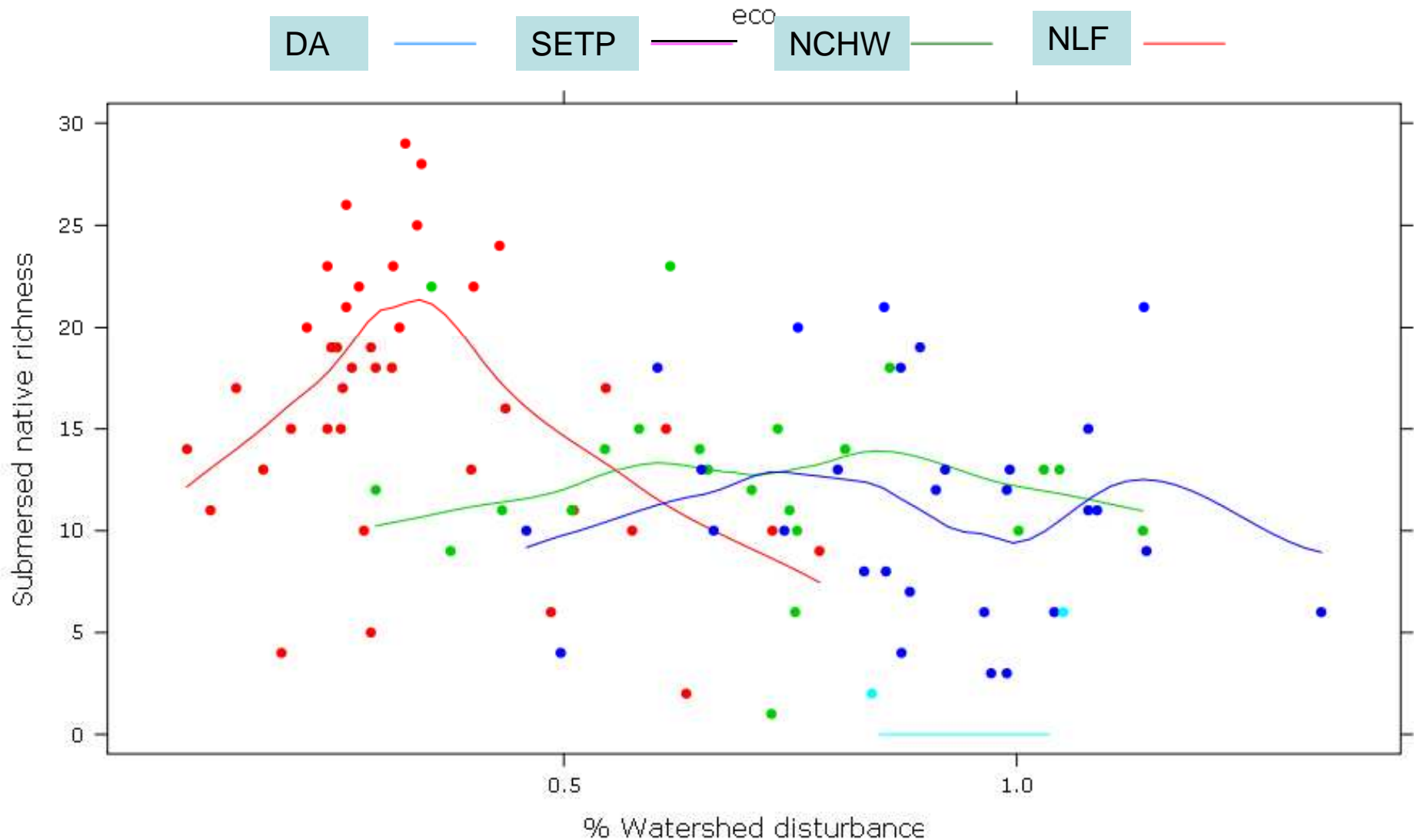
Statewide Lake Surveys

n = 244

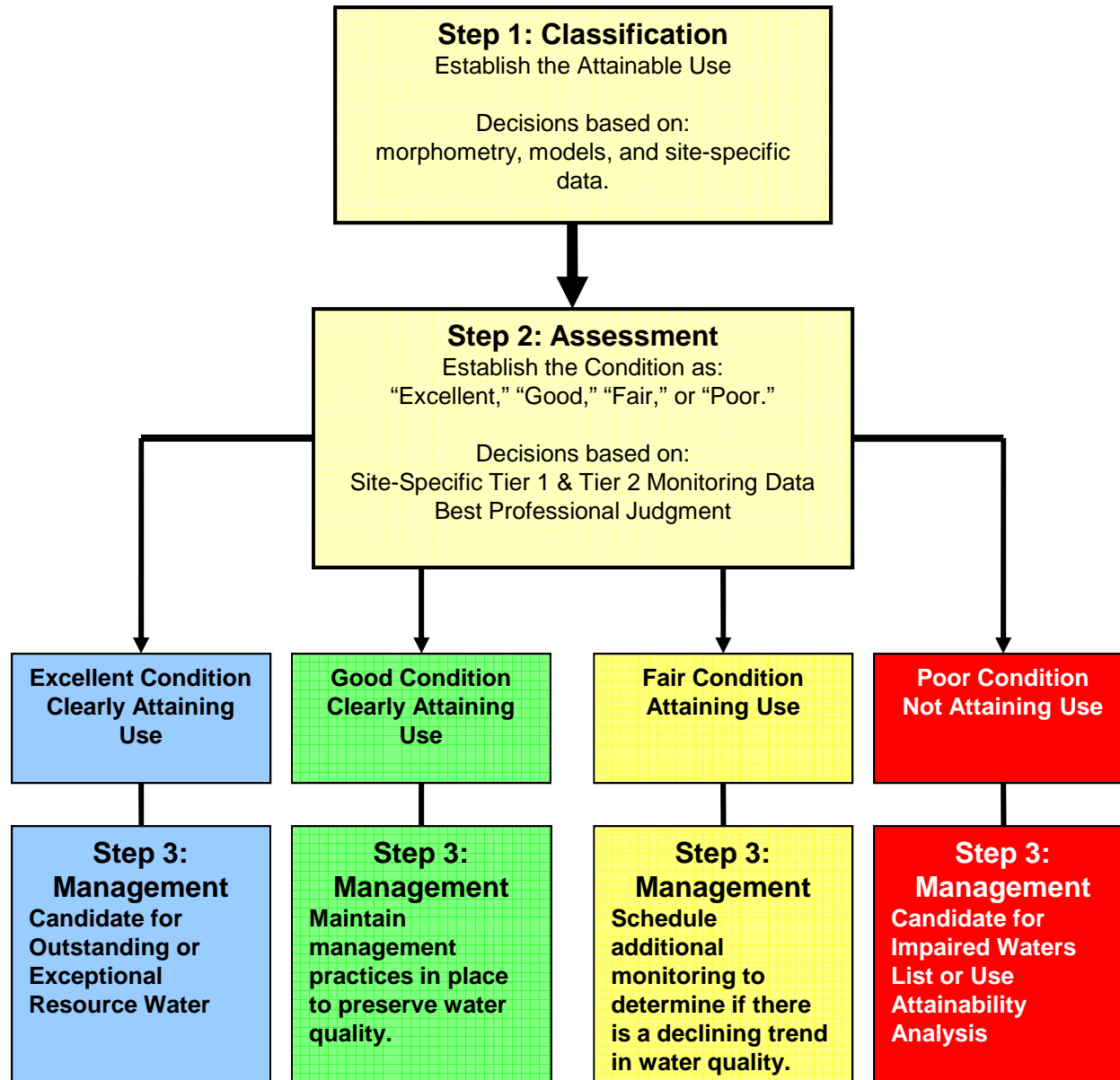


# Reference conditions for plants?

## Submersed native richness versus watershed disturbance



# Process Diagram for Assessment of Lakes, Rivers, and Streams





# Partnerships

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- ❑ Berry Lake – leveraged lake planning grants and heightened awareness of water quality changes and AIS in community
- ❑ Price Lake – baseline information and educational opportunity for lake residents
- ❑ Tribal lakes – shared information and analytical resources, better working relationships



# Berry Lake, Wisconsin

An online community resource serving the Berry Lake area

[Home](#)  
[Newsletter](#)  
[Calendar of Events](#)  
[Berry Lake Photos](#)  
[BLPO](#)  
[Marketplace](#)  
[BL Blog](#)  
[Visit Creators](#)



PO BOX 492 GILLET, WI 54124

[berrylakewi@gmail.com](mailto:berrylakewi@gmail.com)

updated 03-27-10

## ICE OFF 2010 - MARCH 26TH!

No one guessed March 26th for ICE OFF, however 2 Berrylakers guessed 25th which is the next closest date. Congratulations to the Swans Jill DePrey for coming the closest to this year's ICE OFF date of March 26th (prizes yet to be determined).

<http://dnr.wi.gov/lakes/nls>[Home](#) | [About](#) | [Topics](#) | [Contact Us](#)

## Wisconsin Lakes

## National Lake Survey

## Survey Overview

## What was measured?

## How were data analyzed?

## Survey Results

National Survey  
Draft Report

Individual Wisconsin Lake  
Results

Wisconsin Summary  
