PROCEEDINGS OF THE

MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 38

27-28 April 2006

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PROCEEDINGS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 38

MISSISSIPI RIVER RESEARCH CONSORTIUM, INC.

38th ANNUAL MEETING
27-28 APRIL 2006
RADISSON HOTEL
LA CROSSE, WISCONSIN

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Jonathan W. Petersen and Corby Lewis, Army Corps of Engineers Centre, 190 East Fifth Street, St. Paul, Minnesota 55101-1638

9:00 – 9:20 AM FACTORS AFFECTING N^{15} FOR TERRESTRIAL AND INSTREAM SEDIMENTS
Ranjani B. Theregowda and Thanos A. Papanicolaou, Hydroscience and Engineering, 100 C. Maxwell Stanley Hydraulics Laboratory, The University of Iowa, Iowa City, IA 52242

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Alex P. Levchuk[1], John H. Chick[1], Kim A. Medley[2], John E. Havel[2], Jeff D. Jack[3], [1]Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Avenue, Brighton, IL 62012, [2]Department of Biology, Missouri State University, Springfield, MO 65897, [3]Department of Biology, University of Louisville, Louisville, KY 40292

10:00 – 10:20 AM TRANSPORTED ORGANIC MATTER IN A FLOODPLAIN RIVER: EVIDENCE OF HYDROLOGICAL CONTROLS ON TROPHIC DYNAMICS
Michael D. Delong, Large River Studies Center and Biology Department, Winona State University, Winona, MN 55987

SESSION II – TURTLES (Moderator – John Tucker)

10:20 – 10:40 AM COMMON SNAPPING TURTLE (CHELYDRA SERPENTINA) DEMOGRAPHICS
John K. Tucker, Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Avenue, Brighton, IL 62012

10:40 – 11:00 AM **BREAK**

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Ken S. Lubinski, USGS Upper Midwest Environmental Science Center and The Nature Conservancy

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Marian E. Havlik, Malacological Consultants, 1603 Mississippi Street, La Crosse, Wisconsin 54601-4969

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Jeffrey M. Stepping, Richard V. Anderson, and Benjamin G. Kirgan, Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

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Steven J. Zigler[1], Teresa J. Newton[1], Jeff J. Steuer[2], Michelle R. Bartsch[1], and Jennie S. Sauer[1], [1]U.S.Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603, [2]U.S. Geological Survey, Wisconsin Water Science Center, Middleton, WI 53562

2:30 – 2:50 PM **BREAK**

SESSION IV – VEGETATION, FORESTS, & SYSTEM GOALS (Moderator: Thad Cook)

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Thad R. Cook and Mike A. McClelland, Illinois Natural History Survey, Illinois River Biological Station, Havana, Illinois 62644

3:10 – 3:30 PM RADIAL GROWTH RELATIONSHIPS OF QUERCUS SPP. AND FRAXINUS PENNSYLVANICA TO FLOODING IN THE LOWER KASKASKIA RIVER, SOUTHERN ILLINOIS, USA

Susan P. Romano[12], James J. Zaczek[1], David J. Gibson[3], Sara G. Baer[3], and Karl W. J. Williard[1], [1]Department of Forestry, Southern Illinois University-Carbondale, Carbondale, IL 62901, [2]Department of Biological Sciences, Western Illinois University, Macomb, IL 61455, [3]Department of Plant Biology, Southern Illinois University-Carbondale, Carbondale, IL 62901

3:30 – 3:50 PM GOALS AND OBJECTIVES FOR CONDITION OF THE UPPER MISSISSIPPI RIVER ECOSYSTEM

Daniel B. Wilcox[1], David L. Galat[2], C.H. Theiling[3] and K.S. Lubinski[4], [1]St. Paul District, U.S. Army Corps of Engineers St. Paul MN 55101, [2]Missouri Cooperative Research Unit University of Missouri-Columbia Columbia, MO 65211, [3]Rock Island District, U.S. Army Corps of Engineers, Rock Island, IL 61204, [4] U.S. Geological Survey Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

3:50 – 5:40 PM **POSTER SESSION**

6:00 – 8:00 PM **BANQUET**

PLATFORM PROGRAM
HOTEL BALLROOM A
FRIDAY, APRIL 28, 2006

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Neal Mundahl, Kristin Nelson, Michael Harnung, and Sarah Hach, Department of Biology, Winona State University, Winona, MN 55987

8:30 – 8:50 AM HABITAT CHANGES REFLECTED IN THE DIETS OF COMMON CARP (CYPRINUS CARPIO) FROM SWAN LAKE, CALHOUN COUNTY, ILLINOIS
Thomas Timmerman, Chad R. Dolan, John H. Chick, Illinois Natural History Survey, Great Rivers Field Station, 8450 Montclair Avenue, Brighton, IL 62012

8:50 – 9:10 AM A COMPARISON OF FISH COLLECTIONS USING RANDOM AND FIXED SITE SAMPLING DESIGNS ON THE ILLINOIS RIVER
Michael A. McClelland and Thad R. Cook, Illinois Natural History Survey, Illinois River Biological Station, 704 N. Schrader Ave., Havana, IL 62644

9:10 – 9:50 AM **MIDDLE AND HIGH SCHOOL STUDENT POSTERS/BREAK**

SESSION VI - VERTEBRATES, FISH AND TURTLES *cont.* (Moderator: Kevin Irons)

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Robert E. Colombo[1,2], James E. Garvey[1,2], David P. Herzog[3], Robert A. Hrabik[3], and Neal D. Jackson[1,2], [1]Department of Zoology, Southern Illinois University, Carbondale, IL 62901, [2]Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901, [3]Missouri Department of Conservation, Resource Science Division, Open Rivers and Wetlands Field Station, 3815 East Jackson Boulevard, Jackson, MO 63755

10:10 – 10:30 AM PALLID STURGEON MOVEMENT IN THE MIDDLE MISSISSIPPI RIVER

Brian Koch[1], **Ron Brooks**[1], Jim Garvey[1], Dave Herzog[2], and Bob Hrabik[2], [1]Southern Illinois University, Fisheries and Illinois Aquaculture Center, Carbondale, IL 62901-6511, [2]Missouri Department of Conservation, Resource Science Division, Open Rivers and Wetlands Field Station, 3815 East Jackson Boulevard, Jackson, MO 63755

10:30 – 10:50 AM ASIAN CARP IN THE ILLINOIS RIVER

Kevin S. Irons, John P. Wisher, T. Matthew O'Hara, Michael A. McClelland, and Thad R. Cook, Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, Illinois 62644

10:50 – 11:00 AM **BREAK**

11:00 – 12:00 PM **BUSINESS MEETING AND RAFFLE**

12:00 – 1:30 PM **LUNCH**

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POSTER PRESENTATIONS
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Authors Present 3:50 PM – 5:40 PM
(Listing by Topic)

FISH

1) THE MIDWEST DRIFTLESS AREA RESTORATION EFFORT- A NATIONAL FISH HABITAT INITIATIVE PARTNERSHIP
Louise Mauldin, U.S. Fish and Wildlife Service, 555 Lester Avenue Onalaska, WI 54650

2) FISH, MACROINVERTEBRATES, HABITAT AND WATER QUALITY IN THE CATFISH CREEK (DUBUQUE COUNTY, IOWA) WATERSHED
Matthew McDermott, Daniel Call, Benjamin Breitbach, Andrew McDonnell, and Ezra O'Heron, Department of Natural & Applied Sciences, University of Dubuque, Dubuque, IA 52001

3) ACKERMAN CREEK WATERSHED ASSESSMENT: FISH ASSEMBLAGES OF THREE ILLINOIS RIVER TRIBUTARIES
Nerissa N. Michaels, Thad R. Cook and Michael A. McClelland, Illinois Natural History Survey, Illinois River Biological Station, 704 N. Schrader Ave., Havana, IL 62644

4) PROGRESSION OF A FISH COMMUNITY AT SPUNKY BOTTOMS PRESERVE
Melissa L. Smith, Mike A. McClelland, T. Matthew O'Hara, Kevin S. Irons, Thad R. Cook, and Mike A. Smith, Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, IL 62644

5) INVESTIGATION OF ASIAN CARP COMPETITION WITH TWO NATIVE FISHES: BIGMOUTH BUFFALO AND GIZZARD SHAD
John P. Wisher, Kevin S. Irons, T. Matthew O'Hara, Michael A. McClelland, and Thad R. Cook, Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, IL 62644

FOOD WEBS

7) TEMPORAL PATTERNS OF BENTHIC MICROALGAE AND PHYTOPLANKTON IN THE UPPER MISSISSIPPI RIVER
Briana L. Flattum and Michael D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

8) RESPONSE OF DETRITAL TRANSPORTED ORGANIC MATTER TO TEMPORAL AND SPATIAL CONDITIONS IN THE UPPER MISSISSIPPI RIVER
Danh C. Voong and Michael D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

9) COMMUNITY METABOLISM IN A LARGE FLOODPLAIN RIVER: HABITAT COMPARISIONS OVER TIME
Jackie L. Scherle and Michael D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

10) DISSOLVED ORGANIC CARBON AND TOTAL NITROGEN CONCENTRATIONS UNDER DIFFERENT SPATIAL AND TEMPORAL CONDITIONS IN THE UPPER MISSISSIPPI RIVER
Danielle Quist and Michael Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

LANDSCAPES AND LAND USE

11) EFFECTS OF AN EARLY SPRING FLOOD ON LANDSCAPE IN POOL 8, UPPER MISSISSIPPI RIVER
Scott D. Genson [1] Nelson, J.C. [2] Tyser, R.W. [1,2], [1]River Studies Center, University of Wisconsin-La Crosse, 1725 State St. La Crosse, WI 54601, [2]Upper Midwest Environmental Science Center, 2630 Fanta Reed Rd. La Crosse, WI 54603

12) HOW DOES LANDCOVER CLASSIFICATION SYSTEMS INFLUENCE LANDSCAPE METRICS?
Audra R. DeVault [1] Nelson, J.C. [2] Tyser, R.W.[1,2], [1]River Studies Center, University of Wisconsin-La Crosse. 1725 State St. La Crosse, WI 54601, [2]Upper Midwest Environmental Science Center. 2630 Fanta Reed Rd. La Crosse, WI 54603

