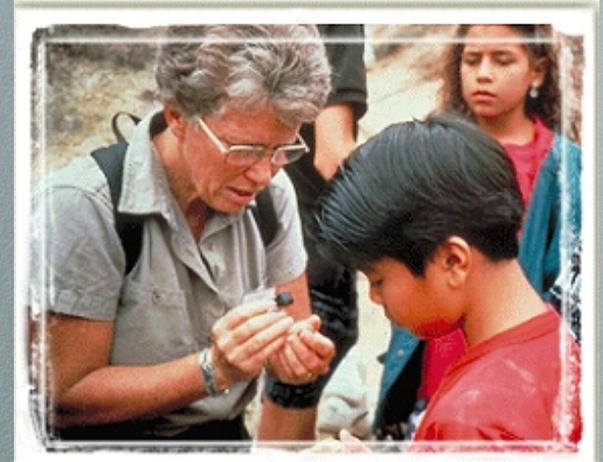




# U.S. Geological Survey



- Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment.

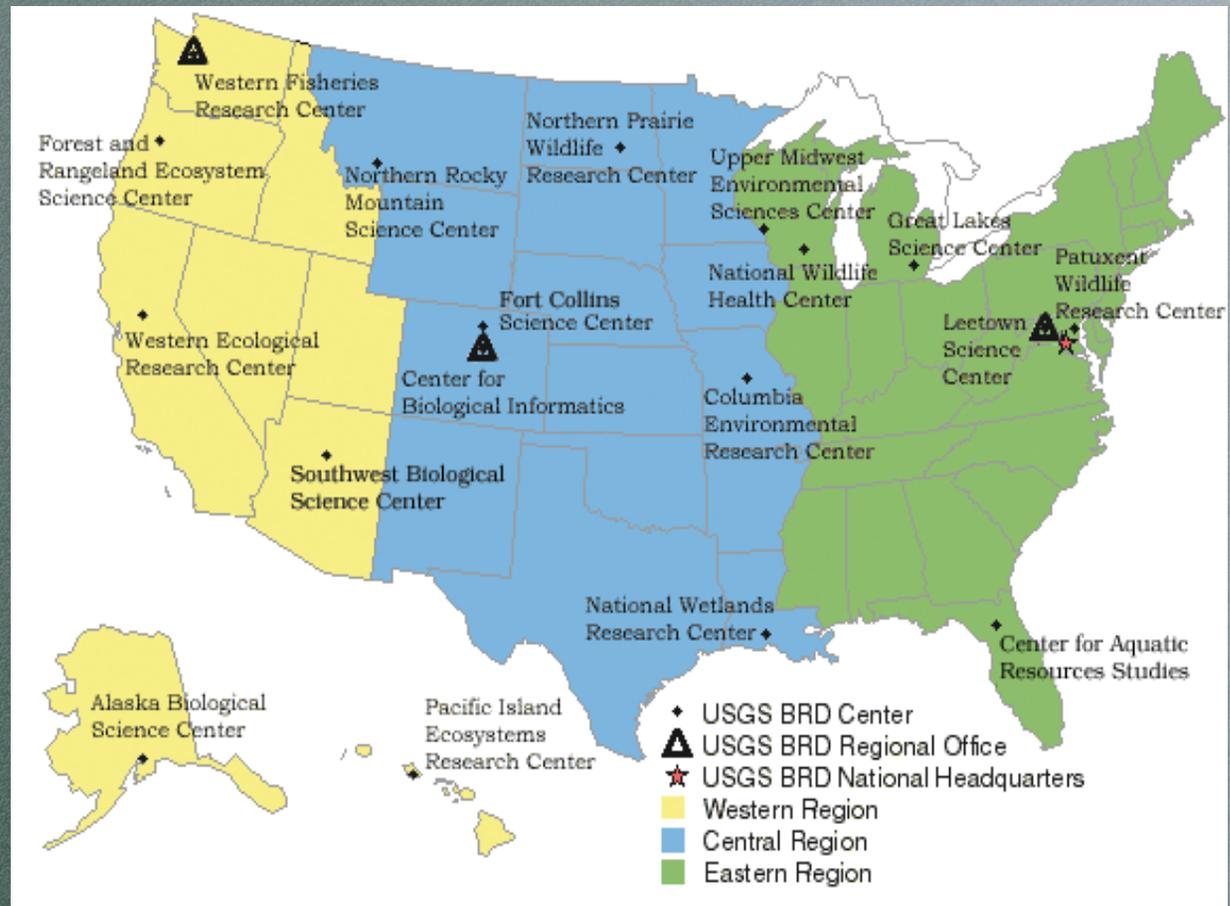


- Four disciplines of science: Biology, Geology, Geography, Water
- Provides Scientific support to the Department of Interior agencies that manage natural resources, such as the U.S. Fish & Wildlife Service, National Park Service, and Bureau of Land Management.
- Conducts cooperative research and monitoring with numerous federal and agencies, universities, and NGOs
- Base funding from USGS supplemented by reimbursable agreements



