US EPA ARCHIVE DOCUMENT

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

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Jennifer Sauer
Upper Midwest Environmental Sciences Center

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

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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
- Illinois DNR
- Illinois NHS
- Missouri DOC
- Iowa DNR

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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.**

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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

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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.

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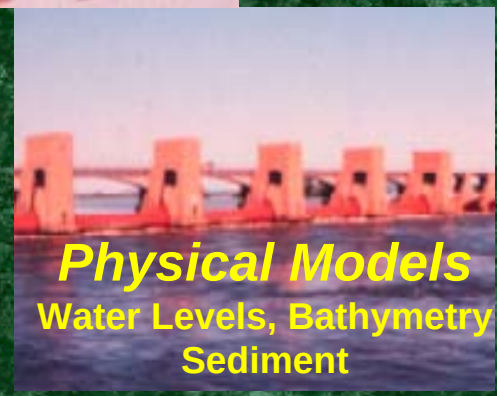
Long Term Resource Monitoring Program Components



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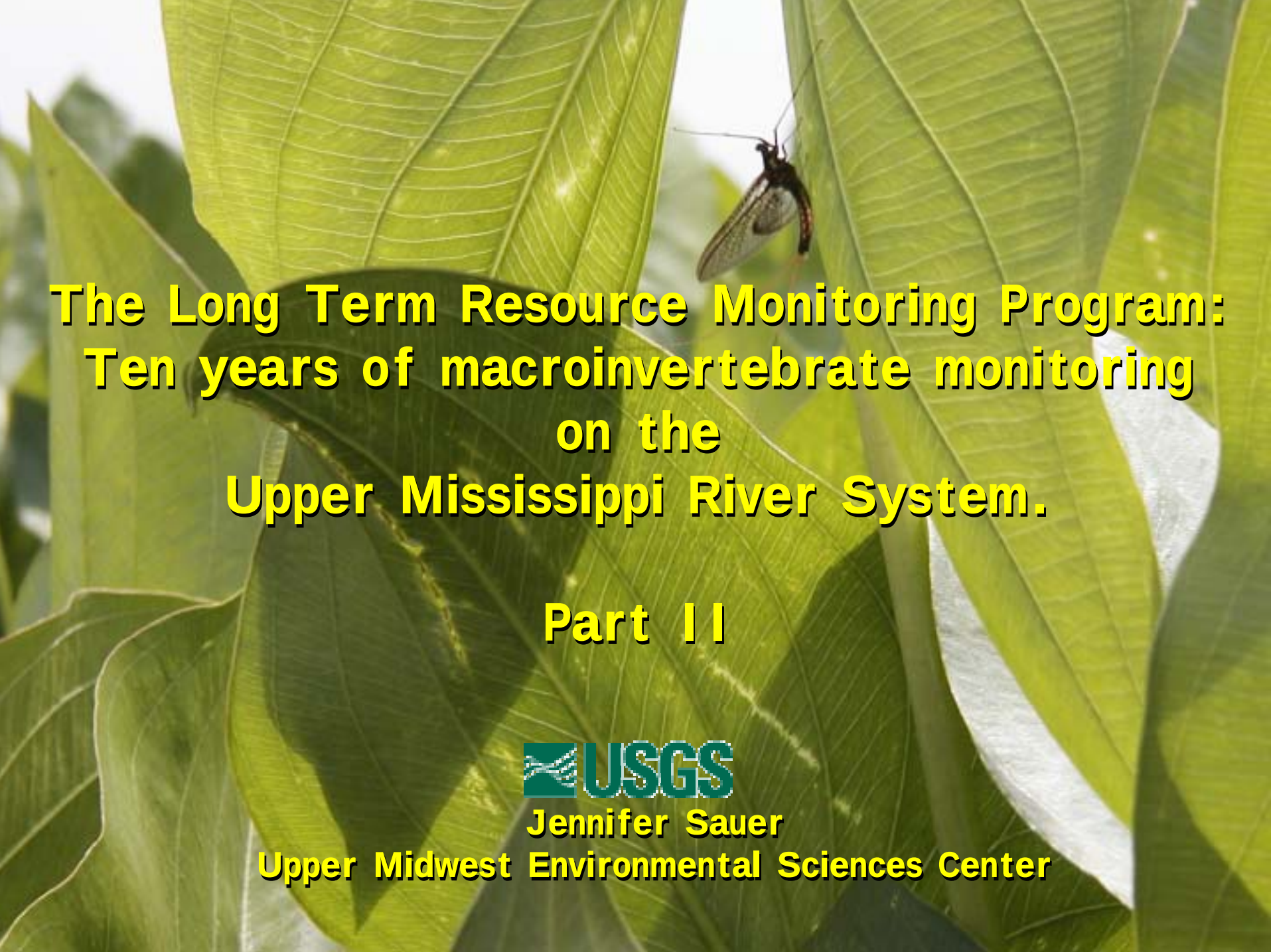

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Part II

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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.

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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.**

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

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Presence/absence is noted on other taxa.