13) SECONDARY BENEFITS OF USFWS WETLAND MANAGEMENT: SEDIMENT AND NUTRIENT CAPTURE AND REMOVAL AT THE HALFWAY CREEK MARSH COMPLEX, HOLMEN, WISCONSIN
William Richardson[1], Joe Schubauer-Berigan[2], Peter Hughes[3], Lynn Bartsch[1], Jennifer Cavanaugh[1], and James Nissen[4], [1]US Geological Survey, Upper Midw. Envir. Sci. Ctr., La Crosse, WI, [2]US EPA, ORD, Cincinnati, OH, [3]US Geological Survey, Wisconsin Water. Sci. Ctr., Middleton, WI, [4]UMR National Wildlife & Fish Refuge, Onalaska, WI

14) PRELIMINARY ASSESSMENT OF THE VEGETATION RESPONSE TO THE 2005 WATER LEVEL DRAWDOWN OF UMR NAVIGATION POOL 5
Kevin P. Kenow, James T. Rogala, and Larry R. Robinson, U. S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

15) STUDY OF INORGANIC POLLUTANTS MOBILITY FROM CATFISH CREEK WATERSHED INTO THE MISSISSIPPI RIVER
Andrew McDonnell, and Chulsung Kim, Department of Natural and Applied Science, Univeisty of Dubuque, Dubuque, IA 52001

MUSSELS

16) RS CORWIN AT THE US BUREAU OF FISHERIES & MILWAUKEE PUBLIC MUSEUM
Joan P. Jass, Invertebrate Section, Milwaukee Public Museum, Milwaukee WI 53233

PHYTOPLANKTON

17) SPATIAL AND TEMPORAL CHANGES IN PHYTOPLANKTON QUALITY IN A LARGE FLOODPLAIN RIVER
Fareeda Taher Nazer Hussain and Michael D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

18) VARIATION IN PHYTOPLANKTON COMPOSITION WITHIN LARGER RIVERS: STABLE ISOTOPIC APPROACH
Anita J. Kumar and Michael D. Delong, Large River Studies Center, Biology Department, Winona State University, Winona, MN 55987

TURTLES

19) A SUMMARIZATION OF TURTLE DATA COLLECTED USING LTRMP FISH SAMPLING METHODS
Matt Stroub and Matt O'Hara, Kevin Irons. Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Ave. Havana, Il 62644

20) A CONTINUED ASSESSMENT OF A TURTLE COMMUNITY IN THE CEDAR RIVER, IOWA
Andrew J. Huck and Gerald L. Zuercher, Department of Natural and Applied Sciences, University of Dubuque, 2000 University Avenue, Dubuque, IA 52001

21) A COMPARISON OF RIVER TURTLE COMMUNITIES AT TWO SITES ON THE CEDAR RIVER, IOWA
Valerie A. Kimler, Andrew J. Huck, and Gerald L. Zuercher, Department of Natural and Applied Sciences, University of Dubuque, 2000 University Avenue, Dubuque, IA 52001

WATERFOWL HARRASMENT

22) A VOLUNTARY PROGRAM TO CURTAIL BOAT DISTURBANCE TO MIGRATING WATERFOWL ON THE UPPER MISSISSIPPI RIVER
Kevin P. Kenow[1] and James M. Nissen[2], [1]U. S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603, [2]U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, WI 54601

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HARVEST OF SHOVELNOSE STURGEON INFLUENCES YEAR CLASS STRENGTH AND ADULT ABUNDANCE: ARE WE MOVING TOWARDS COLLAPSE?

Robert E. Colombo[1,2], James E. Garvey[1,2], David P. Herzog[3], Robert A. Hrabik[3], and Neal D. Jackson[1,2]
[1]Department of Zoology, Southern Illinois University, Carbondale, IL 62901. [2]Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901. [3]Missouri Department of Conservation, Resource Science Division, Open Rivers and Wetlands Field Station, 3815 East Jackson Boulevard, Jackson, MO 63755

The collapse of caviar fisheries in the Volga River and Caspian Sea, has increased demand for domestic caviar, thereby increasing harvest of shovelnose sturgeon in the Middle Mississippi River (MMR). Currently, harvest impacts are unknown. We sampled density and age structure of shovelnose sturgeon in the MMR during 2000, 2002, and 2004 to determine the impact of harvest on this population. Simulation modeling assessed how different length limits affected population yield and reproductive potential. Annual mortality for MMR shovelnose sturgeon was higher than previously published mortality rates for this species. Both adult density ($P < 0.001$) and recruitment strength (2000, $P < 0.05$; 2001, $P < 0.05$; 2003, $P < 0.05$) declined with harvest. Simulation modeling suggested that under the current level of harvest with no minimum length limit or the proposed minimum length limit (609 mm), the population of shovelnose sturgeon in the MMR would experience unsustainable growth and recruitment overfishing. If a more conservative length limit (650 mm) was imposed, the shovelnose sturgeon fishery in the MMR could withstand an increase in harvest. Commercial exploitation is negatively affecting the shovelnose sturgeon population in the MMR, potentially causing a collapse of the fishery if not addressed.

Key Words: shovelnose sturgeon, Mississippi River, harvest, year class strength, simulation modeling

SUBMERSED AQUATIC VEGETATION DISTRIBUTION OF THE UPPER ILLINOIS RIVER

Thad R. Cook and Mike A. McClelland
Illinois Natural History Survey, Illinois River Biological Station, Havana, Illinois 62644

The importance of aquatic vegetation to the ecological health of the Illinois River, and aquatic systems in general, is widely recognized. Submersed aquatic vegetation (SAV) for example, serves as a main source of nutrition, nesting and rearing habitat for invertebrates, fish, waterfowl and other wetland organisms. The importance of monitoring and documentation of these life forms is also widely recognized. The relevance of historical and present-day SAV distribution, changes over time and factors influencing these changes are import when considering restoration. Random sampling was conducted in three upper Illinois River reaches, Dresden, Marseilles, and Starved Rock in 2005 utilizing Long Term Resource Monitoring Program (LTRMP) vegetation monitoring protocols to document SAV distribution. A total of 236 sites were sampled throughout the three reaches with no SAV documented in the Marseilles and Starved Rock. However, 9 species of SAV were documented within the Dresden reach. Water Stargrass *Heteranthera dubia*, Wild Celery *Valisneria americana*, and Eurasion watermilfoil *Myriophyllum spicatum*, had the highest frequency among vegetated sites with 41.0%, 31.8%, and 21.6% respectively. Understanding factors influencing SAV distribution within these reaches is key to restoration planning and implementation efforts within large river systems.

Keywords: submersed aquatic vegetation, SAV, distribution, Illinois River, LTRMP

TRANSPORTED ORGANIC MATTER IN A FLOODPLAIN RIVER: EVIDENCE OF HYDROLOGICAL CONTROLS ON TROPHIC DYNAMICS

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

Food web studies have generated increasing evidence that phytoplankton and benthic microalgae are principle drivers of energy flow in large rivers. These snapshots of trophic linkages made it possible to begin testing new hypotheses on the functioning of large river ecosystems. We examined changes in composition and quality of the algal and detrital components of transported organic matter (TOM) in the Mississippi River by assessing chlorophyll concentration plus carbon and nitrogen stable isotope ratios April–September 2004 in main channel, secondary channel, and backwater habitats. Rather than follow expected climatic-based temporal shifts, all measures of phytoplankton and detrital TOM responded to more strongly to hydrological conditions. Phytoplankton chlorophyll concentrations were highest in spring and summer when hydrological retention time was high (low discharge). Stable isotopic ratios also responded to hydrological conditions, possibly reflecting changes in inorganic nutrient sources. Moreover, quality of detrital TOM was also highest during low discharge, suggesting that senescent phytoplankton were a major part of detritus during these periods. Isotopic ratios of the filter-feeding caddisflies *Hydropsyche orris* and *Cheumatopsyche* sp. from the main channel were examined concurrent to this study. The $\delta^{15}N$ of both caddisflies corresponded closely to the temporal pattern observed for the $\delta^{15}N$ of phytoplankton. This study illustrates the importance of hydrologic dynamics to resource availability and trophic dynamics in floodplain rivers.

Keywords: phytoplankton, transported organic matter, stable isotopes, food web, habitat, hydrology

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MUSSEL SURVEYS AT SIX SITES ON THE SOUTH FORK OF THE ZUMBRO RIVER, ROCHESTER, OLMSTED CO., MN, JULY AND SEPTEMBER 2005

Marian E. Havlik
Malacological Consultants, 1603 Mississippi Street, La Crosse, Wisconsin 54601-4969

Quantitative and qualitative mussel surveys were conducted at six sites on the South Fork of the Zumbro River, between Broadway Street and the 37th Street Bridge, downstream (N) of the Silver Lake Dam, 6 July & 26 September 2005, prior to installation of a new sewer line. A total of 172 mussels were found; 20.9% were Minnesota listed mussels. Nine living species were found + 1 dead species; one species was the Minnesota Threatened *Alasmidonta marginata* Say 1818, elktoe (3-10 yrs), and the others were the Minnesota Special Concern species: *Lasmigona costata* (Rafinesque, 1820), flutedshell (6-12 yrs), and *Lasmigona compressa* (Lea, 1829), creek heelsplitter (5 and 7 yrs) Forty-two listed mussels were numbered, aged, and measured before translocation to a site between Silver Lake Dam and the mouth of Cascade Creek. Results ranged from 131 mussels at Site 1 (9 living + 1 dead sp.,) to no dead or live mussels at Site 3A. Four living species plus one dead species were found at Site 2; 9.1% represented two listed species. Two species were found at Site 3 but 33.3% were a Minnesota Threatened mussel. About 24-0.25 m^2 quadrats were sampled at each site, followed by random samples. *Alasmidonta marginata* was the most numerous and frequently occurring listed mussel; several were found on 3 of 6 centerlines.

Three additional areas were sampled in September. This survey was hampered by high water levels and strong currents. Our previous experience has shown that higher densities are found during lower water levels. Only 13 living mussels (2 species) were found, but 1 species was the Minnesota Threatened *Alasmidonta marginata* (7.7%); the other species was the common *Lampsilis cardium* (Rafinesque 1820), pocketbook (92.3%). No mussels were recovered at Site 3A, near the mouth of Rocky Creek. One living *L. cardium*, pocketbook, was recovered at Site 4, just S of the 37th St. Bridge. The entire area appears to have recovered somewhat from a mid-1980's riprap project for flood control. The MDNR project permit threshold for full mussel translocations was exceeded at 4 of 6 sites.

