Missouri River Natural Resources Conference
7th Annual • 2003

# Restoring the "butifull Praree & Timber deversity"

# Program

Benedictine College

June 1-4, 2003
Benedictine College
Atchison, Kansas

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# Restoring the "butifull Praree & Timber deversity"

*"As we approached this place the Praree had a most butifull appearance Hills& Valies interspds with Coops (copses) of Timber gave a pleasing deversity to Senery."*

Excerpt from William Clark's journal when the Corps of Discovery visited near what is now the Benedictine Bottoms Fish and Wildlife Mitigation Site in Atchison, Kansas on July 4, 1804.

Bill Stephens/Kansas Travel and Tourism

# Welcome to Atchison

From the time of the Corps of Discovery when the "Praree had a most butifull appearance" to the challenges of habitat loss, species management and system restoration we face today, the Missouri River remains a dynamic and vital part of our natural heritage. These challenges require much effort on our part, but they also bring great opportunity.

As we face the challenges of managing a system with so many physical and hydrological changes it is easy to say we don't know enough. The immense size of the Missouri River system alone can be overwhelming. Yet we shouldn't lose sight that change and knowledge often come in small steps. This conference is an opportunity to share what we have learned about this great river system, realize how far we have come, and contribute to the legacy of one of America's great rivers.

Enjoy the conference,

Steve Adams
Conference Chairman
Kansas Department of Wildlife and Parks
Topeka, Kansas

## Program Contents


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Missouri River map . inside back cover
Area map . . . back cover


## Conference Sponsors & Steering Committee

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**Conference financial support**
HDR Engineering, Inc.
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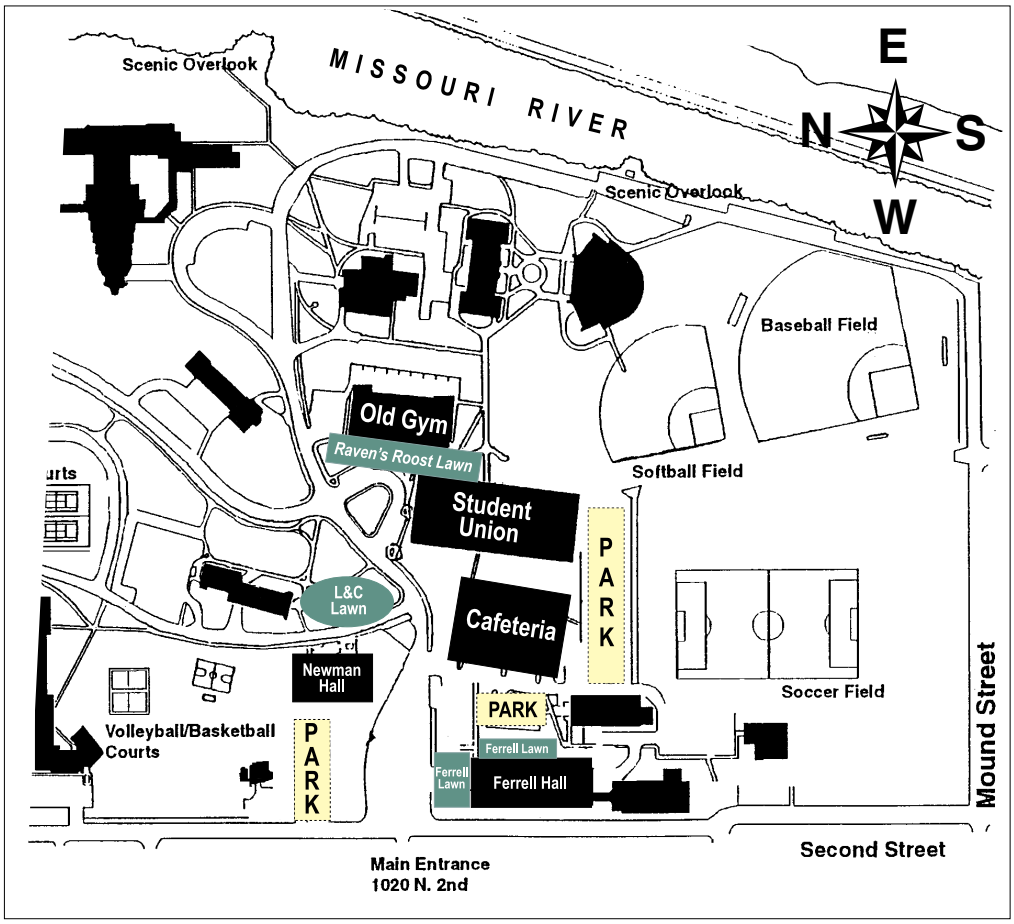
# Benedictine College

Perched above the Missouri River on 100 acres, Benedictine College was founded in 1858 when monks opened a boarding school and enrolled six students. Today the college hosts 1000 students and provides a liberal arts education for students of all backgrounds and faiths. Since 1994, the Biology Department has conducted research on Benedictine Bottoms through its *Missouri River Biodiversity Assessment Program.*

## Event Locations

- *Registration*
  Sunday - Ferrell Hall Garden Floor
  Monday - Student Union Ground Floor
- *Presentations*
  Student Union Auditorium and Band Room
- *Posters, exhibits, and breaks*
  Student Union Atrium
- *Breakfast, lunch, and banquet*
  Cafeteria
- *Sunday picnic*
  Ferrell Hall Lawn
- *Tuesday picnic*
  Raven's Roost Lawn
- *Small meetings*
  Ferrell Hall
  Heritage Room 200
- *Exercise facilities*
  Student Union



# Schedule Overview

**RATHSKELLER -** *Ferrell Hall Garden Floor Lobby*

Each night after the last scheduled event of the day.

Ferrell Hall Garden Floor Lobby

## Sunday, June 1

page 5-6

Noon - 6:00 p.m. . . . . Registration - *Ferrell Hall Garden Floor*
Exhibit and poster set-up - *Student Union Atrium*
Tours in and around Atchison (p.5)
3:30 p.m. . . . . Public Meeting - *Ferrell Hall Heritage Room* (p.5)
5:00 p.m. . . . . Picnic & Lewis and Clark reenactors - *Ferrell Hall Lawn*
7:30 p.m. . . . . Presentation - *Student Union Auditorium* (p.6)

## Monday, June 2

page 7-9

7:00 a.m. - 7:45 a.m. Breakfast - *Cafeteria*
7:00 a.m. - 5:00 p.m. Registration - *Student Union Ground Floor*
7:00 a.m. - 7:00 p.m. Exhibits and posters - *Student Union Atrium*

8:00 a.m. . . . . Plenary with keynote presentation - *Auditorium* (p.7)
9:45 a.m. . . . . Break - *Atrium*
10:15 a.m. . . . . Adaptive Management Panel Session - *Auditorium* (p.7)
12:15 p.m. . . . . Lunch - *Cafeteria*
1:45 p.m. . . . . Concurrent Presentations (p.8)
(1) Hydrology - *Auditorium*
(2) Research, Education, Extension - *Band Room*
3:05 p.m. . . . . Break
3:35 p.m. . . . . Concurrent Presentations (p.9)
(1) Avian Populations - *Auditorium*
(2) Fisheries - *Band Room*
5:15 -5:45 p.m. . . . . Meeting - *Ferrell Hall Heritage Room* (p.9)
5:30 p.m. . . . . Social with exhibit and poster session - *Atrium* (p.9)
7:30 p.m. . . . . Banquet and performance - *Cafeteria* (p.9)

## Tuesday, June 3

page 10-11

7:00 - 8:15 a.m. . . . . Breakfast - *Cafeteria*
8:30 a.m. . . . . Opening Session - *Auditorium* (p.10)
9:30 a.m. . . . . Break - *Atrium*
10:00 a.m. . . . . Concurrent Presentations (p.10)
(1) Vertebrate Populations - *Auditorium*
(2) Invertebrate Populations - *Band Room*
11:00 a.m. . . . . Lunch - *Cafeteria*
Noon . . . . . Field Trip (p.11) -
*Fort Leavenworth and Benedictine Bottoms*
6:00 p.m. . . . . BBQ Picnic - *Raven's Roost Lawn*

## Wednesday, June 4

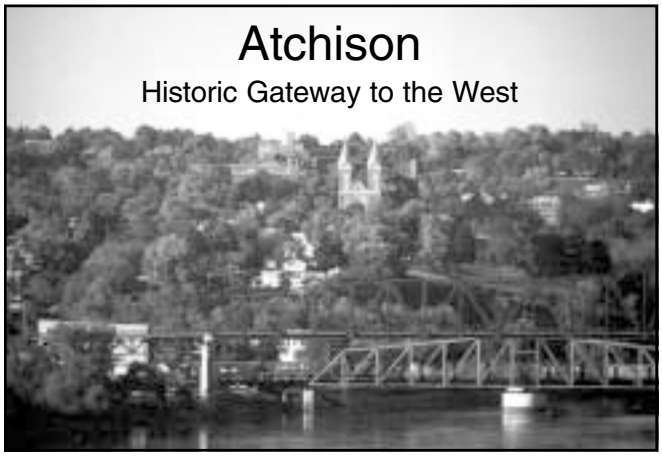
page 12-13

7:00 - 7:45 a.m. . . . . Breakfast - *Cafeteria*
8:00 a.m. . . . . Concurrent presentations (p.12-13)
(1) Water Quality - *Auditorium*
(2) Vegetation • Management Challenges in the Dynamic River - *Band Room*
9:20 a.m. . . . . Break - *Student Union Atrium*
11:30 a.m. . . . . Lunch - *Student Union Atrium*
12:30 p.m. . . . . Presentation - *Auditorium* (p.13)
1:30 p.m. . . . . Water Quality Meeting - *Ferrell Hall Heritage Room*

**REGISTRATION -** *Ferrell Hall Garden Floor*
**Exhibit and Poster Set-up** - *Student Union Atrium* Noon - 6:00 p.m.

**TROLLEY TOURS** 1:00 - 6:30 p.m.

The trolley holds 18-people and leaves from the Santa Fe Depot, 200 S. 10th St. at Noon, 1:00, 2:00, and 3:00 p.m. Cost is $4/adult; $2/child. Free tours from the college are at 4:30, 5:30, and 6:30 p.m. The narrated tour passes many of the city's 20 sites on the National Register of Historic Places. 913-367-2427




All photos courtesy of Atchison Area Chamber of Commerce

**Maps** are available at registration to conduct self-guided tours of the Atchison Victorian mansions and five local museums.

Muchnic Art Gallery

2:00 - 5:00 p.m. 2:00 - 5:00 p.m.

**LOCAL TOUR**
*Gather at the Ferrell Hall Lawn at 1:45 p.m.*

- *Fort Leavenworth Military Museum* exhibits material culture of Frontier Army soldiers who served west of the Mississippi River between 1804 and 1917. **MUST HAVE PHOTO ID!** (leav-www.army.mil/museum)
- *Little Bean Marsh* is an outstanding natural marsh with a slough and bottomland forest in the old Missouri floodplain (map, back cover). (www.conservation.state.mo.us/areas/natareas/p101-1.htm)

Amelia Earhart birthplace

3:30 - 5:30 p.m. 3:30 - 5:30 p.m.

**PUBLIC MEETING**
Missouri River Basin Advisory Committee of the Kansas Water Authority - *Ferrell Hall Heritage Room*

# Schedule

## Sunday Evening, June 1

5:00 p.m. **WELCOMING PICNIC -** *Ferrell Hall Lawn and L&C Lawn*

**Special thanks to HDR Engineering Inc. for sponsoring the Sunday and Monday night socials.**

On July 4, 1804, the Lewis and Clark expedition celebrated the first Independence Day in the West near present-day Atchison. At the picnic, visit with Lewis and Clark reenactors from the Discovery Expedition of St. Charles.

See the Missouri Department of Conservation Lewis and Clark encampment and dugout canoe replica on the L&C Lawn.

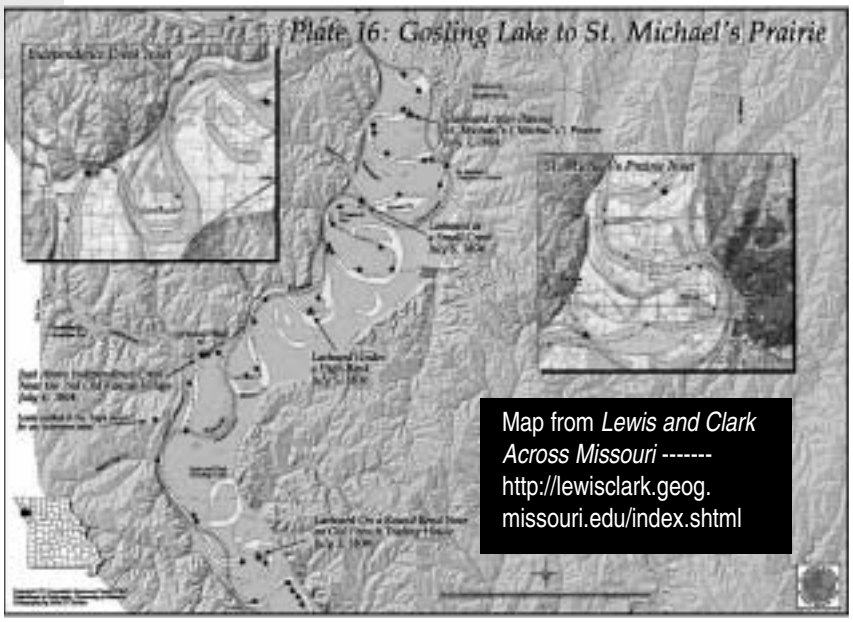
Reenactor Dewayne Knott as Corporal Richard Warfington of the Lewis and Clark Corps of Discovery.

www.lewisandclark.net

7:30 p.m. **PRESENTATION -** *Student Union Auditorium*
***Historical Missouri River Maps* by Jim Harlan**

*James D. Harlan is Assistant Program Director, Geographic Resources Center, Department of Geography, University of Missouri, Columbia, MO. harlanj@missouri.edu*

As part of the *Lewis and Clark Historic Landscape Project,* Jim Harlan digitized, geo-referenced, and mapped all of the retrievable information from the Lewis and Clark journals and the 18th and 19th-century land survey notes along the Missouri River corridor from the Mississippi River to McKissick Island. The work was published in the April 2002 *National Geographic Magazine* and in an ongoing series in *Missouri Life* magazine. It is a collaborative project of the University of Missouri and the Missouri State Archives.




Map from *Lewis and Clark Across Missouri* ------- http://lewisclark.geog.missouri.edu/index.shtml

After Events - Rathskeller - *Ferrell Hall Garden Floor Lobby*

**REGISTRATION -** *Student Union Ground Floor* 7:00 a.m.
Poster and Exhibits on display for the next three days - *Student Union Atrium*

**BREAKFAST** - *Cafeteria - Wear your nametag to all meals!* 7:00 a.m. - 7:45 a.m.

**PLENARY** 8:00 a.m.

*Welcome*
Dr. Stephanie VanDyne, Benedictine College Board of Directors, Atchison, KS

Steve Adams, Conference Chairman
Kansas Department of Wildlife and Parks, Topeka, KS

Mike Hayden, Secretary
Kansas Department of Wildlife and Parks, Topeka, KS

**KEYNOTE ADDRESS -** *Auditorium* 8:30 a.m.

***River Engineering versus River Restoration***

Dr. Philip Williams, PWA Ltd, San Francisco, CA
(page 25)

**Overview of Adaptive Management Implementation -** *Auditorium* 9:15 a.m.
as presented in the National Research Council Report:
*The Missouri River Ecosystem: Exploring the Prospects for Recovery*

Dr. Steven Gloss, U.S. Geological Survey, Flagstaff, AZ (page 26)

**BREAK -** *Atrium* 9:45 a.m.

**Adaptive Management Panel Session** - ***Auditorium*** (page 26) 10:15 a.m.
***Moderator: Dr. Steven Gloss***

PANELISTS

- Rose Hargrave, U.S. Army Corps of Engineers
- Sue Lowry, Wyoming State Engineers Office,
  Missouri River Basin Association
- Michael Mac, U.S. Geological Survey
- Tony Prato, Missouri River Institute, University of Missouri
- Charles Scott, U.S. Fish and Wildlife Service
- Gene Zuerlein, Nebraska Game and Fish Commission,
  Missouri River Natural Resources Committee

**LUNCH** - *Cafeteria* 12:15 p.m.

# Monday Afternoon, June 2

## CONCURRENT SESSIONS

| | ***Session 1 - Auditorium*** **HYDROLOGY** Moderator: Glenn Covington U.S. Army Corps of Engineers Kansas City, MO | ***Session 2 - Band Room*** **RESEARCH, EDUCATION, EXTENSION** Moderator: Tony Prato, Missouri River Institute, UMC, Columbia, MO |
|---|---|---|
| 1:45 p.m. | *Missouri River Updated Stage-Frequency, Gavins Point Dam to Rulo, Nebraska.* Dan Pridal, U.S. Army Corps of Engineers, Omaha, NE (page 27) | *Cooperative Ecosystem Studies Units in the Missouri River Basin: What Do They Have to Offer?* Kyle D. Hoagland, University of Nebraska, Lincoln, NE (page 31) |
| 2:05 p.m. | *Missouri River 2-Dimensional Model Development.* Lynn Schaper, U.S. Army Corps of Engineers, Omaha, NE (page 27) | *Methane Development in the Upper Missouri River Basin.* K.J. Reddy, Department of Renewable Resources, Laramie, WY (page 31) |
| 2:25 p.m. | *Flow Field Over Bedforms in the Lower Missouri River.* Robert R. Holmes, Jr., U.S. Geological Survey, Urbana, IL (page 27) | *Regional Water Quality Information and Educational Programs within the Missouri River Basin.* Jerry Miller, Iowa State University, Ames, IA (page 32) |
| 2:45 p.m. | *Habitat Patterns in Time and Space, Lower Missouri River.* Robert Jacobson, U.S. Geological Survey, Columbia, MO (page 28) | *The Missouri River Institute at the University of South Dakota.* Bruce A. Barton, University of South Dakota, Vermillion, SD (page 32) |
| 3:05 p.m. | **BREAK -** *Atrium* | |

### Bob Dyer, Songteller

Bob Dyer was raised on the banks of the Missouri River in the historic Boonslick region of central Missouri. Bob combines his skills as a poet, musician, historian, folklorist and teacher in his "songtelling" presentations. His songs, accompanied by guitar, are original folk-style ballads that encompass many historical themes, especially related to the Missouri River.
(members.tripod.com/~Write4801/celebrity/bobdyer.html)

