PROCEEDINGS OF THE

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PROCEEDINGS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 39

MISSISSIPI RIVER RESEARCH CONSORTIUM, INC.

39th ANNUAL MEETING
12-13 APRIL 2007
RADISSON HOTEL
LA CROSSE, WISCONSIN

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PLATFORM PROGRAM

HOTEL BALLROOM A
THURSDAY, APRIL 12, 2007

7:50 – 8:00 AM Welcome and Announcements - **John Chick**, MRRC President

SESSION I – SEDIMENTS, NUTRIENTS, ALGAE AND ZOOPLANKTON
(Moderator: Steven Zigler, UMESC)

8:00 – 8:20 AM NUTRIENT DYNAMICS, OXYGEN CONCENTRATIONS AND ECOSYSTEM METABOLISM IN THE UPPER MISSISSIPPI RIVER
J.N. Houser[1], L.A. Bartsch[1], J. Sullivan[2], W.B. Richardson[1], [1]Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, WI 54603 [2]Wisconsin Department of Natural Resources, 3550 Mormon Coulee Road, La Crosse, WI 54601

8:20 – 8:40 AM EFFECTS OF FLOOD PULSES ON NITRIFICATION RATES IN UPPER MISSISSIPPI RIVER FORESTED FLOODPLAINS
T.M. Jicha[1, 2,] B.H. Hill[1], L. Johnson[3], C.M. Elonen[1], and M.S. Pearson[1], [1] US Environmental Protection Agency, Mid-Continent Ecology Division, Duluth, MN. [2] University of Minnesota-Duluth [3] Natural Resource Research Institute, UMN- Duluth, MN

8:40 – 9:00 AM NITROGEN AND SEDIMENT LOADING TO THE UPPER MISSISSIPPI RIVER: ASSESSMENTS OF 25 WATERSHEDS IN MINNESOTA AND WISCONSIN
E. Mundahl[1] and **N. Mundahl**[2], [1]Michigan Technological University, Houghton, MI 49931 [2]Winona State University, Winona, MN 55987

9:00 – 9:20 AM EVALUATION OF LIGHT PENETRATION ON NAVIGATION POOLS 8 AND 13 OF THE UPPER MISSISSIPPI RIVER
S. Giblin[1], K. Hoff[1], J. Fischer[2], T. Dukerschein[1], [1]WI Department of Natural Resources, Long Term Resource Monitoring Program, La Crosse, WI 54603. [2]WI Department of Natural Resources, La Crosse, WI, 54601

9:20 – 9:40 AM ZOOPLANKTON OF THE UPPER MISSISSIPPI RIVER: SPATIAL PATTERNS OF COMMUNITY STRUCTURE AND THE INSHORE RETENTION CONCEPT
A.P. Levchuk and J. H. Chick, Illinois Natural History Survey, Great Rivers Field Station, Brighton, IL 62012

9:40 – 10:00 AM ZOOPLANKTON IN LAKE PEPIN: SPATIAL AND TEMPORAL RELATIONSHIPS
R. M. Burdis[1] and J. K. Hirsch[2] , [1]Minnesota Department of Natural Resources, LTRMP Lake City Field Station, 1801 South Oak Street, Lake City, MN 55041 [2]Minnesota Department of Natural Resources, Ecological Resources, 500 Lafayette Road, St. Paul, MN 55155

10:00 – 10:20 AM **BREAK**

SESSION II – CONTEMPORARY HEALTH AND HISTORICAL FLOWS
(Moderator: Greg Sass, INHS)

10:20 – 10:40 AM NORTH-TO-SOUTH POSITION OF MISSISSIPPI RIVER STATES AND THEIR HEALTH RANK: A COMMENTARY
J. Hart, Sherman College of Straight Chiropractic**,** P.O. Box 1452, Spartanburg, South Carolina 29304

10:40 – 11:00 AM RETRO-MODELING THE PHYSICAL TEMPLATE OF THE MISSISSIPPI RIVER SYSTEM
J.W.F. Remo [1, 2] and N. Pinter [1, 2], [1] Environmental Resource and Policy Program and [2] Department of Geology, Southern Illinois University, Carbondale 62901-4324, USA

KEYNOTE PRESENTATION
11:00 – 11:50 AM WHY NATURALIZE DEVELOPED FLOODPLAINS? AN INTEGRATED ANALYSIS AND RESPONSE
Richard E. Sparks, National Great Rivers Research & Education Center, Godfrey, IL 62035

11:50 – 1:00 PM **LUNCH** (on your own)

SESSION III – NON-NATIVE SPECIES
(Moderator: Jonathan Remo, SIUC)

1:00 – 1:20 PM DISTRIBUTION AND ABUNDANCE OF NON-INDIGENOUS FISHES IN THE GREAT RIVERS OF THE CENTRAL BASIN, USA
M.S. Pearson[1], D. Bolgrien[1], T. Angradi[1], F.H. McCormick[2], T. Jicha[1], D.L. Taylor[1], B.H. Hill[1]. [1]USEPA, ORD, NHEERL, Mid-Continent Ecology Division, Duluth, MN 55804 [2]USFS, Environmental Sciences Research, Olympia, Forestry Sciences Laboratory, Olympia, WA 98512

1:20 – 1:40 PM LARVAL ASIAN CARP IN THE UPPER AND MIDDLE MISSISSIPPI RIVER: AN INDEX OF ESTABLISHMENT AND DISPERSAL POTENTIAL.
A.M. Lohmeyer, and J.E. Garvey, Fisheries and Illinois Aquaculture Center, Department of Zoology, Life Science II Room 173, Southern Illinois University, Carbondale, IL 62901

1:40 – 2:00 PM REDUCED CONDITION FACTOR OF TWO NATIVE FISH SPECIES COINCIDENT WITH INVASION OF NON-NATIVE ASIAN CARP IN THE ILLINOIS RIVER: EVIDENCE FOR COMPETITION AND REDUCED FITNESS?
K.S. Irons[1], G.G. Sass[1], M.A. McClelland[1], and J.D. Stafford[2],
[1]Illinois River Biological Station, Illinois Natural History Survey, 704. N. Schrader Ave., Havana, Illinois 62644, USA [2]Forbes Biological Station, Illinois Natural History Survey, P.O. Box 590, Havana, Illinois 62644, USA
2:00 – 2:20 PM ACTIVE VERSUS PASSIVE MANAGEMENT OF COMMON AND GRASS CARP

FOR BACKWATER LAKE NATIVE FISH RESTORATION: A CASE STUDY FROM THE NATURE CONSERVANCY'S EMIQUON PRESERVE
G.G. Sass, K.S. Irons, T. M. O'Hara, T.R. Cook, M.A. McClelland, N.N. Michaels, M.L. Smith, and M.R. Stroub,
Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, IL 62644

2:20 – 2:40 PM HYBRIDIZATION BETWEEN SILVER AND BIGHEAD CARP IN THE MISSISSIPPI AND ILLINOIS RIVERS
J.T. Lamer[1], C.R. Dolan[1], J.H. Chick[1], and J.M. Epifanio[2],
[1]Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave., Brighton, IL 62012. [2]Illinois Natural History Survey, Center for Aquatic Ecology and Conservation, 1816 S. Oak St., Champaign, IL 61820

2:40 – 3:00 PM **BREAK**

SESSION IV – ENVIRONMENTAL RESPONSES IN MANAGED RIVERS
(Moderator: Teresa Newton, UMESC)

3:00 – 3:20 PM ECOSYSTEM RESPONSES TO AN EXPERIMENTAL DRAWDOWN ON THE UPPER MISSISSIPPI RIVER: A SUMMARY OF FINDINGS
M.D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

3:20 – 3:40 PM IDENTIFYING POTENTIAL CONTROLS ON THE DIVERSITY OF FISHES AND ABUNDANCE AND SIZE STRUCTURE OF CENTRARCHIDS IN OFF-CHANNEL AREAS IN THE UPPER MISSISSIPPI RIVER SYSTEM: AQUATIC VEGETATION AND PHYSICAL FEATURES
B.C. Knights, B.S. Ickes, Y. Yin and J.C. Nelson, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, WI 54603

3:40 – 4:00 PM RELATIONSHIP BETWEEN COMMUNITY STRUCTURE OF YOY FISHES AND WATER QUALITY VARIABLES FROM POOL 26 OF THE UPPER MISSISSIPPI RIVER: A CROSS-COMPONENT ANALYSIS OF LTRMP DATA
J.H. Chick, , L.A. Soeken-Gittinger, E.N. Ratcliff, E.J. Gittinger, and B.J. Lubinski, Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave, Brighton, IL 62012

4:00 – 4:20 PM THE EFFECTS OF DROUGHT-LIKE CONDITIONS ON FISH AND WATER QUALITY PARAMETERS IN POOL 26 OF THE MISSISSIPPI RIVER
B.J. Lubinski, E.N. Ratcliff, L.S. Gittinger, and J.H. Chick,
Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave. Brighton, IL 62012

4:20 – 4:40 PM THE EFFECT OF A RECENTLY COMPLETED HABITAT REHABILITATION

AND ENHANCEMENT PROJECT (HREP) ON FISH ABUNDANCES IN THE LA GRANGE REACH OF THE ILLINOIS RIVER USING LONG TERM RESOURCE MONITORING PROGRAM (LTRMP) DATA
T.M. O'Hara, M.A. McClelland, K.S. Irons, T.R. Cook and G.G. Sass, Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, Illinois 62644

4:40 – 5:00 PM SWAN LAKE HABITAT REHABILITATION AND ENHANCEMENT PROJECT (HREP): POST-PROJECT BIOLOGICAL AND PHYSICAL RESPONSE MONITORING
C.R. Dolan, J.T. Lamer, and J.H. Chick, Illinois Natural History Survey, Great Rivers Field Station, Brighton, Illinois 62012

5:00 – 6:00 PM **POSTER SESSION**

6:00 – 8:00 PM **BANQUET**

NOTES

PLATFORM PROGRAM
HOTEL BALLROOM A
FRIDAY, APRIL 13, 2007

7:50 – 8:00 AM Morning Welcome and Announcements – **John Chick,** MRRC President

SESSION V – FISH, LANDSCAPES AND BENTHOS
(Moderator: Jeff Houser, UMESC)

8:00 – 8:20 AM EFFECTS OF COMMERCIAL HARVEST ON SHOVELNOSE STURGEON POPULATIONS IN THE UPPER MISSISSIPPI RIVER
J. Koch[1], M.C. Quist[1], and C.L. Pierce[2], [1]Department of Natural Resource Ecology and Management, Iowa State University, Ames, IA. [2]USGS-Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University, Ames, IA

8:20 – 8:40 AM DEMOGRAPHICS OF SHOVELNOSE STURGEON POPULATIONS IN THE LOWER PORTION THE UPPER MISSISSIPPI RIVER
M.J. Afflerbaugh, T.W. Spier, and M.L. Miller, Western Illinois University Department of Biological Sciences, Macomb, IL 61455

8:40 – 9:00 AM TRENDS IN LARGEMOUTH BASS AND BLUEGILL POPULATIONS AMONG THE UPPER AND LOWER ILLINOIS RIVER, 1957-2006
M.A. McClelland and G.G. Sass, Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, Illinois 62644

9:00 – 9:20 AM FISH MOVEMENT IN THE MISSISSIPPI RIVER
R. Brooks [1], J. Garvey [1], **S. Tripp** [1], M. Hill [1], M. Madegan [1], T. Spier [2], D. Herzog [3], and B. Hrabik [3], [1]Southern Illinois University, Carbondale, IL. [2]Western Illinois University, Macomb, IL, [3]Missouri Long Term Monitoring Station, Jackson, MO

9:20 – 9:40 AM A PRELIMINARY ANALYSIS OF CHANGES IN LANDSCAPE STRUCTURE FOR THE UPPER MISSISSIPPI RIVER FROM 1989 TO 2000
M.M. Porzky[1], J.C. Nelson[2], R.W. Tyser[1], and C.M. Hupy[3],[1]River Studies Center, University of Wisconsin-La Crosse, 1725 State St., La Crosse, WI 54601 [2]Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd., La Crosse, WI 54603
[3]Department of Geography, University of Wisconsin-La Crosse, 1725 State St., La Crosse, WI 54601

9:40 – 10:00 AM BENTHIC PRODUCTIVITY AND LIFE-HISTORY OF FINGERNAIL CLAMS OF POOL 9, UPPER MISSISSIPPI RIVER
J. Eckblad, M. Hoegh, D. McAdam, B. Reynolds, B. Evans, M. Swenson, K.Swenson, D. Schultz, M. Howie, T. Young, N. Leslein, B. Powell, L. Doerr, K. McVey, Department of Biology, Luther College, Decorah, Iowa 52101

10:00 – 10:20 AM **MIDDLE AND HIGH SCHOOL STUDENT POSTERS/BREAK**

SESSION VI – MUSSELS, TURTLES, AND HABITAT ASSESSMENTS
(Moderator: Brian S. Ickes, UMESC)

10:20 – 10:40 AM FACTORS AFFECTING THE NEST SITE SELECTION OF SMOOTH SOFTSHELL TURTLES (APALONE MUTICA)
K.L. Brown, M.A. Romano, and S.T. Meiers, Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455

10:40 – 11:00 AM EFFECTS OF A HUMAN-MADE ENVRIONMENTAL BARRIER TO GENE FLOW IN A SEMI-AQUATIC TURTLE, Trachemys scripta ON THE MISSISSIPPI RIVER
L.M. Coghill[1], M.A. Romano[1], B. Sloss[2], and R. Franckowiak[2],
[1]Western Illinois University, 1 University Circle, Department of Biological Sciences Waggoner Hall, Macomb IL, 61455. [2]College of Natural Resources, Univ. of Wisconsin-Stevens Point 800 Reserve Street, Stevens Point, WI USA 54481

11:00 – 11:20 AM ENVIRONMENTAL CUES AND RED-EARED SLIDER (TRACHEMYS SCRIPTA ELEGANS) REPRODUCTION
J.K. Tucker, Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclair Avenue, Brighton, Illinois 62012-2032, USA

11:20 – 11:40 AM CLIMATIC WARMING, RED-EARED SLIDERS (TRACHEMYS SCRIPTA ELEGANS), AND SEX RATIO
J.K. Tucker[1], C.R. Dolan[1], J.T. Lamer[1], and E.A. Dustman[2],
[1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclair Avenue, Brighton, Illinois 62012-2032, USA; [2]Department of Biology, Southern Illinois University at Edwardsville, Edwardsville, Illinois 62025, USA

11:40 – 12:00 PM POPULATION ESTIMATES OF NATIVE FRESHWATER MUSSELS IN POOL 5 OF THE UPPER MISSISSIPPI RIVER, 2006
M. Davis[1], J. Kern[2], T. Newton[3], and B. Gray[3], [1]Minnesota Department of Natural Resources, Lake City, MN 55041. [2]Kern Statistical Services, Inc., Sauk Rapids, MN 56379. [3]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

12:00 – 1:00 PM **LUNCH**

SESSION VII – STATISTICS AND HABITAT ASSESSMENT (Moderator: John Chick, INHS)

1:00 – 1:20 PM CONCERNS ASSOCIATED WITH SUBSTITUTING AVERAGES FOR SAMPLE DATA
B.R. Gray, U.S. Geological Survey, Upper Midwest Environmental Sciences Center

1:20 – 1:40 PM A NOVEL APPROACH TO EVALUATE HABITAT QUALITY IN THE UPPER MISSISSIPPI RIVER -- QUANTITATIVE ANALYSIS OF ESSENTIAL FATTY ACIDS
M. Bartsch, L. Bartsch, B. Knights, J. Vallazza, S. Gutreuter, W. Richardson, and T. Newton, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

1:40 – 2:00 PM HOME ON THE BIG RIVER: ASSESSING HABITAT CONDITION IN THE GREAT RIVERS OF THE CENTRAL UNITED STATES
D.L. Taylor, T.R. Angradi, D.W. Bolgrien, B.H. Hill, T.M. Jicha[1], M.S. Pearson, S.L. Batterman, and M.F. Moffett, USEPA, ORD, NHEERL, Mid-Continent Ecology Division, 6201 Congdon Blvd., Duluth, MN 55804

2:00 – 2:40 PM **BUSINESS MEETING**

2:40 – 3:20 PM **RAFFLE AND SILENT AUCTION**

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POSTER PRESENTATIONS
THURSDAY APRIL 12, 2007 12:00 PM – 6:00 PM
Authors Present 5:00 PM – 6:00 PM
(Listing by Topic)

FISH

1) FISH ASSEMBLAGES WITHIN THE GREAT RIVERS OF THE UNITED STATES
M.A. McClelland, K.S. Irons and **T.R. Cook,** Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, Illinois 62644

2) EFFECT OF BACKWATER LAKE MANAGEMENT ON HABITAT FOR RIVERINE FISH
T.R. Timmermann, C.R. Dolan, and J.H. Chick, Great Rivers Field Station, Illinois Natural History Survey, Brighton, IL 61012

3) FISH POPULATION DYNAMICS OF AN ANNUALLY-FLOODED SEASONALLY-ISOLATED BACKWATER LAKE OF THE ILLINOIS
M.R. Stroub, G.G. Sass, and K.S. Irons, Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, Illinois 62644

4) FOOD PREFERENCES AND FEEDING RATES OF SLIMY SCULPIN
D. Mundahl[1] and **N. Mundahl**[2], [1]Winona Senior High School, Winona, MN 55987. [2]Winona State University, Winona, MN 55987

5) SPORTFISH TRENDS IN THE LA GRANGE REACH OF THE ILLINOIS RIVER, 1994-2006
N.N. Michaels, G.G. Sass, and K.S. Irons, Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Avenue, Havana, Illinois 62644

6) UPPER MISSISSIPPI RIVER BACKWATERS AS FISH OVERWINTERING REFUGIA: EVIDENCE OF FISH MIGRATION IN LATE FALL
A. Bartels[1] and J. Janvrin[2], [1]Wisconsin Department of Natural Resources, La Crosse, WI 54603. [2]Wisconsin Department of Natural Resources, La Crosse, WI 54601