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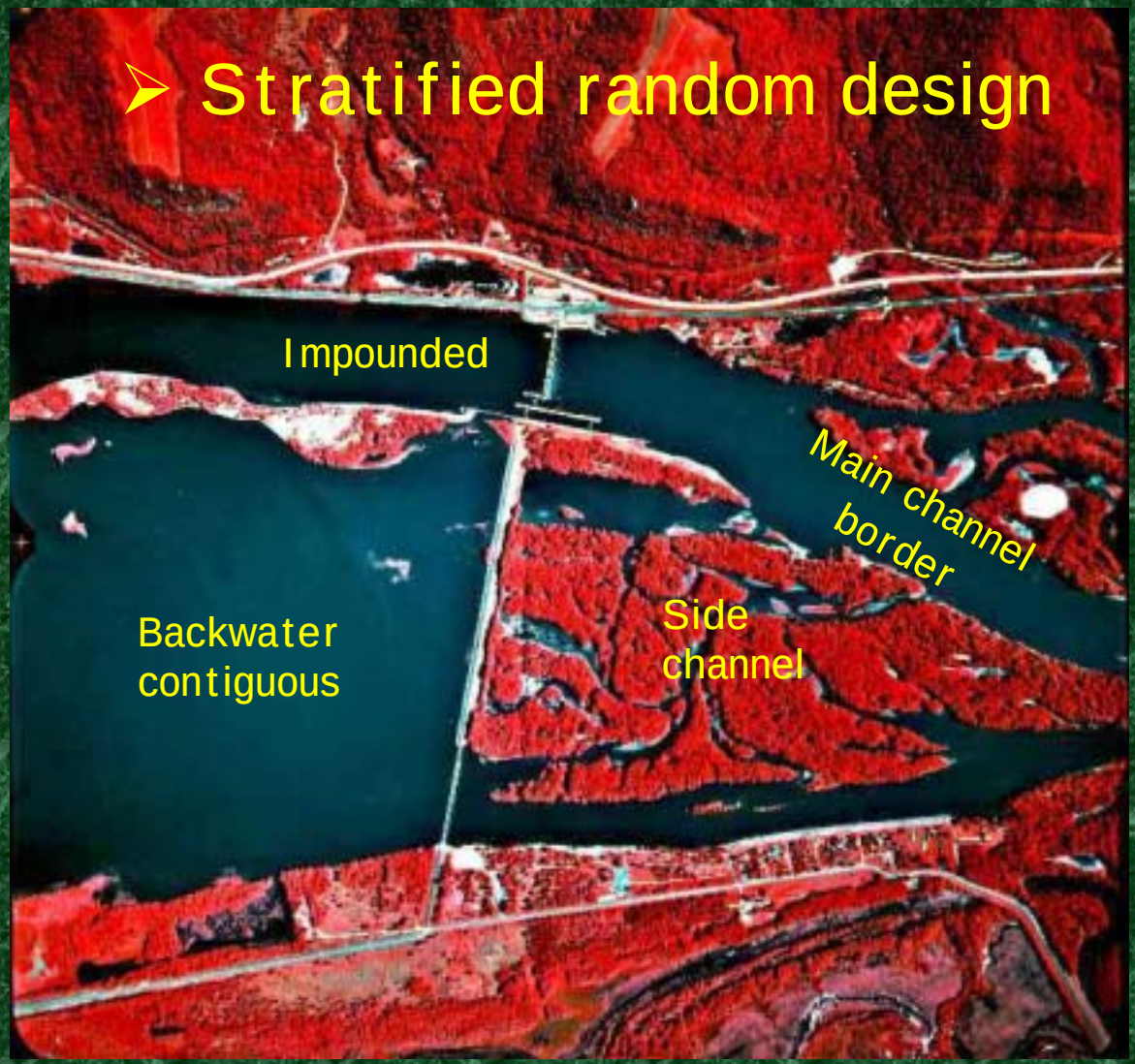
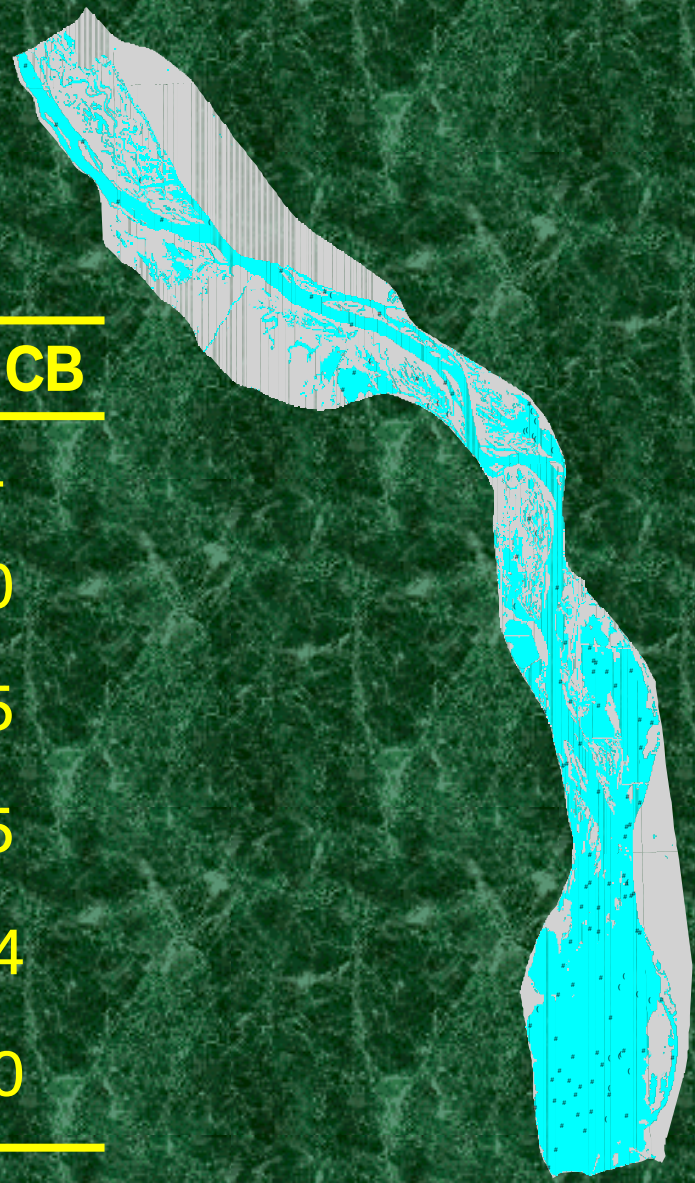
Methods


Stratified random design
Impounded
Main channel border
Side channel
Backwater contiguous