## CONCURRENT SESSIONS

| *Session 1 - Auditorium*<br>**AVIAN POPULATIONS**<br>Moderator: Roger Collins<br>U.S. Fish and Wildlife Service<br>Bismarck, ND | *Session 2 - Band Room*<br>**FISHERIES**<br>Moderator: David Galat<br>U.S. Geological Survey<br>Cooperative Research Unit<br>University of Missouri, Columbia, MO | |
|---|---|---|
| *Bird Biodiversity Comparisons Between the Benedictine Bottoms and Surrounding Kansas and Missouri Counties.*<br>Tiffany M. Cope, Benedictine College, Atchison, KS (page 28) | *Methods for Reproductive Status Determination of Missouri River Pallid Sturgeon: What We Know So Far.*<br>Mark L. Wildhaber, U.S. Geological Survey, Columbia, MO (page 33) | 3:35 p.m. |
| *Shorebird Use of Sandbar and Side-Channel Habitat Along the Lower Missouri River.*<br>John M. Finley, University of Missouri, Columbia, MO (page 29) | *Fish Abundance and Diversity in Backwater and Main Channel Areas of the Middle Missouri River*<br>Bryan R. Gasper. Department of Biology, Vermillion, SD (page 34) | 3:55 p.m. |
| *Distribution and Abundance of Neotropical Migrant Songbirds in Floodplain Habitats of the Lower Missouri River.*<br>Neal B. Young, University of Missouri, Puxico, MO (page 29) | *Abnormal Hermaphroditism in Shovelnose Sturgeon from the Missouri River.*<br>Diana Papoulias, U.S. Geological Survey, Columbia, MO (page 34) | 4:15 p.m. |
| *Analysis of Bird Feeding Assemblages, Habitat Structure and Resident Status on the Benedictine Bottoms.*<br>Jill C. Hellmer, Benedictine College, Atchison, KS (page 30) | *Winter Habitat Selection by Asian Carp in the Lower Missouri River and Tributaries.*<br>Duane C. Chapman, U.S. Geological Survey, Columbia, MO (page 35) | 4:35 p.m. |

### Evening Activities

5:15 - 5:45 p.m. - **Meeting -** *Ferrell Hall Heritage Room*
Missouri River Basin Consortium Meeting

5:30 p.m. - **Social -** *Atrium*
Poster and Exhibit Session - *Sponsored by HDR Engineering, Inc.*

7:30 p.m. - **Banquet -** *Cafeteria*
Performance by Songteller Bob Dyer (see page 8)

After events - **Rathskeller** - *Ferrell Hall Garden Floor Lobby*

# Schedule *Tuesday Morning, June 3*

7:00 a.m. - 8:15 a.m. **BREAKFAST -** *Cafeteria*

## OPENING SESSION - *Auditorium*

8:30 a.m. ***Plant and Animal Communities of Fort Leavenworth Military Reserve.***

Introduction: Matt Nowak, Fort Leavenworth, Fort Leavenworth, KS
Presentation: Craig C. Freeman and William H. Busby
Kansas Biological Survey, Lawrence KS (page 36)

9:30 a.m. **BREAK -** *Atrium*

## CONCURRENT SESSIONS

| | ***Session 1 - Auditorium*** **VERTEBRATE POPULATIONS** Moderator: Tim Fobes HDR Engineering, Kansas City, MO | ***Session 2 - Band Room*** **INVERTEBRATE POPULATIONS** Moderator: Martin Simon Benedictine College, Atchison, KS |
|---|---|---|
| 10:00 a.m. | *Mammalian Biodiversity Monitoring on Benedictine Bottoms Fish and Wildlife Mitigation Site.* Mike Snyder, HDR Engineering, Inc. Kansas City, MO (page 37) | *Abundance, Biodiversity, and Biomass of Aerial Invertebrates on the Benedictine Bottoms.* Nicole Bruckerhoff, Benedictine College, Atchison, KS (page 39) |
| 10:20 a.m. | *Herpetological Research at a Missouri River Marsh, Van Meter State Park, MO.* Mark Mills, Missouri Valley College, Marshall, MO (page 37) | *Soil Microbial Biodiversity and Abundance on the Benedictine Bottoms Wildlife Mitigation Site.* Bryan Adams, Benedictine College, Atchison, KS (page 39) |
| 10:40 a.m. | *Turtle Response to Wetland Rehabilitation in the Missouri River Floodplain, Overton Bottoms.* Maureen A. Gallagher, U.S. Fish and Wildlife Service, Columbia, MO (page 38) | *Abundance and Biodiversity of Terrestrial Invertebrates on the Benedictine Bottoms.* Zac Cusumano, Benedictine College, Atchison, KS (page 40) |

11:00 a.m. **LUNCH -** *Cafeteria*

U.S. Army Corps of Engineers

Matthew Nowak stands beneath a giant pecan tree on Fort Leavenworth Military Reserve.

Your Name
Your Address

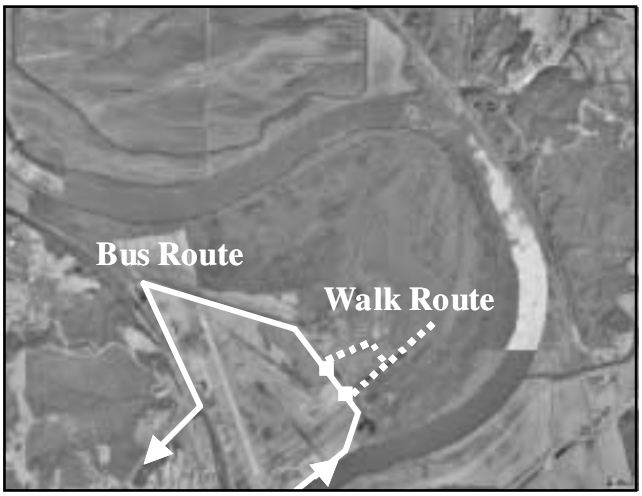
**Bring your photo ID!!**

**FIELD TRIPS**
**12:00 - 6:00 p.m.**
*Meet at Ferrell Hall Lawn*

## Fort Leavenworth Military Reserve

The Fort Leavenworth riparian forest is the oldest such bottomland forest in the Lower Missouri River system. The presentation by Drs. Freeman and Busby in the morning provides a backdrop for what is seen on the tour. At the site, receive an overview presentation along with maps and a nature walk with foresters, hydrologists, and biologists; discussion includes Missouri River forest succession, growth patterns, and native hard and soft woods.

**area map on back cover**




Fort Leavenworth Military Reserve
www.leavenworth.army.mil/cac/history.htm

## Benedictine Bottoms Fish & Wildlife Mitigation Site

Benedictine Bottoms is located just north of the college where it serves as a laboratory for biology students through the *Missouri River Biodiversity Assessment Program.* Students explain their research on the tour. The site is part of the *Missouri River Fish and Wildlife Mitigation Project;* resource managers from the Kansas Department of Wildlife and Parks and U.S. Army Corps of Engineers provide restoration objectives and techniques. Other topics include native plants and grasses, shoreline river structure modification work, and challenges to constructed wetlands.

Benedictine Bottoms Fish and Wildlife Mitigation Site
www.nwk.usace.army.mil/projects/mitigation/sites/benedictine_area/benbot.htm.

6:00 p.m.
**BBQ Picnic** -
Raven's Roost Lawn

# Wednesday Morning, June 4

## CONCURRENT SESSIONS

| | *Session 1 - Auditorium*<br>**WATER QUALITY**<br>Moderator: Larry Shepard<br>U.S. Environmental Protection Agency, Kansas City, KS | *Session 2 - Band Room*<br>**VEGETATION**<br>Moderator: Mark Laustrup<br>U.S. Geological Survey, Columbia, MO |
|---|---|---|
| 8:00 a.m. | *Water Quality in the Garrison Reach of the Missouri River, ND: Preliminary EMAP Findings.*<br>Ted Angradi, U.S. EPA Office of Research and Development, Duluth, MN (page 41) | *A Probability Survey of Successional Forest Composition and Condition in a Great River Floodplain Landscape.*<br>E. William Schweiger, U.S. Environmental Protection Agency, Denver , CO (page 49) |
| 8:20 a.m. | *Nutrient Loading in the Missouri River Basin.*<br>Joe Engeln, Missouri Department of Natural Resources, Jefferson City, MO (page 41) | *Woody Species and Structure in a Chronosequence of Riparian Forest.*<br>Thomas Faust, University of Missouri, Columbia, MO (page 50) |
| 8:40 a.m | *Tissue Contamination Trends in the Missouri River and its Tributaries since 1985.*<br>Lorenzo Sena, U.S. Environmental Protection Agency, Kansas City, KS (page 42) | *Physical Factors Influencing the Effectiveness of Woody Corridors in Levee Protection.*<br>Stephen B. Allen, University of Missouri, Columbia, MO (page 50) |
| 9:00 a.m. | *Assessment of Power Plant Cooling Water Discharges to the Missouri River.*<br>John Dunn, U.S. Environmental Protection Agency, Kansas City, KS (page 42) | *Temporal Study of the Flora of the Benedictine Bottoms.*<br>Catherine Wiegand, Benedictine College, Atchison, KS (page 51) |
| 9:20 a.m. | **BREAK -** *Atrium* | |

### Rebecca Wodder

President of American Rivers since 1995, Rebecca Wodder grew up in Omaha along the banks of the Missouri River. She holds a bachelor's degree in biology and environmental studies from the University of Kansas and a master's degree in landscape architecture and water resources management from the University of Wisconsin. Since Rebecca took the helm, American Rivers has doubled its membership, staff, and annual budget – and quintupled the number of field offices. (www.amrivers.org)

## CONCURRENT SESSIONS

| ***Session 1 - Auditorium*** **WATER QUALITY**<br><br>Moderator: Larry Shepard<br>U.S. Environmental Protection Agency<br>Kansas City, KS | ***Session 2 - Band Room*** **MANAGEMENT CHALLENGES in the DYNAMIC RIVER**<br><br>Moderator: Jud Kneuvean<br>U.S. Army Corps of Engineers<br>Kansas City, MO | |
|---|---|---|
| *National Park Baseline Water Quality Data Inventory and Analysis, Report Series.*<br>Mike Matz, Colorado State University at the National Park Service, Ft. Collins, CO (page 43) | *Corps of Engineers Missouri River Fish and Wildlife Mitigation Project, Present and Future.*<br>Kelly Ryan, U.S. Army Corps of Engineers, Kansas City, MO (page 52) | 9:50 a.m. |
| *Missouri River Interstate Water Quality Project.*<br>Jeanne Heuser, U.S. Geological Survey, Columbia, MO (page 44) | *Bank Stabilization and Habitat Analysis in Four Open Reaches of the Missouri River.*<br>Patrick J. Engelbert, HDR Engineering, Inc., Omaha, NE (page 52) | 10:10 a.m. |
| *Historical Water Quality of the Lower Missouri River with Comparisons to Modern Conditions.*<br>Dale Blevins, U.S. Geological Survey, Independence, MO (page 45) | *Development of Biological Indicators for Floodplain Wetlands of the Upper Missouri River Basin.*<br>Steven Chipps, U.S. Geological Survey, Brookings, SD (page 53) | 10:30 a.m. |
| *Challenges in Assessing Water Quality of the Iowa Reach of the Missouri River.*<br>John Olson, Iowa Department of Natural Resources, Des Moines, IA (page 45) | *Emerging Deltas in the Missouri River's Reservoirs: A Silver Lining for Biodiversity.*<br>Michael Scott, U.S. Geological Survey, Fort Collins, CO (page 54) | 10:50 a.m. |
| *Results from the Upper Mississippi Water Quality Assessment.*<br>Bill Franz, U.S. Environmental Protection Agency, Chicago, IL (page 46) | *Evaluation of a Spring Rise for the Missouri River.*<br>Donald Jorgensen, Lakota Consulting, Jefferson, SD (page 55) | 11:10 a.m. |

**LUNCH -** *Atrium* 11:30 a.m.

USGS

**PRESENTATION -** *Auditorium*

*Honoring the Legacy: Discovering and Restoring the Rivers of Lewis and Clark*

by Rebecca Wodder (page 12)

# Exhibits

*Student Union Atrium*

**Earth Science**
**Emporia State University**
James Aber
1200 Commercial
Emporia, KS 66801
620-341-5981

**Environmental Systems Research Institute (ESRI)**
Stephen Kinzy
820 South Main Street, Suite 207
St. Charles, MO 63301
636-949-6620
skinzy@esri.com

**Eastern Kansas Organic Crop Improvement Association**
Jake Geiger
2015 Raccoon Road
Robinson, KS 66532
785-544-6860

**HDR Engineering**
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Kansas City, MO 64111
816-360-2769
jturner@hdrinc.com

**Kansas Department of Wildlife and Parks**
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Topeka, KS 66612
785-296-0019
stevea@wp.state.ks.us

**The Nature Conservancy**
Jason Skold
1019 Leavenwroth St., Suite 100
Omaha, NE 68102
402-342-0282

**U.S. Army Corps of Engineers-Kansas City**
*Missouri River Fish and Wildlife Mitigation Program*
Kelly Ryan
601 E. 12th St.
Kansas City, MO 64106
816-983-3324
kelly.ryan@usace.army.mil

**U.S. Army Corps of Engineers-Kansas City**
*Lewis and Clark Bicentennial, Lower Missouri River*
Greg Miller
601 E. 12th St.
Kansas City, MO 65106
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gregory.a.miller@usace.army.mil

**U.S. Environmental Protection Agency-Kansas City**
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**U.S. Fish and Wildlife Service**
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**U.S. Geological Survey**
Columbia Environmental Research Center
*Missouri River InfoLINK*
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**U. S. Geological Survey and U.S. Fish and Wildlife Service**
**BOAT DISPLAY -** *Ferrell Hall Lawn*

*Two research vessels are displayed near Ferrell Hall:*

Researchers from the U.S. Fish and Wildlife Service Columbia Fishery Research Office in Columbia, MO are displaying their 27-foot, inboard jet drive, stern trawler used for fish studies on the Missouri River.

Researchers conducting Missouri River habitat studies at the USGS River Studies Station are displaying their vessel, the *R/V Slim Funk,* (below). It is a 19-foot, shallow draft habitat mapping boat that simultaneously collects depth, velocity and substrate data.

USGS

USGS River Studies Station research vessel, *Slim Funk,* used in Missouri River habitat studies.

# Posters

**Posters are listed alphabetically by title.**

Detailed descriptions of posters on pages 17-23.

*Bank Stabilization Implications on Missouri River Floodplain Land Use.*

Brock Hoegh, HDR Engineering, Inc. Omaha, NE (page 17)

*Deer Population Structure on the Benedictine Bottoms Missouri River Mitigation Site (1994-2002).*

Kyle Kellner, Benedictine College, Atchison, KS (page 17)

*Endocrine Disrupting Compounds in Drinking Water: Sources, Temporal Variations, and Fate and Transport in Eastern Nebraska.*

Jason R. Vogel, U.S. Geological Survey, Lincoln, NE (page 18)

*Forestry Resources of the Lower Missouri River Bottomland.*

James S. Aber, Emporia State University, Emporia KS (page 18)

*Larval Fish Usage of the Main Channel in the Lower Missouri River.*

Sandra J. Clark, University of Missouri, Columbia, MO (page 19)

*Management Practices on the Benedictine Bottoms Fish and Wildlife Mitigation Site.*

Larissa Hilger, Benedictine Bottoms, Atchison, KS (page 19)

*Reconnaissance of Nutrient Enrichment in Streams of Central Nebraska.*

Jill D. Frankforter, U.S. Geological Survey, Lincoln, NE (page 20)

*Seasonal Changes in Abundance and Diversity of Young-of-the-Year Fishes in the Missouri River.*

Connie S. Gilliland, University of South Dakota, Vermillion, SD (page 20)

*Small Mammal Biodiversity on Benedictine Bottoms*

Kyle Schrick, Benedictine College, Atchison, KS (page 21)

*Spawning Periods and Growth of Selected Species of Larval Fishes from the Lower Missouri River.*

Lori Patton, University of Missouri, Columbia, MO (page 21)

*Studies of Natural Plant Recolonization on the Benedictine Bottoms.*

Erin Urban, Benedictine College, Atchison, KS (page 22)

*The Pulse Rate of Pallid Sturgeon and the Fish Community of the Missouri River.*

Mark Drobish, U.S. Army Corps of Engineers, Yankton, SD (page 22)

*Use of Shallow-Water Habitat by Larval Fishes in the Lower Missouri River.*

Kerry Reeves, University of Missouri, Columbia, MO (page 23)

Posters listed alphabetically by title.

## Bank Stabilization Implications on Missouri River Floodplain Land Use

**Brock Hoegh**
**HDR Engineering, Inc.**
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The open reaches of the Missouri River downstream of the main stem dams have experienced significant channel widening, as a result of stream bed lowering due to dam operations. To better understand the impacts to the adjacent landowner and to riparian habitat caused by the channel widening, a land use analysis was performed. The land use analysis also evaluated the effects of bank stabilization on adjacent land uses and riparian habitat. This was accomplished by rectifying aerial photography for both the mid 1970's (pre-revetment) and the late 1990's (post-revetment). Six land cover classes were identified and include: (1) Urban, (2) Agriculture, (3) Rangeland/non-agriculture vegetated land, (4) Forest, (5) Water, and (6) Barren/non-vegetated. GIS was utilized to electronically digitize land cover and identify land use changes that have occurred. This information was used to evaluate how each land use has been impacted by bank stabilization. The study reaches were Ft. Peck Dam to the upper end of Lake Sakakawea, Garrison Dam to the upper end of Lake Oahe, Ft. Randall Dam to the upper end of Lewis and Clark Lake, and Gavins Point Dam to Ponca State Park.

BIO: Brock Hoegh is an Environmental Planner for the Environmental & Resource Management Group in Omaha, Nebraska. Brock has been with HDR for four years and received his Bachelor of Science in Natural Resources and his Masters in Community and Regional Planning from the University of Nebraska-Lincoln.

## Deer Population Structure on the Benedictine Bottoms Missouri River Mitigation Site (1994-2002)

**Kyle Kellner**
**Benedictine College**
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Co-Authors: Kyle Schrick, Dominic Lickteig, Tucker Porter, Dr. Martin Simon, Dr. Daniel Bowen, Benedictine College Department of Biology, 1020 North 2nd Street, Atchison, KS 66002

The purpose of this research is to determine the population structure of deer on the Benedictine Bottoms, to compare the relative abundance of deer on the Benedictine Bottoms and adjacent agricultural land, and to investigate possible factors affecting deer population structure.