# U. S. Geological Survey... Biological Research Division

Biology has  
18 research  
& technology  
Centers  
across  
the Nation.



# Upper Midwest Environmental Sciences Center



# Upper Midwest Environmental Sciences Center



- Biological research center in La Crosse, WI
- Cooperate with 5 states to manage 6 field monitoring stations
- Employ nearly 150 people

• Conducts research on biological resources of the Upper Midwest, Upper Mississippi River, and Great Lakes ecosystems.

• Scientific expertise on large river ecology & monitoring, declining species, invasive species, restoration of degraded habitats, and decision support systems.



# UMESC Core Science Activities

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1. Upper Mississippi River System Monitoring and Analysis - Long Term Resource Monitoring Program (LTRMP)
2. Large River Ecosystem Processes
3. Invasive Species
4. Restoration of Declining Species (amphibians, mussels, fish, migratory birds)
5. Contaminant Exposure and Effects
6. Development of Decision Support Systems including Geospatial Information and Models
7. Development of Fishery Management Chemicals and Drugs

# Primary Areas of Expertise

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Aquatic Ecology  
Avian Ecology  
Chemistry (*Analytical, Residue, and Water*)  
Freshwater Mussels  
Fishery Biology  
Herpetology  
Invertebrates  
Large River Ecology  
Pharmacology  
Physiology, Fish  
Remote Sensing  
Sediment Dynamics  
Water Quality  
Wildlife/Aquatic Modeling

Aquatic Toxicology  
Bathymetry  
Conservation Biology  
Data Management  
Fish Culture  
GIS  
Invasive Species  
Landscape Ecology  
Nutrient Dynamics  
Photointerpretation  
Plant Ecology  
Telemetry  
Statistics  
Web Development  
Wildlife Toxicology

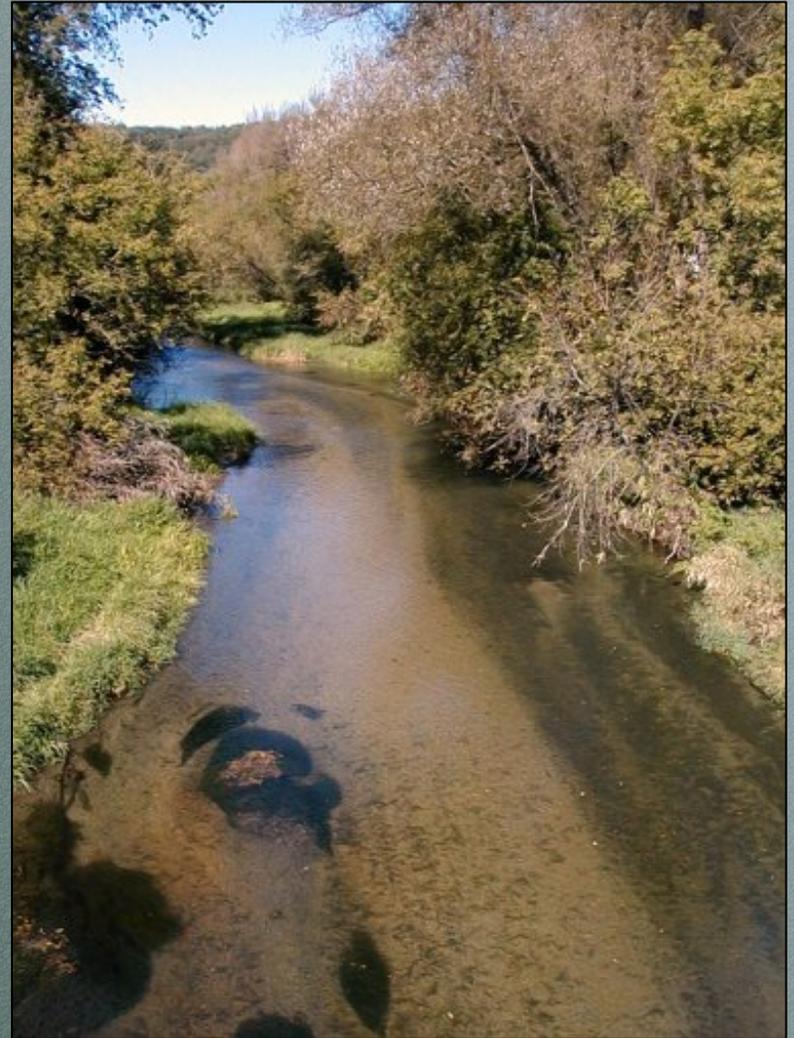
## **In-stream biological characteristics and processes effected by agriculture and measurable by UMESC:**

