PROCEEDINGS OF THE

MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 43

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PROCEEDINGS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 43

MISSISSIPI RIVER RESEARCH CONSORTIUM, INC.

43rd ANNUAL MEETING
28 – 29 APRIL 2011
RADISSON HOTEL
LA CROSSE, WISCONSIN

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PLATFORM PROGRAM

Radisson Hotel –Ballroom B (All Sessions)
La Crosse, Wisconsin
Thursday, 28 April 2011

8:10-8:20 am Welcome and Announcements – **Jeff Houser**, MRRC President

SESSION I – CLIMATE CHANGE, GEOMORPHOLOGY, AND ENVIRONMENTAL ENGINEERING (Moderator: Doug Schnoebelen)

8:20-8:40 am OPPORTUNITIES FOR CLIMATE CHANGE ADAPTATION IN UPPER MISSISSIPPI RIVER LEVEED FLOODPLAINS
Charles Theiling. U.S. Army Corps of Engineers, Rock Island District, Economic and Environmental Policy Branch, PO Box 2004, Clock Tower Bldg., Rock Island, IL 61204-2004.

8:40-9:00 am THE IMPACT OF WATER TEMPERATURE AND DISCHARGE ON THE GEOMETRY OF SUBAQUEOUS DUNES, UPPER MISSISSIPPI RIVER POOL 16.
Reuben A. Heine and Christopher Hawes. Department of Geography, Augustana College, Rock Island, IL 61201.

9:00-9:20 am ENVIRONMENTAL RIVER ENGINEERING ON THE MIDDLE MISSISSIPPI RIVER: ST. LOUIS HARBOR CHEVRONS
Robert D. Davinroy[1], Edward J. Brauer[1], Gary Dyhouse[2]. [1]U.S. Army Corps of Engineers, Applied River Engineering Center, St. Louis, MO 63118. [2]U.S. Army Corps of Engineers, St. Louis District (retired), St. Louis, MO 63103.

9:20-9:40 am **BREAK (HOTEL FOYER)**

SESSION II – WATER QUALITY (Moderator: Thad Cook)

9:40-10:00 am TEMPORAL AND SPATIAL TRENDS OF VARIOUS WATER QUALITY PARAMETERS AND CHLOROPHYLL CONCENTRATIONS WITH IN THE 59-MILE REACH OF THE MISSOURI NATIONAL RECREATIONAL RIVER
***Danielle J. Quist**, Daniel A. Soluk, Mark D. Dixon, and Tim Cowman Missouri River Institute, Department of Biology, University of South Dakota, Vermillion, SD 57069.

* indicates student presentation

10:00-10:20am TRACING ENERGY FLOW PATHWAYS TO FISH USING FATTY ACIDS AND STABLE HYDROGEN AND OXYGEN ISOTOPES
***Neil P. Rude [1]**, Jesse T. Trushenski [1], Alex L. Sessions [2], and Gregory W. Whitledge [1] **.** [1]Fisheries and Illinois Aquaculture Center, Southern Illinois University Carbondale, Carbondale, IL 62901. [2]Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91106.

10:20-10:40am LIPID FLUX FROM THE UPPER MISSISSIPPI (UMR) AND ILLINOIS RIVERS (IR) BY INSECT EMERGENCE: PRELIMINARY RESULTS
William Richardson[1], Brent Knights[1], Patrick Kelly[2], and Roger Haro[2].
[1] US Geological Survey Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd., La Crosse, WI 54603. [2]University of Wisconsin, Department of Biology, Rivers Studies Center, La Crosse, WI 54601.

10:40-11:00am SEASONAL ZOOPLANKTON COMMUNITIES FROM TWO CONTRASTING FLOODPLAIN LAKES IN POOLS 11 AND 12 OF THE UPPER MISSISSIPPI RIVER
Daniel Call[1,2], Jacqueline Call[2], Michael Okpalaeze[1] and Raymond Harrington[1]. [1]Department of Natural & Applied Sciences, University of Dubuque, Dubuque, IA 52001. [2]Environmental Research & Information Analysts, LLC, 11367 Robin Hood Drive, Dubuque, IA 52001.

KEYNOTE PRESENTATION

11:00-11:50am THE ECOHYDROLOGY OF LARGE RIVER BASINS
Martin C. Thoms. Riverine Landscapes Research Laboratory, University of New England, New South Wales 2351, Australia.

11:50-1:20 pm **LUNCH** (on your own)

SESSION III – RIVERINE ECOSYSTEMS AND MUSSELS (Moderator: Richard Sparks)

1:20 -1:40 pm THE RIVERINE ECOSYSTEM SYNTHESIS: APPLICATION OF MULTIPLE SCALES ACROSS SPACE AND TIME
Michael D. Delong. Large River Studies Center and Biology Department, Winona State University, Winona, MN 55987.

1:40 -2:00 pm THE EFFECTS OF WATER LEVEL MANIPULATION ON NATIVE MUSSEL POPULATIONS IN THE UPPER MISSISSIPPI RIVER
T. Newton[1], S. Zigler[1], R. Kennedy[1], A. Hunt[2], M. Davis[3] and P. Ries[1].
[1]USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]USFWS Upper Mississippi National Wildlife Refuge, Winona, MN 55987. [3]MN Department of Natural Resources, Lake City, MN 55041.

2:00 -2:20 pm A LEVEL 1 MUSSEL SURVEY IN THE PROPOSED HWY 43 BRIDGE REPLACEMENT AREA, MISSISSIPPI RIVER MILE 725.8, WINONA, MN
Marian E. Havlik. Malacological Consultants, La Crosse, WI 54601-6609.

2:20 -2:40 pm EFFECTS OF DESICCATION ON TWO LIFE STAGES OF AN INVASIVE SNAIL ITS NATIVE COHABITANT
Gregory J. Sandland[1,2], Allison M. Wood[1], Cody R. Haro[1], and Roger J. Haro[1,2] . [1]Department of Biology, University of Wisconsin – La Crosse, 1725 State Street, La Crosse WI 54601. [2]River Studies Center, University of Wisconsin – La Crosse, 1725 State Street, La Crosse, WI 54601.

2:40-3:00 pm **BREAK (HOTEL FOYER)**

SESSION IV – BIRDS, TURTLES, AND MOIST SOIL VEGETATION (Moderator: Mike Romano)

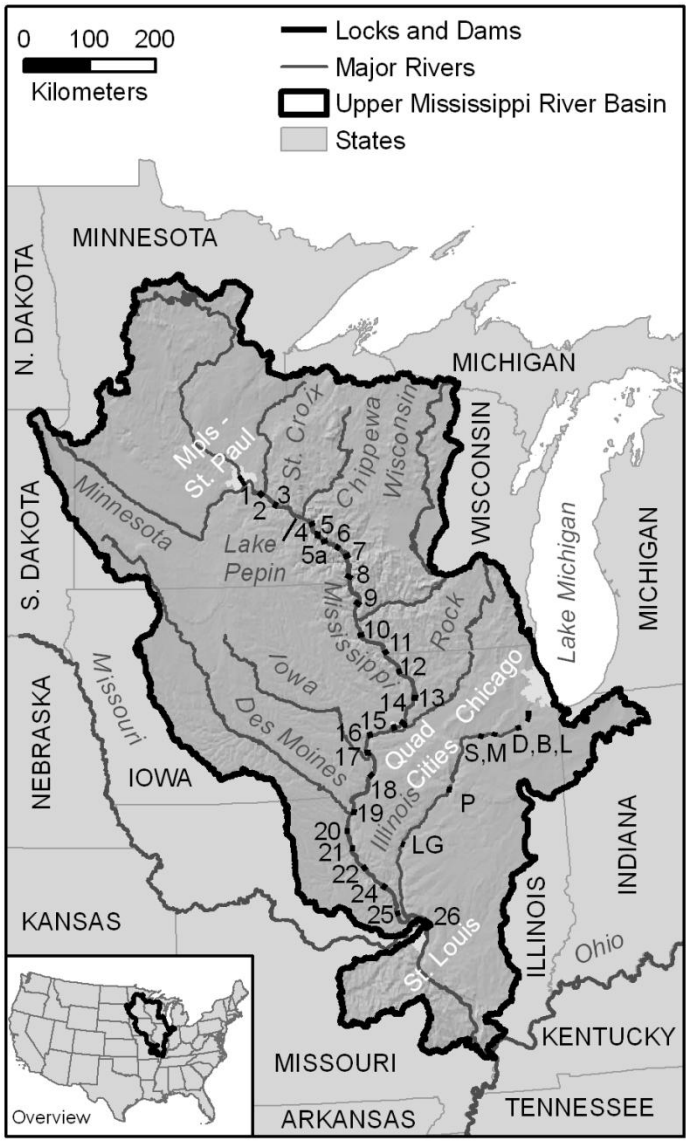
3:00-3:20 pm SUMMARY AND RESULTS OF THE MILAN BOTTOMS BALD EAGLE NIGHT ROOST SURVEY PROJECT
Cathleen D. Monson, Kelly J. McKay, Robert R. Bryant, Richard A. Sayles, Walter M. Zuurdeeg, Brian P. Ritter, Shirley A. VanMeter, Jason L. Monson, and Brian L. Blevins. BioEco Research and Monitoring Center, P.O. Box 452, Hampton, IL 61256.

3:20-3:40 pm CONSERVATION AND MANAGEMENT OF ORNATE BOX TURTLES (*Terrapene ornata*) AT UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE
Jeramie Strickland, Ed Britton, and Russell Engelke. United States Fish and Wildlife Service, Upper Mississippi National Wildlife & Fish Refuge, 7071 Riverview Road, Thomson, Illinois 61285 U.S.A.

3:40-4:00pm RIVER TURTLE DIVERSITY: SPATIO-TEMPORAL VARIATION AT 9-MILE ISLAND.
***Casey J. Arensdorf**, Gerald L. Zuercher, Mark R. Hennessy, Andrew L. Reese, and Christina M. Chamberlain. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

4:00-4:20 pm POTENTIAL PLANT RESPONSE TO A SEASONAL DRAWDOWN ON NAVIGATION POOL 18 OF THE UPPER MISSISSIPPI RIVER.
***Amber J. Andress** [1,2] and Susan Romano[3,4]. [1]U.S. Fish and Wildlife Service, Rock Island Ecological Services Field Office, Moline, IL 61265. [2]Department of Biological Sciences, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [4]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

4:20-6:00 pm **POSTER SESSION IN THE RADISSON (HOTEL FOYER)**
6:30-9:00 pm **BANQUET – RADISSON BALLROOM A**



Radisson Hotel – Ballroom B (All Sessions)
Friday, 29 April 2011

8:30-8:40 am Morning Welcome and Announcements – **Jeff Houser,** MRRC President

SESSION V – FLOODPLAIN FORESTS (Moderator: Colin Belby)

8:40-9:00 am THRESHOLD EFFECTS OF FLOOD DURATION ON THE VEGETATION AND SOILS OF THE UPPER MISSISSIPPI RIVER FLOODPLAIN
Nathan R. De Jager[1], Meredith A. Thomsen[2], Yao Yin[1], John C. Nelson[1] . [1]USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601

9:00-9:20 am ECOLOGICAL ASSESSMENT OF UPPER MISSISSIPPI RIVER SYSTEM FLOODPLAIN FORESTS
Lyle Guyon[1] and Loretta Battaglia[2]. [1] National Great Rivers Research and Education Center, Alton, IL 62002. [2] Southern Illinois University – Carbondale, Carbondale, IL 62901.

9:20- 9:40 am RELATIONSHIPS OF RIVER HYDROLOGY TO ANNUAL TREE GROWTH IN A POPULATION OF PIN OAK (*QUERCUS PALUSTRIS*) ON THE MISSISSIPPI RIVER.
***Emily Grossman**[1] and Susan P. Romano[2,3]. [1]Department of Biological Sciences,Western Illinois University-Quad Cities 61265. [2] Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

9:40-10:00 am ENVIRONMENTAL FACTORS RELATED TO PIN OAK (*QUERCUS PALUSTRIS*) RADIAL GROWTH WITHIN A FLOODPLAIN OF HIGHER HYDROECOLOGICAL INTEGRITY
Stefanie Fitzsimons[1]*, and Susan P. Romano[2,3]**.** [1]Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

10:00-10:20 am **BREAK (HOTEL FOYER)**

SESSION VI – FISH (Moderator: Greg Sass)

10:20-10:50am MOVEMENT AND SURVIVAL OF WILD AND STOCKED PADDLEFISH ACROSS THEIR SPECIES RANGE: IMPLICATIONS FOR MANAGEMENT OF MIGRATORY FISHES

Brenda M. Pracheil[1], Larkin A. Powell[2], Mark A. Pegg[2], Gerald E. Mestl[3]
[1] Center for Limnology, University of Wisconsin-Madison, Madison, WI 53706. [2] School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE 68583. [3]Fisheries Division, Nebraska Game and Parks Commission, Lincoln, NE 68503

10:50-11:10am IDENTIFYING RECRUITMENT SOURCES OF ASIAN CARPS IN THE ILLINOIS RIVER

Greg Whitledge, Jacob Norman, Quinton Phelps, and Darcy Ernat. Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901-6511

11:10-11:30 am OBSERVATIONAL EVIDENCE FOR ADVERSE EFFECTS OF INVASIVE ASIAN CARPS ON REPRODUCTIVE SUCCESS OF NATIVE FISHES

Steve Gutreuter, Jonathan M. Vallazza, Michelle R. Bartsch, Lynn A. Bartsch, Brent C. Knights and William B. Richardson. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

11:30-11:50 am *SCAPHIRHYNCHID* STURGEON EARLY-LIFE HISTORY

Quinton E. Phelps[1,2], Sara J. Tripp[1], Gregory Whitledge[1], James E. Garvey[1], David P. Herzog[2], David E. Ostendorf[2], Joseph W. Ridings[2], Jason W. Crites[2], and Robert A. Hrabik[2]. [1]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901 [2]Open Rivers and Wetlands Field Station,Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755

12:00-1:00 pm **LUNCH – BALLROOM A**

1:00-1:20 pm **BUSINESS MEETING – BALLROOM B**
IMMEDIATELY FOLLOWED BY THE RAFFLE AND SILENT AUCTION

POSTER PRESENTATIONS

RADISSON HOTEL
THURSDAY APRIL 22, 2010 4:20 PM – 6:00 PM
Authors Present 5:00 PM – 6:00 PM
(Listing by Topic)

LIMNOLOGY

1) **ABIOTIC EFFECTS ON THE ZOOPLANKTON COMMUNITY STRUCTURE OF THE UPPER MISSISSIPPI RIVER**
***Michael S Ahmann**[1], Michael D. Delong[1], William B. Richardson[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona MN 55987. [2]U.S. Geological Survey, Upper Midwest Environmental Science Center, La Crosse, WI 54602.

2) **BIOTIC INTERACTIONS AND REGULATION OF ZOOPLANKTON COMMUNITIES IN A HYDROLOGICALLY DYNAMIC LARGE RIVER**
***Joshua L. Anderson**[1], Michael D. Delong[1], William B. Richardson[2]. [1]Large River Study Center, Biology Department, Winona State University-Winona, MN 55987. [2]Upper Midwest Environmental Science Center, U.S. Geological Survey, La Crosse, WI 54602

3) **MISSISSIPPI RIVER WATER QUALITY ASSESSMENT AT 9-MILE ISLAND AND ITS EFFECTS ON TURTLE TRAPPING**
***Casey J. Arensdorf**, Adam R. Hoffman, Christina M. Chamberlain, Andrew L. Reese, Mark R. Hennessy, Gerald L. Zuercher, Garrett J. Sheldon, Christopher W. Kuhle. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001

4) **TROPHIC COMMUNITY COMPOSITION WITHIN A LATERALLY COMPLEXITY RIVER**
***Christopher W. Bieganek**[1], Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

5) **BRINGING BACK THE LIGHT: DAYLIGHTING THE BEE BRANCH CREEK**
***Christina M. Chamberlain,** Andrew L. Reese, and Adam R. Hoffman
Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001

6) **PATTERNS OF PHYTOPLANKTON CHLOROPHYLL AND NUTRIENTS IN RIVERINE PATCHES OF DIFFERING HYDROLOGICAL RETENTION**
***Qurratul-aine Jadran**[1], Michael D. Delong[1], and William B. Richardson[2]. [1] Large River Studies Center, Biology Department Winona State University, Winona, MN 55987.

[2]Upper Midwest Environmental Science Center, U.S. Geological Survey, La Crosse, WI 54602.

7) **SPATIAL CLUSTERS OF TOTAL NITROGEN (TN), TOTAL PHOSPHOROUS (TP), AND TN:TP IN THE UPPER MISSISSIPPI RIVER, USA.**
Nathan R. De Jager and Jeffery N. Houser, USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

8) **THE EFFECTS OF PHOSPHORUS ON PHYTOPLANKTON COMMUNITIES IN AN UPPER MISSISSIPPI RIVER BACKWATER LAKE**
***Robert J. Mooney**, Eric A. Strauss. River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601

9) **INTERACTIONS BETWEEN NON-NATIVE AND NATIVE LARGE RIVER PLANKTIVORES**
Quinton E. Phelps[1], Jason W. Crites[1], David P. Herzog[1], David E. Ostendorf[1], Joseph W. Ridings[1], Robert A. Hrabik[1],David Glover[2], Sara J. Tripp[2], and James E. Garvey[2]. [1]Open Rivers and Wetlands Field Station, Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755. [2]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901

10) **ECOSYSTEM PROCESSES OF EPILITHIC AND EPIXYLIC PERIPHYTON IN A BACKWATER OF THE UPPER MISSISSIPPI RIVER**
***Shane D. Symmank**, and Eric A. Strauss. University of Wisconsin-La Crosse, River Studies Center, 1725 State Street, La Crosse, Wisconsin 54601

FISH ECOLOGY

11) **TROPHIC POSITION OF PISCIVOROUS FISHES DURING TWO HYDROLOGICALLY DISTINCT YEARS**
***Courtney N. Heins[1],** Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

12) **NEW DISTRIBUTIONAL RECORDS AND RANGE EXTENSIONS OF THE CRYSTAL DARTER (*Crystallaria asprella*) IN MISSOURI AS A RESULT OF USING A MORE EFFECTIVE SAMPLING TECHNIQUE**
David S. Knuth[1], **Robert A. Hrabik[2]**, Jason W. Crites[2], and Jeff M. Ray[3.] [1]Missouri Department of Conservation, Fisheries Division, Cape Girardeau, MO 63701. [2]Open Rivers and Wetlands Field Station, Jackson, MO 63655. [3]University of North Alabama, Department of Biology, Florence, AL 35630

13) RELATIONSHIP BETWEEN BODY SIZE AND TROPHIC STATUS OF PISCIVOROUS FISHES IN A FLOODPLAIN RIVER

***Brian J. Klimek[1]** Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. 507-457-2458: [2] Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas 66047-3759

14) JUVENILE CHANNEL CATFISH HABITAT USE IN THE MIDDLE MISSISSIPPI RIVER

Quinton E. Phelps[1], Sara J. Tripp[1], James E. Garvey[1], David P. Herzog[2], David E. Ostendorf[2], Joseph W. Ridings[2], Jason W. Crites[2], and Robert A. Hrabik[2]. [1]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901. [2]Open Rivers and Wetlands Field Station, Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755

15) *IN-SITU* EVALUATION OF SOUND-BUBBLE-STROBE LIGHT BARRIER TECHNOLOGIES TO PREVENT THE RANGE EXPANSIONS OF ASIAN CARP

***Blake C. Ruebush[1,2]**, Greg G. Sass[2,1], John H. Chick[3,1], and Cory D. Suski[1] [1]University of Illinois, Department of Natural Resources and Environmental Sciences, Champaign, IL. [2]Illinois Natural History Survey, Illinois River Biological Station, Havana, IL. [3]Illinois Natural History Survey, Great Rivers Field Station, Brighton, IL

16) FISH COMMUNITY STRUCTURE AS A FUNCTION OF LONGITUDINAL GEOMORPHOLOGICAL DIFFERENCES IN A LARGE RIVER NETWORK

***Alexander J. Sazama[1]**, Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2] Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

17) THE NATURE CONSERVANCY'S EMIQUON PRESERVE: LARGEMOUTH DIET RESPONSE TO RESTORATION.