Site:	1	2	2A	3	3A	4	**Total**	**%**
A. marginata	25	8	1	2			**36**	**20.9%**
L. costata	2	2					**4**	**2.3%**
L. compressa	2						**2**	**1.2%**
Common mussel specimens (6 sp.)	102	12	11	4		1	**130**	**75.6%**
Total live mussels	131	22	12	6	0	1	**172**	
Total live species	9	4	2	2		1	**9**	
Dead species	1	1	2		0	1	**2**	
Density/m2	0.30	0.33	0.33	0.08	0.08*	0.08		
Potential mussel population	1239	929	824	190	178*	167		
*** = Estimated density and numbers**								

Keywords: mussel distribution, Mississippi River tributary mussel species, threatened and endangered mussels, unionid survey, unionid age and density data

NUTRIENTS, CHLOROPHYLL, AND SUSPENDED SOLIDS IN THE UPPER MISSISSIPPI RIVER: TEMPORAL AND SPATIAL VARIABILITY

Jeffrey N. Houser, Brian R. Gray, and James T. Rogala
U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

Substantial variability in time and space is a defining characteristic of large, floodplain rivers. We investigated temporal and spatial variation in a group of limnological variables related to river primary production using data from the Upper Mississippi River (UMR) Long Term Resource Monitoring Program (LTRMP). We included nutrient, chlorophyll a, and suspended sediment concentrations from 6 study reaches of the UMRS measured quarterly from 1994 to 2005. We found that total phosphorus (TP) and total suspended solids (TSS) increased moving downriver among the study reaches. Total nitrogen (TN) and chlorophyll varied among study reaches but did not exhibit consistent downstream increases. Chlorophyll and TP were generally higher in backwater areas than in the main channel, indicating higher algal standing stock and potentially higher rates of production in these backwater areas. TN was usually higher in the main channel than in backwater areas, probably reflecting the relatively high rates of denitrification that occur in off-channel areas. Backwater TSS was higher than main channel TSS during low discharge conditions and lower than main channel TSS during high discharge conditions. Contrasting seasonal patterns occurred for TN (highest in spring) and TP (lowest in spring) in some reaches. Seasonal patterns in chlorophyll varied among study reaches. These spatial and temporal patterns in limnological characteristics of the UMR provide important context for understanding the physical and biological processes that structure the UMRS and similar large, floodplain rivers.

Keywords: nitrogen, phosphorus, chlorophyll, suspended solids, water quality

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ASIAN CARP IN THE ILLINOIS RIVER

Kevin S. Irons, John P. Wisher, T. Matthew O'Hara, Michael A. McClelland, and Thad R. Cook
Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, Illinois 62644

Non-native Asian carp (bighead carp *Hypophthalmichthys nobilis*, silver carp *Hypophthalmichthys molitrix*, and grass carp *Ctenopharyngodon idella*) have been present in the Illinois River since the early 1990's. Bighead carp have been collected by the Long Term Resource Monitoring Program (LTRMP) through routine monitoring of the La Grange Reach, Illinois River since 1995, silver carp since 1998, and grass carp since 1992. The LTRMP fish data reveals significant spawn and recruitment of both bighead and silver carp in 2000, and variable spawning success since. Length distributions from this data give insight into growth rates and cohort strength. Additionally, bighead and silver carp dietary overlap with two species, gizzard shad *Dorosoma cepedianum* and bigmouth buffalo *Ictiobus cyprinellus*, is suspected. Over 2,400 fish were measured and weighed in part to test for a change in fitness (weight at length) through time. The long-term monitoring also gives a unique perspective into the invasion of these species by affording us the opportunity to capture and share some unique video events.

Keywords: Asian carp, Illinios River, LTRMP, length distribution, cohort strength

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PALLID STURGEON MOVEMENT IN THE MIDDLE MISSISSIPPI RIVER

Brian Koch[1], **Ron Brooks**[1], Jim Garvey[1], Dave Herzog[2], and Bob Hrabik[2]
[1]Southern Illinois University, Fisheries and Illinois Aquaculture Center, Carbondale, IL 62901-6511; [2]Missouri Department of Conservation, Resource Science Division, Open Rivers and Wetlands Field Station, 3815 East Jackson Boulevard, Jackson, MO 63755.

There is no information describing Pallid Sturgeon movement or habitat use for the entire middle Mississippi River (MMR), and determination of migration and possible spawning areas is extremely important for recovery of this endangered species. Telemetry was conducted during fall 2002 through summer 2005 in attempt to identify migratory patterns, staging areas, spawning locations and periods, and habitat use. Pallid Sturgeon (n=87) were implanted with ultrasonic transmitters. A total of 8,629 km were tracked, and 22 stationary receivers were set during that period yielding 612 combined locations. Over the life of their transmitters, individuals were located 0-300 km from their release sites and had maximum movement rates of 16.9 km/d upriver and 73.4 km/d downriver. Average daily movement ranged from 0.0 km/d to 1.5 km/d and was greatest during spring and summer. Pre-spawn, migratory movement was detected during April in all three years when water temperatures were 13-14°C. Spawning in 2005 was assumed when water temperatures reached 18°C and movement decreased. At 21°C, post-spawn movement was apparent since movement again increased and was generally in the opposite direction of pre-spawn movement. Five areas in the MMR were identified as possible spawning locations. Throughout the entire study period, sturgeon were located in habitats associated with wing dikes 47% of the time despite the fact that the habitat only represented 7% of that available in the MMR. Open and border channel habitats were used in 44% of the locations. Pallids were most often located on sand substrates (48%) and least often on soft mud or silt (2%), and they were usually in 6-12 m of water (60%). Season, water levels, or water discharges had little affect on movement, habitat type, depth, or substrate used.

Keywords: pallid sturgeon, Mississippi River, movement, habitat, spawning

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ENUMERATION OF ZOOPLANKTON SAMPLES: EFFECTS OF MESH SIZE ON DENSITY ESTIMATES OF COPEPODS, CLADOCERANS, AND ROTIFERS

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Zooplankton are critical components of many aquatic ecosystems, linking primary production, microbial, and detrital resources to higher trophic levels. They form a critical food source for young of the year fishes of many species. Zooplankton support large biomasses of recreationally, commercially, and ecologically important zooplanktivorous fish such as bluegill (*Lepomis macrochirus*), bigmouth buffalo (*Ictiobus cyprinellus*), gizzard shad (*Dorsoma cepedianum*), and invasive bighead and silver carp (*Aristichthys nobilis*, *Hypophthalmichthys molitrix*). As part of the United States Environmental Protection Agency's (USEPA) Environmental Monitoring and Assessment Program (EMAP), 56 zooplankton samples were collected from the Upper Mississippi River during the summer of 2004. We divided zooplankton into two major groups: microzooplankton, which includes rotifers and copepod nauplii, and macrozooplankton, which includes cladocerans, adult, and juvenile copepods. Rotifers are links to both the primary production and to microbial and detrital resources, and tend to dominate the zooplankton communities in great rivers. Crustacean zooplankton (copepods and cladocerans) are more directly linked to primary production. Separate sampling procedures were used for the two groups: 18 L of water filtered through a 20 µm mesh for microzooplankton and 180 L of water filtered through a 63 µm mesh for macrozooplankton. Microzooplankton were enumerated and identified using a compound microscope and Sedgewick-Rafter cells. Macrozooplankton were enumerated and identified using a dissecting scope and a Ward-Whipple counting wheel. Both groups of zooplankton were counted in all samples. Our analysis strongly supports our methodological decisions. These results suggest that the majority of zooplankton studies grossly underestimate the abundance of rotifers, possibly by 2-3 orders of magnitude. Many studies of zooplankton community structure and the diet of zooplanktivorous fishes are strongly biased in favor of crustaceans relative to rotifers.

Keywords: zooplankton, sampling methodology, mesh size, great rivers

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A COMPARISON OF FISH COLLECTIONS USING RANDOM AND FIXED SITE SAMPLING DESIGNS ON THE ILLINOIS RIVER

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The Illinois River fish population has been monitored by the Illinois River Biological Station since1957 through a long-term electrofishing program (LTEF). Patterns in fish species composition and abundances along six reaches of the Illinois River are examined annually using a fixed site sampling design. In 2005 a series of random sites were added to the LTEF sampling regime to supplement current monitoring efforts. Current protocol for fixed site sampling allows for one hour electrofishing runs at 27 sites within the six LTEF reaches, while random sampling was accomplished via 30 minute electrofishing runs at 32 sampling sites in all six LTEF reaches. A total of 12,120 fish were collected between both sampling designs with 7490 fish collected by fixed sites and 4630 fish collected by random sites. Mean catch per hour were similar between both designs overall (292.0 for fixed sites, 294.6 for random sites) and no significant differences (P=0.96) were found between the two designs over all reaches and within reaches (P=0.15). Species diversity for both designs was also similar; a total of 62 species were collected with numbers ranging from 56 species and two hybrids collected through fixed sampling and 54 species and one hybrid collected by random sampling. Community analysis illustrated further similarity in catches between the sampling techniques and both were capable of revealing upstream to downstream differences in species composition. Although few differences were discovered in the catches between the two designs, collections did reveal nine species unique to the fixed site design with six species unique to random sampling. Random sampling also collected two species new to the LTEF program where fixed site sampling only collected one new species. While results between these two techniques proved to be very similar in catch, the scientific benefits of supplemental random sampling may prove valuable in the future for the LTEF program.

