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
Biology has 18 research & technology Centers across the Nation.
Upper Midwest Environmental Sciences Center
• 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.

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
UMESC Core Science Activities

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

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

USGS - UMESC
is the science leader for the ≈ 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)
Six state-operated field stations have been established for data collection.

LTRMP Partners

USACE
USFWS
USGS
Dept. of Agriculture
Dept. of Transportation
EPA
Minnesota DNR
Wisconsin DNR
Illinois DNR
Illinois NHS
Iowa DNR
Missouri DC
Long Term Resource Monitoring Program Components

Aquatic Vegetation
Water Quality
Fish
Terrestrial Vegetation
Macroinvertebrates
Land-use Land-cover
GIS
Physical Models
Water Levels, Bathymetry Sediment
Data Platforms Essential for Big Picture: Space and Time

Recent LCLU

- 1991: Grass, 0.03 acres
- 2000: Lowland, 0.46 acres

Bathymetry

History

- 1890: Pool 7 extends from Lock and Dam 7 located near Dresden, Minnesota upstream to Lock and Dam 6 located near Trempealeau, Wisconsin
- 1989: Pool 7
  - Total: 1,968 Acres
- 1990: Pool 7
  - Total: 23,518.1 Acres
Hypothesis: Vegetation occurrence can be predicted from flow velocity, bathymetry, fetch, light extinction and river stage.
Differences among strata: Nitrate and Suspended Solids


Pattern: Nitrate conc. is lower in BW relative to MC
Hypothesis: Backwaters are an important site for nitrogen removal from the river

**Suspended solids (1994–2002)**

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.
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