***Nerissa N. Michaels[1, 2]**, Greg G. Sass[1], and Tim W. Spier[2]. The Nature Conservancy's Emiquon Preserve: Largemouth Diet Response to Restoration. [1]Illinois Natural History Survey, Illinois River Biological Station, Havana, IL, 62644. [2]Western Illinois University-Department of Biological Sciences, Macomb, IL, 61455.

18) EFFECTS OF BIGHEAD AND SILVER CARP ON EMERGENT INSECTS IN THE UPPER MISSISSIPPI RIVER BASIN

***Patrick T. Kelly[1]**, Roger J Haro[1], Brent C. Knights[2], and William B. Richardson[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

GEOMORPHOLOGY

19) SEDIMENTATION IN LAKE POTTER BETWEEN 1935 AND 2010, UPPER MISSISSIPPI RIVER POOLS 16

***Ryan Hancock** and Reuben Heine. Geography Department, Augustana College, Rock Island, IL

20) FISH CONDITION UNDER DIFFERENT DEGREES OF GEOMORPHIC COMPLEXITY IN THE UPPER MISSISSIPPI RIVER

***JoHannah R. Heller[1]**, Michael D. Delong[1], James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

21) EFFECT OF LONGITUDINAL GRADIENT ON FISH TROPHIC DYNAMICS IN A LARGE TEMPERATE RIVER

***Eric J. Krumm**[1], Michael D. Delong[1], and James 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 66047-3759.

22) A COMPARISON OF SEDIMENT PARTICLE-SIZE DISTRIBUTIONS BETWEEN 1925 AND 2010, UPPER MISSISSIPPI RIVER POOLS 18 AND 24

***Ryan Johnson** and Reuben Heine
Geography Department, Augustana College, Rock Island, IL

INVERTEBRATES

23) EFFECTS OF CLIMATE CHANGE ON ADULT AND JUVENILE FRESHWATER MUSSELS

***Alissa Ganser**[1], Teresa Newton[2], and Roger Haro[1]. [1]University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI 54601. [2]USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

24) THE DISTRIBUTION AND ABUNDANCE OF FRESHWATER MUSSELS IN THE MISSISSIPPI RIVER IN HANCOCK COUNTY, ILLINOIS

***Kenny Kusimba,** Dr. Susan Meiers, Dr. Sean Jenkins and James Lamer
Kibbe Biological Station, Department of Biological Sciences, Western Illinois University, Macomb, IL 61455-1390

25) MUSSEL COMMUNITY DISTRIBUTION ALONG 9-MILE ISLAND IN POOL 12 OF THE UPPER MISSISSIPPI RIVER

***Lisa A. LaBudde**, Samantha M. Sporer, Adam R. Hoffman, and Gerald L. Zuercher. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

26) CLADOCERAN DIVERSITY IN LAKE GALENA, ILLINOIS, AN IMPOUNDMENT OF A TRIBUTARY TO THE MISSISSIPPI RIVER
***Michael J. Malon.** University of Dubuque, 2000 University Ave., Dubuque, IA 52001

27) THE INFLUENCE OF BED AND SUSPENDED SEDIMENT ON FRESHWATER MUSSELS IN POOL 12 OF THE UPPER MISSISSIPPI RIVER
***Samantha M. Sporer**, Lisa A. LaBudde, Adam R. Hoffman. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

WILDLIFE ECOLOGY

28) EVALUATION OF A VOLUNTARY PROGRAM TO CURTAIL BOAT DISTURBANCE TO MIGRATING WATERFOWL USING POOL 7 OF THE UPPER MISSISSIPPI RIVER
Kevin P. Kenow[1], Brian Gray[1], James Nissen[2], **Pete Boma**[1], Steve Houdek[1], Jessica Larson[2], and Luke Fara[1]. [1]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, WI 54650.

29) CHARACTERIZING SOUTHERN FLYING SQUIRRELS IN EASTERN IOWA
***Christine M. Grannis**, Tori M. Ballweg, Michael Collins, Gerald L. Zuercher, and David E. Koch. Department of Natural & Applied Sciences, University of Dubuque

30) POPULATION CHARACTERISTICS OF RIVER TURTLES ON 9-MILE ISLAND, POOL 12, MISSISSIPPI RIVER
***Mark R. Hennessy,** Andrew L. Reese, Casey J. Arensdorf, Christina M. Chamberlain, Gerald L. Zuercher, and David E. Koch. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

31) EVALUATION OF SHOREBIRD RESPONSE TO CHANGES IN VEGETATION ON NEWLY-CONSTRUCTED ISLANDS WITHIN THE WISCONSIN ISLANDS CLOSED AREA, NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER
Steven C. Houdek[1], Craig Kelling[2], Kevin Kenow[1], Brian Gray[1], James Rogala[1], and Pete Boma[1]. [1]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]Winona State University, Winona, MN 55987.

32) SHOREBIRD RESPONSE TO ISLAND RESTORATION IN THE POOL 8 WISCONSIN ISLANDS CLOSED AREA ON THE UPPER MISSISSIPPI RIVER
Craig Kelling[1], Kevin Kenow[2], Neal Mundahl[1], Steve Houdek[2], Pete Boma[2], Eileen Kirsch[2]. [1]Winona State University, Winona, MN 55987. [2]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

33) EFFECTS OF ABIOTIC FACTORS ON THE CAPTURES OF A RIVER TURTLE COMMUNITY

***Andrew L. Reese,** Mark R. Hennessy, Casey J. Arensdorf, Christina M. Chamberlain, and Gerald L. Zuercher. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

34) SPATIAL DISTRIBUTION OF THE EURASIAN TREE SPARROW, *PASSER MONTANUS*

***Annina M. Rupe[1]**, Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. [2] Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

35) SPATIAL DISTRIBUTION OF INDIANA BAT (*MYOTIS SODALIS*) HABITAT AND WIND FARMS IN IOWA AND ILLINOIS

***Eric S. Schroder[1]** and Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University-Quad Cities, Moline, IL 61265 . [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

VEGETATION

36) SPATIAL DISTRIBUTION OF BOX ELDER IN PROXIMITY TO WATER SOURCE IN FLOOD PLAIN FORESTS

***Katherine Johnson[1]** and Susan P. Romano[2,3]. [1]Department of Geography, Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 62165. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

37) UNDERSTORY HERBACEOUS COMMUNITIES OF HERON ROOKERIES ON THE UPPER MISSISSIPPI RIVER

***John Kurtz[1]**, Susan P. Romano[2,3], and Sean Jenkins[1]. [1] Department of Biological Sciences,Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

PLATFORM PRESENTATION ABSTRACTS
ALPHABETICAL LISTING (by Presenting Author)

POTENTIAL PLANT RESPONSE TO A SEASONAL DRAWDOWN ON NAVIGATION POOL 18 OF THE UPPER MISSISSIPPI RIVER

Amber J. Andress [1,2] and Susan P. Romano[3,4] . [1]U.S. Fish and Wildlife Service, Rock Island Ecological Services Field Office, Moline, IL 61265. [2]Western Illinois University – Quad Cities, Moline, IL 61265. [3]Departments of Biological Sciences and Geography, Western Illinois University – Quad Cities, Moline, IL 61265. [4]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

In response to growing public environmental awareness and concern for the Upper Mississippi River as an ecosystem, the U.S. Army Corps of Engineers and other resource managers are investigating seasonal reductions in water levels as potential ecosystem restoration projects on the Upper Mississippi River (UMR). The incorporation of a water level drawdown into management of select pools of the UMR is intended to mimic pre-impoundment hydrologic cycles and restore many of natural river processes, including wetland and aquatic plant production. We examined the potential vegetation response through a direct seed bank study conducted on samples collected in 2009 from the anticipated drawdown zones in Navigation Pool 18. Soil samples were placed under dry, moist, shallow flooded, and submerged soil conditions, and plant response was documented for one growing season. Forty-eight species were identified in the study, with the most abundant taxa including *Amaranthus* spp., *Ammania* spp., *Cyperus* spp., *Eragrostis* spp., *Gratiola* spp., *Leersia* spp. and *Sagittaria* spp. Moist soil treatments had the greatest productivity (average of 548 stems/m^{-2}), followed by the submerged, shallow flooded, and dry treatments, respectively. Ordination indicates that distinct plant communities would be expected to occur within the drawdown zones, and an analysis of the observed taxa provides insight into potential plant response and degree of subsequent wildlife habitat enhancement as a result of planned water level management.

Keywords: seed bank, drawdown, Pool 18, aquatic vegetation, moist soil

RIVER TURTLE DIVERSITY: SPATIO-TEMPORAL VARIATION AT 9-MILE ISLAND.

Casey J. Arensdorf, Gerald L. Zuercher, Mark R. Hennessy, Andrew L. Reese, and Christina M. Chamberlain. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

In order to assess the importance of small-scale spatial and temporal diversity on community structure of river turtles, we sampled on and around 9-Mile Island within the Upper Mississippi River Wildlife and Fish Refuge (Pool 12) between May and September during 2009 and 2010. Four sites were sampled: the main channel side of the island (MC), the Molo Slough side of the

island (MS), a backwater area located on the south end of the island (BW), and a small side-channel that runs within the island (SC). We captured six species of river turtles during this project: *Apalone spinifera* (spiny softshell), *Chelydra serpentina* (snapping turtle), *Chrysemys picta* (painted turtle), *Graptemys geographica* (common map turtle), *G. ouachitensis* (Ouachita map turtle), and *G. pseudogeographica* (false map turtle). Despite an overall decrease in captures in 2010 compared to 2009, some patterns emerged. The backwater site yielded the highest captures in both years. Turtle community structure changed at both the backwater and Molo Slough sites between 2009 and 2010. Abiotic factors may have negatively impacted our success at capturing turtles as both years experienced deviations from average. In 2009, temperatures were consistently below average while in 2010, river depth was higher than average.

Keywords: 9-Mile Island, Mississippi River, spatial diversity, temporal diversity, turtles

SEASONAL ZOOPLANKTON COMMUNITIES FROM TWO CONTRASTING FLOODPLAIN LAKES IN POOLS 11 AND 12 OF THE UPPER MISSISSIPPI RIVER

Daniel Call[1,2], Jacqueline Call[2], Michael Okpalaeze[1] and Raymond Harrington[1]. [1]Department of Natural & Applied Sciences, University of Dubuque, Dubuque, IA 52001. [2]Environmental Research & Information Analysts, LLC, 11367 Robin Hood Drive, Dubuque, IA 52001

Two floodplain lakes with highly different physical characteristics and human use patterns were sampled and compared for their zooplankton communities on a monthly basis for one year (2008-2009). Big Pond (Pool 11, River Mile 614.5) is a shallow waterbody with an extensive littoral zone that is inaccessible to motorized watercraft. It is a waterfowl refuge that is closed to the public each year from October 1 until freeze-up. Frentress Lake (Pool 12, River Mile 576) is a deep waterbody with a limited littoral zone that undergoes thermal stratification. It has a marina with ready access to the Mississippi River, and is used by recreational watercraft. Mean monthly turbidity readings averaged higher in Big Pond ($p = 0.038$).

Zooplankton communities were distinctly different by lake and season. The Frentress Lake rotifer community was dominated by *Keratella* sp. and *Polyarthra vulgaris*. The Shannon-Weaver diversity index H' ranged from 0.71 to 1.64 for rotifer genera in Frentress Lake, with the lowest values occurring from January to April, and the highest values in June and September. However, the highest total rotifer densities occurred in March and May, when *Keratella* and *Polyarthra* were most abundant. The mean number of total rotifers by month tracked closely with measured concentrations of chlorophyll *a* in Frentress Lake ($r = 0.72$; $p < 0.05$). By contrast, the rotifer community in Big Pond peaked in June. *Keratella* and *Polyarthra* again were the dominant genera. With the exception of June, monthly total rotifer densities did not reach the density levels observed in Frentress Lake. Further, there was no correlation with chlorophyll *a* concentration ($r = -0.007$; $p > 0.05$). H' did not significantly differ between the two lakes ($p = 0.311$). Rotifers in the genus *Triarthra* were commonly observed in Frentress Lake, but not in Big Pond. *Asplanchna*, *Collotheca*, and *Rotaria* were more commonly observed in Big Pond. *Brachionus* and *Trichocerca* were fairly common genera in both lakes. A large pulse

of cladocerans (mainly *Eubosmina*) was observed in May in Big Pond. Otherwise, the numbers of cladocerans were not significantly different ($p > 0.05$) in the two lakes. Total copepods, especially nauplius larvae, likewise exhibited a large population pulse in May, and were significantly greater in number in Big Pond in March, May, August and September ($p < 0.01$).

A non-native, exotic species of rotifer, *Brachionus diversicornis*, was collected from Frentress Lake. To our knowledge, this is the first record of this native European species collected from the Mississippi River. At least two non-native species of zooplankton are now known to exist in Frentress Lake, *B. diversicornis*, and the African native cladoceran, *Daphnia lumholtzi*, that was reported last year to have an established population there. A single observation was made of *D. lumholtzi* from Big Pond.

Keywords: Mississippi River, floodplain lakes, zooplankton, rotifers, exotic species

ENVIRONMENTAL RIVER ENGINEERING ON THE MIDDLE MISSISSIPPI RIVER: ST. LOUIS HARBOR CHEVRONS

Robert D. Davinroy, P.E.,[1] Edward J. Brauer, P.E.**[1],** Gary Dyhouse, P.E.[2]. [1]U.S. Army Corps of Engineers, Applied River Engineering Center, St. Louis, MO 63118. [2]U.S. Army Corps of Engineers, St. Louis District (retired), St. Louis, MO 63103.

The U.S. Army Corps of Engineers has a congressionally mandated responsibility of maintaining a safe and dependable navigation channel in an environmentally friendly manner. This is achieved by using innovative new river engineering structures that not only help maintain the navigation channel but increase environmental habitat. Examples of these structures are w-dikes, notched dikes, chevrons and multiple round point structures. The chevrons constructed in the St. Louis Harbor are perfect examples of the combination of navigation channel maintenance and environmental restoration.

The initial need for structures in the St. Louis Harbor was primarily to solve a navigation issue; repetitive dredging and channel alignment. Navigation structures were necessary to harness the natural forces of the river to manipulate sedimentation patterns and minimize dredging requirements. Rather than using a series of traditional dikes, chevrons were designed to additionally create a more sustainable aquatic environment. The chevrons in particular have provided a more diverse habitat than what was available in the St. Louis Harbor prior to their construction.

The fish community before the construction of the chevrons in the St. Louis Harbor was typical of most open river habitat - very low catch rates with few species retrieved during samplings. Before construction, the harbor consisted of the usual main channel and channel border habitats along with stretches of quality, shallow water habitat along the right descending bank. The construction of the chevron field created many different habitat types including a deep scour hole enclosed by each chevron used for overwintering habitat, areas of low velocities which support numerous backwater fish and sandbar islands.

The chevrons in the St. Louis harbor have also been repeatedly surveyed and studied to help understand their effects on water surfaces. The reach around the chevrons have been surveyed using Multibeam, Acoustic Doppler Current Profiler (ADCP) and Real Time Kinematic (RTK). The results of these studies combined with other studies conducted by the Corps and other organizations and academics there is evidence to support that the chevrons in the St. Louis harbor have no effect on water surfaces.

Keywords: river engineering, environmental restoration, navigation structures, data collection, water surfaces

THRESHOLD EFFECTS OF FLOOD DURATION ON THE VEGETATION AND SOILS OF THE UPPER MISSISSIPPI RIVER FLOODPLAIN

Nathan R. De Jager[1], Meredith A. Thomsen[2], Yao Yin[1], John C. Nelson[1]. [1]USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603, [2]River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601

Although flooding is considered the main determinant of species distribution in floodplain forests, few studies have quantified specific flood durations that constrain broad-scale patterns of plant species composition. Without such information, it is difficult to identify sites with high potential for restoration success or develop benchmarks for water level management efforts that support forest management practices.

We examined relationships between the mean number of days during the growing season that sites were flooded and overstory tree community composition, soil texture, and soil fertility along the floodplain of the Upper Mississippi River (UMR) from near Hastings, MN to near Guttenburg, IA. In general, as flood duration increased, the diversity of tree communities and soil conditions decreased. At sites inundated for less than 35 days (about 20% of the growing season), a wide range of tree community compositions, soil textures and fertilities were found. Sites flooded for longer than 35 days were exclusively silt/clay, had relatively high % organic matter, and lacked rare species (including mast producing oaks). Sites flooded less than 68 days (about 40% of the growing season) had a characteristic mix of silver maple, green ash, and American elm. Finally, sites flooded for longer than 68 days were dominated by silver maple. Hence, flood durations lasting on average <20% of the growing season allow for a wide range of plant communities and soil conditions, while average durations lasting >40% of the growing season create homogeneous patches of silt/clay soils and silver maple stands in this river reach.

We mapped the distribution of these three categories of flood duration: <35 days (silver maple plus ash, elm and rare species), < 68 days (silver maple plus ash and elm) and >68 days (silver maple only) across this same reach of the UMR using high resolution elevation data (lidar) and a database of historical river stages. Our maps suggest that the majority of the UMR floodplain currently in agriculture is suitable for diverse forest communities under the current hydrologic

regime. However, far more of the floodplain could be suitable for diverse communities if river stage was lower during the growing season.

Keywords: flooding, silver maple, soil fertility, soil texture, spatial pattern

THE RIVERINE ECOSYSTEM SYNTHESIS: APPLICATION OF MULTIPLE SCALES ACROSS SPACE AND TIME

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

It is becoming more widely accepted that ecological structure and function in riverine networks does not subscribe to a predictable pattern that confirms to changes based on increasing drainage basin size. Research and conceptual models have determined that the structure and scale of riverine networks is determined by geological and climatic conditions such the location and arrangement ecological, hydrological, and geomorphic conditions has low predictability and can be repeated within the river network. These circumstances create hydrogeomorphic patches of different spatial and temporal scales within a hierarchical framework with the nature of these patches dictating ecological form and function. The riverine ecosystem synthesis draws from this body of work and hierarchical patch dynamics of terrestrial ecology to provide a foundation for studying the dynamics of rivers at multiple, but appropriate, spatial and temporal scales. This includes the linkage of appropriate scales across the disciplines of hydrology, geomorphology, and ecology. Principle to this is the concept of a nested, discontinuous hierarchy proposed in the hierarchical patch dynamics concept, which states that the scale of interest in a study is most strongly influenced by the scale immediately above and below. This presentation will describe the significance of this and the RES in its application for expanding our understanding of river ecosystems.

