PROCEEDINGS OF THE

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PROCEEDINGS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 36

MISSISSIPI RIVER RESEARCH CONSORTIUM, INC.

36th ANNUAL MEETING
1-2 APRIL 2004
RADISSON HOTEL
LA CROSSE, WISCONSIN

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PLATFORM PROGRAM
HOTEL BALLROOM A
THURSDAY, APRIL 1, 2004

8:00 - 8:10 AM Welcome and Announcements
Mike Romano, MRRC President

SESSION I – FISH (Moderator: Brent Knights)

8:10 – 8:30 AM SPATIAL STRUCTURE AND TEMPORAL VARIATION OF FISH COMMUNITIES IN THE UPPER MISSISSIPPI RIVER. **John H. Chick[1]**, Brian Ickes[2], Mark A. Pegg[3], Valerie A. Barko[4], Robert A. Hrabik[4] and David P. Herzog[4]. [1]Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave, Brighton, IL 62012. [2]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, WI 54603. [3]Illinois Natural History Survey, Illinois River Biological Station, 704 North Schrader, Havana, IL 62644. [4]Missouri Department of Conservation Open River Field Station, 3815 E. Jackson Blvd., Jackson, MO 63755.

8:30 – 8:50 AM LARVAE PROVIDE FIRST EVIDENCE OF SUCCESSFUL REPRODUCTION BY PALLID STURGEON IN THE MISSISSIPPI RIVER. **Robert A. Hrabik**, David P. Herzog, David E. Ostendorf, and Michael D. Petersen[1]. Missouri Department of Conservation, Resource Science Division, Open Rivers and Wetlands Field Station, Jackson, MO 63755 [1]Missouri Department of Conservation, Cassville, MO 65625

8:50 – 9:10 AM TEMPORAL DIFFERENCES IN GROWTH OF YOUNG-OF-YEAR BIGHEAD CARP *HYPOPHTHALMICHTHYS NOBILIS* AND SILVER CARP *HYPOPHTHALMICHTHYS MOLITRIX* IN THE ILLINOIS RIVER. **Kevin S. Irons**, Mark A. Pegg, T. Matt O'Hara, and Michael A. McClelland. Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, Illinois 62644 Phone: 309 543-6000 email: kirons@uiuc.edu

9:10 – 9:30 AM SPATIAL AND TEMPORAL VARIATION IN THE RELATIVE ABUNDANCE OF UPPER MISSISSIPPI RIVER FISH SPECIES. **Daniel J. Kirby[1]**, and Brian S. Ickes[2]. [1] Iowa Department of Natural Resources, 206 Rose Street, Bellevue, Iowa, USA 52031 [2] U.S. Geological Survey, Biological Resources Division, Upper Midwest Environmental Sciences Center, 575 Lester Avenue, Onalaska, Wisconsin, USA 54650

9:30 – 9:50 AM A COMPARISON OF TWO ELECTROFISHING GEARS USED FOR FISH MONITORING ON THE ILLINOIS RIVER. **Michael A. McClelland**, Mark A. Pegg, Kevin S. Irons, T. Matt O'Hara, and Thad R. Cook. Illinois Natural History Survey, Illinois River Biological Station, 704 N. Schrader Ave, Havana, Illinois 62644.

9:50 – 10:10 AM **BREAK**

SESSION I – FISH *cont.* (Moderator: Sean Jenkins)

10:10 – 10:30 AM UPSTREAM FISH PASSAGE OPPORTUNITIES AT OHIO RIVER MAINSTEM DAMS. **Brent C. Knights**, Joseph H. Wlosinski, John A. Kalas, and Sean W. Bailey. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin 54603.

10:30 – 10:50 AM ANALYSIS OF CAGED BLUEGILL SPAWNING AND FINGERLING PRODUCTION AT FAIRPORT HATCHERY, IA. **Aleshia Kenney[1,2],** Ken Snyder[2] and Richard V. Anderson[1]. [1]Department of Biological Sciences, Western Illinois University, Macomb, IL 61455 [2]Fairport Hatchery, Iowa DNR, Fairport, IA

10:50 – 11:10 AM THE EVALUATION OF THREE OFF-SHORE FISHERIES GEARS IN LAKE CHAUTAUQUA, ILLINOIS RIVER. **T. Matt O'Hara**, Kevin S. Irons, Michael A. McClelland and Mark A. Pegg. Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, Illinois 62644

SESSION II – VEGETATION

11:10 – 11:30 AM ON THE COMPETITION FOR LIGHT BETWEEN AMERICAN WILDCELERY AND SAGO PONDWEED AT HIGH AND LOW NUTRIENT AVAILABILITY: A MODELING APPROACH. **Elly P.H. Best,** Gregory A. Kiker, and William A. Boyd U.S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS 39180-6199.

11:30 – 11:50 AM EFFECTS OF REED CANARY GRASS (*Phalaris arundinacea*) ON TERRESTRIAL ARTHROPOD ABUNDANCE, BIOMASS, AND DIVERSITY IN UPPER MIDWESTERN RIPARIAN WET MEADOWS. **Melissa S. Meier [1,2],** Eileen M. Kirsch[1], and Robin Tyser[2] [1]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54602. [2]River Studies Center, Department of Biology, University of Wisconsin-La Crosse, La Crosse, WI 54601.

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

SESSION III – BIVALVES (Moderator: Richard Anderson)

1:00 – 1:20 PM INVESTIGATION OF FRESHWATER MUSSEL HABITATS USING FIELD MEASUREMENT, HYDRODYNAMIC SIMULATION, AND ECOLOGICAL MODELING. Andrew McCoy, Yenory Morales, **Larry Weber**, and Nathan Young IIHR – Hydroscience & Engineering, Department of Civil & Environmental Engineering, The University of Iowa, Iowa City, IA, 52242.

1:20 – 1:40 PM SAVING THE HIGGINS EYE PEARLYMUSSEL (*LAMPSILIS HIGGINSII*) FROM EXTINCTION: 2003 STATUS REPORT ON THE ACCOMPLISHMENTS OF THE MUSSEL COORDINATION TEAM. **Gary J. Wege** U.S. Fish & Wildlife Service, 4101 East 80th Street, Bloomington, MN, 55425-1665

1:40 – 2:00 PM THE RELATIONSHIP BETWEEN HABITAT AND UNIONID MUSSEL SHELL WEIGHT AND SIZE. **Cynthia D. Brownlee** and Richard V. Anderson Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

2:00 – 2:20 PM CONSERVATION ASSESSMENTS FOR *Lasmigona compressa*, *Lasmigona costata*, *Ligumia recta*, and *Venustaconcha ellipsiformis* (UNIONIDAE) IN EIGHT NATIONAL FORESTS IN MINNESOTA, WISCONSIN, AND MICHIGAN. **Marian E. Havlik**, Malacological Consultants, 1603 Mississippi Street, La Crosse, WI 54601-4969

2:20 – 2:40 PM **BREAK**

SESSION III - BIVALVES *cont.* (Moderator: Robert Connour)

2:40 – 3:00 PM BLUE CATFISH AND CHANNEL CATFISH ARE SUITABLE HOSTS FOR THE ENDANGERED WINGED MAPLELEAF MUSSEL. **Mark C. Hove**[1], Mark T. Steingraeber[2], Michelle R. Bartsch[3], Daniel J. Hornbach[4], Marissa McGill[1], Teresa J. Newton[3], John A. Kalas[2], Carrie L. Nelson[1], and Erick A. Simonsen[1] [1]University of Minnesota, Department of Fisheries, Wildlife, and Conservation Biology, St. Paul, MN 55108, [2]U.S. Fish and Wildlife Service, Fishery Resources Office, Onalaska, WI 54650, [3]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603, [4]Macalester College, Biology Department, Saint Paul, MN 55105

SESSION IV – BIRDS

3:00 –3:20 PM A HIERARCHICAL SPATIAL COUNT MODEL WITH APPLICATION TO IMPERILED GRASSLAND BIRDS. **Wayne E. Thogmartin[1]**, John R. Sauer[2], and Melinda G. Knutson[1] [1]Upper Midwest Environmental Sciences Center, U.S. Geological Survey, La Crosse, WI, U.S.A.; [2] USGS Patuxent Wildlife Research Center, Laurel, MD, U.S.A.

3:20 – 3:40 PM BREEDING BIRD HABITAT USE IN RIPARIAN WET MEADOWS: DOES REED CANARY GRASS AFFECT BIRD TERRITORY PLACEMENT? **Eileen M. Kirsch**, Wayne E. Thogmartin, Tim Fox, and Brian R. Gray, USGS, Upper Midwest Environmental Sciences Center, La Crosse, WI, 54603.

4:30 - 6:00 PM **POSTERS**

6:30 – 8:00 PM **BANQUET**

PLATFORM PROGRAM
HOTEL BALLROOM A
FRIDAY, APRIL 2, 2004

SESSION V – MACROINVERTEBRATES (Moderator: Tom Dunstan)

8:10 – 8:30 AM WATER LEVEL MANAGEMENT AND HYDROLOGIC DISTURBANCE GRADIENTS IN BACKWATERS OF A MISSISSIPPI RIVER NAVIGATION POOL: RESPONSES OF MACROINVERTEBRATES AND BENTHIC ORGANIC MATTER. **Michael B. Flinn**[1], Matt R. Whiles[1], S. Reid Adams[1,2], J. E. Garvey[1,2] [1]Department of Zoology, Southern Illinois University, Carbondale, IL 62901 [2]Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901

8:30 – 8:50 AM MACROINVERTEBRATES IN THE MAIN CHANNEL OF THE MISSISSIPPI RIVER NEAR CAPE GIRARDEAU, MO. **Juliann M. Battle**, John K. Jackson, and Bernard W. Sweeney. Stroud Water Research Center, Avondale, PA 19311.

SESSION VI – WATER QUALITY AND HYDROLOGY

8:50 – 9:10 AM SPATIO-TEMPORAL VARIATION IN SESTON AND ITS RELATIONSHIP WITH DISCHARGE IN LTRMP KEY POOLS OF THE UPPER MISSISSIPPI RIVER SYSTEM. **Robert M. Burdis** Minnesota Department of Natural Resources, Mississippi River Monitoring Station, 1801 South Oak Street, Lake City, MN 55041.

9:10 – 9:30 AM THE COUPLING OF A TWO-DIMENSIONAL HYDRODYNAMIC/SEDIMENT ROUTING MODEL WITH AN UPLAND WATERSHED EROSION MODEL IN A WATERSHED. **Thanos Papanicolaou**[1] and A. Bdour[1] The University of Iowa, Iowa Institute of Hydroscience and Engineering, Iowa City, Iowa 52242

9:30 – 10:10 AM **BREAK, MIDDLE & HIGH SCHOOL STUDENT POSTERS**

SESSION VI – WATER QUALITY AND HYDROLOGY *cont.* (Moderator: Susan Meiers)

10:10 – 10:30 AM EFFECTS OF FLOOD TIMING AND SPATIAL DISTRIBUTION ON NITRATE EXPORT FROM THE UPPER MISSISSIPPPI BASIN. **David M. Soballe[1],** Dennis M. Wasley[2], and Richard H. Coupe[3] [1]Environmental Laboratory, Army Engineer Research and Development Ctr, 3909 Halls Ferry Rd, Vicksburg, MS 39180, [2]Minnesota Pollution Control Agency, 520 Lafayette Road North, St. Paul, MN 55155-4194. [3]U. S. Geological Survey, 308 South Airport Road, Pearl, MS 39208-6649

SESSION VII – TURTLES

10:30 – 10:50 AM TURTLE COMMUNITY STRUCTURE IN A BACKWATER LAKE OF THE ILLINOIS RIVER. **John K. Tucker**[1] and James T. Lamer[2] [1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclaire Ave, Brighton, IL 62012. [2] Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455.

