

# Integration of Probabilistic Surveys, Intensive Watershed Designs, and Targeted Sampling for Monitoring and Assessing Surface Waters in Minnesota

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*St. Paul, MN*

*EMAP 2007 Symposium*

*April 10-11<sup>th</sup> 2007*

*Washington, DC*



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# Overview

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- Summarize various approaches used to monitor MN Lakes, Streams, and Wetlands [Condition Monitoring]
- Integration/coordination of the various designs in Minnesota
- Discuss partnership opportunities with National Surveys

# Lake Water Quality Assessment Program

## 10 Year Monitoring Strategy

Area (acres)	#	Monitoring Design
> 500	~800	Census
100 - 500	~4000	Targeted; selection based on Citizen Monitoring, Remote Sensing, and/or Local Interest
< 100	~7000	

high

Priority

low



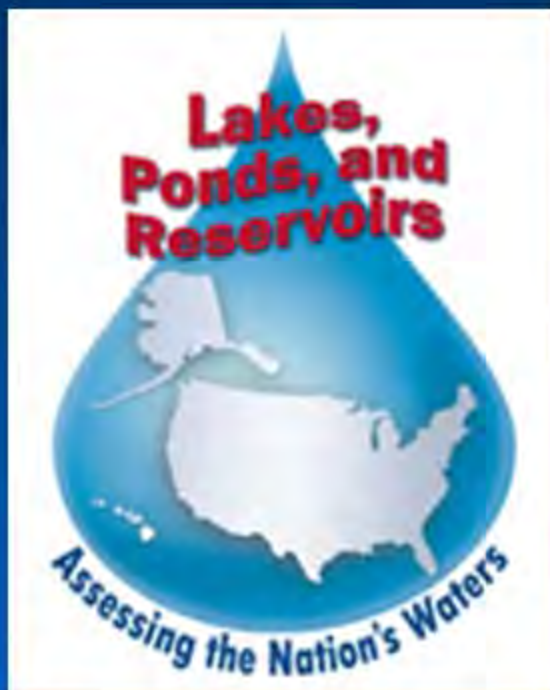
- Monitor ~100 Lakes/Year
- Assess swimmable use (primary contact)
- Indicators: TP, Chl-a, Secchi Depth
- 305(b) report/303(d) list

# Other Lake Assessment Programs

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	<u>Monitoring Design</u>	<u>Indicators</u>	<u>Outcomes</u>
<b>Citizen Lake Monitoring (CLMP)</b>	Fixed-Station	Secchi Depth	Status & Trends (individual lakes)
<b>CLMP+</b>	Fixed-Station	TP, Chl-a, DO, Secchi, Temp	Supplement CLMP dataset
<b>Remote Sensing</b>	Census (lakes > 20 acres)	Water Clarity	Statewide Status & Trends