Keywords: riverine ecosystem synthesis, scale, hierarchy, hydrology, geomorphology

ENVIRONMENTAL FACTORS RELATED TO PIN OAK (*QUERCUS PALUSTRIS*) RADIAL GROWTH WITHIN A FLOODPLAIN OF HIGHER HYDROECOLOGICAL INTEGRITY

Stefanie Fitzsimons[1], and Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

The pin oak (*Quercus palustris* Münchh.) is an important component of the forest community within the floodplains of the Upper Mississippi River. This tree species is very valuable, providing acorn mast to a variety of wildlife. The pin oak population throughout the Upper

Mississippi River floodplain has declined in recent years. The purpose of this research is to determine relationships of several environmental factors to the radial growth, and therefore health, of pin oak along the Wapsipinocon and Mississippi River confluence. This portion of the Upper Mississippi River maintains water level fluctuations similar to river hydrology prior to dam placement. Pin oak cores were randomly collected in the floodplain near the confluence of the Wapsipinicon and Mississippi Rivers. Soil texture, historical climate/drought, and flood frequency/duration are expected to influence radial growth. Preliminary analysis indicates that there are significant differences in radial growth between trees. Further analysis will determine the relationship of these radial growth differences to soil texture, climate, and river hydrology.

Keywords: *Quercus palustris*, floodplain, dendrochronology, hydroecology, Mississippi River

RELATIONSHIPS OF RIVER HYDROLOGY TO ANNUL TREE GROWTH IN A POPULATION OF PIN OAK (*QUERCUS PALUSTRIS*) ON THE MISSISSIPPI RIVER

Emily Grossman[1] and Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University-Quad Cities, Moline, IL 61265. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

Pin oak (*Quercus palustris*) was once an important tree species on the floodplains along the Mississippi River, but has been declining in recent years. This decline may be due in part to changes in river hydrology caused by human alterations to the river, such as locks and dams and development along the river. This research focused on a population of pin oaks near the confluence of the Mississippi and Maquoketa Rivers. Forty tree cores were collected and the annual rings of each core were measured. These measurements will be compared with daily river level data to determine the relationship of annual tree growth to the height and duration of flooding. Average growth for all trees was 3.2568 mm and ranged from 1.1540 to 5.6994 mm for individual trees. Tree establishment was fairly even over the years. Multiple regression using the yearly flood frequency and duration data revealed no significant relationship between the flooding variables and annual tree growth, though there were still some apparent patterns in tree growth. The lack of a significant relationship suggests that there are other factors that help to determine the annual growth of pin oak at this site.

Keywords: Pin oak, *Quercus palustris*, floodplain forest, radial growth, Mississippi River

OBSERVATIONAL EVIDENCE FOR ADVERSE EFFECTS OF INVASIVE ASIAN CARPS ON REPRODUCTIVE SUCCESS OF NATIVE FISHES

Steve Gutreuter, Jonathan M. Vallazza, Michelle R. Bartsch, Lynn A. Bartsch, Brent C. Knights and William B. Richardson. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

The invasive planktivorous bighead and silver carps have become abundant in much of the Mississippi River. Those species have the potential to out-compete native fishes for planktonic food resources. We used the combination of lipid markers and data from the Long Term Resource Monitoring Program of the Upper Mississippi River System to explore the hypothesis that those invasive Asian carps impair reproductive success in selected native species. The omega-3 polyunsaturated eicosapentaenoic and docosahexaenoic fatty acids (EPA and DHA, respectively) are produced de novo mainly by diatoms and flagellated algae. Both have essential physiological roles, including in reproduction in fishes. EPA and DHA were strongly depleted in paddlefish, bigmouth buffalo, and age-0 gizzard shad in the presence of the Asian carps. We then used hierarchical Bayesian statistical models to evaluate evidence for effects on reproductive success in nine common native fishes. Probabilities of reproductive impairment by silver carp exceeded 0.5 in five species, and were less than 0.1 for only gizzard shad and bluegill.

Keywords: reproduction, invasion, *Hypophthalmicthys*, fatty acids, models

ECOLOGICAL ASSESSMENT OF UPPER MISSISSIPPI RIVER SYSTEM FLOODPLAIN FORESTS

Lyle Guyon[1] and Loretta Battaglia[2]. [1] National Great Rivers Research and Education Center, Alton, IL 62002. [2] Southern Illinois University – Carbondale, Carbondale, IL 62901.

Historical and present day disturbances have contributed to long-term changes in the composition and structure of Upper Mississippi River System (UMRS) floodplain forests. Low tree species diversity and a lack of successful regeneration have been documented in many areas, which could result in continued losses of forest habitat over time. Floodplain forest restoration has therefore been widely recognized as an important management concern in the UMRS. A key component of the restoration process is assessing the ecological characteristics of remnant high quality reference sites. This will allow for the establishment of target conditions for forest restoration efforts and the successful matching of potential vegetation types with different environmental variables and conditions at local and regional spatial scales. Fourteen reference sites were established along a 710 mile longitudinal stretch of the Upper Mississippi River (river miles 50-760), the Lower Illinois River, the lower Big Muddy River, and in the lower Cache River watershed. Biological (species composition, species richness and diversity, density, basal area, and structure) and physical (soil texture, elevation, canopy cover, and hydrology) characteristics were sampled from a set of 1,000 m^2 plots permanently located at each study site. Non-metric multidimensional scaling (NMDS) was used to examine trends in species composition in these forest communities. Vector fitting was used to examine patterns of

correlation between the ordination and explanatory variables, and statistical significance was tested by random permutation. Overstory floodplain forest communities were generally dominated by silver maple (*Acer saccharinum*) and a variable combination of green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), pin oak (*Quercus palustris*), and hackberry (*Celtis occidentalis*). Common understory trees capable of overstory recruitment included green ash, silver maple, American elm, and hackberry. The scarcity of mast species in the understory was evident throughout the study sites, even where they were present in the overstory. Overstory species richness and diversity was generally high in the floodplain forest communities incorporated into this study. However, species richness in the understory layer was on average about half that of the overstory layer, and diversity was also much lower. This trend was more pronounced in the northernmost sites. Herbaceous communities were notably variable across and even within study sites. Structural data indicate that the majority of floodplain forest communities exhibited an uneven-aged diameter distribution, but large mature trees were common. Understory vegetation was generally sparse, and in some cases nearly absent. The NMDS ordination revealed substantial compositional overlap between sites, but there were some regional differences in species composition. In addition, richness and diversity generally decreased from south to north. Patterns in the ordination were significantly correlated with canopy cover, elevation, soil texture, and several hydrologic parameters. Results suggest that regional differences should be considered when selecting stands as restoration sites. At local scales, it is also important that consideration be given to site characteristics such as micro-topographic features and hydrogeomorphology. Further study is needed to accurately match individual species to within-site environmental characteristics at the finer spatial scales required for specific restoration projects.

Keywords: floodplain forests, Upper Mississippi River, ecological characteristics, restoration, reference sites

A LEVEL 1 MUSSEL SURVEY IN THE PROPOSED HWY 43 BRIDGE REPLACEMENT AREA, MISSISSIPPI RIVER MILE 725.8, WINONA, MN

Marian E. Havlik, Malacological Consultants, La Crosse, WI 54601-6609.

A Level 1 mussel survey was done 13-14 September 2010, at Mississippi River Mile 725.8, Winona, MN. No federally endangered mussels were found in the proposed Winona Hwy 43 bridge area, however we cannot say that there are no Federally Endangered Species are in the area. A total of 348 live mussels were found in 45 qualitative dives of 20 minutes each. Eleven live species were recovered, plus six species represented by empty shells. The 800,000+ square foot area was divided into several sections. Section 1, under the existing bridge was further divided into three areas: Section 1A was the section next to Latsch Island, and included several piers outside the main navigation channel. Section 1C was next to the Winona City shoreline. Section 1B, the navigation channel, was only surveyed next to the piers bordering the main channel. Most of Site 2, off of Latsch Island, from the city boat harbor inlet down to the proposed bridge site, had a few *Obovaria olivaria*, and *Ligumia recta*, both Minnesota Special Concern species. There were two wing dams in Site 2A, both clearly marked with buoys to

delineate the edge of the main navigation channel. Near both shores of the existing bridge, more mussels were found. On the city shore, 14 *L. recta* were found 200 feet upstream of the existing bridge (a total of 22 live mussels found at site). There were various sizes of *L. recta* found here, indicating reproduction. A total of 18 *L. recta* and 16 *O. olivaria* were found throughout the study area. No other state or federal listed mussel species were found alive.

Near Latsch Island, in the vicinity of the existing bridge, and slightly upstream, 22-63 mussels/dive were found in shallow water and vegetation. There are rock piles upstream (in fairly shallow water) of the railroad bridge which appear to be ice protectors. Overall, many areas were barren sand with relatively few mussels. A few exotic mussels were found with only a few *Dreissena polymorpha* on some native mussels. Most live *Dreissena* were quite small, less than 3/8 inch long, probably this year's age class, however many old *D. polymorpha* abyssal threads were on most native mussels. All live (unmarked) mussels were returned to river downstream of the old railroad bridge. Only worn shells of several unionid species were found on the Latsch Island shoreline. One existing pier (Pier #20) near Latsch Island was extremely scoured on the upstream side, especially towards Latsch Island. The state my want to consider the cost saving measure of eliminating a Level 2 survey and just moving mussels from both shorelines near the existing bridge a short time before any construction.

Keywords: Mississippi River mussels, Minnesota listed mussels, *Dreissena polymorpha*, Unionidae, impacts on mussels

THE IMPACT OF WATER TEMPERATURE AND DISCHARGE ON THE GEOMETRY OF SUBAQUEOUS DUNES, UPPER MISSISSIPPI RIVER POOL 16

Reuben A Heine and Christopher Hawes. Department of Geography, Augustana College, Rock Island, IL

Subaqueous dunes (bedforms) have long been recognized as an important factor in the hydraulics and geomorphology of river and stream channels. From a hydraulic perspective, dunes are known to cause bed roughness and flow separation between the down-bound streamflow and the flow reversals behind dune features. From a hydroecological standpoint, these mid-channel pockets of relatively slack water are increasingly being recognized as having the potential to serve as flow-refuges within the channel/thalweg zones of a river and act as "hydraulic retention zones". Much of what is presently known about dunes comes from flume studies. Very little work has been published on the spatial or seasonal nature of dunes in the Upper Mississippi River. In order to test the applicability of theoretical and empirical dune models to the Mississippi River, we analyzed the geometric characteristics of dunes in a 4.8-km reach of the Mississippi River (near Buffalo, IA) once every two weeks over the period of one year. Surveys were made between March 2008 and April 2009 with sample-day discharge events ranging between 850cms (30,000cfs) to 7,080cms (250,000cfs). In addition to the biweekly surveys, six surveys were made between June 11th and June 30th in an attempt to capture the impact of flooding on dune geometry. Surveys of the bed morphology along the thalweg were completed using a coupled GPS and echo sounder and an onboard computer as the data logger. Partitioning

of the continuous bed profile into discrete dunes was accomplished using an automated dune-detection methodology based on Nordin and Richardson's zero-crossing approach. The approach enabled the identification of nearly 2000 dunes in 19 surveys. Dunes were analyzed for height, length, symmetry, and steepness. Because of course-grained bed material in the upper one-third of the study area, dunes were consistently present only in the lower two-thirds of the study area. Average dune lengths were found to vary from 42 to 63 meters, average heights vary from 0.3 to 0.9 meters, and average steepness vary from 0.6% to 1.7% slope. Dune heights were significantly smaller during the cold-water months of November thru April and largest in July and August where nearly one-third of the dunes exceeded 1.5 meters in height. The relationship between dune height and water temperature found here is consistent with flume and field studies however neither the height nor length of dunes measured in this investigation were successfully predicted by published empirical models. Finally, dune symmetry was assessed using the modified symmetry index which compares the length of the lee side of the dune to the stoss side. Dunes tended to be more asymmetric during the cold-water months and more symmetric during flooding. The increase in geometric symmetry during floods has the impact of lowering flow separation, bed roughness and the potential for flow refuges. These findings provide specific details about the seasonal geometry of dunes in one reach of the Mississippi River but because the dunes tend to follow predicted patterns from flume studies, the results here are likely transferable to other reaches.

Keywords: Bedforms, dunes, dune geometry, water temperature, symmetry index.

SUMMARY AND RESULTS OF THE MILAN BOTTOMS BALD EAGLE NIGHT ROOST SURVEY PROJECT

Cathleen D. Monson, Kelly J. McKay, Robert R. Bryant, Richard A. Sayles, Walter M. Zuurdeeg, Brian P. Ritter, Shirley A. VanMeter, Jason L. Monson, and Brian L. Blevins. BioEco Research and Monitoring Center, P.O. Box 452, Hampton, IL 61256.

Human development and activities continue to increase and encroach on the floodplain habitats of the Upper Mississippi River. For example, economic development is occurring immediately adjacent to the Milan Bottoms Complex in Rock Island County, Illinois. Evidence suggests that this area functions as a major night roost location for wintering Bald Eagles. Therefore we conducted a standardized night roost survey here during three consecutive winters (2005-2008), in order to document the importance of this site to wintering eagles. Each week, one evening and one morning survey were carried out from early December through late March (17 weeks). In 2005-2006, a total of 10,386 observations were recorded of eagles entering or exiting the night roost. Of these, 32% were adults, 36% were immature, and 32% were unaged. In contrast, only 2,553 eagle observations were reported in 2006-2007, including 44% adults, 32% immature, and 24% unaged. Eagle numbers increased in 2007-2008 to 6,957 observations. Among these, 39% were adults, 27% were immature, and the remaining 34% were unaged. During the first three years of this project, the majority of night roosting eagle observations occurred in December and January, with steadily decreasing numbers in February and March, respectively. The upstream

end of Milan Bottoms (i.e. the widest track of floodplain forest habitat) appears to be the most heavily utilized portion of the study area for night roosting purposes.

Keywords: Bald Eagle, Mississippi River, night roost, winter, *Haliaeetus leucocephalus.*

THE EFFECTS OF WATER LEVEL MANIPULATION ON NATIVE MUSSEL POPULATIONS IN THE UPPER MISSISSIPPI RIVER

T. Newton[1], S. Zigler[1], R. Kennedy[1], A. Hunt[2], M. Davis[3] and P. Ries[1]
[1]USGS, La Crosse, WI 54603. [2]USFWS Upper Mississippi National Wildlife Refuge, Winona, MN. [3]MN Department of Natural Resources, Lake City, MN.

Managers in the Upper Mississippi River (UMR) are using reductions in the river's water levels during summer to mimic historical water regimes and rehabilitate habitats for vegetation and other species. Concerns for the unintended effects of these actions on mussel populations threatened to halt these projects. Lacking definitive data, scientists assumed 100% mortality of mussels in the shallow waters, although some mussels might move out of the drawdown zone and reach deeper water, and some might survive by burrowing into the substrate. Our objective was to characterize the movement and survival of 2 mussel species in the UMR associated with a water level drawdown. During 2009 (non-drawdown year) and 2010 (1.0' summer drawdown) we glued PIT (passive integrated transponder) tags and buoyant fluorescent line to 10 *Amblema plicata* and 10 *Lampsilis cardium* at each of 11 sites. Five sites were in shallow areas minimally affected by the drawdown, and 6 sites were in shallow areas directly affected by the drawdown. Mussels were located about weekly from June to November 2009, and June to September 2010. Mussel locations were mapped by trilateration from surveyed stakes at each site. Recovery of tagged mussels was >88% in 2009 and 2010. Individual mussels were relocated ~14 times each. Mortality of tagged mussels averaged ~5% in 2009 and ~22% in 2010. During the drawdown, *A. plicata* appeared to move vertically and burrow into the substrates, whereas *L. cardium* appeared to move horizontally and follow the receding water. Analysis of movement trajectories of mussels is ongoing. Results from this study are being used by resource managers to better evaluate the effects of this management tool on native mussel populations.

Keywords: freshwater mussels, water level drawdown, mortality, movement, Upper Mississippi River

SCAPHIRHYNCHID STURGEON EARLY-LIFE HISTORY

Quinton E. Phelps[1,2], Sara J. Tripp[1], Gregory Whitledge[1], James E. Garvey[1], David P. Herzog[2], David E. Ostendorf[2], Joseph W. Ridings[2], Jason W. Crites[2], and Robert A. Hrabik[2]
[1]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901. [2]Open Rivers and Wetlands Field Station,Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755

Rehabilitation of sturgeon populations requires an understanding of the autecology during all life stages, especially during early life when high mortality occurs. To begin to understand sturgeon early-life history we determined river of origin, habitat use, and early-life dynamics in an unimpounded reach of the Mississippi River. Our trace element analyses suggest that age-0 sturgeon captured in the middle Mississippi River have drifted from as far upstream as the Gavins Point Dam on the Missouri River (> 1200 Km), while other individuals originated locally in the Middle Mississippi River. On a more refined scale of specific habitats used (post-drift), age-0 Scaphirhynchus sturgeon catch rates were highest around artificial structures (i.e., wing dikes) and island areas while main channel habitat comprised the lowest catch rates. Within these habitats, young sturgeon frequently occupied low velocities (i.e., ~0.1), moderate depths (i.e., 2 to 5 m), and sand substrate. Although determination of river of origin and specific habitats used are imperative for restoration they likely regulate early-life dynamics. Mean sturgeon growth rates ranged from 1.42-1.50 mm/d over the four years; however, growth rates did not differ among years. Individuals hatched over a 25 to 50-d period and peak hatch dates were between 10- 20 May in all years. Moreover, hatch timing coincided with optimum spawning temperatures of 17-20 ^{o}C and an increase in river stage. Abundance appeared to be regulated by river stage; longer durations of high water related to higher relative abundance. Mortality increased with the number of days where water temperature exceeded 28 ^{o}C. In the end this study has laid the framework for understanding early-life ecology of Scaphirhynchus sturgeon. Furthermore, we believe that this research will be used to begin to rehabilitate these imperiled sturgeon populations.

