



In cooperation with the U.S. Environmental Protection Agency
and the National Biological Information Infrastructure

Missouri River InfoLINK

1999 Report



U.S. Department of the Interior
U.S. Geological Survey



Missouri River InfoLINK



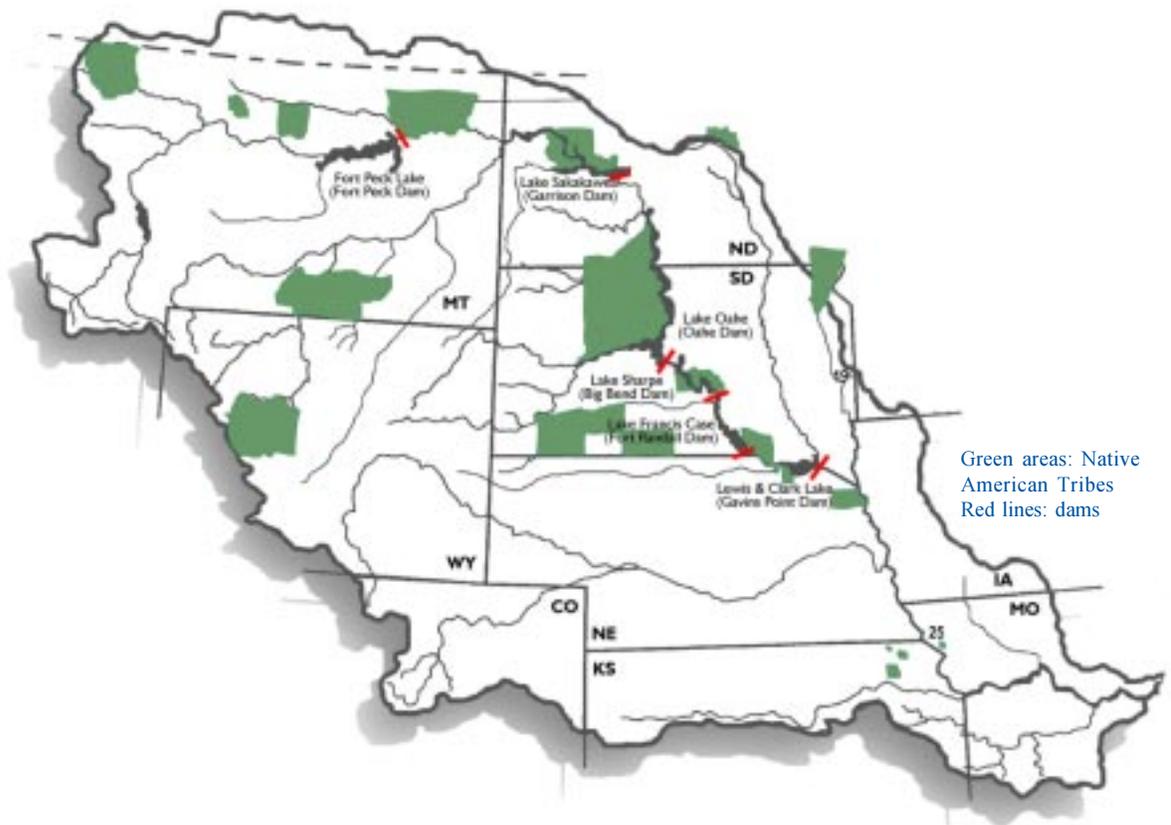
The InfoLINK enhances understanding of the Missouri River through information, partnerships, maps, and science.

The Missouri River flows 2,341 miles from the Rocky Mountains through the Great Plains to its confluence with the Mississippi River at St. Louis. Its watershed drains one-sixth of the United States. One-third of the meandering river has been channelized. Another third has been impounded by six dams that allow the U.S. Army Corps of Engineers to regulate the water flow through the river system. The Missouri River system is managed for multiple uses.

Decisions related to river management affect the lifestyles of Americans from Montana to Missouri. The Missouri River InfoLINK was created for these stakeholders who represent diverse river interests and need to make informed decisions about its future use and management. It is for people who want to understand how the river functions. The InfoLINK seeks to be a center point for common ground, uniting interests through sharing information that facilitates communication among all of the basin's citizens.

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THE BIG MUDDY

The highly engineered Missouri River system is managed by the U.S. Army Corps of Engineers for:

- fish and wildlife
- flood control
- hydroelectric power generation
- irrigation
- municipal and industrial water supplies
- navigation
- water quality

The Missouri River basin is home to 10 million people from 28 Native American tribes, 10 states, and a small part of Canada. In the past 150 years, people have attempted to tame the river by removing snags; constructing a navigation channel; stabilizing the banks; and building dams to hold back flood waters, generate hydroelectric power, and provide irrigation.

These changes to the river have generated both benefits and problems. Problems include a loss of habitat for native fish and wildlife that has resulted in the listing of several species as threatened or endangered and delta formation in reservoir headwaters that has caused increased flooding and loss of surface water.

Weather in the past 12 years has contributed to additional problems in the basin. The Great

Plains drought lasted from 1988 to 1992. It created such a financial crisis for upper river reservoir recreation and lower river navigation that the U.S. Army Corps of Engineers began a review of its *Master Water Control Manual* to determine if there was a better way to manage the water. The wet years began with the Midwest Flood of 1993 with basin residents experiencing some of the worst flooding in modern times.

The climatic events and the *Master Manual* review have increased people's awareness of the complex issues behind Missouri River management. Various forms of information are needed to help stakeholders make management decisions. The Missouri River InfoLINK was created to provide this information and facilitate communication and cooperation.