The United States Army Corps of Engineers purchased 855 hectares of floodplain on the Missouri River approximately 1.5 kilometers northeast of Atchison, Kansas. As a part to determine the presence and abundance of mammals residing on the bottoms, deer spotlight surveys were conducted on a six kilometer portion of elevated road surrounding the bottoms and the adjacent agricultural land during the fall and winter from 1994-2002. These surveys serve to determine the population structure of Whitetail Deer, a mammal of particular interest on the Bottoms.

In 2001, an average of 49.0 deer were seen on each survey. Fawns represented 23.8% of the population, does 22.4%, bucks 8.2%, sub-bucks 7.5%. 38% were left unclassified.

# Posters

**Posters listed alphabetically by title.**

## Endocrine Disrupting Compounds in Drinking Water: Sources, Temporal Variations, and Fate and Transport in Eastern Nebraska

**Jason R. Vogel**
**U.S. Geological Survey**
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Known or suspected endocrine-disrupting compounds have been detected in water from streams, groundwater, and drinking water. In 2001 and 2002, the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency and the City of Lincoln, Nebraska, collected various environmental water samples near the City of Lincoln well field, Nebraska, to evaluate (1) the sources and temporal variations of known or suspected endocrine disrupters, pharmaceuticals, hormones, and other wastewater compounds, and, (2) the fate and transport of these compounds from the Platte River through an alluvial aquifer into water from wells used for drinking water based on environmental samples. Samples were analyzed for more than 150 dissolved compounds, including herbicides and their metabolites, personal-care products, prescription and nonprescription drugs, and industrial compounds.

Preliminary results show that pesticides as well as numerous other organic compounds are released into the environment throughout the year. Sources of organic compounds include animal feeding operations and a wastewater-treatment plant with cumulative concentrations of (1) pesticides up to 3 mg/L in water from a wastewater-treatment plant, (2) organic wastewater compounds of more than 1,000 mg/L in water from a lagoon of an animal feeding operation, and (3) pharmaceuticals of more than 10 mg/L in water from a lagoon at an animal feeding operation in February 2002. Moreover, preliminary results of the study also indicate that some organic chemicals readily can travel through more than 30 m of riverine sediments mainly consisting of sands and gravels. Indirectly, preliminary results of the study also indicate that numerous organic compounds released by point and nonpoint sources readily can degrade or be adsorbed in the environment prior to reaching drinking-water intakes given enough travel time for degradation and adsorption to take place. Nevertheless, at times, given the right conditions, contaminants can be transported along with surface water into groundwater potentially contaminating drinking water directly or indirectly obtained from polluted rivers. Contamination of a water supply can occur at parts per trillion or parts per billion levels depending upon the drinking-water treatment processes used by the affected drinking-water utility.

## Forestry Resources of the Lower Missouri River Bottomland

**James S. Aber**
**Earth Science, Emporia State Univesity**
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Co-Authors: Margaret Landis, Earth Science, Emporia State Univesity, 1200 Commercial, Emporia, KS 66801 and Matthew Nowak, Fort Leavenworth, KS

Forestry resources of the Lower Missouri River valley were evaluated based on Landsat Thematic Mapper (TM) imagery from southeastern South Dakota to eastern Missouri. Eight summer Landsat TM datasets were processed to provide continuous coverage of the bottomland. Standard satellite image processing methods were applied including use of vegetation indices and image classification techniques. The bottomland forest was extracted for analysis of its spatial distribution, and other types of valley land use/cover were (continued on next page)

**Posters listed alphabetically by title.**

enumerated. In addition, we have employed kite aerial photography (KAP) to acquire low-height, high-resolution images of bottomland forest cover at Fort Leavenworth, KS. This type of detailed imagery improved our interpretation of Landsat TM data. The Landsat and KAP images also proved useful for interpretation of alluvial geomorphology, impact of river control, and historical archaeology. Some of the results of this project are available to the public in the Lewis and Clark bicentennial space-age atlas: www.emporia.edu/nasa/lewis_cl/.

## Larval Fish Usage of the Main Channel in the Lower Missouri River

**Sandra J. Clark**
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Co-Authors: Kerry Reeves, University of Missouri, Columbia, MO and David Galat, U.S. Geological Survey Cooperative Research Unit, University of Missouri, Columbia, MO.

Larval fish usage of the main channel of the Lower Missouri River has not been extensively researched and even less is known about the larval fish drifting in the main channel compared to drift near the shoreline. Larval fish were sampled every two weeks from July 4, 2002 through September 2, 2002 in the Lower Missouri River at locations upstream and downstream of point sandbars. Four point sandbars were chosen between river mile 179 and 158 due to their proximity to each other. The sandbars were paired and the distance between them was determined using a range finder. Sampling was conducted at the midpoint between the sandbars and then equidistant above and below the sandbar. The channel width was determined and sampling was done at distances 3%, 33%, 66% and 97 % of the channel width. The distance sampled was held constant at 300 meters for every sampling period. Sampling was done using bow-mounted icthyoplankton nets moving downstream at a speed of 1 m/s faster than the current. The presence of rip-rap was documented when sampling near the shoreline. Implications on whether larval fish are in greater abundance above sandbars or below, whether rip-rapping has an effect on larval fish abundance, and whether greater abundances of larval fish are located near the shoreline or in the main channel were all considered in this study.

## Management Practices on the Benedictine Bottoms Fish and Wildlife Mitigation Site.

**Larissa Hilger**
**Benedictine College**
1020 North 2nd St. Atchison, KS 66002

Co-Authors: Catherine Wiegand, Erin Urban, Daniel Bowen, Martin Simon, John Davis, Benedictine College, 1020 North 2nd St., Atchison, KS 66002

In 1994, the Biology Department of Benedictine College initiated the Benedictine Bottoms *Missouri River Biodiversity Assessment Program* on the Benedictine Bottoms Fish and Wildlife Mitigation Site. The emphasis of this endeavor is shifting from general descriptions of temporal changes in biodiversity to the effects of specific management practices on biodiversity patterns. This change is in response to the recently published National Academy of Sciences recommendation that the Corps of Engineers use adaptive management to develop and maintain mitigation sites on the Lower Missouri River (*The Missouri River Ecosystem: Exploring the Prospects for Recovery* 2002, The National Academy of Sciences).

This study will display the development of the management practices of the Benedictine Bottoms as it has changed over time. It exhibits the old management methodologies by the U.S. Army Corp of Engineers, the

**Posters listed alphabetically by title.**

current management under Kirk Thompson and the Kansas Department of Wildlife and Parks, and finally, future development plans that will take place under the KDWP.

At the end of the 1993 growing season, the U.S. Army Corps of Engineers began restoration of the Benedictine Bottoms. The Corps worked to restore the agricultural land to a biodiverse riparian-wetland complex. They succeeded in building roads, installing water regulation mechanisms, and planting 176,100 trees and shrub seedlings on 223 ha. In 1998, management of the Benedictine Bottoms was assigned to the Kansas Department of Wildlife and Parks. Their duties continued and included mowing, spraying weeds, managed burning, and cultivating the restoration areas. KDWP management continues with special concerns for maintaining broadleaf plant diversity, reduction of grassland monoculture, and the invasion of unwanted species such as cottonwoods and noxious weeds.

## Reconnaissance of Nutrient Enrichment in Streams of Central Nebraska

**Jill D. Frankforter**
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Co-Authors: Michaela R. Johnson, and Ronald B. Zelt, U.S. Geological Survey, 100 Centennial Mall North, Federal Building Room 4, Lincoln, NE 68508

Nutrients are a leading cause of water-quality impairment in surface waters of the United States. Federal guidance for nutrient criteria for water quality is currently developing in the form of regional numerical target ranges for States and Tribes to use in management programs to reduce over-enrichment in surface waters.

Documentation of biological responses to a range of nutrients conditions among agricultural streams will aid this effort. The objectives of a nutrient enrichment study to be conducted in Central Nebraska include determination of (1) relations between biological communities and nutrient conditions in streams from contrasting agriculturally dominated environmental settings, and (2) relations between nutrients, algae, and stream metabolism at the watershed scale.

Digital map data for streams, ecoregions, drainage area, estimated ground water contribution to baseflow, and estimated potential nutrient loading were used to stratify the study area and select candidate sampling reaches. A field reconnaissance of nutrient conditions in more than 60 streams in September and October, 2002 defined the expected range of total nitrate and orthophosphate concentrations during low flow conditions. Nitrate concentrations ranged from <0.1 to 6.2 milligrams per liter (mg/L) as nitrogen, and orthophosphate concentrations ranged from <0.02 to 6.3 mg/L. During Summer 2003, water quality, biological communities, and stream metabolism will be sampled at 28 sites.

## Seasonal Changes in Abundance and Diversity of Young-of-the-Year Fishes in a Missouri River Backwater

**Connie S. Gilliland**
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Co-Authors: Bryan R. Gasper and Bruce A. Barton, Department of Biology, University of South Dakota, 414 East Clark Street, Vermillion, SD 57069

A systematic survey of young-of-the-year fishes was conducted during the summer, 2002 on a Missouri River backwater at Ponca State Park, Nebraska, to document fish abundance and species diversity in this wetland. This area is scheduled for restoration and is suspected to be an important nursery habitat for many fishes. Four samples from each of three representative sites were made every 2 weeks using a 5-m seine net (total: 84 samples).

**Posters listed alphabetically by title.**

From June to August, nine fish species were documented using this area. The dominant species were emerald shiners, river carpsuckers, red shiners, gizzard shad, and bluegill. Initial analysis shows that emerald shiners were generally the most common species in the samples (34-96%). River carpsuckers were most abundant at the end of June (48%) and then absent by August, and red shiners were most prevalent in late July (28%). Subsequent analysis will include a comparison of species diversity using the Shannon-Weaver index. Preliminary data show that this area is an important habitat for young-of-the-year Missouri River fishes and a key forage site for the endangered least tern, which has been observed feeding in this backwater.

## Small Mammal Biodiversity on Benedictine Bottoms

**Kyle Schrick**
**Benedictine College**
1020 North 2nd St., Atchison, KS 66002

Co-Authors: Kyle Kellner, Dominic Lickteig, Martin P. Simon and Daniel E. Bowen, Benedictine Bottoms Missouri River Biodiversity Assessment Program, Biology Department, Benedictine College, Atchison, KS 66002

The Benedictine Bottoms (Bottoms) is a mitigation site developed by the U.S. Army Corps of Engineers to renew the natural floodplain habitat along the Missouri River. The Bottoms consists of 855 hectares of floodplain habitat. The goal of our research is to measure the changes in biodiversity associated with this mitigation. 20-30 small mammal traps are placed at each of 3 transects each month. The traps are checked for three consecutive days. In addition, the mammals seen on the bottoms during these days are also recorded. The most abundant species to date on the Bottoms is the deer mouse *(Peromyscus maniculatus)*. Other abundant species include the hispid cotton rat (*Sigmodon hispidus)*, prairie vole (*Microtus ochrogaster*), and house mouse (*Mus musculus)*. To date there have been 11 species trapped on the bottoms. 51% of the species occurring at the Fort Leavenworth benchmark site also occur on the Bottoms. Not observed on the Bottoms are squirrels and bats. Small mammal abundance has differed significantly in different years. The peak abundance of small mammals occurred in the month of November. Small mammal abundance has not been shown to be significantly affected by rainfall.

## Spawning Periods and Growth of Selected Species of Larval Fishes from the Lower Missouri River.

**Lori Patton**
**University of Missouri-Columbia**
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Co-Authors: Kerry S. Reeves, University of Missouri, Columbia, MO and David Galat, U.S. Geological Survey Cooperative Research Unit, University of Missouri, Columbia, MO.

Scientists have recently recognized the value of larval fishes as indicators of ecological integrity. More precise data can be derived from larval fishes than from adult fishes due to their environmental sensitivity and limited mobility. We propose to characterize environmental conditions that define optimal nursery habitat for larval fishes in the Lower Missouri River to aid in habitat rehabilitation efforts. We are using a hierarchical approach to define nursery habitat with comparisons at the macro-scale (among main channel and sandbar types), meso-scale (among locations within sandbar types) and micro-scale (0.25 m2 grids within individual sandbar mesohabitats). Data from the previous field season will include measurements from macro- and meso-scale levels. Larval fish otoliths will be used to approximate time of spawning, growth rates, and time spent in the larval stage for selected species. Providing or restoring habitat that (continued on next page)

**Posters listed alphabetically by title.**

decreases time spent in the larval stage can increase recruitment of a species or guild. We will define optimal nursery habitat for selected species using growth rates, species diversity and richness, and total abundance as indicators. In conjunction, we will characterize habitat using current velocity, temperature, substrate, sinuosity, and distance from shore.

### Studies of Natural Plant Recolonization on the Benedictine Bottoms

**Erin Urban**
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Co-Authors: Catherine Wiegand, Larissa Hilger, John Davis, Martin Simon, and Daniel Bowen, Benedictine College, 1020 North 2nd St., Atchison, KS 66002

The transition of the Benedictine Bottoms from farmland back to floodplain habitat was begun when the Corps of Engineers purchased the site in 1992. Between 1994 and 1997 the Corps planted 200 hectares with 176,000 trees and shrubs as well as an additional 300 hectares with native grass species and legumes. Natural vegetation grew on the remaining land.

In this study, all plants in bloom or with seeds are collected, preserved, and identified. Natural and planted vegetation is the energy and structural base on which all the biodiversity on the Benedictine Bottoms is based. Ecological succession species that have been extirpated are compiled and divided into five-year cycles. The first cycle began May 1995 and was completed in 2000. Plants collected through the 1999 growing season totaled 47 Families, 103 Genera, and 127 Species. We are currently analyzing the second cycle, to be completed in 2004. So far, some plants that we have found in the second cycle, but not in the first, include: *Gutierrezia sarothrae, Cyperus strigosus, Trifolium campestre,* and *Campsis radicans*.

Plant biodiversity is being monitored by comparing it to a relatively undisturbed wetland, 20 miles south of the Benedictine Bottoms in Ft. Leavenworth. Ft. Leavenworth Military Reservation, which was established in 1827, encompasses a relatively undisturbed floodplain. The Bottoms flora is being compared to an inventory of the flora on the reservation, which was conducted by the Kansas Biological Survey from 1995-1997.

BIO: Erin Urban is a Junior Biochemistry major at Benedictine College. This is her second year presenting a plant biodiversity poster at the Missouri River Natural Resources Conference.

### The Pulse Rate of Pallid Sturgeon and the Fish Community of the Missouri River

**Mark Drobish**
**U.S. Army Corps of Engineers**
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A pallid sturgeon and fish community assessment plan for the Missouri River system is being developed by a group of fisheries biologists. This plan will incorporate Standard Operating Procedures for sampling strategies, habitat classification, gears, methods, GPS, physical habitat characteristic data collection, etc. throughout the system. Biological monitoring of habitat improvement projects (shallow water habitat) will be incorporated into the sampling strategy to assess the impacts of these modifications to pallid sturgeon and the fish community.

BIO: Mark Drobish is a Fisheries Biologist with the Corps of Engineers' Threatened and Endangered Species Section located at the Gavins Point Project.

**Posters listed alphabetically by title.**

## Use of Shallow-Water Habitat by Larval Fishes in the Lower Missouri River

**Kerry Reeves**
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Co-Author: David Galat, U.S. Geological Survey Cooperative Research Unit, University of Missouri, Columbia, MO 65211

Larval fish, having limited motility and sensory ability are restricted to habitat within a narrow range of environmental conditions. Due to these constraints, much of the impacts on fisheries stocks observed after river channelization and the installation of associated engineering controls may be attributed to a loss of nursery habitat. Providing habitat which decreases the time spent in this vulnerable stage can increase the recruitment through the larval bottleneck. To ensure that channel or flow modifications to restore nursery habitat are successful, it is first vital that larval fish habitat requirements be defined in specific terms. To accomplish this, we are using an adaptive sampling design (the results from one field season will be used to more precisely focus sampling effort for the following season) with a hierarchical framework to define nursery habitat on the Lower Missouri River with comparisons at the macro- (between primary and secondary channels, as well as sandbar types), meso- (sandbar regions), and micro- scales (physical factors acting at 0.25m2). Optimal nursery habitat will be defined using species presence/absence, relative abundance, and species richness curves as indicators. This habitat will then be characterized using current velocity, depth, temperature, substrate type, bank slope, shoreline sinuosity, and distance from shore.

The research goal is to define optimal nursery habitat for a suit of Missouri River species in precise terms to provide guidance in the restoration or creation of potential nursery habitat, and provide needed life history information.

Benedictine College

Stained glass window in the Ferrell Hall Heritage Room at Benedictine College.

# Notes

Monday
June 2

PLENARY

8:00 a.m. -
12:15 p.m.

## River Engineering Versus River Restoration

**Philip Williams, Ph.D., P.E., Eur. Ing.**
**President**
**Philip Williams and Associates, Ltd.**
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The presentation discusses the frustrations and dilemmas river managers face who are caught between two paradigms: the 19th century utilitarian idea of the river as a resource to be exploited and the contemporary view of sustainable multi-objective resource management. Explore how the river engineering legacy has created institutional, conceptual and technical barriers that must be overcome in order to effectively restore river ecosystems.

BIO: Dr. Williams has been engaged in a wide range of national and international hydrologic and engineering hydraulics work since he received his Ph.D. in 1970. In 1976, after working in civil engineering and environmental planning firms, he opened his own practice, expanding to form Philip Williams & Associates in 1979. During the past two decades, he has developed considerable expertise in a wide range of technical issues and water-related policy issues both in the U.S. and abroad. From his original research field of sediment hydraulics, Dr. Williams has pioneered practical technical analyses in wetland hydrology, multi-objective river corridor management, lake water balances, the impacts of climate change, the hydraulics of coastal lagoons, and estuarine management. His work has addressed a wide variety of problems, including flood management, salt marsh restoration, reservoir operation, harbor maintenance dredging, riparian management, watershed sediment yield, groundwater management, and coastal lagoon restoration.

The majority of Dr. Williams' work has been assessment of the environmental effects of hydrologic change, often in working with professionals of other disciplines to prepare feasibility studies, management plans, and environmental impact studies. He has directed more than 250 such studies, including projects on flood control, wetland restoration, river management, national park plans, water resources development, and estuarine management plans.

USGS

Amelia Earhart Bridge links Missouri to Kansas at Atchison

**Monday**
**June 2**

**PLENARY**

8:00 a.m. -
12:15 p.m.