Key words: Illinois River, electrofishing, sampling design, fish population, fish community

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PREFERRED HABITATS OF SLIMY AND MOTTLED SCULPIN IN COLDWATER TRIBUTARIES OF THE UPPER MISSISSIPPI RIVER, SOUTHEASTERN MINNESOTA

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Habitat use and preferred habitats of slimy (*Cottus cognatus*) and mottled (*Cottus bairdi*) sculpin were examined in five coldwater tributaries of the Upper Mississippi River in southeastern Minnesota. Availability and sculpin use of substrate type, water depth, and bottom current velocity were assessed to determine habitat preferences for both young-of-year (YOY) and adult sculpin. Most (>70%) individuals of both species (slimy n = 777, mottled n = 100) used coarse substrates and vegetation, shallow water (< 30 cm), and slow current velocities (<20 cm/sec). Adults of both species preferred boulder substrate, whereas YOY preferred gravel and rubble. Slimy sculpin YOY and adults also preferred vegetation, but mottled sculpin did not. Mottled sculpin YOY and adults preferred shallower water (0-20 cm) than slimy YOY (0-30 cm) or adults (10-50 cm). Slimy YOY and adults and mottled YOY preferred slower bottom velocities (0-30 cm/sec) than mottled adults (20-40 cm/sec). Preferred substrates, depths, and current velocities were all found together (ideal habitat) at >15% of individual points surveyed in the streams. Two streams where slimy sculpin were recently reintroduced contained <8% ideal habitat, but another contained >18%. Sections of two streams that had been improved for trout habitat had one-third less ideal sculpin habitat than nearby, unimproved sections of the same streams, primarily the result of more deep (>60 cm) water in improved sections. To improve success, future sculpin reintroductions should focus on coldwater streams that have >10% ideal sculpin habitat.

Keywords: sculpin, preferred habitats, coldwater streams, *Cottus*

SEDIMENTATION CORRELATED TO POOL-WIDE DRAWDOWN ON THE UPPER MISSISSIPPI RIVER

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Hydrodynamic and sedimentation models and monitoring have provided insight to the physical effects of a pool-wide drawdown in the Upper Mississippi River. The drawdown was completed in Pool 5 during the summer of 2005. The effects of the drawdown on the main channel as well as backwaters, most notably Weaver Bottoms were determined. The Corps has completed a one-dimensional model of main channel sediment capacity in Pool 5, comparing normal water levels to drawdown levels. Discharge measurements were completed during the drawdown and compared to normal years distributions. A suspended sediment analysis and budget of Weaver Bottoms was done during the drawdown and compared to a similar study in 1993 & 1994.

The one-dimensional sediment capacity analysis was completed with HEC-RAS, using the hydraulic design – sediment transport capacity function. A calibrated model using flow split discharge measurements was used in conjunction with England-Hansen sediment transport functions to calculate sediment transport capacity in the main channel. The calculated sediment capacity compared reasonably to a sediment budget for pools 1 through 10, however significantly more variation was obtained with the model. Dredging and depositional areas were evaluated in detail.

Numerous discharge measurements on the main, secondary, and tertiary channels were completed during the drawdown and compared to previous measurements. The drawdown altered flow patterns in all channels; results showed decreased flow in secondary and tertiary channels and increased flow in the main channel. The average increase in main channel flow during the drawdown was 10%.

A suspended sediment study was completed for Weaver Bottoms, with daily measurements collected at all major inlets and outlets to the area. Analysis completed includes a suspended sediment budget, assessment of the relationship between wind, submerged aquatic vegetation, and total suspended solids, a comparison to 1993 & 1994 data, and determining drawdown effects on sediment movement.

Keywords: sedimentology, Mississippi River, drawdown, backwaters, Pool 5

RADIAL GROWTH RELATIONSHIPS OF *QUERCUS* SPP. AND *FRAXINUS PENNSYLVANICA* TO FLOODING IN THE LOWER KASKASKIA RIVER, SOUTHERN ILLINOIS, USA

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Dams, canalization, and levee installation often alter flooding conditions within the floodplain of large river systems. The radial growth of floodplain forest trees may be affected by these changes. Previous research has indicated that various flooding conditions can have no effect, a negative effect, or a positive effect on radial growth of *Fraxinus pennsylvanica* and *Quercus* spp. Growing season flood frequency and duration were modeled for three sites along the Lower Kaskaskia River with historic river gage data, on-site monitoring wells, GPS, and ArcMap. Step-wise multiple regression was used to determine relationships of standard ARSTAN chronology output (radial growth) and mean annual growing season flood variables before and after the installation of the Kaskaskia River dam including: number of days of flooding, number of days of flooding lagged 1 year, flood frequency, flood frequency lagged 1 year, duration of flood event, duration of flood event lagged 1 year, average frequency/total days of flooding, average frequency/total days of flooding lagged 1 year, Palmer Drought Severity Index during the growing season, ($PDSI_{GS}$) and $PDSI_{GS}$ lagged 1 year.

The $PDSI_{GS}$ which utilizes rainfall and temperatures to estimate regional high or low moisture stress tended to be related to either *F. pennsylvanica* and *Quercus* spp. or both species radial growth at most sites for the corresponding year or sometimes for the following year's radial growth during the time period before the dam. The weather prior to dam construction was more variable than after the dam construction, with a major flood period followed by a drought period prior to the dam. After the dam, $PDSI_{GS}$ was related to radial growth only for Fraxinus at one site. The flood frequency, total number of flooded days, the length of flooding events, and flood frequency/total number of flooded days, were all related to radial growth, depending on the site and species. Flooding was more frequent, with shorter flood events, and for a greater number of days during the growing season at Posey before dam installation. Hydrology at Venedy before the dam was similar to hydrology following dam construction. This was primarily due to tributary inputs above the site. At Fayetteville, the length of flooding events was significantly shorter than at Posey, due to the canalization of the River just below the site.

This study indicates that the collective influence of important flood and weather relationships contribute to the complexity of the positive and negative impacts of these factors on radial growth. Factors may need to reach a threshold point or value before they exert a significant influence either positively or negatively on growth, or when the factor surpasses a threshold it can mask the effect that other variables have. Relationships of flood length, frequency, and weather factors to radial growth will shift as any one factor may become the dominant influence for a particular year.

Keywords: radial growth, flood frequency, flood duration, *Fraxinus pennsylvanica*, *Quercus* spp.

LATERAL DISTRIBUTION OF UNIONID MUSSELS IN SHALLOW CHANNEL BORDER HABITAT OF POOL 19, MISSISSIPPI RIVER

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Many shallow channel border habitats of the upper Mississippi River have low density mussel populations. These populations are important since they may serve as the source of colonizers to reestablish depleted mussel beds. Density and distribution patterns of the mussel population in a shallow channel border habitat at RM 378 in Pool 19, Mississippi River, was quantitatively sampled during the summer of 2004 and 2005. Mussels were sampled every 5 m along a 135 m transect positioned from the shoreline toward the navigation channel. Mean density at the site was 27.8 mussels per m2. Peak densities and diversities occurred between 20 and 60 m from the shoreline in approximately 1 m of water. Lowest densities were in the wave washed areas 5 to 10 m from the shoreline. Some species specific distribution patterns were observed. Pimplebacks, threeridges, and fragile papershells were all more abundant within 60m of the shoreline. Other shallow channel border sites exhibited similar distribution patterns, although mean density varied significantly between sites from a low of .9 to a high of 27.8 per m2. Some mussels species were collected from all channel border sites sampled. Zebra mussel infestation levels were low in these habitats during the sampling period with fewer than 10% of the mussels carrying a mean of just over 1 zebra mussel per shell. The channel border habitat is important to the maintenance of mussel communities in this riverine system.

Keywords: Unionid mussels, channel border habitat, Mississippi River, distance from shoreline

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FACTORS AFFECTING N^{15} FOR TERRESTRIAL AND INSTREAM SEDIMENTS

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Determining reasons for N^{15} variability in the sediment transport process is being conversed in this paper due to the identification of nitrogen isotope as a significant signature abetting in linking sediments to their terrestrial source which aids in estimating the delivered sediment impact on aquatic systems. This study is being performed at the Clear Creek Watershed, located at Upper South Amana. Clear Creek is a tributary of the Iowa River, IA. The watershed is mainly divided into 60% agricultural covered by row crops and 20% being covered by pasture/hay, remnant 20% represents roads, floodplain, and NRCS CRP as land use. It has been a targeted watershed by the State's Geological Survey, IDNR, NRCS and other non-profit organizations (e.g. Clear Watershed Board). Since 1940s, agricultural activities (e.g., tilling) and natural events (e.g., floods) have contributed significantly to the increased influx of fine sediments and associated pollutants into the Creek. The experiment performed to attain the objective involves characterization of the terrestrial (source) soil and then simulating natural conditions using flumes at the laboratory to study the significance of instream factors towards spatial variability of the sediments. Primary factors mediating variability at the terrestrial source can be distinguished as biogeochemical characteristics: physical/geological (e.g., moisture content, temperature, light intensity, slope variability, vegetation, soil type), chemical (e.g., pH, CEC, concentration & form of nitrogen available) and biological (e.g., photosynthetic pathway of vegetation, litter and concentration & type of biota). In the stream though chemical aspects have the same weight as in the terrestrial environment, all physical factors may not be significant contributors, and conversely biological properties (e.g., phyto & zoo-plankton) may show consumption at diverse levels. Reference and instream sediments collected are subjected to isotopic and biogeochemical tests. During the experiment, 5 different terrestrial soils will be considered corresponding to 5 different land coverage. In order to asses the effects of instream processes on N^{15} variability, stream water will be used during the experiments. Hence, the biological factors causing N^{15} variability will be isolated. The 5 flumes will be placed in a temperature controlled environment that can match the existing temperature conditions and ranges found in the region. Water flow recirculation will be maintained throughout the tests to simulate flow rates found in CC in order to prevent changes of the biological conditions in the water column. pH will be also kept the same with the one found in the stream to minimize variability in sediment agglomeration. The results of this study will be compared with findings reported in the Upper Mississippi watershed and other regions of the world.

Keywords: N^{15} variability, Clear Creek Watershed, biogeochemical, terrestrial, instream.

HABITAT CHANGES REFLECTED IN THE DIETS OF COMMON CARP (CYPRINUS CARPIO) FROM SWAN LAKE, CALHOUN COUNTY, ILLINOIS

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Backwater lakes are critical components of large river ecosystems providing nursery, refuge and feeding grounds for many fishes. Due to recent alterations in the hydrology of large river systems, many of these backwaters have been degraded, filling in with sediment and losing large amounts of aquatic vegetation. In Swan Lake, there have been significant alterations made to the lake to combat the sedimentation and loss of vegetation. Major alterations include construction of a levee, dividing the lake into units, allowing for different backwater lake management strategies to be implemented in the different units. Since implementation of these management strategies, we have noticed a difference in the diets of Common Carp (*Cyprinus carpio*) between the units. One unit had 25% empty stomachs and the other 66% empty. While the overall prey selection did not vary significantly, the amount of food consumed did. We believe that sediment flocculency might be the main cause of changes in diets. Sediment cores are being taken to determine if higher flocculency causes a decrease in the amount of food consumed.