BEGINNINGS

The Missouri River InfoLINK is a project of the U.S. Geological Survey's (USGS) Columbia Environmental Research Center located in Columbia, Missouri. It began in 1998 as an extension of the Lower Missouri River Ecosystem Initiative (LMREI), one of 12 ecosystem initiatives selected through a competitive process in 1994.

The initiatives were created in response to a critical need to assess the biological condition of important ecosystems. The goal was to provide information, oversight, and coordination to promote a scientifically broad understanding of the biological condition of identified ecosystems.

Funding for LMREI ended in 1998 and the Environmental Protection Agency (EPA)-Region 7 joined the USGS to continue the program as the Missouri River InfoLINK. The National Biological Information Infrastructure and the USGS-Biological Resources Division Office of Biological Informatics and Outreach provided additional funds.

In 1999, EPA-Region 8 and the U.S. Fish and Wildlife Service-Region 6, joined the InfoLINK partnership. All Federal agencies share a similar goal to make scientific information readily available to the public.



Gates of the Mountains between Helena and Great Falls, Montana

INFORMATION

InfoLINK Services

The InfoLINK enhances understanding of the Missouri River by providing the following services to resource managers, policy-makers, and citizens:

INFORMATION

InfoLINK maintains an Internet-based information clearinghouse.

PARTNERSHIPS

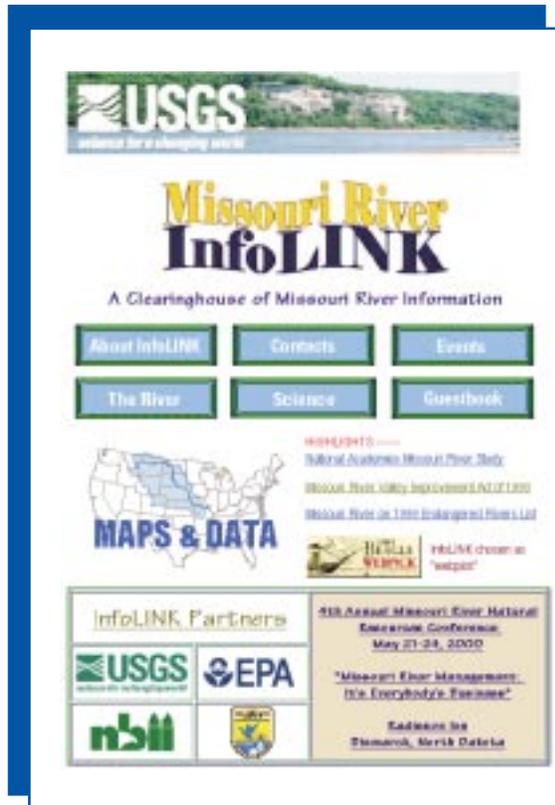
InfoLINK works with partnerships to facilitate communication and cooperation.

MAPS

InfoLINK provides access to geospatial information.

SCIENCE

InfoLINK packages complex river science into easily understood concepts.



<http://infolink.cr.usgs.gov/>

The InfoLINK manages an Internet-based information clearinghouse. The current page was initiated in August 1998 and incorporated information originally found on the Lower Missouri River Ecosystem Initiative site (page 3).

The InfoLINK web page provides information on the river's history and its current condition by linking to sites that explain water flow, river stages, reservoir water levels, and snow and rain runoff quantities. The web page has current Missouri River events and an extensive list of contacts in the public and private sectors.

The "Science" category includes the *Missouri River Natural Resources Bibliography*, a 2,200 entry listing of scientific studies conducted in the past 30 years, as well as information on endangered species, habitat studies, floods, and the proposed *Missouri River Environmental Assessment Program* (page 15).

Missouri River maps, interactive and displayed at different scales, provide a visual perspective of

the basin. The maps include views of political boundaries, watersheds and rivers, ecoregions, dams and reservoirs. Local views show levees, public land ownership, 1879 land cover, and 1993 flood extent.

The web page was acknowledged by two web reviewers in 1999. The *Scout Report for Science and Engineering*, October 27, 1999 from the University of Wisconsin called the site "an outstanding site, rich in information of varying complexity." The *HMS Beagle*, the *BioMedNet Magazine*, had the InfoLINK as a pick of the day in early November.

InfoLINK Presentations

Various presentations were made in 1998-99 to introduce the InfoLINK web page and demonstrate use of the interactive maps:

- **Environmental Protection Agency (EPA)-Region 7**
Kansas City, MO – September 1998
- **EPA-7 and EPA-8, Fish and Wildlife Service-Region 3 & 6** Columbia, MO – September 1998
- **Missouri River Basin Association** Kansas City, MO – December 1998
- **Missouri River Collaboration Meeting** Columbia, MO – January 1999
- **USGS Geology Division Conference** Denver, CO – March 1999
- **3rd Annual Missouri River Natural Resources Conference** Pierre, SD – March 1999
- **Missouri River Communities Network Manitou Bluffs Project** Columbia, MO – March 1999
- **Missouri GIS Conference** Columbia, MO – March 1999
- **Coordinated Resource Management Program** Bismarck, ND – April 1999
- **South Dakota Corridor Project** Pierre and Yankton, SD – April 1999
- **EPA-8** Denver, CO – May 1999
- **Missouri River Federal Interagency Roundtable** Great Falls, MT – June 1999
- **USGS Openhouse** Rolla, MO – August 1999
- **Missouri River Rediscovery Conference** St. Charles, MO – October 1999
- **North Dakota Water Users Conference** Bismarck, ND – December 1999

InfoLINK database

The InfoLINK maintains a comprehensive database of Missouri River contacts. In 1999, the database was expanded to over 3000 names by consolidating the Missouri River Natural Resources Conference list with contacts from EPA-8, the South Dakota Missouri River Corridor Program, and American Rivers Missouri River Coalition.