Keywords: *Scaphirhynchid*, Sturgeon, Mississippi River, Missouri River

MOVEMENT AND SURVIVAL OF WILD AND STOCKED PADDLEFISH ACROSS THEIR SPECIES RANGE: IMPLICATIONS FOR MANAGEMENT OF MIGRATORY FISHES

Brenda M. Pracheil[1], Larkin A. Powell[2], Mark A. Pegg[2], Gerald E. Mestl[3]. [1] Center for Limnology, University of Wisconsin-Madison, Madison, WI 53706. [2] School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE 68583. [3]Fisheries Division, Nebraska Game and Parks Commission, Lincoln, NE 68503

Migratory freshwater fish have sustained substantial declines globally due to factors such as habitat loss and overharvest. Attempts at large-scale conservation plans for these fishes have been made in the USA through the Mississippi River Interstate Cooperative Resource Association (MICRA) paddlefish and sturgeon committee. The most conspicuous result of this effort has been a long-term, nearly range-wide mark-recapture database containing >35,000 encounters with individually marked paddlefish and release information on >2 million batch marked hatchery-reared paddlefish. We used data from the paddlefish stock assessment database to describe 1.) survival and recapture probabilities of paddlefish, 2.) the spatial extent of wild and stocked paddlefish movements and 3.) concomitant management implications of these survival and movements estimates. Annual survival probability estimates of wild paddlefish were lowest for the Mississippi River Basin (the Mississippi River and its tributaries, except the Missouri and

Ohio rivers—S=0.64) and highest for the Missouri River Basin (S=0.87). Survival, recapture and movement probability estimates for stocked paddlefish were not reliable (very wide or suspiciously small confidence estimates) likely due to a very small number of recaptures compared to the number of stocked fish at large (recaptures <1%). Paddlefish immigration to and emigration from river basins appears to play a role in population dynamics at the long-term, range-wide scale and suggests that current state-specific management of migratory fish may not be of a sufficient spatial reach to effectively manage migratory fish populations. Movement information contained in this database may provide useful for creation of an interjurisdictional management framework.

Keywords: paddlefish, migratory fishes, migratory fish management, migratory fish conservation, Mississippi Interstate Cooperative Resource Association paddlefish stock assessment

TEMPORAL AND SPATIAL TRENDS OF VARIOUS WATER QUALITY PARAMETERS AND CHLOROPHYLL CONCENTRATIONS WITH IN THE 59-MILE REACH OF THE MISSOURI NATIONAL RECREATIONAL RIVER

Danielle J. Quist, Daniel A. Soluk, Mark D. Dixon, and Tim Cowman
Missouri River Institute, Department of Biology, University of South Dakota, Vermillion, SD 57069

The 2003 Missouri River Biological Opinion calls for the restoration of 20% of the shallow water habitat (SWH) which existed prior to the construction of the Missouri River Bank Stabilization and Navigation Project (BSNP). Numerous techniques of restoration are being implemented, including flow management, channel widening, restoring chutes and side channels, and/or manipulation of summer flows. Monitoring the restored SWH is crucial to assess their contributions to the Missouri River ecosystem as a whole and provide feedback for future SWH restorations. The Missouri River Institute has taken on the responsibility of helping to monitor three of these restored SWH (RM 806, 777, and 754) as well as three existing natural SWH (RM 774, 766, and 757) along the 59-mile reach of the Missouri National Recreational River (MNRR). Samples were collected monthly in June-Sept. 2010 from the 3 reconstructed and 3 natural backwaters, as well as adjacent main channel sites. Abiotic measurements included: ammonia, nitrate, total phosphorus, alkalinity, total suspended solids (TSS), total dissolved solids (TDS), temperature, conductivity, and turbidity. Chlorophyll a concentrations were also measured and collected at the same time. Zooplankton and macroinvertebrate samples were collected but haven't been fully identified and analyzed at this time. Preliminary results indicate significant temporal trends in nitrate, ammonia, TSS, phosphorus, TDS, temperature, turbidity, and chlorophyll concentration ($p<0.05$). Chlorophyll a concentration trends indicate a more light limited then nutrient limited system. Differences and comparisons between natural and restored backwaters will also be examined.

Keywords: chlorophyll a, water quality, shallow water habitat, TSS, Missouri River

LIPID FLUX FROM THE UPPER MISSISSIPPI (UMR) AND ILLINOIS RIVERS (IR) BY INSECT EMERGENCE: PRELIMINARY RESULTS

William Richardson[1], Brent Knights[1], Patrick Kelly[2], and Roger Haro[2]. [1] US Geological Survey Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Rd., La Crosse, WI 54603. [2]University of Wisconsin, Department of Biology, Rivers Studies Center, La Crosse, WI 54601

Rivers are known to provision floodplain ecosystems with catchment-derived nutrients by flooding and marine-derived material through fish migrations and subsequent carcass consumption. Insect emergence is another, but poorly understood, provisioning mechanism. Recent studies in lakes have shown that significant insect emergence can influence insectivore (e.g., birds, spiders, etc.) foraging patterns and likely survival. Despite perceived importance, insect emergence on the UMR has not been quantified and only limited data exits for the IR. Further, no studies have characterized the relative importance of insect-derived nutritive material including lipids and associated essential fatty acids to floodplain biota. Finally, nothing is known about the effect of non-native planktivores (e.g., Asian Carps) on insect emergence via competition for plankton resources. Here we report preliminary data on patterns of lipid and fatty acid flux (FA) by way of insect emergence from two floodplain rivers, and the potential effects of Asian Carp on these patterns.

Emergent insect traps (0.25 m^2) were placed at backwater sites with (carp-free) and without Asian Carp (carp) in the Illinois or Upper Mississippi River. Traps were run every 3 to 6 days between May 17 and June 25 in the UMR, or May 27 and July 9 in the IR; these periods correspond to the observed Tree Swallow nesting at each site. Tissue was sampled from seston, emergent insects, fish and Tree Swallow nestlings for FA analysis.

Preliminary analyses indicate that insect emergence was dominated by chironomids at all sites. By late June (day 31 IR), the cumulative tissue FA in emerging chironomids from IR carp sites was lower (~6 to 11 mg/m^2) than the IR carp-free sites (~16 to 26 mg/m^2). By mid July (day 43), however, the cumulative FA content of chironomids from one IR carp site (~22 mg/m^2) was similar to IR carp-free sites. The cumulative total FA content of chironomids at the UMR carp-free sites was low and ranged from ~3 to 12 mg/m^2 by late June (day 40). Similarly, cumulative ω-3 FA in adult chironomids at IR carp-free sites was ~ 4 to 6 mg/m^2, whereas at IR carp sites ~1.8 to 4 mg/m^2 ω-3 FA had accumulated by mid July. Cumulative ω-3 FA was low (~0.6 to 1.8 mg/m^2) at UMR carp-free sites by late June.

Insect emergence clearly provides significant quantities of lipids to floodplain ecosystems of the Illinois and Upper Mississippi Rivers. The Illinois River produced a greater flux of lipids via chironomid emergence than did the Upper Mississippi River, but Asian Carp might reduce the potential flux in the Illinois River. Data on specific fatty acid dynamics and incorporation to avian insectivores (Tree Swallows) are being analyzed, as is the relation of lipid dynamics with algal mass and composition.

Keywords: insect emergence, Chironomidae, lipids, fatty acids, Asian Carp, Navigation Pool 8, Illinois River

TRACING ENERGY FLOW PATHWAYS TO FISH USING FATTY ACIDS AND STABLE HYDROGEN AND OXYGEN ISOTOPES

Neil P. Rude [1], Jesse T. Trushenski [1], Alex L. Sessions [2], and Gregory W. Whitledge [1]
[1]Fisheries and Illinois Aquaculture Center, Southern Illinois University Carbondale, Carbondale, IL 62901. [2]Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91106.

Recent studies have demonstrated that use of stable carbon isotopes and fatty acid biomarkers in combination can be a powerful approach to elucidate trophic relationships in aquatic ecosystems. Stable δ^2H and $\delta^{18}O$ isotope ratios of lipids and essential fatty acids in fishes may reflect environmental δ^2H and $\delta^{18}O$ signatures, enabling identification of the importance of floodplain lake and riverine energy sources for large river fishes. However, relationships between water and fish lipid or fatty acid δ^2H and $\delta^{18}O$ have not been examined. The objectives of this study were to determine whether fatty acid profiles of bluegill differed among rivers and lakes that differed in water δ^2H and $\delta^{18}O$ and to characterize relationships between water and fish lipid δ^2H and $\delta^{18}O$. Fatty acid profiles of bluegill were different among sites (lake and riverine sites); bluegills could be identified to their environment of capture with 83.5% accuracy based on their fatty acid profiles. δ^2H and $\delta^{18}O$ of bluegill lipids were correlated with water δ^2H and $\delta^{18}O$. δ^2H of individual fatty acids were strongly correlated with water δ^2H. Results suggest that fatty acid profiles in conjunction with lipid or fatty acid δ^2H and $\delta^{18}O$ may provide new insights into energy sources and environments (e.g., floodplain lakes vs. main channel) that ultimately support fish production in large river ecosystems.

Keywords: Stable Isotopes, Fatty Acids, Energy Sources, Large Rivers, Floodplain Lakes

EFFECTS OF DESICCATION ON TWO LIFE STAGES OF AN INVASIVE SNAIL ITS NATIVE COHABITANT

Gregory J. Sandland[1,2], Allison M. Wood[1], Cody R. Haro[1], and Roger J. Haro[1,2]. [1]Department of Biology, University of Wisconsin – La Crosse, 1725 State Street, La Crosse WI 54601. [2]River Studies Center, University of Wisconsin – La Crosse, 1725 State Street, La Crosse, WI 54601

Invasive species are of critical concern as they have the potential to rapidly alter biotic systems around the globe. The upper Mississippi River system has been recently invaded by the aquatic snail, *Bithynia tentaculata*, which spread from the Great Lakes region. In addition to potentially impacting the local aquatic snail community, *B. tentaculata* also carries three parasites which kill thousands of migrating waterfowl annually. Although this invader is having detrimental impacts on a number of species in the UMR region, little is known regarding 1) the tolerances of *B. tentaculata* to abiotic stresses in this area, and 2) how stress thresholds in this species compare to native species across developmental stages. To help fill in these informational gaps, we conducted a series of laboratory experiments aimed at assessing the tolerances of *B. tentaculata* and a native snail (*Physa gyrina*) to desiccation at two stages of ontogeny (eggs and adults).

Results showed that *P. gyrina* egg masses were more tolerant to a transient desiccation period (9 hours) than *B. tentaculata* egg masses as evidenced by their higher hatching success. Conversely, adult survival in *B. tentaculata* was much greater than that of *P. gyrina* after a longer desiccation period (1 week). Although superior tolerance to drying varies between developmental stages, *B. tentaculata* may have an overall advantage due to its ability to endure prolonged drying at maturity. These results suggest that hydrologic fluctuations in the UMR may contribute to reductions in *P. gyrina* numbers, potentially facilitating *B. tentaculata* colonization and the spread of waterfowl infections.

Keywords: *Bithynia*, *Physa*, species invasions, desiccation, ontogeny

CONSERVATION AND MANAGEMENT OF ORNATE BOX TURTLES (*Terrapene ornata*) AT UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

Jeramie Strickland, Ed Britton, and Russell Engelke
United States Fish and Wildlife Service, Upper Mississippi National Wildlife & Fish Refuge
7071 Riverview Road, Thomson, Illinois 61285 U.S.A.

In 2008, a long term comprehensive study of ornate box turtles (*Terrapene ornata*) was implemented within the sand prairies of the Upper Mississippi River National Wildlife and Fish Refuge in northwest Illinois. In 2010, the study expanded to include two Illinois Nature Preserve sites and two private properties. The primary goals were to identify the population status of ornates within these areas and to implement best management practices to protect this imperiled species. A secondary goal was to reestablish a viable population of ornates at Lost Mound Sand Prairie. To date, field surveys have found fewer ornate populations and smaller numbers of individuals within each population than expected. On the nine prairies surveyed, three contained no ornates, three had only a few individuals, and three had viable populations. Radio transmitters were attached to 66 turtles located at five prairies to identify habitat use, home range size and brumation characteristics. Through the use of automated telemetry, we are quantifying activity patterns and specific behaviors such as nesting events. We are also examining the efficacy of using radio transmitters with tilt sensors to quantify patterns of male courtship activity. Our nest predation study showed a mean predation rate of 30% with values that ranged as high as 56%. The first year of a headstart program was successful with the release of four turtles into the wild where the young turtles exhibited movement patterns similar to wild turtles and entered into brumation when fall temperatures plunged. Habitat management techniques were adopted to protect and conserve ornates. Environmental education programs were implemented to provide public awareness on the plight of the imperiled ornate box turtle. Project partners included local, state and federal agencies, conservation organizations, universities, zoos, commercial developers and private land owners.

Keywords: ornate box turtle, *Terrapene ornate*, sand prairie, Upper Mississippi River National Wildlife and Fish Refuge, telemetry

OPPORTUNITIES FOR CLIMATE CHANGE ADAPTATION IN UPPER MISSISSIPPI RIVER LEVEED FLOODPLAINS

Charles Theiling. U.S. Army Corps of Engineers, Rock Island District, Economic and Environmental Policy Branch, PO Box 2004, Clock Tower Bldg., Rock Island, IL 61204-2004,

Global and regional climate change models predict 40 percent more annual precipitation in the Upper Midwest, with much delivered in large storm events. Increasing river discharge over the last 70 years has changed the hydrologic conditions that UMR navigation and flood damage reduction infrastructure was designed for almost 100 years ago. Historic changes and the high potential for future change creates new challenges and opportunities for large scale floodplain management.
Challenges for floodplain farmers in the leveed floodplain include increased risk of catastrophic flooding and increased costs for pumping interior drainage and floodwater seepage. Challenges for natural resource managers include potential habitat change and reduced ecosystem resiliency because of the decoupling of the river from the floodplain. Other factors influencing large scale floodplain management include: FEMA map modernization, rate changes in the National Flood Insurance Program, and levee decertification which all create further uncertainty for floodplain land management decisions.

Opportunities for landowners and managers to adapt to changes include traditional infrastructure hardening and intensive resource management which have been investigated in great detail. An alternative integrated floodplain management plan is necessary to optimize a mix of ecosystem management, flood damage reduction, and crop production in the floodplain. Land set-aside programs like the USDA Conservation Reserve Program and Wetlands Reserve Program have demonstrated great ecological value and their immense popularity with landowners results in substantial unmet restoration opportunity because of limited funding. It may be very likely that agriculture economic production loss can be balanced by habitat incentive programs, logging, perennial crops, hunting fees, flood easements, and ecosystem service valuation. There could also be new opportunities to expand flood easements for appropriate levee districts to act as "release valves" that would be allowed to flood first to provide greater levels of flood protection to other levee districts.

Ecosystem management and flood damage reduction can be greatly enhanced in the UMR leveed floodplain and basin. It is important to build, calibrate, and validate integrated models to estimate ecosystem and economic production in the Upper Mississippi River floodplain and watershed. The models can help evaluate alternative floodplain management scenarios and target land use to the most appropriate sites. Climate change adaptation incorporates all Corps business lines (i.e., flood damage reduction, navigation, and ecosystem restoration) and will also incorporate other agency, NGO, and private sector economic interests.

Keywords: climate change, floodplain management, ecosystem restoration, ecosystem services

THE ECOHYDROLOGY OF LARGE RIVER BASINS

Martin C. Thoms. Riverine Landscapes Research Laboratory, University of New England, New South Wales 2351, Australia

Studies of physical structures within large river basins and their association with ecological communities tend to rely upon stream ordering or or other longitudinally-based classifications of river ecosystems. These relatively simple approaches can only provide a crude estimation of the physical and ecological make of stream networks. Most characterizations of rivers fail to acknowledge the importance of their hierarchical organisation and, as a consequence, use incorrect variables in their attempt to define stream networks. An alternative typology for characterizing riverine landscapes is available. It focuses on a specific level within the riverine landscape hierarchy, employing a set of regional, catchment and valley criteria for developing a quantitative river characterisation scheme. Fifteen geomorphic variables are used in this desktop based, objective, quantitative river typing scheme. These variables are extracted from digital data using a series of automated GIS modules which are analysed using a series of multivariate analyses. The approach allows for the self emergence of a distinct set of 'river types' within a stream network. The applicability of the approach to the study of the ecohydrology of the Murray Darling Basin, Australia is demonstrated. The Murray Darling Basin, has a catchment area in excess of 1.6 million km^2 with the combined lengths of the two principal rivers (the Murray and the Darling) being the sixth longest river system in the world. The composition of 'river types' within the stream network of the Murray Darling Basin displays a mosaic of functional process zones and this spatial organization is associated with distinct ecological communities. The approach taken highlights a number of the tenets put forward in the recent Riverine Ecosystem Synthesis.

Keywords: Riverine networks, ecohydrological diversity; complex systems; RES

IDENTIFYING RECRUITMENT SOURCES OF ASIAN CARPS IN THE ILLINOIS RIVER

Greg Whitledge, Jacob Norman, Quinton Phelps, and Darcy Ernat
Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901-6511

Knowledge of recruitment sources for Asian carps inhabiting the Illinois River and Chicago waterways would be valuable for directing population reduction efforts intended to supplement electrical barriers in the Chicago Sanitary and Ship Canal and limit the probability of Asian carps invading the Great Lakes. However, it is unknown whether Asian carps in the upper portion of the Illinois River and Chicago area waterways are of local origin or are primarily migrants that have recruited from downstream river reaches. The extent to which the Mississippi and Missouri Rivers contribute Asian carp recruits to the Illinois River is also unknown. The objectives of this study are to identify natal environments of adult Asian carps in the Illinois River using stable isotope and trace element analyses of otolith cores. Results to date indicate that adult silver carp

collected from the upper Illinois River originated primarily from within the Illinois River itself, but some individuals emigrated from the middle Mississippi River and others recruited from floodplain lakes along the lower Illinois River valley. Because of the geographically widespread points of origin for individual fish, our results suggest that efforts to substantially reduce Asian carp abundance in the Illinois River drainage and limit propagule pressure on the electric barriers should be directed at a similarly broad geographic scale.

Keywords: bighead carp, silver carp, *Hypophthalmichthys*, otolith chemistry, Illinois

POSTER PRESENTATION ABSTRACTS
ALPHABETICAL LISTING (by Presenting Author)

ABIOTIC EFFECTS ON THE ZOOPLANKTON COMMUNITY STRUCTURE OF THE UPPER MISSISSIPPI RIVER

Michael S Ahmann[1], Michael D. Delong[1], William B. Richardson[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona MN 55987. [2]U.S. Geological Survey, Upper Midwest Environmental Science Center, La Crosse, WI 54602.

Zooplankton are an important part of the food web in large river ecosystems through the predation of larval fish, planktivorous fish, and various filter feeding invertebrates. Certain abiotic factors influence the distribution of these organisms throughout different river habitats. The objective of this study was to identify abiotic factors that regulate community structure of crustacean and rotifer zooplankton in different hydrogeomorphic patches of the Upper Mississippi River. Cladoceran, copepod, and rotifer samples were taken monthly at multiple sites from June - September 2009, and June - August 2010. Abundance of aquatic vegetation, current velocity, water temperature, pH, conductivity, Secchi depth, water depth, and turbidity were measured at each sample site. The major types of habitats sampled were main channel, side channel, channel enbankment, slackwater lakes, and horseshoe island slackwaters. Preliminary results indicate a negative correlation between abundance of aquatic vegetation and several species of *Daphnia*. This might be a result of low densities of *Daphnia* spp. and an unusually high abundance of vegetation in 2010. There was also a negative correlation of turbidity and depth with some Cladocera taxa, possibly because of the higher turbidity of the deeper channel sites. Additional analysis will be presented to address abiotic influences on rotifers and more detailed examination of potential measures of hydrological retention.

