

The Long Term Resource Monitoring Program:
Ten years of macroinvertebrate monitoring
on the
Upper Mississippi River System.



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The background image is an aerial photograph of a river system. The river flows from the top left towards the bottom right, creating many curves and small islands. The surrounding land is covered in dense green vegetation, including forests and fields. In the far distance, there are more hills and mountains under a clear sky.

Talk outline

- 1. What is the LTRMP?**

- 2. Macroinvertebrate monitoring**
Methods
Results
Modeling efforts
Future endeavors

LTRMP

Part of the Environmental Management Program

- Established by the federal government with the 1986 Upper Mississippi River Management Act
- Legislation created 3 major programs
 1. Long Term Resource Monitoring (LTRMP)
 2. Computerized Inventory and Analysis System
 3. Habitat Rehabilitation and Enhancement (HREP)
- Funding appropriations are provided through the US Army Corps of Engineers

Environmental Management Program

Comprised of:

Federal agencies:

Corps of Engineers

Fish and Wildlife Service

US Geological Survey

Dept. of Agriculture

Dept. of Transportation

Environmental Protection Agency

State agencies:

Minnesota DNR

Wisconsin DNR

I Illinois DNR

I Illinois NHS

Missouri DOC

Iowa DNR

The LTRMP

- The largest river-related inventory, monitoring, research, spatial analysis, and information sharing program in the United States—is implemented by the Upper Midwest Environmental Sciences Center, a U.S. Geological Survey science center.

LTRMP - Original mission and goals



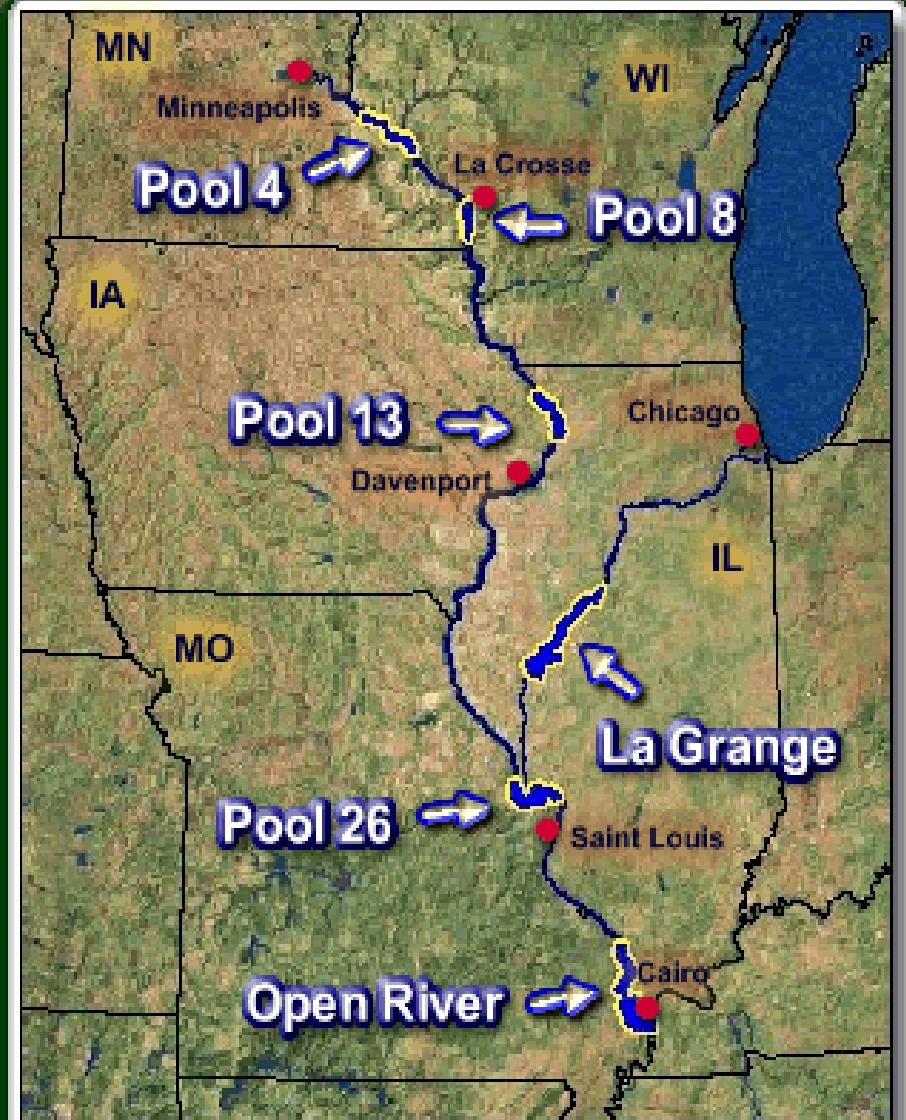
Mission

To provide resource managers and decision makers with information necessary to maintain the UMRS as a sustainable multiple-use large river ecosystem

Goals

1. Increase our understanding of how the river ecosystem operates
2. Monitor UMRS natural resources status and trends
3. Assist in the evaluation of management alternatives
4. Manage and provide access to resulting data, information, and products

LTRMP



- The UMRS encompasses the commercial navigable reaches of the Upper Mississippi River, as well as the Illinois River.
- Six remote state-operated field stations have been established for data collection.

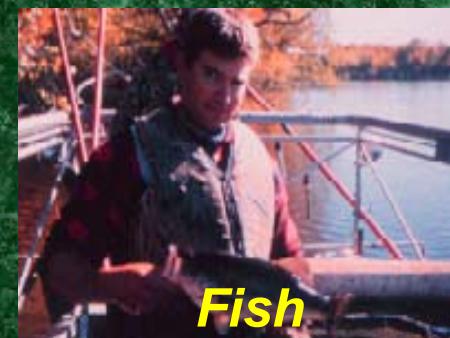
Long Term Resource Monitoring Program Components



