

**ASSESSING THE QUALITY AND  
QUANTITY OF DEPRESSIONAL  
WETLANDS IN THE REDWOOD RIVER  
WATERSHED UTILIZING A  
PROBABILISTIC SURVEY DESIGN**

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

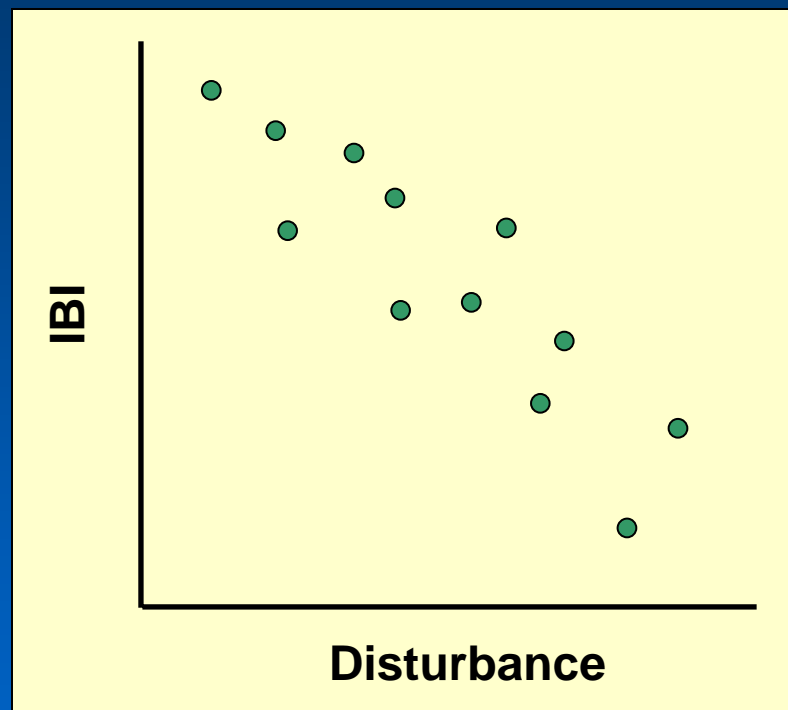
*Washington, DC*

# Introduction

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## Index of Biological Integrity (IBI)

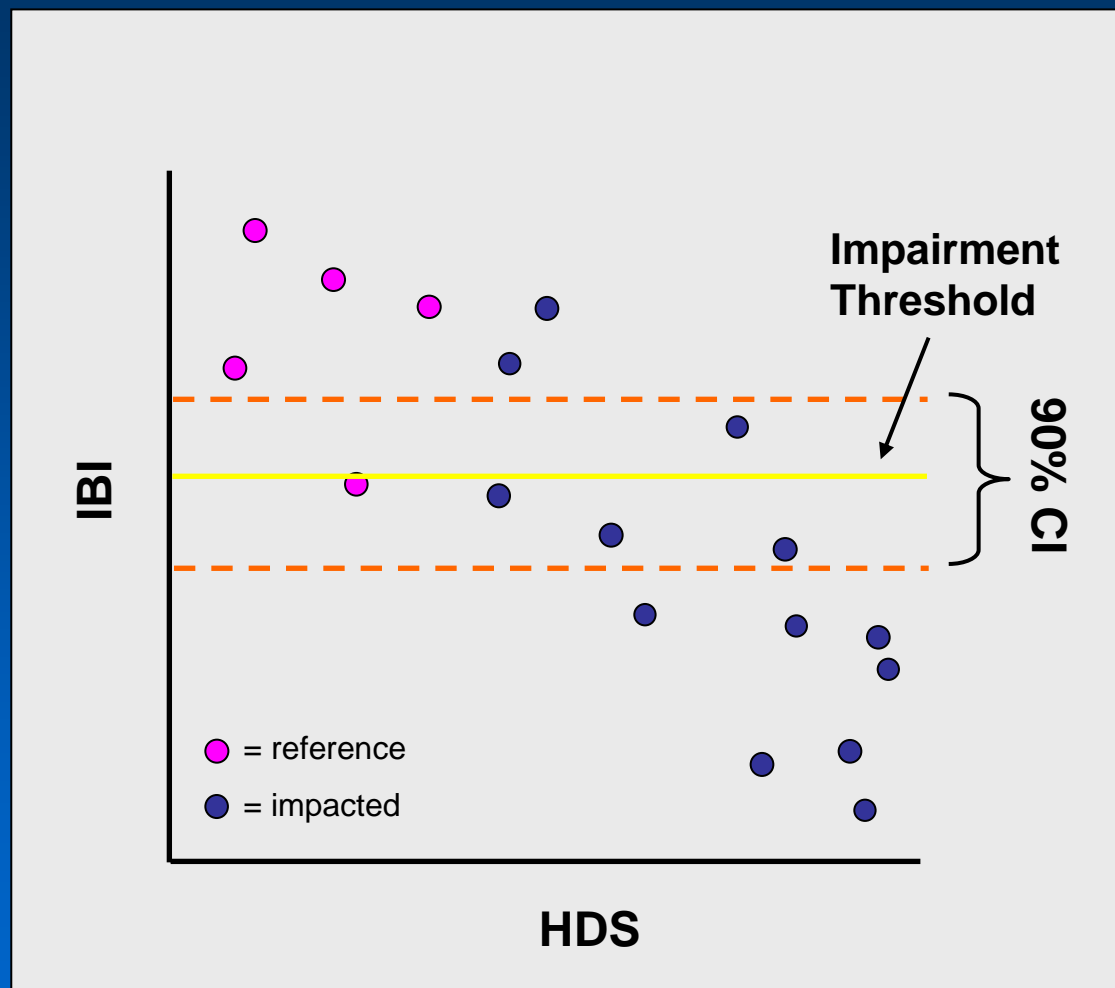
- Multimetric Index
- Based on deviation from reference conditions (least impacted sites)
- Measurement of condition (quality)



# Introduction

## Assessment

- Aquatic Life Use Support (ALUS)
- Impairment threshold
  - Lowest scoring reference site
- Confidence interval