From this directory, a new database is being developed to provide an overview of entities involved in Missouri River projects and what those projects entail. This *Matrix* will facilitate basinwide coordination of activities, groups, and individuals.



Fort Randall Dam on Lake Francis Case, South Dakota

PARTNERSHIPS



**Missouri River
Management:
It's Everybody's
Business**

**May 21-24, 2000
Bismarck
North Dakota**

The Missouri River Natural Resources Conference is the only annual basinwide conference available to all basin residents. It was initiated in 1997 by the USGS and the Missouri River Natural Resources Committee (MRNRC) as an opportunity for people in the basin to learn about the river's environmental condition and share points of view on river management. Papers, field trips, socials, posters, and exhibits offer an opportunity to network and participate in the discussion.

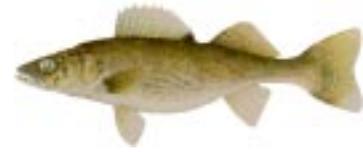
InfoLINK serves as the central support for a steering committee consisting of representatives from the MRNRC, Missouri River Basin Association, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and local government agencies and nonprofit organizations. InfoLINK also contributes to mailing list database management, agenda development and promotional materials design and production.

NORTH DAKOTA GAME AND FISH DEPARTMENT



Four types of InfoLINK partnerships facilitate communication and cooperation among agencies and the public:

- ▶ **Support**
- ▶ **Technical Assistance**
- ▶ **Data Management**
- ▶ **Community**



Support Partnerships

USGS – Biological Resources Division (BRD)

In 1998, the USGS-BRD Central Regional Office designated the USGS Columbia Environmental Research Center (CERC), home of the InfoLINK, as the lead center for Missouri River information dissemination.

A State Partnership grant was awarded to create a partnership between the InfoLINK and the Missouri River Communities Network in Columbia, Missouri, for mapping and information transfer (page 9) and to establish an NBII node at the CERC.

National Biological Information Infrastructure (NBII)

The InfoLINK fulfills the NBII mission of providing swift, user access to biological databases, information products, directories, and guides maintained by Federal, State, and local government agencies, nongovernment institutions, and private sector organizations.

InfoLINK data collection, consolidation, and documentation uses metadata procedures of NBII and the National Spatial Data Infrastructure to keep it standardized on a national level.

The NBII provided InfoLINK funds to develop a map interface for data from the Missouri River Benthic Fishes Study (page 15).

U.S. Environmental Protection Agency-Region 7 (EPA-7)

EPA-7 provided major funding in 1998 when the original money available for the Lower Missouri River Ecosystem Initiative ended. It is a goal of EPA through its Community-Based Environmental Protection Program to provide the best available information to communities so they can make sound resource management decisions. EPA was particularly supportive of providing interactive maps so the public can get a sense of the “place” where they live.

U.S. Environmental Protection Agency-Region 8 (EPA-8)

EPA-8 provided a Regional Geographic Initiative grant to support mapping through a community partnership with the Coordinated Resource Management Program in Bismarck, North Dakota, and to expand InfoLINK local map coverage into the upper basin (page 9).

U.S. Fish and Wildlife Service (FWS)

The FWS-Region 6, provided funding for InfoLINK general support and to enhance the endangered species sections in the web page.

Technical Assistance Partnerships

Missouri River Basin Association (MRBA)

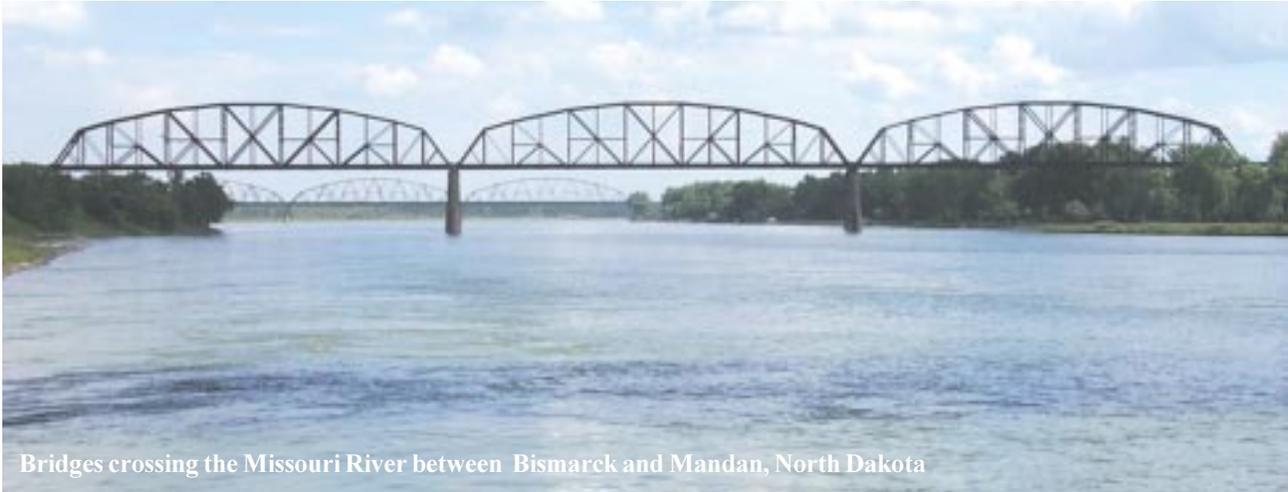
Created in 1981 by the Governors of the basin states, the MRBA coordinates planning activities and resolves water management issues. InfoLINK provides technical assistance to the MRBA by helping with web page design, publications, and meetings.

Missouri River Natural Resources Committee (MRNRC)

The MRNRC is a group of state fish and wildlife agency representatives whose mission is to implement a systems approach to managing Missouri River natural resources.