Keywords: Upper Mississippi River, zooplankton, Rotifera, Cladocera, Crustacea

BIOTIC INTERACTIONS AND REGULATION OF ZOOPLANKTON COMMUNITIES IN A HYDROLOGICALLY DYNAMIC LARGE RIVER

Joshua L. Anderson[1], Michael D. Delong[1], William B. Richardson[2]. [1]Large River Study Center, Biology Department, Winona State University-Winona, MN 55987. [2]Upper Midwest Environmental Science Center, U.S. Geological Survey, La Crosse, WI 54602.

Biotic interactions potentially play an important role in the structuring of communities in riverine ecosystems. There have been only limited studies of zooplankton interactions and the factors affecting zooplankton community structure in rivers. The objective of this study is to gain a better understanding of competition and predation of zooplankton in lotic systems. Samples were taken monthly from June - September 2009 and June - August 2010 in different patch types reflecting different degrees of connectivity to the mainstream Upper Mississippi River. Rotifers, crustacean zooplankton, chlorophyll concentrations, total nitrogen and total phosphorus were

analyzed and compared for this study. Data from 2009 and 2010 were combined and compared to incorporate the hydrological variability over the 2-yr period. Significant positive interactions were noted among the taxa of the crustacean zooplankton over the period of the study. There were no significant negative interactions between crustacean zooplankton. The positive correlation of copepods is likely the result of similar response to changing abiotic conditions. There was a significant negative correlation between cyclopoid copepods and the number of rotifer taxa and total densities of rotifers in 2009. Some cyclopoid copepods prey on rotifers, which is likely the cause for the negative correlation between rotifers and cyclopoids. Additional analysis will be performed to examine interactions between rotifer and crustacean zooplankton over the combined two years of study.

Keywords: zooplankton, biotic interactions, large river, hydrologically dynamic system, Cladocera, Rotifera

MISSISSIPPI RIVER WATER QUALITY ASSESSMENT AT 9-MILE ISLAND AND ITS EFFECTS ON TURTLE TRAPPING

Casey J. Arensdorf, Adam R. Hoffman, Christina M. Chamberlain, Andrew L. Reese, Mark R. Hennessy, Gerald L. Zuercher, Garrett J. Sheldon, Christopher W. Kuhle. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

Water samples were collected to assess water quality in conjunction with the trapping of turtles around 9-Mile Island within the Upper Mississippi River Wildlife and Fish Refuge (Pool 12). Sampling took place from May to September in both 2009 and 2010. The four sites sampled were the main channel side of the island (MC), the Molo Slough side of the island (MS), a backwater area located on the south end of the island (BW), and a small side-channel that runs within the island (SC). Water samples were collected and analyzed to: (1) determine if water quality affects the number or variety of turtles captured at specific sites; and (2) determine if temporal and spatial changes in water quality occur at specific sites. Parameters tested were pH, dissolved oxygen, nitrite, nitrate, chloride, dissolved reactive phosphorus, total phosphorus, and total suspended solids. No significant correlation was found between water quality and turtle captures. Small differences in water quality were noted in both 2009 and 2010 among the sites. In addition, yearly differences in water quality parameters were noted when years 2009 and 2010 were compared.

Keywords: water quality monitoring, Upper Mississippi River, 9-Mile Island, nitrogen, phosphorus

TROPHIC COMMUNITY COMPOSITION WITHIN A LATERALLY COMPLEXITY RIVER

Christopher W. Bieganek[1], Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759.

Variation in hydrology and geomorphology between habitats in large rivers has the potential to affect trophic composition of fish communities. Little research has been performed on this topic in respect to large rivers. The objective of our study was to determine if trophic composition of fish communities in the Upper Mississippi River varied predictably by habitat. The study area included two sites on the Upper Mississippi River – one near Winona, MN and another near La Crosse, WI. Three habitats were sampled at each site: main channels, secondary channels, and backwaters. Fish were collected by boat electrofishing in nearshore areas for 5 - 10 min for each of five transects. Fish were captured by net, identified, weighed, and measured. Species were placed into piscivore, invertivore, omnivore, and planktivore feeding guilds. We compared habitats by proportion of community represented by each feeding guild and relative density (catch per unit effort). Invertivores were the most abundant feeding guild in all three habitats. Secondary channels had the smallest proportion of invertivores. Omnivores were most abundant in backwaters, and comprised the lowest proportion of the community in the main channels. Piscivores showed no difference in abundance between habitats. Preliminary results indicate there are differences in trophic community composition between the habitats. Further analysis will be performed to determine the nature of the differences in trophic community composition as a function of their location laterally.

Keywords: Upper Mississippi River, lateral complexity, feeding guilds, large river management, fish

EVALUATION OF A VOLUNTARY PROGRAM TO CURTAIL BOAT DISTURBANCE TO MIGRATING WATERFOWL USING POOL 7 OF THE UPPER MISSISSIPPI RIVER

Kevin P. Kenow[1], Brian Gray[1], James Nissen[2], **Pete Boma**[1], Steve Houdek[1], Jessica Larson[2], and Luke Fara[1]. [1]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, WI 54650.

The Lake Onalaska Voluntary Waterfowl Avoidance Area (VWAA) is a 13.6 km^2 (3365 acre) area within Lake Onalaska in Navigation Pool 7 of the Upper Mississippi River. The VWAA was established to reduce boating disturbance and therefore provide a quality resting and feeding stopover area for migratory waterfowl on the Upper Mississippi River National Wildlife and Fish Refuge. Boaters are encouraged to voluntarily avoid traveling through the VWAA during October 15 – mid November, which traditionally coincides with peak use of the area by

diving ducks. The U.S. Geological Survey and the U.S. Fish and Wildlife Service have collaborated to monitor boater compliance with the VWAA program. Boating activity has been monitored several times (1986-1988, 1993, 1997, 2004 and again in 2010) to assess compliance with the VWAA since the limited entry area was established in 1986. Objectives of these studies were to determine boater compliance with the VWAA, identify the types of watercraft and boating activities involved in intrusions into the VWAA, and document waterfowl disturbance resulting from intrusions. Boating activity was observed from an elevated site on the Minnesota bluffs adjacent to Lake Onalaska. During fall 2010, we conducted observations during the VWAA period on 19 days that were systematically selected. Here we report on boating activity, intrusion, and disturbance rates during 2010 and compare rates to previous years. We also identify boating activities that were most likely to result in intrusion into the VWAA and associated disturbance to waterfowl.

Keywords: boating, disturbance, intrusion, compliance, waterfowl

EFFECTS OF BIGHEAD AND SILVER CARP ON EMERGENT INSECTS IN THE UPPER MISSISSIPPI RIVER BASIN

Patrick T. Kelly[1], Roger J Haro[1], Brent C. Knights[2], and William B. Richardson[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

Bighead (*Hypophthalmichthys nobilis*) and Silver (*H. molitrix*) carp are two invasive fish species that have had large effects on the ecology of the Upper Mississippi River (UMR) and associated tributaries since their introduction. Because of their voracious appetite and planktivorous feeding habits, they have the possibility of removing or altering a large portion of the available seston that many aquatic insects use as a food source. Aquatic insects serve as an intermediary between producers and organisms at higher trophic levels, as well as provide an important subsidy of energy to the terrestrial system as they emerge as adults. The objective of this study was to determine the impact that Asian carp have on the emergent insect communities in the areas that they have invaded. Floating traps (surface area = 0.25 m^2) were used to sample emerging adult insects, and were placed in study sites with and without Asian carp. Sites without carp include Lawrence Lake and Shellhorn (Navigation Pool 8 - UMR) and Emiquon North and Emiquon South (Emiquon National Wildlife Refuge - Illinois River). Sites with Asian carp include Big Lake North and Big Lake South (Illinois River). Insects were sorted, identified to family, dried and individually weighed to to determine emergent biomass rates. Initial results show a family richness of 33, 33, 30, 29, 24, and 25 families collected for Big Lake North, Big Lake South, Emiquon North, Emiquon South, Lawrence Lake, and Shellhorn sites, respectively. In total, 55 families were collected. Although many of the Illinois River samples have yet to be processed for biomass estimation, several trends have developed. Chironomid midges emerged in the greatest proportion averaging between 36.9% - 86.9% of the biomass (mg dry wt.) per site. Ephydrid flies emerged as the second most common insect averaging between 1.3% - 12.7% of the biomass per site. Emergence rates ranged between 10 – 30 mg dry wt. m^{-2} d^{-1} for

each site. These data, along with water chemistry, lipid, and seston data, will be analyzed to evaluate the overall effects of invasive carp on emergent insects.

Keywords: Asian carp, aquatic insects, emergent insects, energy subsidies

BRINGING BACK THE LIGHT: DAYLIGHTING THE BEE BRANCH CREEK

Christina M. Chamberlain, Andrew L. Reese, and Adam R. Hoffman
Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

The City of Dubuque has initiated a $32 million project, funded in part by the EPS and Clean Water State Revolving Funds, to restore a portion of the Bee Branch Creek, which flows into a detention basin before empting into the Mississippi River. The project plan is to daylight 4,500 feet of Bee Branch Creek currently flowing through storm sewers to provide aquatic habitat, increase aesthetic value, help control flood waters, and increase water quality. Daylighting is a little studied process that entails deliberately exposing some or all of the flow of a previously covered river, creek, or storm water drainage. Monthly at the outflow of Bee Branch Creek samples of water were taken and analyzed for dissolved oxygen, temperature, nitrate, nitrite, pH, phosphate, chloride, water temperature, transparency, water depth, water velocity, water hardness, alkalinity, dissolved reactive phosphorus, total phosphorus, and total metals using standard methods. Bed sediment samples were collected and analyzed for water content, organic matter, bioavailable phosphorus, and total phosphorus. Our results have helped set a baseline for water quality changes to be measured as the restoration project is completed. This research will discuss the potential to predict the changes in the water quality that can be expected after the daylighting project is complete.

Keywords: daylighting, Bee Branch Creek, water quality monitoring

PATTERNS OF PHYTOPLANKTON CHLOROPHYLL AND NUTRIENTS IN RIVERINE PATCHES OF DIFFERING HYDROLOGICAL RETENTION

Qurratul-aine Jadran[1], Michael D. Delong[1], and William B. Richardson[2]. [1] Large River Studies Center, Biology Department Winona State University, Winona, MN 55987. [2]Upper Midwest Environmental Science Center, U.S. Geological Survey, La Crosse, WI 54602.

Water quality in rivers is vital to humans and to maintenance of biotic and ecological integrity. These conditions will vary spatially in rivers, especially in the complex mosaic of floodplain rivers. There is still, however, a limited understanding of differences in functional characteristics of patches within these complex rivers. The objective of this study is to examine the influence of hydrological retention on phytoplankton abundance and nutrient availability relative to hydrological retention. The study was conducted in the Upper Mississippi River between

Winona, MN and Trempealeau, WI from June – September 2009 and June – August 2010. Water samples from 12 - 16 sites were taken June - Sept 2009 and June - Aug 2009. Water samples were obtained for determination of phytoplankton chlorophyll concentration, total nitrogen, total phosphorus, ammonia, and nitrate+nitrite. Other physical-chemical measurements were taken at each site. Preliminary analysis indicates chlorophyll concentration and availability of nutrients is influenced by short-term changes in discharge. There is a weak linear relationship between chlorophyll concentration, NH_4, NO_3 and soluble reactive phosphorus. There is, however, a slightly stronger polynomial relationship of chlorophyll concentration to total nitrogen and total phosphorus. Additional analysis of these patterns relative to hydrological variables will be given during our presentation.

Keywords: Hydrological retention, phytoplankton, chlorophyll, nutrient, total phosphorus, total nitrogen, Upper Mississippi River

SPATIAL CLUSTERS OF TOTAL NITROGEN (TN), TOTAL PHOSPHOROUS (TP), AND TN:TP IN THE UPPER MISSISSIPPI RIVER, USA.

Nathan R. De Jager and Jeffery N. Houser, USGS Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

We identified spatial clusters of high and low total nitrogen (TN), total phosphorous (TP), and TN:TP ratio within five reaches of the Upper Mississippi River during spring and summer and tested for associations between cluster presence and four strata (main channel, side channel, backwaters, and impounded areas from 1994-2008. Spatial clusters of observations with low nutrient concentrations or ratios were designated as LL clusters, whereas those that had high concentrations or ratios were designated HH clusters.

The distribution of HH clusters of TN among strata was nearly identical to our sample distribution during both spring and fall, indicating that spatial clusters of high TN occur in all strata and with an approximately random distribution. In contrast, LL clusters were positively associated with backwaters ($p<0.001$) and negatively associated with all other strata ($p<0.05$) during both seasons. Over 95% of 327 LL clusters of TN during spring and the 393 LL clusters during summer were found in backwaters.

HH clusters of TP were found in all strata during spring, with a distribution among strata that closely approximated our sample distribution. However, over 96% of all HH clusters of TP were found in backwaters during summer. LL clusters of TP were rare during summer (n=21), but during spring (n=98), LL clusters of TP were found in all strata.

As for HH clusters of TN, the distribution of HH clusters of TN:TP closely matched our sample distribution during both seasons, although they were negatively associated with backwaters during summer ($p<0.001$). In contrast, LL clusters of TN:TP were positively associated with backwaters during spring and summer and negatively associated with all other strata during both

seasons. Greater than 96% of the TN:TP LL clusters during spring (n=181) and summer (n=358) were found in backwaters.

Our results are consistent with previous, smaller-scale studies suggesting that backwaters are low in N (due to low N delivery and rapid N removal by denitrification) and high in P during summer (due to P release from sediments). Importantly, our results indicate that the finer-scale patterns observed in backwaters from other studies appear to occur consistently throughout the five reaches of the UMR studied here, indicating that spatial clustering of low TN:TP in backwaters is a widespread phenomenon. In contrast, the occurrence of spatial clusters of TN, TP and TN:TP in other strata varied among river reaches and appear to depend on more local circumstances.

Keywords: backwater, cluster, denitrification, nutrient concentration, spatial pattern

EFFECTS OF CLIMATE CHANGE ON ADULT AND JUVENILE FRESHWATER MUSSELS

Alissa Ganser[1], Teresa Newton[2], and Roger Haro[1]. [1]University of Wisconsin–La Crosse, River Studies Center, La Crosse, WI 54601. [2]USGS, La Crosse, WI 54603.

Freshwater mussels are a diverse, but imperiled fauna and may be especially sensitive to increasing water temperatures because of their patchy distribution, limited dispersal, limited mobility, spatial and temporal dependence of their larvae on host fish, and the fact that they already inhabit fragmented landscapes. Recent research suggests that many mussel species are currently living near their upper thermal limits and that increased temperatures may alter physiological traits of freshwater mussels. I plan to address the following objectives for my Master of Science research: (1) increased temperatures alter the timing of glochidial release in freshwater mussels; (2) glochidia released prematurely from mussels exposed to increased temperatures will have reduced viability; and (3) elevated temperatures will adversely affect physiological traits in adult and juvenile mussels. Because different species react differently to thermal stress, I will use the functional niche approach that has been developed for lotic macroinvertebrates to ensure that the breadth of species responses in this diverse faunal group is captured in the study design. Test endpoints include glochidial release, glochidial viability, oxygen consumption, nitrogen excretion, and heat shock protein in adults and heart rate, growth rate, and oxygen consumption in juveniles. These data, and those of a parallel study on lethal responses of mussels to elevated temperatures, will be used in a downscaled global climate change model. This research will provide an understanding of the thermal preferences of freshwater mussels that can be utilized by federal and state resource managers to forecast species responses to climate change and to develop adaptation strategies to mitigate any adverse effects.

Keywords: freshwater mussel, climate change, physiology, reproduction, thermal stress

CHARACTERIZING SOUTHERN FLYING SQUIRRELS IN EASTERN IOWA

Christine M. Grannis, Tori M. Ballweg, Michael Collins, Gerald L. Zuercher, and David E. Koch. Department of Natural & Applied Sciences, University of Dubuque

Southern flying squirrels, *Glaucomys volans*, are considered a species of "Special Concern" in Iowa; their abundance is "Uncommon" and their population trend is "Unknown." There are relatively few records for the species within the state despite their reported distribution in Iowa including all but the extreme northwest corner. As part of a pilot project, we documented a population of southern flying squirrels in Mines of Spain Recreation Area, a state park in situated within the bluffs along the Mississippi River. We established two transects along park trails which were approximately 1-km apart where flying squirrels had been previously captured. Ugglan® multiple-capture traps were placed between 4 and 5 meters off the ground in large trees, baited with peanut butter, and checked each morning. We successfully captured and tagged 20 individuals (12 males and 8 females) and recaptured 10 individuals (8 males and 2 females), some as many as six times. While both recaptured females exhibited strong site fidelity, five males were captured on both transects. Average daily movements by males were approximately seven-times greater than those by females. This difference needs further investigation as it seems to suggest that males utilize much larger areas than females. Our success in capturing and recapturing southern flying squirrels will be the basis for development of long-term monitoring and assessment of this species in eastern Iowa. In addition, we intend to further investigate movement patterns within the park and adjacent areas.

Keywords: *Glaucomys volans*, Iowa, movements, southern flying squirrel

SEDIMENTATION IN LAKE POTTER BETWEEN 1935 AND 2010, UPPER MISSISSIPPI RIVER POOLS 16

Ryan Hancock and Reuben Heine. Geography Department, Augustana College, Rock Island, IL

Backwater sedimentation is an issue of great concern for the Upper Mississippi River (UMR) because backwater areas play a vital role in the biology, recreational use, ability to attenuate flood waters, and many other important factors. Backwater sedimentation has been accelerated since the 1930s because of the installation of navigation lock and dams which impounds water behind the dams and increases the durations of river flow and associated sedimentation in to these areas. Being able to estimate the historic rates of sedimentation is important for understanding the environmental impact of impoundments and for making future predictions concerning the fate of the backwater areas. A review of literature found that sedimentation rates have been estimated for backwater and off-channels areas in Navigation Pools 4 – 14 and sediment-accumulation rates have been found to range from fractions of 1 cm/yr to ~4 cm/yr. This present study utilizes a simple sounding rod methodology to contribute new information about sedimentation rates for Lake Potter, a backwater area in pool 16 near Rock Island, IL. A typical challenge for the estimation of sediment rates is that the grain texture of prehistoric sediments resembles closely the grained texture of the historic sediments. For Lake Potter, the

contrast is much greater because this backwater area was created as part of a 1930s-era sand and gravel operation. Therefore today, a packet of flocculent fine-grained sediments (post about 1935) rest on a bed of coarse sand (of the Tazewell Terrace). We found that a simple sounding rod was sufficient to locate the top and bottom of the fine-grained historic sediments and that this simple method enabled us to make 56 observations in the 16 hectares (40 acres) Lake Potter. From these data we were able to produce sediment thickness maps and found a mean sedimentation rate of 2.57 cm/yr, a minimum rate of 1.00 cm/yr, a maximum rate of 4.19 cm/yr, and a standard deviation rate of 0.87 cm/yr. These values fall within the upper half of rates estimated in other UMR backwater areas.