# *Study Objectives*

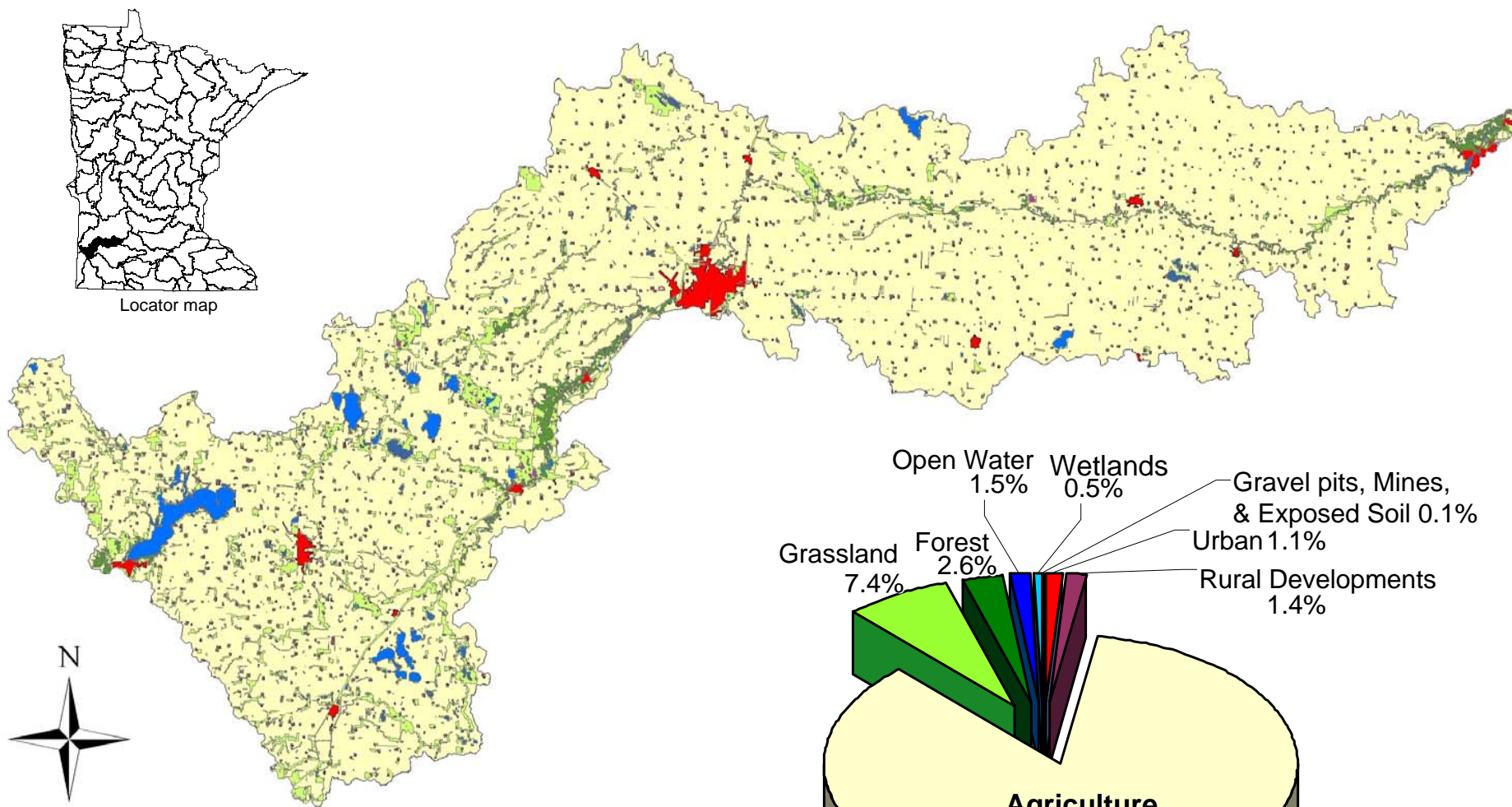
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- Assess quality of depressional wetlands in a watershed using a probabilistic survey
- Estimate wetland loss since early 1980s
- Evaluate feasibility of utilizing a randomized survey design for wetland condition monitoring

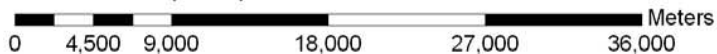


# Study Area-Redwood River

## 1990 Land Use in Redwood Watershed



Projection: UTM Zone 15  
Data Source: Minnesota Department of  
Natural Resources - Bureau of MIS  
Data available online at:  
<http://maps.dnr.state.mn.us/deli/index.html>





# *Target Population*

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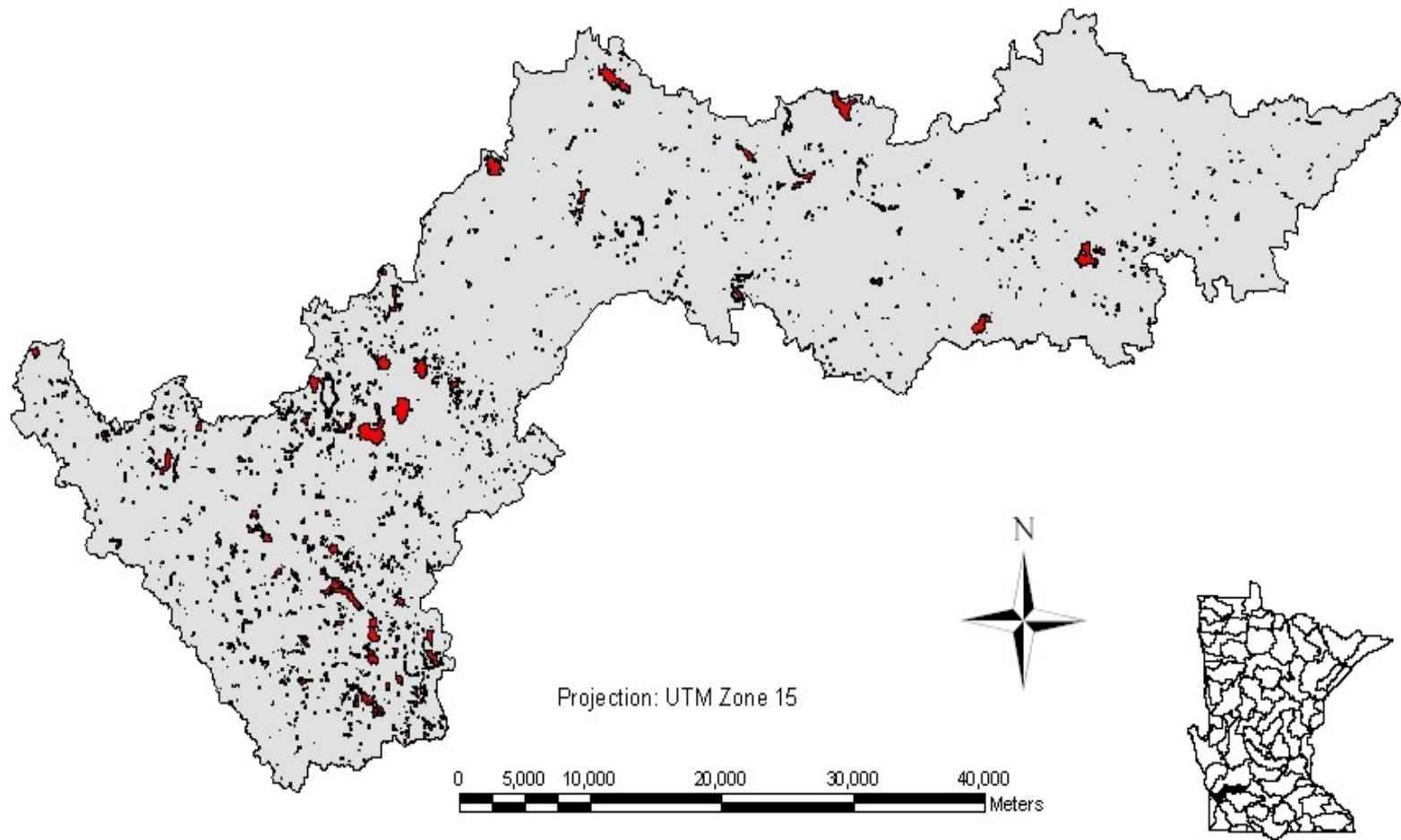
Seasonal, Semi-permanent,  
& Permanent Emergent  
Depressional Wetlands