InfoLINK works with the MRNRC on the Missouri River Natural Resources Conference, promotion of the *Missouri River Environmental Assessment Program*, and various graphics products.

PARTNERSHIPS (continued)



Bridges crossing the Missouri River between Bismarck and Mandan, North Dakota

Data Management Partnerships

InfoLINK Technical Committee

Environmental Protection Agency
- Region 7, Kansas City, MO
and Region 8, Denver, CO

Missouri Department of
Conservation, Columbia, MO

Missouri Resource Assessment
Partnership, Columbia, MO

Missouri River Corridor Program,
Pierre, SD

North Dakota State Water
Commission, Bismarck, ND

Planning and Development District
III, Yankton, SD

South Dakota Department of
Energy and Natural Resources,
Pierre, SD

U.S. Army Corps of Engineers,
Kansas City, MO

USGS Mid-Continent Mapping
Center, Rolla, MO

InfoLINK Technical Committee

InfoLINK is creating a technical committee to provide advice and direction on map development. The goal is to reduce duplication of effort between Federal, State, and local map generation and to create maps that are consistent with each other. Ultimately, individual maps will be combined to provide a spatial view of the entire river.

Through its work with the technical committee and local communities, InfoLINK plans to produce a template for map generation so local communities can produce maps of their river reaches that fit in with other communities, again contributing to a complete picture of the river system.

Benthic Fishes Study

InfoLINK is coordinating with the USGS Cooperative Fish and Wildlife Research Units and the USGS Mid-Continent Mapping Center to spatially display biological data from the Benthic Fishes Study (page 15).

Mississippi and Missouri River Watershed Strategy

The USGS Columbia Environmental Research Center joined forces with the USGS Upper Midwest Environmental Science Center, LaCrosse, Wisconsin, and the USGS National Wetlands Research Center, Lafayette, Louisiana, to collaborate on data collection and documentation efforts for the entire Mississippi River basin. Plans are underway to coordinate standards, databases, and tools for use by resource managers, scientists, and decision makers with a land cover pilot demonstration project.

Missouri River Federal Interagency Roundtable

The roundtable is a consortium of Department of Interior agencies, EPA, Corps of Engineers, Federal Emergency Management Agency, and Department of Agriculture. It was formed to coordinate agency activities on the river and to reduce duplication of effort in data and information generation and dissemination.

Community Partnerships

The InfoLINK has established partnerships with local communities in Missouri and North Dakota to increase the capacity of local citizens to utilize geospatial data for community planning.

These partnerships are putting into practice place-based projects that support the goals behind the Community/Federal Information Partnership Program, an initiative of the Federal Geographic Data Committee that:

- promotes informed decision making at the community level,
- improves land and resource use,
- fosters a more informed public,
- provides a greater opportunity for public participation in decision making, and
- readily transfers data back and forth between the Federal government and communities.

Coordinated Resource Management Program

The Coordinated Resource Management Program (CRMP) is a broad-based coalition of local stakeholders from five counties around Bismarck, North Dakota, in the Missouri River Garrison Reach between Lake Sakakawea and Lake Oahe. The group is dealing with planning issues such as bank stabilization, flood-plain development, and delta buildup in Lake Oahe.

EPA-8 provided InfoLINK funds to help the CRMP acquire maps needed for local planning efforts and to serve the maps on the InfoLINK. Another part of this project is to begin development of a mapping “template” that other communities can follow when doing similar planning activities.

Missouri River Communities Network

The Missouri River Communities Network (MRCN) Manitou Bluffs Project is a sustainable development planning process in the 50-mile river corridor between Jefferson City, the state capital, and Boonville in mid-Missouri. The goal is to create a plan that protects and enhances the corridor within this rapidly urbanizing four-county area.

The USGS provided a State Partnership grant for the InfoLINK to determine the specific types of information the MRCN needed to profile its river reach, help build its capacity to use GIS for local decision making, and serve data on the InfoLINK web page.



Missouri River Manitou Bluffs Region north of Jefferson City, Missouri

MAPS

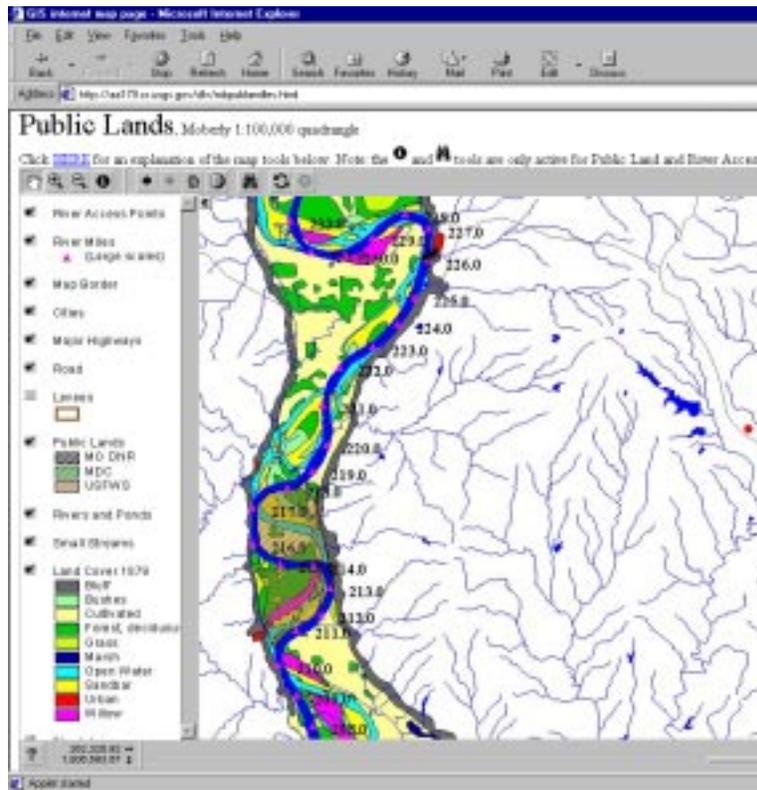
Maps provide a visual perspective of the Missouri River.