FOOD WEBS

7) HISTORICAL TIMELINE OF LARGE RIVER FOOD WEBS THROUGH STABLE ISOTOPE ANALYSIS
E.E. Zelenka[1], M.M. Delong[1], and J.H. Thorp[2], [1]Large River Studies Center and Biology Department, Winona State University, Winona, Minnesota 55987. [2]Kansas Biological Survey and Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047

8) EFFECTS OF AN EXPERIMENTAL DRAWDOWN ON FOOD WEBS IN UPPER MISSISSIPPI REACH 5
B. Sheehan and M. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, Minnesota 55987

9) AN ANALYSIS OF CHANGES IN TROPHIC DYNAMCS IN THE ST. CROIX RIVER: A STABLE ISOTOPIC EVALUATION

D. Ramanan[1], M.D. Delong[1], and J.H. Thorp[2], [1]Large River Studies Center and Biology Department, Winona State University, Winona, Minnesota 55987. [2]Kansas Biological Survey and Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047

10) TEMPORAL TRENDS OF THE DIETS OF FISH IN THE OHIO RIVER USING STABLE ISOTOPES

J.M. Hofmann[1], M.D. Delong[1], and J.H. Thorp[2], [1]Large Rivers Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047

11) ISOTOPIC COMPOSITION OF RIVERINE AUTOTROPHS: RELATIONSHIP WITH ISOTOPIC RATIOS OF INORGANIC NUTRIENTS

M.E. Babcock and M.D. Delong, Large River Studies Center, Biology Department, Winona State University, MN 55987

FIELD STATION HIGHLIGHTS

12) DEVELOPMENT OF THE MIDDLE MISSISSIPPI RIVER WETLANDS FIELD STATION: OPPORTUNITIES FOR RESEARCH AND EDUCATION

D.J. Myers and M.R. Whiles, Center for Ecology, Department of Zoology, Southern Illinois University, Carbondale, IL 62901-6501

13) THE GREAT RIVERS FIELD STATION: PAST, PRESENT AND FUTURE HIGHLIGHTS FROM OVER A DECADE OF MONITORING POOL 26 OF THE MISSISSIPPI RIVER

E.J. Gittinger, R.J. Cosgriff, L.A. Gittinger, B.J. Lubinski, E.N. Ratcliff, J.K. Tucker, and J.H. Chick**,** Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave, Brighton, IL 62012

TURTLES

14) CLIMATIC WARMING AND RED-EARED SLIDER (*TRACHEMYS SCRIPTA ELEGANS*) NATURAL HISTORY

J.K. Tucker[1], C.R. Dolan[1], J.T. Lamer[1], and E.A. Dustman[2], [1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclair Avenue, Brighton, Illinois 62012-2032, USA; [2]Department of Biology, Southern Illinois University at Edwardsville, Edwardsville, Illinois 62025, 54603

15) COMMON SNAPPING TURTLE (*CHELYDRA SERPENTINA*) SEX DETERMINATION AND DEMOGRAPHICS

E.A. Dustman[1], J.K. Tucker[2], C.R. Dolan[2], and J.T. Lamer[2], [1]Department of Biology, Southern Illinois University at Edwardsville, Edwardsville, Illinois 62025, USA; [2]Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclair Ave., Brighton, Illinois 62012 USA

INVERTEBRATES

16) POTENTIAL WOOD EXCAVATION BY COMMON NET-SPINNING CADDISFLIES IN POOL 8, UPPER MISSISSIPPI RIVER

R.J. Haro[1], W.B. Richardson[2], and R.M. Northwick[1,2], [1]River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601. [2]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54602

PHYTOPLANKTON

17) ARE MIGRATING WATERFOWL TRANSPORTING *CHARA* AS THEY MIGRATE?

R. Smith, and S.T Meiers, Department of Biological Sciences, Western Illinois University Macomb Illinois 61455

ECOSYSTEM ASSESSMENT

18) UTILIZATION OF WATER QUALITY INDEX TO ASSESS THE OVERALL WATER QUALITY IN UPPER MISSISSIPPI RIVER

V. Kimler, and C. Kim, Department of Natural and Applied Science, University of Dubuque, Dubuque, IA 52001

19) EXPLORATORY ANALYSIS OF INDEX OF BIOTIC INTEGRITY SCORES CALCULATED FROM DATASETS OBTAINED FROM THREE DIFFERENT DAY ELECTROFISHING PROTOCOLS

A. Bartels[1], **T. Dukerschien[1]**, and B.S. Ickes[2], [1]Wisconsin Department of Natural Resources Field Station, 2630 Fanta Reed Road, La Crosse, WI 54603; [2]USGS Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, Wisconsin 54603

GEOGRAPHIC INFORMATION SYSTEMS

20) A GEOGRAPHIC INFORMATION SYSTEM FOR THE MINES OF SPAIN RECREATION AREA, DUBUQUE, IA

C. Moonen[1], J.J. White[1], G.L. Zuercher[1], D.H. Easley[1], and W. Buchholtz[2], [1] Department of Natural and Applied Sciences, University of Dubuque, 2000 University Avenue, Dubuque, IA 52001. [2] Mines of Spain Recreation Area, E.B. Lyons Interpretive Center, 8991 Bellevue Heights Road, Dubuque, IA 52003

MAMMALS

21) WHITE FOOTED MICE (PEROMYSCUS LEUCOPUS) AT MINES OF SPAIN RECREATION AREA, IOWA

J.J. White[1], C. Moonen[1], G.L. Zuercher[1], D.H. Easley[1], and W. Buchholtz[2], [1] Department of Natural and Applied Sciences, University of Dubuque, 2000 University Avenue, Dubuque, IA 52001. [2] Mines of Spain Recreation Area, E.B. Lyons Interpretive Center, 8991 Bellevue Heights Road, Dubuque, IA 52003

SEDIMENT

22) A GIS TECHNIQUE FOR ASSESSING SEDIMENT HARDNESS IN A MANAGED ILLINOIS RIVER BACKWATER

J.T. Lamer, C.R. Dolan, and J.H. Chick, Great Rivers Field Station, Illinois Natural History Survey, Brighton, IL 62012

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DEMOGRAPHICS OF SHOVELNOSE STURGEON POPULATIONS IN THE LOWER PORTION THE UPPER MISSISSIPPI RIVER

Matthew J. Afflerbaugh, Timothy W. Spier, and Marcus L. Miller

Western Illinois University Department of Biological Sciences, Macomb, IL 61455

The collapse of many foreign sturgeon markets has lead to an increased pressure on North American sturgeon populations as a source for sturgeon products. A commercial fishery currently exists for shovelnose sturgeon in the Mississippi River. Presently, little is known about the population structure of shovelnose. Samples were taken throughout 2005 and 2006 for age, growth, and mortality estimates to help establish a baseline as new commercial fishing regulations are being implemented. Careful monitoring of sturgeon populations will be needed to prevent overfishing and possible collapse of the Mississippi River fishery.

Keywords: shovelnose sturgeon, *Scaphirhynchus platorynchus*, Mississippi River, fishing regulations, aging sturgeon

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A NOVEL APPROACH TO EVALUATE HABITAT QUALITY IN THE UPPER MISSISSIPPI RIVER -- QUANTITATIVE ANALYSIS OF ESSENTIAL FATTY ACIDS

Michelle Bartsch, Lynn Bartsch, Brent Knights, Jon Vallazza, Steve Gutreuter, William Richardson, and Teresa Newton

U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

Quantitative analysis of fatty acids (FAs) has emerged as a powerful tool to determine food sources and quality in aquatic food webs. Polyunsaturated fatty acids (PUFAs), which includes omega-3 and omega-6 FA, are almost exclusively synthesized by vascular plants and algae, yet play an important role in cellular function and hormone metabolism of animals. PUFAs that cannot be biosynthesized *de novo*, such as α-linolenic acid and linoleic acid, or in sufficient quantities to ensure optimal physiological performance, such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are called essential fatty acids (EFAs). EPA and DHA have been shown to regulate aspects of growth, development, reproduction, or immunological response in marine mollusks and fish, and freshwater zooplankton. In addition to indicators of consumer health, FAs have been used as diet biomarkers to elucidate prey type and dietary importance for marine and freshwater fish, marine carnivores, and freshwater zooplankton. We have begun using FAs as potential indicators of food sources and habitat quality in Upper Mississippi River food webs. Preliminary data showed that concentrations of EFAs in consumers are higher in channel habitats than in backwaters. For example, concentrations of EPA and DHA were significantly higher in bluegill, unionid and zebra mussel tissues from channel habitats compared to backwaters. In contrast, concentrations of arachidonic acid (ARA, a known precursor of stress prostaglandins in fish and humans) were significantly higher in bluegill and zebra mussel tissue from backwaters compared to channel habitats. ARA concentrations were similar in unionid mussel tissue between habitats. Preliminary results suggested that channel habitats provided consumers with a better mix of EFAs than backwaters, implying that consumer health was better in channels than backwaters. We hypothesize that low EFA concentrations in backwaters may result from: 1) the long hydraulic retention times that inhibit replenishment of depleted EFA supplies; 2) lower production of EFA-rich phytoplankton; or 3) abundant populations of cyanobacteria (due to long retention times and late summer nitrogen depletion of backwaters). Future research will more explicitly examine the spatial and temporal patterns of EFAs in food webs in these habitats including relations between: 1) EFA concentrations in algal groups and consumers; 2) EFA concentrations and rates of secondary and tertiary production; and 3) nutrient concentrations, habitat connectivity, and food web production. Finally, these initial studies will identify baseline patterns of food web interactions and food sources against which the effects anthropogenic perturbations (e.g., invasive species, habitat restoration, and climate change) can be measured.

Keywords: fatty acids, food webs, habitat quality, Mississippi River, channel and backwater

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FACTORS AFFECTING THE NEST SITE SELECTION OF SMOOTH SOFTSHELL TURTLES (*APALONE MUTICA*)

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Smooth softshell turtles (*Apalone mutica)* require several very specific habitat conditions to be met before the females will dig a nest and lay her eggs. Preferred sites generally include sandy, open beaches that have very little disturbance from humans and predators, adequate temperature and exposure to light, and little to no vegetation present. Softshell turtles were observed during the nesting and hatching seasons, mid-June to mid-October of 2006, at two locations along the Mississippi River near Hamilton, Illinois below lock and dam 20. Nests were identified as false, predated, or hatched based upon the presence and conditions of eggs. Data were collected during weekly visits to the nest sites and included the temperature of all nests at the soil level and the temperature at the depth of six inches. A square meter plot was measured around the center of each nest and the amount and type of vegetation recorded. The incline and clinometer were taken using a Suunto Tandem directly upstream of each nest. The distance to vegetation lines created by the fluctuating river were taken from the permanent vegetation line to each and to the nest itself. We hypothesized that the softshell turtles would lay their eggs in sandy, open beaches, that have a slight slope, that have little predation or human disturbance, and no vegetation around the nests. Also, previous research suggested that the temperature would be in a narrow range between 36-37^{o}C. A total of 582 nests were found, of which 12 hatched, 288 were false, and 282 were predated. All hatched nests were found between August 25 and September 22, 2006, with only one from the Missouri side beach. Both soil and surface temperatures varied greatly over a broad range, with the most variation seen in false nests, followed by predated and then hatched. Principle component analysis revealed three significant components corresponding to vegetation composition around the nests, effect of woods and its shading with surface temperature, and soil temperature and moisture respectively. These components explained 82.7% of the variation in nest site selection of smooth softshell turtles. Softshell turtles prefer to nest in sandy, open beaches that are slightly sloped, with little vegetation present around nest site which supported our hypothesis. There was a broad temperature range that turtle nests were located for at both surface and soil temperatures. Our hypothesis that turtles would prefer to nest on a site with little disturbance or predation did not prove to be based on the tremendous predation rate seen on both beaches.

Keywords: *Apalone mutica*, turtles, predation, temperature, soil

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ZOOPLANKTON IN LAKE PEPIN: SPATIAL AND TEMPORAL RELATIONSHIPS

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Zooplankton is an important prey item in the life history of most fishes and often serves as a vital link between trophic levels in aquatic ecosystems. Zooplankton is also sensitive to perturbations in aquatic ecosystems that either cascade down or result from bottom-up stressors. Lake Pepin provides a unique habitat on the Mississippi River for zooplankton due to its morphometry. Vertical tows of zooplankton have been collected in Lake Pepin since 1993 in conjunction with the Long Term Resource Monitoring Program's water quality sampling effort. Analysis of the data revealed seasonal and spatial patterns in the zooplankton community of Lake Pepin. Negative relationships of zooplankton density, with chlorophyll and discharge were also evident.

Keywords: zooplankton, chlorophyll, Daphnia, LTRMP, Lake Pepin

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RELATIONSHIP BETWEEN COMMUNITY STRUCTURE OF YOY FISHES AND WATER QUALITY VARIABLES FROM POOL 26 OF THE UPPER MISSISSIPPI RIVER: A CROSS-COMPONENT ANALYSIS OF LTRMP DATA

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Data from the LTRMP water quality and fish components were combined in a cross-component analysis. Patterns of fish community structure for all size classes did not correlate with LTRMP water quality data or riverine discharge, but patterns of young-of-the-year (YOY) community structure were significantly correlated with spring Chl-a, spring discharge, and summer temperature. Significant positive relationships were found between CPUE of YOY black crappie, sauger, and smallmouth buffalo with discharge. We found multiple regression models with $R^2 > 0.50$ for YOY black and white crappie, channel catfish, largemouth bass, sauger, and common carp with combinations of these environmental factors and the abundance of stock-sized fishes (i.e., an index of parental abundance). Multivariate correlations for age-1 fishes with environmental factors during the spring and summer from the previous year support our findings for YOY fishes. The value of these analyses lies primarily in generating testable hypotheses, and with the possibility of repeating them as further data is collected over the coming years and decades.

Keywords: YOY Fishes, Water Quality, LTRMP, Monitoring Data

EFFECTS OF A HUMAN-MADE ENVRIONMENTAL BARRIER TO GENE FLOW IN A SEMI-AQUATIC TURTLE, *Trachemys scripta* ON THE MISSISSIPPI RIVER

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In the past 50 years the state of Illinois has lost almost 90% of its original vegetation and drained over 90% of its original wetlands. Almost all of Illinois rivers have been channeled and dammed to control the water for shipping and agricultural use. Extensive pollution has caused many problems, and has an increased effect on aquatic and semi-aquatic organisms.

It has been shown that humans are having a negative effect on river ecosystems in Illinois. The channeling of the Mississippi River in often non-natural courses creates an often unnatural, impassable barrier to aquatic and semi-aquatic organisms. This loss of biodiversity should be cause for alarm. Aquatic and semi-aquatic organisms are often precursors of larger problems with loss of biodiversity and pollution. However, there have always been many arguments about the true levels of biodiversity and how much biodiversity we are truly losing. It is known that some levels of natural extinction always occur. One way to determine if a population has significant levels of gene flow in order to maintain healthy metapopulations is to use microsatellite DNA to examine the levels of gene flow among varying populations. Microsatellites have both the resolution and power to adequately examine the levels of gene flow in given populations. In this study we are examining whether the only true spillway dam system left on the Mississippi River, as well as the oldest dam on the river system, is a barrier to semi-aquatic organisms such as turtles.

In this study, tissue samples were taken from the freshwater river turtle *Trachemys scripta* trapped at 4 different locations along the Mississippi River. *Trachemys scripta* was chosen because it has one of the largest habitat ranges of any North American freshwater turtle. The first site is located directly above Lock and Dam 19. One site below the dam on the Illinois side of the river is located at Eagle Island Slough. The other two sites are on the Iowa side of the river; this was chosen because the lock which allows water flow back and forth across the dam is located on the Iowa side of the river. The first site is the Des Moines River which separates the state of Missouri and Iowa. The second site is further downstream in an island slough, in the proximity of the mouth of the Fox River system. The samples were stored in 95% ethanol. The samples then had their DNA extracted, and 5 individual microsatellite loci were amplified using PCR.

Preliminary data using allozyme studies have shown that there is some level of gene flow across the dam to the downstream side. With the increased resolution of microsatellites the preliminary data is showing that there is a high amount of variation in the Fox River system. This suggests that 1-way gene flow is occurring from above the dam to below the dam, down the Iowa side of the river. This is consistent with the hypothesis that the turtles are getting into the lock system above the dam, and the current from the spillway system is sweeping them downstream on the Iowa side. The turtles, however, are not crossing the river to the Illinois side and there is no lock on the Illinois side to allow the turtles to move downstream on that side of the river. There is also no evidence of gene flow moving from below the dam to above the dam through the lock system.

Keywords: turtle, Mississippi River, *Trachemys scripta*, microsatellite DNA, gene flow

POPULATION ESTIMATES OF NATIVE FRESHWATER MUSSELS IN POOL 5 OF THE UPPER MISSISSIPPI RIVER, 2006

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During summer 2005, water levels in Pool 5 of the Mississippi River were held about 0.5 m below historically targeted levels to reestablish plant communities. Native freshwater mussels living in the dewatered areas were stranded, resulting in substantial, but inadequately measured, mortality. To better understand the possible adverse effects of this management action on freshwater mussels, we conducted a mussel survey during summer of 2006. Our objective was to obtain pool-wide relative density and population estimates for mussels, stratified by depth. We used a systematic grid with multiple random starts to provide an unbiased estimation of the total number of mussels within each zone of interest. The shallow water zone was all depths 0-0.5 m, including the areas dewatered in 2005, and the deep water zone was all depths >0.5 m. Samples were allocated more densely in the shallow zone (1 sample per 5 ha), than in the deep zone (1 sample per 13 ha). Two 0.25m^2 total substrate samples were obtained at each of 359 sites. All live mussels were counted, measured for shell length, aged (if < 10 yrs), and the number of attached zebra mussels was recorded. A total of 669 live mussels, representing 16 species, were obtained. Abundance ranged from 0 to 13 live mussels per sample, with 66% of the samples containing no mussels and 6% of the samples containing ≥ 5 mussels. Five common species (*Amblema plicata*, *Obliquaria reflexa*, *Fusconaia flava*, *Quadrula pustulosa*, and *Utterbackia imbecillis*) accounted for 90% of the mussels. Pool-wide population estimates are forthcoming. High-density sites identified during this survey will be targeted for additional research in the future.