## Adaptive Management Session

**Steven Gloss, Ph.D.**
**U.S. Geological Survey**
Grand Canyon Monitoring and Research Center, 2215 Gemini Driver, Flagstaff, AZ 86001; 928-556-7069; sgloss@usgs.gov

Dr. Steve Gloss served as National Research Council chair for the report, *Missouri River Ecosystem: Exploring the Prospects for Recovery.* He discusses the report's recommendation to implement adaptive management on the Missouri River and shares his experiences as the lead USGS biologist on the Glen Canyon Dam Adaptive Management Program. (www.uc.usbr.gov/amp/index.html)

BIO: Dr. Steven P. Gloss is the Biology Program Manager for the Grand Canyon Monitoring and Research Center (GCMRC). He is responsible for planning, implementation, and management of research and monitoring programs related to biological and ecological resources in the Colorado River ecosystem in Grand Canyon, including the Glen Canyon Dam Adaptive Management Program.

Dr. Gloss was a Professor of Zoology at the University of Wyoming and a member of the faculty in the Institute and School of Environment and Natural Resources from 1987 until joining GCMRC in September 2001. He is the former Director of the Wyoming Water Resources Center and has served as President of the National Institutes for Water Resources.

Dr. Gloss has extensive experience dealing with western riparian and riverine ecosystems as director of the Wyoming Water Resources Center where he also gained an appreciation and understanding of the many legal, political, and economic aspects of water resources issues.

He is a member of the National Research Council's Water Science and Technology Board and received his Ph.D. from the University of New Mexico in Biology working on an interdisciplinary project focusing on the Colorado Plateau.

**PANELISTS**

Rose Hargrave, Master Manual Project Leader
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*State representative to the Missouri River Natural Resources Committee*

# Hydrology

**Monday**
**June 2**

**Concurrent Session 1**

**HYDROLOGY**

1:45 p.m. - 3:05 p.m.

## Missouri River Updated Stage-Frequency, Gavins Point Dam to Rulo, NE

**Dan Pridal**
**U.S. Army Corps of Engineers**
106 South 15th Street, Omaha, NE 68102-1618; 402-221-4419
daniel.b.pridal@usace.army.mil

This paper describes the development of revised stage-frequency data for the Missouri River from Gavins Point Dam downstream to Rulo, NE. Flow-frequency values were recently updated for the Missouri River. The stage-frequency analysis uses an unsteady flow model and a period of record analysis to combine the flow-frequency results with stage-discharge to determine stage-frequency values. Model development issues including calibration, levee modeling, stage-trends, and results are discussed.

BIO: Daniel Pridal is a Hydraulic Engineer with the U.S. Army Corps of Engineers, Omaha District.

## Missouri River 2-Dimensional Model Development

**Lynn Schaper**
**U.S. Army Corps of Engineers**
CENWO-ED-HF, 106 South 15th Street, Omaha, NE 68102-1618; 402-221-7189
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This paper describes the construction of two-dimensional models at several sites along the Missouri River. Details regarding the model development process are presented including data acquisition, model geometry features, and preliminary model calibration. Flow modeling through dike fields is illustrated. (continued)

Model construction issues relating to geometry and sediment transport are discussed. Preliminary model results are presented.

BIO: Lynn Schaper is a Hydraulic Engineer with the U.S. Army Corps of Engineers, Omaha District.

## Flow Field Over Bedforms in the Lower Missouri River

**Robert R. Holmes, Jr.**
**U.S. Geological Survey**
221 North Broadway, Suite 101, Urbana, IL 61801; 217-344-0037; bholmes@usgs.gov

Bedforms often are present on the bed of alluvial sand-bed rivers. Bedforms, such as dunes, impact the flow field. In this field study, detailed velocity measurements were made longitudinally along two different dune fields in the Lower Missouri River. The velocity data was collected using an acoustic Doppler current profiler and acoustic Doppler velocimeters. This paper presents results observed at the Missouri River at St. Charles, Missouri.

BIO: Robert Holmes has worked for the U.S. Geological Survey since January 1987 and currently serves as the Chief of the USGS Illinois District. He has authored numerous papers and reports on issues related to flood hydrology, hydraulics, and sediment transport. He is a registered professional engineer in Illinois and Missouri and received a B.S. and M.S. in Civil Engineering from the University of Missouri-Rolla. He will finish his Ph.D. in Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign in May 2003.

# Papers

**Monday**
**June 2**

**Concurrent Session 1**

**HYDROLOGY**
1:45 p.m. - 3:05 p.m.

**AVIAN POPULATIONS**
3:35 p.m. - 4:55 p.m.

## Habitat Patterns in Time and Space, Lower Missouri River

**Robert Jacobson**
**U.S. Geological Survey**
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Engineered changes in many large, multi-purpose rivers can be categorized into semi-independent hydrologic and geomorphic components. Reservoir regulation is the dominant influence on the hydrologic component and bank stabilization/navigation structures comprise the dominant influence on the geomorphic component. Both components can have profound effects on temporal and spatial ecosystem patterns; on the Lower Missouri River, the interaction of these components is a critical question in management and rehabilitation strategies. Two-dimensional hydraulic modeling of a 8-km reach at Hermann, Missouri using pre- and post-reservoir hydrologic times series, and pre- and post-engineered channel morphology, documents changes in ecosystem pattern measured as habitat diversity, habitat connectivity/fragmentation, and timing of habitat availability. The analysis points to rehabilitation strategies that may help to recover ecosystem patterns and functions.

BIO: Robb Jacobson is a Research Hydrologist with 20 years of experience at the U.S. Geological Survey. He has been studying habitat dynamics on the Lower Missouri River since 1993. He received his Ph.D. in Geomorphology at the Whiting School of Engineering, The Johns Hopkins University.

# Avian Populations

## Bird Biodiversity Comparisons Between the Benedictine Bottoms and Surrounding Kansas and Missouri Counties

**Tiffany M. Cope**
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Co-Authors: Jill C. Hellmer, Manda S. Lee, Virginia L. Winder, TinaRose M. Bosslet, Erika B. Kraus, Daniel E. Bowen, and Martin P. Simon, Benedictine College, Box 102, 1020 North 2nd Street, Atchison, KS 66002

We compared the bird species observed on the Benedictine Bottoms with those seen in selected Kansas and Missouri counties that are within close proximity to the Missouri River. The purpose of the study is to use the composite county lists to predict the potential for bird biodiversity on the Benedictine Bottoms after the site has matured. The Kansas counties are Atchison, Doniphan, Brown, Leavenworth, Wyandotte, Jefferson, and Douglas, and the Missouri counties are Platte, Buchanan, Andrew, and Holt. The Kansas counties were selected because of their proximity to the Missouri River. Johnson County was omitted because it is highly urbanized. The Benedictine Bottoms is a floodplain habitat located 1.5 kilometers northeast of Atchison, KS in the southern section of the Rushville Bend. The original 664 ha of the Benedictine Bottoms was purchased in 1992 and two adjacent tracts in 1994 to bring the total to 855 ha. It is part of the Missouri River Fish and Wildlife Mitigation Project and is intensively managed by the Kansas Department of Wildlife and Parks. The data collection methods include levee survey (94-96, 2002), Kansas Breeding Bird Atlas (95-

97), driving interior roads (95-present), and transect walking (95-present). There are 113 birds present on both the Benedictine Bottoms list and the Atchison County list with an additional 29 bird species present solely on the Benedictine Bottoms and 61 species only in Atchison County. There are 140 species common to Douglas County and the Benedictine Bottoms with only 2 species seen solely on the Benedictine Bottoms. The percent of Benedictine Bottoms birds in common with the county lists ranges from 40% to 65%. Some of the birds observed on the Benedictine Bottoms and all counties include the Northern Harrier, Mallard, American Robin, American Tree Sparrow, and Red-winged Blackbird. A bird species observed only on the Benedictine Bottoms is the Rufous-sided Towhee.

BIO: Tiffany Cope is majoring in Biology and Spanish at Benedictine College. She has studied birds on the Benedictine Bottoms for three years. During the summer of 2002, she was selected as a Heuer Scholar and worked on the Benedictine Bottoms *Missouri River Biodiversity Assessment Program.*

## Shorebird Use of Sandbar and Side-Channel Habitat Along the Lower Missouri River

**John M. Finley**
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Many shorebirds use riverine wetlands in Missouri during the spring and summer/fall migration. Their time budget is dominated by foraging in order to build up endogenous fat reserves to fuel northward or southward flight. Their use of floodplain wetlands has been documented, but little information exists about their use of sandbar and side-channel habitat. This ongoing study is documenting their chronology of arrival, species composition, and numbers on sandbar, side-channel, and temporary wetlands along the Lower Missouri River. In addition, hydrology and plant communities are being monitored to determine their effect on shorebird distribution. During the summer-fall migration of 2002, shorebird numbers peaked on sandbar and side-channel habitats during July and the first part of August. In the same time period, shorebird abundance was greater on sandbars than side-channel habitat, and abundance was greater on sandbar and side channel habitat than farmed and unfarmed temporary wetlands. Hydrology was a major component in shorebird distribution for both the spring and summer-fall migration periods.

BIO: John Finley is a Graduate Student at the University of Missouri. He has a B.S. in Biology from Wheaton College and was a Research Arborist with TruGreen-ChemLawn until 2001.

## Distribution and Abundance of Neotropical Migrant Songbirds in Floodplain Habitats of the Lower Missouri River Watershed

**Neal B. Young**
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Co-Author: Maureen A. Gallagher, U.S. Fish and Wildlife Service Big Muddy National Fish and Wildlife Refuge, 4200 New Haven Road, Columbia, Missouri, 65201

The purpose of the three-year study is to identify how the dynamic morphology of Lower Missouri River floodplain habitat contributes to songbird communities. During the pilot year of this study, bird communities in three distinct habitat types were sampled on the Big Muddy, Swan Lake, and Squaw Creek National Wildlife Refuges and selected state conservation areas in the Lower Missouri River watershed. Early

(continued on next page)

**Monday**
**June 2**

**Concurrent Session 1**

**AVIAN POPULATIONS**

3:35 p.m. - 4:55 p.m.

succession forest, mature bottomland hardwood, and wet prairie habitats were sampled in order to determine the distribution and abundance of migrant and breeding birds. This study is being conducted through support of the U. S. Fish and Wildlife Service, U.S. Army Corps of Engineers, University of Missouri – School of Natural Resources, and Missouri Department of Conservation, to aid in landscape scale habitat management for the benefit of migratory birds and other declining species of the Missouri River.

BIO: Neal Young earned a B.S. degree in Wildlife Biology from Southeast Missouri State University in 1995, and a M.S. in Wildlife Biology from Southeast Missouri State in 1999. For his Master's thesis, he studied the effect of habitat on nest site selection and nesting success in eastern phoebes (*Sayornis phoebe*) in southeast Missouri. Neal has worked on many songbird projects across the country, and has been the senior research specialist on the songbird project at the Big Muddy National Fish and Wildlife Refuge since March 2002.

## Analysis of Bird Feeding Assemblages, Habitat Structure and Resident Status on the Benedictine Bottoms.

**Jill C. Hellmer**
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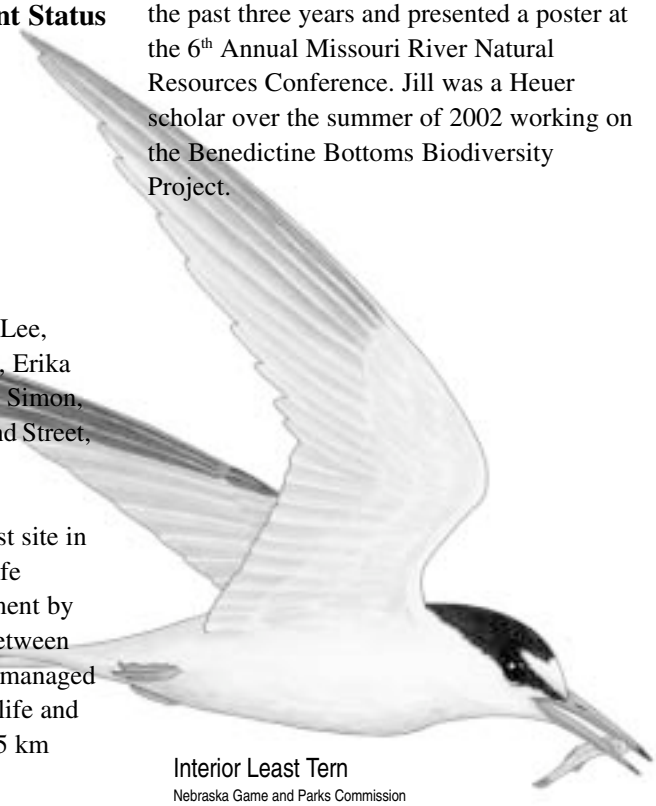
Co-Authors: Tiffany Cope, Manda Lee, Virginia Winder, TinaRose Bosslet, Erika Kraus, Daniel E. Bowen, Martin P. Simon, Benedictine College, 1020 North 2nd Street, Atchison, KS 66002

The Benedictine Bottoms is the first site in the Missouri River Fish and Wildlife Mitigation Project. Peak development by the Corps of Engineers occurred between 1994 and 1997 and the site is now managed by the Kansas Department of Wildlife and Parks. The Bottoms are located 1.5 km northeast of Atchison, Kansas.

Documentation of bird diversity that began in December of 1994 is part of a larger study of biodiversity on the Benedictine Bottoms. In 1995, the first full year in which a portion of the Bottoms had been returned from agricultural land to wetlands, 94 bird species were observed. A total of 142 bird species have now been observed as of December 2002. As the habitats have matured, bird biodiversity has increased. In this paper we categorize the bird species based on three categories: feeding assemblages, grouped by the type of food the bird consumes and how they acquire it, the structure of the habitat they use, and their resident status. Examples of the feeding assemblages are seed and fruit eaters, insect eaters, and omnivores. Habitat structures are divided broadly into two groups, prairie/wetland and forest/woodland birds. The birds are grouped into four categories of resident status; year round residents, migratory birds, winter residents and summer residents. These categorizations will be used to determine the ecological function of the bird species on the Benedictine Bottoms over time.

BIO: Jill Hellmer is a Senior at Benedictine College majoring in Biology. She has worked on the bird biodiversity project for the past three years and presented a poster at the 6th Annual Missouri River Natural Resources Conference. Jill was a Heuer scholar over the summer of 2002 working on the Benedictine Bottoms Biodiversity Project.



Interior Least Tern
Nebraska Game and Parks Commission

**Monday**
**June 2**

**Concurrent Session 2**

**RESEARCH, EDUCATION, EXTENSION**

1:45 p.m. - 3:05 p.m.

## Cooperative Ecosystem Studies Units in the Missouri River Basin: What Do They Have to Offer?

**Kyle D. Hoagland**
**University of Nebraska**
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Cooperative Ecosystem Studies Units (CESUs) are a national network of partnerships between federal agencies, universities, and other natural resources organizations. The Missouri River Basin spans three of these regional units, including the Rocky Mountain (hosted by the University of Montana), Great Plains (University of Nebraska-Lincoln), and most recently, the Upper and Middle Mississippi Valley CESU (University of Missouri-Columbia). The cooperative agreement that ties partner agencies and universities together to constitute each CESU offers an unprecedented opportunity for scientists to collaborate more broadly, efficiently, and in new ways. Resource needs databases are being created to directly link federal agency needs with biological, physical, social, and cultural expertise at participating institutions. Federal funds are transferred directly to participating institutions via work agreements that can be established very quickly, targeting specific needs in the region. CESU agreements also place federal scientists at host universities, to be directly involved in research, teaching, and coordination of the units projects with the agency they represent. (For information on any individual CESU or for the national network, see www.cesu.org/cesu)

BIO: Dr. Hoagland is a Professor of Limnology at the University of Nebraska-Lincoln (UNL). He currently serves as Director of the Water Center at the UNL and Director of the Great Plains CESU. His research interests focus on water quality, particularly ecotoxicology. He teaches courses in limnology, wetlands, and aquatic botany.

## Methane Development in the Upper Missouri River Basin

**K.J. Reddy**
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Co-Authors: Q.D. Skinner, Department of Renewable Resources, P.O. Box 3354, University of Wyoming, Laramie, WY 82071

Demand for natural gas (methane) is increasing because it is an abundant and clean burning fuel. In the United States, because of energy shortages, several upper Missouri River Basin states including Wyoming, Colorado, and Montana are exploring extraction of methane from their coal resources. Extraction of methane from coal deposits is accomplished by pumping aquifer water. Coalbed methane (CBM) product water resulting from pumping groundwater is discharged into associated unlined holding ponds and/or existing streams. The objective of this presentation is to discuss water quality of CBM product water at discharge points, in associated holding ponds, and in stream channels across the Powder River Basin of Wyoming. In addition, potential beneficial uses for CBM product water will be discussed.

BIO: Dr. K.J. Reddy teaches undergraduate and graduate water quality courses at the University of Wyoming. His water quality research emphasizes point and nonpoint water pollution and remediation of contaminants. Dr. Reddy received his Ph.D. in Environmental Quality from Colorado State University in 1986.

# Papers

**Monday**
**June 2**

**Concurrent Session 2**

**RESEARCH, EDUCATION, EXTENSION**

1:45 p.m. - 3:05 p.m.

## Regional Water Quality Information and Educational Programs within the Missouri River Basin

**Gerald Miller**
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Co-Author: Lloyd Walker, Colorado State University, Ft. Collins, CO 80523

USDA Cooperative States Research, Education and Extension Service (CSREES) funded a total of 10 regional information and education coordination projects in FY00, 01 and 02. These regional projects provide funds to the land grant university system whose mission is research, teaching and extension. Two of these regional projects, based on state boundaries within U.S. EPA regions 7 and 8, include nearly all of the land area within the Missouri River Basin. The goal of these projects is to facilitate information and educational programs about water quality and watersheds among appropriate federal and state agencies within each reach region. Within each region activities are being conducted to address specific objectives. Regional objectives address one or more of eight national themes established by CSREES.

Each regional coordination team has established web sites. The Heartland Regional Water Quality Coordination Initiative site is http://www.heartlandwq.iastate.edu/ The Northern Plains and Mountains Regional Water Quality Program site is at: http://waterq.ndsu.nodak.edu/
Current information about themes, scheduled programs, regional team members and links to other regional sites as well as the national site can be accessed at either web site.

BIO: Gerald Miller is an Associate Dean in the College of Agriculture and a Professor of Agronomy at Iowa State University (ISU). He coordinates extension programs and outreach for the College of Agriculture and received his Ph.D. in soil science from ISU in 1974.