The InfoLINK web page provides a visual perspective of the Missouri River basin through maps generated in its geographic information systems (GIS) lab in Columbia and at the Mid-Continent Mapping Center in Rolla, Missouri. Data are transformed into maps using ArcView software. These maps are then displayed on the Internet using ArcView Internet Map Server.

Maps are available at both a basin and local scale. For the local maps, data layers are added on top

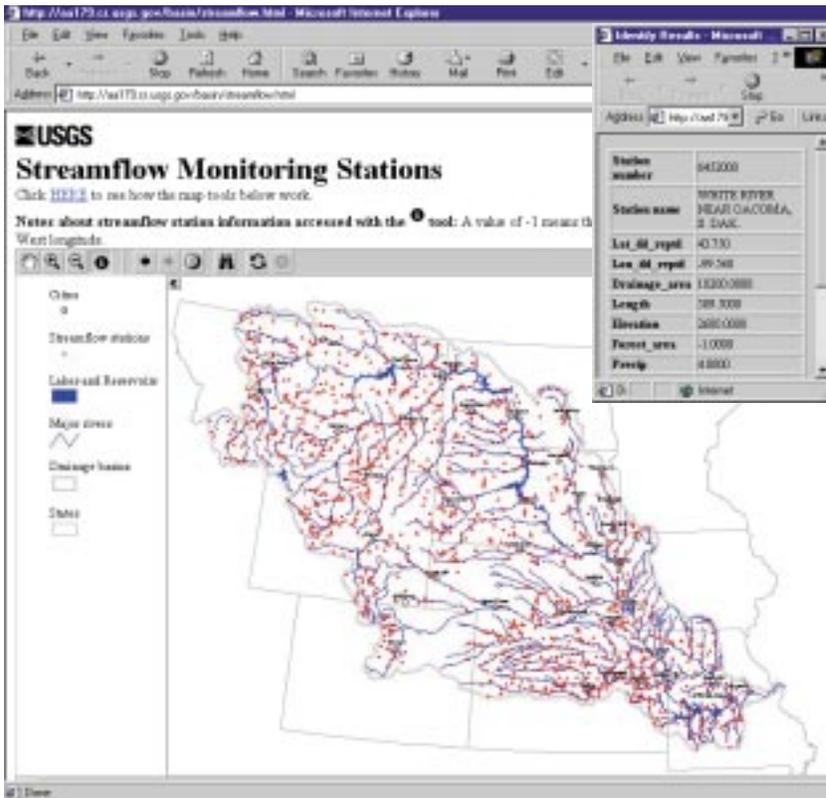
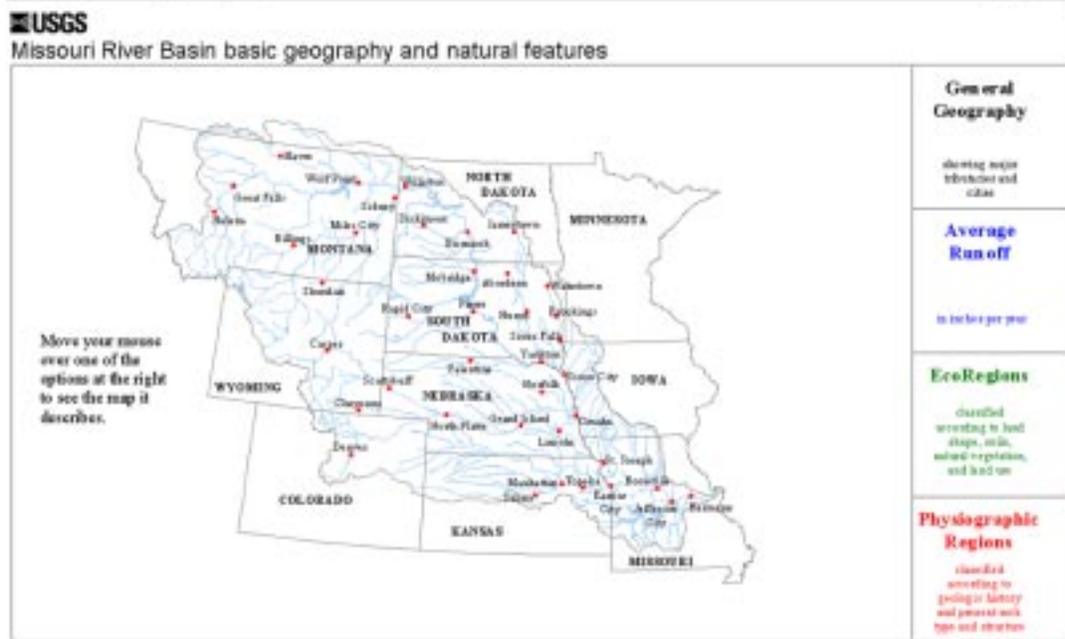
of base USGS 1-100,000 and 1-24,000 scale maps. In 1999, local mapping was done for the lower basin and in 2000, InfoLINK is expanding into the upper basin by developing the 1-100,000 scale base maps.

Whenever possible, links are made on maps to other sites already developed such as the EPA *Surf Your Watershed* where the viewer can find a wealth of information on a specific watershed within the Missouri River basin.



Detailed local maps show specific information on a river reach such as river miles (RM), public land ownership, and historical land cover. This reach includes Lisbon Bottom (RM 219 to 214) where the USGS River Studies Station is conducting research (page 12).