Keywords: mussel survey, systematic sampling, population estimate, pool 5

ECOSYSTEM RESPONSES TO AN EXPERIMENTAL DRAWDOWN ON THE UPPER MISSISSIPPI RIVER: A SUMMARY OF FINDINGS

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Experimental drawdowns have been tested on several occasions as a potential water-level management tool in the Upper Mississippi and other large regulated rivers. The most recent drawdown was executed on Reach 5 of the Upper Mississippi River, where water levels were reduced approximately 0.5-m from the end of June into September 2005. The Large River Studies Center, as part of the broader effort funded by the U.S. Army Corps of Engineers through the Navigation and Environmental Sustainability Program (NESP), monitored changes in factors indicative of ecosystem-level processes in backwater and main channel habitats throughout the reach. Factors measured May – August 2005 included: community metabolism; phytoplankton chlorophyll concentrations; benthic and sestonic organic matter carbon and nitrogen isotope ratios; and trophic linkages. Standard methods used for collecting organic matter and invertebrates in past studies through the LRSC were employed. Metabolism was measured using AquaDevice continuous oxygen/temperature recorders deployed for 7-d periods as part of the monthly sampling regime. The same sample procedures, except trophic measures were repeated in Reach 6. Gross primary production increased in the main channel of Reach 5 increased during the study, whereas GPP of backwaters decreased in both Reachs, but at a slower rate in Reach 5. Production:Respiration remained $\geq$ 1 throughout the study in Reach 5 but declined over time in Reach 6. Nitrogen isotope ratios of phytoplankton increased over time in Reach 5 while decreasing in Reach 6 just as they did in a 2004 study. The differences in $\delta^{15}N$ suggest that inorganic nitrogen sources differed between the two Reaches during the drawdown period. Chlorophyll concentrations were, for the most part, similar between the two Reaches. Findings indicate that riverine primary production was enhanced by the drawdown, which would be expected given the increase in hydrological retention resulting from maintaining lower water levels.

Keywords: ecosystem health, biomonitoring, assessment, ecosystem processes, function

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SWAN LAKE HABITAT REHABILITATION AND ENHANCEMENT PROJECT (HREP): POST-PROJECT BIOLOGICAL AND PHYSICAL RESPONSE MONITORING.

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Sedimentation of backwater lakes in the Mississippi and Illinois River systems is an ongoing problem. Swan Lake is a 1,150 ha backwater lake of the Illinois River in which an HREP was implemented in 1993 to improve conditions. It was divided into three distinct units (upper, middle, and lower), and stop-log gates were installed to manipulate water levels. Goals were to reduce sedimentation rates and consolidate sediments to promote the growth of aquatic vegetation and improve habitat for fish and wildlife. Pre-project monitoring was executed in 1992 to collect baseline data on water quality, sediment, aquatic vegetation, macroinvertebrates, and fishes. Post-project monitoring began in 2004, two years after completion of HREP construction, and was completed in 2006. Sites with consolidated sediments (penetrometer depths < 20 cm) increased due to draw-downs, but areas that remained wet were more flocculent than in 1992. Gross sedimentation rate was 798-1320 g dry wt./m^2/day, and was similar to 1992. Reduced turbidity was observed in the middle unit only, likely a reflection of increased sediment compaction. Submersed aquatics were absent throughout the lake during the post-project except in the upper unit, and substantial growth of emergent vegetation was observed in the middle and upper units. Chironomids were the dominate macroinvertebrate during both project phases. More fish species were collected in the pre- (n=40) versus the post-project (n=30). Fish community changes include the addition of Asian carp, and reduction in buffaloes. Post-project objectives were 1) to compile data on the same abiotic and biotic variables as in 1992, and 2) to compare pre- and post-project data to assess Swan Lake HREP successes.

Keywords: sedimentation, backwaters, habitat rehabilitation, aquatic vegetation, before/after comparison

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BENTHIC PRODUCTIVITY AND LIFE-HISTORY OF FINGERNAIL CLAMS OF POOL 9, UPPER MISSISSIPPI RIVER

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Over a 4-year period (2003 - 2006, May to October) studies were conducted on benthic macroinvertebrate populations of Big Lake, along with 9 other backwater lakes of Pool 9. Thirteen abiotic parameters were estimated to help characterize differences in the 10 lakes. Greater water depth, higher bottom oxygen, greater Secchi depth, higher pore water percentage, higher silt or clay percentage were variables associated with greater numbers of macroinvertebrates. Life-history data for fingernail clams (*Musculium transversum*) was used to estimate reproductive contribution during the months of May to October. This provided additional realism to population models for these populations.

Keywords: backwater lakes, Mississippi River, macroinvertebrate, life-history, fingernail clam

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EVALUATION OF LIGHT PENETRATION ON NAVIGATION POOLS 8 AND 13 OF THE UPPER MISSISSIPPI RIVER

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The availability of light can have a dramatic affect on macrophyte and phytoplankton abundance in virtually all aquatic ecosystems. The Long Term Resource Monitoring Program (LTRMP) and other monitoring programs often measure factors that influence light extinction (non-volatile suspended solids, volatile suspended solids, and chlorophyll) and correlates of light extinction (turbidity and Secchi depth), but rarely measure light extinction directly. Light extinction, Secchi depth, transparency tube, turbidity, total suspended solids, and volatile suspended solids data were collected in 2003 on Pools 8 and 13 of the Upper Mississippi River. Regressions were developed to predict light extinction based upon Secchi depth, transparency tube, turbidity, and total suspended solids. Transparency tube, Secchi depth, and turbidity all show strong relationships with light extinction and can be used to effectively predict light extinction. Total suspended solids do not show as strong a relationship to light extinction when tributaries are included, but the relationship improves when examining the main channel data only. Volatile suspended solids were shown to have a greater influence on light extinction than non-volatile suspended solids. The data were compared to recommended criteria established for light extinction, Secchi depth, total suspended solids, and turbidity by the Upper Mississippi River Conservation Committee to sustain submersed aquatic vegetation in the Upper Mississippi River. During the study period, the average condition in Pool 8 met or exceeded all of the criteria and the average condition in Pool 13 failed to meet any of the criteria. This report provides river managers with an effective tool to predict light extinction based upon readily available data.

Keywords: Light extinction, Upper Mississippi River, transparency tube, Secchi depth, turbidity

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CONCERNS ASSOCIATED WITH SUBSTITUTING AVERAGES FOR SAMPLE DATA

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When modeling associations, investigators often substitute averages for observed data. This might occur, for example, when analyzing cluster averages rather than observed data or when a covariate is not available at the scale at which the outcome is sampled. Modeling using averages raises two problems: i) averages are estimated with uncertainty and ii) the processes in question may respond differently at the scale of observation and at the scale over which observations are averaged. For example, an investigator may be interested in associating fish counts and vegetation levels across a series of lakes. Attempting to associate fish counts with mean vegetation level per lake presumes that lake averages have ignorable sampling variation and that fish-vegetation associations do not occur at scales smaller than the lake. Either assumption may be false. In general, aggregation should be avoided when sampling variation of the covariate (e.g, vegetation in the example) is large relative to the total variation of the covariate and when using nonlinear models.

Keywords: atomistic fallacy, ecologic fallacy, models, statistics

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NORTH-TO-SOUTH POSITION OF MISSISSIPPI RIVER STATES AND THEIR HEALTH RANK: A COMMENTARY

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The recent news that Minnesota ranks first in health and Louisiana last, suggested to the author that their connecting medium, the Mississippi River, might be a factor. Consequently, a correlation was sought between position of states along the Mississippi River and their health rank. Correlations were sought in similar categories such as position of states along the eastern U.S. seaboard and Missouri River. Accordingly, each state was ranked according to its north-to-south position. The position rank was then correlated with the health rank for the years 2004, 2005, and 2006 using the Spearman correlation test. Similar correlations were also made for Mississippi River states and temperature, per capita income, and ACT scores. A strong correlation was found between position of states along the Mississippi River and their health rank for the years assessed (mean $r = 0.959$). Strong correlations were also found for position of Mississippi River states and temperature ($r = 0.976$), per capita income ($r = -0.952$), and ACT scores (mean $r = -0.863$). Correlations were less strong when comparing health rank to state positions along the eastern seaboard (mean $r = 0.859$) and along the Missouri River (mean $r = 0.458$). Thus, a state's north-to-south position, particularly along the Mississippi River, appears to be a risk factor for its health rank. Further study is indicated regarding possible causative mechanisms.

Keywords: Mississippi River, river contaminants, health rank of states, per capita income, ACT scores, and temperature

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NUTRIENT DYNAMICS, OXYGEN CONCENTRATIONS AND ECOSYSTEM METABOLISM IN THE UPPER MISSISSIPPI RIVER

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The Upper Mississippi River (UMR) is composed of a diverse array of aquatic areas. Rates of important biological processes such as nutrient cycling, primary production and respiration are presumed to differ among these distinct areas. During the 2006 growing season, we examined nutrient dynamics, water column primary production and ecosystem metabolism in three contrasting aquatic environments in UMR Navigation Pool 8: contiguous backwaters with a single connection to the main channel (CBW-LC), backwaters with multiple connections to the main channel ("flow through" backwaters, CBW-FT), and the main channel (MC). Dissolved nitrogen (nitrate + ammonia) concentrations were consistently highest in MC, lowest in the CBW-LC and intermediate in CBW-FT. Concentrations of dissolved nitrogen in MC and CBW-FT peaked in early summer and subsequently declined throughout the growing season. Phosphorus dynamics were more complex. A mid-summer algal bloom in the MC resulted in high chlorophyll concentrations (~100 ug/L) and a strong reduction in soluble reactive phosphorus (SRP) concentrations from ~0.07 mg/L in spring to ~0 in mid summer. After the bloom declined in early fall, main channel SRP concentrations increased to ~0.10 mg/L. Seasonal patterns in SRP in the backwaters were less pronounced. SRP concentrations were similar between BWC-LC and BWC-FT, and in most backwater sites the SRP concentration was higher than in the MC. The highest observed rate of water column primary production (production by suspended phytoplankton--measured weekly using light/dark bottle incubations) occurred in the MC. However, the daily change in ambient DO concentrations (measured at 15 minute intervals by dissolved oxygen probes at 0.2 m below the surface in the water column), an indicator of total ecosystem metabolism, was generally higher in the backwaters than in the MC. These results suggest that while water column primary production can be higher in the MC than in the backwaters, overall ecosystem metabolism (which includes aquatic vegetation and sediments) is generally higher in the backwaters. These results illustrate important contrasts in nutrient dynamics and ecosystem metabolism between MC and backwater areas of the UMR.

Keywords: backwaters, dissolved oxygen, nitrogen, phosphorus, primary production, ecosystem metabolism

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REDUCED CONDITION FACTOR OF TWO NATIVE FISH SPECIES COINCIDENT WITH INVASION OF NON-NATIVE ASIAN CARP IN THE ILLINOIS RIVER: EVIDENCE FOR COMPETITION AND REDUCED FITNESS?

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Non-native, Asian bighead *Hypophthalmichthys nobilis* and silver carp *H. molitrix*, have been present in the Illinois River since the early 1990's. The U.S. Army Corps of Engineers' Long Term Resource Monitoring Program (LTRMP) has collected bighead and silver carp during routine monitoring of the La Grange Reach, Illinois River since 1995 and 1998, respectively. Annual recruitment of bighead and silver carp has been variable, but carp biomass in the La Grange Reach has increased exponentially since 2000 and these exotics now dominate the fish community. Previous research suggests that dietary overlap exists between both Asian carp species and two native Illinois River fishes; gizzard shad *Dorosoma cepedianum* and bigmouth buffalo *Ictiobus cyprinellus*. We used length and weight data collected during 2000-2005 from over 2,400 fish to evaluate body condition of shad and buffalo since Asian carp establishment. We evaluated body condition to assess potential competitive interactions and consequences to fitness due to these exotic species. We identified significant declines in body condition of shad and buffalo following Asian carp invasion. We observed statistically significant decreases in shad condition between 2002 and 2005 ($p < 0.001$), while buffalo condition decreased between 2000 and all subsequent years analyzed ($p < 0.003$). To our knowledge, the LTRMP provides the first correlative evidence of direct negative competitive interactions between bighead and silver carp and native fish species. We caution that reductions in shad and buffalo body condition may lead to reduced fitness, thereby potentially accelerating biotic homogenization of Asian carp in the Illinois River and causing further disruptions of the native food web and fish community.

Keywords: bighead carp, bigmouth buffalo, body condition, gizzard shad, Illinois River, LTRMP, non-native, silver carp

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EFFECTS OF FLOOD PULSES ON NITRIFICATION RATES IN UPPER MISSISSIPPI RIVER FORESTED FLOODPLAINS

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Flood frequency and season are the major drivers of floodplain nitrification. The movement of nutrients between terrestrial and aquatic ecosystems during flooding of large floodplain rivers plays an important role in nutrient fluxes downstream. Human control over the natural flood regime is thought to be directly related to downstream phenomena, e.g.; Gulf of Mexico hypoxia. Understanding how flooding affects nitrogen processes is important for ecosystem management of our large floodplain rivers. In this study, the effect of flood pulses on nitrification was examined at 30 sites in the forested floodplain of the Upper Mississippi River Pool 8 in April, August, and November, 2006. Sites were equally divided among three flood pulse categories: rare, moderate, and frequent, based on elevation and the HEC-RAS flood probability model developed by the Corp of Engineers. ANOVA showed a significant difference in nitrification rates among flood pulse categories: rare > moderate > frequent, and over season: summer> spring> autumn. Linear Regression (r^2=0.35, p=0.0049) showed that total carbon, pH, moisture, and percent sand explained a significant amount of variation in nitrification rates. Well oxygenated conditions of dry, sandy soils in rarely flooded areas allow for high nitrification and presumed low denitrification rates. This nitrification/denitrification combination results in a surplus of nitrate available for return to the river and downstream with the next flood. This abstract does not necessarily reflect US EPA policy.

Keywords: ecosystem services and functional roles, wetlands of the Upper Mississippi River, nutrient trading, nitrification, Effects of flooding.

IDENTIFYING POTENTIAL CONTROLS ON THE DIVERSITY OF FISHES AND ABUNDANCE AND SIZE STRUCTURE OF CENTRARCHIDS IN OFF-CHANNEL AREAS IN THE UPPER MISSISSIPPI RIVER SYSTEM: AQUATIC VEGETATION AND PHYSICAL FEATURES

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Fish diversity and centrarchid abundance and size structure are of significant importance to the public in the Upper Mississippi River System (UMRS). Evidence and perceptions that off-channel areas (OCAs) are important in regards to these fishery attributes and that OCAs are degrading has resulted in a focus on these areas for restoration. To date, research on fish diversity and centrarchid abundance and size structure have focused almost entirely at the Pool scale (38-126 km) because the Long Term Resource Monitoring Program (LTRMP) is designed for inferences at that scale. However, given the OCA-scale objectives of many restoration efforts and the hierarchal nature of large river ecosystems there is a need for complementary OCA-scale information. Thus, our research sought to determine how OCA-scale patterns in aquatic vegetation and physical features are related to centrarchid size structure and fish diversity patterns. We adopted a model-based approach that capitalizes on the full history of LTRMP fisheries observations as well as inherent gradients in vegetation abundance and physical attributes.

The models we developed suggest that the abundance of aquatic vegetation, shoreline development, and connectivity were important to fish diversity, small centrarchids (bluegill *Lepomis macrochirus* < 150 mm, black crappie *Pomoxis nigromaculatus* < 200 mm, and largemouth bass *Micropterous salmoides* < 300 mm), and large bluegill (≥ 175 mm). Aquatic vegetation and shoreline development were generally positive influences on fish diversity and centrarchid abundance, whereas connectivity was a negative influence. In contrast, physical attributes had more prominent importance than vegetation for black crappie ≥ 200 mm. For largemouth bass ≥ 300 mm, our models indicated that Pool-scale factors were most important in determining abundance patterns. The proportion of deep water (≥ 2 m) area was unimportant in predicting fish diversity or centrarchid abundance and size structure in OCAs. In general, fish diversity and centrarchid abundance in OCAs should benefit from physical features that produce more lentic conditions. However, literature suggests that some connectivity may be necessary to ensure suitable physicochemical conditions in OCAs for fish. Aquatic vegetation was likely important for small centrarchids because it provides protection from predators and quality habitat for invertebrate prey. Vegetation may further benefit large bluegill by partitioning habitat thus reducing interspecific competition. Managers should also consider structural complexity and spatial configuration (edge or patchiness) of vegetation beds to maximize benefits to centrachids and other fishes. The unimportance of vegetation for large black crappie and largemouth bass may be related to their efficiency as piscivores and the abundance of available prey fishes in open water habitats in the UMRS. Our model results, previous Pool-scale research, and pertinent literature suggest that restoration planners should consider a broad range of physical and floral attributes of OCAs, as well as larger-scale factors, to increase fish diversity and centrarchid abundance in the UMRS.