Keywords: Sedimentation rate, Lake Potter, Rock Island Il, Backwater lake, Sounding rod

TROPHIC POSITION OF PISCIVOROUS FISHES DURING TWO HYDROLOGICALLY DISTINCT YEARS

Courtney N. Heins[1], Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759.

Hydrological dynamics are a critical drive of ecological processes because of their capacity to establish linkages between patches within the river system. This includes food web attributes, including food chain length. The objective of this study is to determine if short-term hydrological differences influence food chain length of piscivorous fishes in the main channel and backwaters of the Upper Mississippi River. Piscivorous fish were collected in 2006 and 2010 using electrofishing. Fish were identified and a 0.5-g tissue sample was removed from piscivores before the fish were released. Gut contents were removed from fish taken in 2010 by gastric lavage. Tissue samples were used to determine carbon and nitrogen stable isotope ratios, which were used to calculate trophic position. There were considerable differences in the annual hydrographs of the Upper Mississippi River from 2006 and 2010. Overall discharge was higher in 2010 than in 2006. This was particularly noticeable June–September when the river was at base flow in 2006. This was in contrast to the multiple flow pulses that occurred during this period in 2010. Trophic position of piscivores was also higher in 2010 than in 2006. *Esox lucius* had the biggest difference in trophic position of fish from the backwaters, whereas *M. salmoides* had the least difference. *M. salmoides* had the greatest difference in trophic position in the main channel while, *M. dolomeiu* had the smallest. We propose that differences in hydrological conditions contributed to differences observed in the trophic position of piscivores. Prolonged periods of high discharge in 2010 may have limited prey lower on the food chain, whereby predators were restricted to piscivory. The prolonged low flows of 2006 may have allowed piscivorous fish to consume a broad range of prey, including invertebrates, which would lead to a lower trophic position for these opportunistic predators.

Keywords: Upper Mississippi River, stable isotopes, trophic position, piscivores, discharge, hydrology

FISH CONDITION UNDER DIFFERENT DEGREES OF GEOMORPHIC COMPLEXITY IN THE UPPER MISSISSIPPI RIVER

JoHannah R. Heller[1], Michael D. Delong[1], James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2]Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

Fish condition has often been an important component of measure used in the analysis of community health. Fish condition as a component of analysis of geomorphic effects on communities has not been applied to use in river studies. Our objective is to ascertain if fish condition to differs between sites relative to their geomorphic complexity. Sampling took place over five sites of differing geomorphic complexity: Lake Pepin, a large lake channel; St. Croix River site 1 (SCR1), with a simple channel and no islands; St. Croix River site 2 (SCR2), with a simple channel and a few islands no longer than 100 m long; Upper Mississippi river site 1 (WIN), with multiple channels and moderate lateral habitat; and Upper Mississippi River site 2 (LAX), with multiple channels and abundant lateral habitat. Electrofishing took place from May to August 2010 at each of the five sites (Pepin, SCR1, SCR2, WIN, LAX), recording species, weight, average and total length. The condition of invertivorous fishes increased with greater complexity in geomorphology. Fish condition was higher in habitats with greater complexity simple open channel systems. The condition of piscivorous and omnivorous fish, in contrast, did not change relative to complexity or location on a longitudinal gradient. The lack of a change in condition of piscivorous fishes may reflect the more generalist nature of riverine predators. We propose the niche space for invertivorous fishes increases, creating an expanded access to prey and spaces in which to feed.

Keywords: fish condition, geomorphology, Upper Mississippi River, habitat complexity, longitudinal gradient

POPULATION CHARACTERISTICS OF RIVER TURTLES ON 9-MILE ISLAND, POOL 12, MISSISSIPPI RIVER

Mark R. Hennessy, Andrew L. Reese, Casey J. Arensdorf, Christina M. Chamberlain, Gerald L. Zuercher, and David E. Koch. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

We have monitored a river turtle community at 9-Mile Island in Pool 12 of the Mississippi River south of Dubuque, Iowa since 2007. The turtle community at 9-Mile Island is consistently dominated by *Chrysemys picta* (painted turtle), with both *Chelydra serpentina* (common snapping turtle), and *Apalone spinifera* (spiny softshell turtle) also occurring regularly. Other turtle species captured at 9-Mile Island, although far less common, include *Graptemys geographica* (common map turtle), *Graptemys ouachitensis* (Ouachita map turtle), and *Graptemys pseudogeographica* (false map turtle). All captured turtles were processed and released on site. For each turtle species we obtained measurements for mass, carapace length, carapace height, carapace width, and tail length. For *Chelydra serpentina* only, we also obtained pre-anal and posterior lobe measurements. When possible, we assigned sex and/or age. We will

present an overview of size characteristics for river turtles at 9-Mile Island during the years 2007 to 2010. We also provide a population estimate for *Chrysemys picta* using the Jolly-Seber method.

Keywords: 9-Mile Island, *Chrysemys picta*, Mississippi River, painted turtle

EVALUATION OF SHOREBIRD RESPONSE TO CHANGES IN VEGETATION ON NEWLY-CONSTRUCTED ISLANDS WITHIN THE WISCONSIN ISLANDS CLOSED AREA, NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER

Steven C. Houdek[1], Craig Kelling[2], Kevin Kenow[1], Brian Gray[1], James Rogala[1], and Pete Boma[1]. [1]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603. [2]Winona State University, Winona, MN 55987.

To date, 18 islands have been completed within the Upper Mississippi River as part of the Environmental Management Program Pool 8 Phase III Habitat Rehabilitation and Enhancement Project. When the islands were initially constructed, shorebirds responded to experimental habitat features that were incorporated into the island design. However, changes in vegetation with island age have the potential to enhance or reduce the capacity of islands to support nesting and migrating shorebirds.

In an effort to better understand the relation between the shorebird use and temporal change in vegetation, shorebird surveys were conducted during July-August 2009 and 2010. Ten shorebird surveys were conducted in 2009; nine surveys were conducted in 2010. Vegetation density, as measured by horizontal visual obstruction, was recorded at 114 random survey points in September 2010. The survey points were distributed across various experimental habitat features incorporated into the island design, and were located on 6 islands within the project area.

Here we report on the survey results for the three most common species, Spotted Sandpiper (*Actitis macularia*), Least Sandpiper (*Calidris minutilla*), and Killdeer (*Charadrius vociferous*), and model bird abundance as a function of habitat feature, plant succession, and year. This study highlights the need to provide resource managers with long-term evaluations of shorebird response to changes in vegetation on newly constructed islands within the Upper Mississippi River basin.

Keywords: shorebirds, vegetation, island habitat, plant succession, Mississippi River

NEW DISTRIBUTIONAL RECORDS AND RANGE EXTENSIONS OF THE CRYSTAL DARTER (*Crystallaria asprella*) IN MISSOURI AS A RESULT OF USING A MORE EFFECTIVE SAMPLING TECHNIQUE

David S. Knuth[1], **Robert A. Hrabik[2]**, Jason W. Crites[2], and Jeff M. Ray[3]
[1]Missouri Department of Conservation, Fisheries Division, Cape Girardeau, MO 63701. [2]Open Rivers and Wetlands Field Station, Jackson, MO 63655. [3]University of North Alabama, Department of Biology, Florence, AL 35630

The Crystal Darter (*Crystallaria asprella*) is "globally vulnerable" to population declines and is thought to be critically impaired or extirpated across much of its range. In Missouri, *C. asprella* (Pisces:Percidae) is state endangered and occurred historically in seven drainages. We surmise *C. asprella* has been poorly detected across much of its range because it is typically found in deep, swift water. Habitats occupied by small-bodied, benthic fishes like *C. asprella* are generally difficult to sample using seines resulting in spurious captures. To improve species detection the Missouri Trawl was designed in 1998. Since then the trawl has been used to describe the current distribution and status of *C. asprella* in Missouri and elsewhere in the Upper Mississippi River drainage. Trawling has resulted in new distributional records and range extensions for the species. Based on historical data, it was thought that *C. asprella* was declining in Missouri; however, our records may suggest otherwise. Preliminary genetic analysis of tissue from *Crystallaria spp.* populations in the United States may indicate a phylogenetic relationship between Minnesota and Missouri populations. Future research should focus on determining the status of extant populations, mapping gene flow among and between populations, and describing reproductive life history.

Keywords: Crystal Darter, *Crystallaria asprella*, Mississippi River, Missouri Trawl, phylogeny, range extension.

SPATIAL DISTRIBUTION OF BOX ELDER IN PROXIMITY TO WATER SOURCE IN FLOOD PLAIN FORESTS

***Katherine Johnson*[1]** and Susan P. Romano [2,3] . [1]Department of Geography, Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

Little information is available for Box Elder (*Acer negundo),* even with the recent emphasis on floodplain and wetland restoration. Box Elder is a common component of the central floodplain forest, but there is a lack of information due to the limited commercial value of the species. The information available for Box Elder is typically on parasitism/predation, mold/slime, gender specific reproductive growth rates, and interaction with other tree species. This research approaches intraspecific interactions within a Box Elder population and its relationship to water bodies. These relationships were determined by observing the spatial relationships of annual radial growth, tree age, and tree diameter at breast height. The average rate of growth within the rings were determined from core samples analyzed using a Velmex dendrochronological high precision measurement system and the MeasureJ2X software program. Core age and year were verified using COFECHA accuracy software. The GPS locations collected at each tree were used in ArcMap to visually interpret spatial clustering and for calculations. Tree clustering positions and sizes were determined by nearest neighbor calculations in ArcMap. The XTools Pro ArcGIS extension was used to calculate the spatial autocorrelations determining the effect of the distance from tree to water source, age versus distance from water source, the growth of individuals versus clump size, and diameter at breast height vs. proximity to other trees. Preliminary research indicates that there is a significant difference in radial annual growth rate, and age with greater distance from the edge of the nearest water body.

Keywords: Box Elder, *Acer negundo*, floodplain, annual radial growth, spatial distribution, dendrochronology

A COMPARISON OF SEDIMENT PARTICLE-SIZE DISTRIBUTIONS BETWEEN 1925 AND 2010, UPPER MISSISSIPPI RIVER POOLS 18 AND 24

Ryan Johnson and Reuben Heine. Geography Department, Augustana College, Rock Island, IL

In 1925, geomorphologist Alvin Lugn collected 235 bed sediment samples from the Upper Mississippi River (UMR) between Rock Island, IL and Cairo, IL. In his study, samples sites were chosen from the main channel, secondary channels, and off-channel slack-water areas. The samples were analyzed to determine particle-size distributions and the results were published in a monograph in 1927. With the exception of Lock and Dam 19, the Lugn survey was completed a decade or more before the construction of the 9-foot-project-era dams and provides a key pre-dam historic record of sediment characteristics for nearly 500 miles of the UMR.
During the summer of 2010, we collected sediment samples from 11 of the same sites that Lugn had sampled 85 years earlier. The 11 sites were deliberately chosen due to their near upstream proximity to a 9-foot-project-era dam (in Dams 18 and 24) because we postulated that sediment

fining would be greatest just above the dams. Locating the Lugn sites required georeferencing Lugn's 1925 maps, comparing these maps to 1930's Brown survey maps, interpreting Lugn's written descriptions, and recording these locations to a common coordinate system for upload to a GPS unit. The 11 samples were drawn from the main channel, secondary channels, and off-channel areas. Particle size analysis was determined by dry sieving.

The results of our comparative analysis do not indicate that the 2010 samples taken near the lower-end of pools consistently have finer sediment particle size than in 1925. In fact, slight coarsening was found for main channel areas while both coarsening and fining were found for off-channel areas. While we knew that it was not ideal, our 2010 sampling took place during high water (near flood stage) which undoubtedly influenced our results. Particle fining may occur during long periods of low flow when the gates on the dams are closed and stream velocities are low but these fine sediments are likely re-suspended and transported during high flows when the gates are lifted. Our study found that the most dramatic changes in particle-size distribution were associated with sites taken near new islands or where islands have disappeared and just below anthropogenic changes such as wing dams. This present study provides a "proof of concept" for using the 1925 Lugn study to assess sediment change. Further research will attempt to match flow conditions and include re-sampling of the 95 samples from the main-channel/thalweg as these samples would provide a longitudinal assessment of sediment changes (including the Open River section below the confluence with the Missouri River).

Keywords: Sediment, Particle-size, Lock and Dams, Pool 18, Historic data.

SHOREBIRD RESPONSE TO ISLAND RESTORATION IN THE POOL 8 WISCONSIN ISLANDS CLOSED AREA ON THE UPPER MISSISSIPPI RIVER

Craig Kelling[1,] Kevin Kenow[2], Neal Mundahl[1], Steve Houdek[2], Pete Boma[2], Eileen Kirsch[2]. [1]Winona State University, Winona, MN 55987. [2]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

The U.S. Geological Survey Upper Midwest Environmental Sciences Center and Winona State University collaborated to assess food availability for migrating shorebirds on several islands that were recently constructed as part of the Environmental Management Program (EMP) Pool 8 Phase III Habitat Rehabilitation and Enhancement Project (HREP). Macroinvertebrates are a key resource for shorebirds, and their abundance can place a major constraint on shorebird response to various island features. The objective of this study was to determine invertebrate abundance among experimental habitat features that were incorporated into the HREP. Over 200 invertebrate samples were collected at three types of island features (mudflat n=39, sandflat n=60, and inter-rock groin shorelines n=105) within the HREP during August 2009. Samples taken at sandflat and inter-rock groin shoreline features were collected along transects extending perpendicular to the shore, from a water depth of 15 cm to an equal distance on shore. Five samples (maximum land height, medium land height, water line, medium water depth, maximum water depth) were collected at each transect. Only 373 invertebrates were identified representing eight different classes/orders (Oligochaeta, Hirudinea, Gastropoda, Amphipoda, Coleoptera,

Diptera, Trichoptera). The numbers of individuals and taxa were highest in mudflat features and successively lower among inter-rock groin shorelines and sandflats. Number of individuals increased with increasing water depth in both inter-rock groin and sandflat transects. Gastropoda were the most abundant organisms in mudflat and inter-rock groin shoreline features, whereas Oligochaeta were the most abundant organisms in sandflat features. All other classes/orders were found in much lower abundances. Results of this study will provide useful information for resource managers as they consider refinements in the design of future island restoration projects on the Upper Mississippi River.

Keywords: Invertebrates, Environmental Management Program, HREP, Habitat Features, Shorebirds

RELATIONSHIP BETWEEN BODY SIZE AND TROPHIC STATUS OF PISCIVOROUS FISHES IN A FLOODPLAIN RIVER

Brian J. Klimek[1] Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. 507-457-2458: [2] Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas 66047-3759

The top of most freshwater food webs is typically occupied by large piscivores. The Upper Mississippi River is home to several large piscivores including some that can grow up to 1.5 m. The objective of this study is to compare stable isotope ratios of piscivores and determine if trophic status changes in response to body size total length has on trophic status within a species as well as amongst several species. To accomplish this objective, piscivores were collected from multiple habitats within the Upper Mississippi River between Winona, MN and Trempeleau, WI . Piscivores were caught via electroshocking and identified, measured for total length, and sampled for a 1 g tissue sample. Tissue samples were analyzed to ascertain to ascertain nitrogen and carbon stable isotope ratios. Seven species of piscivore were sampled from the Upper Mississippi River with *Amia calva* having the largest mean length (669 mm) and *Micropterus salmoides* the smallest mean length (244 mm). Only *Micropterus dolomeiu* appeared to display an ontogenic shift in diet as a function of size. *Amia calva*, despite their large size, displayed a broad range in trophic position indicating a generalist approach in food choice. All other species showed no change in trophic status as total length increased. Lack of trophic change amongst most species indicates that piscivory occurs early in their development and remains fixed throughout the rest of the lifespan for most the species.

Keywords: Piscivores, Upper Mississippi River, trophic status, ontogenic, stable isotope ratios

EFFECT OF LONGITUDINAL GRADIENT ON FISH TROPHIC DYNAMICS IN A LARGE TEMPERATE RIVER

Eric J. Krumm[1], Michael D. Delong[1], and James 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 66047-3759.

Fish trophic dynamics and community structure were previously thought to change along a longitudinal gradient as a function of predictable changes in stream size that lead to greater niche availability. Studies are finding increasing evidence that local/regional complexity and not location on a longitudinal gradient influence community structure and trophic interactions. The objective of this study was to determine if fish trophic dynamics at five different sites were more closely correlated to local complexity or to longitudinal gradient in a large temperate river. Fish were collected by electro fishing, then identified, measured, and returned. Fish were placed into guilds based on public accounts of their feeding habitat and catch per unit effort was calculated. Piscivoreous and invertivoreous species generally increased in density as geomorphic complexity increased. There was no significant difference in the total number of piscivore individuals. Invertivoreous fishes were most abundant at the two sites on the St. Croix River, both of which were intermediate in complexity among the 5 sites. Species abundance correlated to complexity rather than longitudinal gradient. Species diversity was the lowest at the St. Croix sites because of the dominance of *Moxostoma* species. A lack of complexity at the two St. Croix sites could account for the dominance of *Moxostoma* species. Upper Mississippi River sites had the highest species diversity, but had fewer total individuals of each species. Upper Mississippi River sites had relatively high complexity which often leads to increased species diversity, and fewer total individuals of each species. Total numbers of piscivoreous and invertivoreous individuals did not show a correlation to local/regional complexity or longitudinal gradient. Species abundance and diversity were significantly correlated to local/regional complexity rather than longitudinal gradient.

Keywords: fish trophic dynamics, Upper Mississippi River, longitudinal gradient, local/regional complexity, St. Croix River

UNDERSTORY HERBACEOUS COMMUNITIES OF HERON ROOKERIES ON THE UPPER MISSISSIPPI RIVER

John Kurtz[1], Susan P. Romano[2,3], and Sean Jenkins[1]. [1]Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455

Rookeries act as point sources of phosphorous and nitrogen, along with many other soluble ions, upon their environment. Two Great Blue Heron (*Ardea herodias*) rookeries on the Upper Mississippi River allow for an opportunity to evaluate the effect of roosting sites on riparian

herbaceous ecology. Ecological modeling of the understory and groundcover plant communities outside and underneath the rookeries will include edaphic factors of nitrogen, phosphorous, organic matter content, and ph. Additional environmental variables of canopy coverage, elevation, slope, and distance from the river will be measured. This study will investigate if the effect of the birds on the local nutrient dynamics will determine flora underneath the rookeries, or if other abiotic factors are better predictors of herbaceous community distribution.