Aquatic Veg



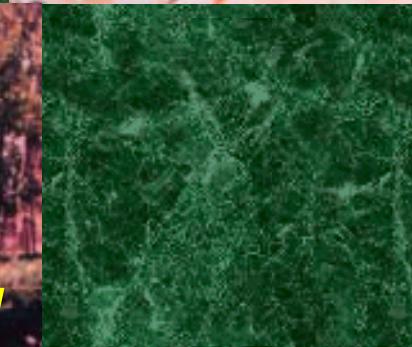
Water Quality



Fish



Terrestrial Veg



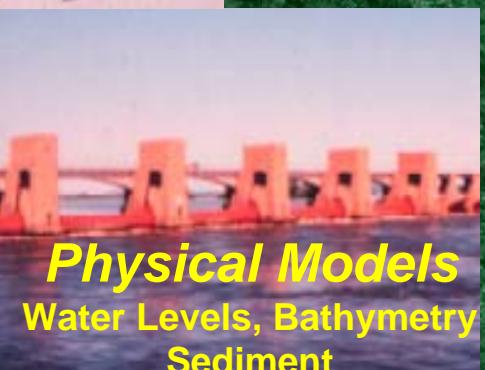
Macroinverts



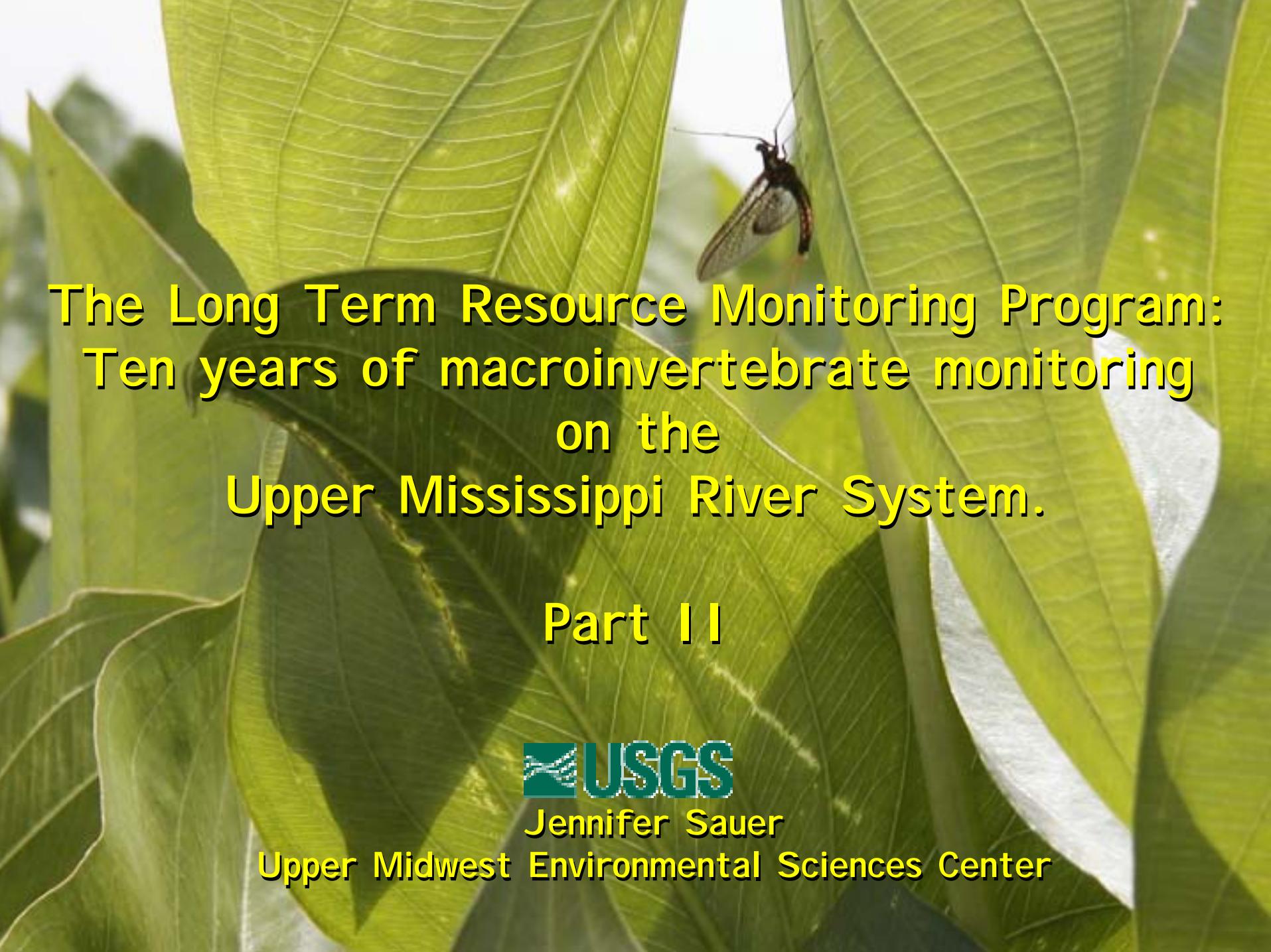
*Land-use
Land-cover*



GIS



Physical Models
Water Levels, Bathymetry
Sediment



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Part III



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Why Monitor Macroinvertebrates??

- Play a major role in the aquatic ecosystem.
 - * Food for waterfowl and fish
 - * Process organic material and recycle nutrients
- A measurement of ecosystem function
 - * Potential to detect changes in water quality, sediment, habitat, and fish and wildlife food.

Objectives

- Document spatial and temporal trends in select benthic macroinvertebrates
 - * Provide baseline data
 - * Provide data for other analyses
(e.g., synthesis among LTRMP components)
- Establish a scientifically acceptable monitoring protocol.

Target organisms (Ephemeroptera, mayfly larva; Chironomidae, midge larva; Sphaeriidae, fingernail clams; Dreissena polymorpha, zebra mussels; and Corbicula fluminea, Asiatic clams) are counted.