## The Missouri River Institute at the University of South Dakota

**Bruce A. Barton**
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Co-Authors: Brian L. Molyneaux, Department of Biology and Missouri River Institute, University of South Dakota, 414 East Clark Street, Vermillion, SD 57069

The Missouri River Institute (MRI) at the University of South Dakota (USD) has operated since 1999 to promote scholarly activity, education and outreach within the university and regional community. Continuing programs include an annual Missouri River Research Symposium that showcases river-related activities by both faculty and students and a Special Lecture Series that invites nationally known scholars to campus to lecture on various topics related to scientific, cultural and environmental issues in the Missouri River basin.

In 2003, the *Missouri National Recreational River Resource and Education Center* at Ponca State Park, housing the USD Research Wing, will open. This new MRI field station will greatly enhance river-related research capabilities at USD. MRI also plans to establish a Missouri National Recreational River Aquatic Ecosystem Health Assessment Unit at USD, which will focus on physical, chemical and biological changes and their interrelationships within the 59-mile Missouri National Recreational River. The goal is to develop a model for small-scale aquatic ecosystem studies that river researchers elsewhere can apply.

BIO: Bruce Barton is a Professor of Biology (fish biology and aquatic ecology) and Co-Director of the Missouri River Institute at the University of South Dakota.

**Monday**
**June 2**

**Concurrent Session 2**

**FISHERIES**

3:35 p.m. - 4:55 p.m.

## Methods for Reproductive Status Determination of Missouri River Pallid Sturgeon: What We Know So Far

**Mark L. Wildhaber**
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Co-Authors: Diana M. Papoulias, Aaron J. DeLonay, Janice L. Albers, Donald E. Tillitt, U.S. Geological Survey, Columbia Environmental Research Center, 4200 New Haven Road, Columbia, MO 65201

A critical component in the ecological restoration of the Missouri River is evaluation of the health of its sturgeon populations. Toward this goal, in May 2001 we began development of methods to determine the reproductive status of pallid sturgeon *(Scaphirhynchus albus)* in the field. Our approach involved year-round, monthly sampling of shovelnose sturgeon *(Scaphirhynchus platorynchus),* a procedural surrogate for pallid sturgeon, using ultrasonic and endoscopic imagery and extraction of blood. Along with the shovelnose data collected, we also collected similar data on pallid sturgeon from the confluence area of the Missouri and Yellowstone rivers.

Though limited, the pallid sturgeon data should allow for some validation of the application of our work with shovelnose sturgeon to pallid sturgeon. This data is being used to develop monthly reproductive stage profiles for shovelnose sturgeon that can be compared to data collected on pallid sturgeon. The goal is to use and cross-validate multiple indicators that define sex and stage of gonad development. The temporal profiles include data on sex steroids and vitellogenin levels, gross anatomical and histological descriptions of the gonads, and ultrasonic and endoscopic imagery. Our preliminary results suggest that the use of ultrasound was moderately successful for internal examination of both pallid and shovelnose sturgeon while the endoscope was ineffective when used on large pallid sturgeon. Ultimately, we hope to be able to use these non-invasive techniques in the field to assess the reproductive status of Missouri River sturgeon, especially the endangered pallid sturgeon.

BIO: Mark Wildhaber is a Research Ecologist at the U.S. Geological Survey, Columbia Environmental Research Center. He has interests in quantitative ecology, behavioral ecology of fishes, ecological modeling, stream community ecology, biostatistics, fate and effect of contaminants in aquatic ecosystems, and risk assessment. He received a Ph.D. in Zoology with a minor in biomathematics from North Carolina State University, Raleigh, NC, a M.S. in Wildlife and Fisheries Sciences from Texas A&M University, College Station, TX, and a B.S. in Zoology and Mathematics with a minor in Chemistry from Southeast Missouri State University, Cape Girardeau, MO.

USGS

Ultrasound used to determine reproductive status in sturgeon.

# Papers

**Monday**
**June 2**

**Concurrent Session 2**

**FISHERIES**

3:35 p.m. - 4:55 p.m.

## Fish Abundance and Diversity in Backwater and Main Channel Areas of the Middle Missouri River

**Bryan R. Gasper**
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Co-Author: Bruce Barton, University of South Dakota, 414 E. Clark St., Vermillion, SD 57069

Backwaters and other non-channel habitats (e.g. chutes, sloughs, and instream structure) vital for the local fish communities are considerably less abundant as a result of channelization and flood control management of the Missouri River. The 59-mile reach of the Missouri River downstream of Gavins Point Dam is the lowermost unchannelized portion of the river. Ponca State Park, located on the extreme downstream end of this reach, recently acquired a 487-acre bottomland adjacent to the river. This area is slated for an extensive restoration project including the renovation of chutes, backwaters, and oxbow lakes.

Prior to restoration, the juvenile and adult fish communities inhabiting a backwater in the park and the neighboring mainstem were systematically surveyed during the summers 2001 and 2002. Thirty-five species representing 11 families were documented using this area. The species that were most dominant over both years were crappies *(Pomoxis spp.),* emerald shiners *(Notropis atherinoides),* goldeyes *(Hiodon alosoides),* and river carpsuckers *(Carpiodes carpio).* Comparisons of species richness, diversity, and relative abundance were completed between areas. Species richness, diversity, and relative abundances were significantly different between areas. Additionally, state and federally listed species such as least terns *(Sterna antillarum)* and false map turtles *(Graptemys pseudogeographica)* were observed frequenting the area.

BIO: Bryan Gasper is currently a Graduate Student in the Department of Biology at the University of South Dakota, Vermillion, SD. He received his B.S. in Biology from Missouri Western State College, St. Joseph, MO in 1999.

## Abnormal Hermaphroditism in Shovelnose Sturgeon from the Missouri River

**Diana Papoulias**
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Co-Authors: Mark L. Wildhaber (1), Aaron J. Delonay (1), Mandy L. Annis (1), Steven Krentz (2), Donald E. Tillitt (1)
1 U.S. Geological Survey, Columbia Environmental Research Center, 4200 New Haven Road, Columbia, MO 65201
2 U.S. Fish and Wildlife Service, 3425 Miriam Avenue, Bismarck, ND 58501

Sturgeon are gonochoristic and hermaphroditism is not a normal mode of reproduction in these fishes. Nevertheless, there have been occasional reports of individual sturgeon with both male and female gametes. We collected adult shovelnose sturgeon *(Scaphirhynchus platorynchus)* monthly from May 2001 through June 2002 from the Lower Missouri River. Abnormal hermaphroditism was observed in some of the collected fish during September, December, January, February, and April. Gross observation indicated that gonadal tissues were mostly testicular. Ova at various developmental stages were embedded in the testicular tissue and not uniformly distributed. Ovigerous folds were observed in some areas of some testes. The proportion of hermaphroditic males ranged from 5% to 35% with the greatest percentage occurring in February. Although the conditions and factors causing abnormal hermaphroditism in sturgeons and other

**Monday**
**June 2**

**Concurrent Session 2**

**FISHERIES**

3:35 p.m. - 4:55 p.m.

gonochoristic species are not known, there is some experimental evidence that altered or degraded environmental conditions may be responsible. Furthermore, it is not known if the reproductive biology of the shovelnose or the co-occurring and related endangered pallid sturgeon *(Scaphirhynchus albus)* may be impaired by the intersex condition. Further investigation must be completed before these observations of abnormal hermaphroditism in shovelnose sturgeon can be applied to our understanding of pallid sturgeon biology.

BIO: Diana Papoulias is a Research Fisheries Biologist at the U.S. Geological Survey, Columbia Environmental Research Center in Columbia Missouri. She has spent the last several years studying the effects of contaminants on fish reproduction.

## Winter Habitat Selection by Asian Carp in the Lower Missouri River and its Tributaries.

**Duane C. Chapman**
**U.S. Geological Survey**
Columbia Environmental Research Center, 4200 New Haven Road, Columbia, MO 65201; 573-876-1866; duane_chapman@usgs.gov

Bighead carp *(Hypophthalmichthys nobilis)* and silver carp *(H. molitrix)* are two large, filter-feeding Asian carps that were introduced from China in the early 90s. They have since rapidly expanded in numbers and distribution in the Mississippi and Missouri River basins. Although the Asian carps are among the most studied of fish due to their long use in aquaculture, little is known of the habits and ecology of these fish in the wild, and almost nothing about their habits in the Missouri River. Suggested impacts on native fish populations include competition with native filter feeders and competition for low velocity winter habitat. We used combined radio and acoustic telemetry to determine winter habitat selection by Asian carp, and to track their movements and activity during the cold water period. Habitats used by Asian carp were characterized as to water quality, physical characteristics such as wing dam morphology and location relative to bends and channel crossovers, and by mapping bedform and water velocities.

BIO: Duane Chapman is a Fisheries Biologist with the U.S. Geological Survey, Columbia Environmental Research Center. He first worked with an Asian carp (grass carp) in aquaculture while an undergraduate summer helper for the Iowa Conservation Commission in 1978. His first scientific journal publication was on grass carp while working on his M.S. at the University of Wyoming in 1988. Duane then took a 14-year detour into the realms of limnology and aquatic and marine toxicology before beginning this project with invasive Asian carp in 2002.

USGS

Chris Witte holds a silver carp. Chris works with Duane Chapman as the field leader of the Asian Carp Project.

# Opening Session

**Tuesday**
**June 3**

**OPENING SESSION**

8:30 a.m. - 9:30 a.m.

## Plant and Animal Communities of Fort Leavenworth Military Reserve

**Craig Freeman**
**Kansas Biological Survey**
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Dr. Craig Freeman is an Associate Scientist and Program Director of the Kansas Natural Heritage Inventory at the Kansas Biological Survey. He is curator of the R.L. McGregor Herbarium, Kansas University Natural History Museum and Biodiversity Research Center.

**William Busby**
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Dr. William H. Busby is an Associate Scientist with the Kansas Natural Heritage Inventory.

The **Kansas Biological Survey** (KBS) is a non-regulatory, non-degree granting research and service unit of the University of Kansas and the State of Kansas. Its programs and activities focus on environmental and biological issues at state, regional, national, and global levels. (www.kbs.ku.edu)

The **Kansas Natural Heritage Inventory** (KSNHI) is a research program of the KBS. The mission of KSNHI is to collect, manage, and disseminate information about the biological diversity of the state. Program staff work closely with public and private decision-makers to provide early notification of potential resource conflicts, to guide land use decisions, and to develop conservation priorities. KSNHI also maintains a core database of biodiversity (plants, animals, and communities) for the state of Kansas.

USGS

A winter view of the Fort Leavenworth Military Reserve looking west across the Missouri River from Weston Bend State Park in Missouri.

Tuesday
June 3

Concurrent
Session I

VERTEBRATE
POPULATIONS

10:00 a.m. -
11:00 a.m.

## Mammalian Biodiversity Monitoring on the Benedictine Bottoms Fish and Wildlife Mitigation Site

**Mike Snyder**
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Co-Authors: Martin P. Simon, Daniel E. Bowen, John W. Davis, Tiffany M. Cope, Zachary T. Cusumano, Jill C. Hellmer, Virginia L. Winder, Department of Biology, Benedictine College, 1020 North 2nd Street, Atchison, KS 66002

In response to the loss of fish and wildlife habitat resulting from the Missouri River Bank Stabilization and Navigation Project, the U.S. Army Corps of Engineers (Corps) was authorized to mitigate for the loss of habitat by acquiring and developing fish and wildlife habitat on land within the floodplain. The Benedictine Bottoms Fish and Wildlife Mitigation Site (Bottoms) was the first site at which habitat development was completed.

We monitored mammalian biodiversity on the Bottoms from 1995-2001. Small and medium size mammals were live trapped while the presence of larger mammals was documented by visual observation and sign. The diversity of mammals on the Bottoms was then compared against that of northeast Kansas and a benchmark community located at the Ft. Leavenworth Military Reserve (FLMR). Twenty-two species of mammals were documented on the Bottoms. The most common small mammals on the Bottoms were the deer mouse *(Peromyscus maniculatus),* house mouse *(Mus musculus),* hispid cotton rat *(Sigmodon hispidus),* and prairie vole *(Microtus ochrogaster),* representing 52%, 19%, 14%, and 8% of the total trapped mammals on the Bottoms respectively. Total relative abundance of trapped mammals did not vary greatly between years with the exception of 1997. Seasonal relative abundance was greatest in autumn. Relative abundances of trapped mammals was notably lower than that reported elsewhere, indicating that the frequent inundation of the Bottoms by Missouri River flood waters likely suppressed population numbers. Of the 54 species of mammals that may occur in northeast Kansas, 29 species have not been recorded on the Bottoms. The Bottoms shared 69% of the mammal species in common with those confirmed to occur on FLMR.

BIO: Michael Snyder is an Environmental Scientist with HDR and recently worked on the preparation of the Supplemental Environmental Impact Statement for the Missouri River Fish and Wildlife Mitigation Project. He has a B.A. in Biology from Benedictine College, where he conducted research on the Benedictine Bottoms Mitigation Site, and a M.S. in Biological Sciences from Emporia State University.

## Herpetological Research at a Missouri River Marsh, Van Meter State Park, MO

**Mark Mills, Missouri Valley College**
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Co-Author: Waylon Hiler, Missouri Valley College, 500 E. College St., Marshall, MO 65340

Our herpetological research is being conducted at the Oumessourit Natural Area in Van Meter State Park (VMSP), Saline County, MO. This Natural Area includes a 186-acre wetland (approx. 2.85 km from the Missouri River) that is one of the few and largest state-owned floodplain marshes in Missouri. It possesses several features that make it biologically significant, including several rare plants, the marsh pondsnail, and the possible historical presence (pre-1960's) of the Massasauga rattlesnake. Also,
(continued on next page)

**Tuesday**
**June 3**

**Concurrent Session 1**

**VERTEBRATE POPULATIONS**

10:00 a.m. - 11:00 a.m.

whereas the marsh was drained in the early 1900's, it has never been plowed. The original goal of this study was to document the effects of intensive restoration management (i.e., frequent fires and water level manipulations) on the marsh pondsnail. Presently, we are surveying the vertebrate fauna of this marsh ecosystem, with an emphasis on marking and monitoring the turtle populations. As of December 2002, we have captured 37 of the approximately 63 species of reptiles and amphibians that could potentially occur at VMSP, including 5 new records for Saline Co. We have marked 38 turtles of three species, with five recaptures. We have also documented turtle movement between VMSP and the nearby (1.4 km) Grand Pass Conservation Area.

Future plans for this study include creating a GIS map of the marsh and surrounding habitats, a more intensive mammal survey, water quality analysis, and marking turtles in the Grand Pass Conservation Area (and other adjacent waterways) to determine movement patterns in and out of the marsh.

BIO: Mark Mills is an Assistant Professor of Biology at Missouri Valley College, Marshall, MO. He received his B.S. and M.A. at the University of Nebraska at Omaha, and his Ph.D. in Ecology from the University of Georgia, studying the ecology of the brown water snake.

## Turtle Response to Wetland Rehabilitation in the Missouri River Floodplain, Overton Bottoms

**Maureen A. Gallagher**
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The Big Muddy National Fish and Wildlife Refuge has efforts underway to evaluate the effectiveness of rehabilitation efforts at Overton Bottoms, near Rocheport, MO. Because of the identification of turtle ecology on the river as a major research need and the existence of a pre-construction data set at Overton Bottoms, the Service continued a mark recapture study begun in 1997 by Russ Bode of the University of Missouri.

The connection of river and riparian habitats through groundwater and over-bank flow provides riparian habitat complexity through hydraulic erosion and deposition. It is important to understand whether floodplain rehabilitation provides the correct timing and magnitude of connection to the river to restore hydrodynamics that are conducive to the needs of turtles. A crucial factor in the evaluation of Overton Bottoms is whether rehabilitation has provided the diversity of habitats essential for the maintenance of turtle populations, especially for successful reproduction and recruitment.

BIO: Maureen Gallagher has been a Biologist with the U.S. Fish and Wildlife Service for 12 years. For the past three years, she has worked for the Big Muddy National Fish and Wildlife Refuge. Maureen has Bachelors degrees in aquatic ecology and zoology from Humboldt State University and a M.S. in political science from University of Missouri.

# Invertebrate Populations

**Tuesday**
**June 3**

**Concurrent Session 2**

**INVERTEBRATE POPULATIONS**

10:00 a.m. - 11:00 a.m.

## Abundance, Biodiversity, and Biomass of Aerial Invertebrates on the Benedictine Bottoms

**Nicole Bruckerhoff**
**Benedictine College**
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Co-Authors: Brooke Arnold, Michele Gamboa, Grant Latta, Daniel E. Bowen, Martin P. Simon, Benedictine College, 1020 North 2nd St., Atchison, KS 66002

The Benedictine College Biology Department is monitoring the biodiversity of the Benedictine Bottoms Mitigation Site, including invertebrates inhabiting the area. Invertebrate sampling was conducted from May 1995 up to October 2002 along permanently established transects. Sampling includes aerial, aquatic, and terrestrial invertebrates. The focus of this paper is on aerial invertebrates.

Sticky traps attached on poles 1-1.3 meters above the ground are used for aerial invertebrate collection; 96 cm2 of transparent sheets are covered with the adhesive, Tanglefoot. Since 1995, over 58 thousand aerial invertebrates have been collected, enumerated, and identified to order. The five most commonly occurring orders are: *Diptera, Coleoptera, Thysanoptera, Hymenoptera,* and *Homoptera.*

The data analyzed up to this point, using ANOVA has shown that the year, month, and habitat are significant factors in determining the abundance of invertebrates. The aerial invertebrate abundance from 1995 to 1998 has shown an overall downward trend, with a small increase in 1999. The highest abundance occurs in May and June with a decline in abundance leading up to the first frost in late October. At present time, the data collected from the years 2001 and 2002 are being analyzed for comparison to the previous data collected. In 2000, biomass was incorporated into the aerial collection, where a1 cm2 sub-sample was designated to assess size distribution of the invertebrates.

BIO: Nicole Bruckerhoff is a Senior at Benedictine College majoring in biology and math. This is her third year working with the invertebrate project in the biology research program.