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



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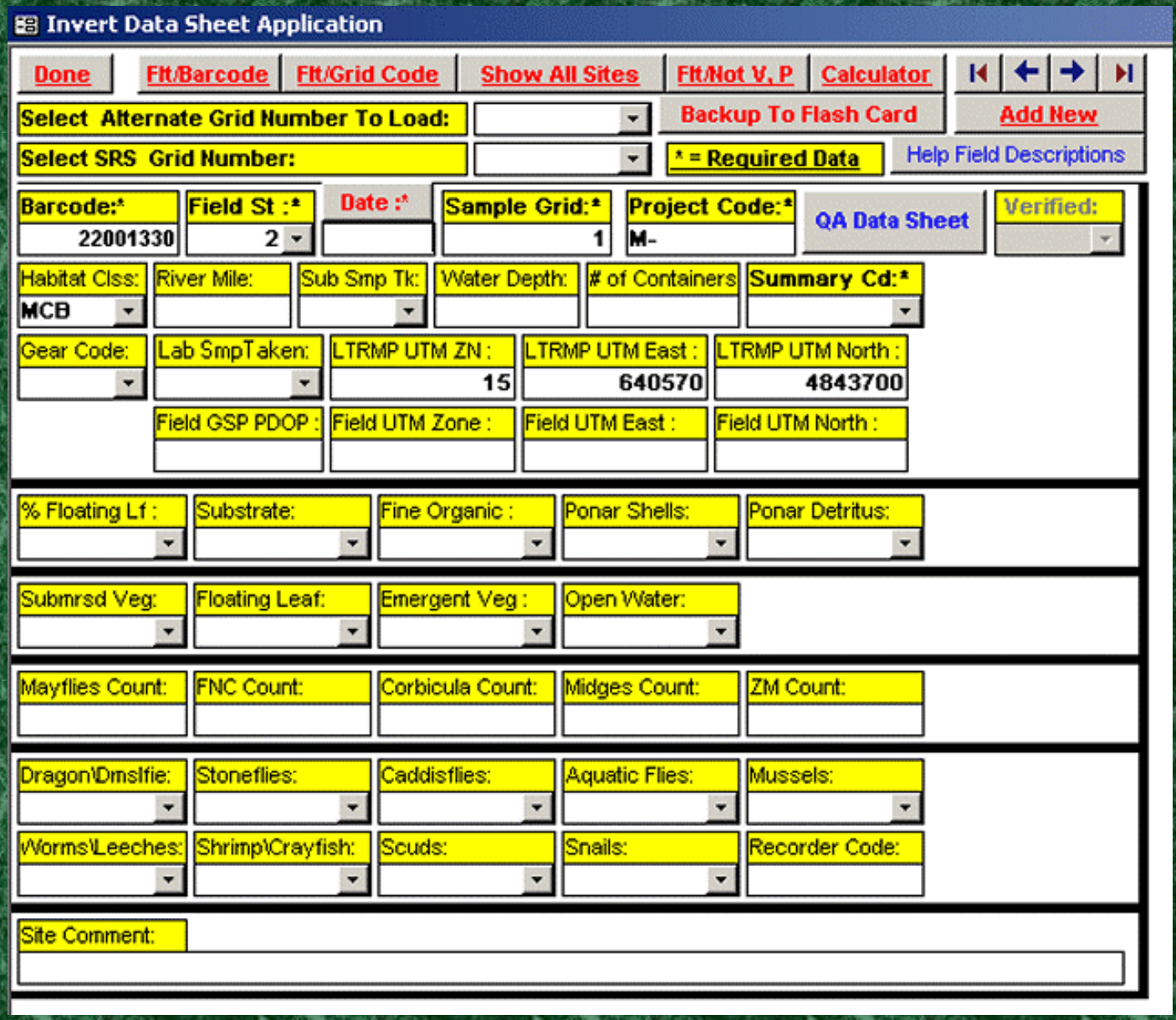
Methods

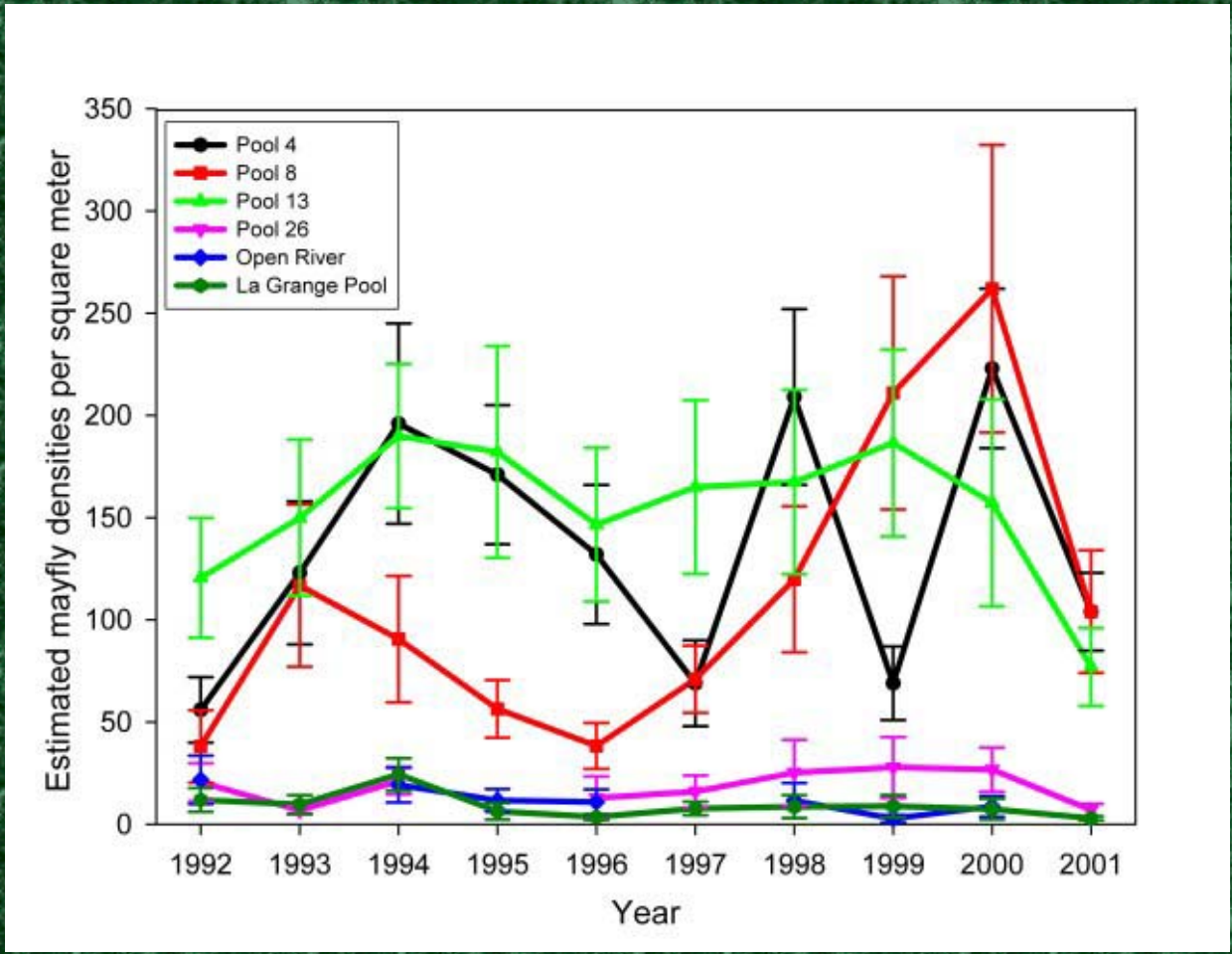
- All samples picked in the field in the spring.
- Standard Ponar grab
- Wash frame mesh size 1.18 mm

- About 10% are brought back to the lab for QA/QC.