1



2



3



5



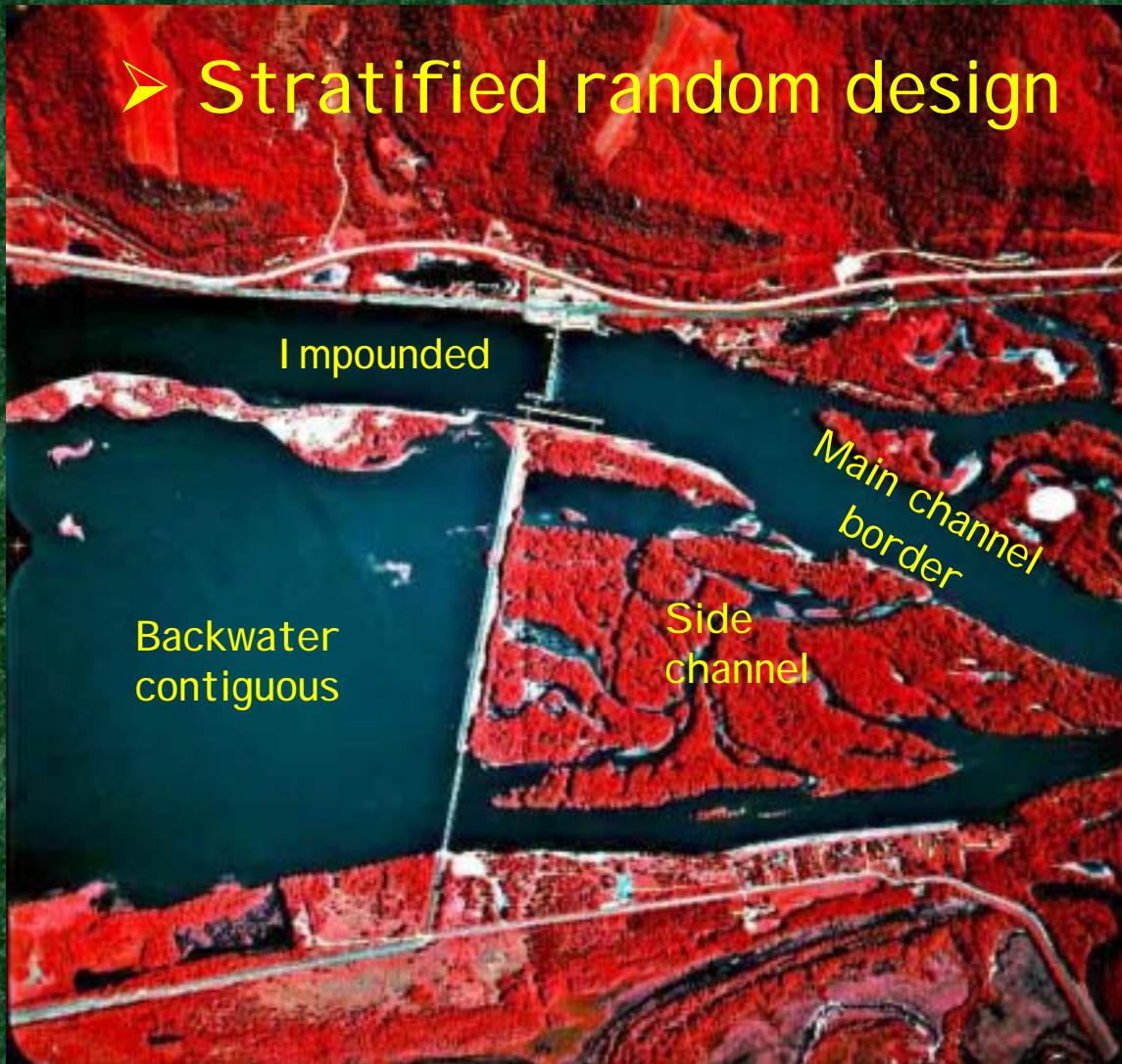
4

Presence/absence is noted on other taxa.



Methods

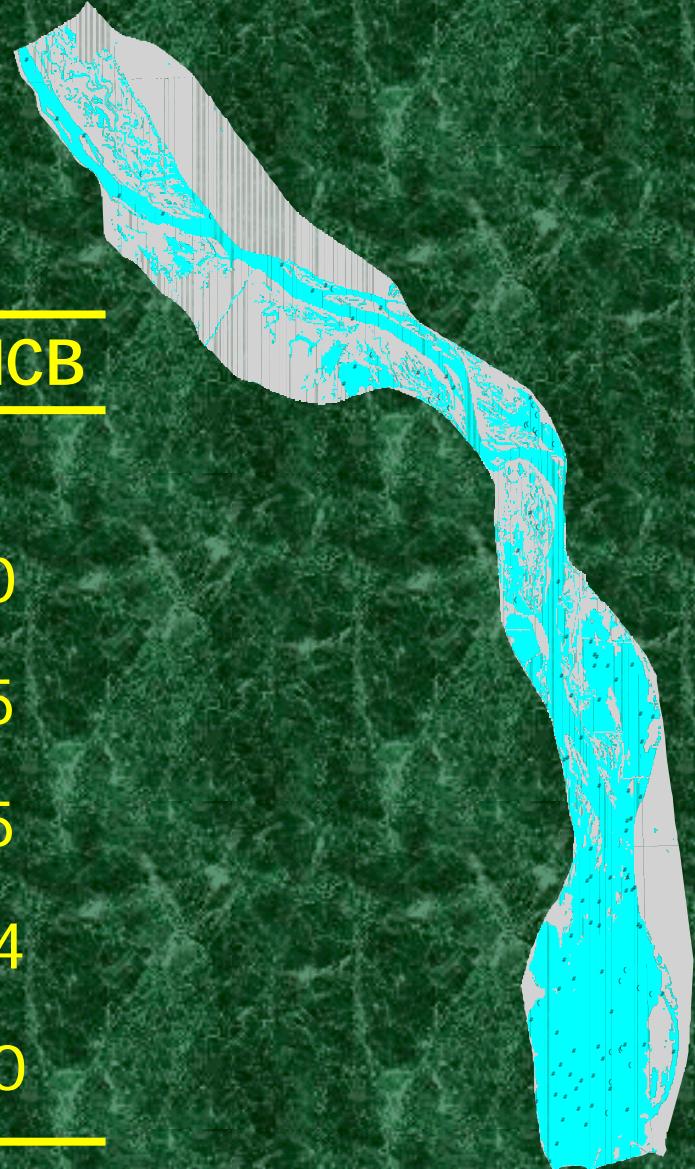
➤ Stratified random design



Methods

➤ >125 sites per study area

Study area	BWC	IMP	SC	MCB
Pool 4	55	44	10	11
Pool 8	34	49	19	10
Pool 13	43	46	14	15
Pool 26	12	28	30	15
Open River	—	—	66	44
La Grange	24	—	35	40



Methods

- All samples picked in the field in the spring.
- Standard Ponar grab
- Wash frame mesh size
1.18 mm
- About 10% are brought back to the lab for
QA/QC.