10:50 – 11:10 AM Gene flow in the red-eared slider turtle (*Trachemys scripta elegans)* along the Mississippi and Illinois Rivers.
James T. Lamer[1], Michael A. Romano[1], Richard V. Anderson[1], John K. Tucker[2], [1]Western Illinois University, Dept. of Biological Sciences, Macomb, IL 61455, [2]Illinois Natural History Survey, 1850 Montclair Ave, Brighton, IL 62012

11:10 – 11:30 AM CONSERVATION AND THE COMMON SNAPPING TURTLE (*CHELYDRA* SERPENTINA) ALONG THE ILLINOIS RIVER. **John K. Tucker**[1] and James T. Lamer[2] [1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclaire Ave, Brighton, IL 62012. [2] Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455.

11:30 – 12:00 PM **MIDDLE & HIGH SCHOOL STUDENT POSTERS**

12:00 – 1:30 PM **LUNCH, BUSINESS MEETING AND RAFFLE**

1:30 PM **ADJOURN**

NOTES

NOTES

POSTER PRESENTATIONS
THURSDAY, APRIL 1, 2004, 10:00 AM – 6:00 PM
Authors Present 4:30 – 6:00 PM
(Listing by topic)

Birds

1) DEVELOPMENT OF REMOTE SENSING TECHNIQUES TO DOCUMENT THE DISTRIBUTION AND NUMBERS OF TUNDRA SWANS ON THE UPPER MISSISSIPPI RIVER. **Kevin P. Kenow**[1], Larry R. Robinson[1], Brian Lubinski[2], and James M. Nissen[3]. [1]U. S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603 [2]U. S. Fish and Wildlife Service, Regional Office, Bishop Henry Whipple Federal Building, 1 Federal Drive, Fort Snelling, MN 55111 [3]U. S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, WI 54601.

Fish

2) COMPARING FISH TROPHIC DYNAMICS IN THREE FLOODPLAIN RIVERS: THE MISSISSIPPI, OHIO, AND MISSOURI. **Tiffany Schriever** and Michael Delong, Large River Studies Center, Biology Department Winona State University, Winona MN 55987

Mammals

3) *CRITTER TALK.* **Daniel Call**[1], John Stewart[2], Michael Willis[3], Brad Clarke[4], Nicole Essman[1] and Benjamin Breitbach[1]. [1]Department of Natural & Applied Sciences, [2]Office of Vice President for Academic Affairs, [3] Office of Technology, [4]Department of Education, University of Dubuque, Dubuque, IA 52001

Mollusks

4) BY LAND AND WATER THEY GO: AQUATIC SNAILS IN THE SYSTEM. ARE THEY NATIVE, EXOTIC, INVASIVE OR JUST GREAT BIO-INDICATORS? **Byron N. Karns[1]** and Ellen Strong [2], St. Croix National Scenic Riverway[1], National Park Service P.O. Box 708 St. Croix Falls, WI 54024; University of Minnesota[2] , Department of Fisheries, Wildlife and Conservation Biology, 100 Ecology Bldg., 1987 Upper Buford Circle, St. Paul, MN 55108

Turtles

5) EPIZOIC ORGANISMS ON TURTLES IN SELECTED HABITATS OF THE UPPER MISSISSIPPI RIVER. **Cathy L. Ziglar** and Richard V. Anderson. Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

Vegetation

6) A COMPARISON OF SUBMERSED AQUATIC VEGETATION IN MAIN-STEM FLOODPLAIN HABITATS AND ISOLATED FLOODPLAIN LAKES OF THE ILLINOIS RIVER; IMPLICATIONS FOR RESTORATION. **Thad R. Cook** and Mark A. Pegg. Illinois Natural History Survey, Illinois River Biological Station, Long Term Resource Monitoring Program, 704 North Schrader Ave., Havana, IL 62644.

7) WHAT PHYTOPLANKTON COMMUNITIES TELL US ABOUT MIXING OF WATER FROM THE NAVIGATION CHANNEL AND VEGETATION BED AT LOCK AND DAM 19, MISSISSIPPI RIVER. **Susan T. Meiers.** Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

Water Quality

8) PRELIMINARY SURVEYS AND GIS MAPS OF TOTAL SUSPENDED SOLIDS IN THE CATFISH CREEK WATERSHED, DUBUQUE COUNTY, IOWA. **William Niemann**, Daniel Call, William Knuth, Katrina Krakow, Andrew Huck, Christopher Green and Zachary Gustafson. Department of Natural & Applied Sciences, University of Dubuque, Dubuque, IA

9) MONITORING OF NITROGEN CYCLING AT AN UPPER MISSISSIPPI RIVER BACKWATER SITE. **R.M. Kreiling**[1,2], W.B. Richardson[2], E.A. Strauss[1,2], L.A. Bartsch[2], J.C. Cavanaugh[1,2]. [1]River Studies Center, University of Wisconsin-La Crosse, La Crosse, WI 54601. [2] US Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603.

10) FOOD WEB DYNAMICS OF LARGE FLOODPLAIN RIVERS: ASSESSMENT THROUGH STABLE ISOTOPE ANALYSIS. **Kelly Slattery** and Michael D. Delong. Winona State University, Large River Studies Center, Biology Department, Winona, MN

NOTES

MACROINVERTEBRATES IN THE MAIN CHANNEL OF THE MISSISSIPPI RIVER NEAR CAPE GIRARDEAU, MO.

Juliann M. Battle, John K. Jackson, and Bernard W. Sweeney
Stroud Water Research Center, Avondale, PA 19311.

The Upper Mississippi River at Cape Girardeau, MO is considered the Open River reach that has remained relatively unimpounded. In main channel at this location there are two major habitats, fine bottom substrates and rocks associated with wing dikes and stabilized banks. We collected aquatic macroinvertebrates from fine sediments and rocks at four separate dikes between river miles 66-71. Fine sediments were sampled using a Petite Ponar dredge during the fall of 1999, 2000, and 2002. Rocks were sampled using artificial substrates (i.e., rock baskets) during the fall of 1999 and 2001. In the fine sediments, a total of 60 taxa were collected during the three sample years. Most of these taxa were insects including 12 EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa and 32 Diptera taxa. Total macroinvertebrate density in the fine sediments ranged from 3737 individuals/m^2 in 2002 to 8706 individuals/m^2 in 2000. Oligochaete worms represented 77-92% of the total numbers. Ephemeroptera (primarily *Hexagenia*) and Diptera (primarily chironomid midges) were the dominant insects collected. The dominant functional feeding group (FFG) in the fine sediments was collector-gatherers (93% of the total numbers), primarily oligochaetes. On the rocks, a total of 50 macroinvertebrate taxa were found in 1999 and 2001. Most (80%) of these taxa were insects, including 21 EPT taxa and 18 Diptera taxa. Total macroinvertebrate density ranged from 3611-10,185 individuals/rock basket with aquatic insects (mainly hydropsychid caddisflies) comprising >99% of the macroinvertebrates collected. Total macroinvertebrate density on the rocks was generally 2-3 times greater in 2001 than in 1999, and this difference reflects increased density of hydropsychid caddisflies. The dominant FFG on the rocks was collector-filterers, which comprised >95% of the total density. There were 34 taxa that occurred in the fine sediments but not on the rocks, and 22 of the 34 were the dipterans no-see-ums and midges. Conversely, there were 20 taxa that occurred on the rocks but not in the fine sediments, and many of these taxa were mayflies and stoneflies. Differences in assemblages between habitats appear to reflect flow and substrates. The fine sediment assemblage was dominated by burrowing insects that prefer low flow, while the rock assemblage was dominated by taxa requiring fast current.

Keywords: macroinvertebrates, substrates, dikes, functional feeding group, Mississippi River

ON THE COMPETITION FOR LIGHT BETWEEN AMERICAN WILDCELERY AND SAGO PONDWEED AT HIGH AND LOW NUTRIENT AVAILABILITY: A MODELING APPROACH

Elly P.H. Best, Gregory A. Kiker, and William A. Boyd
U.S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, MS 39180-6199.

A simulation model has been developed that focuses on the ability of two competing submersed macrophytes, respectively canopy-forming and meadow-forming, to maintain their biomass at different environmental conditions. *Vallisneria americana* (American wildcelery) serves as the example for non-canopy-forming plants, and *Potamogeton pectinatus* (sago pondweed) for canopy-forming plants. The model can be used to predict changes in the species composition of submersed vegetation as a result of changes in the availability of resources in shallow freshwater bodies. In the model, the two plant species compete for light and exhibit different species-characteristic relationships between plant tissue nitrogen (N): phosphorus (P) ratio and reduction in plant biomass production.

Competition for light proved to be a far more important determinant of species composition of the vegetation than the availabilities of N and P in the sediment. Intraspecific competition for light did not occur in wildcelery in a temperate climate, typical for the Upper Mississippi River System (UMRS) at La Crosse, WI. However, it was observed at densities $\geq$ 8-9 plants m^{-2} in a near-subtropical climate, typical for the freshwater systems near Davis, CA. It occurred in sago pondweed at plant densities $\geq$4-5 plants m^{-2}. Coexistence of both species in mixed stands occurred only at wildcelery: sago pondweed plant density ratio's of 28:2 to 26:4 without N and P limitation of growth, irrespective of climate. At density ratio's higher than 28:2 wildcelery wins, and at density ratio's lower than 26:4 sago pondweed wins. The density ratio range at which coexistence was possible increased with water turbidity between extinction coefficients of 0.43 and 2.00 m^{-1}. Epiphyte shading at a level of 25 percent of observed maxima in the UMR allowed coexistence in clear water, but prevented it in turbid water. Under N limiting conditions for both species, sago pondweed wins the competition, but under P limiting conditions for sago pondweed wildcelery wins. Coexistence was expanded by fertilization with both N and P.

These results indicate that sago pondweed has a high potential of replacing wildcelery when allowed to colonize gaps in dense wildcelery stands. N limiting conditions strengthen and P limiting conditions weaken the competitive potential of sago pondweed relative to that of wildcelery, while raised N and P availabilities enhance the potential for coexistence of both species. These notions can be used as a basis for management of submersed macrophytes. Model calibrations and simulation results are currently verified experimentally .

Keywords: aquatic plant growth, competition model, light, nutrients, Mississippi River

THE RELATIONSHIP BETWEEN HABITAT AND UNIONID MUSSEL SHELL WEIGHT AND SIZE.

Cynthia D. Brownlee and Richard V. Anderson
Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

The effect of habitat on unionid mussel growth and shell morphometry has been document for some characteristics and habitat comparisons. These relationships have usually found that shells were thinner in individual of a species from lake habitats than of that species from riverine systems and that grow differed between the habitats It was suggested this was due to differences in the physical environment of these habitats. However, within riverine systems there may be a wide range of physical conditions; different water velocities, substrates, and depths. Invasive epizoites may also interrupt or limit the ability of mussels to obtain the needed dissolved salts and nutrients for grow. To examine the effect of habitat on shell growth in a riverine system mussels were collected from two distinct habitats, an adjacent channel border habitats and an area protected by aquatic macrophyte development in Pool 19, Mississippi River. Growth curves, in terms of shell length verses total body weight, were similar for all species examined from the same habitat. Fast growing species with thinner shells exhibited the same relationship as slower growing heavier species. There was also no difference between individuals of the same species found in different habitats in spite of differences in substrate, current velocity and infestation by zebra mussels. Growth was relatively constant between species and habitats.