# National Lakes Assessment Project: MN

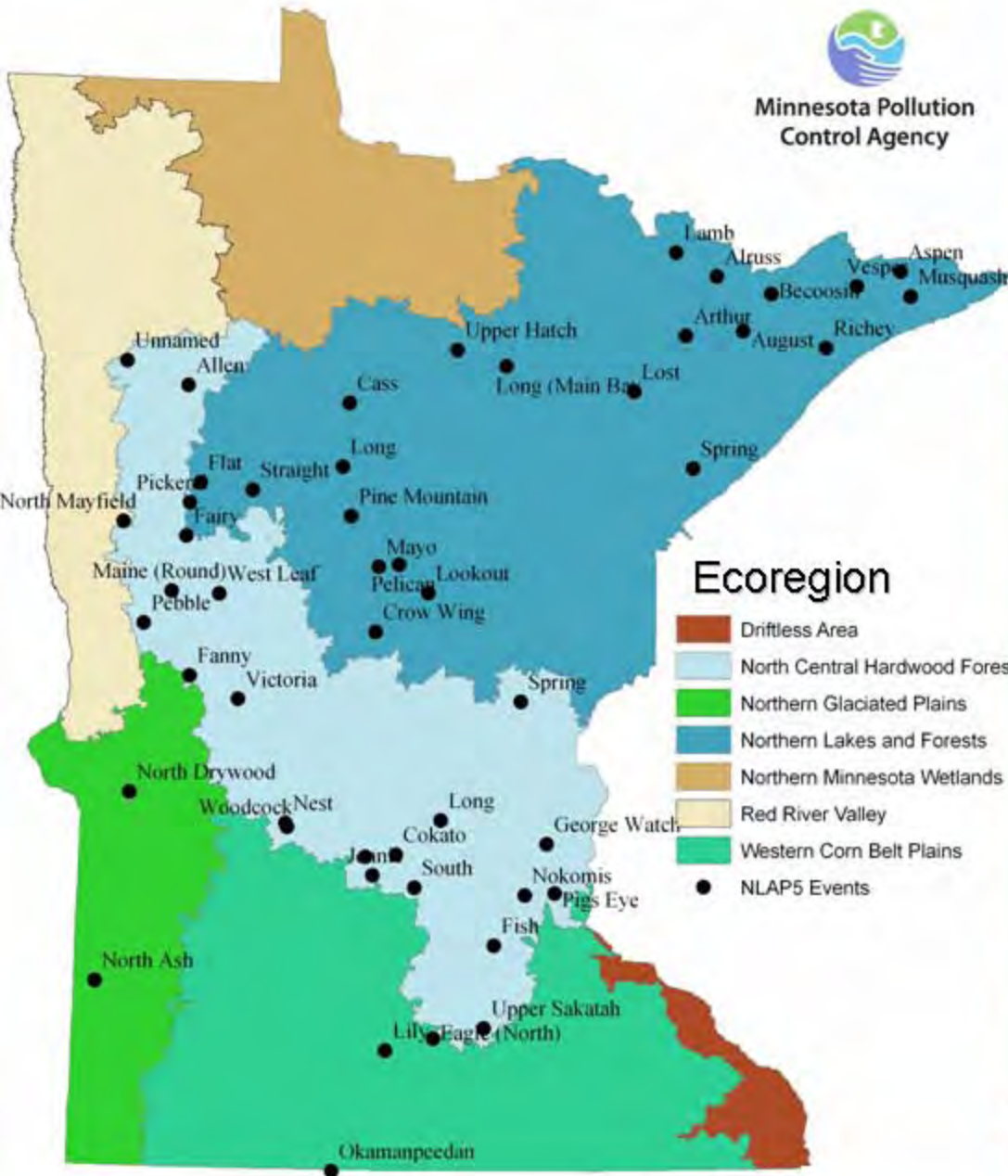


- Probabilistic Survey Design
- Enhance regional/national scale results with additional random sites to support state scale surveys
- Sample collection during summer of 2007 using standardized protocols
- Indicators measured represent biological condition, recreational use, and trophic status
- MN Contributors: Pollution Control Agency, Dept. of Natural Resources, US Forest Service

# National Lake Assessment

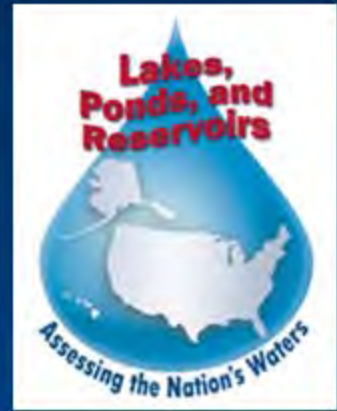


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## Ecoregion

- Driftless Area
- North Central Hardwood Forest
- Northern Glaciated Plains
- Northern Lakes and Forests
- Northern Minnesota Wetlands
- Red River Valley
- Western Corn Belt Plains
- NLAP5 Events



- 41 lakes ranging from 10 to 16,314 acres (Cass Lake)
- Added 9 lakes to gain statewide estimates of condition ( $\pm 10\%$  with 95% confidence)
- Good regional coverage across 4 ecoregions with 98% of MN lakes;