Results

Upper Midwest Ecoregion  
Results

## Articles about the National Lake Survey

## Contact Us

## 2007 National Lake Survey - Wisconsin Results

In the summer of 2007, Wisconsin's lakes got a checkup as part of a national study to assess the percentage of lakes in good, fair, or poor condition. The EPA-sponsored 2007 National Lake Survey examined ecological, water quality, and recreational indicators for lakes across the country. This site explains the purpose of the survey and what researchers in Wisconsin measured. You can also view the data for each visited lake as they become available.

### **National Survey Draft Report. New!**

[What was the Survey's purpose?](#)

[How were lakes picked?](#)

[Which Wisconsin lakes were visited?](#)

[What did researchers measure?](#)

[What additional work did we do here in Wisconsin?](#)

[What's next?](#)

### **What was the Survey's Purpose?**

The purpose of the Survey was to assess the percentage of lakes throughout the country in good, fair, or poor condition with regard to ecological integrity, and recreational value. Researchers also looked at the relative importance of key stressors such as nutrients, lakeshore development, and pathogens on lake conditions.

An additional goal was to establish a sound baseline to compare future surveys in lake health over time. Last, the EPA's approach was to encourage state, tribal, and interstate monitoring programs by encouraging more efficient use of resources, expanding accessibility and use of partnerships.

### **How were lakes picked?**