Electronic Data Entry



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



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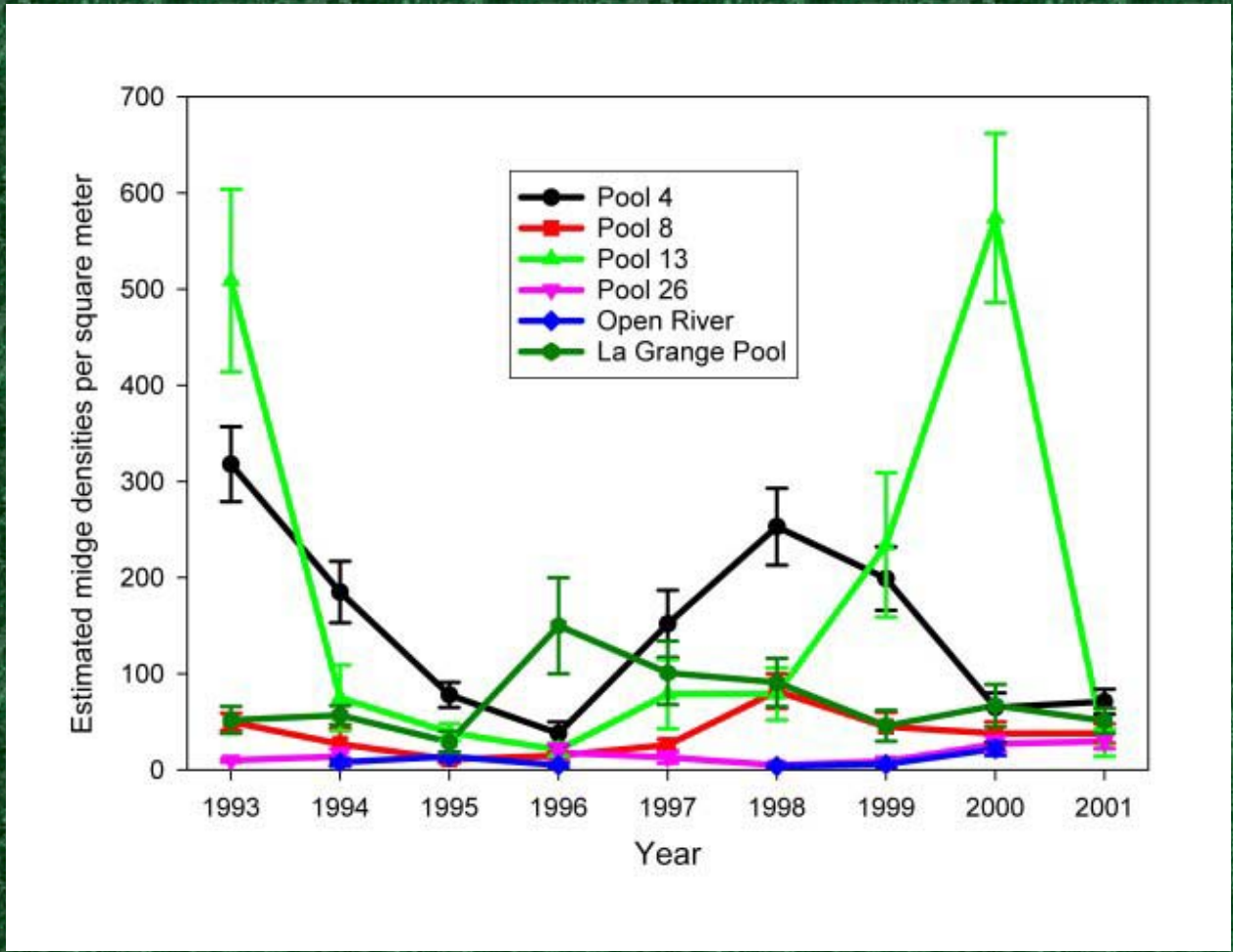
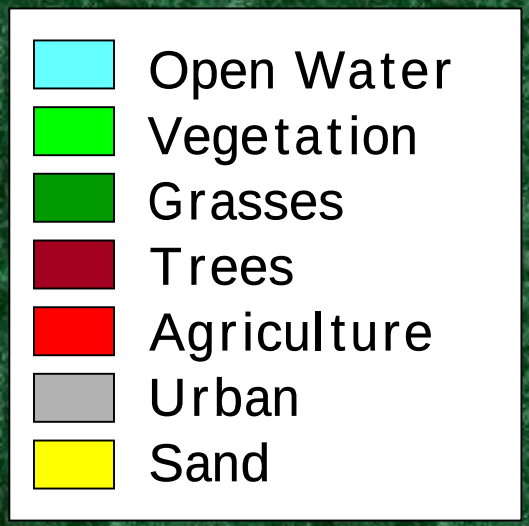