## Soil Microbial Biodiversity and Abundance on the Benedictine Bottoms Wildlife Mitigation Site

**Bryan Adams**
**Benedictine College**
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Co-Authors: Crista Grasser, Angie Armour, Jacqueline M. Bacon, Benedictine College, 1020 North 2nd Street, Atchison, KS 66002

In 1993, the U.S. Army Corps of Engineers purchased the Benedictine Bottoms to mitigate the loss of wetland habitats along the Missouri River. The Benedictine College Biology Department is studying the changes in biodiversity accompanying the mitigation process. Microorganisms play a key role in ecosystem dynamics on the Bottoms. These organisms are crucial to various biogeochemical cycles such as soil nitrification.

BIO: Bryan Adams is a Senior at Benedictine College majoring in Biology. He is finishing his third year on the project.

**Tuesday**
**June 3**

**Concurrent Session 2**

**INVERTEBRATE POPULATIONS**

10:00 a.m. - 11:00 a.m.

## Abundance and Biodiversity of Terrestrial Invertebrates in the Benedictine Bottoms

**Zac Cusumano**
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Box 486, 1020 North 2nd Street, Atchison, KS 66002; 913-367-0191; cusu00@yahoo.com

Co-Authors: Nicole Bruckerhoff, Michele Gamboa, Grant Latta, John Dygert, Tim Valiant, Martin Simon, and Daniel Bowen, Benedictine College, 1020 North 2nd Street, Atchison, KS 66002

The Benedictine Bottoms was purchased in 1992 by the Army Corps of Engineers as part of an ongoing process to mitigate the Lower Missouri River. Between 1993 to 1997 the Corps planted over 176,000 trees, several thousand pounds of grasses, and added water - controlling structures to the area.

In 1993, the Benedictine College Biology Department began monitoring the biodiversity of the Benedictine Bottoms Mitigation Site, including the invertebrates inhabiting the area. Terrestrial invertebrate sampling began in May 1997 and has continued up to the present day. Transects were established throughout the mitigated area and 432 x 14.5 cm pitfall traps were set every 20 m along each transect. Collected specimens were preserved in 75% ethyl alcohol or frozen until identification. Since 1997, over 14,000 invertebrates have been collected and identified to order. The five most commonly occurring orders are: *Orthoptera, Coleoptera, Collembola, Aranae,* and *Diptera* from highest to lowest respectively.

The data were analyzed , using ANOVA, and several factors including year, month, habitat, rainfall, and maximum and minimum temperature have all demonstrated a significant influence on abundance. Each order exhibits its own specificity for those factors that determine its abundance. Trends seen over past years have included the largest abundance appearing in the month of July and decreasing up to the first frost. Examining biomass has shown a relative even distribution between three of the four size class groups: less than 4 mm, between 4 - 10 mm and 10 - 25 mm.

BIO: Zachary Cusumano is a Senior at Benedictine College. He is currently finishing his third year with the Benedictine Biology Research Department and was a Heuer scholar in the summer of 2002.

Can you find these gargoyles in Atchison?

**Wednesday**
**June 4**

**Concurrent**
**Session 1**

**WATER**
**QUALITY**

8:00 a.m. -
11:30 a.m.

## Water Quality in the Garrison Reach of the Missouri River, ND: Preliminary EMAP Findings

**Ted Angradi**
**U.S. Environmental Protection Agency**
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Co-Authors: Billy Schweiger, U.S. Environmental Protection Agency, Office of Research and Development, Mid-Continent Ecology Division, Denver, CO 80202
David Bolgrien, U.S. Environmental Protection Agency, Office of Research and Development, Mid-Continent Ecology Division, Duluth, MN 55804

In 2001 and 2002, summer water quality (WQ) sampling was conducted on open waters (flowing waters of the river channel) and backwaters of the Missouri River between Garrison Dam and Lake Oahe as part of the EPA's Environmental Monitoring and Assessment Program Upper Missouri River Pilot Project (EMAP-UMR). Sampling was conducted using a probabilistic sample design so that robust, unbiased estimates of water quality conditions can be made at the Garrison Reach scale at the completion of sampling in 2003. Study analytes included nutrients, metals, anions, pH, alkalinity, chlorophyll a, turbidity and others. Possible sources of variation in open-water WQ include distance from the dam, cumulative downstream effects of backwaters, and proximity to Bismarck. Sources of variation in backwater WQ include connectivity to the river channel, backwater size, and local non-point source effects. Preliminary data analysis indicates that backwater WQ is much more variable that open water WQ. Unconnected floodplain backwaters were usually chemically distinct from connected backwaters. EMAP WQ data will be used to select reference and test (impaired) sites in the Garrison Reach so that indices of biotic integrity (IBIs) based on benthic macroinvertebrates can be developed for use as assessment tools for the Missouri River ecosystem. This abstract does not necessarily reflect EPA policy.

BIO: Ted Angradi is a Research Biologist with the U.S. Environmental Protection Agency, Office of Research and Development Lab in Duluth, MN.

## Nutrient Loading in the Missouri River Basin

**Joe Engeln**
**Missouri Department of Natural Resources**
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nrengej@mail.dnr.state.mo.us

Concern about hypoxia in the Gulf of Mexico has focused attention on the flow of nutrients within and out of the Mississippi-Atchafalaya River Basin. While nitrogen is the limiting nutrient in waters of the Gulf, phosphorus is the nutrient of greater concern in most inland waters. The Gulf of Mexico Task Force, a group of federal and state agencies has created an Action Plan for monitoring the loading of nutrients and their impacts in both inland waterways and the Gulf of Mexico. The Plan calls for action to reduce nutrient loading and for monitoring to judge the efficacy of approaches to reduce loading. This talk will present an overview of the current situation and plans for reducing nutrient loading through a combination of approaches.

BIO: Joe Engeln is the Assistant Director for Science and Technology at the Missouri Department of Natural Resources. He serves on the Mississippi River-Gulf of Mexico Coordinating Committee.

# Papers

**Wednesday**
**June 4**

**Concurrent Session 1**

**WATER QUALITY**

8:00 a.m. - 11:30 a.m.

## Tissue Contamination Trends in the Missouri River and its Tributaries since 1985

**Lorenzo Sena**
**U.S. Environmental Protection Agency, Region 7**
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The Regional Ambient Fish Tissue (RAFT) Monitoring Program was created in 1977 by the U.S. Environmental Protection Agency to assist Midwestern state environmental agencies by providing analytical and field support to increase sampling and analysis of fish tissue for the protection of human health and for environmental trend monitoring. In this monitoring network, samples of fish are taken from approximately 80 targeted locations in Iowa, Kansas, Missouri and Nebraska during the fall of each year and analyzed for contaminants, including PCBs, some metals and pesticides. During the year 2000, 149 samples were taken from 86 sites throughout EPA Region 7. This data is utilized by the states in the issuance of fish consumption advisories and by the states and EPA for environmental trend analysis. This presentation describes fish contamination trends specifically in the Lower Missouri River main channel and its major tributaries as documented by the EPA RAFT Program since 1985.

BIO: Lorenzo Sena is an Environmental Scientist with the Kansas City Regional Office of the EPA and coordinates the fish tissue sampling program for the Regional Office.

## Assessment of Power Plant Cooling Water Discharges to the Missouri River

**John Dunn**
**U.S. Environmental Protection Agency, Region 7**
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Steam electric power plants generate large amounts of waste heat that must be dissipated to the local environment. Due to increased energy demands many plants are undergoing expansions and new plants are being proposed. At the same time, the Army Corps of Engineers is considering lowering of summer flows in the Missouri River while river background temperatures are increasing. This collection of factors has created the need for more a accurate assessment of heat discharges to the river. Region 7 has been using state of the art methods to improve modeling and the prediction of key factors limiting discharge of heat.

BIO: John Dunn is an Environmental Engineer with the NPDES Permit Program at the U.S. Environmental Protection Agency, Region 7, Kansas City, Kansas.

**Wednesday**
**June 4**

**Concurrent Session 1**

**WATER QUALITY**

8:00 a.m. - 11:30 a.m.

## National Park Baseline Water Quality Data Inventory and Analysis Report Series

**Mike Matz**
**Colorado State University at the National Park Service**
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Co-Author: Dean Tucker, 1201 Oakridge Drive, Suite 250, Ft. Collins, CO 80525

The National Park Service's (NPS) Organic Act of 1916 states that the mission of the NPS is to promote and regulate the use of national parks, monuments, and other units "... to conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." One task embodied by this mission is preserving and protecting water resources and water dependent environments in parks. Ensuring the integrity of park water quality, due to its importance in sustaining natural, aquatic park ecosystems and supporting human consumptive and recreational use, is fundamental to successfully addressing this task.

During the 1990s, the NPS Water Resources Division and the Servicewide Inventory and Monitoring Program initiated an effort to prepare Baseline Water Quality Data Inventory and Analysis Reports for 270 national park units with significant natural resources, including three units along the Missouri River, using data contained in the Environmental Protection Agency's STORET database. The goals of the effort are to provide parks with descriptive water quality information in a format usable for planning and management and to guide future water quality monitoring activities. This presentation will review the effort, its programmatic framework, and discuss lessons learned in using secondary data.

BIO: Michael Matz is employed as a lead Research Associate in Colorado State University's Department of Civil Engineering and supervises the preparation of Baseline Water Quality Data Inventory and Analysis Reports.

Map from *Baseline Water Quality Data Inventory and Analysis, Missouri National Recreational River,* Volume 1 of 2, Water Resources Division and Servicewide Inventory and Monitoring Program, Water Resources Division, National Park Service, Fort Collins, CO. Technical Report NPS/NRWRD/NRTR-98/162

# Papers

**Wednesday**
**June 4**

**Concurrent Session 1**

**WATER QUALITY**

8:00 a.m. - 11:30 a.m.

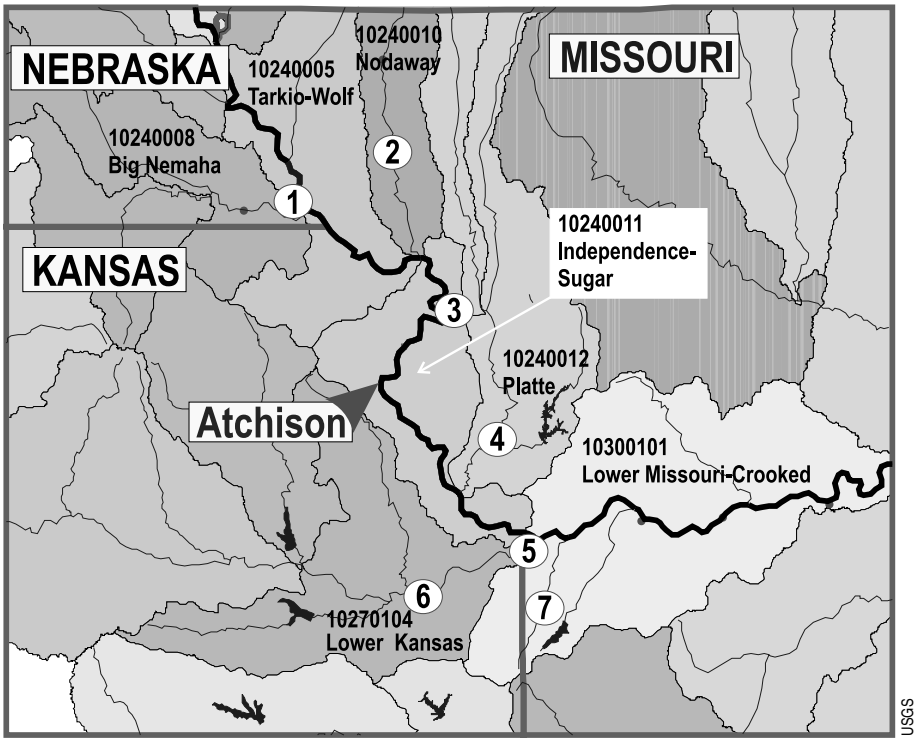
## Missouri River Interstate Water Quality Data

**Jeanne Heuser**
**U.S. Geological Survey**
Columbia Environmental Research Center, 4200 New Haven Road, Columbia, MO 65201; 573-876-1876; jeanne_heuser@usgs.gov

The goal of the *Missouri River Interstate Water Quality Project* is to provide a foundation of information that states can use to coordinate their water quality monitoring and assessment activities as required under the Clean Water Act (CWA) of 1972. Information being gathered as part of the project includes: 1) who conducts monitoring on the Missouri River mainstem, 2) what parameters are monitored, 3) where monitoring occurs, and 4) the frequency of monitoring. State water quality standard assessments (305b) and impairment listings (303d) are compared for all basin states.

The project is funded by U.S. Environmental Protection Agency (EPA), Region 7 and 8 in response to state inconsistencies in designating the quality of Missouri River water through rules implemented in the past ten years. Water quality standards vary from state to state; as a result, when states determine that the river is impaired and not meeting its designated uses, the reasons for the impairment are often inconsistent. This inconsistency causes problems for long term water management, including long-term monitoring of water quality for fish and habitat rehabilitation.

BIO: Jeanne Heuser is a Technical Information Specialist with the U.S. Geological Survey. She manages the Missouri River InfoLINK, which serves to enhance understanding and awareness of the Missouri River and has helped organize the the Missouri River Natural Resources Conference since its inception in 1997.




Watersheds bordering the Missouri River near Atchison with USGS water quality monitoring stations. Map developed as part of the *Missouri River Interstate Water Quality Project.*

*Data from USGS at http://waterdata.usgs.gov/nwis/qw*

USGS Water Quality Testing Stations

1 Missouri River at Rulo, NE
2 Nodaway River near Graham, MO
3 Missouri River at St. Joe, MO
4 Platte River at Sharps Station, MO
5 Missouri River at Kansas City, MO
6 Kansas River at Desoto, KS
7 Blue River near Kansas City, MO

## Historical Water Quality of the Lower Missouri River with Comparisons to Modern Conditions

**Dale Blevins**
**U.S. Geological Survey**
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Impoundment, channelization, urban waste disposal, agriculture, and many other human activities are expected to have substantially changed the water quality of the Lower Missouri River since predevelopment periods. A synthesis of modern literature on trends in water quality of the Lower Missouri River, early water-quality data, and descriptions and notes of early scientists/explorers is underway to compare and identify probable causes of changes in water quality that have occurred since predevelopment periods.

A few reports analyzing water-quality trends have been written during the last 50 years, since water-quality data have been routinely and systematically collected. A synthesis of these trend studies will address many changes such as high fertilizer/pesticide applications, improved sewage treatment, and the banning of selected pesticides; however, the ability to look at water-quality differences during longer periods is limited by the lack of historic data. A few U.S. Geological Survey reports from as far back as 1909, old water-quality analyses from public water supplies, and "boiler water" analyses from railroad companies will provide a basis for comparison of some constituents from the early 20th century. For even earlier conditions, qualitative descriptions from early explorers and scientists such as Lewis and Clark, Bradbury, Brackenridge, Audubon, and Nuttall may provide a glimpse into longer-term changes that may have occurred. Lewis and Clark measured daily water temperatures near St. Louis and collected and analyzed the first suspended sediment samples from the Missouri. Visual observations of sediment and floating debris go back as far as Marquette and Joliet in 1673 (Margry, cited in Matthews 1961). Compilation of data and information from all of these sources are expected to provide a better understanding of the character and habitats to which many Missouri River species evolved and adapted.

BIO: Dale Blevins is the Chief of the U.S. Geological Survey Water Resources Division Office in Lee's Summit, MO. He has been a hydrologist with USGS for 24 years with areas of study including water quality, surface water hydrology and hydraulics. He has a B.S. from Southwest Missouri State University in Physical Geography and a M.S. from the University of Arizona in Watershed Hydrology.

## Challenges in Assessing Water Quality of the Iowa Reach of the Missouri River

**John Olson**
**Iowa Department of Natural Resources**
Wallace State Office Building, Des Moines, IA 50319; 515-281-8905; john.olson@dnr.state.ia.us

Section 305(b) of the federal Clean Water Act requires all states, every two years, to assess the degree to which their surface waters meet state water quality standards. Iowa's Section 305(b) water quality assessments for its 178-mile reach of the Missouri River have historically been based on physical/chemical data from only one monitoring station and on professional judgement of fisheries biologists.

The lack of coordination between Iowa and Nebraska has generated inconsistent water quality assessments for the Missouri River of sufficient magnitude to be highlighted in a 2002 report by the General Accounting Office. An increase in the number of monitoring stations, along with improvements in data accessibility and between-state coordination, are needed to improve the quality of Section 305(b) water quality assessments for the Missouri River and to reduce between-state inconsistencies in assessments. Efforts to coordinate water quality issues between the five states in the Upper Mississippi River basin, as well as a

basin-wide monitoring program, may serve as a model to improve water quality assessments for the Missouri River.

BIO: John Olson has worked in the Iowa DNR Water Quality Bureau for 18 years and since 1994 has prepared the state's biennial water quality reports as required by Section 305(b) of the Clean Water Act; he has also been involved with preparation of Iowa's lists of "impaired waters" as required by Section 303(d) of the Act. He represents Iowa DNR on the Upper Mississippi River Conservation Committee, the Upper Mississippi River Basin Association, and the U.S. EPA Region 7 technical workgroup on nutrient criteria development. John has a bachelor of science degree in Animal Ecology from Iowa State University with an emphasis in fisheries biology.

## Results from Upper Mississippi Water Quality Assessment Report

**Bill Franz**
**U.S. Environmental Protection Agency, Region 5**
77 West Jackson Boulevard, Chicago, IL 60604; 312-886-7500;
franz.william@epa.gov

Co-Authors: John Sullivan, Wisconsin Department of Natural Resources, 3550 Mormon Coulee Road, LaCrosse, WI 54601; David Stoltenberg, Simon Manoyan, Janice Huang, Richard Zdanowicz, and Walter Redmon, U.S. Environmental Protection Agency, Region 5, 77 W. Jackson Blvd., Chicago, IL 60604

A study was undertaken under the auspices of the Upper Mississippi River Conservation Committee (UMRCC), to determine what water quality data are available for the Upper Mississippi River (UMR) mainstem; to analyze and summarize those data for specific time periods; and to provide those data to decision-makers for evaluation and management of the river in the future. The length of river considered for UMR was 872 mi. long, extending from Anoka, MN (above Minneapolis) to Cairo, IL (confluence with Ohio R.). For purposes of analysis, the river was divided into modified USGS Hydrologic Unit Code (HUC) segments; only summer months were considered; and the total time period of data used was 1980-99, although some stations had older data.

Agencies collaborating and providing water quality data included: U.S. Geological Survey (USGS), U.S. Army Corps of Engineers, Wisconsin Dept. Natural Resources (WDNR), Illinois Environmental Protection Agency (IEPA), Minnesota Pollution Control Agency, and Metropolitan Council Environmental Services (Minneapolis area). Entities collaborating and providing fish tissue contaminant data were: Iowa Dept. Natural Resources, IEPA, WDNR, Minnesota Dept. of Health, Missouri Dept. Natural Resources, U.S. Fish & Wildlife Service, and Alcoa, Inc.