Keywords: backwater lakes, habitat restoration, common carp, diet

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COMMON SNAPPING TURTLE (*CHELYDRA SERPENTINA*) DEMOGRAPHICS

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The common snapping turtle (*Chelydra serpentina*) is commonly harvested as a food item in much of its range in the United States. Much has been made of the potential impact of turtle trapping for local and export markets for this species and for other turtles. However, harvest of snapping turtles from roads has received little attention. In many locations, snapping turtles are collected as they attempt to cross roads. These turtles are nearly all females going to nest or returning from nesting. A trapping program was initiated to examine the effect of incidental take from roads on snapping turtles in west-central Illinois. This project used three backwater lakes along the Illinois River as study sites. Two lakes (Lower Stump Lake and Gilbert Lake in Jersey County, Illinois) extend along side Illinois Route 100, a rural road that is heavily traveled. One lake (Swan Lake in Calhoun County, Illinois) is not near heavily traveled roadways, but is surrounded by the Two Rivers National Wildlife refuge. The sites most exposed to human traffic were expected to have male dominated sex ratios compared to the more protected site. Preliminary studies have confirmed this. Sex ratios at Gilbert Lake, the most exposed site, were found to be 90% male, whereas the most protected site (Swan Lake) had close to a 50% male/female ratio.

Keywords: common snapping turtle, *Chelydra serpentina*; Illinois River; demography.

GOALS AND OBJECTIVES FOR CONDITION OF THE UPPER MISSISSIPPI RIVER ECOSYSTEM

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The community of river managers, scientists and the public has been engaged in setting goals and objectives for the UMRS ecosystem over the last decade. Goals in the context of river management and restoration are stated as broad societal values and desired future conditions. Objectives for condition of the river ecosystem are central to adaptive ecosystem management. They define a set of target future conditions; a "virtual" reference for a dynamic and ecologically healthy river. Some ecosystem objectives apply at the local or restoration project scale, others apply at larger scales. Quantitative ecosystem objectives for the UMRS have been proposed within broad essential ecosystem characteristics of water quality, geomorphology, hydrology/river hydraulics, habitat and biota. Operational objectives are then established using SMART criteria: Specific, Measurable, Achievable, Realistic, and Time-bound. Ecosystem objectives are logically related to management actions, indicators, monitoring and evaluation activities as a central and unifying part of adaptive ecosystem management. We have initiated development of a decision support system to facilitate setting ecosystem objectives for restoration projects and for tracking Navigation and Ecosystem Sustainability Program progress. Given the large investment in ecosystem restoration efforts, it is imperative that restoration practitioners adopt quantitative objectives to enable adaptive management and measure success.

Key words: ecosystem, objectives, UMRS, adaptive management

EXPLORATORY STATISTICAL AND SPATIAL MODELS OF UNIONID MUSSEL DISTRIBUTIONS IN A REACH OF THE UPPER MISSISSIPPI RIVER

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We assessed whether the spatial distribution of unionid mussels could be predicted from physical and hydraulic variables in Navigation Pool 8, Upper Mississippi River. Exploratory classification and regression tree (CART) models were constructed using mussel data compiled from various sources, and explanatory variables derived from GIS coverages. Prediction success of CART models for presence-absence of mussels ranged from 71 to 76% across three gears (brail, sled-dredge, and dive-quadrat). Models were largely driven by shear stress and substrate stability variables, but interactions with simple physical variables, especially slope, were also important. Geospatial models, which were based on tree model results, predicted few mussels in poorly connected backwater areas (e.g., floodplain lakes) and the navigation channel, whereas main channel border areas with high geomorphic complexity (e.g., river bends, islands, side channel entrances) and small side channels were typically favorable to mussels. Moreover, discharge-specific CART models suggested that episodic events such as droughts and floods were important in structuring mussel distributions in Pool 8.

Keywords: unionid, mussel, shear stress, tree model, geospatial

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HOW DOES LANDCOVER CLASSIFICATION SYSTEMS INFLUENCE LANDSCAPE METRICS?

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In recent years, the Upper Midwest Environmental Science Center (UMESC) has classified vegetation from aerial photographs of the Upper Mississippi River using several different classification systems. A system implemented in 1989 used over 150 classes and attempted to differentiate vegetation patterns with a relatively high degree of resolution. The current system, which was implemented in 1999 and emphasizes plant dominance and hydrological considerations, includes four sub-groupings of 7, 15, and 31 classes. The original 1989 classification scheme was examined and a crosswalk was created to tie the 7, 15 and 31 classes to the original classification scheme. The objective of this study is to determine the extent to which analyses of landscape pattern are affected by the use of these two classification systems. Aerial photographs of Pool 8 vegetation, taken in late summer of 1989, were interpreted using each classification system. Landscape pattern associated with each classification is being assessed with FRAGSTATS using raster data (cell sizes = 5, 10, and 25 meters) prepared with ArcMAP.

Keywords: landcover, landscape, GIS, FRAGSTATS, Upper Mississippi River

TEMPORAL TRENDS OF BENTHIC MICROALGAE AND PHYTOPLANKTON IN THE UPPER MISSISSIPPI RIVER.

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Benthic microalgae and phytoplankton have been identified as key food sources in large rivers. These studies, however, have not considered temporal variability of the autotrophic sources resulting from changes in nutrient availability. This study was done to investigate temporal changes in carbon and nitrogen stable isotope ratios of benthic microalgae and phytoplankton. Stable isotope samples of microalgae were collected from main channel sites in Reach 6 of the Upper Mississippi River June – September 2004. Epilithic algae were collected by scraping rocks with razorblades. Epipelic algae were collected in 50-mL vials. Epiphytic algae were collected by hand from macrophyte leaves and stems. Phytoplankton samples were collected from a depth of 1-m along transects in the main channel to provide a composite representation. All samples were placed in 50-mL vials and placed on ice until they could be returned to the laboratory. Benthic microalgae and phytoplankton were separated from detritus and sediments using colloidal silica centrifugation. Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope ratios were determined at Kansas State University. The $\delta^{13}C$ of benthic algae and phytoplankton followed the same pattern, increasing from June – August, before declining in September. $\delta^{13}C$ was always greater for benthic microalgae, ranging from -24 to -26 $^{o}/_{oo}$ as compared to -28.5 to -32 $^{o}/_{oo}$ for phytoplankton. $\delta^{15}N$ was similar for phytoplankton and benthic microalgae, although $\delta^{15}N$ of ultrafine phytoplankton (UTOMA) was generally significantly different from $\delta^{15}N$ of benthic algae. $\delta^{15}N$ decreased for all autotrophic sources June – August, before increasing in September. Differences in $\delta^{13}C$ have been reported in other comparisons of benthic algae and phytoplankton. Our study, however, indicates that the nature of inorganic carbon sources for both change over time, as does the nature of inorganic nitrogen. We suggest that these changes in inorganic carbon and nitrogen assimilated by riverine autotrophs is directly associated with changes in hydrological retention time as a function of prevailing discharge conditions.

Keywords: benthic algae, phytoplankton, stable isotope, hydrological retention time, main channel

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EFFECTS OF AN EARLY SPRING FLOOD ON LANDSCAPE IN POOL 8, UPPER MISSISSIPPI RIVER

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Though water level and navigation channels of the Upper Mississippi River (UMR) are extensively regulated, studies have shown that flooding still influences its vegetation complexity, island morphology, and other ecological attributes. Less well known, however, are effects of flooding on landscape structure of the UMR. In April 2001 UMR Pool 8 experienced an early season flood. Land cover data for Pool 8, derived from aerial photographs were prepared for 2000 and 2002 by staff at the Upper Midwest Environmental Sciences Center. The classification scheme used for photointerpretation includes several sub-groupings of 7, 15, and 31 classes. FRAGSTATS was used to calculate landscape and class metrics for several classification resolutions (7, 15, and 31 classes) and for three different cell sizes (5, 10, and 25 meters). The resulting metrics will describe post-flood changes in landscape patterns that occur at different spatial and classification resolutions.

Keywords: flood, Upper Mississippi River, GIS, FRAGSTATS, island morphology

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A CONTINUED ASSESSMENT OF A TURTLE COMMUNITY IN THE CEDAR RIVER, IOWA

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In 2004, we initiated a pilot project at Ingawanis Boy Scout Camp along the Cedar River (Bremer County, Iowa) to assess the river turtle community. This study was repeated during 2005. In both years, wire turtle traps (Nichols Net & Twine Co., Inc., Granite City, Illinois) were opportunistically placed at a depth of no more than 1-m and baited. Trapping during the first year took place mostly on weekends between late-May and early-September 2004. In 2005, we used a 10-day trapping session in May, June, July, and August. Significant flooding events prevented trapping at certain times during each field season. We captured 46 individual turtles representing 5 species in 2004; spiny softshells (*Apalone spinifera*; $n = 19$), snapping turtles (*Chelydra serpentina*; $n = 11$), painted turtles (*Chrysemys scripta*; $n = 12$), common map turtles (*Graptemys geographica*; $n = 2$), and false map turtles (*Graptemys pseudogeographica*; $n = 2$). In 2005, we caught 70 individual turtles, again representing 5 species; spiny softshells ($n = 43$), snapping turtles ($n = 10$), painted turtles ($n = 7$), false map turtles ($n = 9$), and wood turtle (*Clemmys insculpta*; $n = 1$). The wood turtle is an Endangered species in Iowa. In our study, it was captured and released twice and all information was submitted to the Iowa Department of Natural Resources. All turtles were weighed, measured, and marked by drilling a binary code on the posterior scutes with a Dremel® tool. In 2004, many snapping turtles exceeded our capability to weigh them accurately; in 2005, new equipment was used in the field that provided accurate measurements of mass. Several indices of diversity were calculated for 2004 and for 2005. Diversity measures were consistently higher for 2004 except for Dominance (l) which was higher for 2005. The turtle community in 2004 was compared with that of 2005 using three measures of community similarity, Sorenson's (S), Morisita's (C_M), and Horn's (C_H) indices. Each measurement suggested that community similarity between years was quite high. Morphological measurements for spiny softshells, snapping turtles, and painted turtles also are compared between years.