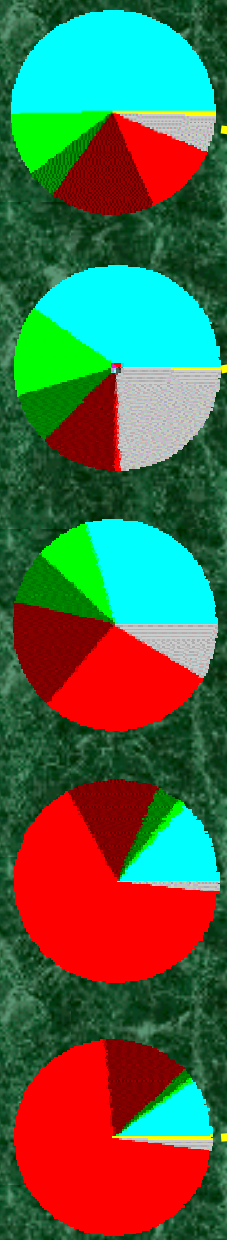
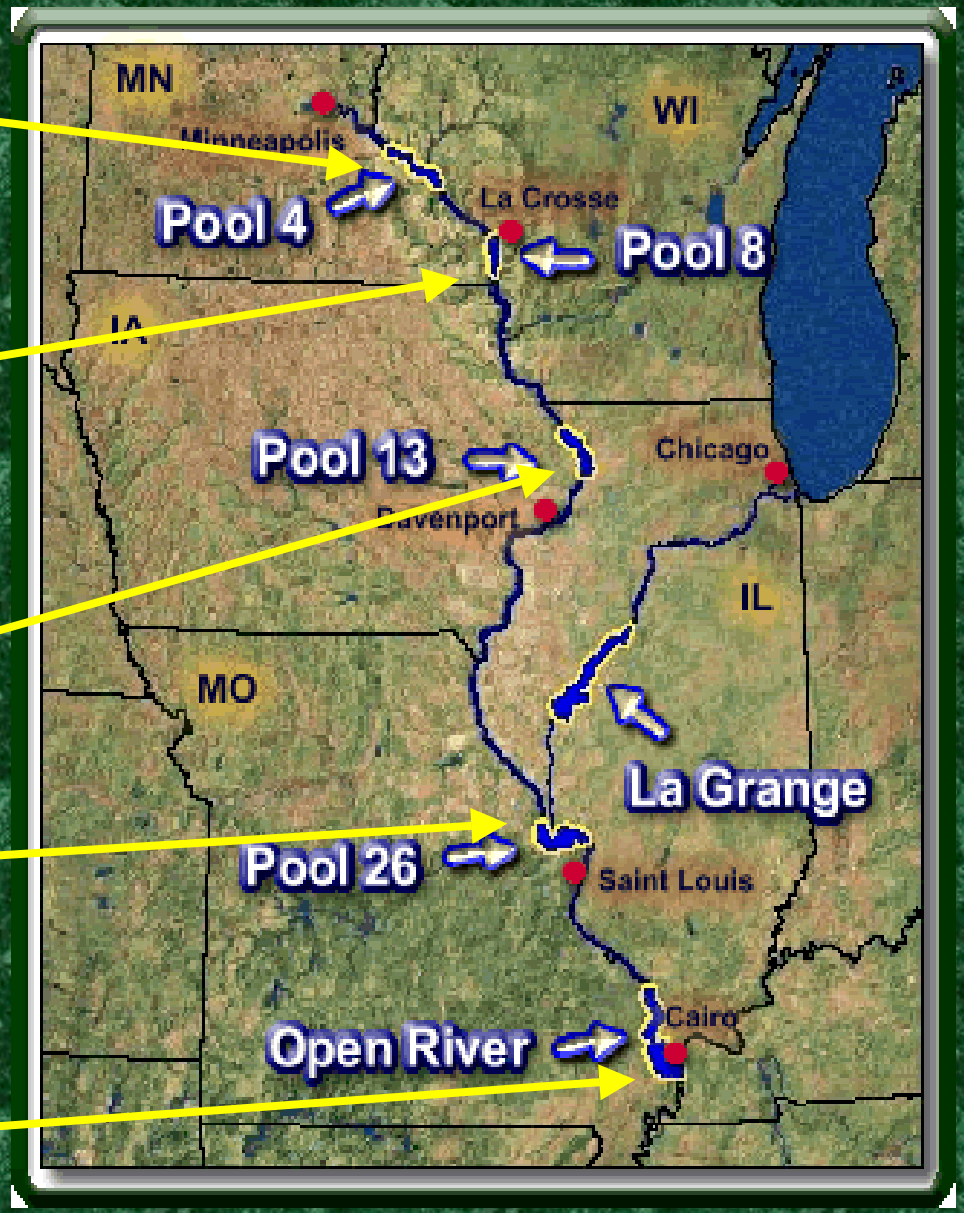
- **Estimated mean densities differed significantly among study area for mayflies, fingernail clams & midges.**