# Stream Biological Monitoring Program

1990 – 1994 - Red and Minnesota Assessments (Fish IBI):  
**Targeted Site Selection**

1996 - Initiated rotating basin assessments (Fish & Invert IBIs): **Probabilistic & Targeted**

2005 - Collected data from all 10 major river basins

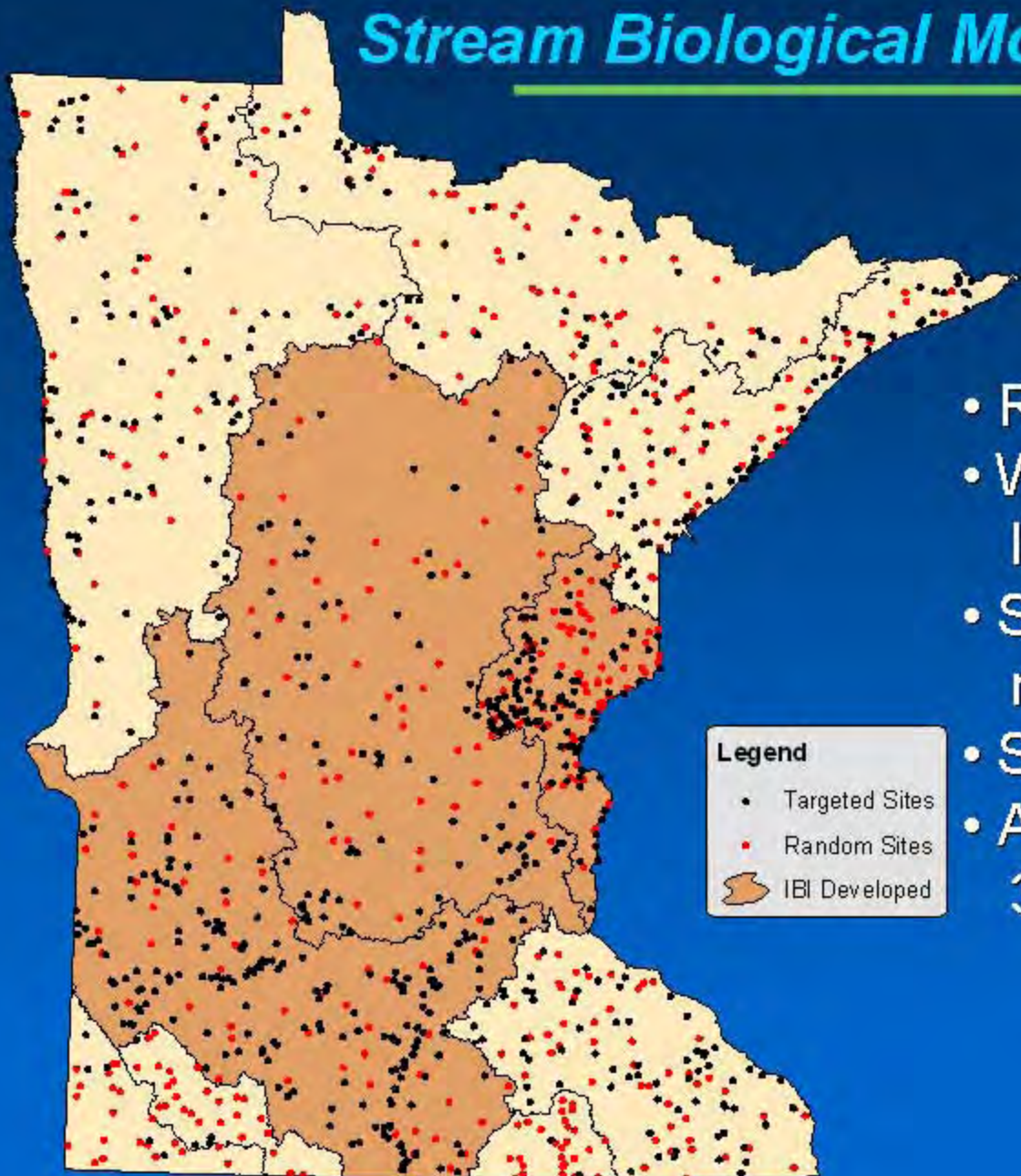
2006 - Repeated probabilistic survey in initial basin (St. Croix)