Keywords: centrarchid, fish diversity, off-channel area, vegetation, physical feature

EFFECTS OF COMMERCIAL HARVEST ON SHOVELNOSE STURGEON POPULATIONS IN THE UPPER MISSISSIPPI RIVER

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In recent years, shovelnose sturgeon have become an increasingly important commercial species in the UMR due to collapsing foreign sturgeon populations and bans on imported caviar. Data regarding shovelnose sturgeon population parameters in the UMR are currently more than thirty years old; therefore, more recent information is needed for managing these populations. We began a project in the spring of 2006, in collaboration with the Iowa Department of Natural Resources (IDNR) and the Wisconsin Department of Natural Resources (WDNR) to study the impacts of commercial harvest on shovelnose sturgeon populations in the upper Mississippi River (UMR). Since the onset of the project, 563 shovelnose sturgeon have been collected from the three study pools (i.e., Pools 9, 13, and 14). Preliminary analyses indicate shovelnose sturgeon in Pool 9 have higher mean lengths, weights, ages, and relative weights (*Wr*) than Pools 13 and 14. Pool 9 is also of interest because of the absence of shovelnose sturgeon less than 530 mm, which were present in the samples from Pools 13 and 14. Sex ratios were similar for Pools 9 and 13 (62 F : 38 M and 69 F : 31 M, respectively), but in Pool 14 the ratio was more evenly distributed among males and females (48 F : 52 M). We are also in the process of modeling potential management scenarios with current population parameters from our study pools.

Keywords: shovelnose sturgeon, *Scaphirhynchus platorynchus*, commercial harvest, Mississippi River, caviar

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HYBRIDIZATION BETWEEN SILVER AND BIGHEAD CARP IN THE MISSISSIPPI AND ILLINOIS RIVERS

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Bighead and silver carp can be differentiated from one another by a number of distinct morphological characteristics. Fish sharing morphological characteristics of both bighead and silver carp have been captured in Swan Lake, a contiguous backwater lake located on river miles 5-12 along the Illinois River in Calhoun County, Illinois and at 3 locations on Pool 26 of the Mississippi River. A small biopsy of muscle, liver and eye were collected from these morphological intergrades and compared to field-identified bigheads and silvers at several enzymatic loci via starch gel allozyme electrophoresis. In addition to the morphological variants showing a high degree of genetic hybridization, some of the fish identified in the field as true bigheads and silvers also displayed hybrid genotypes, with few fish exhibiting pure bighead or silver genotypes. These data suggest a potential for a hybrid swarm between these two species. Replacement of pure bighead and silver carp by some degree of bighead X silver hybrid is a plausible concern. The impact of this hybrid condition, both ecologically and taxonomically, warrants further attention. Additional collections and analyses of fish from alternate sites along the Mississippi and Illinois Rivers are being conducted. The use of microsatellite and mtDNA markers will be implemented in future investigations.

Keywords: Asian carp, hybridization, Mississippi and Illinois Rivers, hybrid swarm, ecological impacts

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ZOOPLANKTON OF THE UPPER MISSISSIPPI RIVER: SPATIAL PATTERNS OF COMMUNITY STRUCTURE AND THE INSHORE RETENTION CONCEPT

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Zooplankton in the Upper Mississippi River System (UMRS) are understudied relative to zooplankton in large lentic systems and even other large rivers. These understudied organisms are an important part of the biota of the UMRS, supporting an abundant and diverse zooplanktivorous fish community. Using zooplankton samples collected as part of the United States Environmental Protection Agency's Great Rivers Ecosystem Environmental Monitoring and Assessment Program, this study describes large-scale spatial patterns in zooplankton community structure and relates these patterns to environmental variables in the UMRS. Zooplankton community structure in the UMRS varies by river reach (Upper, Lower, and Open River), with higher densities of crustacean zooplankton observed in the Upper Reaches. The surface area of habitat features, thought to function as retention zones, above each sampling site was quantified using Aquatic Areas GIS data available from the Upper Midwest Environmental Sciences Center and combined with water quality data collected concurrently with zooplankton sampling. Overall community structure was correlated with temperature, conductivity, and upstream retention zones. Rotifer community structure was only correlated with retention zones in the channel border, but crustacean community structure was correlated with retention zones in both the channel border and floodplain. Community structure of cladocerans and rotifers was most correlated with upstream habitat features one day's distance upstream; whereas, copepod community structure was most correlated with habitat features three days' distance upstream. In addition to correlating zooplankton community structure with inshore retention zones in the UMRS, this study represents the first attempt to determine the spatial scales at which the presence of upstream inshore retention zones affects zooplankton community structure and composition.

Keywords: zooplankton, inshore retention, habitat composition, GRE-EMAP, GIS

LARVAL ASIAN CARP IN THE UPPER AND MIDDLE MISSISSIPPI RIVER: AN INDEX OF ESTABLISHMENT AND DISPERSAL POTENTIAL

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Two Asian carp species, the bighead carp (*Hypothalmichthys nobilis*) and silver carp (*H. molitrix*), have invaded much of the Mississippi River basin. However, it is unclear whether these species are able to successfully reproduce in navigation pools of the Upper Mississippi River (UMR) relative to the unpooled lower reaches. We compared the reproductive output of Asian carps between the pooled UMR and unpooled Middle Mississippi River (MMR) by quantifying larval densities and survival to the juvenile stage. During May through August of 2005 and 2006, larvae were sampled between river kilometer (RKM) 584 and RKM 175 using a neuston net. UMR pools 20, 22, 24, and 26 contained an upstream and a downstream site about 1.5 km from each lock and dam. Larval sampling in the MMR occurred at Chester, IL (RKM 175). During July through September of 2005 and 2006, juveniles were sampled with seining in backwater sites at each of the UMR pools and in the MMR. Larval Asian carp occurred in the MMR and above lock and dam (LD) 26 in the UMR, peaking during the first week of June in both years. Asian carp larvae never occurred in the other UMR pools. During 2006, peak densities were greater in the MMR (14.9 larvae/m^3) than above LD 26 in the UMR (2.2 larvae/m^3). Juveniles occurred in the MMR backwaters for both years and in Pool 26 for 2006 but not the other pools. Impoundments on the UMR may limit reproduction of Asian carps.

Keywords: Mississippi River, bighead carp, silver carp, larval fishes, reproduction

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THE EFFECTS OF DROUGHT-LIKE CONDITIONS ON FISH AND WATER QUALITY PARAMETERS IN POOL 26 OF THE MISSISSIPPI RIVER

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The Great Rivers Field Station has been monitoring fish populations and water quality parameters in Pool 26 of the Mississippi River since the early 1990's for the Long Term Resource Monitoring Program (LTRMP). The monitoring program identified significant changes in fish and water quality parameters during drought-like conditions experienced in 2005 and 2006. Fish sampling in 2006 revealed total catches of fish species including emerald shiner, skipjack herring, channel catfish, and smallmouth bass that were the highest since the program began. This documented increase in total catch occurred despite a 1/3 reduction in monitoring effort due to budget restrictions in 2005 and 2006. Water quality parameters such as Secchi depth, turbidity, chl-a, and suspended solids concentrations were also affected by the drought-like conditions and provide insight into factors driving the changes in fish populations.

Keywords: drought, Mississippi River, fish, water quality, LTRMP

TRENDS IN LARGEMOUTH BASS AND BLUEGILL POPULATIONS AMONG THE UPPER AND LOWER ILLINOIS RIVER, 1957-2006

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Largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) are popular sportfish in Illinois waters. Previous research and anecdotal evidence from the Long-Term Illinois River Fish Population Monitoring Program (LTEF) suggest a potential decline in largemouth bass and bluegill populations in the lower reaches of the Illinois River. We examined collections from the monitoring program to test for spatial and temporal differences in largemouth bass and bluegill populations among the six reaches of the Illinois River. Prior analyses have indicated spatial differences among upper (Starved Rock, Marseilles, and Dresden) and lower (Peoria, La Grange, and Alton) river reaches and temporal changes between early (1957-1981) and late (1982-2006) years of the program. We used these spatial and temporal breaks to compare abundance trends, growth (length/weight relationships), and recruitment of largemouth bass and bluegill. Electrofishing catch per unit effort (CPUE) showed an increasing trend over all years for bluegill and largemouth bass in the upper river. Bluegill catches increased in the lower river, while largemouth bass catches consistently declined. No differences were observed in bluegill and largemouth bass growth among reaches and time periods. Stock assessments of bluegill show increasing numbers of fish at and above stock length in both the upper and lower river, while largemouth bass collections show increasing numbers of fish at and above stock length in the upper river only. Largemouth bass stock assessments revealed a decreasing trend of fish above stock length with little increase in fish of stock length in the lower river. The similarity observed in growth rates between the upper and lower river for the early and late time periods may indicate a similar level of productivity in the Illinois River through time or a lack of density-dependence. Increases in largemouth bass and bluegill abundances in the upper river may be due to higher water clarity, the presence of aquatic vegetation, less variable hydrologic conditions, and improvements in wastewater treatment.

Keywords: bluegill, electrofishing, Illinois River, largemouth bass, Long-Term Illinois River Fish Population Monitoring Program (LTEF)

NITROGEN AND SEDIMENT LOADING TO THE UPPER MISSISSIPPI RIVER: ASSESSMENTS OF 25 WATERSHEDS IN MINNESOTA AND WISCONSIN

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This study was designed to test two hypotheses: 1) that Southeastern Minnesota and West Central Wisconsin tributaries are contributing disproportionately more (compared to drainages further upstream) sediments and nutrients to pools 5-8 of the Upper Mississippi River during summer 2003; and 2) that these pools would be retaining sediments and exporting nutrients. Turbidity and nitrates were measured monthly near the mouths of each of 25 tributaries to pools 5-8, and at the tailwaters of Lock and Dams 4-8. Discharges were measured at 21 tributaries, whereas discharges at four tributaries and the Lock and Dams were obtained online. Turbidities were converted to suspended sediment loads using a standard conversion developed for this region. GIS watershed and land use data were used to determine percentage row crops in each watershed, and then compared to sediment and nitrate loads to determine if row crop agriculture increased sediment and nitrate stream loads. Tributary drainages comprised 11.8% of the watershed area upstream of Lock and Dam 8, but contributed 22.1% of suspended sediments and 12.4% of nitrates delivered to Lock and Dam 8. When percentages of row crops per watershed were compared to sediment and nitrate loads, no significant ($P>0.40$) correlations were found either on a monthly or total summer basis. Pools 5-8 were exporting more sediments than were being delivered during this period of below normal precipitation, with output (107 metric kilotons) exceeding inputs (100 metric kilotons). Nitrates also were exported, but total summer outputs (17.9 metric kilotons) just equaled inputs (17.9 metric kilotons). Disproportionate contributions of sediments and nitrates from the Southeastern Minnesota and West Central Wisconsin tributaries to pools 5-8 of the Mississippi River are degrading the river environment by increasing sediment load and contributing additional nutrients to the Gulf of Mexico Dead Zone.

Keywords: nitrogen loading, sediment loading, Mississippi River, turbidity, tributaries

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THE EFFECT OF A RECENTLY COMPLETED HABITAT REHABILITATION AND ENHANCEMENT PROJECT (HREP) ON FISH ABUNDANCES IN THE LA GRANGE REACH OF THE ILLINOIS RIVER USING LONG TERM RESOURCE MONITORING PROGRAM (LTRMP) DATA

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The Long Term Resource Monitoring Program (LTRMP) fish component monitors fish communities in six regional trend areas of the Upper Mississippi River System (UMRS). Using this data, we evaluated the ability of the LTRMP to detect changes in the fish community of the La Grange Reach of the Illinois River following the Lake Chautauqua Habitat Rehabilitation and Enhancement Project (HREP). In 1996, an estimated 46 million fish representing 34 species were produced and discharged from the south cell of Lake Chautauqua into the Illinois River. While this observation may indicate that the south cell serves as a spawning and nursery area for many fish species, no studies to our knowledge have tested for an effect of the HREP on fish recruitment to the river fish community. At three spatial scales (local 1 river mile (rm), regional ~10 rm, and reach wide 80 rm), we assessed fish catch-per-unit-effort (CPUE) data collected from mini-fyke net and day electrofishing gears among pre- (1993-1995) and post-HREP (1996-2005) periods of the Chautauqua NWR HREP. General Linear Model (GLM) results demonstrated no significant differences among periods or spatial scales in fish CPUE. Applying a Before-After-Control-Impact (BACI) design, we observed significantly higher catches in day electrofishing runs and mini fyke net sets within 10 river miles of the HREP impacted area following construction. Our results may indicate that: (1) the LTRMP sampling design lacked sufficient statistical power to detect reach-wide effects of the HREP; (2) the LTRMP sampling design lacked the spatial and temporal resolution to detect effects; (3) the Lake Chautauqua HREP has not been established long enough to detect long-term trends in fish production; and/or (4) the HREP had no effect on fish recruitment to the Illinois River. Our findings suggest that an intensive study at defined temporal and spatial scales may be required to detect changes in the fish community in the La Grange Reach, Illinois River as a consequence of HREP's. Nevertheless, our results also suggest that backwater areas of the La Grange Reach are major fish producers, and efforts to increase connectivity of backwaters to the mainstem river through HREP's may be important for the long term sustainability of the Illinois River fish community.

Keywords: Long Term Resource Monitoring Program (LTRMP), Lake Chautauqua, fish communities, Habitat Rehabilitation and Enhancement Project (HREP), Upper Mississippi River System (UMRS)

DISTRIBUTION AND ABUNDANCE OF NON-INDIGENOUS FISHES IN THE GREAT RIVERS OF THE CENTRAL BASIN, USA

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EPA has implemented the Environmental Assessment and Monitoring Program, Great Rivers Ecosystems (EMAP-GRE) to assess the ecological condition of the Upper Mississippi, Ohio and Missouri Rivers using a probabilistic sampling design. Fish assemblages, other biotic assemblages, and water quality parameters will be used to assess the condition of these rivers. One important biotic indicator is the relative abundance and distribution of non-indigenous fishes because they are a biological stressor that may disrupt the function and structure of aquatic ecosystems. Fish assemblages were sampled in 2004-2005 on all three rivers using daytime electrofishing along two continuous 500 m shoreline transects (primary and secondary) at each site. The most abundant non-indigenous species across all three rivers was the Common carp (*Cyprinis carpio*). The Bighead carp (*Hypophtlamichthys nobilis*) and Silver carp (*Ctenopharyngodon idella*) were collected in each river, although in smaller numbers. Data will be presented that show the occurrence and proportion of river length occupied by non-indigenous fishes in the Great Rivers of the central basin, USA. *This abstract does not necessarily reflect EPA policy.*

Keywords: Great Rivers, fish assemblages, non-indigenous fish

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A PRELIMINARY ANALYSIS OF CHANGES IN LANDSCAPE STRUCTURE FOR THE UPPER MISSISSIPPI RIVER FROM 1989 TO 2000

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Detailed land cover data, now available for all pools in the Upper Mississippi River (UMR), allow temporal changes in landscape structure to be systematically evaluated. For this study, landscape patterns in 1989 and 2000 were compared for Pools 4 through 26 in the UMR. Land cover data were prepared by staff of the Upper Midwest Environmental Sciences Center from high-resolution aerial photography taken in 1989 (1:15,840) and 2000 (1:24,000). Land cover data from each pool were classified at a 15 class sub-grouping level, and divided into three analysis regions (backwater, main channel, and impounded). Class and landscape metrics were calculated using FRAGSTATS with a 10 meter cell size. The resulting metrics and statistical analyses are used to evaluate basic changes in the landscape that have occurred in the UMR pools from 1989 to 2000.

Keywords: Upper Mississippi River, landscape, land cover, spatial analysis

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RETRO-MODELING THE PHYSICAL TEMPLATE OF THE MISSISSIPPI RIVER SYSTEM

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The assessment of physical and ecological change of river systems is hindered by a lack of reference conditions (Philippi, 1996; Frissell and Ralph, 1998). "Retro-modeling" can provide a surrogate for reference conditions. We define retro-modeling as the use of archival hydrologic and geospatial data in state-of-the-art hydraulic models to assess historic conditions. A wealth of historical data exists from which to develop retro-models for the Mississippi River System. Maps, charts, surveys, structure-history databases, and other quantitative measurements stretch back over 100 years on this system. While measurement techniques (geospatial and hydrologic) have improved since the late 19th and early 20th century, we show this historic data is accurate enough to produce a realistic, large-reach 1-D unsteady-flow "retro-model" which can be calibrated to near-modern standards.

A 1-D unsteady-flow "retro-model" was constructed for a 215 km reach of the Middle Mississippi River using historic (c. 1900) hydrologic and geospatial data and implemented using HEC-RAS. The objective of this modeling was to compare the retro-model and the 2004 Upper Mississippi River System Flood Frequency Study (UMRSFFS) water-surface elevations in order to assess the magnitude and types of changes in flood stages related to 20th century river engineering. This comparison revealed increases in flood stages of 2.3 to 4.7 m for large events (>50-year recurrence interval). These results confirm previous research results showing large-scale reductions in flood conveyance on the Middle Mississippi during the 20th century. Increased roughness of the floodway coupled with reduction in channel and floodplain area due to wing-dike and levee construction are the likely explanation for the observed increases in flood stages. However, this retro-model is not robust enough alone to determine the relative effects of wing dikes and levees on stage for large floods. Development of 1-D and 2-D retro-models is currently on going in order to estimate the relative effects of wing dikes and levees through explicit simulation of these structures.

In addition to hydrodynamic effects of river engineering on flood stages, retro-modeling can be used to aid in the assessment of change in the Mississippi River System ecosystems (e.g., Jacobson and Galat, 2006). We believe information gained from retro-modeling to be useful for river management from which a balance between the human demands on the river and the needs of river biota can potentially be reached.