Land cover/Land use



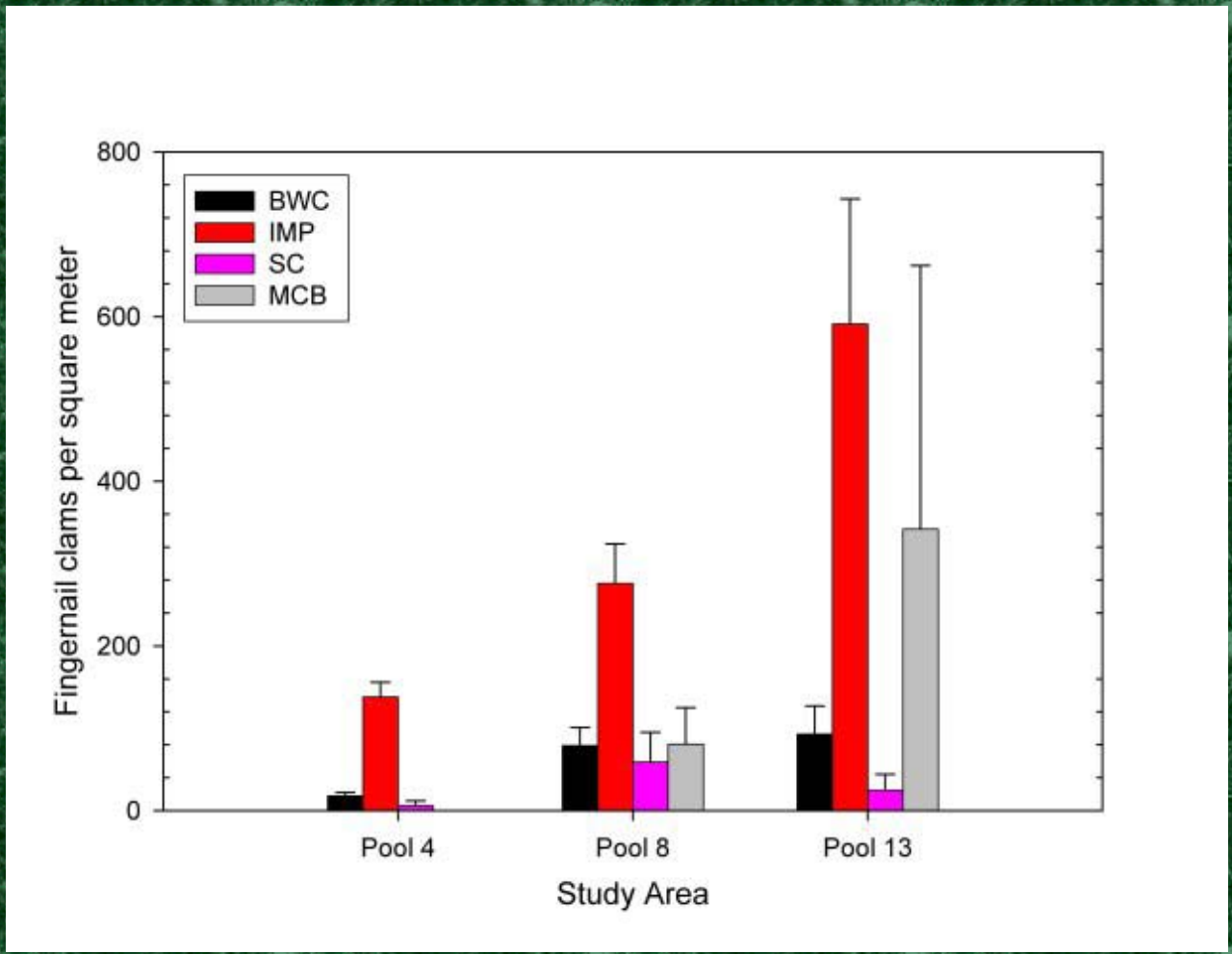




From Laustrup & Lowenberg 1994

Other findings

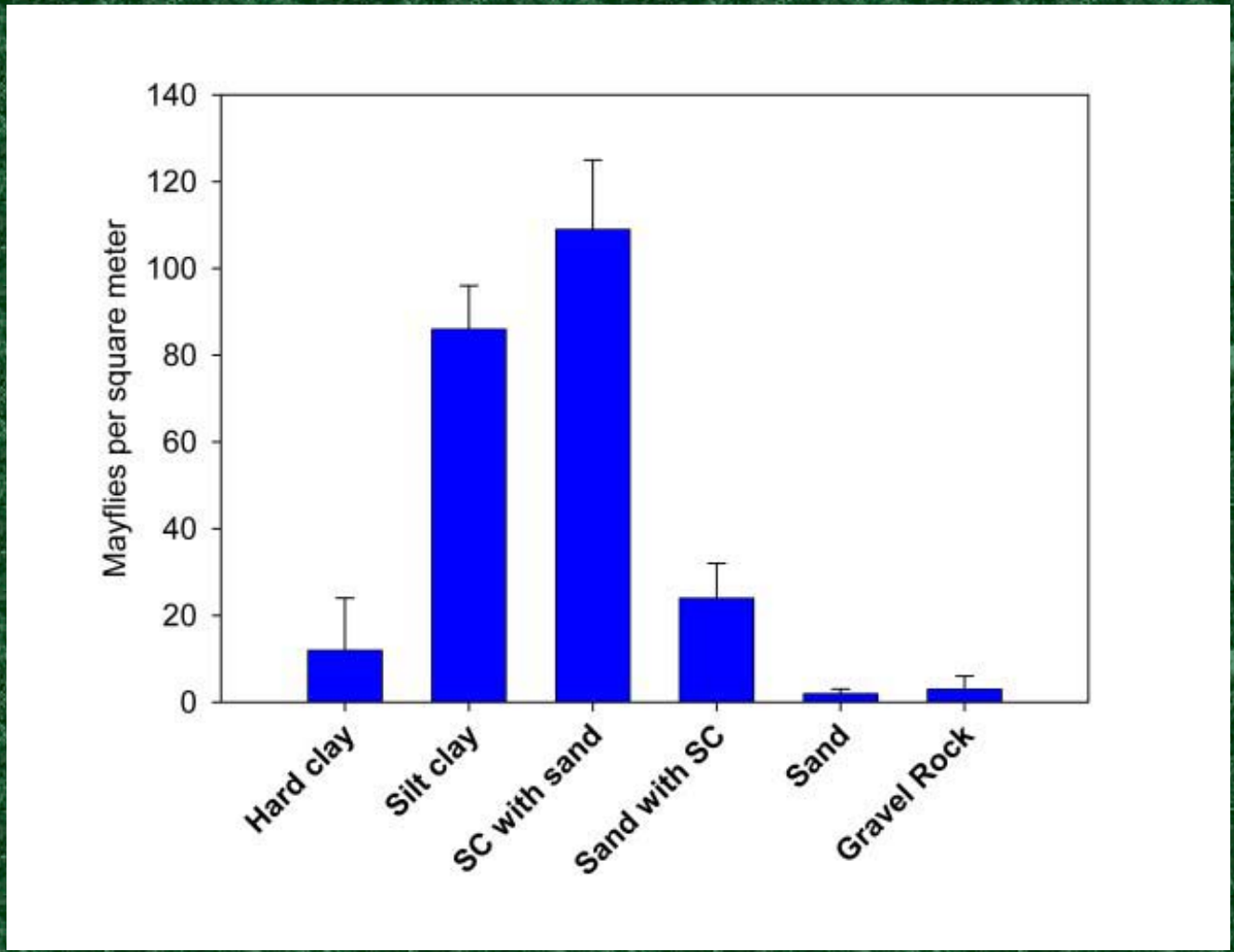
- The impounded aquatic areas (including Lake Pepin) tended to support higher numbers of mayflies, fingernail clams, and midges.