- Initiated Intensive Watershed design (Snake River): **Targeted/Systematic Site Selection**

2007 - Phase II of Snake R. survey; Initiate Phase I of intensive design in two new watersheds

Future - Continue basin assessments: **Probabilistic**  
- Continue intensive watershed surveys

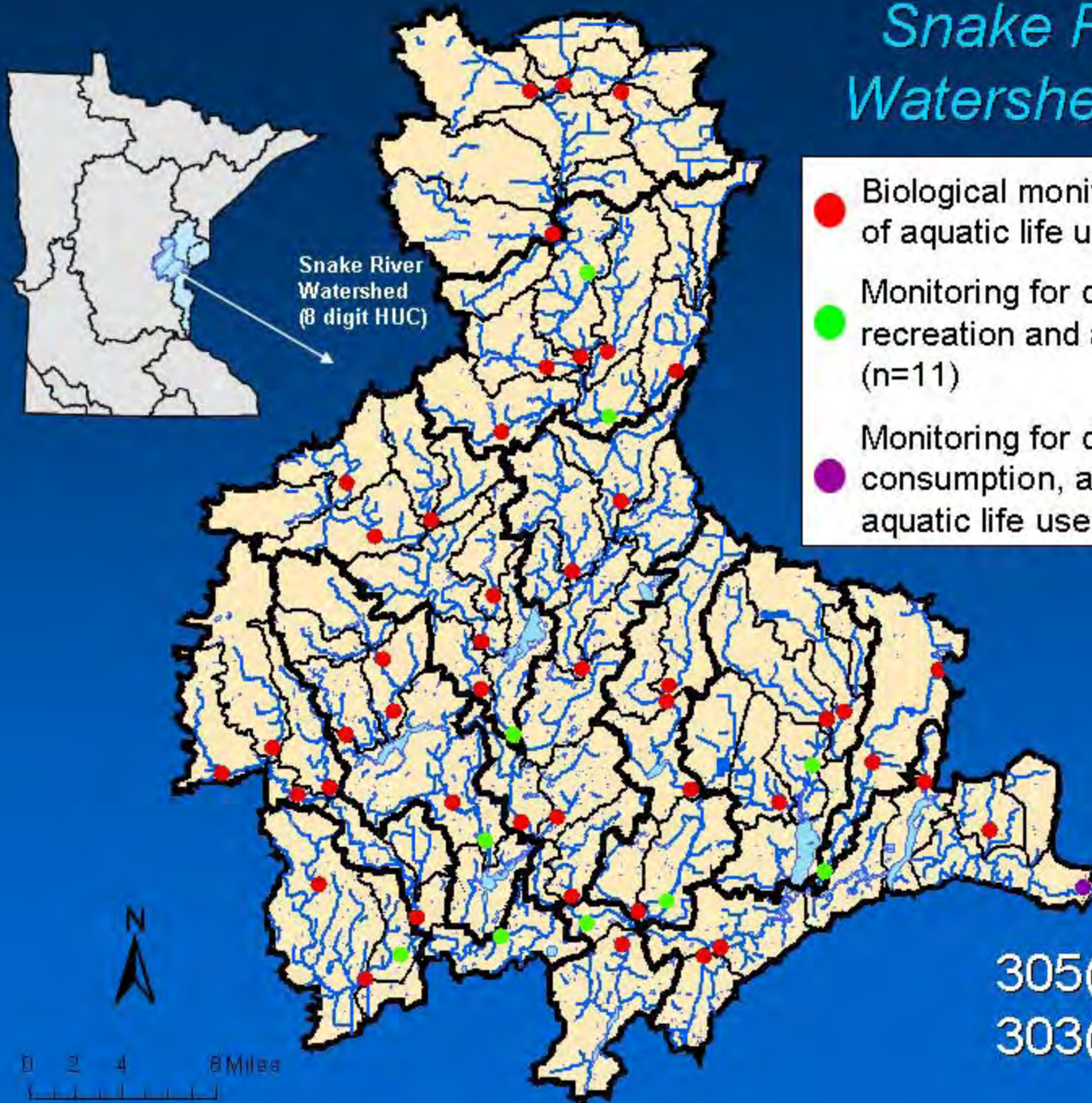
## Stream Biological Monitoring 1990-2006