Keywords: Mississippi River, Pool 19, habitats, unionid mussels, growth

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SPATIO-TEMPORAL VARIATION IN SESTON AND ITS RELATIONSHIP WITH DISCHARGE IN LTRMP KEY POOLS OF THE UPPER MISSISSIPPI RIVER SYSTEM.

Robert M. Burdis
Minnesota Department of Natural Resources, Mississippi River Monitoring Station, 1801 South Oak Street, Lake City, MN 55041.

Suspended material or seston in aquatic systems is a natural and important part of the ecosystem. However, excessive amounts of seston, whether organic or inorganic, can have deleterious effects on the biota of an aquatic system. Measures of seston, including total suspended solids, volatile suspended solids, turbidity, and chlorophyll *a* were analyzed from Long Term Resource Monitoring Program data. Analysis of stratified random sampling data revealed distinct spatial and temporal differences in seston both among the pools and among strata. The results illustrate the efficiency of Lake Pepin at retaining seston and the significant impact the lake has on water quality on the Upper Mississippi River. Seasonality was apparent in all water quality parameters and varied among some pools. The effects of discharge on water quality parameters varied between strata. Water quality variability within strata was also examined.

Keywords: seston, Upper Mississippi River, water quality, Lake Pepin, discharge

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SPATIAL STRUCTURE AND TEMPORAL VARIATION OF FISH COMMUNITIES IN THE UPPER MISSISSIPPI RIVER.

John H. Chick[1], Brian Ickes[2], Mark A. Pegg[3], Valerie A. Barko[4], Robert A. Hrabik[4] and David P. Herzog[4]
[1]Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Ave, Brighton, IL 62012. [2]U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, WI 54603. [3]Illinois Natural History Survey, Illinois River Biological Station, 704 North Schrader, Havana, IL 62644. [4]Missouri Department of Conservation Open River Field Station, 3815 E. Jackson Blvd., Jackson, MO 63755.

We used data from Long Term Resource Monitoring Program collected from 1994 to 2002 to assess variation in community composition and structure of Upper Mississippi River fishes. Community composition of fishes varied more in space than through time, and we found substantial variation in community composition at two spatial scales: large scale differences between upper and lower river reaches, and small scale differences among individual regional trend areas (RTA). Community structure of fishes (catch per unit effort) also varied more through space than through time. We found substantial variation in fish community structure at three spatial scales: 1) large scale differences between upper and lower river reaches, 2) differences among individual RTA, and 3) differences among habitat strata, with backwaters having a distinct community structure relative to the main channel and side channels. When averaged across all RTA, fish community structure in 1994 and 1995 was distinct from all other years, possibly as a result of the 1993 flood. We found a significant Mantel correlation between fish community structure observations for each RTA and year, with the environmental variables measured during the collections. A canonical approach revealed that the greatest correlation with community structure occurred for the combination of secchi depth, water temperature, water velocity, and vegetation abundance.

Keywords: fish communities, Upper Mississippi River, spatial variation, multivariate analysis, 1993 flood

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WATER LEVEL MANAGEMENT AND HYDROLOGIC DISTURBANCE GRADIENTS IN BACKWATERS OF A MISSISSIPPI RIVER NAVIGATION POOL: RESPONSES OF MACROINVERTEBRATES AND BENTHIC ORGANIC MATTER

Michael B. Flinn[1], Matt R. Whiles[1], S. Reid Adams[1,2], J. E. Garvey[1,2]
[1]Department of Zoology, Southern Illinois University, Carbondale, IL 62901
[2]Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901

The St. Louis District of the Army Corps of Engineers implemented Environmental Pool Management in 1994 on Mississippi River Pools 24, 25, and 26. The operational goal of this water level management is to maintain relatively low, stable water levels in the lower portion of the pools, following maximum drawdown in the spring, in order to better simulate a natural hydrograph without inhibiting commercial navigation. When possible, water levels are held up to 2.0 feet below the target pool elevation at the lock and dam for at least 30 days. Previous investigations of mudflats exposed in the lower pool via water level management showed substantial production of emergent vegetation consisting primarily of millet, chufa, and smartweeds; however, there is little information regarding the responses of consumer groups.

The influence of water level management on backwater habitats in Mississippi River Pool 25 varies along the length of the pool and creates a hydrologic disturbance gradient whereby mid-pool backwaters dry for short periods (~10 days/yr) and lower-pool backwaters dry extensively (~60 days/yr), mainly during summer. We examined the influence of this gradient on organic matter and macroinvertebrates during 2001-2003. Three samples were collected seasonally at three mid-pool and four lower-pool sites using a stovepipe sampler. Benthic organic matter values were generally stable at mid-pool throughout the year, but lower-pool values were variable because of significant fluctuations in CPOM ($P<0.01$), especially in fall after vegetation grew on exposed mudflats. Lower-pool habitats had generally higher macroinvertebrate taxa richness, with significantly higher values in spring 2002 and fall 2003 ($P<0.05$), and responses of individual taxa varied. Lower-pool habitats were dominated by multivoltine taxa in spring, but multivoltine groups had higher relative abundance and biomass at mid-pool in fall following summer drying. For example, Oligochaeta and Chironomidae abundance and biomass were higher at lower-pool in spring ($P<0.05$), but both had higher abundance and biomass at mid-pool in fall ($P<0.05$). Univoltine taxa preferred longer hydroperiods typical of mid-pool. For example, *Hexagenia* abundance and biomass were higher in mid-pool habitats throughout the study ($P<0.01$). Results show that water level management in this navigation pool influences backwater organic matter and macroinvertebrates and may increase diversity at the pool scale because of the gradient of hydrologic conditions it creates in backwater habitats.

Keywords: macroinvertebrates, disturbance gradients, organic matter, hydroperiod, water level management

CONSERVATION ASSESSMENTS FOR *Lasmigona compressa, Lasmigona costata, Ligumia recta,* and *Venustaconcha ellipsiformis* (UNIONIDAE) IN EIGHT NATIONAL FORESTS IN MINNESOTA, WISCONSIN, AND MICHIGAN.

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Lasmigona compressa (creek heelsplitter), *Lasmigona costata* (flutedshell), *Ligumia recta* (black sandshell), and *Venustaconcha ellipsiformis* (ellipse shell) are currently designated as Forester Sensitive Species in the Chippewa and Superior National Forests in 7 Minnesota counties, Chequamegon-Nicolet National Forest in 11 Wisconsin counties; and in the Ottawa and Hiawatha National Forests in 11 Upper Michigan counties, and in the Huron-Manistee National Forest in 12 Lower Michigan counties. These unionid species are known to live, or have lived, in some of these Forests. An extensive literature review, museum visits, and interviews with Forest personnel were done to prepare a Conservation Assessment to suggest management actions to conserve each of these species within these eight National Forests. The history of the taxonomic names used for each species was determined, as well as the known global distribution for each species. Difficulties were frequently encountered with inadequate data on museum and literature specimens. Sometimes one or more of these species was known from a single river within a Forest, but their relative abundance and distribution usually differed widely by forest, and in various river systems. In some areas these four species were represented by chalky shells only. Maps were prepared for each species showing all known locations (by county) of each of the four mussel species in each of the three states.

Lasmigona compressa is only known from 28 of 87 Minnesota counties (32.2%), but from 50 of 72 Wisconsin counties (69.4%), and 59 of 83 Michigan counties (71.1%); *L. compressa* has been recorded from 15 states. *Venustaconcha ellipsiformis* has only been recorded from 8 states, but had the widest distribution in Michigan (32 of 83 counties, 38.6%). *V. ellipsiformis* was recorded from 18 of 72 Wisconsin counties (25%), and from 8 of 87 Minnesota counties (9.2%). The ellipse shell had the most limited distribution in the National Forests under consideration. *Lasmigona costata* occurs throughout Wisconsin (known from 70 of 72 counties, 97.2%), but is only known from 47 of 83 Michigan counties (56.6%), and 38 of 87 Minnesota counties (43.7%); *L. costata* is known from 23 states. *Ligumia recta* is known from 58 of 72 Wisconsin counties (80.5%), 38 of 87 Minnesota counties (43.7%) and 36 of 83 Michigan counties (43.4%). *L. recta* have been recorded from 25 states. Among the nearly 120 fish species known from the rivers in these eight National Forests, at least 49 fish species (41.5%) have been recorded as hosts for these four Forester Sensitive mussel species. The host fish were evaluated for their presence in each forest, and in the rivers involved, which drain to the Mississippi River, Great Lakes, and Hudson Bay; more host fish work is needed. Lack of field research seems to be the biggest reason why there is the perception that population distributions have decreased in these National Forests, yet there seem to be few serious impacts from agriculture or industry. BMP's and timber harvest buffers seem quite restrictive in all forests. More field work is urgently needed.

Keywords: unionid species, mussels, conservation assessments; National Forests
Platform only; LCD projector (PowerPoint – presentation on CD and or /USB drive).

BLUE CATFISH AND CHANNEL CATFISH ARE SUITABLE HOSTS FOR THE ENDANGERED WINGED MAPLELEAF MUSSEL

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The winged mapleleaf mussel is a federally listed species that has received considerable management attention in recent years. Once found throughout many Midwestern rivers, only two known populations exist, one of which is in a 10-mile stretch of the St. Croix National Scenic Riverway that borders Minnesota and Wisconsin. This population is at risk from zebra mussel infestation, effects of variable water releases from an upstream hydropower dam, and an incomplete knowledge of its life history. One of the factors limiting the recovery of this species, as listed in its recovery plan, is the lack of data on which fish species serve as hosts for its glochidial larvae (mussel larvae require a fish host to complete their life cycle). In 1997, a team of biologists from universities and government, began working together to identify potential fish hosts for this endangered mussel. Prior to 2003, we had evaluated over 60 fish species (comprising 14 taxonomic families) but had achieved very limited success, and only with certain catfish species (Family Ictaluridae). Much of these early efforts were limited by finding sufficient numbers of gravid females. In the fall of 2003, winged mapleleaf had a strong reproductive year and we were able to expose glochidia to four Ictalurid species (blue catfish, channel catfish, flathead catfish, and slender madtom). About 8 to 12 weeks after the fish were exposed (19-22ºC), we recovered about 11,000 living juveniles from blue catfish and about 9,000 juveniles from channel catfish. Most of the juveniles produced by the blue catfish were placed into the St. Croix River near existing mussel beds and their survival rate will be checked periodically. The remaining juveniles are being used experimentally to test over-winter survival rate at two laboratory temperatures. These data show that blue and channel catfish are suitable hosts for this federally listed species. Thus, these data can be used in subsequent years to artificially propagate juveniles to augment existing populations of the winged mapleleaf within its historic range of the Upper Mississippi River System.

Key words: glochidia host, *Quadrula fragosa*, endangered species

LARVAE PROVIDE FIRST EVIDENCE OF SUCCESSFUL REPRODUCTION BY PALLID STURGEON IN THE MISSISSIPPI RIVER.