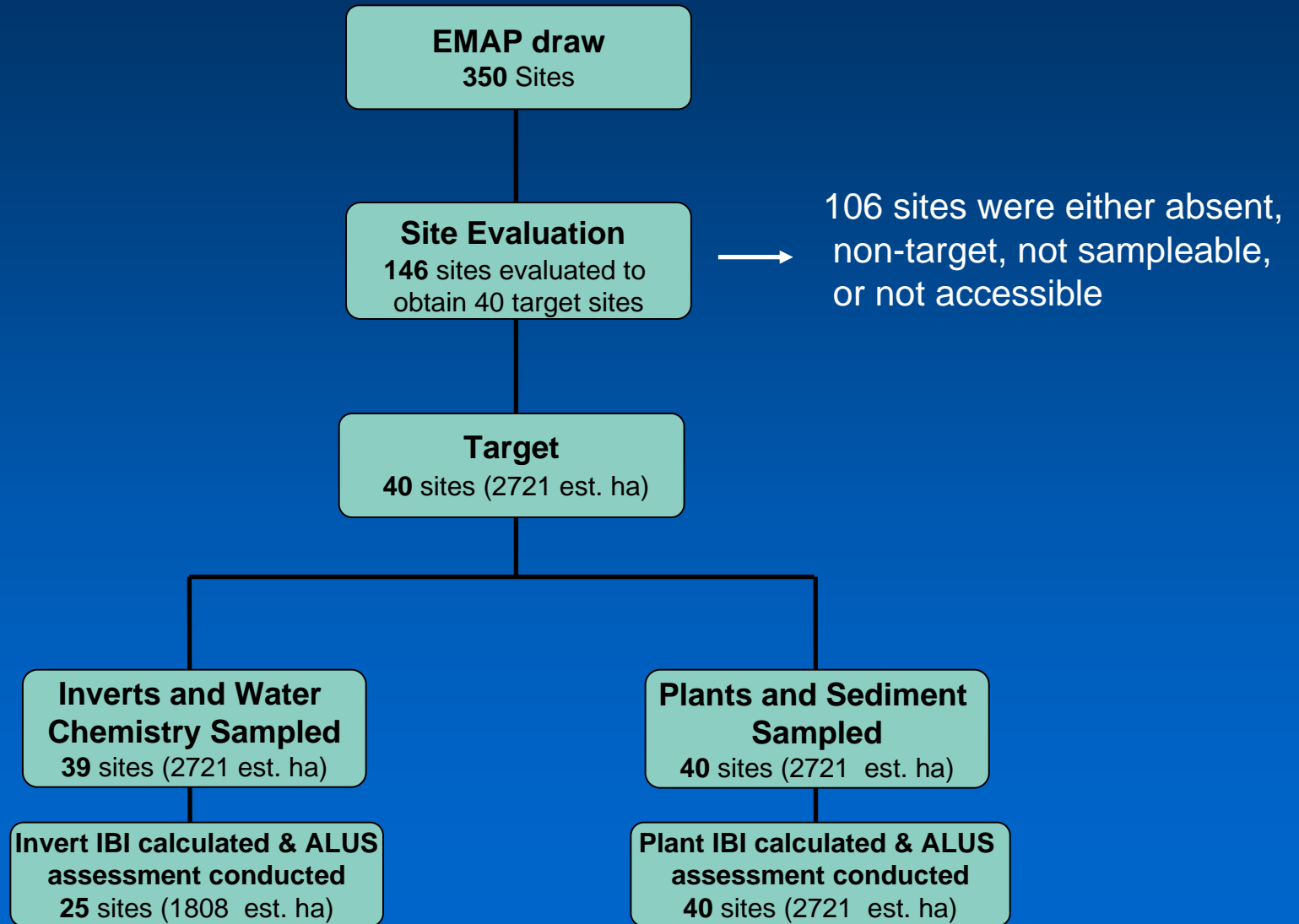
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# Sample Frame-NWI

Redwood River Watershed Sample Frame: Depressional Wetlands



# Site Selection & Sampling

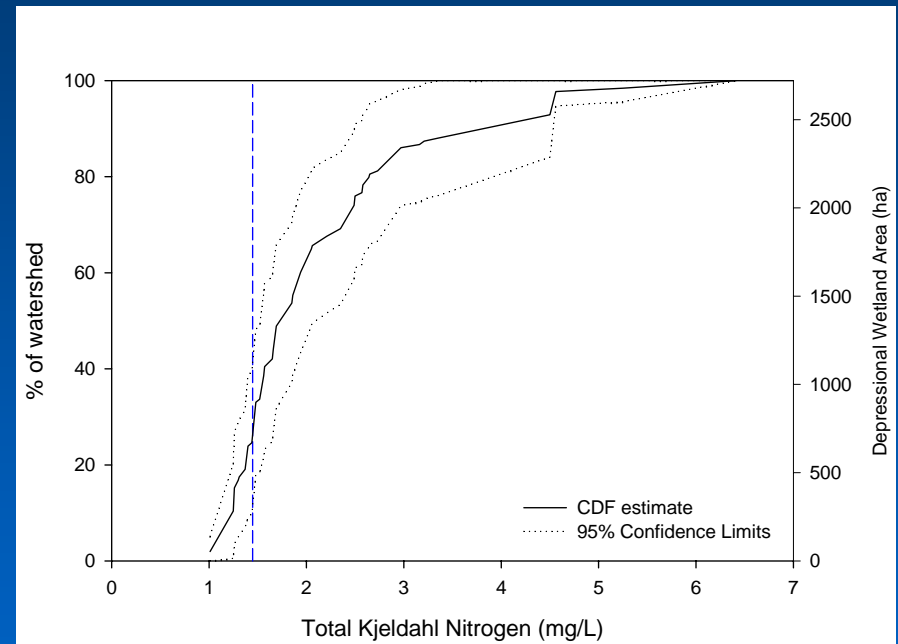
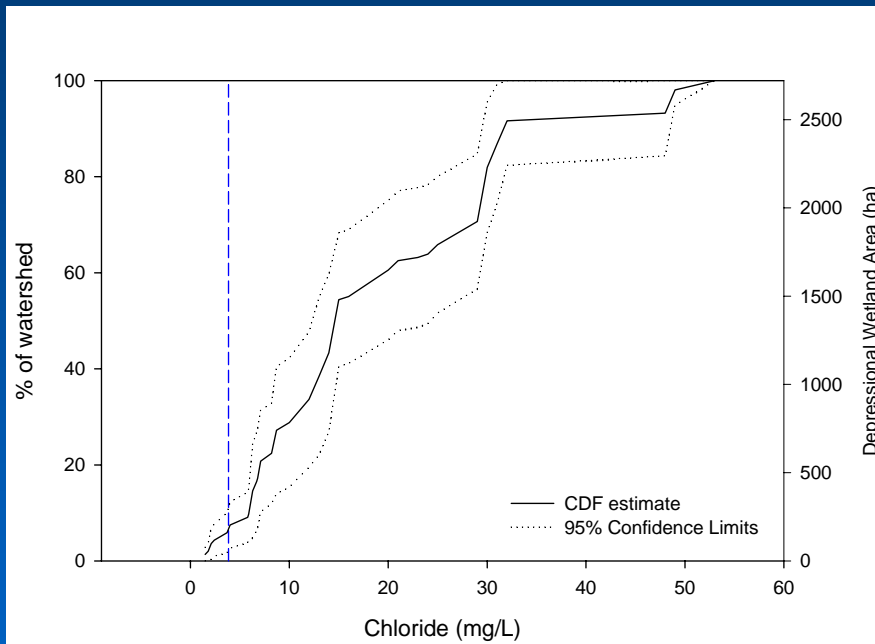