Keywords: ecological modeling, herbaceous communities, Great Blue Heron, *Ardea Herodias*, Mississippi River

THE DISTRIBUTION AND ABUNDANCE OF FRESHWATER MUSSELS IN THE MISSISSIPPI RIVER IN HANCOCK COUNTY, ILLINOIS

Kenny Kusimba, Dr. Susan Meiers, Dr. Sean Jenkins and James Lamer. Kibbe Biological Station, Department of Biological Sciences, Western Illinois University, Macomb, IL 61455-1390

Freshwater mussels are distributed nearly worldwide. Most species diversity is maximized in the creeks, rivers, and lakes of North America. In the Upper Mississippi River, 51 species have been documented but only 44 species have been found in the surveys conducted within the past 35 years. The purpose of this study is to examine the distribution and abundance of freshwater mussel in the Mississippi River in Hancock County, Illinois, and establish whether mussels can be used to determine the health of this habitat. Freshwater mussels remain in one place for many years and cannot escape adverse conditions, and obtain food and oxygen from the water column. These unique attributes make freshwater mussels suitable indicator organisms.

The collection will utilize five transect sites known to have high diversity of mussels. Each transect will measure 100 m laid perpendicular on the flow, useful information about the selected site such as water pH, temperature, turbidity (NTU), dissolved oxygen and the habitat type will be obtained. Three quadrats of sizes 1- 2 m will be placed within each transect spaced 15 m apart. The quadrats will define the boundaries where mussels will be collected, and will be weighed such that they remain in place in case of strong current. Living mussels and dead shells will be collected to obtain data on species composition and general abundance of mussel populations at these sites**.** In turbid waters, the quadrats will be searched by hand. The mussels in the quadrats will be placed in a mesh bag numbered with the corresponding quadrat location. The mussel shell size (length, height and width) and total body weight will be recorded; abundance, species diversity, and size structure within species will be analyzed to indicate reproductive success. Finally, all living mussels and dead shells will be returned to approximately where they were collected.

Keywords: Freshwater mussels, indicator organism, distribution, Hancock County, Mississippi River

MUSSEL COMMUNITY DISTRIBUTION ALONG 9-MILE ISLAND IN POOL 12 OF THE UPPER MISSISSIPPI RIVER

Lisa A. LaBudde, Samantha M. Sporer, Adam R. Hoffman, and Gerald L. Zuercher. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

Mussels are important water quality indicators and serve as key components in the diet of terrestrial and aquatic animals. The decline of freshwater mussels in the Mississippi River has been well chronicled. We explored mussel population distribution this past field season near 9-Mile Island in Pool 12 of the Mississippi River. Mussels were collected at six sites around 9-Mile Island by pollywogging along twenty five meter transects of randomly selected quadrants around the island. Collected specimens were identified, measured, checked for *Dreissena polymorpha (*zebra mussel) colonization, marked, and released to the same section of the transect from which they were caught. A total of 728 individual mussels, representing fifteen species, were caught and cataloged. The captures of *Cyclonaias tuberculata* (purple wartyback; n = 3) and *Quadrula fragosa* (winged mapleleaf; n = 1) were especially notable as *C. tuberculata* is threatened in Iowa and *Q. fragosa* is federally endangered. The two most captured species, *Amblema plicata* (threeridge; n= 476) and *Fusconaia flava* (wabash pigtoe; n = 176), varied widely in *D. polymorpha* colonization as 72% of *A.plicata* had associated *D. polymorpha* while only 17% of the *F. flava* had associated *D. polymorpha*. Species diversity indices, (Simpson's, D_S, and Shannon's, *H'*), for five sites with adequate captures suggest two patterns: 1) sites with large numbers of captures have lower diversity and 2) the west side of the island (opposite the main channel) has higher diversity. Horn's community similarity index (C_H) reveals that sites on the east side of the island are more similar to each other than either is to the west side site. Further investigations will examine recolonization by *D. polymorpha* as well as continue to explore the dynamics of mussels near 9-Mile Island.

Keywords: mussels, species diversity indices, Pool 12 Upper Mississippi River, *Dreissena polymorpha*,

CLADOCERAN DIVERSITY IN LAKE GALENA, ILLINOIS, AN IMPOUNDMENT OF A TRIBUTARY TO THE MISSISSIPPI RIVER

Michael J. Malon . University of Dubuque, 2000 University Ave., Dubuque, IA 52001

Lake Galena, IL was surveyed monthly from April – November 2010 to determine the presence and density of exotic cladoceran Daphnia lumholtzi. The lake is an impoundment of a tributary of the Mississippi River, where D. lumholtzi has become established. This impoundment would limit D. lumholtzi introduction to cross contamination by lake users (anthropogenic or avian predator). D. Lumholtzi was not found in Lake Galena through this sampling regimen however the data collected demonstrates the Plankton Ecology Group (PEG) model of population surge and collapse within the lake and the interaction between cladoceran populations. This study also

provides a comparison of how zooplankton populations occurred throughout the 2010 year without the presence of D. Lumholtzi in the driftless region of Illinois.

Keywords: Daphnia lumholtzi, PEG-model, cladoceran diversity, Lake Galena, Mississippi river tributary

THE NATURE CONSERVANCY'S EMIQUON PRESERVE: LARGEMOUTH DIET RESPONSE TO RESTORATION

Nerissa N. Michaels[1, 2], Greg G. Sass[1], and Tim W. Spier[2]. The Nature Conservancy's Emiquon Preserve: Largemouth Diet Response to Restoration. [1]Illinois Natural History Survey, Illinois River Biological Station, Havana, IL, 62644. [2]Western Illinois University-Department of Biological Sciences, Macomb, IL, 61455.

The Nature Conservancy's (TNC) Emiquon Preserve is a 2,800 ha floodplain restoration effort located in Fulton County, Illinois. The area is historically significant in that it once housed two of the most productive backwater lakes in the Illinois River Valley (IRV): Thompson and Flag lakes. The area was leveed, drained, and converted into agricultural land in the 1920's. TNC purchased the property in 2000 with hopes of restoring it to its natural state. Following a large-scale rotenone of the remnant agricultural farm ditches in 2007, the area was allowed to naturally flood. A large piscivore population (mainly Largemouth Bass *Micropterus salmoides*) was immediately established to reduce the effects of two common ecosystem stressors: eutrophication and Common Carp *Cyprinus carpio* establishment. I tested the potential of the Largemouth Bass population to control eutrophication through trophic cascade of the food web and Common Carp populations through diet analyses and bioenergetics modeling over the first two years of restoration, 2008-2009. Largemouth Bass showed a shift in prey use from less profitable prey types (i.e. benthic invertebrates) to highly profitable prey types (i.e. fish) in early July in 2008 and 2009. There was evidence to suggest density dependence occurring in 2008, but an increase in lake surface area reduced the effects of density dependence in 2009. Secchi disc transparencies significantly decreased from 2007-2010. Additionally, no Common Carp were collected in Largemouth Bass diets. My results suggest that the Largemouth Bass population may not be controlling eutrophication from a top-down mechanism or Common Carp populations.

Keywords: The Nature Conservancy, Emiquon Preserve, *Micropterus salmoides*, diet, prey use

THE EFFECTS OF PHOSPHORUS ON PHYTOPLANKTON COMMUNITIES IN AN UPPER MISSISSIPPI RIVER BACKWATER LAKE

Robert J. Mooney, Eric A. Strauss. River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601

Phytoplankton are key organisms in the aquatic food webs of lentic and large lotic systems because of their ability to produce oxygen and serve as a vital basal food source. Often the main determinant of phytoplankton communities is the availability of essential nutrients, e.g. nitrogen (N) and phosphorus (P). Although these nutrients are necessary, increases in their concentrations have been linked to eutrophication. The purpose of this study was to determine how P concentrations affected the phytoplankton community in a backwater lake in Pool 8 of the Upper Mississippi River (UMR). In June 2010, carboys (3.7 L) were filled with water from mid-depth of Target Lake, and then a known amount of PO_4^{3-} was added. To determine the effects on biomass and biodiversity, there were two treatments: a control (no P addition) and a +0.25 ppm PO_4-P. Each treatment was repeated five times at various locations of the lake and incubated at mid-depth for 17 to 18 days. Chlorophyll *a* and Shannon-Wiener indices were measured to determine differences between the two treatments. To determine P uptake rates, six treatments were used: a control (no P addition), +0.05 ppm, +0.1 ppm, +0.2 ppm, +0.5 ppm, and +1.0 ppm PO_4-P. Each treatment was repeated three times. The initial soluble reactive phosphorus (SRP) concentration of each treatment was measured, and it was measured again after twelve days of mid-depth incubation. The amount of SRP taken out of the system was found by subtracting the post-incubation concentration from the initial concentration. Phosphorus uptake rates of the phytoplankton community were observed to follow Michaelis-Menton uptake kinetics and the average uptake rate was 0.0176 mg P/L/day. In the presence of high P concentrations (>0.25 ppm PO_4-P), the phytoplankton community significantly increased in algal biomass (chlorophyll *a*) and shifted from a green algae dominated to a cyanobacteria dominated community. There was also a significant difference in the biodiversity indices of the natural and +P communities. These results suggest that potential increases in P delivery to the UMR might have profound effects on the biomass and diversity of the phytoplankton community.

Keywords: phytoplankton, phosphorus, eutrophication, Mississippi River, nutrient

INTERACTIONS BETWEEN NON-NATIVE AND NATIVE LARGE RIVER PLANKTIVORES

Quinton E. Phelps[1], Jason W. Crites[1], David P. Herzog[1], David E. Ostendorf[1], Joseph W. Ridings[1], Robert A. Hrabik[1],David Glover[2], Sara J. Tripp[2], and James E. Garvey[2]. [1]Open Rivers and Wetlands Field Station, Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755. [2]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901

Understanding fish community interactions is a critical component of large river ecology, especially the interactions of nonindigenous fishes on native fauna. Non-native large bodied

planktivores are capable of posing deleterious effects to large river ecosystems. In particular, the effects of silver carp on native planktivorous large river fishes such as bigmouth buffalo and gizzard shad have received little attention despite the apparent relevance. As such, the objective of this study was to understand the interactions of silver carp with bigmouth buffalo and gizzard shad (i.e., native planktivores) in the free-flowing stretch of the Upper Mississippi River (a.k.a., the Middle Mississippi River, MMR). Specifically, we used data collected for the Long Term Resource Monitoring Program (LTRMP) throughout the MMR from 1992-2008 to evaluate trends in both non-native and native planktivores population attributes. Our results suggest that non-native planktivore relative abundance has increased while relative abundance of native planktivorous fishes has declined. Specifically, the gizzard shad and bigmouth buffalo have shown precipitous declines in abundance while silver carp have dramatically increased. Furthermore and as a quantitative measure of a limiting resource, we found that silver carp condition has remained fairly consistent while bigmouth buffalo and gizzard shad condition has declined. To this end, our results suggest that potential negative interactions are occurring between non-native and native planktivores. We suggest that future research should be directed at understanding the specific mechanisms that are structuring this relationship. If silver carp are indeed negatively influencing native planktivorous fishes (e.g., creating a limiting resource through competition), management efforts should be directed at reducing silver carp abundance to subsequently rehabilitate native planktivores.

Keywords: Plaktivores, Upper Mississippi River, Middle Mississippi River

JUVENILE CHANNEL CATFISH HABITAT USE IN THE MIDDLE MISSISSIPPI RIVER

Quinton E. Phelps[1], Sara J. Tripp[1], James E. Garvey[1], David P. Herzog[2], David E. Ostendorf[2], Joseph W. Ridings[2], Jason W. Crites[2], and Robert A. Hrabik[2]. [1]Fisheries and Illinois Aquaculture Center, Department of Zoology, Southern Illinois University, Carbondale, Illinois, USA 62901. [2]Open Rivers and Wetlands Field Station, Missouri Department of Conservation, 3815 East Jackson Boulevard, Jackson, Missouri, USA 63755

Channel catfish *Ictalurus punctatus* are a major recreational and commercially important large river species. However, anthropogenic activities have heavily degraded the majority of riverine catfish habitats. To maintain catfish populations, an understanding of channel catfish early-life habitat use is necessary. We quantified habitat use of juvenile channel catfish in the Middle Mississippi River from 2004 through 2007 by trawling in main channel, channel border, island, and artificial structure habitat (i.e., river training structures or wing dikes) features throughout the sampling reach (N = 878 trawls; N = 538 juvenile channel catfish). Channel catfish occurred most frequently in island and off channel habitats. Few juvenile channel catfish were trawled in the main channel. All macrohabitat features were used by a broad size range of juvenile channel catfish, with the exception of the main channel, where only larger juvenile channel catfish were captured. Within each habitat, juvenile channel catfish catch rates were highest in sand substrate, low velocity, and shallow depths. Channel catfish in the Middle Mississippi River use a variety of habitats during early life. Maintaining existing habitats,

creating habitats with these attributes, and coupling this with proper management will foster sustainability of the channel catfish population at current commercial and recreational fishing levels in the Middle Mississippi River.

Keywords: *Ictalurus punctatus*, channel catfish, Middle Mississippi River, habitat

EFFECTS OF ABIOTIC FACTORS ON THE CAPTURES OF A RIVER TURTLE COMMUNITY

Andrew L. Reese, Mark R. Hennessy, Casey J. Arensdorf, Christina M. Chamberlain, and Gerald L. Zuercher. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, IA 52001.

We sought to analyze the effects from several abiotic factors on river turtle captures in a backwater portion of 9-Mile Island (Pool 12 in the Upper Mississippi River Wildlife and Fish Refuge). We captured river turtles between mid-May and late-September and then analyzed the captures rates with respect to several abiotic factors: Daily High Temperature, Daily Low Temperature, River Stage, Precipitation, Moon Phase, Trapping Site, Trapping Session, and Season (early versus late). Overall, six species of river turtles were captured during this project: *Chrysemys picta* (painted turtle; $n = 59$), *Apalone spinifera* (spiny softshell turtle; $n = 14$), *Chelydra serpentina* (common snapping turtle; $n = 7$), *Graptemys geographica* (common map turtle; $n = 3$), and *G. pseudogeographica* (false map turtle; $n = 1$). Response variables were either turtle capture (a binary score with 1 = turtle(s) captured and 0 = no turtle captured) or total turtles captured. Continuous variables were tested via linear regression while categorical variables were tested via Analysis of Variance. Three variables independently explained a significant ($\alpha = 0.05$) amount of variation in the data: Moon Phase, Trapping Site, and Season. Two variables, Precipitation and Trapping Session, were not statistically significant but were suggestive of a trend and need future examination. These results, though preliminary, offer some insight into development of a more effective turtle sampling protocol, the biology behind which needs further investigation. To test these results, we also examined three previous years of trapping data.

Keywords: 9-Mile Island, Abiotic Factors, Mississippi River, River Turtles

IN-SITU EVALUATION OF SOUND-BUBBLE-STROBE LIGHT BARRIER TECHNOLOGIES TO PREVENT THE RANGE EXPANSIONS OF ASIAN CARP

Blake C. Ruebush[1,2], Greg G. Sass[2,1], John H. Chick[3,1], and Cory D. Suski[1]
[1]University of Illinois, Department of Natural Resources and Environmental Sciences, Champaign, IL. [2]Illinois Natural History Survey, Illinois River Biological Station, Havana, IL. [3]Illinois Natural History Survey, Great Rivers Field Station, Brighton, IL

Bighead *(Hypophthalmichthys nobilis)* and silver *(Hypophthalmichthys molitrix)* carps have invaded the Mississippi River Basin and have successfully established populations in the Illinois River. The invasion of Asian carps in the Illinois River has negatively influenced native fish populations and they now pose an imminent threat to invading Lake Michigan through the Chicago Sanitary and Ship Canal. Sound-bubble-strobe light barrier technologies may have the ability to slow Asian carp range expansions. In 2005, sound-bubble barrier technologies were shown to be 95% effective at deterring adult bighead carp passage in hatchery raceways. We tested the effectiveness of sound-bubble-strobe light barriers at repelling Asian carps and native fishes in 2009 and 2010, within Quiver Creek, a tributary to the Illinois River. To test barrier effectiveness, Asian carps and native fishes were removed from upstream of the barrier. Captured fishes were measured for length, weight, received a fin clip and floy-tag, and were then released downstream of the barrier. Trials were 1-14 days in length and were conducted with the barrier ON and OFF to test upstream passage rates. Barrier effectiveness was determined by upstream recaptures. Our results suggest that barrier effectiveness could be as high as 99% and 97% at repelling Asian carps and native fishes, respectively.

Keywords: Asian carp, *Hypophthalmichthys nobilis, Hypophthalmichthys molitrix,* Sound-Bubble-Strobe Light Barrier, Illinois River

SPATIAL DISTRIBUTION OF THE EURASIAN TREE SPARROW, *PASSER MONTANUS*

Annina M. Rupe[1], Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

The Eurasian tree sparrow (*Passer montanus*) and House sparrow (*Passer domesticus*) are introduced avian species from Europe and Asia. The House sparrow has a wide range in the United States; however, despite the similarities between the two species, the Eurasian tree sparrow's range has not expanded much from its introduced area. This research aims to identify the unique conditions of the Eurasian tree sparrow niche in western Illinois that makes this habitat ideal for this species, in contrast to the House sparrow. The niche theory used in this research follows the Hutchinsonian theory, which states that an organism's niche is specific to that organism rather than to the environment (Pulliam 2000, Colwell and Rangel 2009). In addition, the Hutchinsonian theory breaks the overall niche down into fundamental and realized niches (Pulliam 2000). The fundamental niche includes all of the variables that affect the continued existence of a certain species; it is an area in which the species can theoretically survive (Pulliam 2000). The realized niche is an area inside the fundamental niche where the species exerts dominance, and therefore the survival ratio is positive (Pulliam 2000). The area inside the fundamental niche but outside the realized niche can support the species; however, other conditions and organisms that are in the same space limits the survival of the species of interest (Pulliam 2000). Due to the similarities between these two species of birds, yet the extreme differences of their New World ranges, this niche theory is very applicable.

This research will take place in McDonough County, Illinois. The area is of mixed landscape, including abundant cropland and forest. McDonough County lies in between two large rivers: the Illinois River to the east, and the Mississippi River to the west. These large rivers may play a role in the extent of the Eurasian tree sparrow's range. Data will be collected from points plotted in ArcView. From these points, the presence of Eurasian tree sparrows and House sparrows by call will be noted, via observer and sound recorder. In addition, the distance to the nearest forest edge, pond, cropland, idle land, river and building will be measured using the Natural Resources Conservation Service (NRCS) National Agriculture Imagery Program (NAIP) Mosaic Image. Forest edge variability and elevation will also be collected for each point. All data collected will be inserted into the Hyperniche modeling software to determine the unique habitat of the Eurasian tree sparrow in the United States. Conclusions from this research may be applied to exotic species invasion theory and help to understand the factors of displacement of native threatened and endangered species who share similar fundamental niches.