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The Pallid Sturgeon (*Scaphirhynchus albus*) was not described until 1905 when it was commonly caught by commercial fishers. This species began to decline in the early 1900's presumably because of overharvest and habitat degradation. The U. S. Fish and Wildlife Service listed *S. albus* as an endangered species in 1990. Because *S. albus* live in deep, turbid rivers that are difficult to sample, very little is known about its reproductive timing and spawning habitat. The act of spawning has never been observed and there had been no captures of wild young *S. albus* to verify natural reproduction. In this paper, we describe the first collections of larval *S. albus* from the wild using a modified slingshot balloon trawl (the Missouri trawl) designed to capture small fishes in deep, turbulent rivers. We captured larval *Scaphirhynchus* spp. in association with island habitats often in heavy detritus, especially at downstream tips. We postulate that *Scaphirhynchus* spp. spawned at the heads of islands upstream from where we collected larvae but we can not be certain. The capture of young pallid sturgeon verifies reproduction in the upper and lower Mississippi River. However, we found no evidence of recruitment of *S. albus* as we were unable to capture young-of-the-year after 374 trawl hauls that captured over 21,735 fish.

Keywords: large river, trawl, young-of-the-year, Missouri, endangered species, hybridization, microhabitat.

TEMPORAL DIFFERENCES IN GROWTH OF YOUNG-OF-YEAR BIGHEAD CARP *HYPOPHTHALMICHTHYS NOBILIS* AND SILVER CARP *HYPOPHTHALMICHTHYS MOLITRIX* IN THE ILLINOIS RIVER.

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Non-native Asian carp, bighead carp *Hypophthalmichthys nobilis* and silver carp *Hypophthalmichthys molitrix*, have been present in the Illinois River since the early 1990's. The Long Term Resource Monitoring Program (LTRMP) has been collecting bighead carp in routine monitoring of the La Grange Reach, Illinois River since 1995 and silver carp since 1998. The monitoring through the LTRMP program has revealed significant spawn and recruitment of both species in 2000, limited spawning and recruitment in 2001–2002, and another significant spawning event in 2003.

Much of the data regarding these species in the literature come from fish grown as part of aquaculture and do not reflect ambient environmental conditions in rivers. Therefore, we wanted to investigate growth rates of bighead carp and silver carp during their first year of life to document growth rates in the wild, albeit within a non-native range. We evaluated young-of-year (YOY) growth rates of both bighead carp and silver carp based on length frequency information collected during routine LTRMP sampling. Our results suggest YOY bighead carp spawned later in 2003 than in 2000. We also found significantly slower growth rates in 2003 than in 2000 ($P < 0.0003$). Silver carp although appearing at roughly the same time in both years also showed slower growth rates during 2003.

Explanations of differences in spawning time for bighead carp and YOY growth rates for both species are numerous. However, abiotic factors such as flood timing, water level management, and temperature fluctuations between years, as well as biotic factors such as inter- and intra-specific competition for resources all likely play a role. These issues and how our findings apply to floodplain river ecology will be discussed.

Keywords: non-native, bighead carp, silver carp, growth, Illinois River

ANALYSIS OF CAGED BLUEGILL SPAWNING AND FINGERLING PRODUCTION AT FAIRPORT HATCHERY, IA.

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Seventy pairs of bluegill were stocked into each of four ponds in an effort to evaluate bluegill spawning at Fairport Fish Hatcher, Muscatine, IA. Bluegill in 2 ponds were placed into 10'L x 4'W x 2'H cages and were removed after one spawning cycle. Bluegill in the other 2 ponds were not caged and were allowed to inhabit the entire pond throughout the production season. Significant differences were found in length, number of fish per pound, and number of fish harvested per pond when the two spawning techniques were compared. Significant differences were also recorded in plankton densities between the two spawning techniques.

Keywords: bluegill, hatchery production, spawning, plankton densities

SPATIAL AND TEMPORAL VARIATION IN THE RELATIVE ABUNDANCE OF UPPER MISSISSIPPI RIVER FISH SPECIES

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During 1993-2002, the Long Term Resource Monitoring Program used day electrofishing to make fish collections (N=3,324) within backwater, main channel border, and side channel aquatic areas at randomly selected sites in Pools 4, 8, 13, and 26 of the Upper Mississippi River and the La Grange Pool of the Illinois River. Electrofishing data were used to assess temporal and spatial variation in the relative abundance of fish species (N=50) common to all study areas (i.e., species that were captured in all five study areas during 1993-2002). Specifically this investigation focused on identifying the presence and relative importance of longitudinal-spatial (i.e., among study area), lateral-spatial (i.e., among aquatic area), and temporal (i.e., among year) variation in the proportion of positive electrofishing runs for each species. Among groups variation at the study area, aquatic area, and year factor levels was measured as group sum of squares using a three-factor analysis of variance. Principal components analysis and three-dimensional rotating plots were used to ordinate species based upon factor level and interaction term group sum of squares. These visual representations of longitudinal-spatial, lateral-spatial, and temporal variation in relative abundance can be used by fisheries managers to determine which fish species are most likely to exhibit a relative abundance response to local habitat modifications, climatic variability, or degradation of specific types of aquatic areas.

Keywords: fish abundance, Mississippi River, spatial variation, temporal variation, fisheries management

BREEDING BIRD HABITAT USE IN RIPARIAN WET MEADOWS: DOES REED CANARY GRASS AFFECT BIRD TERRITORY PLACEMENT?

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Riparian wet meadows are rare in the upper Midwestern US due to river development, conversion of floodplains to agriculture, and urbanization. Most remaining wet meadows are dominated by invasive reed canary grass (*Phalaris arundinacea*), and wet meadows dominated by native vegetation communities are very rare. The prevailing notion among resource managers is that reed canary grass is of little value to birds and other wildlife. In 2001 and 2002, we studied breeding bird habitat use and estimated an index of productivity in riparian wet meadows across a range of reed canary grass dominance. We selected 12 riparian wet meadows in southeastern Minnesota and southwestern Wisconsin for study in 2001 and added another in 2002. We used spot mapping to estimate locations and sizes of bird territories, and indexed productivity from observed behavior. Vegetation features were estimated every 50 meters in a grid pattern at each study plot in late July. Because the sampling units were territories, we developed an ArcView III extension to randomly sample areas outside of territories (e.g. null-territories). Inverse distance weighted surfaces for percent reed canary grass cover, index of reed canary grass dominance, vegetation height density, percent cover of forbs, percent cover of shrubs, and average litter depth were estimated in ArcMap 8.1. Ten a priori logistic regression models of associations of vegetation variables with Common Yellowthroat and Sedge Wren territory presence/absence were averaged to address model selection issues. The averaged models revealed that for Common Yellowthroats amount of shrub was positively associated with territory placement. For Sedge Wrens percent cover of reed canary grass was positively associated with territory presence. For Common Yellowthroats, model averaged weights indicated that shrub cover, vegetation height density, and average litter depth were more important than reed canary grass cover, reed canary grass dominance, and percent forb cover. However, for Sedge Wrens, model averaged weights indicated that none of the other variables approached the importance of reed canary grass percent cover in the suite of models. Thus, Common Yellowthroats do not seem to be affected by reed canary grass presence and dominance, whereas Sedge Wrens actually show a slight affinity for reed canary grass in the study area.

Keywords: breeding birds, habitat use, Phalaris arundinacea, reed canary grass, wet meadows

UPSTREAM FISH PASSAGE OPPORTUNITIES AT OHIO RIVER MAINSTEM DAMS.

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Twenty mainstem navigation dams with lifts of 3.3 to 12.3 m disrupt the longitudinal connectivity of the Ohio River, potentially affecting fish populations. An assessment of upstream fish passage based on a comparison of the hydraulic conditions at dams and the swimming capabilities of migratory fishes was conducted. This assessment suggested that upstream fish passage through mainstem dams might be possible when the gates are out of the water (i.e., open river) during high discharge periods. Conversely during normal-flow conditions, high water velocities through the submerged gate openings likely preclude upstream fish passage. The frequency and duration of open river, and hence the potential for fish passage, varied spatially with dams and temporally with discharge. The frequency and duration of open-river by dam suggested that upstream fish-passage opportunities are variable at downstream dams (i.e., Louisville District), low at middle-reach dams (i.e., Huntington District), and rare at upstream dams (i.e., Pittsburgh District). Despite mainstem dams, most migratory fishes have persisted in the Ohio River.

Keywords: fish passage, Ohio River, migratory fish, dams, and navigation

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GENE FLOW IN THE RED-EARED SLIDER TURTLE (*TRACHEMYS SCRIPTA ELEGANS)* ALONG THE MISSISSIPPI AND ILLINOIS RIVERS.

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T. scripta elegans is a an aquatic turtle species that inhabits a large portion of the Mississippi and Illinois Rivers, with well established populations utilizing sloughs and backwaters along its length. Little is known on the effect large river systems play in the maintenance or possible hindrance of gene flow between potential interbreeding populations of this turtle. In addition to the fluctuating current and variable water levels imposed by a riverine model, various structures such as dams and closing structures serve as potential obstacles. A series of 14 *T. scripta* populations separated by distances ranging from 1-240 km were analyzed via starch gel allozyme electrophoresis. It is shown that northern populations tend to have a lower percentage of heterozygosity to that compared to more southern populations. One population, in particular, separated by Lock and Dam 19 on the upstream side of the Mississippi River, exhibited a marked deficit of H= .015 compared to that of the farthest southern population near Lock and Dam 26 of the same river with a gradual trend revealed moving downstream. In addition, high F_{ST} values between proximal populations lean towards a maintenance of intrapopulational gamete exchange and conservation of large populations sizes in contrast to long-range, over-water, energy expenditures in the pursuit of gene flow with neighboring populations.

Keywords: *Trachemys scripta elegans*, slider turtles, electrophoresis, allozyme variation, heterozygosity, gene flow

A COMPARISON OF TWO ELECTROFISHING GEARS USED FOR FISH MONITORING ON THE ILLINOIS RIVER.

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The fish population of the Illinois River has been monitored since 1957 through the Long Term Illinois River Fish Population Monitoring Program (LTEF). Throughout the project a standard approach using three-phase AC electrofishing gear has been used to collect fish at as many as 28 sites within the system. In 2001 we began "shadowing" selected sampling sites with pulsed DC electrofishing gear used by the Long Term Resource Monitoring Program (LTRMP) in an effort to evaluate differences between the two collection methods. Electrofishing runs were standardized by length and a total of 24 runs provided comparisons of 12 runs for each gear. Our objectives were to determine differences between the gears in fish catch rates across total catch, species diversity, and size classes to potentially identify a correction factor that may be useful in comparing the two electrofishing approaches. Overall, total catch was significantly higher ($P < 0.005$) for DC electrofishing where 4368 total fish with a mean of 364.0 fish per site were collected while 1423 total fish and a mean of 118.6 fish per site were collected by AC electrofishing. Species richness was significantly higher ($P < 0.023$) for DC electrofishing with 50 total species and a mean of 22.3 species per site collected compared to 38 total species and a mean 15.5 species per site for the AC electrofishing. Size classes, broken into 100 mm groups, also had significantly higher catches ($P < 0.001$) for DC electrofishing within the 100, 200, 400, and 500 mm groups. Our analyses show collections from the DC electrofishing gear are significantly higher for total catch and species richness, but a clear and consistent pattern between the two gears was not evident. Therefore, caution must be taken when attempting to compare fish community composition and structure information between these gears.