Keywords: Hydraulic Modeling; Mississippi River; Historic Remote Sensing; Flood Stages; Retro-Modeling

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ACTIVE VERSUS PASSIVE MANAGEMENT OF COMMON AND GRASS CARP FOR BACKWATER LAKE NATIVE FISH RESTORATION: A CASE STUDY FROM THE NATURE CONSERVANCY'S EMIQUON PRESERVE

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Non-native common (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idella*) have been implicated for preventing the establishment of submersed aquatic vegetation and for negatively influencing the sustainability of native fish communities in backwater lake restoration efforts. The Nature Conservancy's Emiquon Preserve, a >2,833 hectare backwater lake restoration effort on the Illinois River, is faced with the dilemma of actively managing for common and grass carp with rotenone or allowing native/exotic species interactions to determine the success of the restoration effort. The Emiquon Preserve is only rivaled by the Florida Everglades in restoration size, and thus serves as an important model to guide future backwater lake restoration efforts. We sampled the fish populations of the Emiquon Preserve in 2001 using variable mesh-size gill nets, and more recently in the winter of 2006 using a multiple gear approach that included mini and large fyke nets, boat electrofishing, and gill nets. In 2001, common and grass carp comprised 20% of the fish sampled and represented 2 of the 5 fish species encountered. Since 2001, anecdotal observations suggested that common and grass carp dominated the fish community of the Emiquon Preserve. However, in 2006, we observed a fish community dominated by native Illinois River backwater fishes that included members of the families Catostomidae (suckers), Centrarchidae (sunfishes), Clupeidae (shads), native Cyprinidae (minnows), Ictaluridae (catfishes), Lepisosteidae (gars), and Sciaenidae (drums). Common carp comprised only 9% of the fish sampled and no grass carp were captured. Analyses of length-frequency distributions for the native fish species assemblage suggested strong representation of multiple year classes and the likelihood of natural recruitment occurring within the Emiquon Preserve. Data from the Long Term Resource Monitoring Program (LTRMP) on the La Grange Reach of the Illinois River suggests that the native fish species assemblage of the Emiquon Preserve is not reflective of the present-day mainstem Illinois River fishery. Therefore, the Nature Conservancy is faced with the trade-off of: 1) actively removing all fish from the preserve in order to establish an augmented native fish community; or 2) passively allowing the native and unique fish community to remain with carp present. Evidence from the Nature Conservancy's Spunky Bottoms Preserve suggests that passive management of carp may be achievable given certain native fish species assemblages and water level management, which may guide managers in future efforts to restore backwater lake ecosystems despite abundant carp populations.

Keywords: backwater lake, common carp, Emiquon Preserve, grass carp, restoration

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WHY NATURALIZE DEVELOPED FLOODPLAINS? AN INTEGRATED ANALYSIS AND RESPONSE

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Why would anyone even consider undoing some development along floodplains of the Upper Mississippi River and its tributaries? There are at least two answers: (1) the Great Flood of 1993 in the Upper Mississippi River Basin and the recent flooding of New Orleans along the lower Mississippi River reminded both the public and policy makers of the hazards of development in dynamic ecosystems characterized by periodic natural disturbances. Although New Orleans was flooded this time by a hurricane-driven storm surge from the sea, the terrible consequences reminded everyone that New Orleans is also vulnerable to great floods from the Mississippi River. (2) In addition to the desire to reduce the economic and human costs of repetitive natural disasters, there is growing public awareness of the services provided by natural systems and a growing desire to retain and recover these natural services. Besides flood reduction and flood protection, natural services include maintenance of biodiversity, opportunities for outdoor recreation (fishing, hunting, viewing wildlife and scenery), and nutrient recycling and reduction (i.e., reduction of nutrient loading from the Upper Mississippi Basin to reduce eutrophication of the Gulf of Mexico).

There are several difficulties with proposals for naturalization. First, there are significant economic consequences to making changes in land use, so it is important to predict, with some precision, the costs and benefits of various alternatives. Second, location is also critical so that sites are chosen for reconnection that will have the greatest benefits for the costs and social disruptions caused by the change. Finally, the man-made alterations to the watersheds (drainage of wetlands and channelization of streams) and to the rivers themselves (navigation dams) have changed the water and sediment regimes in the rivers, so simplistic approaches, such as just buying out some levee districts and breaching the levees could result in muddy lakes and barren mudflats that are unappealing to humans and wildlife alike.

Our project linked hydraulic and ecological models, and economic analyses, to evaluate alternatives for selective reconnection of the Illinois River and its floodplain. The study focused on the La Grange Reach of the river, a section spanning 129 km south of Peoria, Illinois, but the approach is applicable to other developed reaches and rivers. We learned that selective reconnection of portions of the floodplain could be done in a way that would not reduce the overall economic outputs of towns and counties along the river, but could even enhance them. One of the important lessons from the project was that some adjustments in disciplinary approaches and interests were required to address issues that are important to stakeholders along the rivers and to contribute effectively to a multidisciplinary effort.

Keywords: decision support, predictive models, naturalization, restoration, economic impact, multidisciplinary, interdisciplinary, floodplain

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HOME ON THE BIG RIVER: ASSESSING HABITAT CONDITION IN THE GREAT RIVERS OF THE CENTRAL UNITED STATES

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The Great Rivers of the mid-North American continent represent significant wildlife habitat, and are important human recreational destinations and transportation corridors. To assess the condition of the habitat along the mainstems of the Great Rivers of the central U.S., the EPA Environmental Monitoring and Assessment Program began sampling the Upper Mississippi, Missouri and Ohio Rivers in 2004. Principal Components Analysis (PCA) was used to identify influential habitat variables. On the Mississippi River, PCA axis 1 divided reaches with forested riparian zones from highly revetted sites with little riparian vegetation. Axis 2 separated sites with varying amounts of large woody debris and other fish cover. PCA axes 1 and 2 accounted for 43 percent of the variation between sites on the Missouri River, with axis 1 again dividing well-vegetated from unvegetated riparian zones and axis 2 sorting reaches by degree of bank revetment, and by littoral slope and depth. PCA axis 1 on the Ohio river also separated sites by extent riparian vegetation while axis 2 divided sites with ample in-river woody debris from sites in heavily agricultural areas. Data will be used to identify human-induced stressors and integrated into indices that express the habitat requirements of macroinvertebrate and fish communities.

Keywords: Great River, habitat, revetment, riparian, woody debris

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FISH MOVEMENT IN THE MISSISSIPPI RIVER

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Fish biology and life cycles are very difficult to study for species inhabiting large river systems because of their propensity for long-range movement patterns. In freshwater, riverine environments, only ancillary information has been gathered to support the hypotheses of extreme migrations. For most fish species, we know little or nothing of seasonal distributions - even for critical periods such as pre-spawning, spawning, and post-spawning periods. This type of information has historically been collected using telemetry, but only in limited river reaches that were enclosed by dams. Invasion of Asian carp species, the population demise of Pallid Sturgeon, increased exploitation of Shovelnose Sturgeon, Lake Sturgeon and Paddlefish for caviar, and the potential range-limiting effects of dams on all migratory fish have induced interest in movement studies for these and other riverine fish.

With funding from the Army Corps of Engineers, Southern Illinois University (SIUC) and the the Missouri LTRM have conducted several studies to examine long and short-range movement of fish in the upper and middle Mississippi River and the Illinois River. Principle species studied included the Sturgeons, Asian Carp, and Paddlefish.

In addition to traditional manual tracking methods using sonic telemetry equipment, stationary receivers were deployed in all three studies for the first time in large, Midwestern rivers to facilitate the manual tracking effort. The combined methods provided insight to likely Pallid Sturgeon spawning areas and periods, and direct evidence of long-range movements of Pallid Sturgeon, Paddlefish, and Asian Carp. Stationary receivers were also instrumental in providing continuous surveillance of local areas of interest and detect Pallid Sturgeon movement from below a lowhead dam in the Mississippi River into the Missouri River - previously postulated as an unlikely feat for Pallid Sturgeon. The receivers documented Paddlefish and Asian Carp movement from the Illinois River through or over two dams into the middle Mississippi River and/or the Missouri River.

The current receiver network is scheduled to be expanded and will be useful to all research entities that will use transmitters detectable to the receivers. This system will reduce the amount of manual effort required (and likely economically impossible to employ) to monitor movement of large river fishes that exhibit very long movement patterns. In the future, multi-agency cooperation may allow continuous monitoring of transmitters throughout the Mississippi River and its tributaries. A network such as this could provide unprecedented information about the timing and extent of movement of freshwater species.

Keywords: Mississippi River, telemetry, stationary receivers, network

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CLIMATIC WARMING, RED-EARED SLIDERS (*TRACHEMYS SCRIPTA ELEGANS*), AND SEX RATIO

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Sex ratios for hatchlings and turtles collected in aquatic habitats are examined for red-eared sliders (*Trachemys scripta elegans*) collected at Long Lake in west-central Illinois. We found that sex ratio was initially balanced but became progressively more male biased with the passage of time. Large cohorts of newly recruited males seem to underlie the increasing male bias. Recruitment more than doubled between 2001 and 2004 and these turtles were strongly male biased. Climatic warming may have led to the current male bias. A period of warming at the site has allowed females to lay more eggs by lengthening the nesting season. Females are laying an extra clutch, which accounts for the increased recruitment. This clutch is laid when soil temperatures are relatively low explaining the male bias in newly recruited turtles. The impact of the increased number of male turtles on the population is uncertain. However, female condition has declined about 7% between 1994 and 2006 suggesting that an effect may be occurring.

Keywords: Climatic warming, Illinois River, Red-eared Slider, *Trachemys scripta elegans*, sex ratios

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ENVIRONMENTAL CUES AND RED-EARED SLIDER (*TRACHEMYS SCRIPTA ELEGANS*) REPRODUCTION

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A preliminary survey of 100 environmental variables from multiple data sources and their relationships with variation in Red-eared Slider (*Trachemys scripta elegans*) reproductive ecology was performed. During the period 1995 to 2006 a considerable amount of variation in reproductive measures was found. This included a geographic component. Jersey County sliders produce more but smaller eggs than Calhoun County sliders. Remarkably few reproductive parameters were associated with the climatic variables. Female condition (mass versus plastron length) varied with river stage. In years with higher maximum and minimum gauge readings (at Grafton, Illinois), females were in better condition (weighed more for their length) than in years with lower gauge readings. Reproductive output varied with precipitation but not directly with other environmental variables. Apparently, this species benefits from opportunities to exploit floodplain habitats.

Keywords: River stage; Jersey County, Calhoun County, reproductive ecology, environmental variables, Red-eared Slider, *Trachemys scripta elegans*

ISOTOPIC COMPOSITION OF RIVERINE AUTOTROPHS: RELATIONSHIP WITH ISOTOPIC RATIOS OF INORGANIC NUTRIENTS

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Food web studies have provided increasing evidence that phytoplankton and benthic microalgae are key food sources in large rivers. This study was done to examine changes in carbon and nitrogen stable isotope ratios of benthic microalgae, phytoplankton, and inorganic nutrients to answer the question "is there a relationship between the stable isotope ratios of inorganic nutrients and riverine autotrophs?" Autotrophs were collected from main channel and back channel sites of the Upper Mississippi River, late August – October 2006. Water samples were collected to gather information on stable isotope ratios of dissolved inorganic carbon and dissolved inorganic nitrogen. Algae samples were collected from rocks using razor blades. Algae samples were also taken from macrophyte leaves and stems. Phytoplankton samples were taken at 2-4 different locations at each site to provide a composite representation. All samples were put on ice until they could be returned to the laboratory. Benthic microalgae and phytoplankton were then separated from detritus and sediments using colloidal silica centrifugation. Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope ratios were determined by the stable isotope laboratory at Northern Arizona University. Nitrate and ammonia concentrations were also determined. Initial results indicate that NO_3-N concentration differs between main channel and backwater habitats (0.65 and 0.33 mg N/L, respectively). Stable isotope ratios of inorganic nutrients and autotrophs were correlated to each other, demonstrating a direct response between the two.

Keywords: benthic algae, phytoplankton, stable isotope, main channel, back channel, nitrogen, carbon, nitrate

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UPPER MISSISSIPPI RIVER BACKWATERS AS FISH OVERWINTERING REFUGIA: EVIDENCE OF FISH MIGRATION IN LATE FALL

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Many Environmental Management Program Habitat Rehabilitation and Enhancement Projects on the upper Mississippi River have created or enhanced backwater overwintering habitat as a project goal, but a suite of unanswered questions challenges the premise that inadequate quantity or spacing of backwaters functioning as overwintering refugia for fish is limiting certain upper Mississippi River fish populations. Our objective was to answer one question, "How extensively do fish migrate to suitable backwaters as water becomes colder in the fall?" We hypothesized that spatial distribution of fish within each pool would become more concentrated in backwaters as water became colder. We chose adult largemouth bass and adult bluegills as indicator species and examined a multiyear dataset collected randomly by MNDNR, WIDNR, and IADNR throughout Pools 4, 8, and 13 with standard Long Term Resource Monitoring Program protocols between September 15 and October 30, 1994—2005. We divided the dataset into thermal regimes of warm (> 15 ^{o}C), cool (between 10 and 15 ^{o}C), and cold (< 10 ^{o}C) sample collections and plotted fish collections in Arc View. When water temperatures were relatively warm, the fish tended to be widely dispersed throughout each pool, and were consistently present in the impounded section of each pool, just upriver from the dams. When water temperatures fell below 10^{o}C, the spatial distribution of fish was strongly associated with backwater complexes that had water bodies meeting habitat requirements described by Knights (1995) and Pitlo (1992), and fish were seldom collected in impounded sections of the pools or in flowing channels.

Keywords: backwater habitat, overwintering, fish, Mississippi River, water temperatures, spatial distribution, bluegills, largemouth bass

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FISH ASSEMBLAGES WITHIN THE GREAT RIVERS OF THE UNITED STATES

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The Environmental Monitoring and Assessment Program of Great River Ecosystems (EMAP-GRE) has monitored a wide range of biotic and abiotic criteria on three great rivers of the United States. Preliminary EMAP data from electrofishing surveys of 148 randomly selected sites on the Mississippi, Missouri, and Ohio rivers collected 60,586 fish in 2004. Mean catch per run was significantly higher for the Mississippi (305.8) and Ohio (227.6) rivers compared to the Missouri River (90.6; $P < 0.0001$), with no significant difference between the Mississippi and Ohio rivers ($P > 0.05$). However, the Mississippi (16.7) and Missouri (12.6) rivers had significantly higher diversity (numbers of taxa collected per run) than the Ohio River (11.8, $P < 0.001$), although differences were not significant between the Mississippi and Missouri rivers ($P > 0.05$). Analysis of Similarity showed that fish assemblages between rivers were similar ($R = 0.39$), however non-metric multi-dimensional scaling suggests fish assemblage differences between the Missouri and Ohio rivers. Fish assemblages from all three rivers were dominated by four common species, common carp *Cyprinus carpio*, emerald shiner *Notropis atherinoides*, gizzard shad *Dorosoma cepedianum*, and freshwater drum *Aplodinotus grunniens*. This large-scale, inter-river, multi-agency monitoring effort may likely provide further insight into large river fish population ecology.

Keywords: Environmental Monitoring and Assessment Program (EMAP), fish assemblages, Mississippi River, Missouri River, Ohio River

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EXPLORATORY ANALYSIS OF INDEX OF BIOTIC INTEGRITY SCORES CALCULATED FROM DATASETS OBTAINED FROM THREE DIFFERENT DAY ELECTROFISHING PROTOCOLS

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We analyzed fish community data from the Upper Mississippi River (UMR) collected by the Long Term Resource Monitoring Program (LTRMP), the Environmental Monitoring and Assessment Program – Great Rivers Ecosystems (EMAP-GRE), and Wisconsin's non-wadeable stream monitoring program (WDNR). Each of these programs uses day electrofishing to sample fish communities, but protocols and sampling designs differ. We calculated Index of Biotic Integrity (IBI) scores per metrics calibrated for Wisconsin rivers by Lyons *et al*, 2001 and compared results among programs. We used non-metric multi-dimensional scaling (NMDS) and univariate plots of the data to examine statistical differences among the programs and to suggest factors that might have contributed to those differences. The combined dataset provided significant discrimination between all five IBI scoring categories (very poor to excellent), but IBI scores calculated from the EMAP dataset suggested that three rating categories might be more suitable for that program. NMDS yielded significant differences between the WDNR program and the other two programs, but not between EMAP and LTRMP. Both EMAP and LTRMP span the entire Upper Mississippi River mainstem, whereas WDNR encompasses only Wisconsin waters. In Wisconsin waters, IBI scores from all 3 protocols increased or remained stable from north to south. However, in the context of the entire UMR, IBI scores for both LTRMP and EMAP-GRE declined from north to south. Ten years of LTRMP sampling generally demonstrated consistent scores through time except for the area near Bellevue, Iowa, a recognized zone of ecological transition. Plots of individual metrics against river mile suggested that some metrics (i.e. round-bodied suckers) in the Lyons IBI may be affected by geographic range limitations of the species selected for those metrics.

Keywords: Upper Mississippi River, monitoring, fish, IBI, NMDS, LTRMP, EMAP, WDNR

COMMON SNAPPING TURTLE (*CHELYDRA SERPENTINA*) SEX DETERMINATION AND DEMOGRAPHICS

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Sex ratios for common snapping turtles (*Chelydra serpentina*) were surveyed at six sites in west-central Illinois. Habitats that were considered vulnerable to road mortality had statistically significant male biased sex ratios with percentage males ranging from 61.2 to 74.1 % males. We tested the use of the ratio between the preanal length and posterior lobe of the plastron (= PPR) to identify sex. This ratio did not overlap in known sex turtles greater than 199 mm in carapace length. Males had PPRs greater than 1.0 and females had PPRs less than 1.0. Potential overlap in a larger sample of turtles whose sex was unknown was minimal (6%). Sexual dimorphism was found in carapace length with males averaging larger than females yielding a size sexual dimorphism ratio of –1.15. The mass (males heavier), the length of the plastron (longer in females), and the height of the carapace (higher in females) varied sexually when adjusted for carapace length. Resource managers could address male-biased sex ratios by limiting take of turtles from roads during the nesting season. This would protect females but not interfere with reasonable resource use.