# Results-Water Chemistry

## Chloride

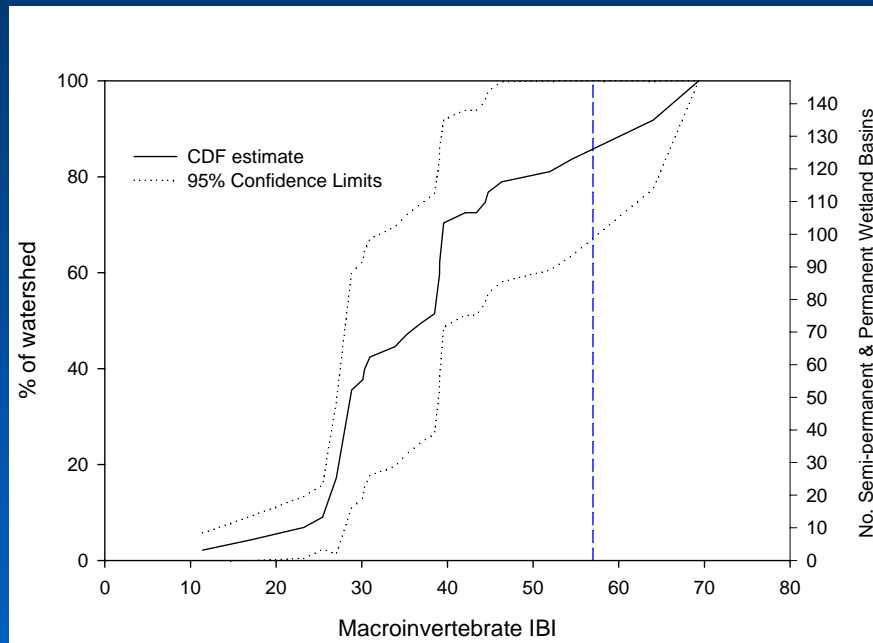
## Total N



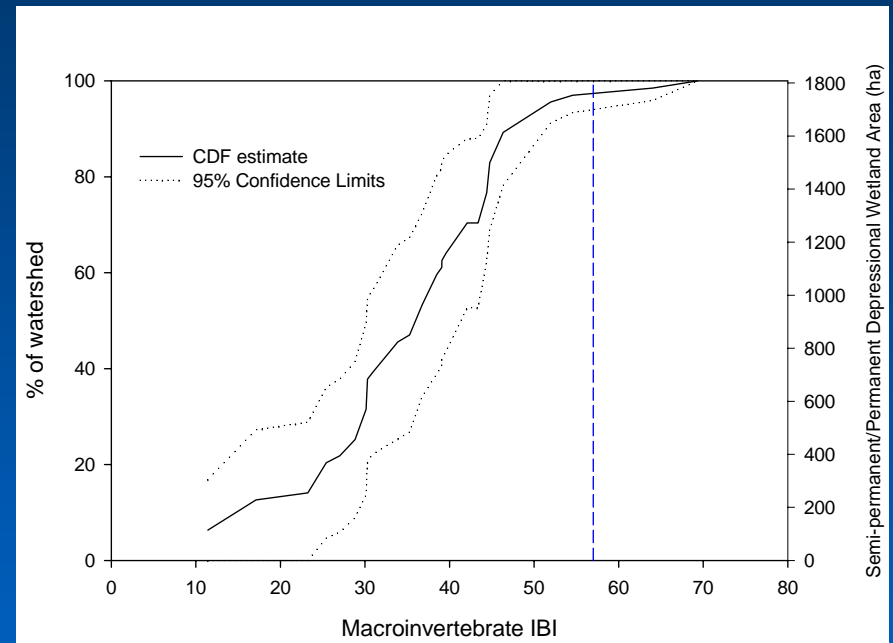
--- Regional Reference Conditions

# Results-Invertebrate IBI

## Number of Basins



## Cumulative Area



--- Biological Impairment Threshold

## Impairment

Basins – 86%

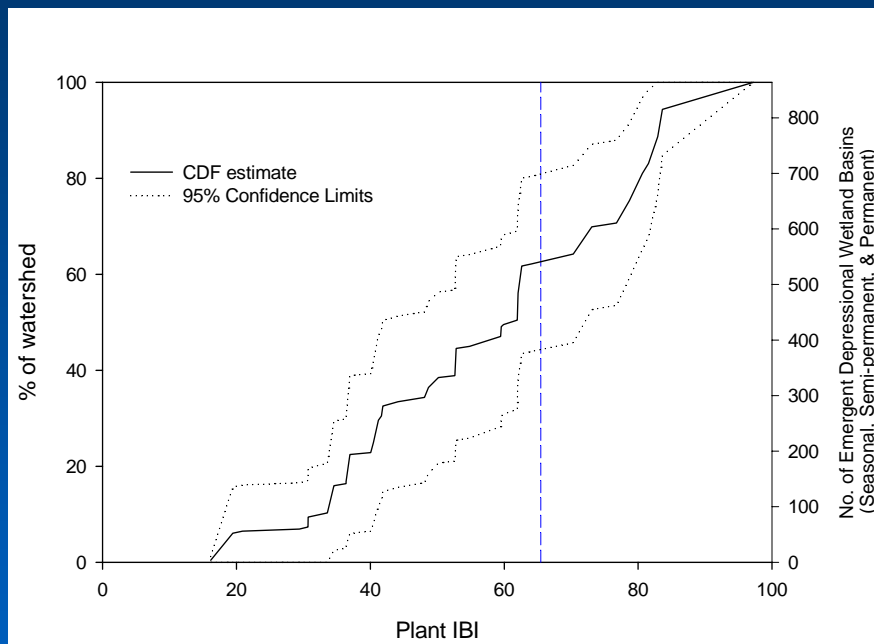
Area – 97%



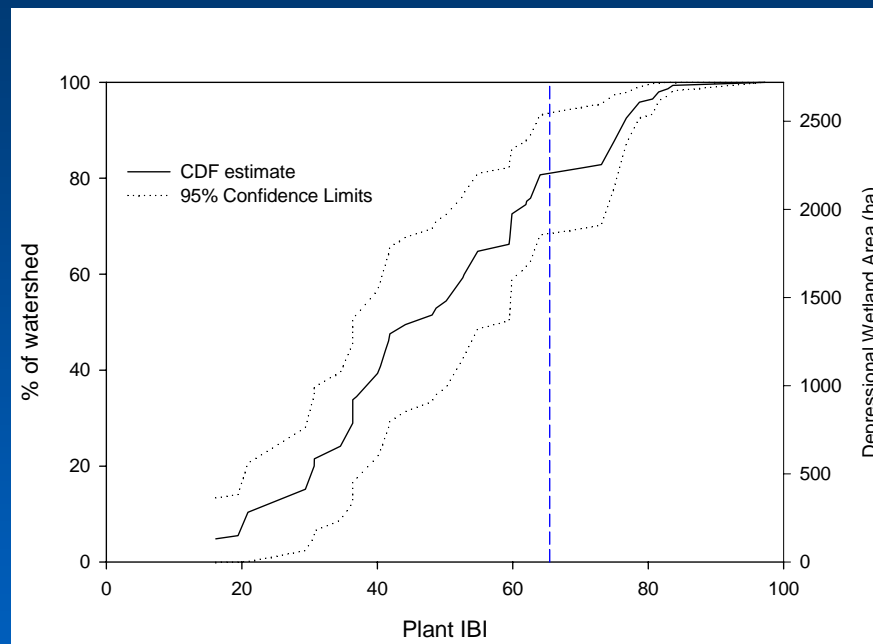
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# Results-Plant IBI