Keywords: electrofishing gear, fish collection, species richness, fish community composition and composition

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INVESTIGATION OF FRESHWATER MUSSEL HABITATS USING FIELD MEASUREMENT, HYDRODYNAMIC SIMULATION, AND ECOLOGICAL MODELING

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Three ongoing and interrelated research projects at IIHR-Hydroscience and Engineering are seeking to develop a more complete understanding of freshwater mussel habitats in the Upper Mississippi River (UMR). The goal of these efforts is to provide information useful for the preservation and restoration of declining UMR mussel populations.

Field research is being conducted in UMR Navigation pool 16 (Pool 16) to characterize the physical habitat of UMR freshwater mussels. Bathymetric, velocity, substrate, and mussel dispersal data will be collected at the reach and mussel habitat scales to quantify physical variables influencing habitat quality. Methods used include acoustic Doppler velocimetry and high-resolution side-scanning sonar.

Bathymetric and velocity data are being used to generate computational fluid dynamics (CFD) simulations of flow in Pool 16. These models will provide information about the entire flow field in the river reach and will allow for simulation of historical high and low flows that may be an important factor in structuring the dispersal of freshwater mussels. A nested modeling approach will be employed, using higher-density numerical grids and more complex physics in mussel habitat areas.

An individual-based ecological model simulating growth, reproduction, dispersal, and competition in native freshwater mussel species and invasive zebra mussels is also being developed. The model simulates mussel response at various life stages to a number of metrics describing hydrodynamics, food availability, temperature, fish-host relationships, water quality, and other environmental variables. This model will use CFD and other data to simulate mussel population dynamics in Pool 16.

Keywords: Upper Mississippi River; freshwater mussels; hydrodynamics; habitat, numerical modeling

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EFFECTS OF REED CANARY GRASS (*Phalaris arundinacea*) ON TERRESTRIAL ARTHROPOD ABUNDANCE, BIOMASS, AND DIVERSITY IN UPPER MIDWESTERN RIPARIAN WET MEADOWS.

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The invasive nature of reed canary grass (*Phalaris arundinacea*) is widely known. However, effects of reed canary grass (RCG) invasion upon wildlife are not known. Current research indicates that wet meadow birds do not seem to be negatively affected by RCG. However, for reed canary grass to provide suitable habitat for birds, it must provide adequate resources for nesting and foraging. Arthropods are the main source of food for many grassland birds, especially during the nesting season. We hypothesized that sample biomass (wet weight, in grams), number of individuals, and diversity of the terrestrial arthropod community vary in relation to RCG dominance (measured as percent cover) at sample points. Twelve wet meadow sites were selected in SE Minnesota and SW Wisconsin, representing a range of RCG infestation. Study sites ranged in size from 4.5-16.5 ha. Each site was marked with PVC poles at 50-m intervals to create a grid. At every point of the grid, all plant species within a 2-m radius were identified and percent cover of each species was estimated. Maximum vegetation height, vegetation height density and litter depth were also recorded. Arthropod sampling was conducted in late June-early July in 2001 and 2002. This time period approximately coincides with peak chick rearing and may represent arthropod species available to birds during this critical stage. Arthropods were sampled with sweep-nets at 3 to 8 randomly selected grid points at each plot (73 samples per year). A sweep net sample consisted of walking a 20-m transect in a random direction, making upward and downward sweeps through the vegetation, alternating sides with each step. Net contents were placed in a killing jar containing a few drops of ether then transferred to a labeled sample jar. Arthropods were separated from plant material and counted. The entire arthropod sample was weighed to the nearest 0.0001-g and preserved in 70% alcohol. Samples were sorted to order and identified to family. We modeled the effects of vegetation variables on log (biomass) and counts of individuals per sample and counts of families per sample. Variables included in the analyses were percent cover of RCG, percent cover of forbs, average vegetation height density, and average litter depth. Eight a priori models were considered. Biomass models were fit using a linear mixed procedure (PROC MIXED, SAS 8.1) and the models for counts of individuals and families per sample were fit using generalized linear procedures (PROC GENMOD, SAS 8.1). Because this analysis was exploratory, models were averaged to reduce model selection bias. Percent cover of RCG, percent cover of forbs, and average litter depth were not associated with log (biomass). Vegetation height density was negatively associated with log (biomass). Percent cover of forbs was positively associated with number of individuals and number of families per sample. The other vegetation variables were not associated with either count variables. The most abundant orders were Diptera, Homoptera, and Hymenoptera, followed by Hemiptera, Coleoptera, and Araneae. There also appeared to be differences in family composition between points of low RCG and high RCG. Although data analysis is still in progress, we have not detected a clear relationship between RCG and the arthropod community.

Keywords: *Phalaris arundinacea,* reed canary grass, terrestrial arthropods, vegetation height density, wet meadows

THE EVALUATION OF THREE OFF-SHORE FISHERIES GEARS IN LAKE CHAUTAUQUA, ILLINOIS RIVER.

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The composition and structure of off-shore backwater lake fish communities in the Illinois River is largely unknown. The lack of a diverse approach to effectively sample off-shore areas of backwaters gives us limited information for these fish communities. In 2001 and 2002, we sampled the off-shore fish community within the north cell of Lake Chautauqua. The north cell is a 480-ha isolated Illinois River backwater lake that is managed for submergent and emergent aquatic vegetation through relatively stable water levels to provide habitat for fish and waterfowl. During this study we evaluated three off-shore fish collection gears (gill net, tandem fyke net and tandem mini fyke net) to determine which gear or gear combinations most reasonably assessed the off-shore fish community. Standardized gears and techniques with the exception of the experimental gill nets were used following protocols outlined by the Fish Procedures Manual of the Long Term Resource Monitoring Program (LTRMP). The three gears were fished during the same time at a similar off-shore location of the lake to reduce spatial and temporal biases. During the study, off-shore gears collected 5,826 fish with tandem fyke nets 42% of total catch, gill nets (41%) and tandem mini fyke nets (16%). We examined total catch for each gear type and preliminary results show significant differences in total catch per net set ($p = 0.02$) among the three gear types with tandem fyke nets having the highest catch-per-effort (205.1) followed by gill nets (200.5) and tandem mini fyke nets (79.9). Species richness was also significantly higher in gill net catches (12.5 species per net; $p < 0.005$) perhaps suggesting it provides better off-shore fish community composition information. The results of these analyses and potential implications for sampling off-shore fish communities will be discussed.

Keywords: off-shore, Illinois River, fish, gill net

THE COUPLING OF A TWO-DIMENSIONAL HYDRODYNAMIC/SEDIMENT ROUTING MODEL WITH AN UPLAND WATERSHED EROSION MODEL IN A WATERSHED

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In an effort to generate new knowledge and improved understanding of the complex interrelationships between watershed and instream parameters and the scale integrity influences on channel morphology, an integrated watershed hydrologic/sedimentation framework for medium size watersheds is developed. This framework provides advanced analytical techniques and numerical models for simulating upland (macro level) and instream (micro level) processes in an integrated fashion. The framework is developed based on the premise that watershed-wide parameters have cumulative impacts on stream ecology and therefore, watershed modeling should facilitate integration of spatial and temporal scales in order to provide meaningful answers from the physical and statistical point of view. First, a statistical analysis is employed to classify the watershed upland and instream affecting parameters and to quantitatively describe the impacts of these parameters on stream ecology, as it is expressed with the Index of Fish Density (IFD). Second, the GeoWEPP soil erosion model is employed to simulate the hydrologic, and sediment entrainment phenomena at the uplands of the watershed. Long-term averages and different frequency distributions analyses are performed to investigate the temporal variability in upland soil erosion processes. Third, to accurately address the scale and coupling issues, a thorough investigation for the particle transit time is performed using the state of the art concepts, including the hypsometric curve approach and the particle virtual velocity approach. It is demonstrated that a fine sediment particle moves from the uplands to the mouth of the watershed within a relatively short period of time (few days). Fourth, this work also involves enhancing capabilities of an existing instream two-dimensional (2-D) hydrodynamic and sediment transport model that was originally developed to simulate the transport of uniform sediments. The new version of the model, EnSEDZL model, incorporates the Parker and Wilcock's sediment transport equations to predict multifractional bedload transport rates. Supplemented by several empirical functions for predicting bedload transport capacity, hiding function, reference transport rate, etc. The streambed elevation changes obtained from an overall mass balance equation. The upland soil erosion model is eventually combined with the instream numerical model, by matching the return period for a rainfall storm event for the upland soil erosion processes with instream flow that has the same return period for instream sediment transport processes, to accurately determine the upstream boundary conditions for the instream sediment transport modeling. Finally, modeling results are compared with 13-year detailed field data and against the predictions of commercial and private models, including the USACE models (RMA2 and SED2D) and the 3ST1D model developed in-house.

Keywords: Watershed, Stream Scales, Sediment Transport, Upland Erosion, Coupling

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EFFECTS OF FLOOD TIMING AND SPATIAL DISTRIBUTION ON NITRATE EXPORT FROM THE UPPER MISSISSIPPPI BASIN

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We examined the transport of nitrate + nitrite nitrogen (nitrate) in the Mississippi River during the period 1992-2001 with emphasis on two major floods (1993 and 2001) in the Upper Mississippi River basin (above the Missouri River confluence with the Mississippi River). We found significant influences of flood frequency (antecedent conditions), seasonal timing, and geographic distribution of flooding on nitrate transport. The results show that major floods dominate the movement of nitrate in this system and that the spatial and temporal distribution of flooding has substantial influence on nitrate transport. Of particular importance to the concentration of nitrate in flood waters is the level of discharge from the basin during the preceeding year. The character of flood waters delivered from the Upper Mississippi Basin to the Gulf of Mexico can also be strongly influenced by dilutional flows from other basins in the Mississippi drainage (e.g., the Ohio River) so that the seasonal timing of Upper Mississippi floods relative to flooding in other subbasins can have important consequences. Our results show that the size of the summer hypoxic zone in the Gulf of Mexico, which varies in relation to discharge from the Upper Mississippi River, appears particularly sensitive to May discharge from the Upper Mississippi.

keywords: nitrogen, Gulf hypoxia, antecedent conditions, loading

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A HIERARCHICAL SPATIAL COUNT MODEL WITH APPLICATION TO IMPERILED GRASSLAND BIRDS.

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We utilized a Markov Chain Monte Carlo approach to spatially predict abundance of 5 rare grassland birds (Bobolink, Grasshopper Sparrow, Sedge Wren, Upland Sandpiper, Henslow's Sparrow) in the upper midwestern US. Twenty-one years of North American Breeding Bird Survey counts were modeled as a hierarchical loglinear function of explanatory variables describing habitat, spatial relatedness between route counts, year effects, and nuisance effects associated with differences in observers. The model included a conditional autoregressive term representing the correlation between adjacent routes. Explanatory habitat variables in the model included land cover composition and configuration, climate, terrain physiognomy, and human influence. The model hierarchy was due to differences in route counts between observers over time. We fitted this model with WinBUGS. Preliminary evaluation of the models based on independent data suggested generally good agreement with model predictions. Discrepancies between evaluation data and model predictions were due, in some unknown measure, to insertion of errors when translating the statistical model into a mapped model.

Keywords: MCMC, overdispersed Poisson regression, spatially-correlated counts, species-habitat models

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CONSERVATION AND THE COMMON SNAPPING TURTLE (*CHELYDRA SERPENTINA*) ALONG THE ILLINOIS RIVER.

John K. Tucker[1] and James T. Lamer[2]
[1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclaire Ave, Brighton, IL 62012. [2] Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455.