**Productivity and growth of algae and plants (including undesirable and harmful species);**

**Respiration of bacteria, primary producers, etc. (at times leading to hypoxia and anoxia);**

**Reduction in populations of desirable native species;**

**Understanding of these processes can help direct restoration to “swimable and fishable” waters.**



# What is the LTRMP?

**One of the largest river-related monitoring, research, and information-sharing programs in the United States.**

**It was the first large-scale effort to determine the status and trends of critical fish and wildlife, habitats, water quality, and physical components of large rivers**

# Long Term Resource Monitoring Program

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**USGS - UMESC**

is the science leader for the  $\approx$  5 million dollar program

- Part of EMP (Environmental Management Program) administered by USACE
- Monitoring, Focal Research, Data Management, Analysis and Evaluation
- 5 State Partnerships
- > 20 years of monitoring data on river productivity and function (fish, water quality, aquatic vegetation and macroinvertebrates)



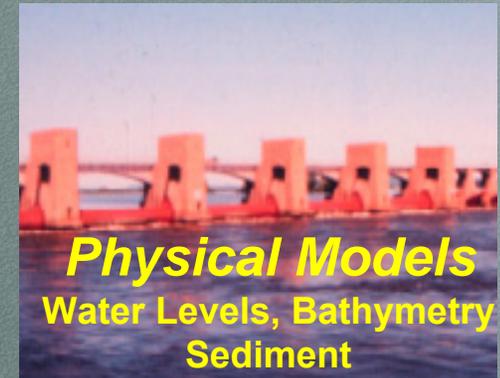
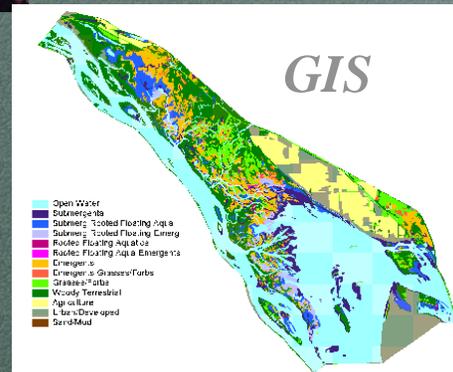
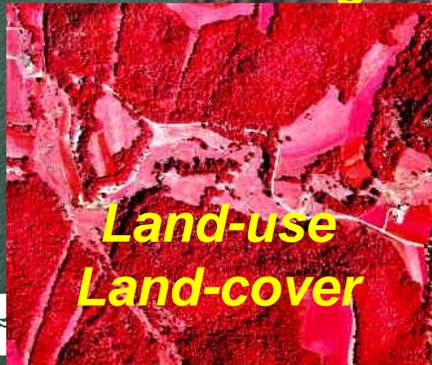
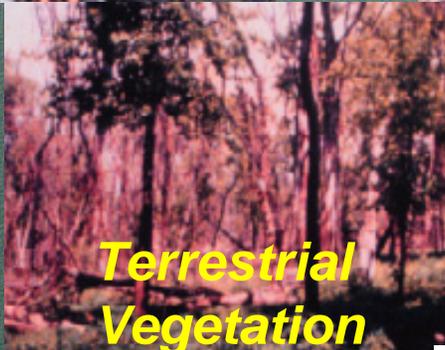
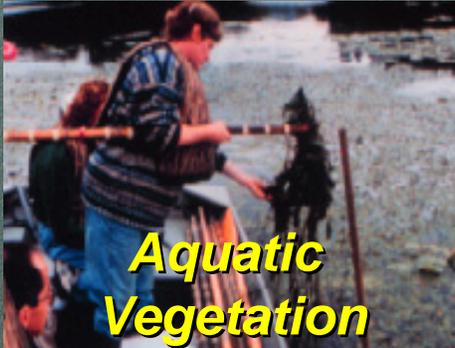
# LTRMP Partners