Missouri River InfoLINK 1999 Report



Overview maps help people understand their place in the basin.

USGS streamflow monitoring stations showing a link to the data associated with one station in South Dakota.

SCIENCE

River Studies Station

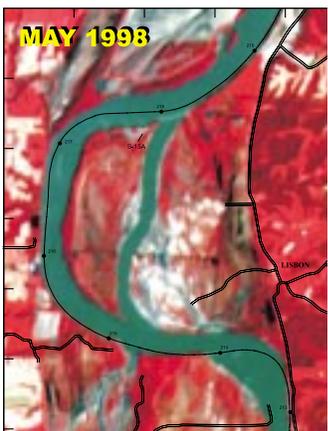
The InfoLINK serves as the information distribution branch for the USGS Columbia Environmental Research Center's River Studies Station by serving scientific information on the web page and creating displays that translate complex data into easily understood concepts.

The River Studies Station develops and synthesizes scientific information for management of large rivers. Researchers take a multidisciplinary approach to understanding the complex physical, biological, and chemical processes involved in a highly productive large river flood plain ecosystem.

Initial projects focus on the Missouri River system. Managers recognize that the river's capability

to sustain the natural ecosystem must be increased while maintaining traditional economic and quality of life values such as agriculture, water supply, recreation, and navigation.

To help managers improve the ecosystem, scientists study the links between river management; physical changes in the river corridor; and responses of river corridor biological, soil, and wetland resources. Understanding the connections between water flow, river structures, and riverine land use provides information needed to determine the effectiveness of rehabilitation efforts and guide future designs. These types of "focused investigations" will be a major part of the *Missouri River Environmental Assessment Program* (page 15).



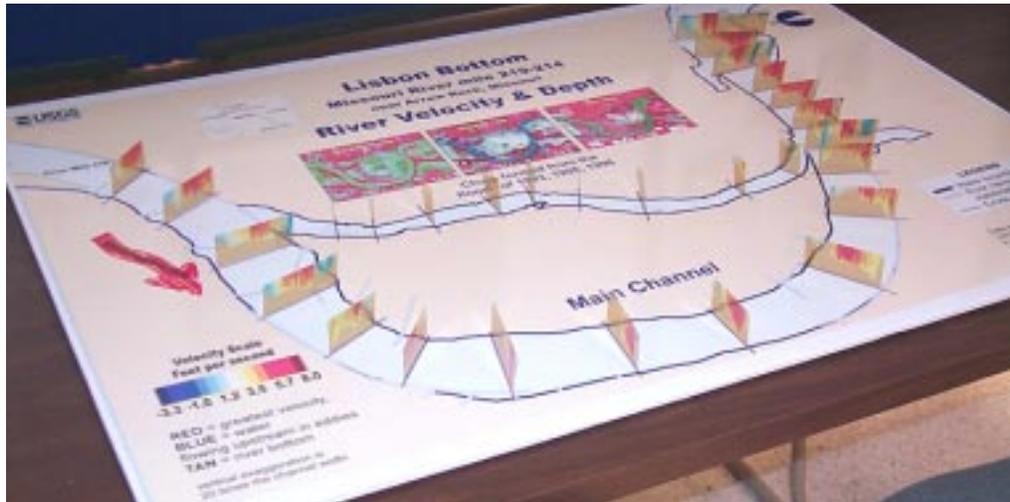
WASHINGTON UNIVERSITY

After the Midwest Flood of 1993, a side-channel chute formed naturally from river flows at Lisbon Bottom (river mile 214-219).

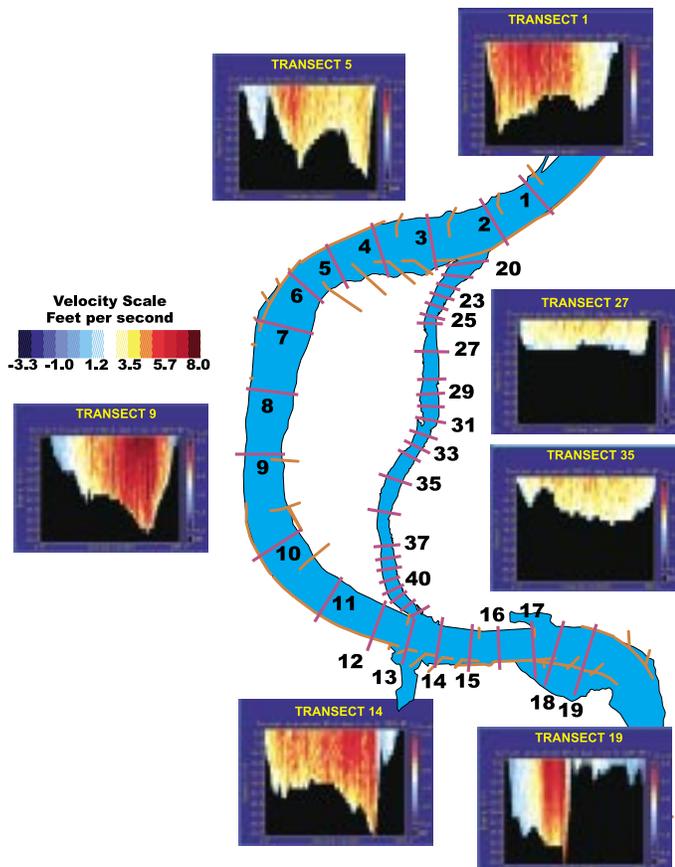


The River Studies Station is conducting the *River Corridor Habitat Dynamics Project* at Lisbon Bottom, a unit of the *Big Muddy National Fish and Wildlife Refuge* south of Glasgow, MO. The study is designed to improve scientific understanding of how habitat is lost and created, to document ecological responses to rehabilitation projects, and to provide a stronger scientific basis for rehabilitation of the Lower Missouri River.