Keywords: Eurasian tree sparrow, niche, model, *Passer montanus*, House sparrow

FISH COMMUNITY STRUCTURE AS A FUNCTION OF LONGITUDINAL GEOMORPHOLOGICAL DIFFERENCES IN A LARGE RIVER NETWORK

Alexander J. Sazama[1], Michael D. Delong[1], and James H. Thorp[2]. [1]Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987. [2] Kansas Biological Survey and Dept. Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66047-3759

A widely held view is that fish species richness increases as a function of an increase in river basin size. More recently geomorphic complexity, instead of longitudinal changes, has been identified as a key factor in fish community structure. Complexity is an attribute of local geology and climate independent of any continuum of physical connection. With greater complexity there is greater chance of more diverse habitat. This study will examine fish community structure in longitudinally arranged patches to test longitudinal gradient and local geomorphology as determinants of community composition. We electrofished at five different sites, from low to high complexity: Lake Pepin, Saint Croix River (2 sites), and Upper Mississippi River (2 sites). Fish were identified and quantified as catch per unit effort. Analysis included density of each species, number of taxa, and species diversity. Preliminary results indicate that species richness increased with greater geomorphologic complexity, and that the relationship of fish community structure is weaker when it is considered a function of a longitudinal gradient instead of considering it a function of geomorphic complexity. The findings, therefore, indicate that geomorphic complexity and not location on a longitudinal gradient is a critical determinant of community structure.

Keywords: geomorphic complexity, river, community structure, fish

SPATIAL DISTRIBUTION OF INDIANA BAT (*MYOTIS SODALIS*) HABITAT AND WIND FARMS IN IOWA AND ILLINOIS

Eric S. Schroder[1] and Susan P. Romano[2,3]. [1]Department of Biological Sciences, Western Illinois University-Quad Cities, Moline, IL 61265, [2]Departments of Biological Sciences and Geography, Western Illinois University-Quad Cities, Moline, IL 61265. [3]Institute for Environmental Studies, Western Illinois University, Macomb, IL 61455.

Recently, concern has risen over the mortality of bats due to wind farms. Of major concern is the Indiana bat (*Myotis sodalis*) due to its endangered species status and its range overlap with Illinois and Iowa wind farms. The Indiana bat migrates into Iowa and Illinois in the summer to form maternity colonies underneath the sloughing bark of trees. If wind farms are in close vicinity to the maternity colonies, mortalities may occur. Mapping of spatial distributions of Indiana bat habitat and wind farms in Iowa and Illinois will take place. It is believed that riparian habitats are of vital importance to *M. sodalis* maternity colonies due to its source of nutrition and ability to provide maternity colony roost trees. Detailed habitat survey of Indiana bat maternity colonies will occur that will measure tree diameter, identify tree species and tree status, proximity of other roost trees, habitat type being used, percentage of peeling bark on tree, canopy coverage, distance from a roost tree to a stream (perennial or intermittent), distance from a roost tree to the forest edge, and distance from roost tree to the nearest hibernaculum. Statistical tests will be employed to describe desirable habitat characteristics for maternity colonies to identify potential maternity colony habitat. From this research, it is hoped that *M. sodalis* mortalities by wind turbines can be greatly reduced.

Keywords: Indiana bat, *Myotis sodalis*, wind farm, riparian, wind turbine

THE INFLUENCE OF BED AND SUSPENDED SEDIMENT ON FRESHWATER MUSSELS IN POOL 12 OF THE UPPER MISSISSIPPI RIVER

Samantha M. Sporer, Lisa A. LaBudde, Adam R. Hoffman. Department of Natural and Applied Sciences, University of Dubuque, Dubuque, Iowa 52001.

Freshwater mussels are important biological indicators of water quality in rivers and streams. In the Mississippi River the numbers and diversity of freshwater mussels have declined over the past century. There are many causes for their decline, including many chemical and physical factors that have influenced freshwater mussel habitat. Our study examined several chemical and physical parameters in suspended and surficial bed sediments in six mussel beds located along 9-Mile Island south of Dubuque, IA. In those beds, a total of 728 individual mussels, representing fifteen species, were caught. Sediment parameters measured during each sampling session were percent moisture, bulk density, porosity, and total organic matter for the sediment samples, and suspended particulate matter in water samples. At each mussel bed two bed sediment samples were collected. Small variations in percent moisture (average RSD = 3.7%), bulk density (average RSD = 0.12%), porosity (average RSD = 4.7%), and total organic matter (average RSD = 0.59%), were noted within the given sites; however larger variations among the different sites

were noted for percent moisture (average RSD = 6.3%), bulk density (average RSD = 0.27%), porosity (average RSD = 10.1%), and total organic matter (average RSD = 1.02%). Chemical analysis involved quantifying concentrations of phosphorus and nitrogen, which were examined in the bed and suspended sediment samples at each site. Implications of the distribution and abundance of species of mussels due to these chemical and physical parameters will be discussed.

Keywords: suspended sediment, bed sediment, mussels, total organic matter, bulk density

ECOSYSTEM PROCESSES OF EPILITHIC AND EPIXYLIC PERIPHYTON IN A BACKWATER OF THE UPPER MISSISSIPPI RIVER

Shane D. Symmank, and Eric A. Strauss. University of Wisconsin-La Crosse, River Studies Center, 1725 State Street, La Crosse, Wisconsin 54601

In large lotic aquatic systems like the upper Mississippi River (UMR), the majority of primary production is most often attributed to pelagic (free-floating) biological communities, or macrophyte communities. However, the ecological significance of benthic microbial communities is critical when assessing the quality of aquatic habitats. Benthic systems teem with aquatic microbes, many of which inhabit matrix-enclosed biofilms (i.e., periphyton) that contribute to key ecological processes such as primary production, community respiration, nutrient cycling, and secondary production. Evaluation of periphyton has long been used in small stream ecosystems to observe and monitor the effects of water chemistry, nutrient dynamics, hydraulic conditions, habitat availability, and food-web structure, on benthic communities. The objective of this study was to culture periphyton on three different types of artificial substrates (unglazed ceramic tile and two types of wood: poplar and pine) situated inside exclosures developed specifically to inhibit colonization by large macroinvertebrate grazers. The exclosures were deployed for three week incubations throughout the summer of 2010 in Target Lake, a backwater lake in Pool 8 of the UMR. Periphyton growth on the substrates was subsequently analyzed for biomass (i.e., chlorophyll *a* and AFDM), primary production, and secondary production. The study was complicated by record amounts of precipitation that caused unexpected fluctuations in exclosure depth at the study site, which resulted in significant variation in data among exclosure replicates. However, the novel exclosure design was a success and did allow for the quantification of periphyton biomass and ecosystem processes on the artificial substrates. The overall experimental design showed promise and could potentially be used for future studies to better understand how periphyton interacts with and influences other attributes of backwater ecosystems.

Keywords: Mississippi River, benthic, primary production, secondary production, periphyton

FISH PASSAGE AT ST. JOHN'S BAYOU

Sara Tripp[1], Jim Garvey[1], Jack Killgore[2]. [1]Fisheries and Illinois Aquaculture Center, Department of Zoology, Center for Ecology, Southern Illinois University, Carbondale, IL 62901. [2] Engineer Research and Development Center Environmental, Laboratory CEERD-EE-A, 3909 Halls Ferry Road, Vicksburg, MS 39180

Many riverine fish species rely upon seasonally predictable flood pulses, which provide access to floodplain areas that can be utilized for reproduction (i.e. spawning and rearing), foraging, overwintering, or as refuge from intolerable conditions. While the connection of a river to its floodplain is crucial for many riverine organisms, anthropogenic river modifications (e.g. navigation enhancements, water storage, and flood control) have impaired natural floodplain inundation, and as a result have drastically reduced floodplain connectivity. While water control structures can restore floodplain connectivity, their effect on fish movement and passage is not yet certain. The main objective of this project was to evaluate the impacts of a flood control project in the St. John's Bayou and New Madrid Floodway on the fish community and determine if the water control structure allows access to the floodplain. Our telemetry effort was successful at documenting fish passage through the water control structure and determining that the number of fish utilizing the bayou increased with rising water levels. With the majority of passages occurring during the spring and summer we assume that fish are accessing the floodplain through the water control structure to find suitable spawning habitat. Another peak in river stage during December, followed by increased numbers of fish detected in the bayou shows that fish may also be using the floodplain for overwinter habitat. While fifteen fish moved out of the bayou into these major rivers, seven of those fish moved back down into the bayou, showing that the bayou provides an important connection to the floodplain. By continuing the mark/recapture study and telemetry efforts we will be able to determine the potential of fish passage through the existing structure and other proposed structures in the New Madrid Basin.

Keywords: water control structure, floodplain connectivity, fish passage, telemetry, riverine fish

MINUTES OF THE 2010 BUSINESS MEETING

ANNUAL MEETING OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

April 23, 2010
President Sass called the business meeting to order at 12:38 pm. Officers attending were Greg Sass (President), Jeff Houser (Vice-President), Susan Romano (Secretary), and approximately 30 Consortium members.

President's Report

Acknowledgements
President Sass welcomed member to our business meeting, and acknowledged and thanked the following for their participation in the 2010 MRRC meeting:

- Members of the executive committee, Jeff Houser, Neal Mundahl, and Susan Romano for their help with planning and proceedings
- Cammy Smith for her help with registration, logistics, and the website
- Nerissa Michaels for help with registration and the raffle
- Terry Duckershein, Raffl Coordinator, and those that donated items to the raffle and silent auction
- Roger Haro, and the University of Wisconsin-La Crosse River Studies Center for providing the poster display boards
- UMESC and LTRMP INHS for operating the video equipment
- Platform moderators were acknowledged including Doug Schnoebelen, Kathryn McCain, Kevin Irons, Nathan De Jager, Yao Yin, and Susan Romano
- Judges for student presentations and posters were also acknowledged
- Dr. Bukaveckas as our keynote speaker, USGS for providing funding for his travel, and Jeff Houser for making the arrangements. A plaque was presented to Dr. Bukaveckas in appreciation.
- Thanks to the National Great Rivers Research Center for hosting our website

Minutes
Our President asked members of the consortium for corrections or additions to the 2009 MRRC minutes as presented in the 42st Annual Proceedings. A motion to approve the minutes as published was made by Mike DeLong, seconded by Mike Romano.

Meeting Attendance
President Sass announced meeting attendance as 107 registrants (83 pre-registrations and 24 registrations upon arrival), an increase of 7 over last year's registration, and commended the excellent student poster and platform presentations.

Awards
Appreciation Awards
Georgina Ardinger and Cammy Smith were presented with awards for many their years of help with arrangements and registration for the MRRC.

Student Awards
President Haro presented the best student platform presentation award to Alexander Devonald, University of Wisconsin-La Crosse, and the best student poster presentation award to Craig Kelling, Winona State University, accepted for him by Mike DeLong.
Student Travel Awards were presented to Matthew Phillips, Bemidji State University, Aloah Pope, University of Illinois at Urbana-Champaign, and Orathai Pongruktham, University of Mississippi.

Treasurer's Report
Neal Mundahl, Treasurer, prepared the Treasurer's report published in the 2010 Consortium Proceedings. President Haro presented the report, indicating an income of $8,635.95 and expenses of $6,847.78 as of June 30, 2009. Transactions from July 1, 2009 to March 1, 2010, resulted in $6.04 as income, and $44.41 as expenses. Accounts as of March 1, 2009, were $8476.72 in the checking account, and $5,995.45 in savings, for a total of $14,472.17. Motions were made to approve the Treasurer's Report, and consortium members unanimously approved the Treasurer's Report as presented.

Old Business
Future meetings are scheduled at the Radisson in La Crosse for the following dates: April 28-29, 2011; April 26-27, 2012; April 25-26, 2013.
Bob Miller acknowledged the editors and authors for the special issue of the MRRC Hydrobiologia journal volume, *Upper Mississippi River Research Synthesis: Forty Years of Ecological Research*, published February 15, 2010.

New Business

River Conference Announcements
The second International Meeting of River Scientists will be held August 8-12, 2011, in Berlin, Germany. See website, riversociety.org, for further information.
Election of Officers
Susan Romano and Eric Strauss were nominated as candidates for Vice-President by the MRRC executive board. Bob Miller motioned to close the nomination, and Rip Sparks seconded the motion. Susan Romano was elected by consortium members as the next Vice-President. Eric Strauss and Thad Cook were nominated for Secretary. Eric Strauss was elected by consortium members as Secretary for a 2-year term.
Passing of the Presidency
In accordance with MRRC bylaws, President Sass turned the meeting over to the new President, Jeff Houser. President Houser presented Dr. Sass with a plaque commemorating his year of service as the President of MRRC.
Adjournment
President Houser entertained a motion to adjourn by Kevin Irons, seconded by Mike Romano. The motion passed, and President Houser adjourned the 2010 Business Meeting of the Mississippi River Research Consortium at 1:07 pm.

MISSISSIPPI RIVER RESEARCH CONSORTIUM
TREASURER'S REPORT – SUBMITTED BY NEAL D. MUNDAHL
10 MARCH 2011

Accounts as of 30 June 2008		$12,722.37
Accounts as of 30 June 2009		$14,510.54
Transactions, 1 July 2009 to 30 June 2010		
INCOME		
	2010 Registration and dues	7475.00
	2010 Raffle proceedings	1510.00
	T-shirt sales	81.00
	Interest	11.99
Total		9,603.99
EXPENSES		
	Hydrobiologia book	3129.75
	2010 meeting (Radisson)	5595.24
	2010 Proceedings	658.06
	2010 Keynote expenses	380.35
	2010 Raffle prizes	174.05
	2010 Awards	238.00
	2010 Student Travel awards	550.00
	T-shirts	64.00
	Postage, mailing, supplies	87.61
	2009 Corporation fee	10.00
Total		6,847.78
Accounts as of 30 June 2010		$13,227.47
Transactions, 1 July 2010 to 1 March 2011		
INCOME		
	Interest	5.68
Total		5.68
EXPENSES		
	2010 Corporation fee	10.00
Total		10.00
Accounts as of 1 March 2011		$13,223.15
Accounts		
	Checking account	7216.07
	Savings account	6007.08
Total		$13,223.15

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.
BUSINESS MEETING AGENDA

29, April 2011, 1:00 PM
Radisson Hotel, La Crosse, Wisconsin

1. Call to Order

2. President's Report

   - Acknowledgments
   - Approval of 2010 minutes and Proceedings
   - 2011 attendance/participation growth information
   - Awards

3. Treasurer's Report – N. Mundahl

4. Old Business

   - Future Meeting Dates
   - 2012 Meeting in La Crosse, WI

5. New Business

   - Executive board nomination
   - Election of officers
   - Passing of the Presidency
   - 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.

6.01c. *Special symposia* - The Board of Directors may advertise and assemble special symposia within the annual conference program with the following limitations: a) symposia shall not be scheduled concurrently with standard conference sessions; b) symposia shall not exceed ½ day within the annual conference program; c) symposia subject matter shall be proposed by the Board to the membership 1 year or more in advance; and d) the membership must move to adopt the proposal and vote in majority favor of the proposal.

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 RECIPIENTS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM FRIEND OF THE RIVER AWARD

Friend of the River	Organization	Year	Meeting	Presenter
Calvin R. Fremling	Winona State University	1992	24th	Neal Mundahl
Thomas O. Claflin	University of Wisconsin-La Crosse	1993	25th	Ronald G. Rada
Pamela Thiel	U.S. Fish & Wildlife Service	1997	29th	Terry Dukerschein
Richard V. Anderson	Western Illinois University	1998	30th	Michael A. Romano
Ronald G. Rada	University of Wisconsin-La Crosse	1999	31st	Terry Dukerschein
Richard E. Sparks	Illinois Natural History Survey	2001	33rd	Doug Blodgett
Marian E. Havlick	Malacological Consultants, La Crosse, Wisconsin	2008	40th	Brian Ickes
Carl Korschgen	USGS, Columbia Environmental Research Center, Columbia, Missouri	2009	41st	Roger Haro and Jim Wiener

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

Meeting	Year	Location	Board of Directors
15th	1982	Radisson Hotel, La Crosse, WI	Dr. Richard Anderson Dr. Dave McConville Dr. Jim Wiener
-----	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	Dr. Leslie Holland Dr. Mike Winfrey Mr. Hannibal Bolton
20th	1988	Univ. of Wisconsin-La Crosse, La Crosse, WI	Mr. Verdel Dawson Dr. Fred Copes Mr. John Pitlo
21st	1989	Holiday Inn, La Crosse, WI	Dr. Larry Jahn Mr. Jerry Rasmussen Dr. Bill LeGrand
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	**1**992	Holiday Inn, La Crosse, WI	Mr. Kent Johnson Dr. Richard Anderson Mr. Mike Dewey 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

Meeting	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

Meeting	Year	Location	Board of Directors
40th	2008	Grand River Center, Dubuque, IA	Mr. Brian Ickes Dr. Roger Haro Dr. Robert Miller Dr. Neal Mundahl
41st	2009	Radisson Hotel, La Crosse, WI	Dr. Roger Haro Dr. Greg Sass Dr. Susan Romano Dr. Neal Mundahl
42nd	2010	Radisson Hotel, La Crosse, WI	Dr. Greg Sass Dr. Jeff Houser Dr. Susan Romano Dr. Neal Mundahl
43rd	2011	Radisson Hotel, La Crosse, WI	Dr. Jeff Houser Dr. Susan Romano Dr. Eric Strauss 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.

ACKNOWLEDGMENTS 2011

The following persons or institutions have contributed substantially to the planning, execution, support, and ultimately, the success of the 43rd Annual Meeting of the Mississippi River Research Consortium. The 2010-2011 Board of Directors and Consortium members gratefully acknowledge their efforts.

Local Meeting Arrangements, Meeting Announcements, and Mailings

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

Jeff Houser, USGS Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Program and Proceedings

Jeff Houser, USGS Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin.

Susan Romano, Western Illinois University-Quad Cities, Moline, Illinois

Eric Strauss, University of Wisconsin-La Crosse, La Crosse, Wisconsin

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

Registration Table

Cammy Smith, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Poster Boards

University of Wisconsin – La Crosse River Studies Center, La Crosse, Wisconsin

Visual Aids, Poster Arrangements, and Awards

John Kurtz, Western Illinois University, Macomb, Illinois

Eric Strauss, University of Wisconsin-La Crosse, La Crosse, Wisconsin

Susan Romano, Western Illinois University-Quad Cities, Moline, Illinois.

Sales and Arrangements (Raffle)

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

Cammy Smith, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Mike Romano, Western Illinois University, Macomb, Illinois

Website

Cammy Smith, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Platform Session Moderators

Colin Belby, University of Wisconsin-La Crosse, La Crosse, Wisconsin

Thad Cook, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Mike Romano, Western Illinois University-Quad Cities, Moline, Illinois.

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

Doug Schoebelen, IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa

Richard Sparks, National Great Rivers Research and Education Center, Alton, Illinois

Photography

Cammy Smith, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Annina Rupe, Western Illinois University, Macomb, Illinois

Stefanie Fitzsimons, Western Illinois University, Macomb, Illino

Donators of Raffle and Silent Auction Prizes MRRC 2011 (as of printing date)

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

Nathan De Jager, U.S. Geological Survey Upper Midwest Environmental Sciences Center, La Crosse, WI

Steve DeLain, Minnesota Department of Natural Resources

Russ and Terry Dukerschein, La Crescent, MN

Jim Eckblad, http://www.oakleafsystems.net, Decorah, Iowa

Dave Ford and Melinda Knutson, La Crosse, WI, US Fish and Wildlife Service

Roger Haro, UW-La Crosse River Studies Center, La Crosse, WI

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

Mike and Susan Romano, Western Illinois University, Macomb, IL

James and Gloria Wiener, La Crosse, WI