USACE  
USFWS  
USGS  
Dept. of Agriculture  
Dept. of Transportation  
EPA  
Minnesota DNR  
Wisconsin DNR  
Illinois DNR  
Illinois NHS  
Iowa DNR  
Missouri DC



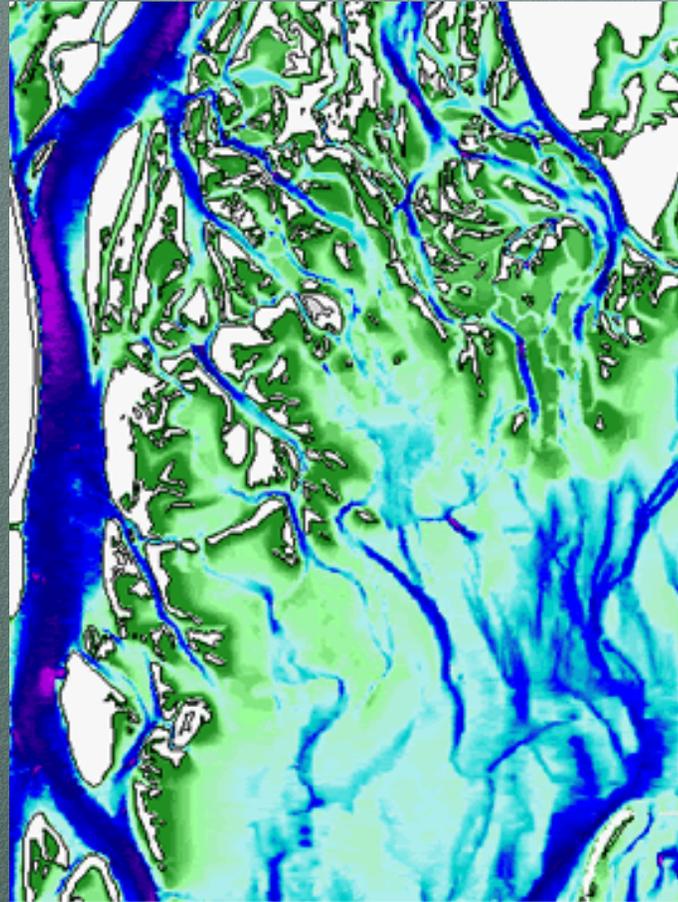
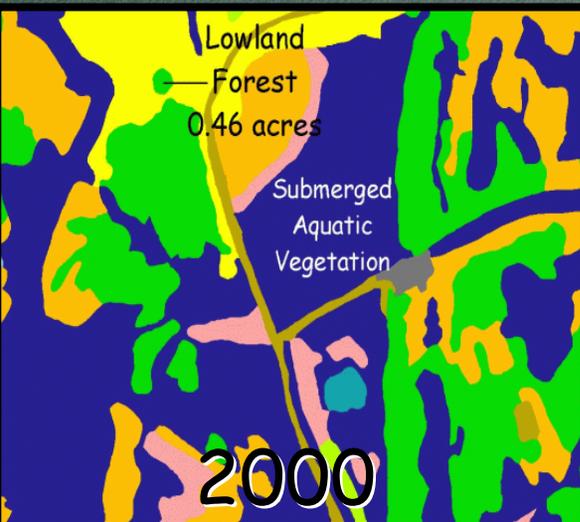
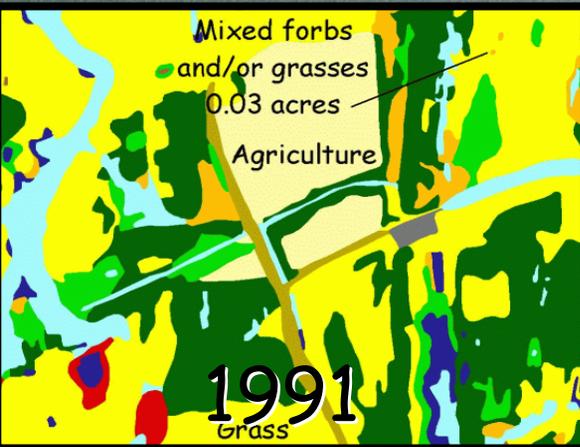
Six state-operated field stations  
have been established for  
data collection