## Number of Basins



## Cumulative Area



--- Biological Impairment Threshold

## Impairment

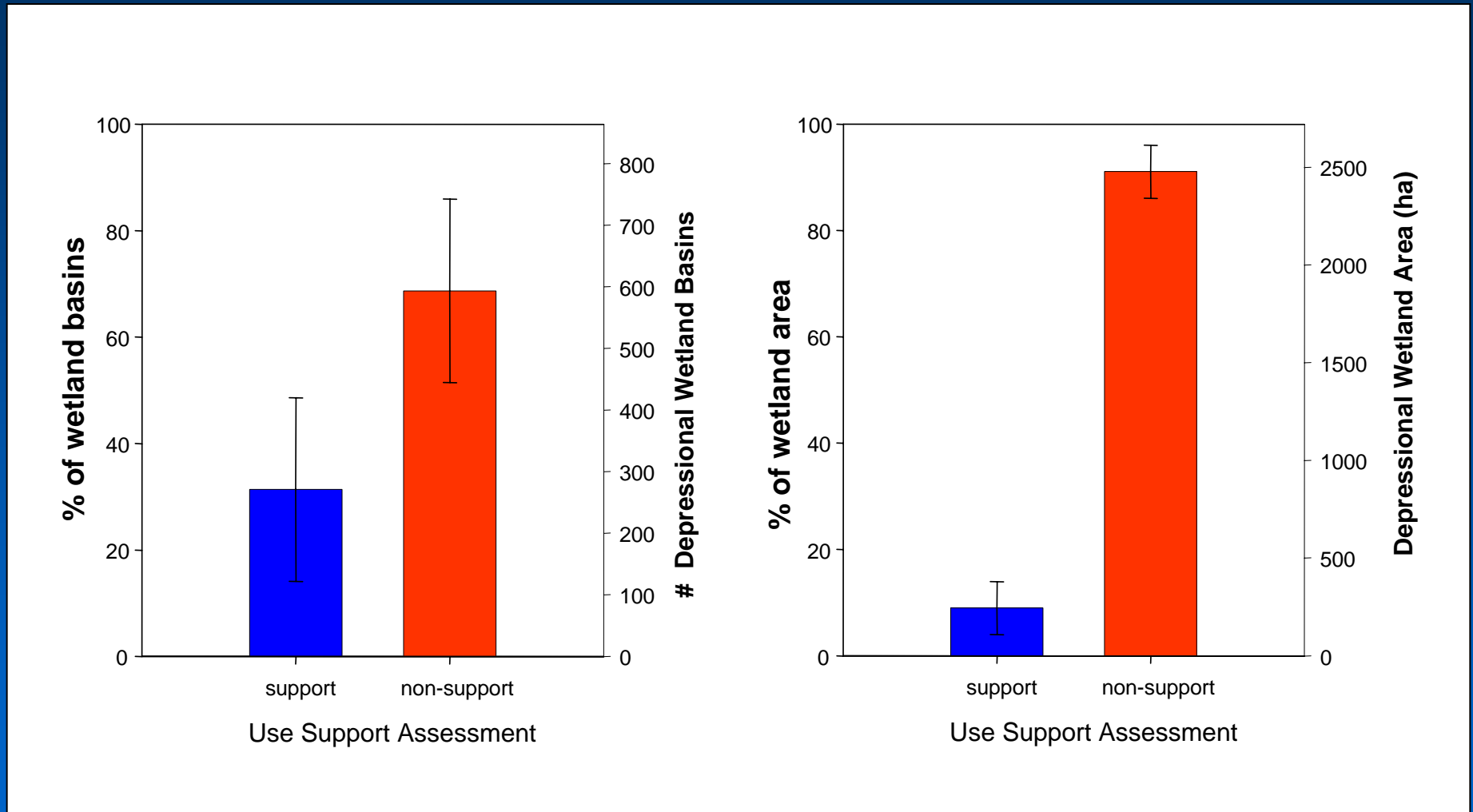
Basins – 63%

Area – 81%



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# Results-ALUS



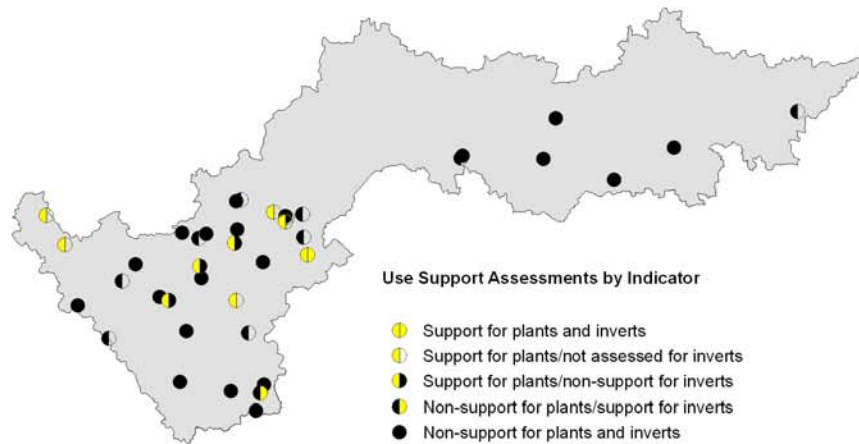
Error bars = 95% Confidence limits



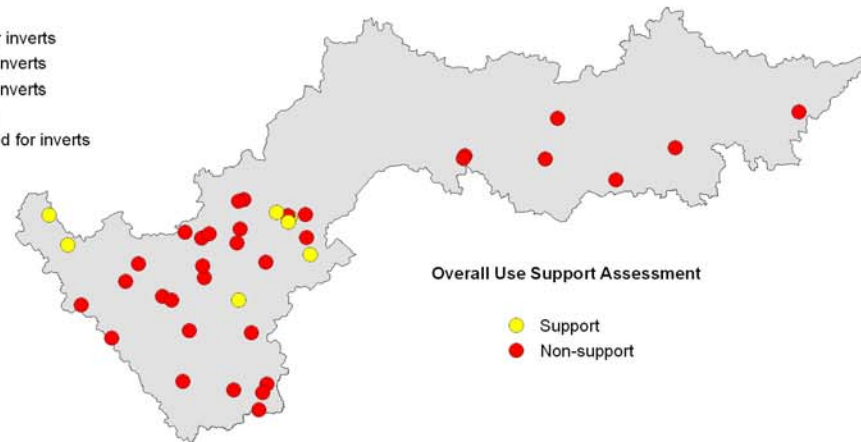
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# Results-ALUS