- Rotating Basin Design
- Wadeable streams and large rivers
- St. Croix and Upper Miss. reports completed
- St. Croix re-sampled 2006
- Assessments used for both 305(b) and 303(d)



# Snake River Intensive Watershed Pilot: Phase I



- Biological monitoring for determination of aquatic life use support (n=58)
- Monitoring for determination of aquatic recreation and aquatic life use support (n=11)
- Monitoring for determination of aquatic consumption, aquatic recreation, and aquatic life use support (n=1)

305(b) Reporting &  
303(d) Listing

# Mission Creek: Phase II

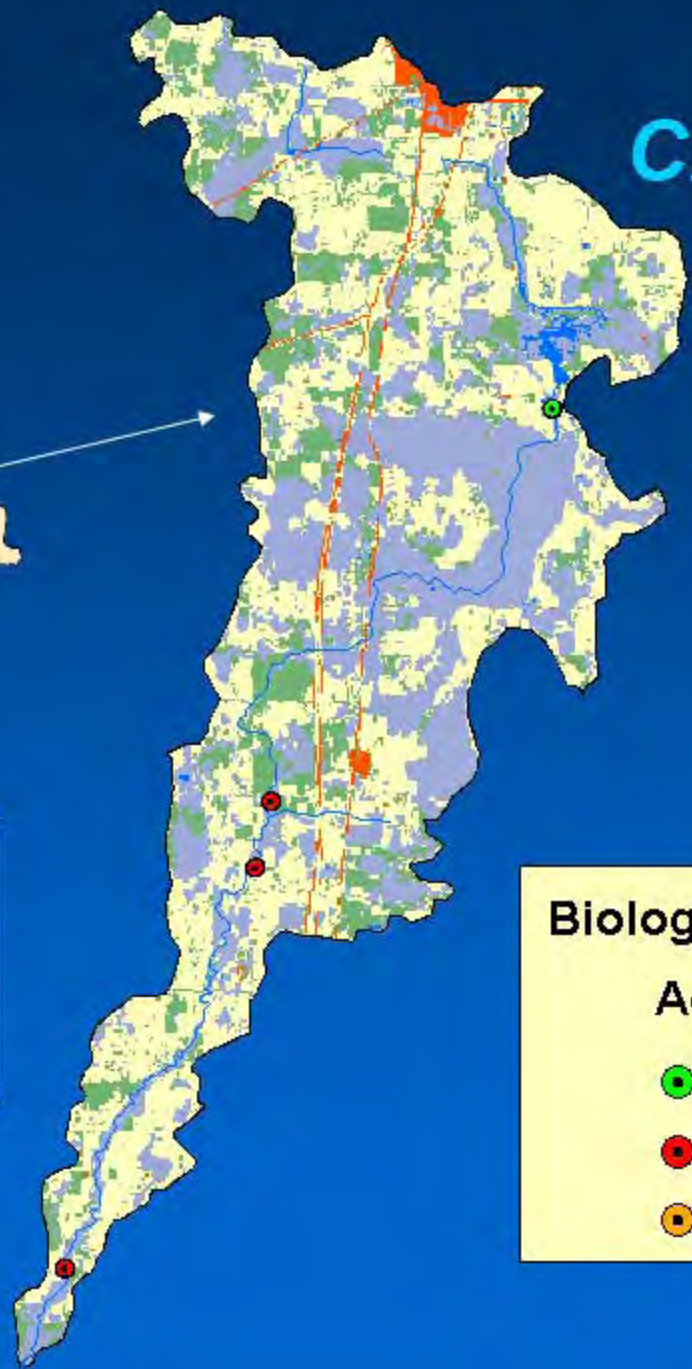


Snake River Watershed  
(8 digit HUC)