# Long Term Resource Monitoring Program Components



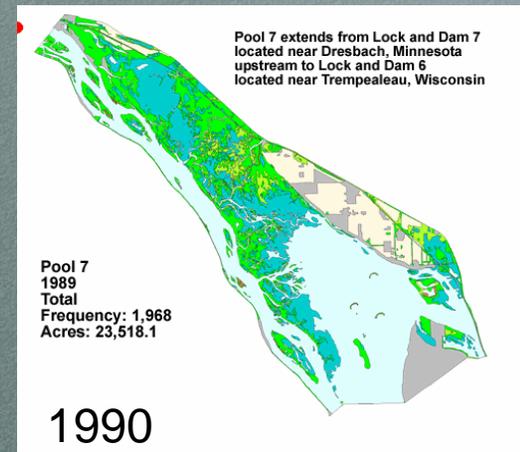
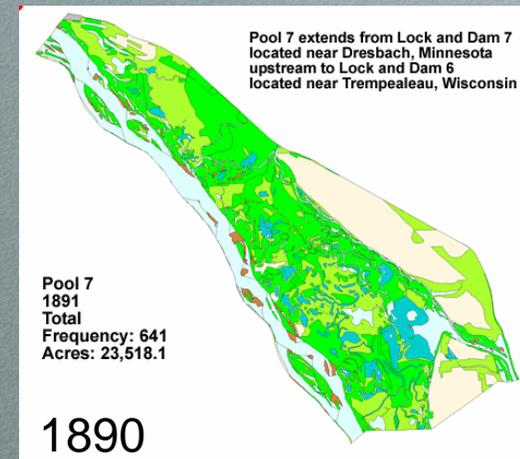
# Data Platforms Essential for Big Picture: Space and Time