Keywords: sex ratio, common snapping turtle, *Chelydra serpentina*, sexual dimorphism, male bias

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THE GREAT RIVERS FIELD STATION: PAST, PRESENT AND FUTURE HIGHLIGHTS FROM OVER A DECADE OF MONITORING POOL 26 OF THE MISSISSIPPI RIVER

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Since 1991, the Illinois Natural History Survey has operated the Great Rivers Field Station, one of six field stations associated with the Long Term Resource Monitoring Program (LTRMP), to monitor the water quality (WQ), fish, plants, and invertebrates in Pool 26 of the Mississippi River. In addition to the LTRMP, several other projects have been conducted by the field station studying turtles, habitat rehabilitation projects, floodplain forests, and several student projects/theses. We have recorded several notable developments in the last 10 yrs. Our sampling shows an increase in water temperature in the main channel from 1994 to 2004, which matches an increase in the average air temperatures locally. This warming trend appears to have affected some biota such as changes in turtle nesting habits and sex ratios, and it may be one of the factors explaining our dramatic increase in blue catfish populations, which are more common in southern latitudes. LTRMP data were also useful for detecting the spread of exotic species into Pool 26, such as an increase in grass carp and the population explosion of bighead and silver carp. Conversely the common carp has significantly declined in numbers, which appears to be a systemic trend. We found evidence that the great flood of 1993 produced strong year classes for several species of fish. The flood also induced changes in forest community structure and composition, leaving a long-term imprint on the ecology of the Upper Mississippi River System. The purpose of this poster is to provide a brief description of the Great Rivers Field Station, highlight some of our findings from the last decade, and glimpse into the future of the field station.

Keywords: Mississippi River, Pool 26, Fish, Water Quality, Floodplain Forest

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POTENTIAL WOOD EXCAVATION BY COMMON NET-SPINNING CADDISFLIES IN POOL 8, UPPER MISSISSIPPI RIVER

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Hydropsyche orris and *Cheumatopsyche campyla* (Trichoptera: Hydropsychidae) are ubiquitous and abundant net-spinning caddisflies in the upper Mississippi River (UMR). These larvae are commonly found on hard natural (e.g., snags) and artificial (e.g., wing dams) substrates in the UMR where there is sufficient flow to support suspension feeding. In the spring of 2006, Hester-Dendy artificial substrates (H-DAS) were placed in 3 main channel areas (9 per area) of Pool 8 to assess macroinvertebrate colonization patterns and to estimate macroinvertebrate instantaneous growth rates and production. Each H-DAS has 14 round Masonite™ plates (75 mm dia.) separated by smaller (25 mm dia.) spacers. We removed a subset of H-DAS every month for analysis from each area. In the laboratory we discovered many of the plates covered with curved, oblong pits underneath the fix-retreats made by the caddisfly larvae. Pit areas ranged between 3.84 – 44.69 mm^2. Larval body areas ranged between 0.75 – 25.12 mm^2 and 0.38 – 13.49 mm^2 for *H. orris* and *C. campyla*, respectively. Because larvae were removed from the plates prior to identification, it is not known whether one or both of the species were responsible for the excavation. Larvae excavated a mean (±SD) total of 18.7±4.1% of exposed area per plate face. The mean (±SD) volume of Masonite™ excavated per exposed face was 603.4±132.4 mm^3; this processing represented a removal of 154 cm^3/m^2. Why larvae excavated the plates remains to be determined. Potential hypotheses include: 1) larvae excavate organic substrates to supplement suspension feeding; 2) larvae excavate organic substrates to minimize exposure to drag forces in the current; 3) excavation permits the larva to retain a fixed foraging location within a crevice while increasing in body size; 4) larvae use excavated material in the construction of their fixed retreats; and 5) pits are excavated through larval development in preparation for pupation. Given the historical levels of natural wood substrates throughout the UMR, caddisfly excavation may have been and may still represent a significant amount of organic processing and seston generation. This is the first known example of wood excavating by hydropschid caddisfly larvae and the authors plan a series of laboratory and field-based experiments in the spring and summer of 2008 to address these hypotheses.

Keywords: net-spinning caddisflies, Mississippi River, wood excavation, artificial substrates

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TEMPORAL TRENDS OF THE DIETS OF FISH IN THE OHIO RIVER USING STABLE ISOTOPES

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Most large rivers throughout the world have been heavily impacted by human activity for a century or more. These long-term disturbances make it difficult to determine the extent of change from one activity. This study examines the changes in nitrogen ($\delta^{15}N$) and carbon ($\delta^{13}C$) stable isotopes of fish from the Ohio River over the past century. During this time, the Ohio River was subjected to organic pollution, introduction of non-native species, and the construction of navigation dams. Museum specimens, which will allow us to look at the isotope levels before and after the disturbances, were obtained from different museums around the country. Muscle tissue samples were dried at 60°C for 48 hr, ground into a fine homogenous powder, and 1.5 to 2.0 mg of the ground sample was placed in tin capsules, and shipped to Kansas State University for stable isotope measurements. Preliminary results show that $\delta^{15}N$ remains relatively the same over the past century. $\delta^{13}C$ decreases in planktivores and piscivores. Omnivorous fish have an increased level of $\delta^{13}C$. This increase of $\delta^{13}C$ may be caused by the construction of the multiple navigation dams on the river. Navigation dams increase near shore productivity and a shift toward benthic food sources. Consumers will also shift toward benthic sources from increased competition caused by the introduction of zebra mussels to the Ohio River in the early 1990's.

Keywords: Ohio River, nitrogen isotope, fish diets, carbon, carbon isotopes, disturbance

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UTILIZATION OF WATER QUALITY INDEX TO ASSESS THE OVERALL WATER QUALITY IN UPPER MISSISSIPPI RIVER

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Efforts have been performed to evaluate the overall water quality of upper Mississippi River using the indicator of Water Quality Index (WQI) especially focusing on the water quality change over late summer and early fall. Two sampling sites close to city of Dubuque were selected representing different geographic activities. Nine primary parameters including temperature, pH, dissolved oxygen, biochemical oxygen demand, nitrate, phosphate, fecal coliform, suspended solid as well as turbidity were determined for water samples either on-site or at laboratory. The WQI was calculated based on the collected primary parameters. With the assessed WQI values for one season, while the upper Mississippi River water quality is not at risk, it sure can be improved significantly. The detailed WQI results as well as the relationship between the primary parameters will be discussed during the presentation.

Keywords: Water Quality, Water Quality Index (WQI), Mississippi River

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HYBRIDIZATION BETWEEN SILVER AND BIGHEAD CARP IN THE MISSISSIPPI AND ILLINOIS RIVERS

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Bighead and silver carp can be differentiated from one another by a number of distinct morphological characteristics. Fish sharing morphological characteristics of both bighead and silver carp have been captured in Swan Lake, a contiguous backwater lake located on river miles 5-12 along the Illinois River in Calhoun County, Illinois and at 3 locations on Pool 26 of the Mississippi River. A small biopsy of muscle, liver and eye were collected from these morphological intergrades and compared to field-identified bigheads and silvers at several enzymatic loci via starch gel allozyme electrophoresis. In addition to the morphological variants showing a high degree of genetic hybridization, some of the fish identified in the field as true bigheads and silvers also displayed hybrid genotypes, with few fish exhibiting pure bighead or silver genotypes. These data suggest a potential for a hybrid swarm between these two species. Replacement of pure bighead and silver carp by some degree of bighead X silver hybrid is a plausible concern. The impact of this hybrid condition, both ecologically and taxonomically, warrants further attention. Additional collections and analyses of fish from alternate sites along the Mississippi and Illinois Rivers are being conducted. The use of microsatellite and mtDNA markers will be implemented in future investigations.

Keywords: Asian carp, hybridization, Mississippi and Illinois Rivers, hybrid swarm, ecological impacts

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SPORTFISH TRENDS IN THE LA GRANGE REACH OF THE ILLINOIS RIVER, 1994-2006

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The Illinois Natural History Survey's, Illinois River Biological Station has been monitoring fish communities on the La Grange reach of the Illinois River as part of the Long Term Resource Monitoring Program (LTRMP) since 1990. To date, we have collected 1,375,867 fish comprising 90 native species, 9 native hybrids, 9 exotics, and 3 exotic hybrids. Anecdotal evidence from our collections and recreational angler accounts suggest a decline in largemouth bass *Micropterus salmoides* abundances in the La Grange reach. We used LTRMP data from 1994-2006 to test for abundance changes in six common sportfishes. In addition, we examined several abiotic and biotic variables to explain potential change. We limited our data analysis to 1994-2006 because of changes in LTRMP protocols and unstable river conditions due to the major flood of 1993. We used linear regression to test for changes in catch-per-unit effort (CPUE) of black crappie *Pomoxis nigromaculatus*, bluegill *Lepomis macrochirus*, channel catfish *Ictalurus punctatus*, largemouth bass, white bass *Morone chrysops,* and white crappie *P. annularis* among three selected habitats (contiguous backwater-shoreline, main channel border-unstructured, and side channel border) across years. Our results indicated that all species CPUE from combined strata were below their respective means and were recently at their lowest, excluding bluegill, during the 13 year period. We observed significant decreases in black crappie ($P = <0.001$) and largemouth bass ($P = 0.04$) CPUE for all strata combined, while black crappie, bluegill, largemouth bass, and white crappie showed significant decreases in side channel border habitats (all $P < 0.025$). Channel catfish and white bass CPUE showed no consistent patterns among habitats and over time. Our results suggest that the centrarchid fish species assemblage of the La Grange reach of the Illinois River may be decreasing due to changes in river conditions; specifically, variability in side channel border habitats. These unknown changes in habitat appear to have larger effects on fish species with nest-guarding life histories compared to alternative spawning strategists. The establishment of Asian carp in the Illinois River may have additional, compounding negative effects on centrarchid abundances through competitive interactions.

Keywords: Centrarchidae, Illinois River, La Grange reach, Long Term Resource Monitoring Program (LTRMP), sportfish

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A GEOGRAPHIC INFORMATION SYSTEM FOR THE MINES OF SPAIN RECREATION AREA, DUBUQUE, IA

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Geographic Information Systems (GIS) are collections of mapping, database, and analysis tools that enhance users' ability to utilize spatial data to solve problems and test hypotheses. The Mines of Spain Recreation Area is immediately south of Dubuque, Iowa along the Mississippi River. Land uses at this state park are multiple, including hiking trails, roads, natural areas, an abandoned quarry, wildlife-viewing areas, past mining activities, habitat studies, and agriculture. Managing these sometimes-competing uses requires a good understanding of their spatial locations and proximity, the varying topography, types of vegetation, and habitat change through time. GIS has proven to be a useful tool in helping create this understanding. A baseline GIS created for the Mines of Spain includes the locations of roads and trails, soil types, slope, and historical photography. Additional data layers linking recent research and survey activities on small mammals and vegetation have been incorporated and data from future research activities can be easily included. The GIS product will enhance the spatial management of this multiple-use park.

Keywords: GIS, Mines of Spain, Iowa

FOOD PREFERENCES AND FEEDING RATES OF SLIMY SCULPIN

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Slimy sculpin *(Cottus cognatus)* diet preferences and food consumption rates were examined in a series of field and laboratory experiments. Food consumption rates of sculpin were tested in 24-h feeding experiments conducted at three different temperatures (12°C, 17°C, and 22°C), with amphipods as prey. Natural diets were assessed by examining stomach contents of sculpin collected from six streams in southeastern Minnesota. Benthic samples also were collected from the same streams to assess the availability of sculpin prey. In the 24-h feeding experiments, sculpin consumed marginally more amphipods per fish body weight at 17°C than either of the other temperatures (12°, 27.3 mg food/g fish; 17°, 46.6 mg food/g fish; 22°, 29.8 mg food/g fish). In the field diet analysis, sculpin consumed 33 different types of prey, but showed strong preferences (Ivlev's electivity index) toward fly larvae and amphipods. Benthic samples indicated that preferred prey items were abundant in most streams. Slimy sculpin have broad diets, but prefer and consume mostly fly larvae and amphipods. Sculpin consumed more food at 17°C, a typical summertime water temperature for coldwater streams in southeastern Minnesota.

Key words: slimy sculpin, invertebrates, food preferences, feeding rate, temperature

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DEVELOPMENT OF THE MIDDLE MISSISSIPPI RIVER WETLANDS FIELD STATION: OPPORTUNITIES FOR RESEARCH AND EDUCATION

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The Middle Mississippi River (MMR) corridor is defined as "…the lands and waters between the bluffs from the confluence of the Missouri and Mississippi Rivers south to the confluence of the Ohio and Mississippi Rivers, including the Ohio River floodplain up to the planning limits of the Cache River." Often identified as part of the Upper Mississippi River, there are many physical and ecological features of the MMR that warrant separation. The MMR is unimpounded from the Missouri River to the Ohio River. Approximately 160 kilometers downstream from St. Louis, the Mississippi flows through Thebes Gap and into the northern portion of the Mississippi delta. The MMR is one of the most important North American migratory stops for waterfowl, shorebirds, and neotropical migrants, and a stronghold for the federally endangered pallid sturgeon. With river and floodplain restoration efforts increasing on many of the world's great river systems, there is a growing need for large river-floodplain research and demonstration facilities. The Middle Mississippi River Wetland Field Station (MMRWFS), located on ~1,400 acres of recently restored MMR floodplain, is being developed for research, demonstration, and education on floodplain restoration and management, with a research emphasis on the influence of hydrology on the structure and function of floodplain ecosystems. Owned by the State of Illinois and managed by Southern Illinois University at Carbondale, the MMRWFS includes ~1.5 km of Mississippi River frontage, with a public boat launch located 3 km away. There are 9 wetland cells on site, ranging in size from 2 to nearly 40 acres, all with water control (stop-log) structures and continuous water level and temperature recorders installed. There are 2 wells with high capacity pumps available for further hydrologic manipulation. The station is bordered on 2 sides by USDA Forest Service property, which is also available for research and monitoring activities. There is modest on-site housing available with electricity, water, and climate control for up to 6 people, with expansion planned in the near future. There is also a large indoor equipment and vehicle storage area on site. The MMRWFS is a member of the Organization for Biological Field Stations (OBFS). Researchers, educators, and resource managers with interests in large river floodplain ecology and related issues are encouraged to use the MMRWFS and contribute to its development.

Keywords: Middle Mississippi River, wetland restoration, floodplain research, WRP, OBFS

AN ANALYSIS OF CHANGES IN TROPHIC DYNAMCS IN THE ST. CROIX RIVER: A STABLE ISOTOPIC EVALUATION

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The Upper Mississippi River flows from the headwaters at Lake Itasca, Minnesota to Cairo, Illinois creating a capacious range of physical, chemical and biological diversity. One of the tributaries, the St. Croix River flows through Wisconsin and Minnesota qith much of the river designated as a National Scenic Riverway under the protection of the National Park Service. The St. Croix River is one of the rivers of the Mississippi River basin least affected by human actions. The objective of this research was to study the alterations in food webs over the past century in the St. Croix River using stable isotope ratios of carbon and nitrogen as indicators. Fish and mussel samples of 0.5g were collected from past to present years using preserved specimens from museum collections. The samples were dried, ground and 1.5 – 2.0 mg of powder, and packed in tin capsules. Samples were sent to Kansas State University for determination of isotopic ratios. Carbon and nitrogen stable isotope ratios were determined separately for piscivores, insectivores, omnivores/detrivores and planktivores. Previous studies show that terrestrial vegetation present on the St. Croix today is similar to what was present prior to settlement. Similarly, the results of this study show that there has been very little change from 1900 to 2000 in the stable isotope ratios of fish. This indicates that there has not been a significant change in the assimilated diet of fishes of all feeding guilds. Hence, it is evident that the trophic dynamics in the St. Croix River have been relatively stable over the past century.

Keywords: trophic dynamics, food webs, stable isotopes, St. Croix River, temporal

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EFFECTS OF AN EXPERIMENTAL DRAWDOWN ON FOOD WEBS IN UPPER MISSISSIPPI REACH 5

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An experimental drawdown was conducted on Reach 5 of the Upper Mississippi River in 2005 to mimic the river's pre-dam summer flow. While there has been some study on the effects of experimental drawdowns on specific biota (including aquatic vegetation and mussels), little is known about the ecosystem response to such a drawdown. The objective of this study was to determine if food sources important to benthic invertebrate primary consumers change during the course of the drawdown. Linkages between sources and consumers were made using stable isotopic ratios of carbon and nitrogen. Samples were collected June – August 2005 from backwater and main channel sites located throughout Reach 5. Source and consumer samples were collected using established techniques. Temporal differences in isotopic ratios were evident for both phytoplankton and benthic algae, with $\delta^{15}N$ increasing and $\delta^{13}C$ decreasing over the course of the study. Isotopic ratios of consumers followed the same pattern. Initial comparisons of source and consumer isotopic ratios indicate that basal sources important to consumers remained unchanged during the drawdown, with phytoplankton serving as the main energy source. A similar food web study in Reach 6 also indicated that phytoplankton was the major resource, thereby suggesting that trophic dynamics were not adversely impacted by the drawdown. Linkages between sources and consumers will be examined more thoroughly using a dual-isotope multiple source mixing model.

Keywords: food web, mixing model, stable isotopes, drawdown, invertebrates, phytoplankton

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ARE MIGRATING WATERFOWL TRANSPORTING *CHARA* AS THEY MIGRATE?

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Charophytes are plantlike green algae that are an important in regulating lake chemistry, and providing food, nutrients, and habitat for animals. Previous studies (Proctor 1967, 1968, and Proctor and Malone 1965) have shown that *Chara* propagules can survive passage through the digestive systems of migrating waterfowl and remain viable, suggesting that migrating waterfowl could have a significant impact on charophyte dispersal. In this study, we examined *Chara* samples from 6 different lakes in the southern, eastern, and western regions of Illinois that are stops along waterfowl migration routes. We sequenced a segment of the chloroplast *atp*B gene that is phylogenetically informative for other charophytes (Sakayama et al 2004, 2005). Utilizing parsimony in the analysis program PAUP, analyses resulted in 3 most parsimonious trees of 113 steps (CI=0.885, RI =0.629), that indicated that some *Chara* individuals from one region of the state were most closely related to individuals from other regions of the state. This indicates support for the hypothesis that migrating waterfowl are indeed transporting viable *Chara* propagules around the state.