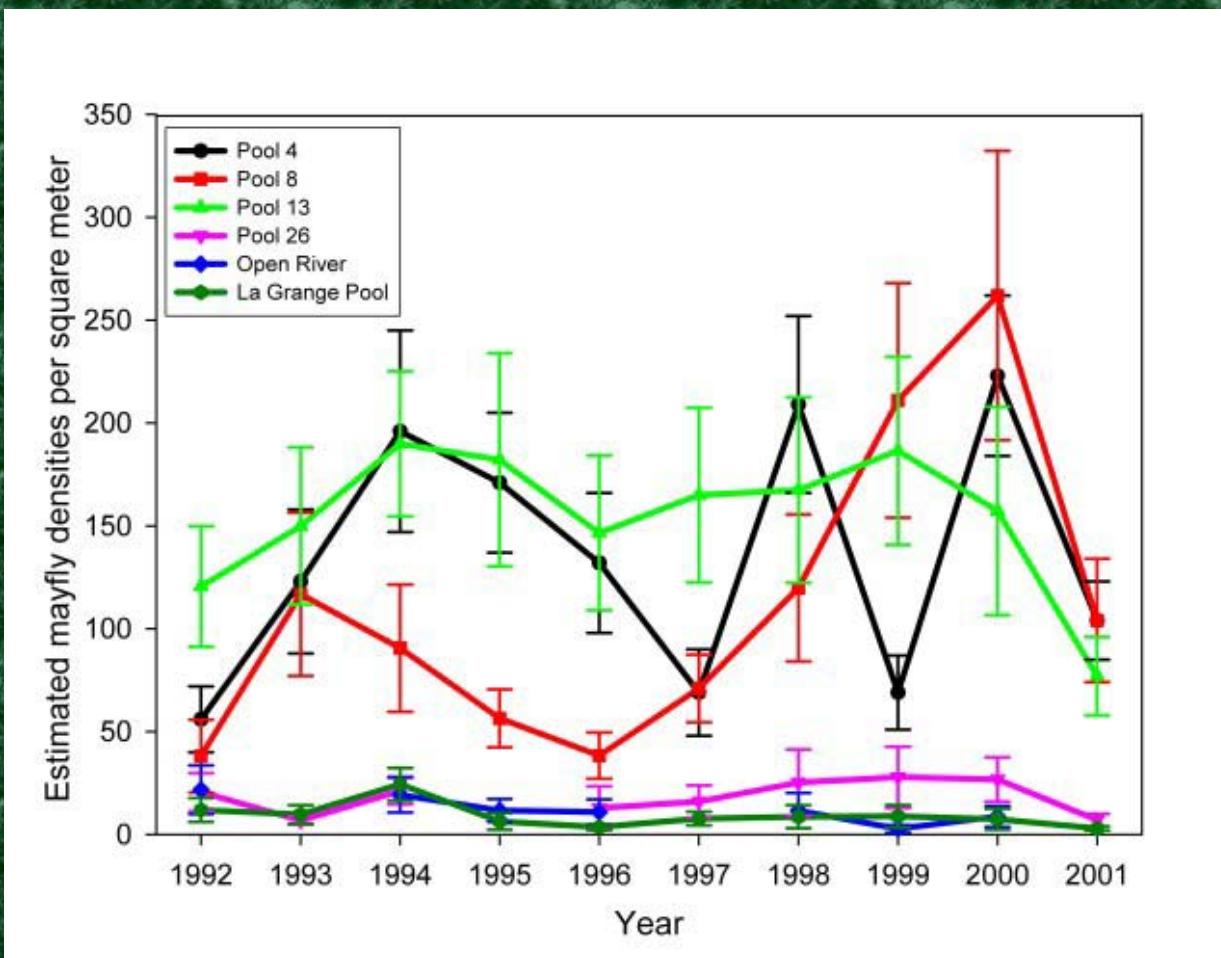


Electronic Data Entry

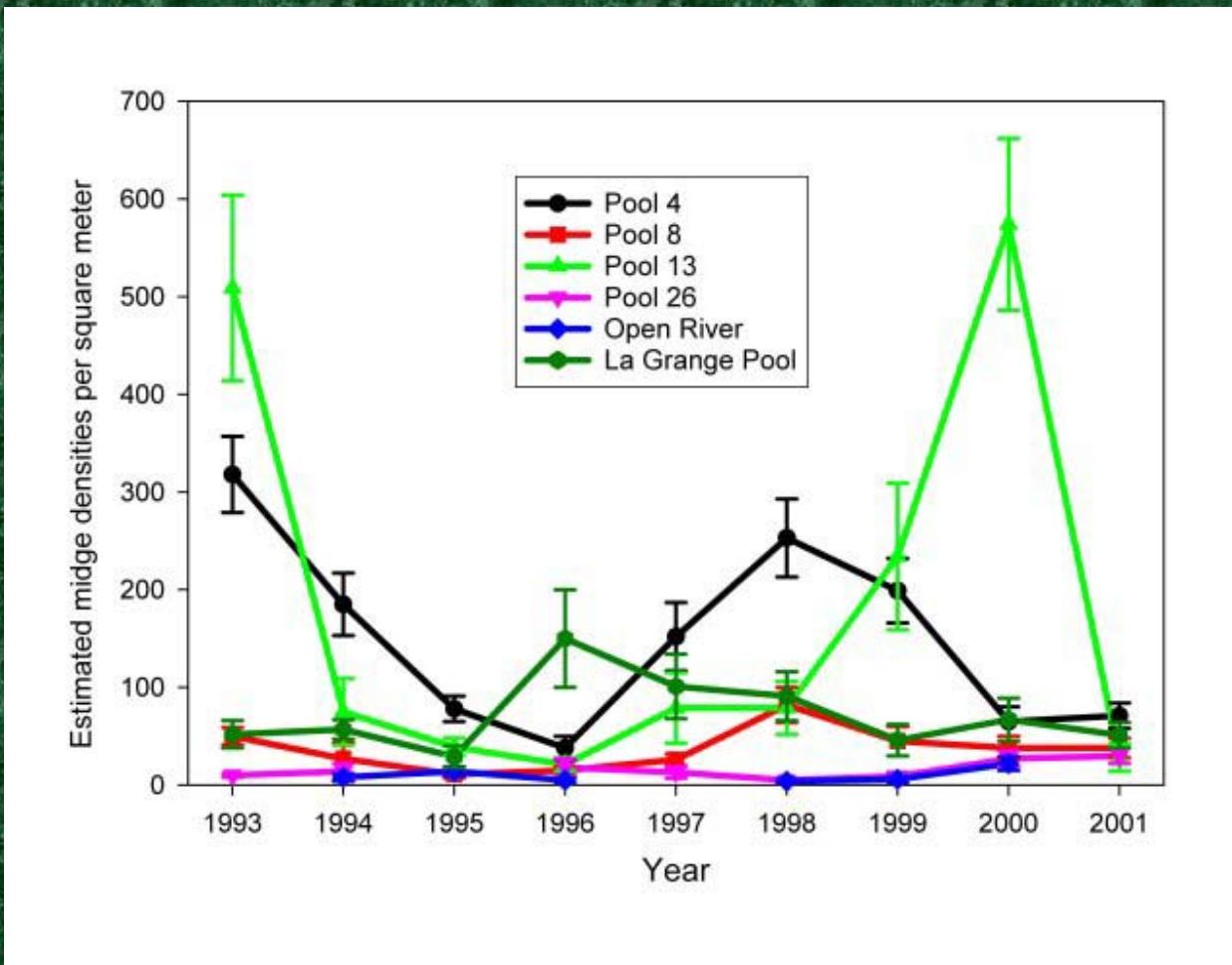
Invert Data Sheet Application

Done	Fit/Barcode	Fit/Grid Code	Show All Sites	Fit/Not V, P	Calculator					
Select Alternate Grid Number To Load:				Backup To Flash Card		Add New				
Select SRS Grid Number:				* = Required Data		Help Field Descriptions				
Barcode: 22001330	Field St : 2	Date : 	Sample Grid: 1	Project Code: M-	QA Data Sheet	Verified: 				
Habitat Clss: MCB	River Mile: 	Sub Smp Tk: 	Water Depth: 	# of Containers: 	Summary Cd: 					
Gear Code: 	Lab Smp Taken: 	LTRMP UTM ZN : 15	LTRMP UTM East : 640570	LTRMP UTM North : 4843700						
Field GSP PDOP : 	Field UTM Zone : 	Field UTM East : 	Field UTM North : 							