## Recent LCLU

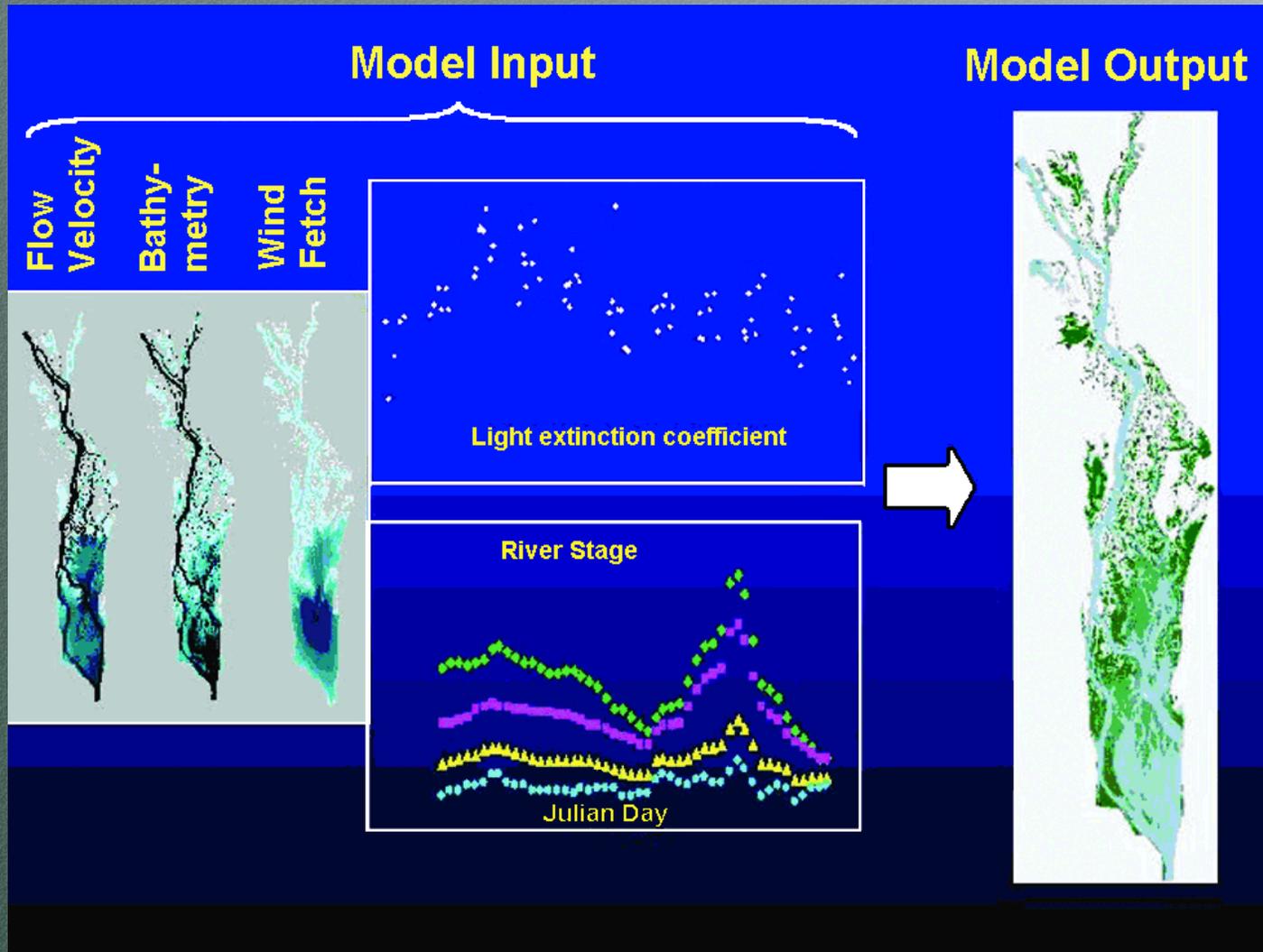


## Bathymetry

## History



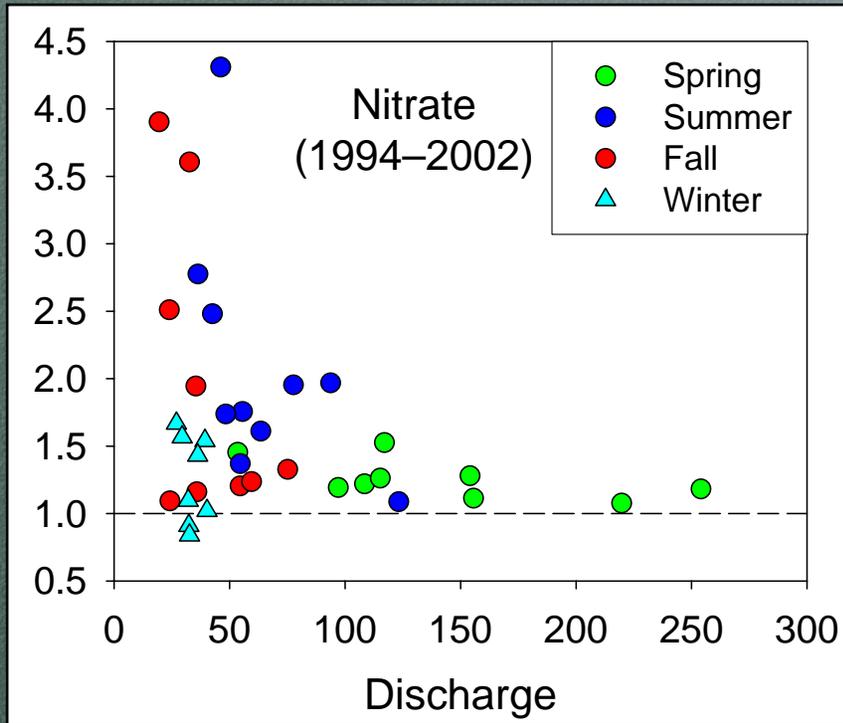
# Aquatic Vegetation Model



Hypothesis: Vegetation occurrence can be predicted from flow velocity, bathymetry, fetch, light extinction and river stage.