A. Use Support Assessment by Biological Indicator



B. Overall Use Support Assessment



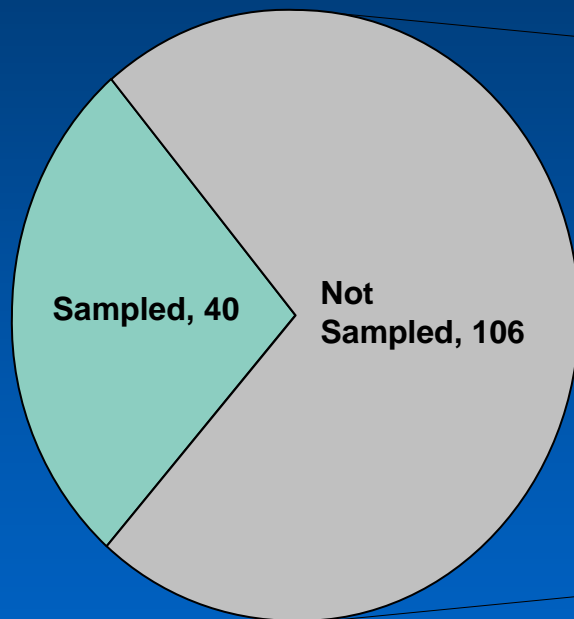
Projection: UTM Zone 15



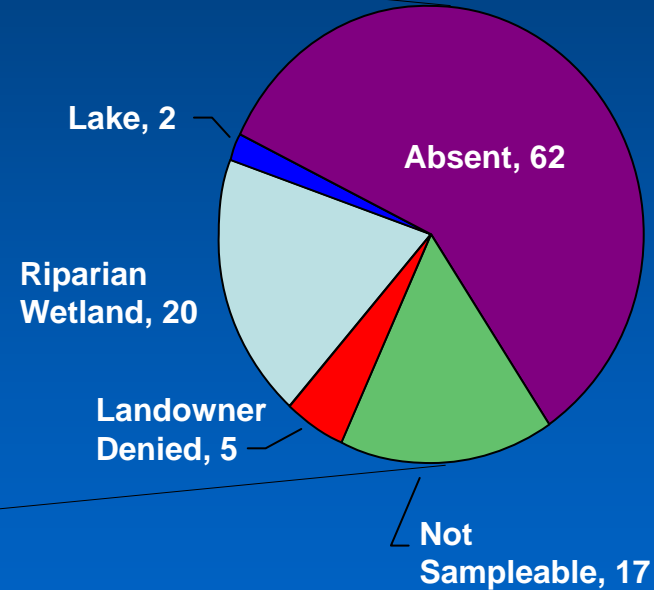


# Results-Site Evaluation

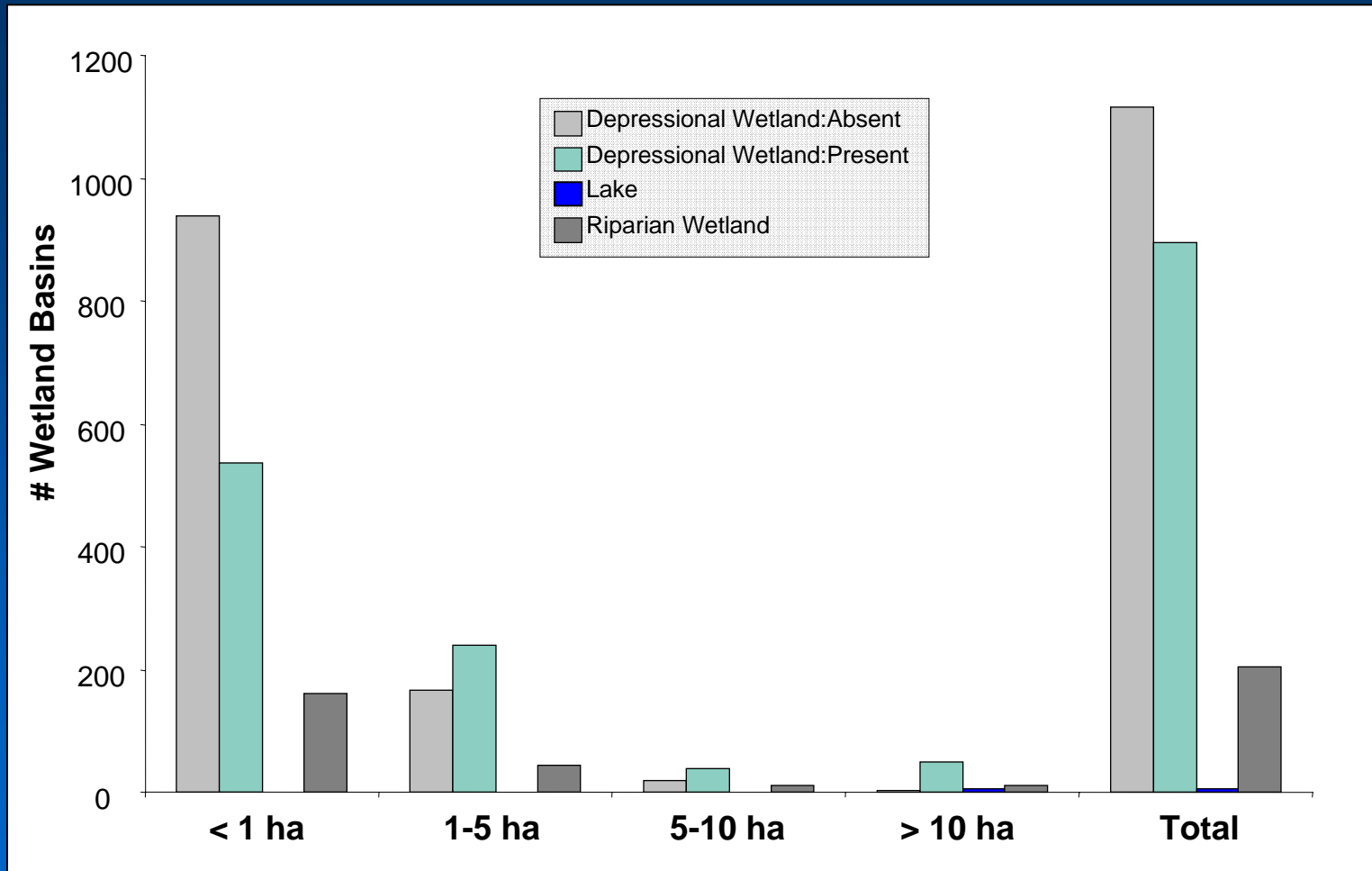
## All Evaluated Sites



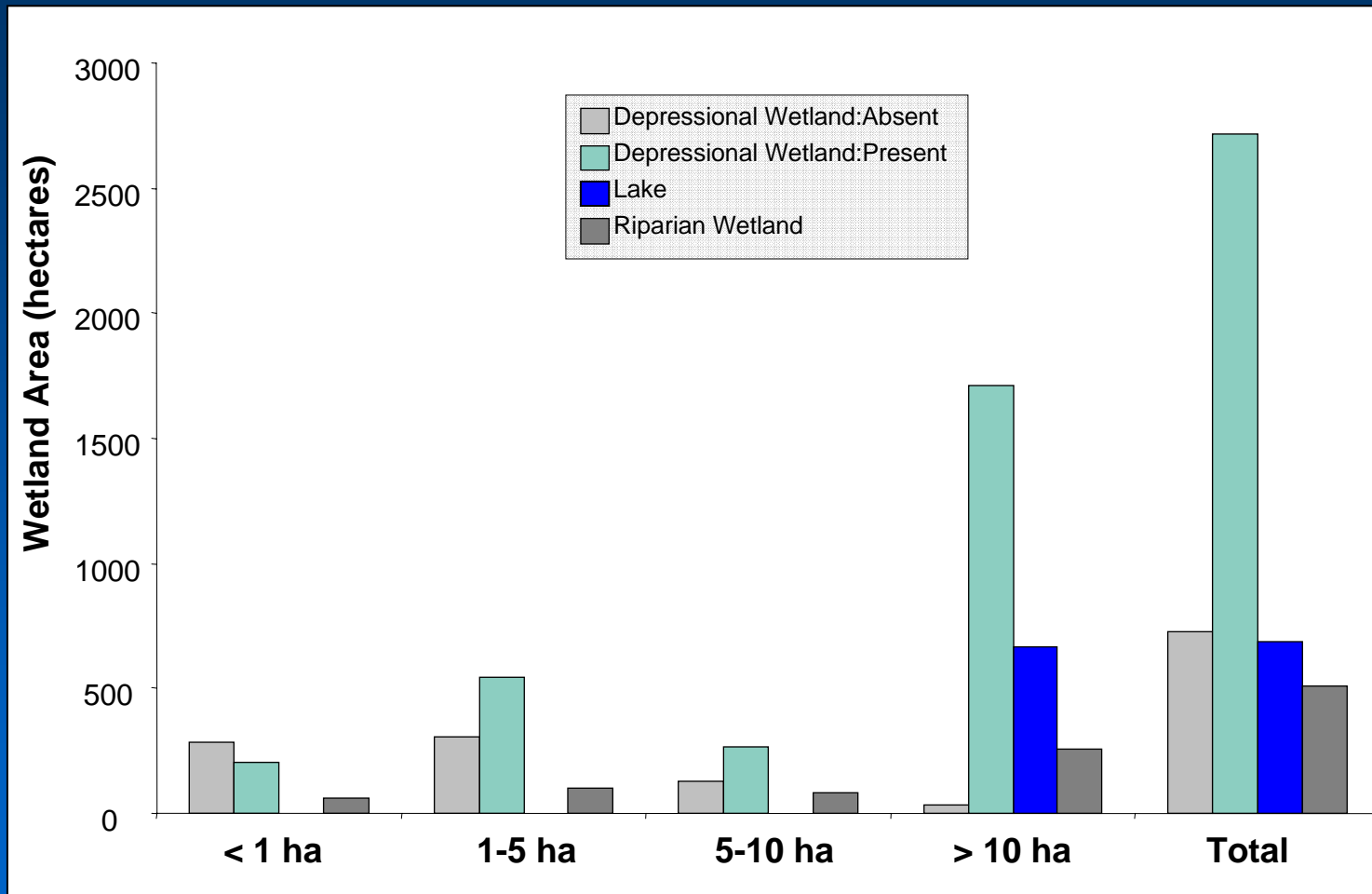
## Dropped Sites



# Results-Basin Extrapolation



# Results-Area Extrapolation



# Results-Wetland Losses

Size Category (ha)	Estimated No. of Wetland Basins			Estimated Wetland Area (ha)		
	circa 1980	2003	% change	circa 1980	2003	% change
< 1	1475	536	<b>-63.6</b>	486.8	201.7	<b>-58.6</b>
1-5	407	241	<b>-40.9</b>	848.2	541.2	<b>-36.2</b>
5-10	58	39	<b>-33.3</b>	396.2	266.8	<b>-32.7</b>
> 10	51	48	<b>-6.2</b>	1741.7	1711.1	<b>-1.8</b>
Total	2012	896	<b>-55.5</b>	3437.6	2714.4	<b>-21.0</b>



# Conclusions

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- Majority of depressional wetlands in the Redwood are biologically impaired
- Likely stressors: nutrients, invasive species, sedimentation, altered hydrology
- Significant losses of small (seasonal) wetland basins from 1980-2003
- These are *not* net losses
  - No accounting for permitted actions & mitigation, and/or wetland additions from conservation programs (CREP, WRP, etc)