% Floating Lf : 	Substrate: 	Fine Organic : 	Ponar Shells: 	Ponar Detritus: 						
Submrsd Veg: 	Floating Leaf: 	Emergent Veg : 	Open Water: 							
Mayflies Count: 	FNC Count: 	Corbicula Count: 	Midges Count: 	ZM Count: 						
Dragon\Drmslfie: 	Stoneflies: 	Caddisflies: 	Aquatic Flies: 	Mussels: 						
Worms\Leeches: 	Shrimp\Crayfish: 	Scuds: 	Snails: 	Recorder Code: 						
Site Comment: 										

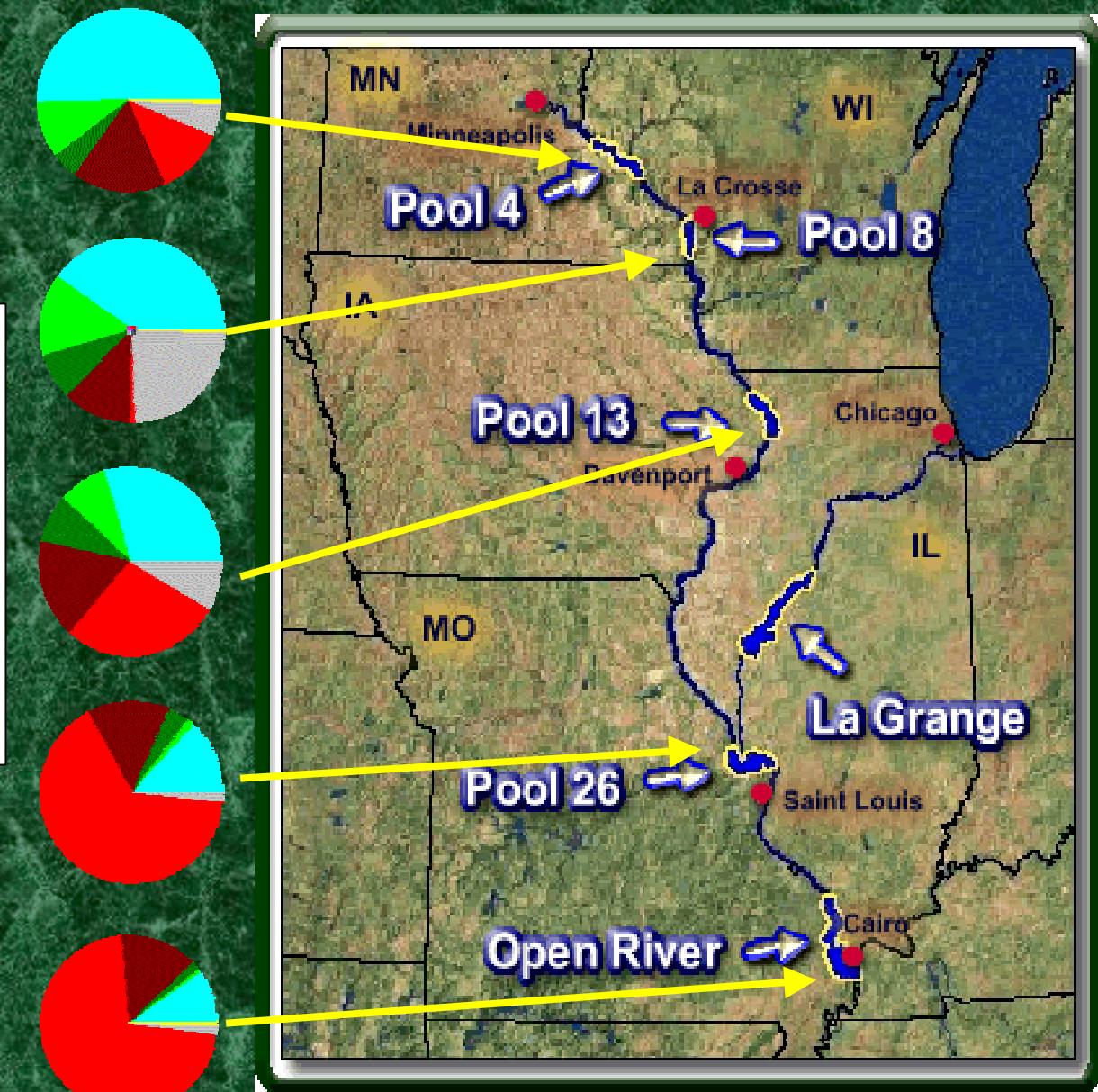
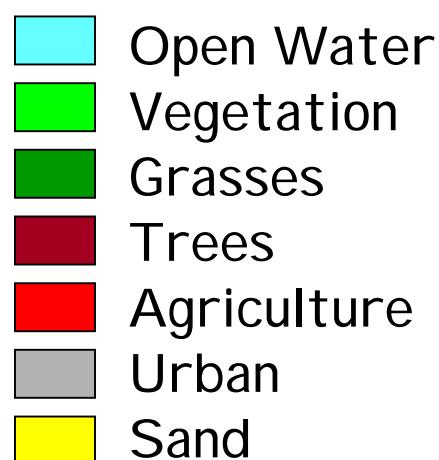
- No statistically significant overall linear trends were detected in the estimated mean densities of mayflies, fingernail clams or midges across years.



- Estimated mean densities differed significantly among study area for mayflies, fingernail clams & midges.