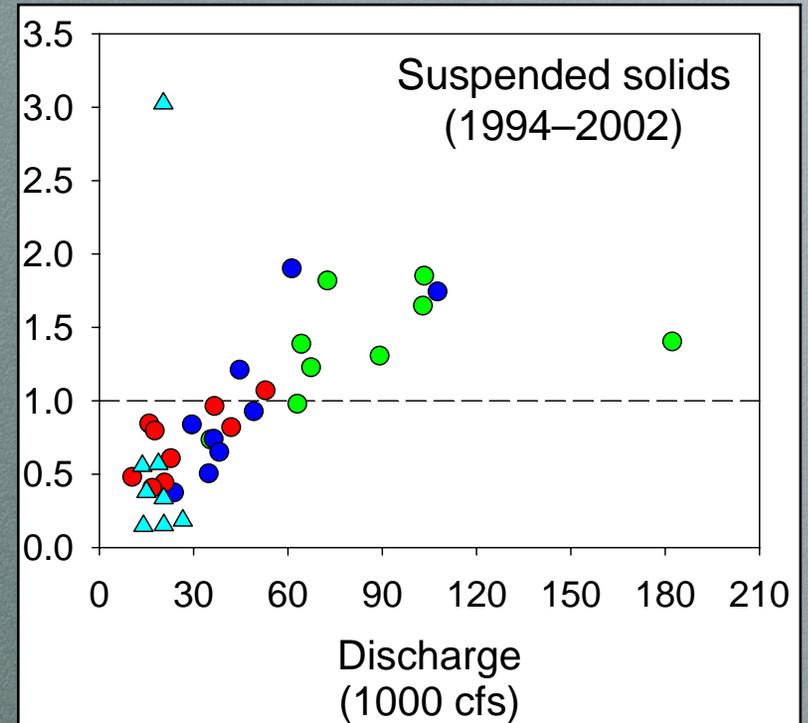
# Differences among strata: Nitrate and Suspended Solids

Main Channel / Backwater  
(>1 indicates higher MC concentration)



Pattern: Nitrate conc. is lower in BW relative to MC

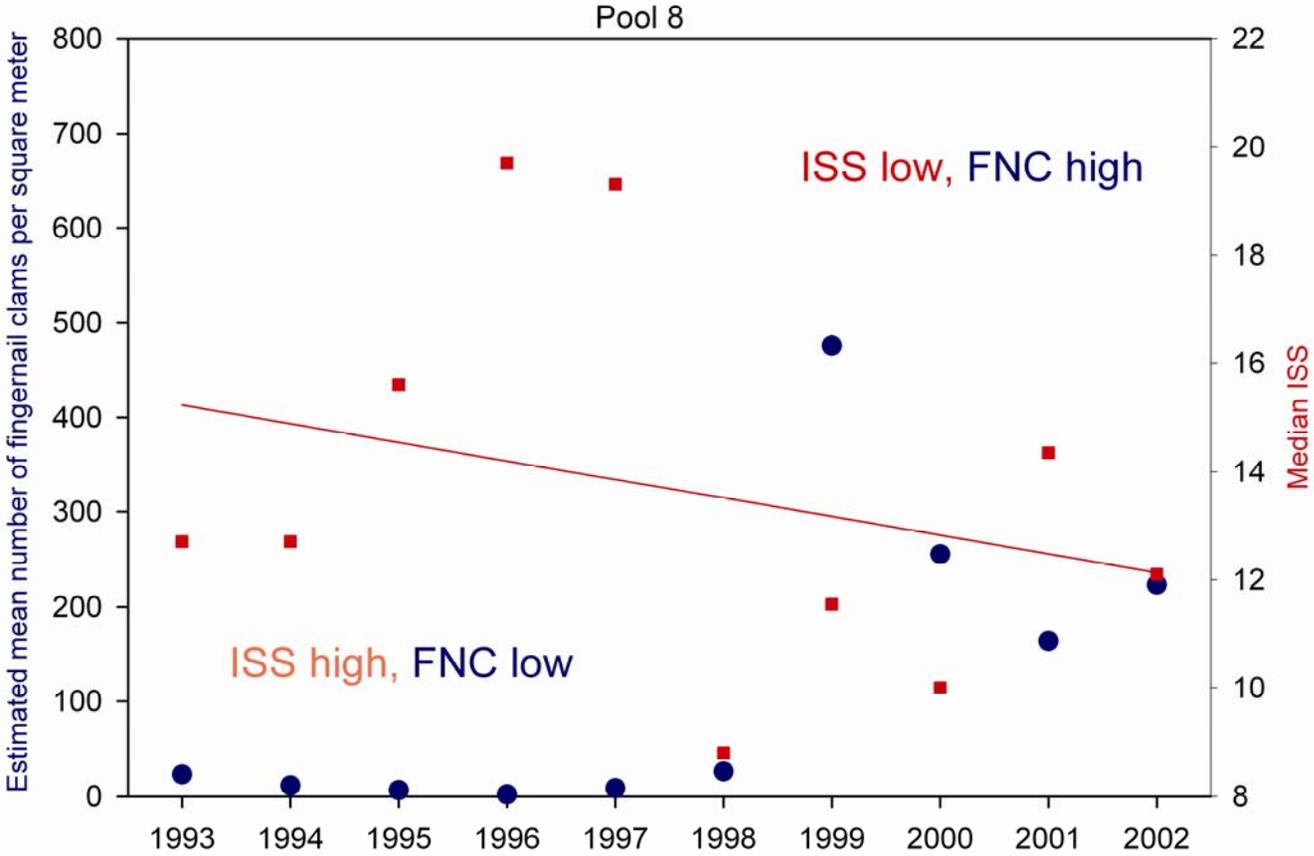
Hypothesis: Backwaters are an important site for nitrogen removal from the river



Pattern: TSS is lower in BW during high discharge, higher in BW during low discharge.