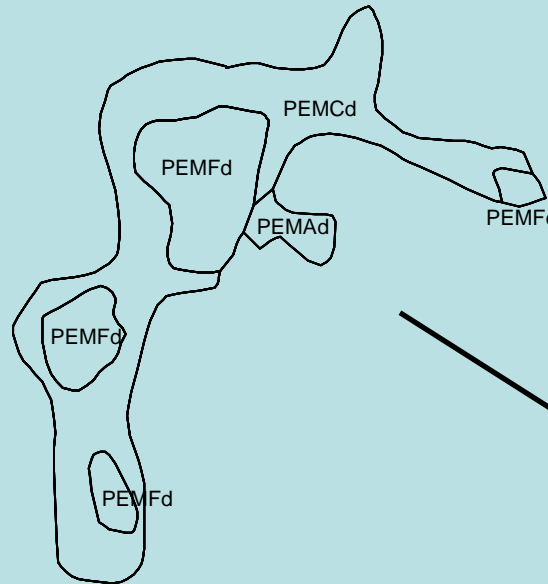




# Conclusions-Probabilistic Survey

- Accurate sample frame is crucial
  - NWI format is problematic
  - Data is > 20 yrs
- Access not a big issue

NWI Wetland Classification:  
wetland type polygons



MPCA Assessment  
Unit:  
wetland basin



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# Acknowledgements

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Mark Gernes – idea for project, study design, field work, comments & suggestions on report

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Adam Hoffman

Travis Fristed

## EPA Support

Rich Sumner

Mary Kentula

Naomi Detenbeck

Sue Elston

Alicia Hernandez



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# Comprehensive Wetland Assessment, Monitoring, and Mapping Strategy (CWAMMS)

- Probabilistic Survey of Wetland Quantity and Quality (Statewide Status & Trends)
- Update NWI
- Develop Web-Based Wetland Accounting System (permit and mitigation tracking)



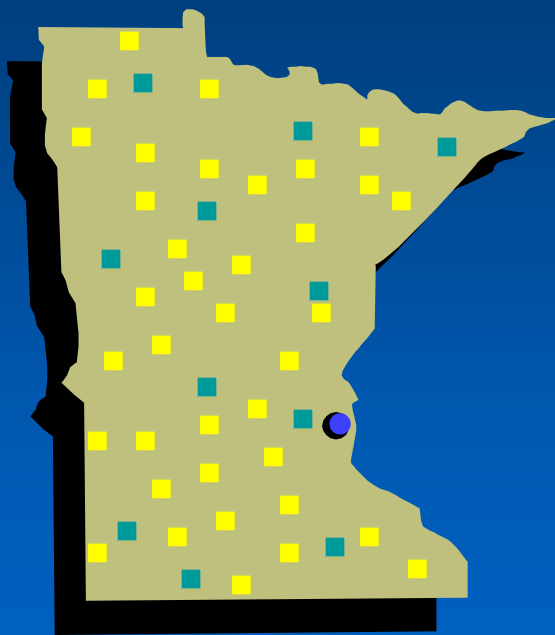
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July 2006

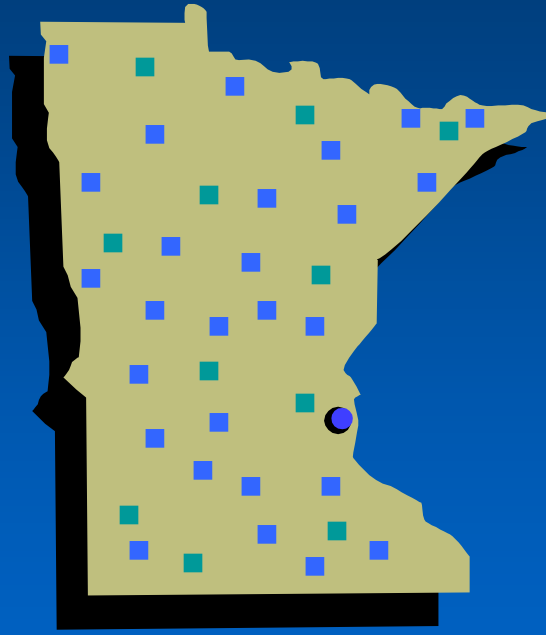
# Probabilistic Statewide Wetland Survey