The common snapping turtle (*Chelydra serpentina*) is harvested as a food item in much of its range in the United States. Harvest of snapping turtles from roads has received little attention. These turtles, which are nearly all females going to nest or returning from nesting, are usually destined for the cooking pot. Removing nesting females has to have a large impact on populations. Recently, we initiated a trapping program to examine the effect of incidental take from roads on snapping turtles in west-central Illinois. Our goal was to develop data sufficient to use in protecting the snapping turtle as a renewable resource. We chose three backwater lakes along the Illinois River as study sites (see Tucker, 2001). Two lakes (Lower Stump Lake and Gilbert Lake in Jersey County, Illinois) extend along side Illinois Route 100, a heavily traveled road. One lake (Swan Lake in Calhoun County, Illinois) is surrounded by the Two Rivers National Wildlife refuge. We predicted that the sites most exposed to human traffic would have male dominated sex ratios compared to the more protected site. Our findings support this hypothesis. Males made up more than 80% of the catch at the two Jersey County lakes whereas they made up 53% of the catch at Swan Lake. These results are important because the practice of removing snapping turtles from roads is widespread and our data suggest that the impact is considerable.

Keywords: Illinois River, common snapping turtle, male dominated sex ratios, harvest pressure, conservation, resource management.

TURTLE COMMUNITY STRUCTURE IN A BACKWATER LAKE OF THE ILLINOIS RIVER.

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[1] Great Rivers Field Station, Illinois Natural History Survey, 8450 Montclaire Ave, Brighton, IL 62012. [2] Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455.

Turtle communities of large rivers of the United States have received little systematic study. Turtles are important in aquatic environments contributing considerable biomass. Regardless most community studies involve lakes and ponds. We report here on a three year trapping study of Long Lake, a backwater lake of the lower Illinois River. Turtles were trapped each year in July and August, which were the only months that water levels and hunting use allowed us reliable access to the lake. Legler hoop traps baited with fish were used in each year to catch turtles. Turtles were identified to species, weighed, measured, marked, and released. Overall we caught 3,473 turtles from six species including the spiny softshell (*Apalone spinifera*), the red-eared slider (*Trachemys scripta elegans*), the painted turtle (*Chrysemys picta*), common map turtle (*Graptemys geographica*), the stinkpot (*Sternotherus odoratus*), and the common snapping turtle (*Chelydra serpentina*). Red-eared sliders dominated catches in each year of the study ranging from 90.6% (2002) to 96.8% (2003) of the turtles caught. In contrast, we caught only 2 common snapping turtles in Long Lake during the three year study. Common snapping turtles are usually an abundant species and their absence is unexplained. Sex ratio for various species varied from female biased in the spiny softshell (82.7% females) and stinkpot (61.7% female) to male biased in the painted turtle (60.7% male). Sliders had equal numbers of males and females (50.1% male). Male sliders averaged 146 mm in plastron length and 675 g in mass. Female sliders averaged 171 mm in plastron length and 1098 g in mass. Catch per unit effort increased dramatically from 2001 (3.43 turtles/trap/day) to 2003 (20.88 turtles/trap/day). The change appears to be due to increased numbers of small turtles caught in 2003. Density can be estimated for the entire lake at about 171 sliders/hectare. However, a more realistic estimate of density based on the actual area trapped is 433 sliders/hectare. The slider density (433 turtles/hectare) for the actual area trapped is similar to the number of sliders per hectare reported for stream and pond habitats elsewhere. Estimated biomass for sliders was a minimum of 128 kg/hectare for the entire lake and about 325 kg/hectare for the area actually trapped. These estimates are comparable to biomass estimates for fish communities suggesting that turtles are an important but largely ignored component of the ecosystem in river backwaters.

Keywords: Illinois River, turtles, turtle biomass, population increases, community structure.

SAVING THE HIGGINS EYE PEARLYMUSSEL (*LAMPSILIS HIGGINSII*) FROM EXTINCTION: 2003 STATUS REPORT ON THE ACCOMPLISHMENTS OF THE MUSSEL COORDINATION TEAM

Gary J. Wege
U.S. Fish & Wildlife Service, 4101 East 80th Street, Bloomington, MN, 55425-1665

Zebra mussels (*Dreissena polymorpha*) are an exotic species and a significant threat to native freshwater mussels of the Upper Mississippi River (UMR). At high densities, they compete for food, prevent opening/closing of shells, degrade habitat conditions, and prevent successful reproduction and recruitment.

Zebra mussels attach to nearly all underwater objects including large boats using the federal navigation system of locks and dams on the UMR. In April, 2000, the U.S. Fish & Wildlife Service (Service) determined that continued operation and maintenance of the federal 9-Foot Channel Project would jeopardize the continued existence of the federally-endangered Higgins eye pearlymussel (*Lampsilis higginsii*). To avoid jeopardy, the Service recommended the U.S. Army Corps of Engineers establish populations of Higgins eye in areas with no/few zebra mussels, and implement a zebra mussel control program. Since April, 2000, a variety of conservation measures have been implemented including genetics studies, propagation of mussels at the Genoa National Fish Hatchery, propagation in cages in the UMR and tributaries, stocking juveniles, relocating adults, stocking glochidia-inoculated fish, cleaning and stockpiling adults, and survey/monitoring activities.

Keywords: Higgins eye pearlymussel, Mississippi River, glochidia, Lampsilis higginsii, propagation

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CRITTER TALK

Daniel Call[1], John Stewart[2], Michael Willis[3], Brad Clarke[4], Nicole Essman[1] and Benjamin Breitbach[1]
[1]Department of Natural & Applied Sciences, [2]Office of Vice President for Academic Affairs, [3] Office of Technology, [4]Department of Education, University of Dubuque, Dubuque, IA 52001

Critter Talk is a 9-minute compact disc video presentation designed for viewing by the general public. This video focuses on two macroinvertebrate species that are resident to the Upper Mississippi River in the Dubuque, IA, area. The burrowing mayfly (*Hexagenia bilineata*) is a species that is commonly encountered during the time of its emergence and ephemeral adult existence in late June or early July. The glass shrimp (*Palaemonetes kadiakensis*) is a less commonly encountered benthic species that inhabits portions of the river with slow current and macrophyte beds. Various aspects of the biology of these two species are presented, and the use of these species as indicators of ecosystem health is discussed. Their presence in a given stretch of river indicates that basic ecological requirements for their survival, such as adequate levels of dissolved oxygen, have been met. Information on their positions in the aquatic food web, and their roles in the bioaccumulation of certain chemicals in different food chains, is also presented.

Keywords: macroinvertebrates, video, *Hexagenia bilineata*, *Palaemonetes kadiakensis*, public education

A COMPARISON OF SUBMERSED AQUATIC VEGETATION IN MAIN-STEM FLOODPLAIN HABITATS AND ISOLATED FLOODPLAIN LAKES OF THE ILLINOIS RIVER; IMPLICATIONS FOR RESTORATION.

Thad R. Cook and Mark A. Pegg.
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The importance of aquatic vegetation to the ecological health of aquatic systems is widely recognized. Documentation of species richness, abundance, and their importance to the Illinois River and its floodplain lakes began in the late 1800's and continues today. An assessment of submersed (SAV) and rooted floating leaf (RFL) vegetation utilizing a stratified random sampling design (SRS) began in 1998 to monitor frequency, percent cover and to establish an abundance index (AI =relative index of plant density ranking) of these species in main-stem, isolated backwater lakes (IBW), contiguous backwater lakes (CBW), and isolated floodplain lakes (LK) of La Grange Reach (RM 80-158). We also examined community structure of SAV and RFL species at Spunky Bottoms and Emiquon, two isolated floodplain backwater areas of the Illinois River recently purchased by The Nature Conservancy. We compared IBW, CBW and LK strata using SRS data from 1998 to 2002. Data from the Spunky and Emiquon areas were collected using different sampling techniques and therefore were used for comparison of species presence/absence only. Stratified random sampling collections yielded a total of 13 SAV and RFL species in La Grange Reach. Of the nearly 2,800 sample sites, no SAV was recorded in the IBW and CBW strata. Therefore, the LK strata housed all of the SAV species recorded during the SRS. Mean frequency (% occurrence in all SRS sites) in the LK strata was 79.2% with an AI of 23.4 for all SAV species combined. Alternatively, RFL were collected in all strata demonstrating an ability to withstand a wide range of hydrological conditions. Mean frequencies for RFL in LK, IBW and CBW strata were 32.9%, 2.8% and 1.3% respectively. Mean percent cover (% cover in all SRS sites) estimates were .32%, .27% and 15.6% respectively. Similarly, species diversity was high in Spunky bottoms where 12 SAV and RFL species were recorded. Species composition for both the LK strata and Spunky bottoms were similar, but differed greatly from that of the IBW and BWC strata. Emiquon, currently managed for agriculture, also had higher diversity than that of the main-stem strata with a total of 2 species of SAV recorded. Monitoring aquatic vegetation within the floodplain is needed to understand how environmental factors can influence growth and distribution of these important species. The direction of restoration efforts within the Illinois River is moving towards restoring former floodplain areas (i.e., drainage and levee districts). Understanding the dynamics and benefits of such restoration efforts will prove critical to the success of future restoration and management.

Keywords: Submersed aquatic vegetation, Rooted floating leafed vegetation, restoration, Illinois River

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BY LAND AND WATER THEY GO: AQUATIC SNAILS IN THE SYSTEM. ARE THEY NATIVE, EXOTIC, INVASIVE OR JUST GREAT BIO-INDICATORS?

Byron N. Karns[1] and Ellen Strong [2].
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The St. Croix National Scenic Riverway is a major tributary of the Upper Mississippi River. The Riverway is a unit of the National Park System and is recognized for its outstanding recreational and biological resources, particularly the nationally significant richness and abundance of freshwater mussels (~40 species). The diversity of unionids within the Riverway is the greatest in the Upper Mississippi watershed. There is little doubt that the assemblage of aquatic gastropods is of similar note. These faunal groups will be severely impacted by a zebra mussel infestation or other exotic invasions. Freshwater mollusks are a keystone faunal group of freshwater systems and while the unionid mussels in the St. Croix and Namekagon Rivers have been relatively well studied, little detailed information is available for aquatic snail species. Past surveys and sporadic collecting efforts over the past 110 years are sufficient to indicate that snails are indeed present in this system, and that snail diversity is typically lower than that of unionids, but with similar abundances in suitable habitats. However, no recent data is available to assess shifts and/or trends in patterns of snail distributions and abundance.

The questions are thus posed in the face of imminent threats. The St. Croix National Scenic Riverway has remarkable native mussel diversity, so one would expect similar snail diversity. Little or no current information on snails from the Riverway is known. Zebra mussels might spell the demise of species before river managers are aware of their presence. Black carp *(Mylopharyngodon piceus)* are certain to have a negative impact on all the Riverway's mollusks species. Mollusks are experiencing dramatic declines and unprecedented levels of extinction as a consequence of habitat degradation from agricultural and industrial pollution, damming, invasive species (e.g. New Zealand mud snails, Zebra mussels, etc.) and a number of other human mediated impacts (Kay 1995a,b; Lydeard et al. In press). A thriving and diverse molluscan assemblage is an integral component and indicator of healthy aquatic/riparian ecosystems. Therefore, discovering what snail species are present and where, does the Riverway support exotic/invasive species, and what impacts will other invasive/native species have on this faunal group is a critical set of questions to begin to answer.

The poster will outline the study plan for a survey of aquatic snails on the St. Croix and Namekagon during the 2004 field season. Location information will be detailed and previous collections explored for sites to reexamine. Emphasis will be placed on those species which are rare or invasive and what strategies might be best to conserve or eliminate species based on this determination. Also discussed will be tools that might be used to protect desired species from the onslaught of threats, particularly aquatic invasive species.