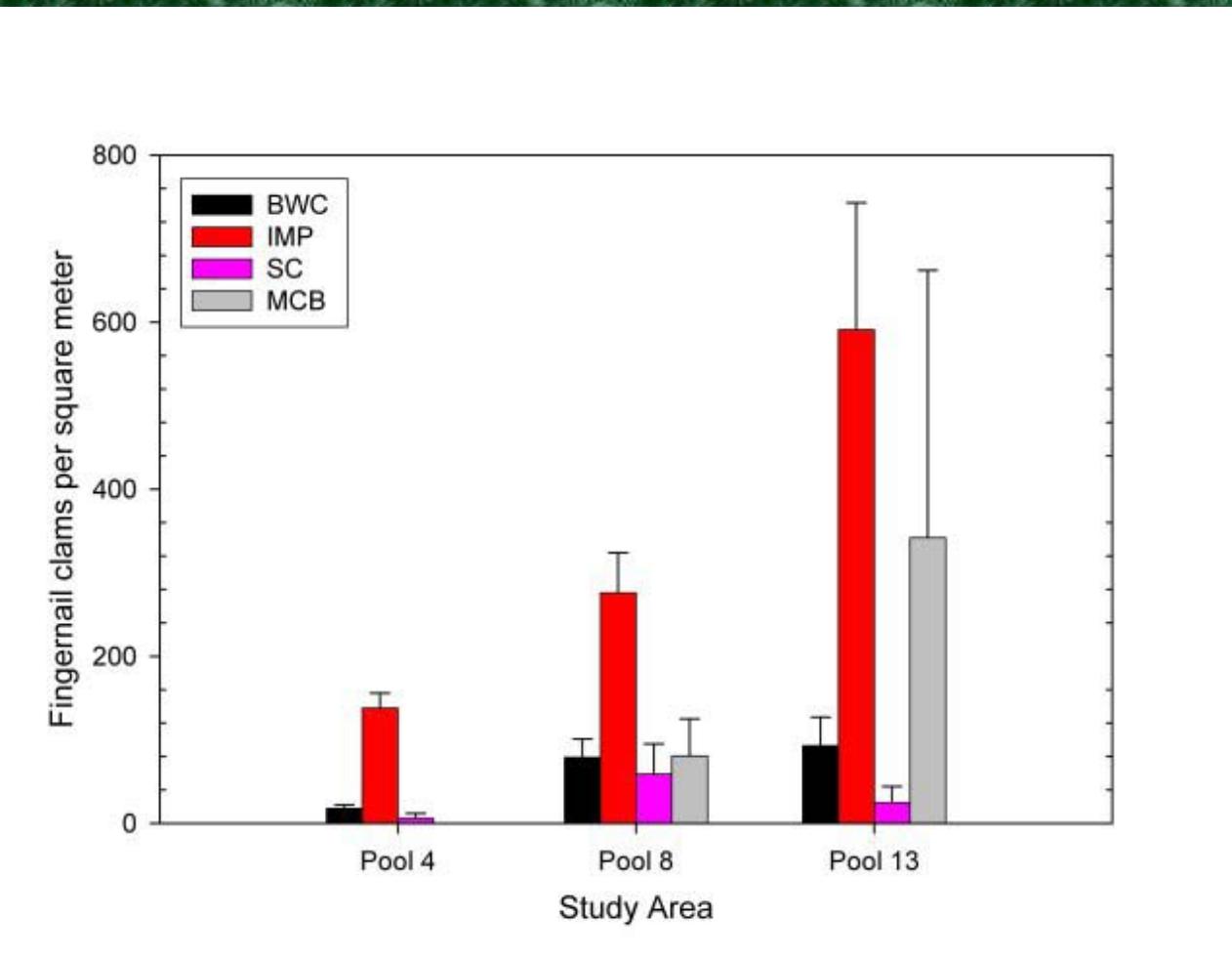
Land cover/Land use



From Lastrup & Lowenberg 1994

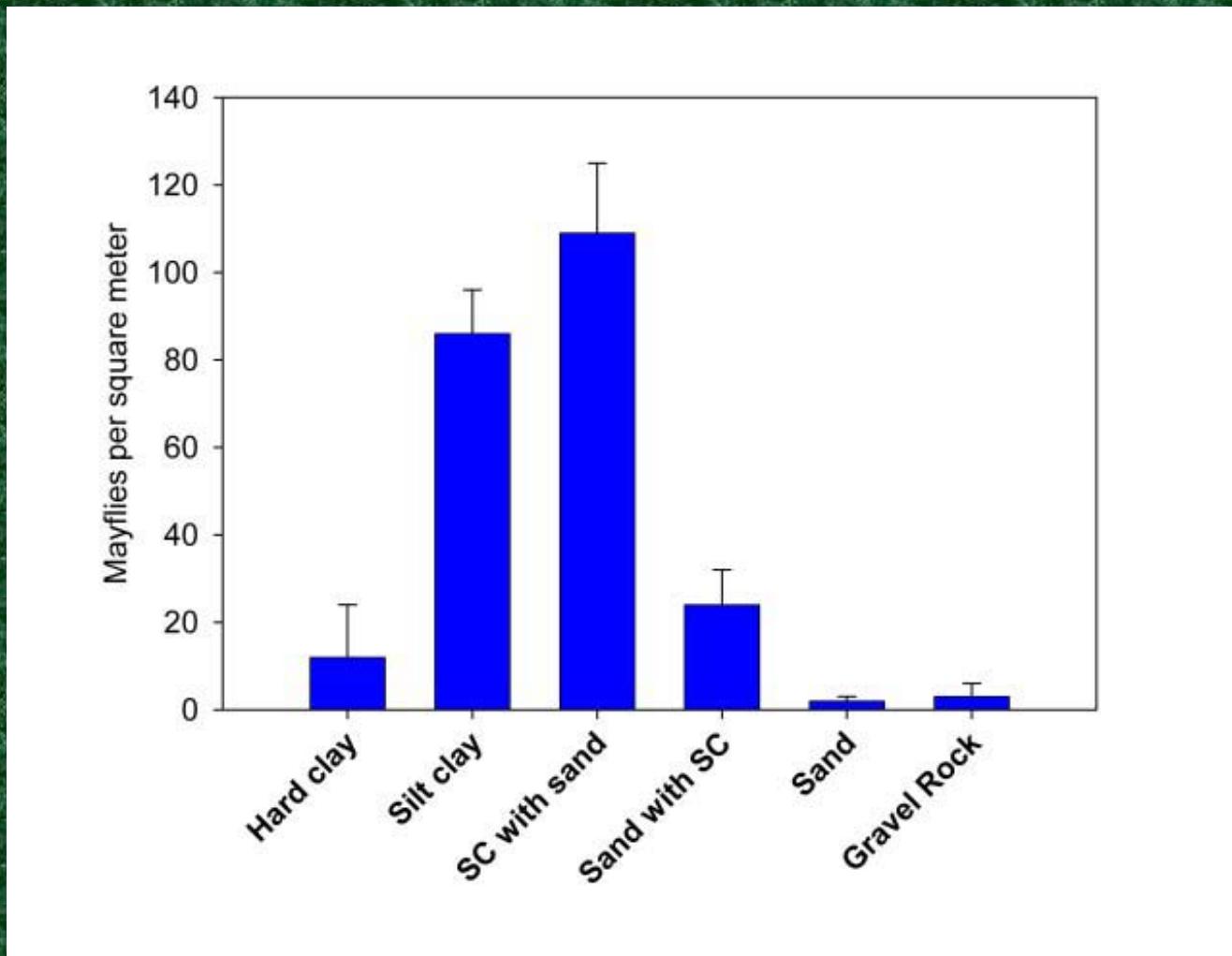
Other findings

- The impounded aquatic areas (including Lake Pepin) tended to support higher numbers of mayflies, fingernail clams, and midges.