## 3-Panel Interpenetrating Design



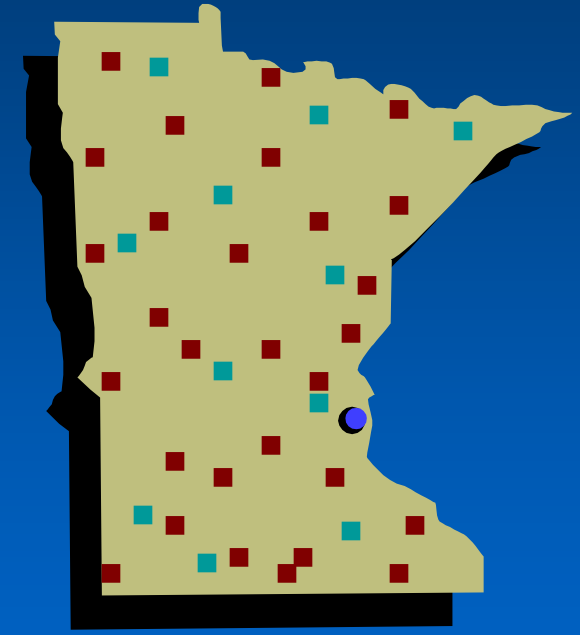
Year (Panel) 1

1580 1 mi<sup>2</sup> plots



Year (Panel) 2

1580 1 mi<sup>2</sup> plots



Year (Panel) 3

1580 1 mi<sup>2</sup> plots

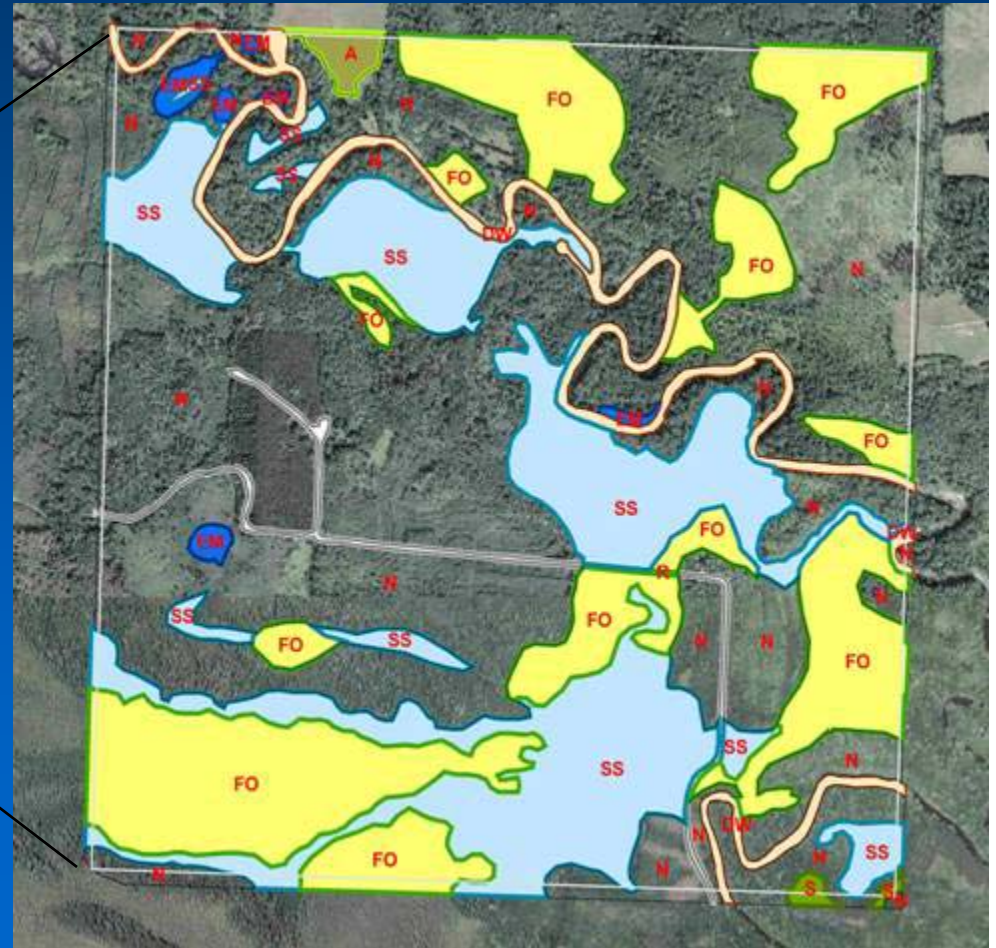
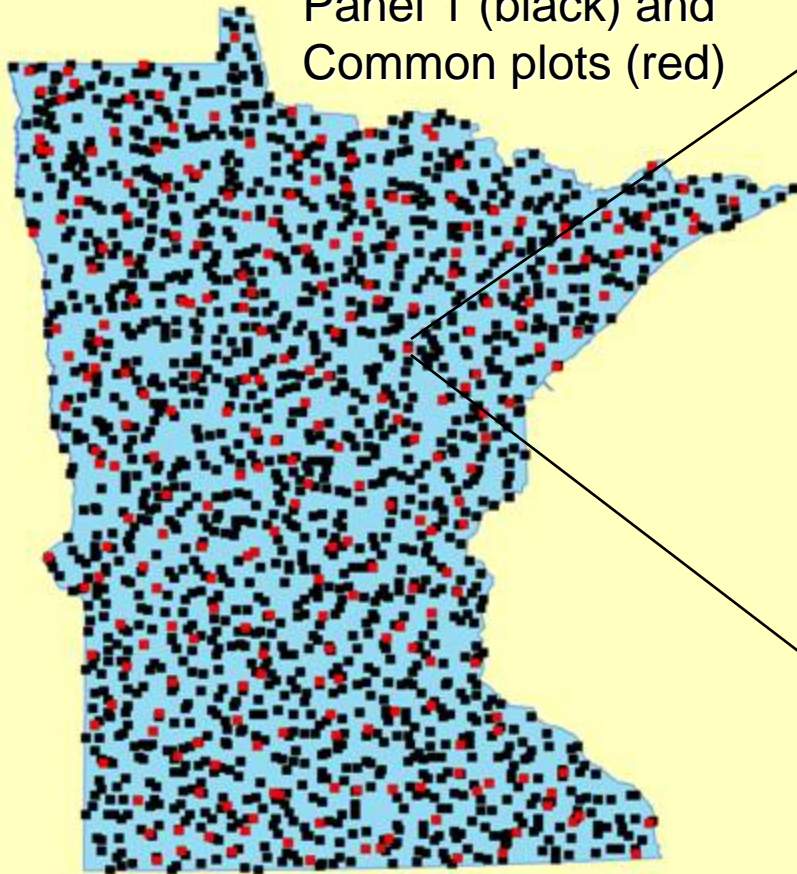
+ 250 Common Plots Sampled each year ----->



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

2006

Panel 1 (black) and  
Common plots (red)





# Questions?



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Redwood Report available at:

<http://www.pca.state.mn.us/water/biomonitoring/bio-wetlands.html>

More CWAMMS information available at:

<http://www.pca.state.mn.us/water/wetlands/cwamms.html>