Keywords: *Apalone spinifera*, *Chelydra serpentina*, *Chrysemys scripta*, Iowa, Cedar River

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SPATIAL AND TEMPORAL CHANGES IN PHYTOPLANKTON QUALITY IN A LARGE FLOODPLAIN RIVER.

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Food web studies in the past have shown that instream primary production, particularly phytoplankton, is a major organic matter source for large rivers. These studies, however, only examined trophic linkages at only a single point in time. Questions remain as to if phytoplankton quality remains high enough for a sufficient period of time to sustain the food web throughout the year. To help resolve these questions, we compared patterns and changes in the concentration of chlorophyll *a* and carbon mass:chlorophyll *a* ratio of phytoplankton in main channel and backwater habitats in Reaches 5 and 6 of the Upper Mississippi River over four sample dates (June – August 2004). Living and detrital components of ultrafine (UTOM) and fine transported organic matter (FTOM) were separated using colloidal silica centrifugation. The algal fraction of TOM, which represents phytoplankton, was used in our analyses. Chlorophyll concentration was measured using spectrophotometry and carbon mass data were generated as part of stable isotope analysis. Chlorophyll concentrations in the main channel increased as discharge decreased over the course of the study. Chlorophyll concentrations in backwaters also increased over the same period, but not at a lower rate than observed in the main channel Carbon: chlorophyll a ratios remained relatively constant throughout the study. This study, in addition to similar work done in 2004, suggests that phytoplankton abundance and quality in the main channel is directly influenced by hydrological retention time, whereas other factors are important in backwaters.

Keywords: transported organic matter, temporal, phytoplankton, chlorophyll, backwater, main channel

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RS CORWIN AT THE US BUREAU OF FISHERIES & MILWAUKEE PUBLIC MUSEUM

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Roy S. Corwin did research on the "propagation of freshwater mussels for pearl button purposes" while working for the U.S. Bureau of Fisheries from 1917-1921 out of the Fairport IA and Homer MN Stations. This work was the basis for two articles on raising freshwater mussels in enclosures, published in the 1920 Transactions of the American Fisheries Society. The following year Corwin joined the Milwaukee Public Museum (MPM) staff and donated to MPM specimens related to his former Mississippi River work: 1) perforated shells from Lake Pepin fishermen, 2) several lots collected by John M. Holzinger, and 3) a set of 22 examples of principal species used in the pearl button industry. In 1925 MPM staff members conducted fieldwork to prepare for the creation of a Mississippi River Fishery habitat diorama. The museum crew received the cooperation and assistance of the Bureau of Fisheries in securing materials for this exhibit. Activities of fishery workers were documented on motion picture film, including that of commercial clammers near "Stram's Point" in the vicinity of Lynxville, Wisconsin. The short film from this work has now been re-discovered and is maintained in the museum's Photo Archives along with still photographs taken by MPM zoologist T.E.B. Pope during this fieldwork, providing documentation of historic Mississippi River fisheries and fisheries research.

Keywords: Roy S. Corwin, Mississippi River, U.S. Bureau of Fisheries, Milwaukee Public Museum, pearl button industry

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A VOLUNTARY PROGRAM TO CURTAIL BOAT DISTURBANCE TO MIGRATING WATERFOWL ON THE UPPER MISSISSIPPI RIVER.

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A voluntary waterfowl avoidance area (VWAA) was established on Lake Onalaska in Navigation Pool 7 of the Upper Mississippi River in 1986, to reduce boating disturbance to migratory waterfowl. The U.S. Geological Survey and the U.S. Fish and Wildlife Service have collaborated to monitor boater compliance with the VWAA program when the program was established (1986-88) and again in 1993, 1997, and 2004. Boating traffic on Lake Onalaska during the avoidance period has increased steadily from the 1981 level of 1.59 boating events per hour to 3.06 in 2004. Since the inception of the VWAA, the hourly rate of intrusion into the VWAA and rate of resulting disturbances have remained fairly constant. Consequently, the number of disturbances per boating event has declined dramatically. The lake-wide disturbance rate in 2004 (0.08 disturbances per lake-wide boating event) was at the lowest point measured and well below the rate of boating disturbance to waterfowl before establishment of the VWAA (0.30 disturbances per boating event). We also saw evidence of better boater compliance with the VWAA program in 1997 and 2004 compared to 1986-88 and 1993 as indicated by a decline in the proportion of boats that intruded into the VWAA. Reduced boating activity in the VWAA, in turn, has probably contributed considerably to the value of the VWAA as a waterfowl refuge, a notion supported by the observed concentration of birds. Monitoring conducted in 1986-88, 1993, 1997, and 2004 indicate that the VWAA program has been successful in reducing disturbance to waterfowl and it has been evident that many boaters made an obvious effort to travel out of their way to comply with the VWAA. This program is an example of a management strategy that River managers and biologists may use to enhance the UMR as an important waterfowl staging area.

Keywords: disturbance, Lake Onalaska, staging, Voluntary Waterfowl Avoidance Area, waterfowl

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PRELIMINARY ASSESSMENT OF THE VEGETATION RESPONSE TO THE 2005 WATER LEVEL DRAWDOWN OF UMR NAVIGATION POOL 5

Kevin P. Kenow, James T. Rogala, and Larry R. Robinson
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In an effort to enhance aquatic plant production and habitat diversity, the U.S. Army Corps of Engineers St. Paul District conducted a water level reduction (drawdown) on Navigation Pool 5 of the on the Upper Mississippi River during summer 2005. The water level reduction was expected to dry and consolidate bottom sediments and thereby improve conditions for seed germination and growing conditions for emergent and submersed aquatic vegetation. We assessed vegetation response to the drawdown through (1) use of high-resolution aerial photography and land cover data generated from that photography, (2) field measures of the distribution of submersed aquatic vegetation (SAV), and (3) field measures of the composition and productivity of emergent perennial and moist soil vegetation on exposed substrates. Here we present our preliminary findings.

The drawdown was initiated on 13 June and the target reduction of 1.5' reached on 01 July. The drawdown was maintained near the target level at L&D 5 until 19 July, when low flow conditions (< 24,000 cfs) necessitated switching from dam to control point management of the pool surface water elevation. Subsequently, drawdown varied between 0.5 and 1.5' through 25 September when completed. The extent of substrate exposed on 15 July was determined to be 1,002 acres or 7.4 % of the 13,515 acre study area (L&D 5 discharge at this time was 30,600 cfs).

We identified 86 taxa of moist soil, emergent, rooted floating aquatic, submersed aquatic, non-rooted aquatic, shrub, and tree species growing on substrates exposed during the drawdown. Dominant species that developed on exposed substrates were teal love grass (*Eragrostis hypnoides*), rice cut grass (*Leersia orizoides*), broadleaf arrowhead (*Sagittaria latifolia*), water stargrass (*Heteranthera dubia*), sandbar willow (*Salix exigua*), redroot flatsedge (*Cyperus erythrorhizos*), and chufa flatsedge (*C. esculentus*). Plant species composition was related to the duration of substrate exposure. In areas of Pool 5 that were not completely dewatered, we anticipated that the drawdown would enhance conditions for SAV as overall reduction in water depths would enhance light penetration (i.e., provide an opportunity for SAV germination and growth). In fact, we observed an increase in SAV in the Weaver Bottoms backwater area during summer 2005 relative to 1999 through 2004. However, SAV in other areas of Pool 5 did not differ in abundance from that measured in previous years. We compare vegetation response to this drawdown to that conducted on Pool 8 in 2001.

Keywords: drawdown, moist soil, Navigation Pool 5, vegetation response, water level management

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A COMPARISON OF RIVER TURTLE COMMUNITIES AT TWO SITES ON THE CEDAR RIVER, IOWA

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In the absence of long-term monitoring, it is unclear whether spatial and temporal changes in river turtle community structure are due to environmental change or to exploitation by humans. Although river turtle species richness may not differ between distant locations along a major watercourse, the composition of those communities often does differ. Spatial differences may be reflective of different environmental conditions or may be due to different harvest pressure; only a few turtle species are currently protected from harvest in Iowa. The Cedar River, Iowa represents an ideal test of spatial heterogeneity. We compared river turtle communities at 2 sites on the Cedar River: Lower Cedar River (near Moscow, Iowa) and Upper Cedar River (near Waverly, Iowa). Species richness was identical for the 2 sites, but composition was different. Turtle species captured from lower and upper reaches of the Cedar River were *A. spinifera* (spiny softshell turtle), *Chelydra serpentina* (snapping turtle), and *Chrysemys picta* (painted turtle). At the Lower Cedar River site *Graptemys ouachitensis* (Ouachita map turtle) and *Trachemys scripta* (red-eared slider) also were captured while at the Upper Cedar River site *Clemmys insculpta* and *G. pseudogeographica* (false map turtle) were captured. The capture of Clemmys insculpta is noteworthy due to its Endangered status that has been designated by Iowa Department of Natural Resources. Multiple measures of community similarity suggest only moderate similarity between the 2 sites. Measures of diversity were typically higher for the Lower Cedar River site. Morphological comparisons (carapace length, carapace width, and total mass) of *A. spinifera*, *Chelydra serpentina*, and *C. scripta* between the Lower and Upper sites suggests differences occur within each species.

Keywords: *Apalone spinifera*, Cedar River, *Chelydra serpentina*, *Chrysemys scripta*, Iowa

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VARIATION IN PHYTOPLANKTON COMPOSITION WITHIN LARGER RIVERS: STABLE ISOTOPIC APPROACH

Anita J. Kumar and Michael D. Delong
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A number of recent studies have indicated that autochthonous primary production, particularly phytoplankton, are a major food source in floodplain ecosystems. Previous studies have also shown phytoplankton concentrations change overtime as a function of biological, chemical, and physical attributes of the river ecosystems. This study examined the carbon and nitrogen stable isotope ratios phytoplankton both main channel and backwater habitats on four separate dates (June-August). The study was conducted in Reaches 5 and 6 of the Upper Mississippi River. Standard techniques used in past studies were employed for collection and processing of TOM samples. Algal and detrital fractions were separated using colloidal silica centrifugation. TOM was divided in the field and laboratory into fine TOM (FTOM; 1000-100 μm) and ultrafine (UTOM; 100-1 μm). Samples were shipped to Kansas State University for determination of carbon and nitrogen stable isotope ratios. Carbon isotope ratios of phytoplankton in both the main channel and backwaters increased during the course of the study. Nitrogen stable isotope ratios decreased in both habitats over the course of the study, with $\delta^{15}N$ of backwater phytoplankton decreasing more than observed in the main channel. This study indicates that the inorganic carbon and nitrogen sources used by phytoplankton change as hydrological retention time in main channel and backwater habitats increases. The decrease in $\delta^{15}N$ reflects a likely shift from biogenic inorganic nitrogen to atmospheric nitrogen. The findings of this study suggest that hydrological retention time is also important in shaping system function in the main channel.