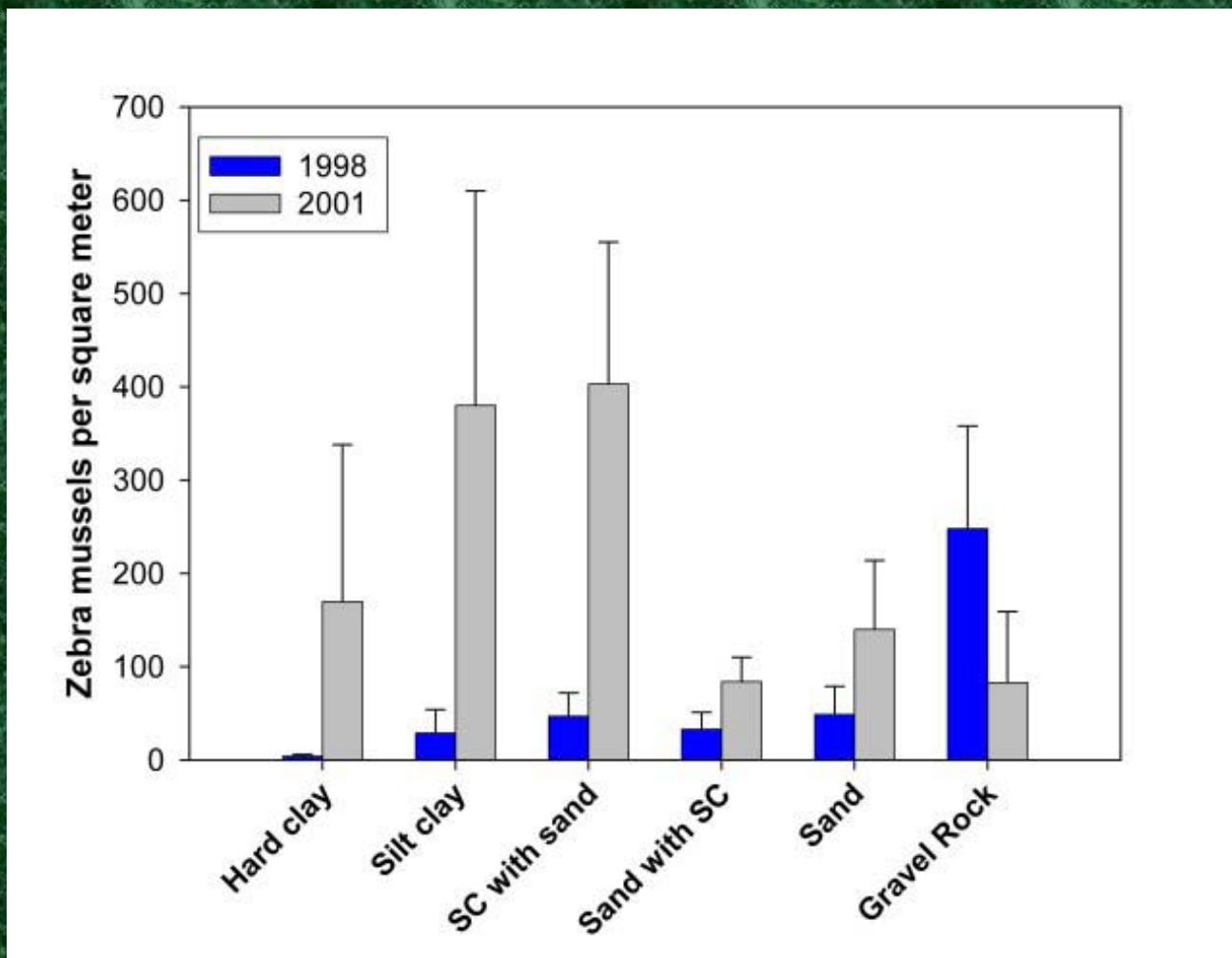
Other findings

- Silt/clay substrates tended to support higher numbers of mayflies, fingernail clams, and midges.