Water quality and physical variables selected for analysis included: river flow, temperature, dissolved oxygen, specific conductivity, total nitrogen (N), ammonia-N (ionized and un-ionized), nitrite and nitrate-N, total phosphorus, total suspended solids, pH, and chlorophyll a. All of the water quality data were compiled into a spreadsheet in a standard format; the data were queried for summer months only (June 1 - Sept. 15), and the data were grouped by hydrologic segments (HUC) and four 5-year time periods (1980-99). Individual data were plotted by station longitudinally and standard software was used to generate summary statistics and longitudinal boxplots. Fish tissue contaminant data (PCBs, mercury, chlordane) were also compiled into a spreadsheet, and median tissue concentrations were derived for specific navigational pools and time periods. These data were plotted longitudinally to aid in spatial and temporal evaluations.

A final report has been completed, which includes GIS-generated maps showing HUC river segments, station locations, and approximate data density (including data gaps). All of the draft information (text, tables, figures, spreadsheets, and

**Wednesday**
**June 4**

**Concurrent Session 2**

**WATER QUALITY**

8:00 a.m. - 11:30 a.m.

appendices) has been placed on a CD for purposes of sharing with interested agencies/ groups. The recommendations include: 1) this assessment should be updated at 5-year intervals; 2) monitoring agencies should coordinate efforts to improve monitoring coverage; 3) statistical trend analyses should be conducted at locations where more than 20 years of data are available; and 4) UMR agencies should coordinate consistent sampling of fish contaminants at 5-year intervals.

BIO: Bill Franz has been the Team Manager for the Upper Mississippi in EPA, Region 5, Water Division for eight years. For 25 years, he worked in the National Environmental Policy Act (NEPA) Review, serving as Branch Chief for the last seven years. He holds a B.S. in Environmental Engineering from the University of Illinois at Chicago and a Masters of Public Health from the University of Illinios Medical Center.

**Figure 1. Upper Mississippi River Water Quality Monitoring: Mainstem Segments by Hydrologic Unit Code (HUC) and River Mile**

Map from the *Upper Mississippi River Water Quality Assessment Report,* published in March 2002 by the Upper Mississippi River Conservation Committee, Water Quality Technical Section.

# Notes

# Vegetation

**E. William Schweiger**
**U.S. Environmental Protection Agency**
Office of Research and Development, Mid-Continent Ecology Division, 999 18th Street, Denver, CO 80202; 303-312-7022; schweiger.billy@epa.gov

Floodplains within the Great River Ecosystems (GREs) of the central U.S. are composed of mosaics of successional habitat that (when unmodified) are typically dominated by cottonwood forest *(Populus ssp.).* GRE riparian habitat condition and successional dynamics are linked to endangered species habitat, maintenance of biodiversity and provision of many ecosystem services. Most research suggests that the successional trajectories of GRE riparian systems have been drastically altered by flow regulation, reservoir inundation and shifts in land use. Nearly all existing estimates of these systems rely on biased sample designs which cannot quantify, with known precision, estimates of composition and condition of riparian habitat.

We present preliminary (2 of 3 years) data from the U.S. EPA Environmental Monitoring and Assessment Program (EMAP) pilot study on the Garrison Reach of the Upper Missouri River. EMAP uses probability survey and inference techniques that generate unbiased estimators of an entire resource. We present an array of indicators (e.g., woody species density, size distribution, dispersion, canopy structure, tree vigor) that describe riparian stand composition (successional status) and condition. Meso- and landscape scale measures of patch structure and composition and measures of current and historical geomorphology were used in preliminary models associating current riparian condition and successional status with historical condition and current stressors. Finally, we compare our results with previous estimates of successional status and trajectories in the Garrison Reach and discuss the implications of our findings on GRE management. This abstract does not necessarily reflect EPA policy.

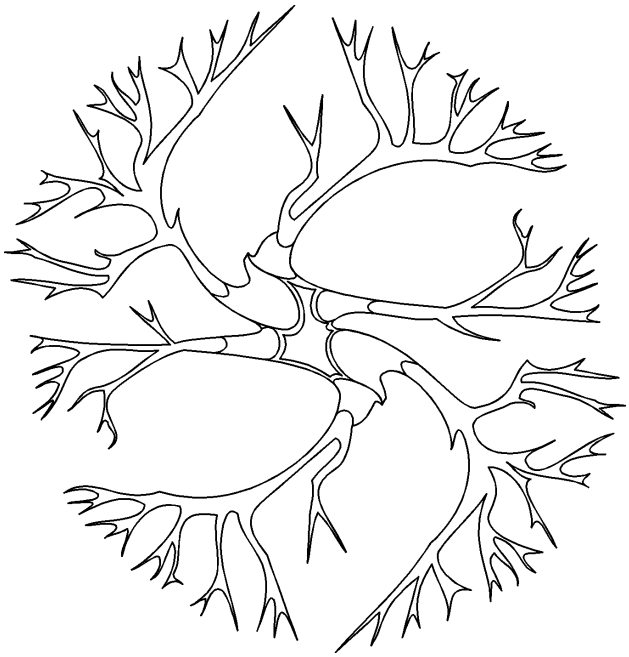
BIO: Billy Schweiger is a Landscape/ Community Ecologist with the U.S. Environmental Protection Agency. Since 1994, he has worked on development and application of large-scale sampling designs and synoptic modeling of watershed condition and is currently a principal investigator on the EMAP-Upper Missouri River research project, focusing on Great River Riparian and Landscape monitoring and assessment. He received his Ph.D. from the University of Kansas in 1998.

**Wednesday**
**June 4**

**Concurrent Session 2**

**VEGETATION**

8:00 a.m. - 9:20 a.m.



# Papers

**Wednesday**
**June 4**

**Concurrent**
**Session 2**

**VEGETATION**

8:00 a.m. -
9:20 a.m.

## Woody Species and Structure in a Chronosequence of Riparian Forest

**Thomas Faust**
**University of Missouri - Columbia**
Department of Forestry, 203T Anheuser Busch Natural Resources Building, Columbia, MO 65211
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Co-Authors: Richard Guyette and Dan Dey, University of Missouri, Department of Forestry, 203T Anheuser Busch Natural Resources Building, Columbia, MO 65211

This project is analyzing the changes in species and structural diversity over time in Northern Missouri floodplain forests and relating these changes to abiotic and biotic factors. Specifically, we are analyzing the importance of disturbance regimes, land-use history, and geomorphology to riparian forest diversity and structure. In addition, we will describe a disturbance regime for these forests.

BIO: Tom Faust is a Ph.D. student in Forestry at the University of Missouri in Columbia, MO. He has a B.S. in Biology and Marine Science from the University of South Carolina and a M.S. in Conservation Biology from the University of Minnesota. Tom served in the Peace Corps from 1988-90 working in environmental education and wildlife management.

## Physical Factors Influencing the Effectiveness of Woody Corridors in Levee Protection

**Stephen B. Allen**
**University of Missouri Center for Agroforestry**
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Co-Authors: John P. Dwyer (1), David R. Larsen (1), Douglas C. Wallace (2), Elizabeth A. Cook (2)
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Previously, our research focused on the width of woody corridors as a primary factor in the ability of the woody corridor to provide protection to levees along the Missouri River during the Flood of 1993. Current research is focused on other attributes of woody corridors such as tree diameters and forest densities that are noted in the literature as influencing the protective effectiveness of woody corridors. These data will be used to calculate Manning's roughness coefficients for woody corridors along the Missouri River to determine how roughness and corridor width interact to reduce and prevent damage to levees. We will also look at the forces acting on levees and woody corridors to determine the forces necessary to cause levee damage and what corridors widths and roughness coefficients were most effective in reducing levee damage.

BIO: Stephen Allen holds a B.A. from the University of New Hampshire and a M.A. in Geography from the University of Missouri-Columbia. He is currently pursuing a Ph.D. in the Department of Fisheries and Wildlife Sciences at the University of Missouri-Columbia with an emphasis in water quality.

## Temporal Study of the Flora of the Benedictine Bottoms

**Catherine Wiegand**
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Co-Authors: Larissa Hilger, Erin Urban, Daniel E. Bowen, Martin P. Simon, Lawrence Bradford, John Davis, Benedictine College, 1020 North 2nd St, Atchison, KS 66002

The Water Resources and Development Acts of 1986-1990, mandated that the Army Corps of Engineers mitigate wetlands, floodplain prairie, and bottomland hardwood along the Missouri River. To understand the potential vegetation when the Benedictine Bottoms is mature, we compare current plant species on the Benedictine Bottoms to plant species historically found along the Lower Missouri River.

We are expanding on our previous comparisons of plants found by the Lewis and Clark expedition in 1804-1806 and the Public Land Surveys in the 1850s. Historical research is expanded to include the time between Lewis and Clark and the Public Land Surveys. Alexander Philipp Maximilian, Prince of Neuwied, Prussia, and Karl Bodmer, a Swiss-born artist, explored part of the Missouri River from 1832-1834. Maximilian was trained in natural history. He hired Bodmer as an illustrator for their journey, which reached as far north as Montana. After the two returned to Europe, Maximilian published a two-volume book on his exploration of the interior of the United States. Bodmer created aquatints on his journey, some of which were published in Maximilian's book. Maximilian's and Bodmer's plant collection includes familiar Lower Missouri River plants such as the redbud tree, the scouring-rush, and the May apple. Only the scouring-rush is presently found on the Benedictine Bottoms.

BIO: Catherine Wiegand is a senior biology major at Benedictine College who has worked on the Benedictine Bottoms for three years. She was a full time undergraduate researcher in the summer of 2001 on the Benedictine Bottoms and in the summer of 2002 studied water usage of invasive red cedar trees at the University of Kansas.

USGS

Winter view of Benedictine Bottoms Fish and Wildlife Mitigation Site from Benedictine College.

**Wednesday**
**June 4**

**Concurrent Session 2**

**MANAGEMENT CHALLENGES in the DYNAMIC RIVER**

9:50 a.m. - 11:30 a.m.

# Management Challenges in the Dynamic River

## Corps of Engineers Missouri River Fish and Wildlife Mitigation Project, Present and Future

**Kelly Ryan**
**U.S. Army Corps of Engineers**
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kelly.ryan@usace.army.mil

Co-Authors: Mike Barnes, US Army Corps of Engineers, 601 East 12th Street, Kansas City, MO 64106

The Missouri River Fish and Wildlife Mitigation Project is designed to mitigate, or compensate, for fish and wildlife habitat losses that resulted from past channelization efforts on the Missouri River. The project extends from Sioux City, Iowa to the mouth of the Missouri River near St. Louis, a length of 735 river miles. The purpose of this mitigation effort is to acquire, restore and preserve aquatic and terrestrial habitat on individual sites found along the project length. New wildlife areas will be created. Existing areas will be improved. Historic river features may be returned to historic conditions. The project will develop approximately 166,750 acres of land in separate locations along the river in Nebraska, Iowa, Kansas and Missouri. Preservation or restoration will be accomplished by means of land acquisition from willing sellers, dredging filled-in areas, reopening historic chutes, bank stabilization, dike notching, pumping, dike/levee construction, vegetative plantings, and vegetation and land management. This presentation will focus on the current status of the mitigation effort and what the future looks like in terms of land changes and habitat improvements.

BIO: Kelly Ryan and Mike Barnes are Project Managers for the Kansas City and Omaha Districts of the Corps of Engineers. They are currently responsible for the implementation of the mitigation of fish and wildlife habitat losses due to installation of the Missouri River Bank Stabilization and Navigation project (the navigation channel). They have a combined 42 years of experience working for the Corps of Engineers in planning, construction and project management fields. They are both registered civil engineers and involved in various professional and civic activities.

## Bank Stabilization and Habitat Analysis in Four Open Reaches of the Missouri River

**Patrick J. Engelbert**
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The dams and reservoirs on the Upper Missouri River have caused a lowering of the streambed in the open reaches downstream from the dams contributing to widening of the channel in some locations. Congress created the Section 33 program to enable the U.S. Army Corps of Engineers to assist affected landowners in alleviating these effects through a variety of measures, which include bank stabilization structures. This study documented changes in habitat features (i.e. sandbars), and erosion or deposition that have occurred in the open channel reaches between Fort Peck, Garrison, Fort Randall, and Gavins Point Dams, due to Section 33 program bank

stabilization. Because the study focused on post dam conditions, study periods were selected to try to minimize the hydrologic affects that occurred immediately after construction of the main stem reservoirs. Therefore, the period of study was from the mid 1950's to the present time for the Fort Peck Reach, and from the mid 1970's to the present time for the three downstream reaches. Habitat indices were developed from HEC-RAS models to track sandbar and island formations, as well as chute and backwater areas. In addition, erosion rates were calculated utilizing channel cross section surveys from various time periods. A comparison was made between habitat indices and revetment, as well as erosion rate and revetment.

BIO: Patrick J. Engelbert is a Water Resources Engineer with HDR in Omaha, Nebraska where he is a registered Professional Civil Engineer. He has over nine years experience in the areas of hydrology, hydraulics, and socio-economics and has worked on several Missouri River projects including Overton Bottoms and Lower Hamburg Bend. He earned his B.S. and M.S. in Civil Engineering from the University of Nebraska.

## Development of Biological Indicators for Floodplain Wetlands of the Upper Missouri River Basin

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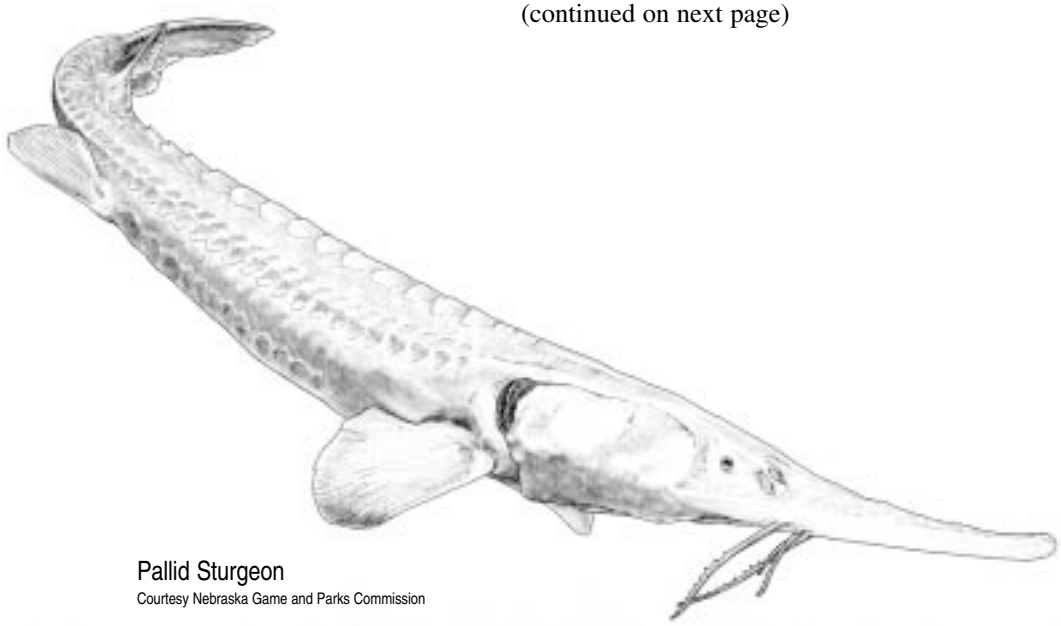
The floodplain ecosystem in the Upper Missouri Basin is influenced by several anthropogenic activities that include: 1) regulated river flows (i.e., reduced flood-pulse), 2) agricultural activities (row crop, grazing), 3) urban development (homes and condominiums), and 4) bank stabilization (rip-rap). The condition and viability of floodplain wetlands along the upper Missouri River is largely unknown. As part of EPA's REMAP program, the purpose of this study was to develop bioindicators of floodplain wetland condition. To accomplish this, we quantified vascular plant communities, periphyton composition, macroinvertebrate abundance, sediment characteristics and water quality parameters and used these data to develop a multimetric (continued on next page)



Pallid Sturgeon
Courtesy Nebraska Game and Parks Commission

index of biotic integrity. Fifty-eight floodplain wetlands were sampled during the summers (June-August) of 2000 and 2001. Structural and functional components of biological communities were tested as candidate metrics for developing biological indicators. Six metrics were selected as bioindicators based on their ability to discriminate between reference (i.e., good quality) and impaired (i.e., poor quality) wetlands. Indicators of wetland condition integrated attributes from macrophyte, periphyton and macroinvertebrate communities and included: 1) proportional biomass of Culicidae, 2) invertebrate diversity, 3) number of obligate wetland macrophyte species, 4) proportional abundance of chironomids, 5) number of sensitive diatom species, and 6) number of macrophyte species with a C-value>3. Biological indicators were generally robust to natural year-to-year variation in hydrological conditions (e.g., precipitation) and were useful in assessing the condition of randomly selected wetlands. Poor-quality sites were characterized by low biological diversity (plants and invertebrates) and a high proportion of Culicidae biomass (i.e., mosquitoes), implying that anthropogenic disturbance of floodplain wetlands may have important implications for conservation (e.g., biodiversity) and human health issues (e.g., increased mosquito biomass).

BIO: Dr. Steven Chipps is Assistant Unit Leader, U.S. Geological Survey, South Dakota Coop Unit, South Dakota State University, Brookings, SD.

## Emerging Deltas In The Missouri River's Reservoirs: A Silver Lining for Biodiversity?

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Riparian or bottomland forests along unregulated rivers are more productive and biologically diverse than surrounding uplands and are structured by distinctive fluvial geomorphic processes and hydrologic conditions found on river floodplains. Dams fragment river ecosystems, creating reservoirs (novel habitats) connected by more natural river and floodplain reaches (relict habitats). Large dams and related channel-works in the Missouri River Basin have diminished or eliminated floods and flow-related channel dynamics. This, combined with various human activities on formerly active floodplains, has resulted in ecological simplification and loss of biological diversity in relict habitats. Small-scale but costly efforts to improve and restore relict habitats are underway on the lower river, and similar efforts are anticipated elsewhere to restore habitat for endangered species. At the same time, new and dynamic novel habitats, like mainstem

Delta at headwaters of Lewis and Clark Lake

or tributary deltas in reservoirs, are increasing in area. These emerging deltas, such as those forming in Lake Sharpe (mainstem) and Lewis and Clark Lake (Niobrara River tributary), may represent the only new areas of native riparian and wetland vegetation becoming established on the Upper Missouri. However, the spatial and temporal dynamics of novel habitats, and their contribution to biodiversity has not been studied. Improved information on novel habitats would provide river managers with a better understanding of the effects of river management on ecological resources within the basin. We discuss a research effort to 1) determine the historic rate and extent of growth of reservoir deltas and their vegetation, 2) map and quantify the current spatial extent of delta vegetation types, and 3) quantify the composition and diversity of these vegetation types in selected deltas.