Keywords: Charophytes, *Chara zeylanica*, waterfowl dispersal, atpB gene, phylogeny

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FISH POPULATION DYNAMICS OF AN ANNUALLY-FLOODED SEASONALLY-ISOLATED BACKWATER LAKE OF THE ILLINOIS RIVER

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Connectivity and isolation to/from rivers may be major drivers of fish community composition in backwater lakes. Matanzas Lake is a seasonally-isolated backwater lake of the La Grange reach of the Illinois River. On an annual basis, Matanzas Lake is connected to the mainstem Illinois River in spring and isolated for the rest of the year. Our goal is to test for annual fish community compositional changes as a consequence of flooding and isolation. We examined data from the Long Term Resource Monitoring Program (LTRMP) during 1995-2006 to establish baseline conditions of the fish community of Matanzas Lake. In the summer of 2007, we will use a multi-gear approach to test for changes in the fish community at shorter temporal resolutions. Factors influencing the fish community of Matanzas Lake during isolation may include piscivorous fish abundances, avian piscivores, water quality, water level, fishery harvest, and habitat availability. From 1995-2006, the fish community of Matanzas Lake has reflected the fish species composition of the mainstem Illinois River. No unique fish species to Matanzas Lake were observed. Over time, trends in sportfish catches for the mainstem Illinois River have been consistent with changes in sportfish catches in Matanzas Lake. Total catch of black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and white crappie (*P. annularis*) declined significantly from 1995-2006 (linear regression; all $p < 0.019$). Benthivorous smallmouth buffalo (*Ictiobus bubalus*) catches also declined significantly during the time period (linear regression; $p < 0.001$). Our results suggest that seasonal flooding resets the fish community of Matanzas Lake on an annual basis. However, seasonal flooding may also introduce non-native fishes such as Asian carp (grass *Ctenopharyngodon idella*, bighead *Hypopthalmichthys nobilis*, silver carp *H. molitrix*), which may affect long-term fish community dynamics. In addition, increases in avian piscivore abundances (white pelican *Pelecanus erythrorhynchos*, double-crested cormorant *Phalacrocorax auritus*) and periodic commercial fishing may reduce native fish biodiversity and biomass on shorter time scales. Research in the summer of 2007 will attempt to determine shorter-scale mechanistic interactions leading to annual changes in the fish community of Matanzas Lake.

Keywords: fish community, Illinois River, Long Term Resource Monitoring Program (LTRMP), Matanzas Lake, seasonal flooding

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EFFECT OF BACKWATER LAKE MANAGEMENT ON HABITAT FOR RIVERINE FISH

Thomas R. Timmermann, Chad R. Dolan, and John H. Chick

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Backwater lakes are critical components of large river ecosystems providing nursery, refuge and feeding grounds for many fishes. Due to recent alterations in the hydrology of large river systems, many of these backwaters have been degraded, filling in with sediment and losing large amounts of aquatic vegetation. In Swan Lake, there have been significant alterations made to the lake to combat the sedimentation and loss of vegetation. Major alterations include construction of a levee, dividing the lake into units, allowing for different backwater lake management strategies to be implemented in the different units. In the summer and winter of 2005 we examined fish diets to determine if a particular management strategy provided for a more suitable foraging habitat. We observed a difference in the total calories consumed between units for Crappie (both *Pomoxis negromaculatus* and *P. annularis*) for the summer and winter. Examination of the diet of Common Carp (*Cyprinus carpio*) revealed that the fish from one unit had 25% empty stomachs while the other had 75% empty. While the overall prey selection did not vary, the total calories consumed varied significantly. This led us to examine the effect of extremely flocculent sediments on the vertical distribution of invertebrates. Core samples taken from the Middle Unit revealed that the majority of the prey was available within feeding depths, while samples from the Lower Unit showed that the majority of the invertebrates were below the feeding depth.

Keywords: backwater lakes, water level manipulation, diet, *Cyprinus carpio*, macroinvertebrates

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WHITE FOOTED MICE (*Peromyscus leucopus*) AT MINES OF SPRAIN RECREATION AREA, IOWA

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[1] Department of Natural and Applied Sciences, University of Dubuque, 2000 University Avenue, Dubuque, IA 52001
[2] Mines of Spain Recreation Area, E.B. Lyons Interpretive Center, 8991 Bellevue Heights Road, Dubuque, IA 52003

Between May and August 2006, we trapped white-footed mice (*Peromyscus leucopus*) throughout Mines of Spain Recreation Area in Dubuque County, Iowa. The park is located along the western bank of the Mississippi River in Pool 12. We trapped at 21 different locations within the park, 14 of which had been previously sampled 25-years prior. Most transects consisted of 2 parallel 200-meter trap-lines separated by 10-meters. Four transects were limited to 100-meters in length due to physical impediments. Transects were categorized according to dominant habitat type (forest or prairie) and human-activity (heavy or light). Ugglan multiple-capture live traps were baited with a peanut butter-oatmeal mixture and set every 10-meters along each trap-line. Traps were set on Mondays, checked daily, and collected on Fridays. We logged 3,208 trap-nights and accumulated 273 total captures (90 recaptures) that included white-footed mice, prairie voles (*Microtus ochrogaster*), western harvest mice (*Reithrodontomys megalotis*), house mice (*Mus musculus*), and short-tailed shrews (*Blarina brevicauda*). We estimated population size of white-footed mice for the entire park using 4 standard mark-recapture methods (Peterson, Schnabel, Burnham-Overton, and Jolly-Seber). Additionally, we compared estimates according to categories to evaluate the importance of habitat type and human activity on white-footed mice populations. We will present the results from all population estimation methods used and comment on model assumptions.

Keywords: Iowa, mark-recapture, Mines of Spain, white-footed mice, *Peromyscus leucopus*

HISTORICAL TIMELINE OF LARGE RIVER FOOD WEBS THROUGH STABLE ISOTOPE ANALYSIS

Emily E. Zelenka[1], Michael M. Delong[1], and James. H. Thorp[2]

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For as long as humans have lived they impacted the large river systems that they live near. Yet, for all this time, it has only been in the last few decades that we have begun to study these impacts. This study was conducted to further our understanding of how trophic dynamics of river systems are affected by human disturbances using stable isotope ratios of carbon and nitrogen. Tissue samples of fish collected between Winona, MN and Clinton City, IA were obtained from museum and university collections. Fish were available in collections dating from 1880 to present time. A 0.2 g tissue sample was removed from each preserved fish. Samples were dried at 60°C for 48 hr and then ground into a fine homogenous powder using a Wig-L-Bug or, when necessary, with a mortar and pestle. A 1.5-2.0 mg sample of the powder was placed in a tin capsule and sent to Kansas State University for isotopic analysis. Isotopic ratios were used to establish a timeline of events that may have impacted the river to see if they coincide with shifts in trophic positions, and thus ecosystem dynamics. There is a trend of increase in $\delta^{15}N$ after 1920 and again after 1950. These times coincide with the expansion of intensive agricultural land use, followed by the introduction of man-made fertilizers following World War II. There seems to be a similar increase in $\delta^{13}C$ in 1900 then again in 1920 and decrease in 1980. This may coincide with changes in pH at those times, but other physical-chemical factors require further consideration. From this, it can be concluded that anthropogenic events have a clear impact on food web dynamics on a temporal scale.

Keywords: food web; Mississippi River; stable isotope; trophic dynamics; timeline; human disturbance

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MINUTES OF THE 2007 BUSINESS MEETING
ANNUAL MEETING OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

13 April 2007

President Chick called the business meeting to order at 2:10 PM. In attendance were Brian Ickes (Vice President), Robert Miller (Secretary), Neal Mundahl (Treasurer), and 60 members of the Consortium.

President's Report

Student Travel Stipends

President Chick presented travel stipends of $300 to Jeff Koch of Iowa State University, Alexander Levchuk of the Illinois Natural History Survey, and Jonathan Remo of Southern Illinois University.

Recognition of Junior Poster Participants

President Chick, Randy Hines, and Jeff Hansen honored the students from Longfellow Middle School for their participation in the junior poster session.

Acknowledgements

President Chick presented a plaque and honorarium to the keynote speaker, Dr. Richard Sparks. Thanks were extended to Georgina Ardinger and Cammy Smith for their efforts in meeting registration; to Terry Dukerschein for conducting the raffle and securing raffle donations; to Tom Claflin for donating a custom fishing rod; to Sara Lubinski for donating a pastel portrait of Brownville, MN boathouses; and to the many Consortium members who donated their talents and additional raffle prizes. President Chick also acknowledged the help of audiovisual support from the Upper Midwest Environmental Sciences Center, and expressed appreciation for the work of judges and moderators. President Chick thanked Randy Hines and the staff of Longfellow Middle School for organizing and conducting the junior poster session.

Minutes

President Chick asked if there were any corrections to be made to the minutes of the 2006 meeting as presented in the 39th Annual Proceedings. Under Acknowledgements, David Kennedy made a donation of decoys; however David's name was misspelled. A motion to approve the minutes as corrected was made by M. Delong, seconded by B. Richardson, and passed by the members present.

Meeting Attendance

President Chick announced that the official meeting attendance for 2007 was 114 registrants, slightly higher than the 108 in 2006. He noted a large increase in the number of platform presentations, from 19 to 35. He commended the varied and stimulating program presented during the meeting.

Awards

President Chick presented the award for best student platform presentation to Alexander Levchuck of the Illinois Natural History Survey, Great Rivers Field Station, Brighton, IL. He presented the award for best student poster presentation to Deepshika Ramanan of Winona State University, Winona, MN.

Treasurer's Report

President Chick called attention to the report submitted by Treasurer Neal Mundahl as listed on page 77 of the Proceedings. As the report shows, funding for the Consortium is holding steady. A motion to accept the Treasurer's report was made by M. Romano, seconded by T. Newton, and passed by the members present.

Old Business

Annual Meeting Dates

Future Dates for the annual meeting will be April 24 and 25 in 2008 at the Grand River Center in the Port of Dubuque, IA; April 30 and May 1, 2009, and April 22 and 23, 2010 at the Radisson Hotel in La Crosse, WI. The Board will attempt to schedule the 2011 and 2012 meetings at the Radisson in La Crosse also.

Update on the 2008 Meeting in Dubuque

Secretary Miller reported on arrangements that have been made for the 40th Anniversary Annual Meeting that will be held April 24 & 25, 2008 in Dubuque, IA. The main location, where sessions will meet, is the Grand River Center in the Port of Dubuque. Thursday night's banquet will be held at the National Mississippi River Museum and Aquarium in the Port, where behind-the-scenes tours of rearing and holding areas are being arranged. A block of rooms at special rates has been reserved at the Grand Harbor Resort and Waterpark, which is attached to the Grand River Center. A local arrangements committee, chaired by Secretary Miller, is finalizing details. Following a discussion at which members expressed strong support for the Dubuque meeting, a short audiovisual presentation on the Museum was shown.

President Chick asked for old business items from the floor and none was brought forth.

New Business

Trailblazer Award

President Chick introduced Mary Schaefer, Deputy Secretary of the Wisconsin DNR, who presented a Governor's Trailblazer Award to member Marian Havlik on behalf of Wisconsin

Governor Jim Doyle. The award cited Marian Havlik's many years of operating a river-based company and her authorship of hundreds of papers and reports. Her accomplishments as an entrepreneur were noted as representing improvements in economics for women in Wisconsin. In accepting the award, Marian expressed delight in the progress that has been made and excitement about the potential of new research that is being conducted.

International Society for River Science

President Chick called on Mike Delong to report on the new society. Mike noted a 30-year history of holding triennial Great Rivers meetings, and pointed out that this led to the formation of the society, in which scientists from 6 continents take part. The first issue of the society's journal was published this year. Jim Thorp is serving as the society's first president. The International Society for River Science plans to hold meetings on each continent; the next will be in June 2009 in St. Petersburg, Florida.

40th Anniversary Special Publication

President Chick asked Susan Romano to speak about progress being made on the publication, which was called for at the 2006 meeting. The Board has asked Susan to serve as editor of the publication. Susan reported that the current plan is to review research that has been presented at MRRC meetings. A working group of experts from within the Consortium membership have been asked to contribute papers on specific areas of research. The assembled papers will inform current members regarding research progress that has been made during the years that the Consortium has existed. Each author will also present at the Anniversary meeting in Dubuque. The idea of publishing the papers in a specific journal is being actively pursued.

Executive Board Nominations and Election of Officers

President Chick noted that Brian Ickes would become the President of the MRRC. Neal Mundahl has agreed to continue as Treasurer, and the Executive Board has nominated Roger Haro for Vice President. President Chick asked for additional nominations from the floor and none were offered. A motion to elect the individuals nominated for office was made by Ken Lubinski and seconded by Mike Delong. The members present elected Roger Haro Vice President unanimously.

In accordance with MRRC bylaws, President Chick turned the meeting over to the new President, Brian Ickes.

President Ickes presented Dr. Chick with a plaque commemorating his year of service as the President of the MRRC. Dr. Chick graciously accepted the plaque.

Other New Business

President Ickes introduced the topic of special symposia to be held jointly with MRRC annual meetings. Specifically, a focus on the Long Term Resource Monitoring Program (LTRMP) was suggested at the 2006 meeting as an appropriate subject for a symposium. Jeff Houser made the

point that a focus on scientific topics is preferable to a focus on programs for symposium topics, and there seemed to be support among the members present for that position, recognizing that the LTRMP is represented very well by research presented at MRRC meetings. President Ickes suggested withdrawing the idea of an LTRMP symposium, and the members agreed. Mike Delong called for other ideas for future symposia.

Marion Havlik suggested an official from the Mayo Clinic in Rochester, MN as a prospective keynote presenter in 2008. She described the important environmental work sponsored by the Mayo brothers, specifically the support of a unique population of "giant" Canada geese that survives in Minnesota lakes. President Ickes stated that this would be considered for a keynote speaker at a future meeting.

Neal Mundahl announced that Winona State University would host a meeting of the North American Prairie Conference in August of 2008. The 5-day meeting will include many field trips, and its theme is "The Prairie Meets The River".

Ken Lubinski suggested posting PowerPoint presentations from MRRC meetings on the MRRC Website.

Marion Havlik asked about scanning in abstracts from all previous MRRC Proceedings to the Website.

With no other items of new business coming forth, President Ickes entertained a motion to adjourn made by John Chick and seconded by Mike Delong. The motion passed unanimously and President Ickes adjourned the 2007 business meeting of MRRC at approximately 3PM.

MISSISSIPPI RIVER RESEARCH CONSORTIUM

TREASURER'S REPORT

Submitted by Dr. Neal Mundahl (1 March 2007)

Accounts as of 30 June 2004			$10,615.73
Accounts as of 30 June 2005			$10,911.21
Transactions, 1 July 2005 to 30 June 2006			
INCOME			
	2006 Registration and dues	5422.35	
	2006 Raffle proceeds	802.00	
	2006 T-shirt sales	222.00	
	Interest	11.89	
Total		6458.24	
EXPENSES			
	Radisson Hotel - 2006 meeting	5066.60	
	2006 Proceedings	326.70	
	2006 Raffle prizes	207.86	
	2006 Awards	191.00	
	2006 Honorarium	100.00	
	T-shirts	200.00	
	Postage, mailing, supplies	461.00	
	Corporation fee	10.00	
Total		6563.16	
Accounts as of 30 June 2006			$10,806.29
Transactions, 1 July 2006 to 1 March 2007			
INCOME			
	Interest	6.00	
Total		6.00	
EXPENSES			
	Postage, mailing, supplies	187.10	
	2007 Raffle prizes	200.00	
	Corporation fee	10.00	
Total		397.10	
Accounts as of 1 March 2007			$10,415.19
Accounts			
	Checking account	4455.60	
	Savings account	5959.59	
		10415.19	

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.
BUSINESS MEETING AGENDA

13 April 2006, 2:00 PM
Radisson Hotel, La Crosse, Wisconsin

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1. Call to Order

2. President's Report

   - Acknowledgments
   - Approval of 2006 minutes
   - 2007 attendance/participation growth information
   - Awards

3. Treasurer's Report

4. Old Business

   - Future Meeting Dates
   - 2009 Meeting in Dubuque - update from Secretary

5. New Business

   - Trailblazer Award
   - International Society for River Science – Delong
   - 40th Anniversary Special Publication – S. Romano
   - Executive board nomination
   - Election of officers
   - Future meeting dates
   - Other new business

6. Adjournment

Business Meeting Notes

CONSTITUTION OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I. NAME AND OBJECT

1. This organization shall be named Mississippi River Research Consortium, Inc.

2. The objective of this organization shall be:

    a. To establish and encourage communication between river scientists and between the scientific community and the public.

    b. To encourage pure and applied research concerning the water and land resources of the Mississippi River and its valley.

    c. To provide an annual meeting where research results can be presented, common problems can be discussed, information can be disseminated, and where river researchers can become acquainted with each other.

    d. To encourage cooperation between institutions and to encourage the sharing of facilities.

    e. To function as an advisory group to other agencies.

    f. To aid in the formation of a concerted and organized research effort on the Mississippi River.

ARTICLE II. ORGANIZATION

1. The organization of the Mississippi River Research Consortium shall be provided for by the enactment of suitable by-laws.

2. The by-laws of this organization shall designate the officers and standing committees, the provisions for the election of officers, the conduct of meetings, and for any other matters which are necessary for the government of this organization.

ARTICLE III. MEMBERSHIP AND DUES

1. The membership of this organization shall consist of any persons who demonstrate an interest in any aspect of the Mississippi River, and who express a desire to join the organization.

ARTICLE IV. AMENDMENTS

1. The constitution or the by-laws of the MRRC may be amended by an affirmative vote of two-thirds of the eligible voting members present at the annual meeting.