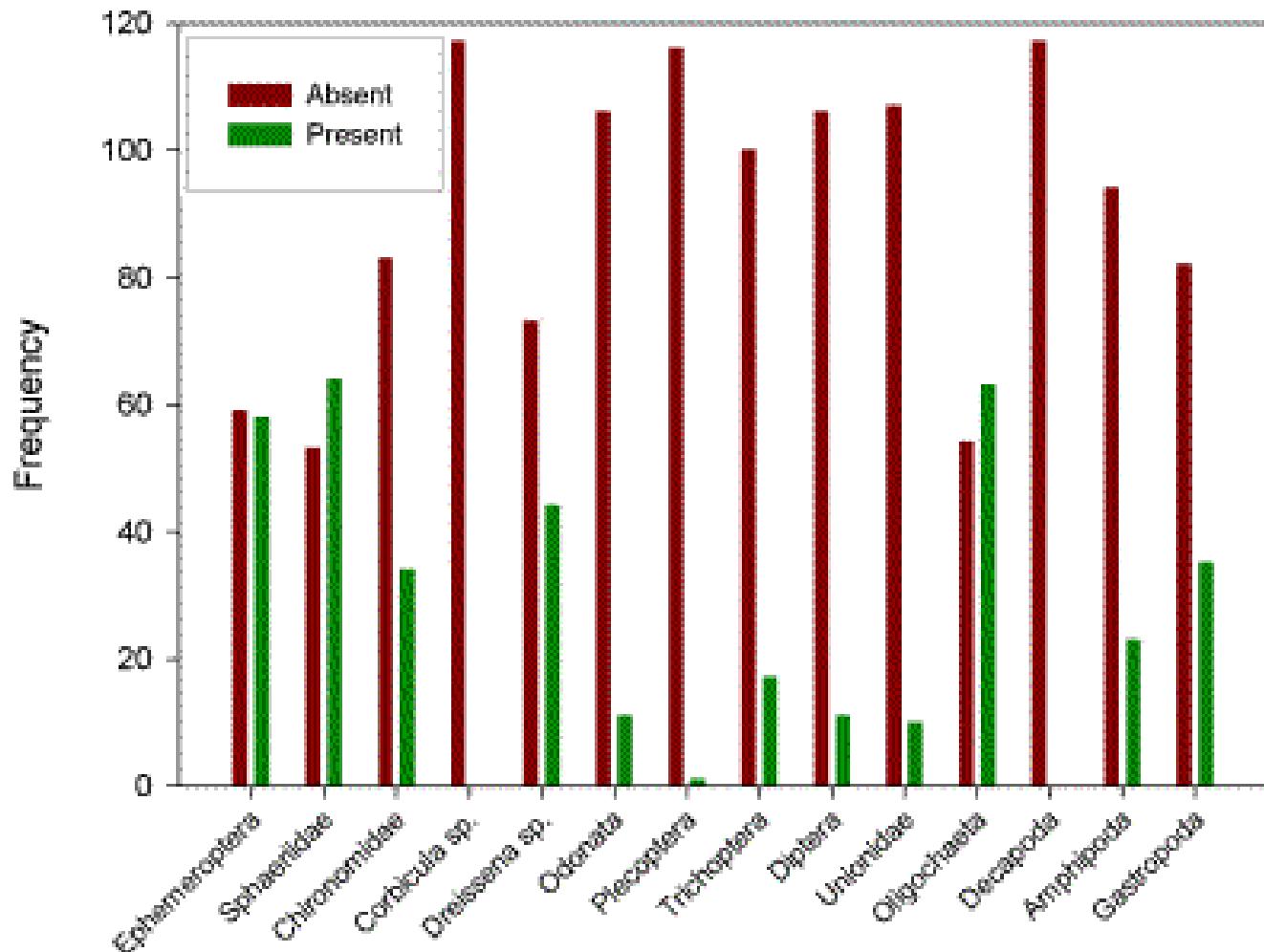
Other findings

- Zebra mussel distribution and substrate



Other findings

Pool 13 - Year 2001



Modeling efforts

To help explain temporal
and spatial patterns

Pool 4; Lake Pepin

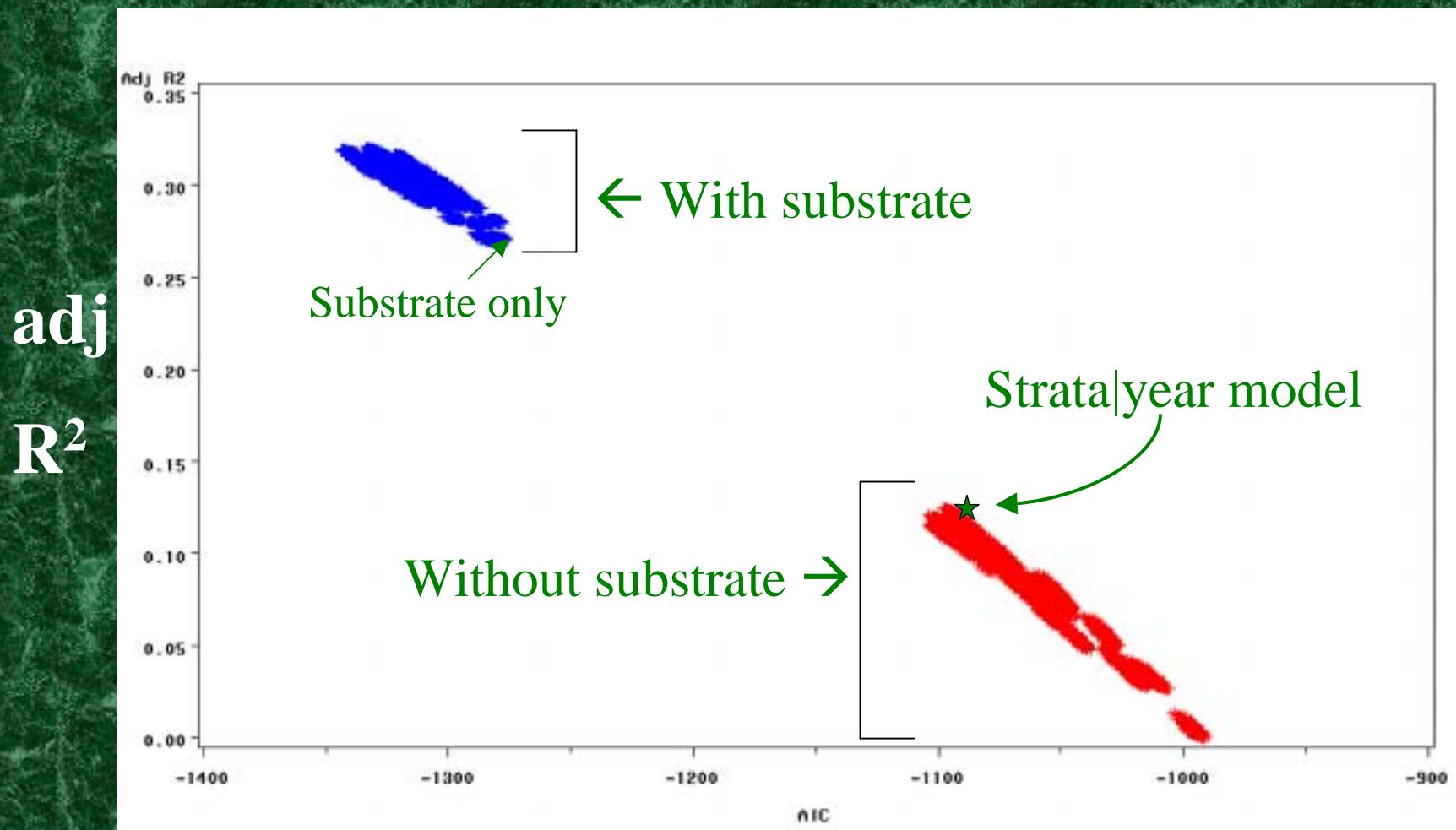
Individuals in a Ponar

- █ Mayflies = 1-20
- █ Mayflies > 20

Methods

- Predictors: *a priori*, from literature
 - DO, particle size, p(freezing), [food], [nutrients], macrophyte biomass, competition and predation
 - Surrogates: depth, avail winter water depth, % sed moisture, annual summer low discharge, annual max discharge, wind-wave resuspension

Substrate → better model



AIC

Where do we go from here...

- Continue modeling efforts
- Evaluation of LTRMP macroinvertebrate component
 - Are we reaching our objectives?
 - Do we need to modify the current design?
 - What other taxa are of interest to managers (e.g., mussels)
- Explore using macroinvertebrates as indicators of ecosystem health on a Large River.