Keywords: Aquatic Snails, Inventories, Invasive Species, Endangered and Threatened Species, St. Croix National Scenic Riverway.

DEVELOPMENT OF REMOTE SENSING TECHNIQUES TO DOCUMENT THE DISTRIBUTION AND NUMBERS OF TUNDRA SWANS ON THE UPPER MISSISSIPPI RIVER.

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The Upper Mississippi River (UMR) has become an important stopover area for the Eastern Population of tundra swans (*Cygnus columbianus columbianus*) during fall migration in recent years. During 1997 through 2002, annual fall swan use averaged more than 760,000 use-days. This represents a 700% increase in river-wide swan use from the early 1980s based on use-day estimates. Because of the increased public interest in swans and the responsibility for management of the UMR for this trust species, river managers and biologists have identified and prioritized research needs that would provide important information to support the wise management of tundra swans. In fall 2003, we initiated pilot work to assess the availability and impacts of tundra swans on food resources within the UMR, a priority research need. A primary objective of this work was to develop efficient techniques to use geo-referenced aerial photography to document numbers and distribution of tundra swans and link the information with vegetation cover data (i.e., USGS Long-term Resource Monitoring Program Land Cover/Land Use spatial database).

Wildlife surveys using remotely-sensed imagery have shown promise but the results are mixed and largely dependent on the imagery format (digital, print, color, black-and-white), the scale of the image (how large or small the animal being counted appears on the image), and how easily the animal being counted can be separated from its habitat and other animals nearby. Aerial photography can generate very detailed images but it is expensive and has a long turnaround time. Digital photography has a rapid turnaround time but, until recently, could not deliver the areal extent and resolution required for large-scale surveys. However, the release of the 14-megapixel Kodak DCS Pro 14n digital camera in 2003 offers the best potential to blend the best of both formats into one relatively inexpensive package. Here we report on the feasibility using the DCS Pro 14n and automated counting software to augment or replace some visual-based waterfowl surveys.

The information gathered in this pilot field study will provide a basis for development of a scope of a detailed study plan to model local movements of swans in association with distribution of food resources and areas closed to waterfowl hunting. The accrued information should guide river resource managers in development and implementation of management strategies for enhancement of the UMR as an important resource for tundra swans.

Keywords: *Cygnus columbianus*, digital imagery, survey techniques, tundra swan, Upper Mississippi River

MONITORING OF NITROGEN CYCLING AT AN UPPER MISSISSIPPI RIVER BACKWATER SITE

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Backwaters of the Upper Mississippi River (UMR) contain highly organic sediments that are anoxic throughout most of the year. This is an optimal environment for nitrogen removal from this high nitrogen system; however, measured rates of denitrification are typically low. We monitored a backwater site on the UMR near navigation Pool 8 at La Crosse, WI to assess temporal trends in nitrogen cycling. We measured water quality, sediment chemistry, and denitrification rates weekly for a three-year period. Denitrification rates ranged from 0-1.6 ugN/cm^2/hr, but were greater in winter months and lower during summer, and were correlated to surface and sediment porewater nitrate levels (r=0.63 and 0.34). During winter we observed huge algal blooms creating oxic conditions (3.5-25 mg/L O_2); when oxygen was present, nitrate was likely generated by nitrification and promoted increased denitrification, despite low temperatures. This study suggests that denitrification in backwaters of Pool 8 may be controlled primarily by the availability of nitrate in the sediment, regardless of temperature.

Keywords: nitrogen cycling, denitrification, Mississippi River, backwater areas

WHAT PHYTOPLANKTON COMMUNITIES TELL US ABOUT MIXING OF WATER FROM THE NAVIGATION CHANNEL AND VEGETATION BED AT LOCK AND DAM 19, MISSISSIPPI RIVER.

Susan T. Meiers
Department of Biological Sciences, Western Illinois University, 1 University Circle, Macomb, IL 61455

Although several studies of large rivers such as the Mississippi have examined community composition throughout the year, few have examined how much mixing of water and species occurs among communities that exist within those rivers. Using observations of phytoplankton communities in the navigation channel and the vegetation bed above Lock and Dam 19, an approximate measure of the mixing of water from these regions was examined. Sampling at the surface and 1 m below the surface occurred at 3 sites above the dam (mid-navigation channel, mid-vegetation bed, and at the edge of the vegetation bed) and 5 sites below the dam (3 sites just below the dam at the Iowa side, Illinois side, and midway point below the dam; and 2 sites further down the river at mid-navigation channel and approximately 200 m north of Eagle Island near the Illinois shore). Examination of above-dam phytoplankton communities indicates there is a small amount of water and community mixing between the navigation channel and the vegetation bed, and that the two sites do have different and community compositions.

Keywords: phytoplankton, Mississippi River, algal community composition, aquatic vegetation, Lock and Dam 19

PRELIMINARY SURVEYS AND GIS MAPS OF TOTAL SUSPENDED SOLIDS IN THE CATFISH CREEK WATERSHED, DUBUQUE COUNTY, IOWA

William Niemann, Daniel Call, William Knuth, Katrina Krakow, Andrew Huck, Christopher Green and Zachary Gustafson
Department of Natural & Applied Sciences, University of Dubuque, Dubuque, IA

The Catfish Creek watershed contains five tributary streams that merge into a single common stream a short distance upstream from its mouth at the Mississippi River in Dubuque, IA. A study was conducted of the levels of total suspended solids (TSS) in each of the tributaries at several times over the past several years at various flow conditions. Data for the study were obtained from: (1) gravimetric measurements of TSS, (2) turbidimetric measurements of stream turbidity, (3) IOWATER transparency tube measurements of water clarity, and (4) IOWATER database measurements for transparency tube measurements, as collected by other volunteers. The predictive capabilities of rapid measurement techniques, such as turbidity and transparency tube measurements, in estimating TSS values were evaluated. Turbidimeter readings in nephelometric turbidity units (NTUs) resulted in a higher coefficient of determination (R^2) and better predictive capability than transparency tube readings. This may be due to the greater subjectivity and more limited overall range of possible values (i.e., 0-60 cm) inherent with the transparency tube method. However, the transparency tube is less expensive, and numerous measurements from the watershed are available in the IOWATER database. Data from the IOWATER database, including transparency tube "snapshots" of water clarity from the tributaries on specific weekends, were used to develop a preliminary geographic information system (GIS) map of the watershed regarding the presence of TSS in the five streams. This type of approach, along with an account for variation in sediment levels with flow, may be useful in determining the particular tributaries that are in the greatest need of attention in reducing erosion into the watershed.

Keywords: total suspended solids, turbidity, transparency, erosion, IOWATER

COMPARING FISH TROPHIC DYNAMICS IN THREE FLOODPLAIN RIVERS: THE MISSISSIPPI, OHIO, AND MISSOURI.

Tiffany Schriever and Michael Delong, Large River Studies Center, Biology Department Winona State University, Winona MN 55987

Individual river systems offer commonalities and differences among other rivers with respect to geomorphology, natural and anthropogenic impacts, and food web dynamics. The Upper Mississippi, lower Ohio, and lower Missouri Rivers indicate similarities within regional constraints; however, the addition of dams, levees, and navigational pathways has impacted these rivers on different levels. This study was undertaken to define and compare the nature of higher trophic levels of river-floodplain ecosystems. Trophic position, which defines the location of higher consumers in a food web, was calculated for a range of fish species using stable isotope ratios of carbon and nitrogen. Fish representing piscivores, invertivores, omnivores, and planktivores were examined in this study. Trophic position models revealed seasonal shifts as well as differences in complexity among the three rivers. Trophic positions of fish in the Mississippi and Ohio Rivers correlated well with expected trophic level-specific locations. Trophic positions of fish from the Missouri River, however, differed considerably and often diverged markedly from expected trophic status. We suggest that similarities in trophic position of fishes in the Upper Mississippi and Ohio Rivers indicate that functional dynamics of these two rivers are comparable, despite obvious differences in overall basin morphology. Marked differences in system dynamics of the Missouri, relative to the other rivers, may be attributed to the pronounced alteration and degradation of this formerly braided and hydrologically dynamic river-floodplain ecosystem.

Keywords: stable isotope, trophic level, food web, trophic position, fish

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FOOD WEB DYNAMICS OF LARGE FLOODPLAIN RIVERS: ASSESSMENT THROUGH STABLE ISOTOPE ANALYSIS

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

Food web ecology has become increasingly important for addressing ecological questions because trophic dynamics emphasize functional aspects that may be more sensitive to fluctuations than structural measures. The objective of this study was to use stable isotope ratios of carbon and nitrogen to build food web models for a quantitative comparison of trophic dynamics of the Upper Mississippi, Ohio and Missouri Rivers. This comparative approach may make it possible to establish common threads in the functioning of river-floodplain ecosystems and to assess the impact of human alterations to structural and functional attributes. Samples were collected for the following components: organic matter within the water column, benthic algae, terrestrial vegetation within the riparian zone, and invertebrate and fish consumers from representative functional feeding groups. A combination of trophic position models and a dual-isotope, multiple-source mixing model were used to establish linkages from basal sources through higher consumers. Energy driving the food web of the Missouri River is dissolved organic matter (DOM) and terrestrial organic matter. Ultrafine transported organic matter and DOM were the major food sources in the Ohio River, whereas DOM, fine transported organic matter, and benthic algae were the primary food web drivers in the Upper Mississippi. While DOM is important in all three rivers, there is a clear partition in the importance of transported organic matter in the Ohio and Upper Mississippi, compared to the significant role of terrestrial organic matter in the food web of the Missouri River. Flow of organic matter to higher trophic levels supports the conclusion that there are clear differences in the functional dynamics of the Missouri River when compared to the other two rivers. While natural structural differences could be responsible, obvious differences in the basin characteristics of the Ohio and Upper Mississippi should lead to greater differences here. We propose that extensive anthropogenic changes in the Missouri River are the primary causal mechanism for differences observed in trophic dynamics.

Keywords: stable isotopes, food webs, large floodplain river ecosystems, human impacts, ecosystem processes

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EPIZOIC ORGANISMS ON TURTLES IN SELECTED HABITATS OF THE UPPER MISSISSIPPI RIVER.

Cathy L. Ziglar and Richard V. Anderson
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While it has long been recognized that turtles harbor a large number of epizoites few studies have looked at the epizoic community as a whole or compared the epizoites of turtles in different habitats. Turtles were collected from 3 habitats; open river, slough, and backwater, in the upper reach of Pool 20, Mississippi River. One hundred thirty-nine turtles of 6 species were examined for epizoites, but only red-eared sliders, (*Trachemys scripta*), common snapping turtle (*Chelydra serpentine*), painted turtles (*Chrysemys scripta*) and soft-shelled turtles (*Apolone* spp.) were collected in sufficient numbers for data analysis. Five epizoites were attached directly to turtles; 3 species of leeches of genus *Placobdella*, algae of genus *Basicladia*, and protozoan *Vorticella*. All hard shelled turtle species carried all 5 epizoites, but soft-shelled species carried only *P. multilineata*, *P. ornata*, and *Vorticella*. The highest infestation rates occurred on snapping turtles with 94% leeches, 94% algae, 48% *Vorticella*. The lowest rates for each group of epizoites were painted turtles with 26% leeches, and soft-shelled turtles with 0% algae, and 5% *Vorticella*. Habitat specificity was found for the leech, *P. ornata*, and *Vorticella* both of which occurred significantly more frequently on snapping turtles and red-eared sliders in the backwater habitat.