Keywords: transport organic matter, Upper Mississippi River, phytoplankton, backwater, main channel, hydrology, stable isotope

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THE MIDWEST DRIFTLESS AREA RESTORATION EFFORT- A NATIONAL FISH HABITAT INITIATIVE PARTNERSHIP

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The nation's aquatic resources are declining at an alarming rate. This decline is primarily due to loss, degradation, and alteration of habitat. Recognized as a national problem, the National Fish Habitat Initiative (NFHI) was established to address aquatic habitat restoration. It is a nationwide strategy that harnesses the energies, expertise and existing partnerships of federal, state and local agencies and conservation organizations. The NFHI fosters geographically-focused, locally-driven, scientifically-based partnerships to protect, restore and enhance aquatic habitats and reverse the decline of fish and other aquatic species across the nation. Similar to the highly successful North American Waterfowl Management Plan, the NFHI uses the "joint venture" approach. It is centered on the establishment of partnerships and the implementation of restoration efforts at multiple geographic scales. The Midwest Driftless Area Restoration Effort (MDARE) is a broad partnership formed under the National Fish Habitat Initiative. It is a geographically-focused, coordinated approach to protect, restore and enhance riparian and aquatic habitat throughout the Driftless Area. The MDARE partnership is working together to: enhance brook trout, smallmouth bass and other aquatic communities; reduce nutrient and sediment inputs to coldwater streams and large tributaries of the Upper Mississippi River; improve water quality; increase angling and other recreational opportunities; and raise awareness as to the importance of the Driftless Area and its aquatic resources.

Keywords: national fish habitat initiative, midwest driftless area restoration effort, Upper Mississippi River, stream restoration, brook trout

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FISH, MACROINVERTEBRATES, HABITAT AND WATER QUALITY IN THE CATFISH CREEK (DUBUQUE COUNTY, IOWA) WATERSHED

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The Catfish Creek Watershed, a small watershed (approximately 150 km^2) in Dubuque County, Iowa, draining into the Mississippi River at Dubuque, was studied for its fish and macroinvertebrate communities, stream habitat, and selected measures of water quality as time snapshots during the fall of 2005. Four tributaries in the watershed (i.e., Middle Fork, South Fork, Catfish Creek Main Stem, and Granger Creek) were each sampled in their upper and lower reaches. The fish community was sampled by backpack electrofishing for 300 seconds in a riffle, run and pool at each site. Five fish families were represented (Cyprinidae, Catastomidae, Ictaluridae, Centrarchidae, and Percidae), with Cyprinidae being the most abundant overall in terms of number of species and total number of fish. Cyprinids had the greatest abundance in all three habitat types. Darters (Percidae) were second in abundance in both riffles and runs at all sites combined, and centrarchids were second in abundance in the pools. Johnny darters (*Etheostoma nigrum*) were most common, followed by fantail darters (*E. flabellare*). The mud darter *(E. asprigene*) was collected at one site (i.e., the downstream site in Granger Creek). By weight, cyprinids were predominant in all three habitat types, with centrarchids second in the runs and catastomids second in the pools. There was some evidence of a longitudinal distribution of species between the upper and lower reaches. Fantail darters were more abundant than johnny darters at the upstream sites by an approximate 3:1 ratio, while johnny darters predominated downstream by a similar ratio. The southern redbelly dace (*Phoxinus erythrogaster*) was collected in relatively large numbers in the upper reaches of the South Fork and Granger Creek. Smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), and bluegill (*Lepomis macrochirus*) occurred more commonly in the lower reaches, with the exception of the Middle Fork, which had its gradient interrupted by a dam and small reservoir. The population densities of caddisflies, mayflies and other macroinvertebrates in the riffles varied widely by site, and were compared to the abundances of darters and minnows in the riffles at the sites. Both the fish and macroinvertebrate communities were viewed statistically in light of the habitat and water quality characteristics at each site to evaluate the strength of any associations.

Keywords: streams, fish, macroinvertebrates, habitat, water quality

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STUDY OF INORGANIC POLLUTANTS MOBILITY FROM CATFISH CREEK WATERSHED INTO THE MISSISSIPPI RIVER

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The city of Dubuque, located in northeast Iowa on the Mississippi River, historically had numerous mining operations, but those industries closed between 30 and 100 years ago. One of the major local creeks flows near by city of Dubuque is Catfish Creek which has a number of tributaries including Granger Creek, the South Fork of the Catfish, and the Middle Fork of the Catfish. The Catfish Creek flows into the Mississippi River running through the old abandoned zinc and lead mining area called Fessler Mine which locates close to the entrance of the Mississippi River.

Due to the location of old mine and flow directions of the creek, the Catfish Creek could be a potential source of toxic trace metals discharging into the Mississippi River. Efforts have been conducted to study the mobility and distribution of trace metals such as lead, zinc, manganese, and iron along the Catfish Creek watershed and near the Mississippi River entrance area. Various core sediment samples were collected to investigate both the surface trace metal distribution and the amount of trace metals as a function of sediment depth to monitor the sediment quality alteration for a certain period of sedimentation. In addition, water quality parameters including pH, DO, nitrate, nitrite, phosphate, conductivity, turbidity, alkalinity, hardness, total suspended solids (TSS) were determined over the creek area under three different flow conditions such as riffle, run, and pool.

Based on the findings, the trace metal concentrations are higher as close to the mouth of the Mississippi River and the amount of trace metals fluctuate as a function of depth. Detailed and updated findings including water quality and trace metal analysis will be discussed over the presentation.

Keywords: trace metal, sediment, Mississippi River, water quality

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ACKERMAN CREEK WATERSHED ASSESSMENT: FISH ASSEMBLAGES OF THREE ILLINOIS RIVER TRIBUTARIES

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The Illinois Natural History Survey's Illinois River Biological Station conducted a baseline assessment of riparian and aquatic biota of three tributaries located in the Ackerman Creek Watershed. This study was conducted in conjunction with the Army Corps of Engineers and the Illinois Department of Natural Resources as part of Illinois River Basin Restoration efforts. Ackerman, Farm and Ten Mile Creeks, located in Peoria and Woodford Counties in central Illinois, were sampled at two 150 meter sites for fish and invertebrate abundance and composition, ancillary water quality and habitat data. Fish sampling gears included a 1500-watt AC electric seine with block nets and a 1600-watt AC backpack shocker. The total number of fish species collected in the three tributaries was 17 and 1 hybrid with a total catch of 2,902 fishes. Although each site exhibited varying degrees of human impact and habitat features, mean catch per site was 483.7 fish and an analysis of variance revealed no significant differences in catch among all six sites (P=0.279). In addition, conflicting results where seen between sites with varying levels of disturbance. Some sites that rendered high levels of disturbance displayed greater species diversity and abundance than other less disturbed sites. Assessment of fish assemblages and composition demonstrated 96.4% of the total catch to be Cyprinids which included sand shiners *Notropis stramineus* (26.3%), central stonerollers *Campostoma anomalum pullum* (24.1%), blacknose daces *Rhinichthys atratulus* (20.5%), river shiners *Notropis blennius* (14.6%), bluntnose minnows *Pimephales notatus* (3.4%), creek chubs *Semotilus atromaculatus atromaculatus* (2.9%) and suckermouth minnows *Phenacobius mirabilis* (2.8%). These Cyprinids, with the exception to river shiners, also dominated each site individually as they were common to all or most sites. Although there were no statistically significant results, such assessments are of importance because of their allowance of an applicable baseline interpretation of small-scale systems, to guide and identify restoration potentiality and priority, as well as track restoration responses.

Keywords: fish assemblage, Illinois River, tributary streams, disturbance

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DISSOLVED ORGANIC CARBON AND TOTAL NITROGEN CONCENTRATIONS UNDER DIFFERENT SPATIAL AND TEMPORAL CONDITIONS IN THE UPPER MISSISSIPPI RIVER

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Dissolved organic carbon (DOC) has been observed to change temporally in large rivers. An important resource for microbial production, DOC concentrations has not been examined thoroughly in backwaters, where DOC concentrations may be greater due to the abundance of macrophytes. The inorganic fraction of total nitrogen (TN) limits primary production, with nutrient availability appearing to be strongly tied to hydrological patterns in large rivers. This study analyzed dissolved organic carbon and total nitrogen concentrations to help better understand nutrient availability backwater and main channel habitats of Reaches 5 and 6 of the Upper Mississippi River , June - August 2005. Samples were obtained by pumping water from a depth of 1 m at each site. Water samples were passed through a 53-μm sieve in the field, then through a 1-μm glass fiber filter in the laboratory, leaving just the dissolved nutrients. DOC and TN were determined using a Shimadzu TOC-V analyzer. DOC was highest in the main channel (10.4 mg/L) in June and steadily declined to 8.8 mg/L by August. TN also decreased over this time period (2.7 mg/L to 1.1 mg/L). This pattern coincided with declining discharge from June through August. DOC and TN exhibited the same pattern in backwaters, but the difference in TN was more pronounced, dropping from 2.9 mg/L in June to 0.9 mg/L in August. The pronounced habitat-related difference in TN is likely a result of differences in the influx of nitrogen to backwaters relative to the main channel.