2001

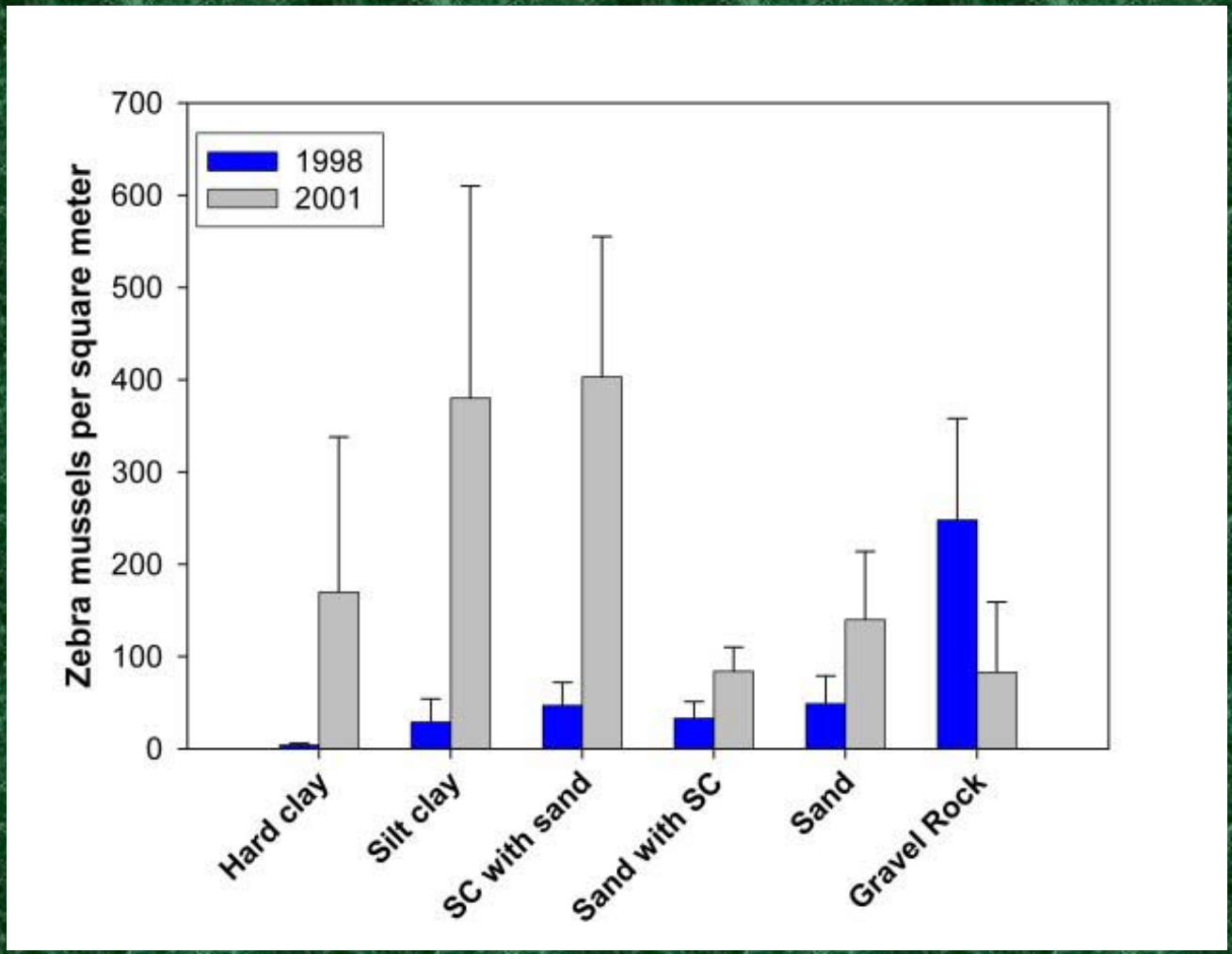
Other findings

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

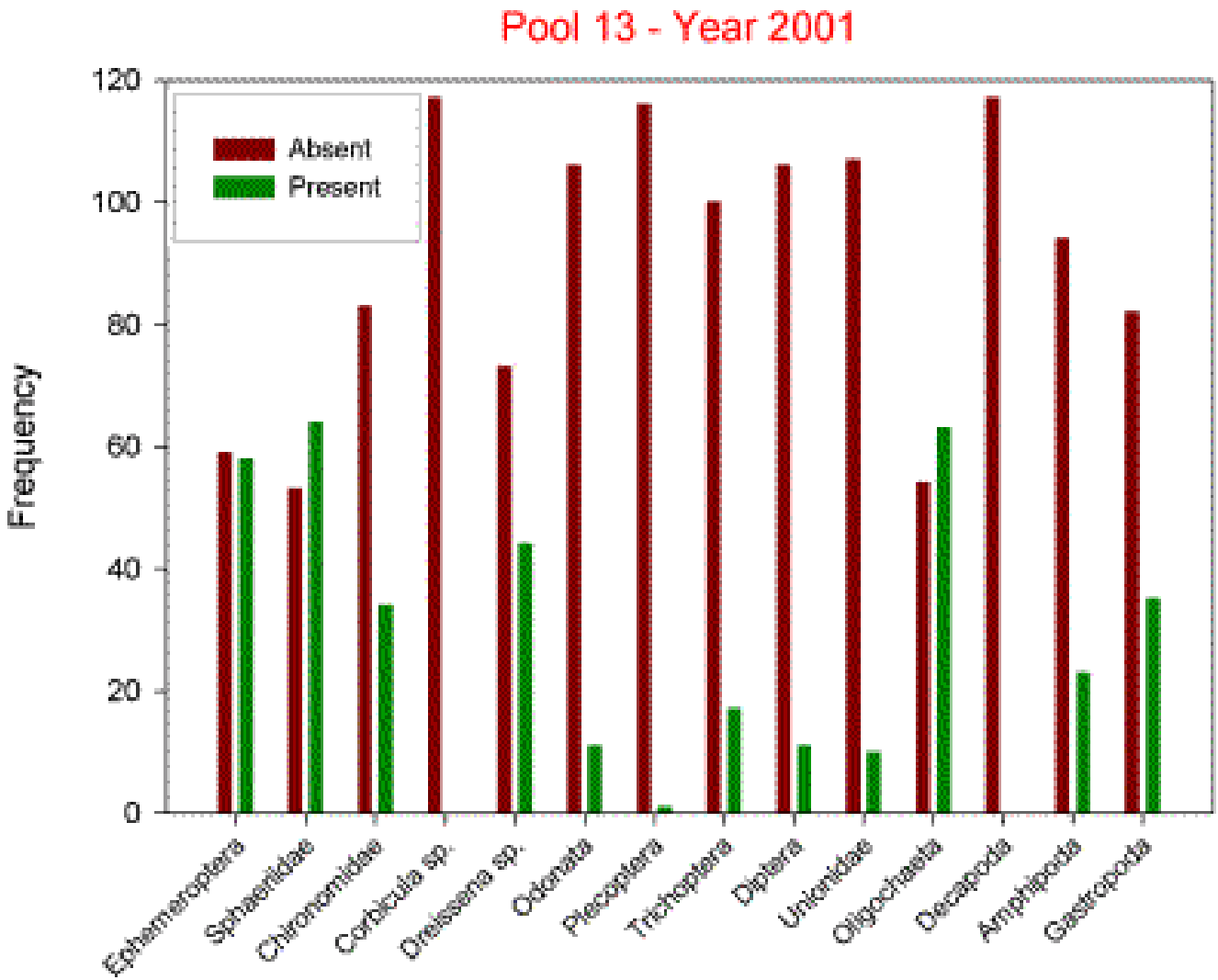


Other findings

- Zebra mussel distribution and substrate

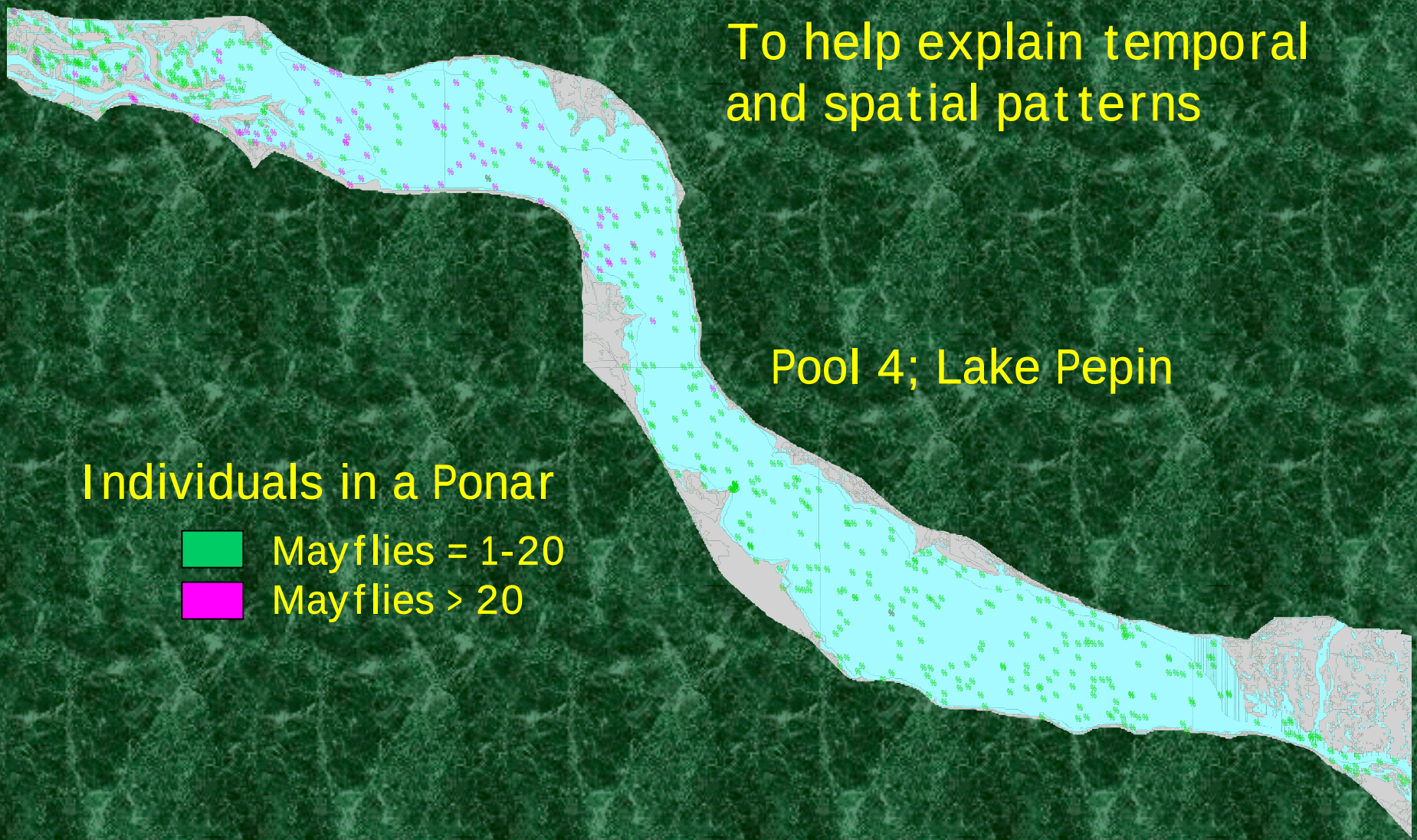


Other findings



Modeling efforts