Keywords: Mississippi River, Pool 20, habitats, freshwater turtles, epizoites,

MINUTES OF THE 2003 BUSINESS MEETING
ANNUAL MEETING OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

25 April 2003

The meeting was called to order at 12:35 p.m. by Jeff Arnold (President). Mike Romano (Vice-President), Jim Fischer (Secretary), and about 50 other members were present. Neal Mundahl (Treasurer) was not present at the meeting.

President's Report

Awards

President Arnold presented the awards for Best Student Paper (platform) to Emily Thorn, Biology Department, Wheaton College, and for Best Student Poster to Jason Granberg, Department of Biological Sciences, Western Illinois University.

Acknowledgements

President Arnold acknowledged Georgina Ardinger for her assistance with registration, set-up, raffle, and maintenance of the mailing list. He also acknowledged the Executive Committee (Mike Romano, Neal Mundahl, and Jim Fischer), Mike Dewey for assistance with the t-shirts and organization of the student poster session, Heidi Imker for design of the t-shirt logo, session moderators, judges for the student presentations, Terry Dukerschein for taking photos, and Randy Hines for taking photos and assistance with the middle-school student posters. Thanks were also given to Thad Cook for the Decoy provided for the raffle, Dave Kennedy for providing prints, and to Tom Claflin for his donation of a custom fishing rod.

Minutes

A motion to accept the Minutes from 26 April 2002 Business Meeting as printed on page 63 of the Proceedings was seconded and approved by acclimation.

Treasurer's Report

Treasurer Neal Mundahl was not present, so President Arnold gave the report on his behalf. The report was published on page 65 of the Proceedings. Jeff indicated that the financial status of the organization continues to be solvent and remains relatively constant, varying by a few hundred dollars from year-to-year. Marian Havlik asked how many people were in attendance at the meeting this year, and President Arnold reported 122 registrations for this year's meeting, which was down by six from last year (128 registrants). A motion to accept the Treasurer's Report was made from the floor, seconded by Terry Dukerschein, and approved by acclimation.

Old Business

Booking Facilities for Annual Meeting

President Arnold reported that the 2004 meeting will be held on April 1-2 at the Radisson, La Crosse, Wisconsin. He remarked that the 2004 meeting had to be scheduled earlier than usual because they were the only Thursday-Friday dates available in April.

No other old business was discussed.

New Business

Nominations. President Arnold called for nominations from the floor for Treasurer and Vice President. There were no nominations from the floor. The Executive Board nominated Neal Mundahl for Treasurer and Mark Pegg (not present at the business meeting) for Vice President. Nominations were closed by M/S/P. President Arnold called for a vote. All in favor, no oppositions, and both positions were approved. Jeff turned the meeting over to the new president, Mike Romano, at 12:50 p.m.

Upcoming Meeting Dates:
President Romano announced that the tentative dates for the next two meetings are April 28-29, 2005, and April 27-28, 2006. Marian Havlik asked if both dates were Thursday-Friday, and Mike confirmed. There was no opposition to the proposed meeting dates, so President Romano recommended that we book both dates immediately following the meeting.

Other New Business

President Romano called for other new business. No other new business.

President Romano closed the meeting with an award for former President Jeff Arnold, and thanked him for his service.

Meeting adjourned by consensus at 12:59 pm. and was followed by the raffle drawings.

MISSISSIPPI RIVER RESEARCH CONSORTIUM
TREASURER'S REPORT - SUBMITTED BY NEAL D. MUNDAHL
1 MARCH 2004

Accounts as of 30 June 2001			$11,274.56
Accounts as of 30 June 2002			$11,175.75

Transactions, 1 July 2002 to 30 June 2003

INCOME			
	2002 Registration	175.00	
	2003 Registration and dues	6288.00	
	2003 Raffle proceeds	1054.00	
	2003 T-shirt sales	361.00	
	Interest	21.88	
Total		7899.88	
EXPENSES			
	Radisson Hotel - 2003 meeting	5835.39	
	2003 Proceedings	711.75	
	2003 Raffle prizes	626.56	
	2003 Best paper/poster awards	101.00	
	2003 Meeting entertainment	350.00	
	T-shirts	538.00	
	Postage, mailing, supplies	492.97	
	Corporation fee	10.00	
Total		8665.67	
Accounts as of 30 June 2003			$10,409.96

Transactions, 1 July 2003 to 1 March 2004

INCOME			
	Interest	7.07	
Total		7.07	
EXPENSES			
	Postage, mailing, supplies	84.33	
	Corporation fee	10.00	
Total		94.33	
Accounts as of 1 March 2004			$10,322.70
Accounts			
	Checking account	3380.52	
	Savings account	6942.18	
Total		10322.70	

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.
BUSINESS MEETING AGENDA

2 April 2004, 12:30 PM
Radisson Hotel, La Crosse, Wisconsin

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1. Call to Order
2. President's Report
    - Approval of 2003 minutes
    - Acknowledgments
3. Treasurer's Report
4. Old Business
    - Discussion of next years meeting and dates
5. New Business
    - Executive board nomination
    - Election of officers
    - Suggested dates for 2007 meeting and meeting reservations at Radisson
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 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, of, 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 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 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 By-Laws,
(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 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. 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.

6.02 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 <u>By The Membership.</u>

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

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

Meeting	Year	Location	President
1st	1968*	St. Mary's College, Winona, MN	Brother George Pahl
2nd	1969	Wisconsin State Univ., La Crosse, WI	Dr. Thomas Claflin
3rd	1970	Winona State College, Winona, MN	Dr. Calvin Fremling
4th	1971	St. Cloud State College, St. Cloud, MN	Dr. Joseph Hopwood
5th	1972	Loras College, Dubuque, IA	Dr. Joesph Kapler
6th	1973	Quincy College, Quincy, IL	Rev. John Ostdiek
7th	1974	No Meeting	---
8th	1975	Monmouth College, Monmouth, IL	Dr. Jacob Verduin
9th	1976	St. Mary's College, Winona, MN	Mr. Rory Vose
10th	1977	Winona State University, Winona, MN	Dr. Dennis Nielsen
11th	1978	Univ. Wisconsin-La Crosse, La Crosse, WI	Dr. Ronald Rada
12th	1979	Cancelled	Dr. Edward Cawley
13th	1980	Loras College, Dubuque, IA	Dr. Edward Cawley
14th	1981	Ramada Inn, La Crosse, WI	Mr. Michael Vanderford
			Executive Committee
15th	1982	Radisson Hotel, La Crosse, WI	Dr. Richard Anderson Dr. Dave McConville
-------	1983	No Meeting	Dr. Jim Wiener
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
			Board of Directors
18th	1986	Radisson Hotel, La Crosse, WI	Dr. Jim Eckblad Dr. Carl Korschgen Dr. Jim Peck
19th	1987	Univ. of Wisconsin-La Crosse, La Crosse, WI	Mr. Hannibal Bolton Dr. Leslie Holland Dr. Mike Winfrey
20th	1988	Univ. of Wisconsin-La Crosse, La Crosse, WI	Mr. John Pitlo Mr. Verdel Dawson Dr. Nani Bhowmik

Meeting	Year	Location	Board of Directors
21st	1989	Holiday Inn, La Crosse, WI	Dr. Larry Jahn Mr. Jerry Rasmussen Dr. Bill LeGrande
22nd	1990	Island Inn, La Crosse, WI	Mr. Doug Blodgett Dr. John Ramsey Mr. John Sullivan
23rd	1991	Holiday Inn, La Crosse, WI	Mr. Kent Johnson Dr. Mike Romano Dr. Joe Wlosinski
24th	1992	Holiday Inn, La Crosse, WI	Dr. Richard Anderson Mr. Mike Dewey Mr. Kent Johnson Dr. Joe Wlosinski
25th	1993	Holiday Inn, La Crosse, WI	Dr. Richard Anderson Dr. Teresa Naimo Mr. Charles Theiling Dr. Joe Wlosinski
26th	1994	Holiday Inn, La Crosse, WI	Dr. Teresa Naimo Dr. Mark Sandheinrich Mr. Charles Theiling Dr. Neal Mundahl
27th	1995	Holiday Inn, La Crosse, WI	Dr. Mark Sandheinrich Mr. Rob Maher Dr. Michael Delong Dr. Neal Mundahl
28th	1996	Holiday Inn, La Crosse, WI	Dr. Mark Sandheinrich Ms. Therese Dukerschein Dr. Michael Delong Dr. Neal Mundahl
29th	1997	Holiday Inn, La Crosse, WI	Ms. Therese Dukerschein Mr. Mark Steingraeber Dr. William Richardson Dr. Neal Mundahl
30th	1998	Yacht Club Resorts, La Crosse, WI	Mr. Mark Steingraeber Dr. Melinda Knutson Dr. William Richardson Dr. Neal Mundahl
31st	1999	Yacht Club Resorts, La Crosse, WI	Dr. Melinda Knutson Dr. Richard Anderson Mr. Brent Knights Dr. Neal Mundahl
32nd	2000	Radisson Hotel, La Crosse, WI	Dr. Richard Anderson Dr. Yao Yin Mr. Brent Knights Dr. Neal Mundahl

Meeting	Year	Location	Board of Directors
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

*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.

Notes

ACKNOWLEDGEMENTS 2004

The following persons or institutions have contributed substantially to the planning, execution, support, and ultimately, the success of the 36th Annual Meeting of the Mississippi River Research Consortium. The 2003-2004 Board of Directors and Consortium members gratefully acknowledge their efforts.

Local Meeting Arrangements, Meeting Announcements, and Mailings

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

Jim Fischer, Wisconsin Department of Natural Resources, LTRMP Field Station, Onalaska, Wisconsin

Kraig Hoff, Wisconsin Department of Natural Resources, LTRMP Field Station, Onalaska, Wisconsin

Kevin Mauel, Wisconsin Department of Natural Resources, LTRMP Field Station, Onalaska, Wisconsin

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

Mark Pegg, Illinois Natural History Survey, Havana, Illinois

Michael Romano, Department of Biological Sciences, Western Illinois University, Macomb, Illinois

Program and Proceedings

Jim Fischer, Wisconsin Department of Natural Resources, LTRMP Field Station, Onalaska, Wisconsin

Mark Pegg, Illinois Natural History Survey, Havana, Illinois

Michael Romano, Department of Biological Sciences, Western Illinois University, Macomb, Illinois

Registration Table

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

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

T-shirt Logo Design

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

Visual Aids and Poster Arrangements

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

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

Sales and Arrangements (Raffle and T-shirt)

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

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

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

Website

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

Brent Knights, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Platform Session Moderators

Richard Anderson, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Robert Connour II, Owens Community College, Findlay, OH 45840

Tom Dunstan, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Sean Jenkins, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Brent Knights, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Susan Meiers, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Judges for Student Presentations

Mike Delong, Large River Studies Center, Biology Department, Winona State University, Winona, Minnesota

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

Tom Dunstan, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

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

Sean Jenkins, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Susan Meiers, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Jessica Petersen, Department. of Biological Sciences, Western Illinois University, Macomb, Illinois

Jennifer Sauer, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

Raffle Prizes

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

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Poster Session and School Outreach

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Mike Johnson, Longfellow Middle School, La Crosse, Wisconsin

Barb Thompson, West Salem School District, West Salem, Wisconsin

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