BIO: Michael L. Scott is a Riparian Ecologist with the U.S. Geological Survey, Fort Collins Science Center, Fort Collins, Colorado.

## Evaluation of a Spring Rise for the Missouri

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A spring rise and summer drawdown for the Lower Missouri River has been advocated in the U.S. Fish and Wildlife Service's (USFWS) biologic opinion (2000) to restore, in part, spawning for fish including the pallid sturgeon, improve sandbar habitat for birds including the least tern and piping plover, and enhance aquatic habitat by increasing connectivity and productivity. Exogenous spawning information collected indicated most species are able to spawn in divergent environments. Cumulatively, 79 of the 85 Missouri River fish species can spawn in tributaries and or lakes. A spring rise in the Missouri River per se is not the essential cue to initiate spawning for fish species that spawn in lakes, tributary streams, and mouths of tributary streams in the Lower Missouri River. Only a few species, including most exotic carp species, were reported to be cued by a spring rise or flood pulse. From the data collected, temperature was indicated as the dominant cue.

In reference to the endangered pallid sturgeon, collected information indicates that temperature, not the spring rise, is the dominant cue for spawning. Additionally, there is little or no confirmed information that the pallid sturgeons are spawning in the Lower Missouri River. It has been observed that sturgeons spawn in tributaries. One likely reason that the pallid sturgeons are not successfully spawning is the lack of gravel substrate in the Lower Missouri River. USFWS biologists have suggested that degradation of the streambed below Gavins Point Dam is creating a gravel stream bottom. However, recent USGS studies do not support this.

A spring rise would not significantly increase connectivity or productivity of the Lower Missouri River because of the minimal backwaters and littoral zones of the Lower Missouri River. The three high flow years (1995, 1996, and 1997) resulted in clean sandbars in the unchannelized reach between Gavins Point and Ponca, Nebraska, which were suitable for nesting of the least tern and piping plover. However, the high flows were not spring rises. In reference to volume of flow, 1995 represented the 102nd highest volume of flow in 104 years, 1996 represented the 98th highest volume, and 1997 represented the highest volume of record. Discharges from Gavins Point are sediment deficient; thus, degradation of the streambed will occur. Higher flows result in exponentially increased degradation with its myriad of unfavorable environmental and economic impacts. Any flow that will cause sandbar cleaning will also cause streambed degradation. Minimum degradation will occur if flood pulses are minimized.

BIO: Don Jorgensen is a Civil Engineer (PE) and Geologist. He is a retired Hydrologist from the U.S. Geological Survey and has more than 50 publications.

# Kansas City
# Saturday, September 13, 2003

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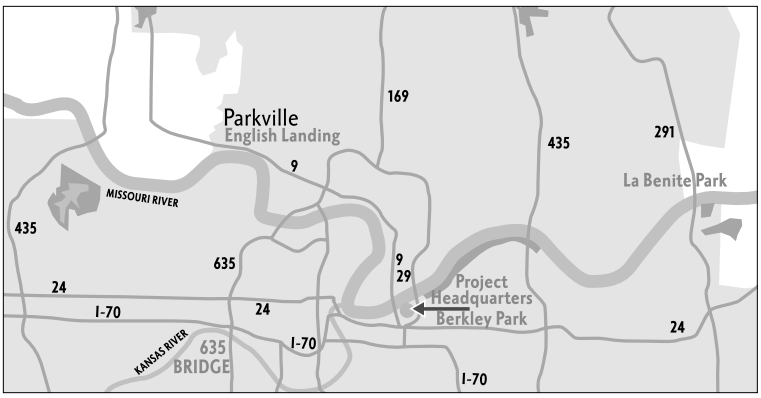
## Looking Toward the River

Kansas City is experiencing a renaissance on it's riverfront. Industrial districts are becoming lofts with river views and concrete wastelands along the river are being transformed into city parks. River accesses are being constructed; trails, boat ramps and pedestrian piers are reconnecting people with their river. And the entire city is looking toward the Missouri River in anticipation of the 2004 Lewis & Clark Commemoration events. What a great time to clean up the Missouri River.




- **Clean up time:** 10 am to 5 pm, Saturday, September 13th (Sunday September 14th is a rain day)
- **Project Headquarters:** Berkley Park, on the river at the base of the Paseo Bridge will be the base of operations for activities taking place up and down the Missouri. Registration begins at 9am.
- **What we're doing:** River survey crews will be defining the exact boundaries of the cleanup area through the summer, but the cleanup is certain to concentrate on a core area from La Benite Park in the East to Parkville in the West. Several miles of the Kansas River will also be cleaned up.

Educational events and associated river festivals are also being planned. This is a perfect opportunity to get out on the Big Muddy and participate in a little hands-on activism.

MISSOURI RIVER RELIEF

**23 South Eighth Street Box 104 Columbia MO 65201**
**www.riverrelief.org**

# St. Charles
# Saturday, September 20, 2003

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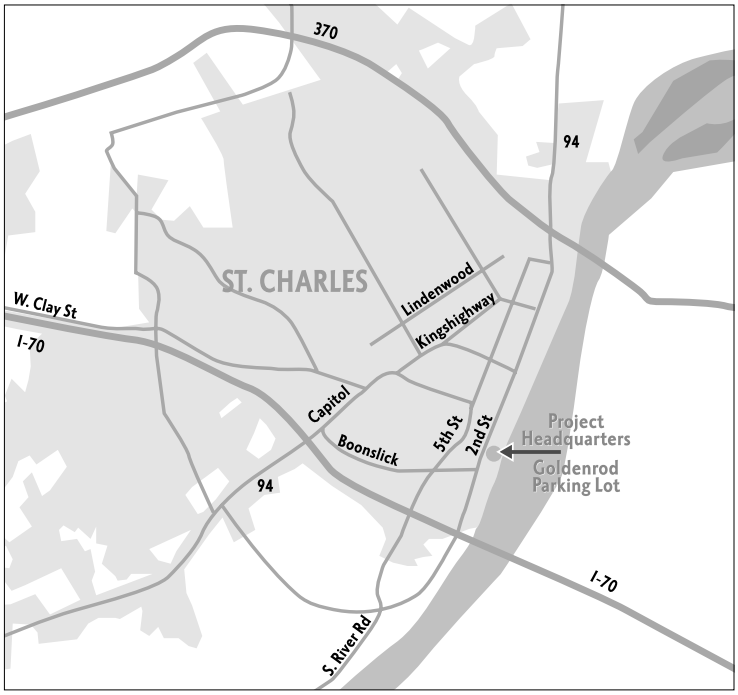
## Cleaning up for the Bicentennial

In 1804, Lewis and Clark passed the city of St. Charles at the start of their epic journey west. Today, St. Charles is preparing to host the bicentennial of the Lewis and Clark Corps of Discovery. The nation's spotlight in 2004 will focus on the St. Charles riverfront as the city hosts one of only 15 national Signature Events during the Bicentennial Commemoration. This fall, we will follow up on last year's River Relief efforts with another massive cleanup of the Missouri River in the St. Charles area. Join us.




- **Clean up time:** 10 am to 5 pm Saturday, Sept 20
- **Location of barges & tugs:** Meet us at the Lewis and Clark Boat House parking lot on the riverfront in St. Charles.
- **What we're doing:** River crews will clean a 5-mile reach of river from the Interstate 70 bridge to Bryan Island, while ground crews clean the KATY trail in the St. Charles area. Trash will be sorted for recycling on river barges operated by Living Lands and Waters, Inc., the nation's only industrial-strength river clean-up organization.

MISSOURI RIVER RELIEF

23 South Eighth Street Box 104 Columbia MO 65201
www.riverrelief.org

# Notes

# Notes

## MISSOURI RIVER NATURAL RESOURCES CONFERENCE

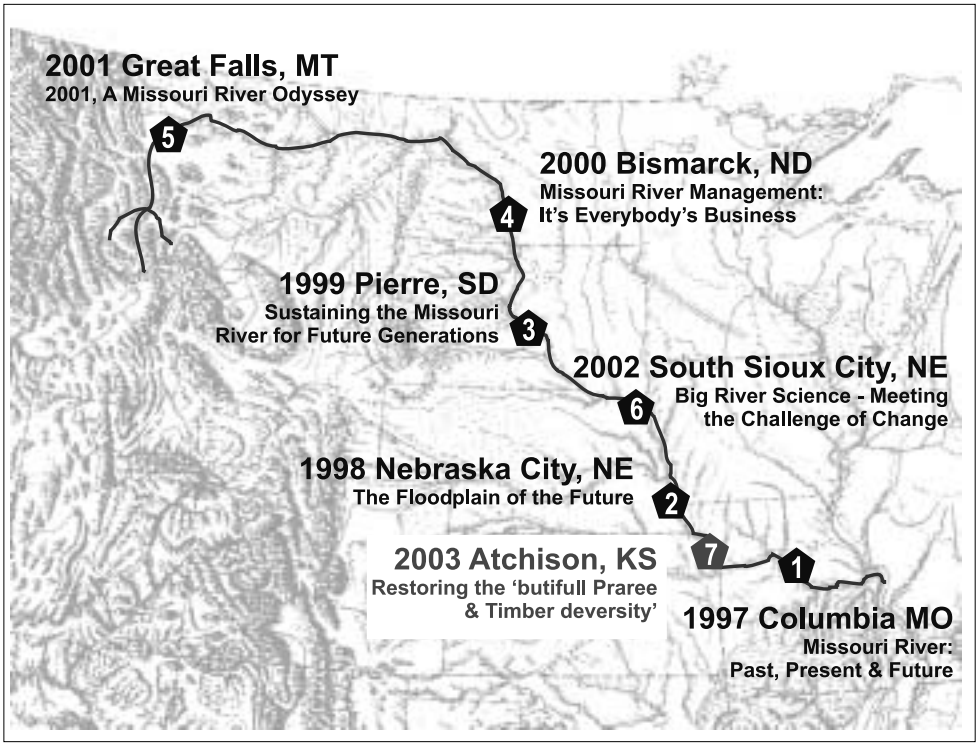
The Missouri River Natural Resources Conference is the only annual basinwide conference dedicated to understanding the health of the Missouri River.

The conference serves as a forum for researchers, resource managers, citizens, and policymakers to share information about the river's environment and perspectives on river management.

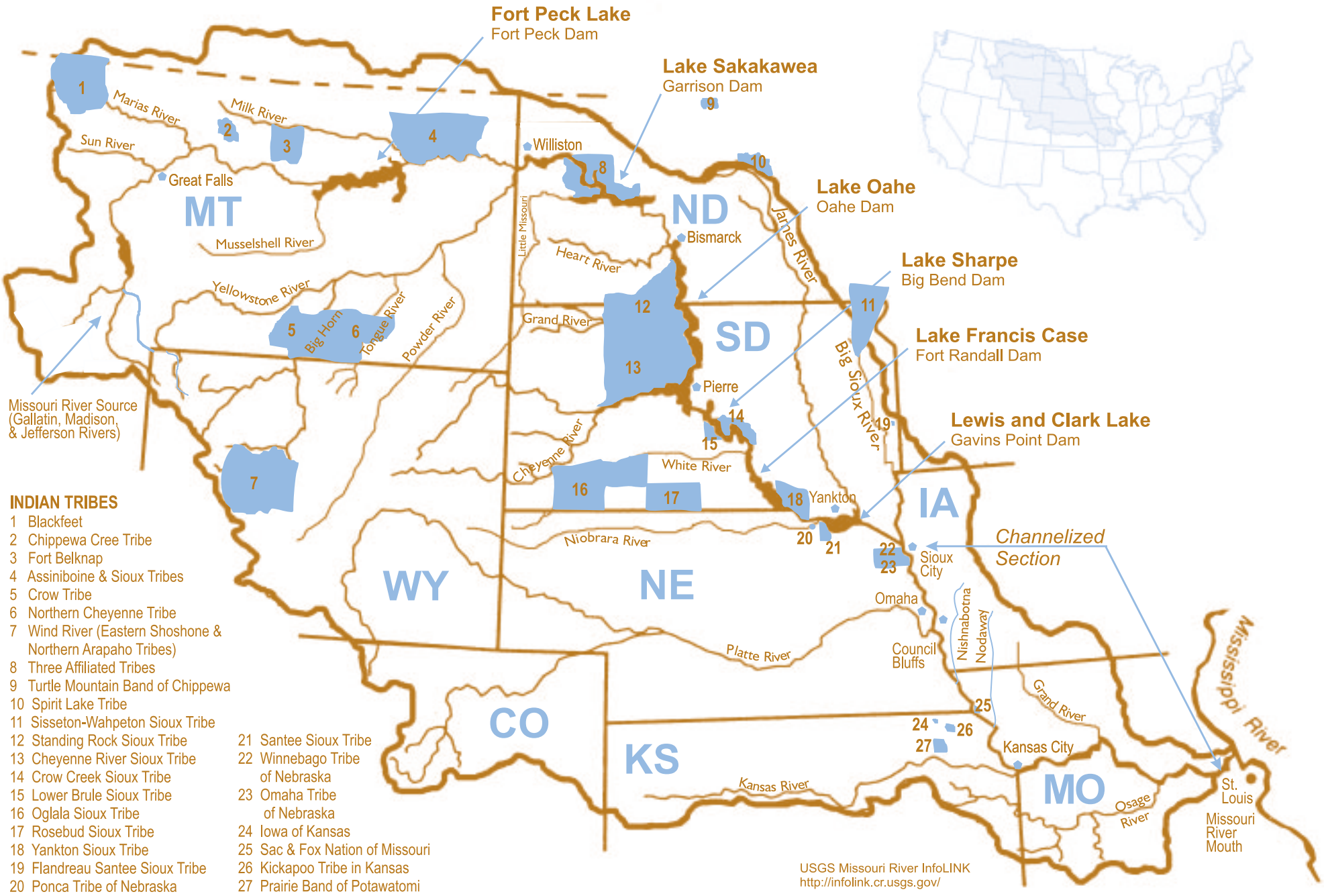
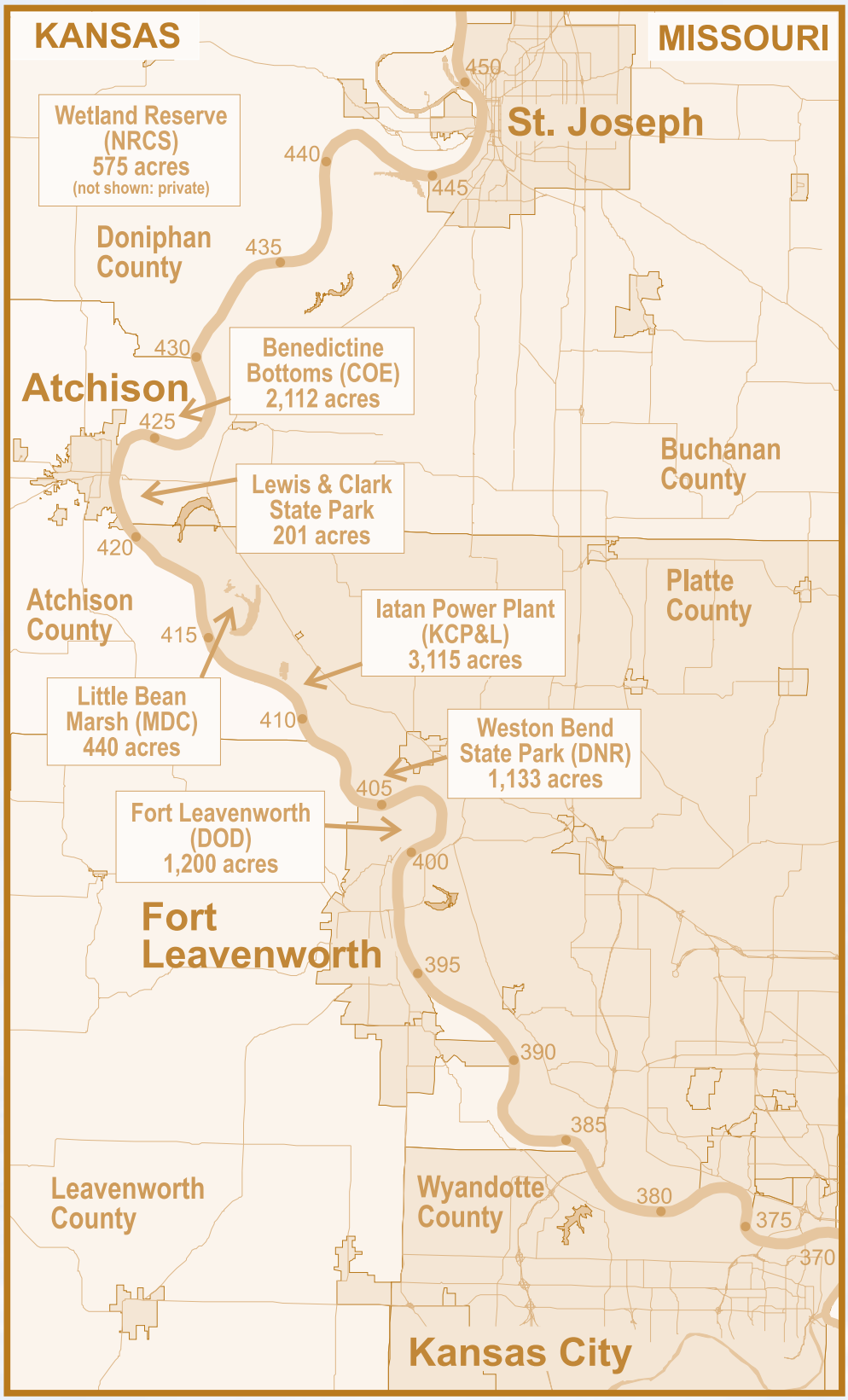
### CONFERENCE FOUNDERS

Missouri River Natural Resources Committee

U.S. Geological Survey, Columbia Environmental Research Center



# MISSOURI RIVER BASIN



# 7th Annual
# Missouri River Natural Resources Conference