To help explain temporal and spatial patterns



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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

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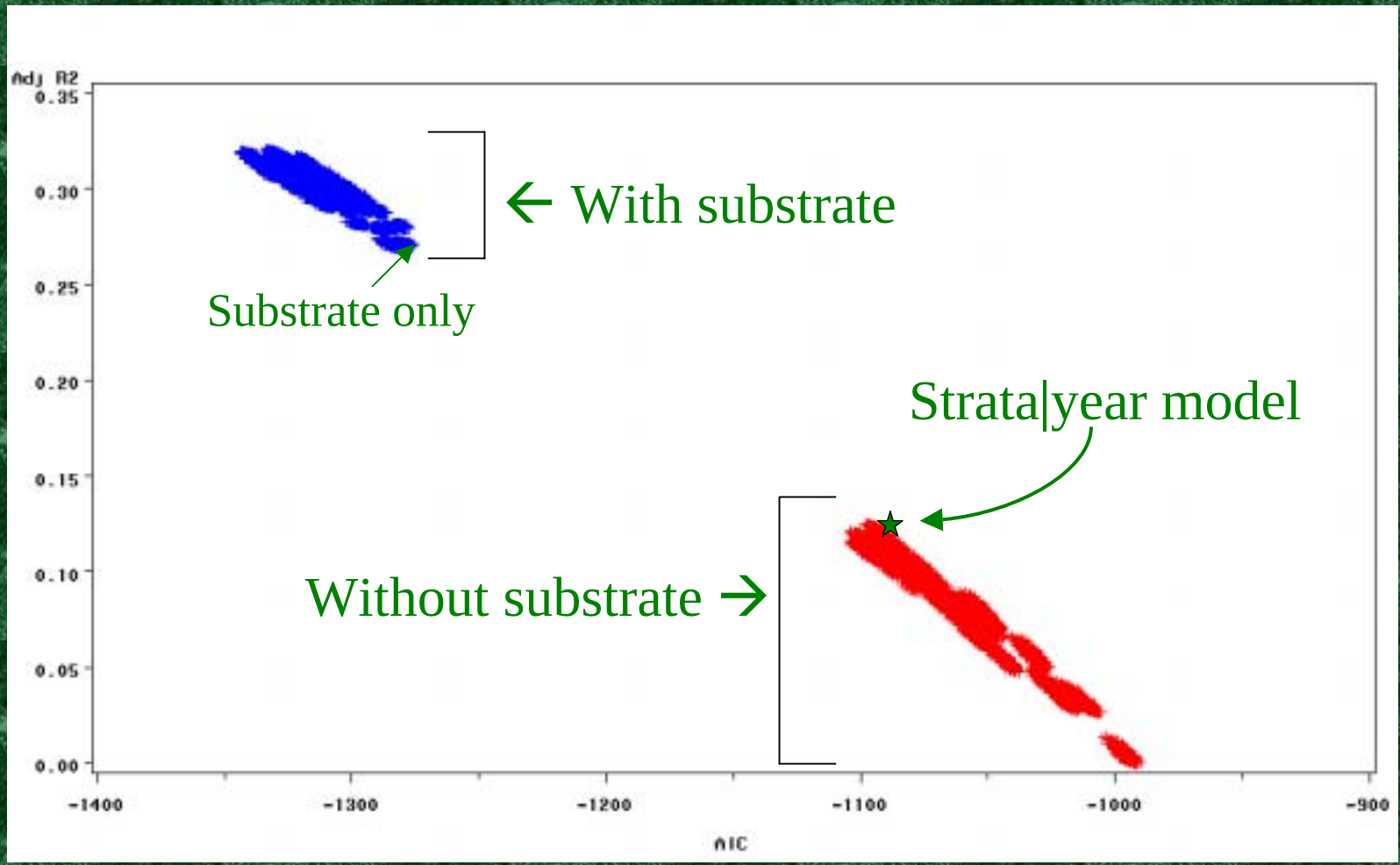
Substrate → better model



adj R^2

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.