Data Display



The InfoLINK translates the work of researchers into displays that help the public understand complex scientific data. Here the depth and velocity of the Lisbon Bottom chute and channel are displayed in a model generated from data graphs shown below.



Missouri River Collaboration Meetings

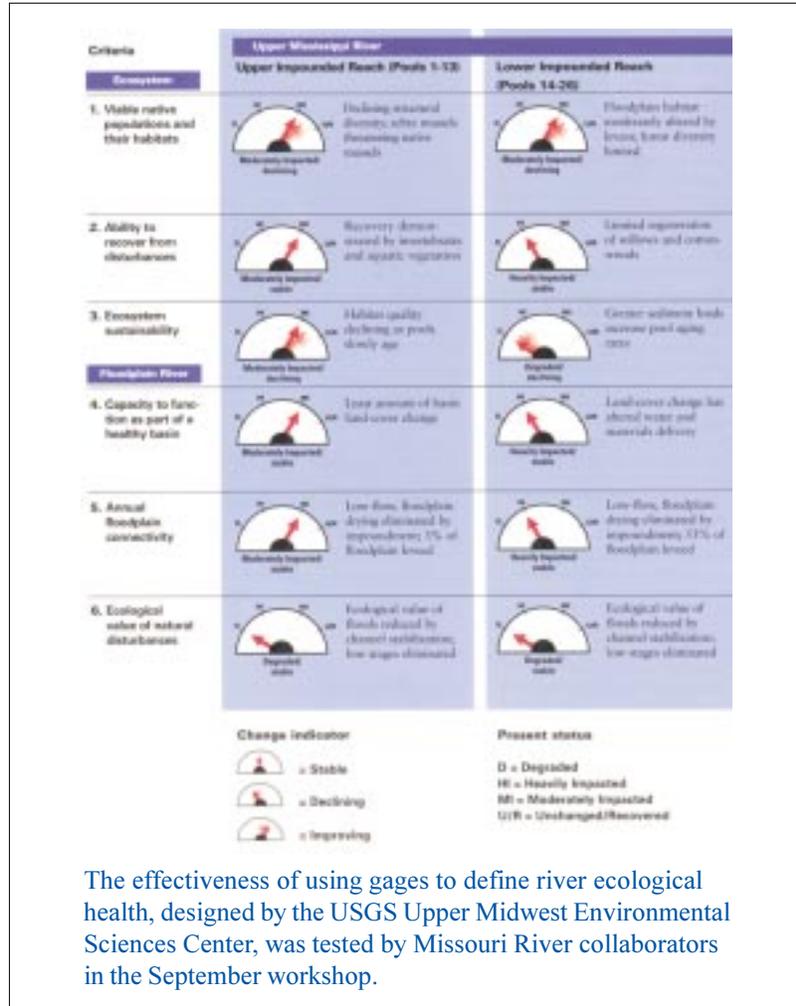
As part of its coordination activities with the River Studies Station, InfoLINK conducts collaborative meetings to consolidate activities of local agencies working on the Missouri River. Over 100 people are invited; between 30 and 60 people attend each presentation.

The Interaction Between Missouri River Stage, Groundwater Level, Wetland Stage, and Soil Saturation in the Lower Missouri River Flood Plain by Brian Kelly, USGS hydrologist, Independence, MO - November 1998

Mendenhall Lecture on *Large Rivers and Their Flood Plains as Conveyers and Storers of Sediment and Contaminants* by Dr. Robert H. Meade, USGS Water Resources Division, Denver, CO - January 1999

Assessment of Geomorphic and Ecological Change, and Prediction of Future Conditions on the Upper Mississippi River System: Planimeters and Spreadsheets to GIS Models by Chuck Theiling, Aquatic Ecologist, USGS Upper Midwest Environmental Sciences Center, LaCrosse, WI - March 1999

Pollution in Big Spring Creek: A Success Story by Isaac Opper, 5th grade student from Lewis and Clark Elementary School in Lewistown, MT, and



Upper Missouri River Photo Journal by Jeanne Heuser, USGS Columbia Environmental Research Center Technical Information Specialist, Columbia, MO - June 1999

Autecology of a Rheophilic Cyprinid: Implications for Restoration in a Large River by Dr. Hubert Keckeis, Institute of Zoology, Department of Limnology University of Vienna, Austria in cooperation with the Missouri Cooperative Research Unit, School of Natural Resources, University of Missouri, Columbia, MO - July 1999

Lewis and Clark Bicentennial Mapping with the U.S. Army Corps of Engineers, Kansas City, MO - August 1999

Defining River Ecological Health: Connecting Science and the Public by Dr. Ken Lubinski, USGS Upper Midwest Environmental Sciences Center, LaCrosse, WI - September 1999

Integrated Ecological Studies at Lisbon Bottom: Update and Prospects by Dr. Robert B. Jacobson, Research Hydrologist, USGS Columbia Environmental Research Center - Columbia, MO - October 1999

Basinwide Monitoring

Benthic Fishes Study

The InfoLINK received funding from the National Biological Information Infrastructure (NBII) to develop a map interface for viewing summary statistics from the Missouri River Benthic Fishes Study. The study is the first of its kind to gather biological data over the entire length of a river as large as the Missouri. It will also be the first time that Missouri River biological data will be presented in a spatial format on the Internet.