Hypothesis: Resuspension is an important cause of high TSS in BW

# Mean fingernail clam density strongly associated with inorganic suspended solids



# Manage and provide access to resulting data, information, and products



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Long Term Resource Monitoring Program  
Vegetation Data

- ▣ About The LTRMP Vegetation Component
- ▣ Help Page
- Vegetation Metrics
- ▣ Frequency
- ▣ Percent
- ▣ Relationship
- ▣ Abundance
- ▣ Percent
- ▣ Distribution
- ▣ Species
- ▣ Community Composition
- ▣ Community Diversity
- ▣ Species
- ▣ Species
- ▣ Vegetation Information

## Graphical Vegetation Database Browser

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Long Term Resource Monitoring Program  
Fisheries Data

- ▣ About the LTRMP Fish Component
- ▣ Help Page
- Fish Metrics
- ▣ Catch Per Unit of Effort
- ▣ Proportional Stock Density
- ▣ Frequency of Occurrence
- ▣ Species List
- ▣ Community Composition
- ▣ Species Richness

## Graphical Fish Database Browser




The Long Term Resource Monitoring Program (LTRMP) is being implemented by the U.S. Geological Survey (USGS) in cooperation with the five Upper Mississippi River System states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin), with guidance and overall Program responsibility provided by the U.S. Army Corps of Engineers.

**Upper Mississippi River Land Cover Viewer**

Select areas to Zoom to  
Select a location



Dubuque,

**LAYERS**

- All Layers
- 2000 Land Cover
  - 7 Class
  - 15 Class
- 1989 Land Cover
  - 7 Class
  - 15 Class
- Base Maps
  - LCU Mapping A
  - EMP HREP AOIs
  - UMR Cities
  - UMR Major Roads
  - UMR Counties
  - Basin Land Cover
  - DOQQs (1990s)

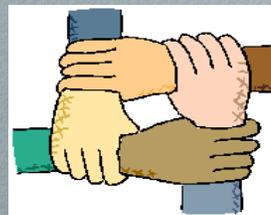
Refresh Map

## Land Cover/Use Data

- [2000](#) Land Cover/Use (LTRMP)
- [1998](#) Land Cover/Use (LTRMP)
- [1995](#) Land Cover/Use (LTRMP)
- [1994](#) Land Cover/Use (LTRMP)
- [1991](#) Land Cover/Use (LTRMP)
- [1989 Landsat](#) Satellite Land Cover/Use (LTRMP)
- [1989](#) Land Cover/Use (LTRMP)
- [1975](#) Land Cover/Use (GREAT)
- [1890's](#) Land Cover/Use (Mississippi River Commission)
- [Vegetation](#) (LTRMP monitoring data)
- [Floodplain Forests](#) (LTRMP)

- [Land Cover/Use Interactive Maps](#)
- [Land Cover Viewer](#) (LTRMP) new

# Partnerships



## Universities (23)

## NGOs, Non-Profits, & Private Sector

Abbott Laboratories

Aqui-S New Zealand

Audubon

Covance Laboratories, Inc.

Electric Power Research Institute

Great Lakes Fishery Commission

Schering-Plough Animal Health

The Nature Conservancy

Upper Mississippi River Basin Assoc.



## Government Agencies

Bureau of Reclamation

Canadian Wildlife Service

Environment Canada

Fisheries and Oceans Canada

Health Canada

International Assoc. of Fish  
and Wildlife Agencies

NASA

NOAA

Dept. of Nat. Resources

(ME, MA, MI, MN, NH, NY, ND, SD, WI)

U.S. Army Corps of Engineers

U.S. Department of Agriculture - NRCS

U.S. Department of Energy

U.S. Department of Interior

**U.S. Environmental Protection Agency**

U.S. Fish and Wildlife Service

U.S. Food and Drug Administration

U.S. Forest Service

U.S. National Park Service