**Land Use Type**

- open water
- developed
- barren
- forest
- grassland
- agriculture
- wetland



**Biological Assessment**

**Aquatic Life Use**

- Supporting
- Impaired
- Not Assessed

# National Stream and River Assessments



## MN Participation

- Site reconnaissance
- Methods/Assessment Comparability (Fish & Inverts)
  - WSA vs. MN Methods
- Provided Reference (Least-impacted) sites for ecoregion expectations

## Large & Great Rivers Assessments

- Large River Method Comparison (Fish & Inverts)
- Great River Method Comparison (Fish only) – **planned for 2007**

# Wetland Biological Monitoring Program

1992 – 2006 - Monitoring efforts focused on indicator development: **Targeted Site Selection**

2003 - First wetland probabilistic survey conducted: **Redwood River Watershed**

2007 - Indicators developed statewide for depressional marshes: **Plant and Invertebrate IBIs**

- Initiate first phase of statewide wetland probabilistic survey

Future - Develop condition indicators for other wetland types: **Targeted Site Selection**

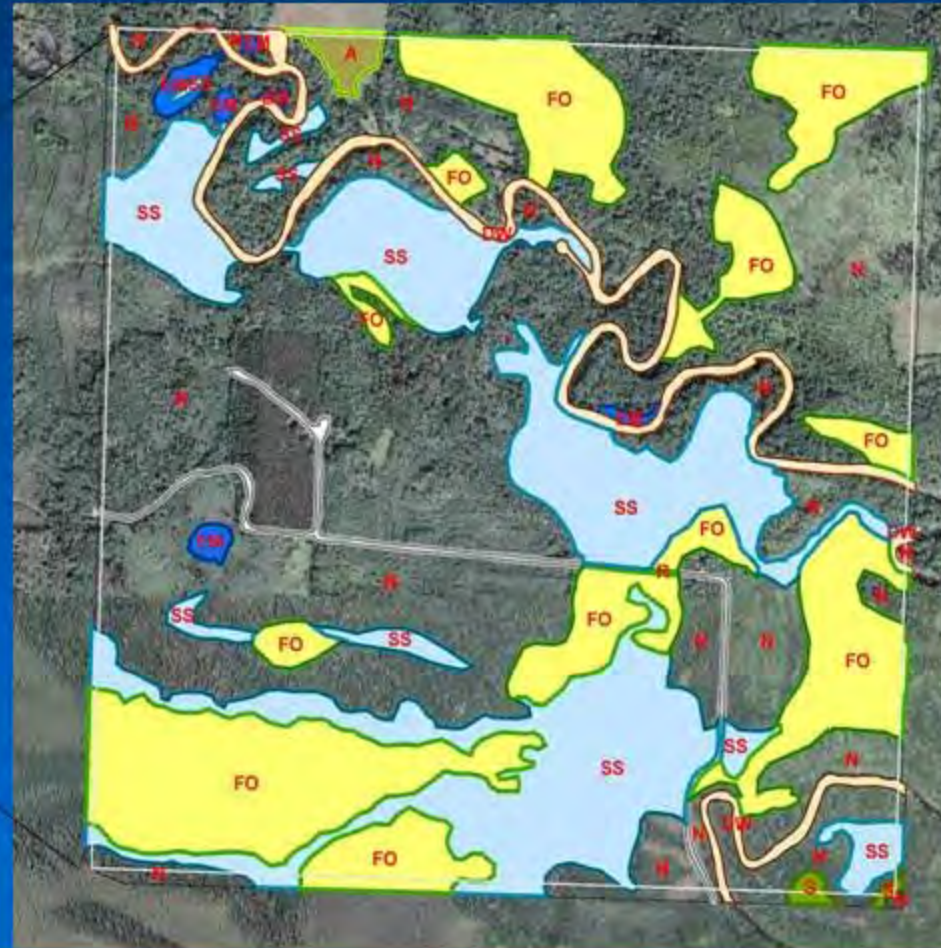
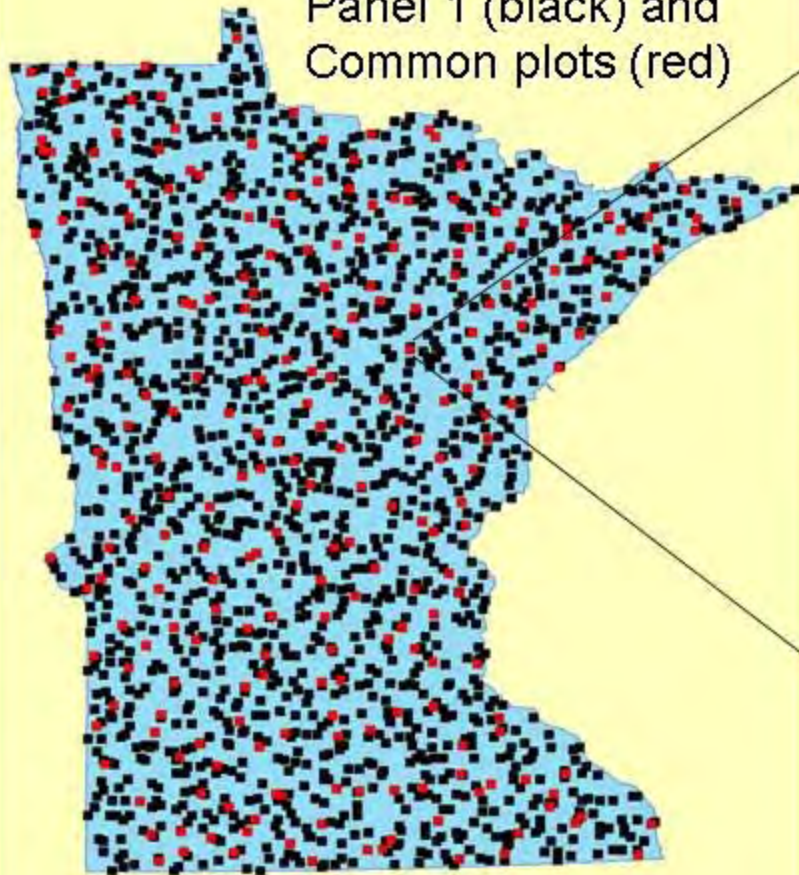
- Monitor set of sites in each ecoregion to assess condition trends: **Fixed-Station**



# Panel 1: 2006 Wetland Quantity Status 2007 Wetland Quality Status

2006

Panel 1 (black) and  
Common plots (red)



# *Depressional Wetland Condition Assessment 2007-2009*



# ***National Wetland Condition Assessment***

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- **Scheduled for 2011**
- **MN participating in National Wetlands Monitoring Workgroup discussions**
  - **Communicating with National Wetland Assessment Team**
- **Collaboration on Method/Indicator Development??**



# MN Condition Monitoring Design Matrix

Design	Lakes	Streams	Wetlands
Census	X		
Targeted	X	X	X
Probabilistic	X	X	X
Fixed-Station	X	X	X
Intensive Watershed		X	

# *Conclusions*

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- Probabilistic designs support some programs better than others
- Alternative designs needed to better support other program needs (e.g., TMDL)
- Integration of designs will result in most efficient use of monitoring resources

# Conclusions

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- Integration with National Surveys depends on whether a statewide probabilistic design already exists for the resource:
  - If one exists → comparable assessment endpoints may allow results of State survey to be used supplement National survey, and vice versa
  - If not → supplementing National survey with additional sites is an efficient way to obtain statistically valid statewide estimates of condition.

**Questions?**



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