This type of work is being done in preparation for providing data and information from the Missouri Environmental Assessment Program (MoREAP). MoREAP has been proposed to conduct long-term scientific

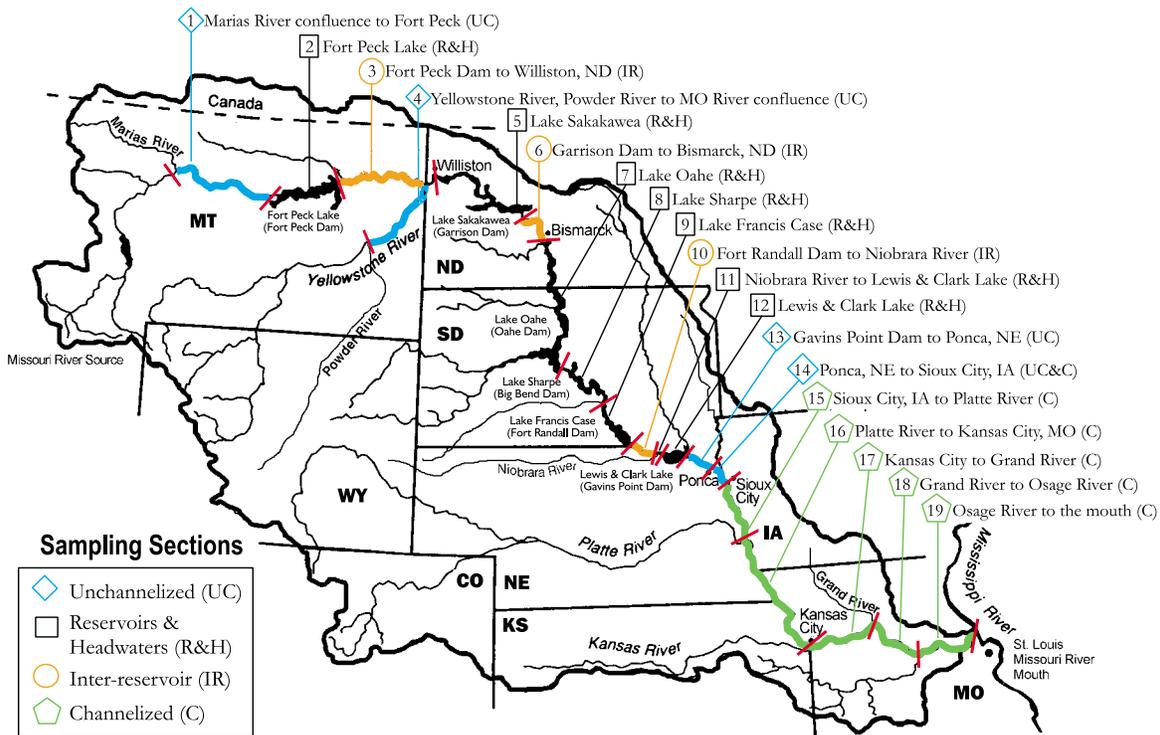
monitoring and focused investigations on the Missouri River. The MoREAP will serve as the scientific foundation for Missouri River management decisions.

In 1996, the Missouri River Natural Resources Committee formed a cooperative partnership of 79 scientists and river managers and the USGS provided funding for the partnership meetings to plan and develop the proposal. It was published in 1998 and now funding is being sought from Congress through the 1999 *Missouri River Valley Improvement Act* proposed by Senator Kerrey of Nebraska.



NEBRASKA GAME & PARKS COMMISSION

Benthic fish are bottom dwelling species selected for study because eight species are identified as “at risk” by State and Federal agencies and others are important recreational and commercial species.



Proposed sampling segments for the *Missouri River Environmental Assessment Program (MoREAP)*.

BRIDGING THE GAP

There is a saying that information is critical to sound decision making. No where is that more important than on the Missouri River where the majority of people are just awakening to the complex issues involved in its use and management. The InfoLINK's Federal agency partners are dedicated to providing information needed by the basin's resource managers, policy makers, and citizens as they discuss the river's management and make decisions which will protect and revitalize their river communities.

Every community faces different challenges depending upon the environmental and economic conditions of its river reach. For example:

People north of Fort Benton, Montana, have the wildest, most natural stretch of river and are confronted with increased recreational use that threatens to degrade the river's environment.

People in the North Dakota Garrison Reach between Lake Sakakawea and Lake Oahe face problems related to delta formation in Lake Oahe headwaters, flood plain development and bank stabilization.

People in Pierre, South Dakota, are part of a Federal Emergency Management Agency buy-out program because of sediment build-up from the Bad River entering at the headwaters of Lake Sharpe, raising water levels and making their homes uninhabitable from repeated flooding.

People in Niobrara, Nebraska, face the continued shrinkage of Lewis and Clark Lake as sediment builds-up from the Niobrara River reducing recreational access and increasing floods.

People in Omaha, Nebraska, are taking advantage of their riverfront location to create hiking trails and recreational opportunities.

People in the Manitou Bluffs Region between Boonville and Jefferson City, Missouri, face the protection and utilization of thousands of flood plain wetlands that returned to public ownership after the Midwest Flood of 1993.

These challenges are interwoven – changes to one area of the river may affect the others. Yet because of the large geographic area of the Missouri River basin, it is difficult for people to appreciate this interconnection.

It is the goal of the Missouri River InfoLINK to serve as the conduit that facilitates river connection. InfoLINK networks with local communities and government agencies to share information; packages complex river science needed by decision makers into easily understood concepts; provides opportunities for collaboration through an annual conference and local meetings that help bridge the gap between river interests. In this way, the InfoLINK strives to enhance everyone's understanding of the Missouri River and its complex management challenges of the 21st Century.

Missouri River InfoLINK 1999 Report



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Cover Pallid Sturgeon, inside cover Interior Least Tern, page 7 Walleye - Nebraska Game and Parks Commission
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