BYLAWS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I: NAME, PURPOSES AND DUTIES

1.01 Incarnation

There is hereby established a Board under the name of the Mississippi River Research Consortium, Inc., having the purpose and duties of governing all matters relating to this corporation. These shall be deemed to include the following without limitation:

(a) To have the ultimate decision making authority for any and all affairs of the Mississippi River Research Consortium, Inc. which includes, but is not limited to, the authority to create and terminate the corporation, to determine the budget and expenditure of funds, to manage affairs, to determine the manner, location and extent of services performed by the corporation, to determine the number, location, and job duties of any employees, and to do all other and necessary work for the benefit of the corporation.

(b) To formulate all policies necessary for the effective and continuous operation of the corporation.

(c) To coordinate and make decisions regarding priorities of services.

1.02 Purpose

The purposes of the organization shall be as follows:

(a) To establish and encourage communication between river scientists and between the scientific community and the public.

(b) To encourage pure and applied research concerning the water and land resources of the Mississippi River and its valley.

(c) To provide an annual meeting where research results can be presented, common problems can be discussed, information can be disseminated, and where river researchers can become acquainted with each other.

(d) To encourage cooperation between institutions and to encourage the sharing of facilities.

(e) To function as an advisory group to other agencies.

(f) To aid in the formation of a concerted and organized research effort on the Mississippi River.

ARTICLE 2: OFFICES

2.01 Principal and Business Offices.
The corporation may have such principal and other offices, either in or out of the State of Wisconsin as the Board of Directors may designate or as the business of the corporation may require from time to time.

2.02 Registered Office.
The registered office of the corporation required by the State of Wisconsin corporation law to be maintained in the State of Wisconsin may be, but need not be, identical with the principal office in the State of Wisconsin, and the address of the registered office may be changed from time to time by the Board of Directors or by the Registered Agent. The business office of the registered agent of the corporation shall be identical to such registered office.

ARTICLE 3: OFFICERS AND BOARD OF DIRECTORS

3.01 General Powers, Responsibility, and Number.
The business and affairs of the corporation shall be managed by its Board of Directors. It shall be the responsibility of the Board to carry out the objectives of the organization and to jointly organize, hold and reside over the annual meeting. The Board of Directors of the corporation shall consist of an elected president, vice-president, secretary and treasurer.

3.02 Election and Terms of Officers.
Each Board member will be elected for a two year term after the 1991 election. In odd numbered years a treasurer and vice-president will be elected, with at least one being a representative of either a state or federal agency. In even numbered years a secretary and a vice-president will be elected, with at least one being a representative of an academic institution. After a vice-president serves for one year, he or she shall become president for the next year. In 1991 all four officers will be elected. The term for president and secretary elected in 1991 will be for one year. The term for the treasurer elected in 1991 will be for two years. The vice-president elected in 1991 will become president in 1992. The term of each officer begins at the annual meeting.

3.03 Removal From Office.
Any officer may be removed by the Board of Directors whenever in its judgment the best interests of the corporation shall be served thereby, but such removal shall be made without prejudice to the contract rights of any person so removed. Election or appointment shall not of itself create contract rights. An officer may be removed from office by affirmative vote of a majority of the Board of Directors, taken at a meeting by the Board of Directors for that purpose. A director may resign at any time by filing a written resignation at the registered office. Any officer who is absent from three (3) consecutive meetings of the Board shall, unless excused by action of the Board, cease to be a member of the Board of Directors and shall be removed forthwith.

3.04 Meetings.
The Board of Directors shall meet on the times and dates to be established by them but at least once during the annual meeting. Meetings of the Board of Directors may be called by or at the request of any officer. The president or secretary may fix the place of the meeting and if no other place is designated or fixed the place of the meeting shall be at the principal business office of the

corporation in the State of Wisconsin. Telephone conference calls can be used in place of regular meetings except during the annual meeting.

3.05 Notice Waiver.

Notice of such meetings of the Board of Directors shall be given by written or verbal notice delivered personally, by phone or mailed or given by telegram to each director at such address or telephone number as such director shall have designated with the secretary, not less than ten (10) days, or a number of days to be decided by the Board, prior to such meeting. Whenever any notice whatever is required to be given to any director of the corporation under the Articles of Incorporation or By-Laws or any provision of law, a waiver thereof in writing, signed at any time, whether before or thereof in writing, signed at any time, whether before or after the time of the meeting, by the director entitled to such notice, shall be deemed equivalent to the giving of such notice. The attendance of a director at a meeting shall constitute a waiver of notice of such meeting, except where a director attends a meeting and objects to the transaction of any business because the meeting is not lawfully called or convened. Neither the business to be transacted at, nor the purpose, or any regular or special meeting of the Board of Directors need be specified in the notice or waiver.

3.06 Quorum.
A majority of the elected members of the Board is necessary for the transaction of business at any meeting, and a majority vote of these present shall be sufficient for any decision or election.

3.07 Conduct of Meetings.

The president and in his or her absence a vice-president and in their absence, any director chosen by the directors present shall call meetings of the Board of Directors to order and shall act as the presiding officer of the meetings. The secretary of the corporation shall act as secretary of all of the meetings of the Board of Directors, but in the absence of the secretary, the presiding officer may appoint any assistant secretary or any director or other person present to act as secretary of the meeting.

3.08 Vacancy.
Any vacancy occurring in the Board of Directors because of death, resignation, removal, disqualification, or otherwise shall be filled as soon as possible by the majority action the Board. If the president vacates office, the vice-president shall become president and the Board shall fill the vice-president position. A vacancy shall be filled for the unexpired portion of the term.

3.09 Executive Director of the Corporation.
The Board may retain and compensate and give directives to an executive officer. Said executive director shall not be considered as a member of the Board of Directors.

3.10. Duties of Officers
All officers have the responsibility of carrying out the objectives of the organization, assisting in the organization of the annual meeting, and preparing a Procedures Manual for the organization. In addition, the president shall:

(a) Act as chairperson of the Board and of any executive committee,
(b) Appoint all committees unless otherwise specified by the Board,

(c) Be executive on behalf of the Board of all written instruments except as provided or directed by the Board,
(d) Be responsible for the agenda to be used at the meeting,
(e) Perform all duties incident to the office of a president and such other duties as shall from time to time be assigned to him by the Board.

The vice-president shall:

(a) Perform the duties and exercise the functions of the president at the request of the president, and when so acting shall have the power of the president,
(b) Be responsible for the preparation and updating of the Procedures Manual for the organization,
(c) Perform such other duties as delegated by the president.

The secretary shall:

(a) Keep the minutes of the meetings of the Board,
(b) See to it that all notices are fully given in accordance with the provisions of the bylaws,
(c) Be custodian of the records of the Board,
(d) Perform all duties incident to the office of the secretary of the Board, and such other duties as from time to time may be assigned by the president of the Board.

The treasurer shall:

(a) Be responsible for financial record keeping and assessment of dues as established by the Board of Directors,
(b) Supervise the preparation of the annual budget,
(c) Receive all funds paid to the organization and shall pay all bills incurred by the Consortium,
(d) Perform other duties as from time to time may be assigned by the president.

3.11 Other Assistance to Acting Officers.

The Board of Directors shall have the power to appoint any person to act as an assistant to any officer, or agent for the corporation in his stead, or to perform the duties of such officer when for any reason it is impractical for such officer to act personally, and such assistant or acting officer or other agent so appointed by the Board of Directors shall have the power to perform all of the duties of the office to which he or she is so appointed to be assistant or as to which he or she is so appointed to act, except as such powers may be otherwise defined or restricted by the Board of Directors.

ARTICLE 4: MEMBERSHIP AND DUES

4.01 Membership and Eligibility.

Membership to include anyone interested in the research and study of the Mississippi River and its valley.

4.02 Membership and Dues.

Membership is to be for one (1) year with annual dues determined by the Board of Directors.

ARTICLE 5: COMMITTEES

5.01 Nominating Committee.

The Board of Directors shall serve as the nominating committee, and file its report with the members at the annual meeting.

5.02 Other Committees.

The Board may provide for such other committees as it deems advisable and may discontinue the same at its pleasure. Each entity shall have the power and shall perform such duties as may be assigned to it by the Board and shall be appointed and the vacancies filled in the manner determined by the Board. In the absence of other direction, the president shall appoint all committees.

ARTICLE 6: MEETING OF MEMBERSHIP

6.01 Annual Meeting.

The annual meeting of the organization shall be held in La Crosse, Wisconsin except in situations when the Board identifies an alternative location for special occasions. The time of the meeting shall be established by the Board of Directors and announced at the previous annual meeting. Reports of officers and committees shall be delivered at the meeting. The Board of Directors shall be elected from those individuals nominated by the Nominating Committee and those nominated from the floor with prior consent of the nominee. All persons attending the annual meeting shall be required to pay membership dues for that year and be a member of the organization in order to participate. Notice of the annual meeting shall be sent in writing to all members.

6.01a. *Keynote Speaker* - The Board of Directors shall invite a keynote speaker to address the membership at each annual meeting. A 60 minute time slot shall be allocated for the keynote speaker's address, including a question and answer period.

6.01b. *Student Travel Awards* - The Board of Directors shall advertise for and select graduate and undergraduate students for travel awards for attending the annual meeting and presenting a platform presentation. Criteria of selection of students for the awards shall be based on academic achievements and the scientific contribution of the student's project to the field of river ecology. The number of awards provided shall be determined each year based on the applicant pool and annual budget.

6.02 Special Meetings.

Special Meetings may be called by the president or by a majority of the Board and shall be called by the secretary on request of five (5) members in writing. The time and place of special meetings shall be announced at least two (2) weeks in advance.

6.03 Quorum.
At all meetings the members of the corporation present shall constitute a quorum for the transaction of business.

ARTICLE 7: AMENDMENTS

7.01 By The Membership.
These Bylaws may also be altered, amended or repealed and new Bylaws may be adopted by the Board of Directors by affirmative vote of two-thirds (2/3rds) of the members present at a meeting at which a quorum is in attendance.

PAST MEETINGS AND OFFICERS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

Meeting	Year	Location	President
1st	1968*	St. Mary's College, Winona, MN	Brother George Pahl
2nd	1969	Wisconsin State Univ., La Crosse, WI	Dr. Thomas Claflin
3rd	1970	Winona State College, Winona, MN	Dr. Calvin Fremling
4th	1971	St. Cloud State College, St. Cloud, MN	Dr. Joseph Hopwood
5th	1972	Loras College, Dubuque, IA	Dr. Joesph Kapler
6th	1973	Quincy College, Quincy, IL	Rev. John Ostdiek
7th	1974	No Meeting	----------
8th	1975	Monmouth College, Monmouth, IL	Dr. Jacob Verduin
9th	1976	St. Mary's College, Winona, MN	Mr. Rory Vose
10th	1977	Winona State University, Winona, MN	Dr. Dennis Nielsen
11th	1978	Univ. Wisconsin-La Crosse, La Crosse, WI	Dr. Ronald Rada
12th	1979	Cancelled	Dr. Edward Cawley
13th	1980	Loras College, Dubuque, IA	Dr. Edward Cawley
14th	1981	Ramada Inn, La Crosse, WI	Mr. Michael Vanderford
			Board of Directors
15th	1982	Radisson Hotel, La Crosse, WI	Dr. Richard Anderson Dr. Dave McConville Dr. Jim Wiener

Meeting	Year	Location	Board of Directors
-----	1983	No Meeting	----------
16th	1984	Radisson Hotel, La Crosse, WI	Dr. Ken Lubinski Ms. Rosalie Schnick Dr. Miles Smart
17th	1985	Radisson Hotel, La Crosse, WI	Mr. Ray Hubley Dr. John Nickum Ms. Pam Thiel
18th	1986	Radisson Hotel, La Crosse, WI	Dr. Jim Eckblad Dr. Carl Korschgen Dr. Jim Peck
19th	1987	Univ. of Wisconsin-La Crosse, La Crosse, WI	Mr. Hannibal Bolton Dr. Leslie Holland Dr. Mike Winfrey
20th	1988	Univ. of Wisconsin-La Crosse, La Crosse, WI	Mr. John Pitlo Mr. Verdel Dawson Dr. Nani Bhowmik
21st	1989	Holiday Inn, La Crosse, WI	Dr. Larry Jahn Mr. Jerry Rasmussen Dr. Bill LeGrande
22nd	1990	Island Inn, La Crosse, WI	Mr. Doug Blodgett Dr. John Ramsey Mr. John Sullivan
23rd	1991	Holiday Inn, La Crosse, WI	Mr. Kent Johnson Dr. Mike Romano Dr. Joe Wlosinski

Meeting	Year	Location	Board of Directors
24th	1992	Holiday Inn, La Crosse, WI	Dr. Richard Anderson Mr. Mike Dewey Mr. Kent Johnson Dr. Joe Wlosinski
25th	1993	Holiday Inn, La Crosse, WI	Dr. Richard Anderson Dr. Teresa Naimo Mr. Charles Theiling Dr. Joe Wlosinski
26th	1994	Holiday Inn, La Crosse, WI	Dr. Teresa Naimo Dr. Mark Sandheinrich Mr. Charles Theiling Dr. Neal Mundahl
27th	1995	Holiday Inn, La Crosse, WI	Dr. Mark Sandheinrich Mr. Rob Maher Dr. Michael Delong Dr. Neal Mundahl
28th	1996	Holiday Inn, La Crosse, WI	Dr. Mark Sandheinrich Ms. Therese Dukerschein Dr. Michael Delong Dr. Neal Mundahl
29th	1997	Holiday Inn, La Crosse, WI	Ms. Therese Dukerschein Mr. Mark Steingraeber Dr. William Richardson Dr. Neal Mundahl
30th	1998	Yacht Club Resorts, La Crosse, WI	Mr. Mark Steingraeber Dr. Melinda Knutson Dr. William Richardson Dr. Neal Mundahl
31st	1999	Yacht Club Resorts, La Crosse, WI	Dr. Melinda Knutson Dr. Richard Anderson Mr. Brent Knights Dr. Neal Mundahl

	Year	Location	Board of Directors
32nd	2000	Radisson Hotel, La Crosse, WI	Dr. Richard Anderson Dr. Yao Yin Mr. Brent Knights Dr. Neal Mundahl
33rd	2001	Radisson Hotel, La Crosse, WI	Dr. Yao Yin Mr. Brent Knights Dr. Michael Romano Dr. Neal Mundahl
34th	2002	Radisson Hotel, La Crosse, WI	Mr. Brent Knights Mr. Jeff Arnold Dr. Michael Romano Dr. Neal Mundahl
35th	2003	Radisson Hotel, La Crosse, WI	Mr. Jeff Arnold Dr. Michael Romano Mr. Jim Fischer Dr. Neal Mundahl
36th	2004	Radisson Hotel, La Crosse, WI	Dr. Michael Romano Dr. Mark Pegg Mr. Jim Fischer Dr. Neal Mundahl
37th	2005	Radisson Hotel, La Crosse, WI	Dr. Mark Pegg Dr. Michael Delong Mr. Lynn Bartsch Dr. Neal Mundahl
38th	2006	Radisson Hotel, La Crosse, WI	Dr. Michael Delong Dr. John Chick Mr. Lynn Bartsch Dr. Neal Mundahl
39th	2007	Radisson Hotel, La Crosse, WI	Dr. John Chick Mr. Brian Ickes Dr. Robert Miller Dr. Neal Mundahl

* The proceedings of the annual meetings of the Mississippi River Research Consortium, Inc. have been published since 1968. Volumes 7 and 12 were not published, as annual meetings were not convened in 1974 and 1979, respectively.

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Local Meeting Arrangements, Meeting Announcements, and Mailings

Georginia Ardinger, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Neal Mundahl, Department of Biology, Winona State University, Winona, Minnesota

Program and Proceedings

Brian S. Ickes, Upper Midwest Environmental Science Center, La Crosse, Wisconsin

John Chick, Illinois Natural History Survey, Brighton, Illinois

Robert Miller (Retired), University of Dubuque, Dubuque, Iowa

Registration Table

Georginia Ardinger, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Cammy Smith, Illinois Natural History Survey, Havana, Illinois

Neal Mundahl, Department of Biology, Winona State University, Winona, Minnesota

T-shirt Logo Design

Heidi Imker, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Visual Aids and Poster Arrangements

Bob Kratt, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Martin Tagesen, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Robin Tyser, Mark Sandheinrich, and University of Wisconsin-La Crosse Biology Department, University of Wisconsin-La Crosse, Wisconsin

Sales and Arrangements (Raffle and T-shirt)

Terry Dukerschein, Wisconsin Department of Natural Resources, La Crosse, Wisconsin

Georginia Ardinger, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Robert Miller (Retired), University of Dubuque, Dubuque, Iowa

Randy Hines, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Website

Mike Caucutt, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

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Brian S. Ickes, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Platform Session Moderators

John Chick, Great Rivers Field Station, Illinois Natural History Survey, Brighton, Illinois

Jonathan Remo, Southern Illinois University, Carbondale, Illinois

Greg Sass, Illinois River Biological Station, Illinois Natural History Survey, Brighton, Illinois

Teresa Newton, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

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Photography

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Bob Kratt, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Raffle and Silent Auction Prizes

Dr. Tom Claflin, T.O.C. Fishing Rods, La Crosse, Wisconsin, 54601

Sara Lubinski, A Sense of Place, Brownsville, Minnesota

Sarah Jahn, Fossil, Inc., Dallas/Fort Worth, Texas

Terry Dukerschein, Wisconsin Department of Natural Resources, Onalaska Field Station, Onalaska, Wisconsin

Dubuque-area facilities hosting the 2008 MRRC meeting, Dubuque, Iowa

For a complete list of contributors, please visit our website
http://www.umesc.usgs.gov/mrrc/sup_agn.html

Poster Session and School Outreach

Randy Hines, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Jeff Hansen, Longfellow Middle School, School on the River Program, La Crosse, Wisconsin