Keywords: dissolved organic carbon, total nitrogen, main channel, backwater, temporal

SECONDARY BENEFITS OF USFWS WETLAND MANAGEMENT: SEDIMENT AND NUTRIENT CAPTURE AND REMOVAL AT THE HALFWAY CREEK MARSH COMPLEX, HOLMEN, WISCONSIN

William Richardson[1], Joe Schubauer-Berigan[2], Peter Hughes[3], Lynn Bartsch[1], Jennifer Cavanaugh[1], and James Nissen[4]
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The Halfway Creek Marsh Complex (HWCM) (Holmen, WI) is managed by the US Fish and Wildlife Service as a waterfowl feeding and loafing site. Portions of the HWCM were restored from agricultural use while the remainder is in a relatively natural condition. The restored portions are linked to the Halfway Creek through an inlet structure used to fill the restored marsh during floods. A secondary function of the restored marsh is to capture sediments and nutrients from floodwaters to reduce downstream flux to the Mississippi River. The Environmental Protection Agency has interest in understanding the effectiveness of such wetland function and funded collaborative research, with the USGS, to determine 1) loads of sediments and nutrients entering the Mississippi River through HWC; 2) the percentage of sediment and nutrient load captured by the HWCM complex during normal management practices; 3) biological and biogeochemical processes important in transformation and removal of nitrogen (N) and phosphorus (P) captured by the Marsh (both restored and natural areas). During 2004 the total load of suspended sediments entering the restored marsh was 4,417 metric tons (mt), N was 37.7 mt, and P was 7.7 mt. Of this load 10 % of the sediment, 5 % of the N, and 10 % of the P was captured in the wetland. We also evaluated rates of nitrification, denitrification, sediment N and C and moisture to determine how well the restored wetlands performed as processors of N relative to natural wetlands. Denitrification (enzyme activity) was greatest in water-saturated areas (2.2 ug-N cm^2 hr^{-1}) and lowest in the restored marsh (0.5 ug-N cm^2 hr^{-1}). Nitrification rates were highest in the drier areas (7.85 ug-N cm^2 hr^{-1}), whereas the restored marsh was lowest (4.8 ug-N cm^2 hr^{-1}). N-removal capacity in the restored and natural marsh areas was correlated with sediment moisture and nitrate concentrations, which are determined by water management practices. Microbial removal of N was minuscule relative to the total load entering the marsh. Excavation and removal of sediments in the restored marsh is the most effective method of sediment and nutrient management in this stream-wetland complex.

Keywords: wetland management restoration nutrient sediment retention

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COMMUNITY METABOLISM IN A LARGE FLOODPLAIN RIVER: HABITAT COMPARISIONS OVER TIME

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While large floodplain rivers have been identified as highly productive systems, little is known about spatial and temporal patterns of community metabolism at levels below river-wide and annual scales. Dissolved oxygen (DO) concentrations serve as a useful and easily measurable product of both primary production and respiration. DO concentrations were measured in both main channel and backwater habitats in Reaches 5 and 6 of the Upper Mississippi River over a 3-mon period (June - August 2005). These measures will be used to estimate Gross Primary Production (GPP), Net Primary Production (NPP), and Respiration (R). BioDevice Aqua 2002 dissolved oxygen and Temperature recorders were deployed at a depth of 1 m in main channel and backwater habitats. Data were recorded every 1 – 3 min for a 7-d period. Calculation of GPP, NPP, and R will be determined by using the calculations of Odum (1956) using a model developed for the U.S. Environmental Protection Agency. Final calibration of the model has been completed and results will be presented. Examination of DO concentration indicates ~0.4 mg/L daily fluctuations of DO in main channel and backwater in June and ~1.5mg/L daily fluctuation of DO in main channel and backwater in August. Diurnal patterns of DO over a 7-d sample period indicates that GPP exceeds R in both habitats, suggesting accumulation of fixed carbon in both habitats. Rates of community metabolism may be similar in backwater and main channel habitats despite obvious physical, chemical, and biological differences.

Keywords: dissolved oxygen, community metabolism, primary production, respiration, floodplain river, Mississippi River

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PROGRESSION OF A FISH COMMUNITY AT SPUNKY BOTTOMS PRESERVE

Melissa L. Smith, Timothy M. O'Hara, Mike A. McClelland, Kevin S. Irons, Thad R.Cook, and Mike A. Smith
Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, IL 62644

Efforts to restore agricultural floodplain into wetlands have increased in recent years within the Illinois River valley. Specifically, in 1998 The Nature Conservancy purchased and restored Spunky Bottoms Preserve (486-ha) located in Brown County, Illinois. To assess restoration success of Spunky Bottoms we sampled the fish community each year during 1999-2005 following the standardized Long Term Resource Monitoring Program (LTRMP) electrofishing protocol. Beginning in 1999 we sampled fish in response to habitat improvement through the course of the restoration. Since 1999, 3,201 fish consisting of 11 species and 1 hybrid have been documented. Mean catch per-unit effort (CPUE) was 6.07 fish per minute during 1999-2005. However, mean CPUE for 2000 was significantly the highest (0.12 mean fish per minute; $P \leq 0.05$) and 2003 having significantly the lowest mean fish per minute (0.03). Annual species richness averaged 8.3 species and total mean catch was 457.3 fish per year. For all years combined, common carp *Cyprinus carpio* were most abundant (n = 619.0) followed by largemouth bass *Micropterus salmoides* (n = 604.0) and bluegill *Lepomis macrochirus* (n = 559.0). Over time, CPUE of largemouth bass increased from 0.3 fish per minute (1999) to 1.8 (2005). Likewise, CPUE of gizzard shad *Dorosoma cepedianum*, an important forage species increased from no fish (1999) to 2.4 fish per minute (2004). The CPUE of green sunfish *Lepomis cyanellus*, known to tolerate degraded conditions, decreased from 1.9 fish per minute (1999) to 0.0 (2005). Similarly, community analyses indicated a potential change in the fish community over time. Our results suggest restoration of Spunky Bottoms has resulted in a positive shift in the fish community.
Keywords: restoration, floodplain, Spunky Bottoms, fish community, largemouth bass, common carp

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A SUMMARIZATION OF TURTLE DATA COLLECTED USING LTRMP FISH SAMPLING METHODS

Matt Stroub and Matt O'Hara, Kevin Irons. Illinois River Biological Station, Illinois Natural History Survey, 704 North Schrader Ave. Havana, Il 62644

The composition and structure of the La Grange Reach turtle community is largely unknown. Since 1990, the Long Term Resource Monitoring Program (LTRMP) has been monitoring fish on the La Grange Reach of the Illinois River. In conjunction with the LTRMP fish monitoring staff have been collecting turtle data from accidental catches in the fish gear since 1992. A total of 1899 turtles have been caught using LTRMP fish gears. With this data we will examine species composition, size structure, habitat preference and gear sex ratios.

Keywords: turtles, Long Term Resource Monitoring Program, Illinois River

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RESPONSE OF DETRITAL TRANSPORTED ORGANIC MATTER TO TEMPORAL AND SPATIAL CONDITIONS IN THE UPPER MISSISSIPPI RIVER

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

Recent studies have suggested that the quality of detrital organic matter transported in the water column (detrital TOM) changes temporally in correlation with increased phytoplankton production. High quality detrital TOM could, therefore, serve as a supplement to the food web, particularly if increases in quality correspond to periods of greater invertebrate and fish production. This study examined changes in the chlorophyll *a* concentration of detrital transported organic matter in main channel and backwater habitats of the Upper Mississippi River over four sample dates (June – August). Sample collection followed established LRSC procedures for collection of transported organic matter. Algal and detrital components of TOM were separated using colloidal silica centrifugation. Highest chlorophyll concentrations of detrital TOM were observed in both main channel and backwater when phytoplankton were most abundant. The rate of increase of chlorophyll concentration was higher in the main channel than in backwaters. Carbon:chlorophyll *a* ratio, a measure of organic matter quality, was also greatest when phytoplankton abundance was highest. We propose that senescing phytoplankton represent the bulk of detrital transported organic matter during periods of high phytoplankton production, resulting in greater detrital quality and the potential for detrital TOM to contribute substantially more to the diet of primary consumers than during other times of the year.

Keywords: transported organic matter, temporal, detritus, chlorophyll, backwater, main channel

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INVESTIGATION OF ASIAN CARP COMPETITION WITH TWO NATIVE FISHES: BIGMOUTH BUFFALO AND GIZZARD SHAD

John P. Wisher, Kevin S. Irons, T. Matthew O'Hara, Michael A. McClelland, and Thad R. Cook
Illinois River Biological Station, Illinois Natural History Survey, 704 N. Schrader Ave, Havana, IL 62644

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, and varied success since. Additionally, dietary overlap with two species, gizzard shad *Dorosoma cepedianum* and bigmouth buffalo *Ictiobus cyprinellus*, has been pointed out by other researchers. Over 2,400 fish were measured and weighed in part to test for a change in fitness (weight at length) through time.

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

MINUTES OF THE 2005 BUSINESS MEETING
ANNUAL MEETING OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

29 April 2005

The meeting was called to order at 11:00 a.m. by Mark Pegg (President), also present were Michael Delong (Vice-President), Lynn Bartsch (Secretary), Neal Mundahl (Treasurer), and about 65 other members.

President's Report

Acknowledgements

President Mark Pegg acknowledged the members of the Board (Michael Delong, Lynn Bartsch and Neal Mundahl), and particularly the volunteers: Terry Dukerschein for help with the raffle, the judges for student awards, Thad Cook for the hooded merganser decoy used in the raffle, Tom Claflin for the custom MRRC fishing rod, Rick Anderson for the bluebill decoy and framed scaup print, Rob Tyser and the University of Wisconsin-La Crosses' River Studies Center for coordinating the delivery and paying for delivery costs for posters boards, Georgina Ardinger for her assistance with raffle drawing, registration set-up, and maintenance of the MRRC mailing list, Upper Midwest Environmental Sciences Center for Audio-visual support.

Awards

President Mark Pegg presented Michael Romano with a plaque to thank and acknowledge his past MRRC presidency. Mark also presented the awards for Best Student Platform presentation to Susan Romano, Department of Biological Sciences, Western Illinois University, Macomb Illinois, and for Best Student Poster to Rebecca J. Bowen, Large River Studies Center, Winona State University.

Meeting Attendance

President Mark Pegg stated that the meeting attendance was up from the 2004 meeting by about 20 persons. The attendance was similar to the 2003 meeting.

Minutes

A motion to accept the minutes from the 2 April 2004 Business Meeting as printed on page 46 of the Proceedings was seconded and approved by those present at the business meeting.

Treasurer's Report

Treasurer Neal Mundahl presented 2005 Annual Treasurer's report. The report was published on page 49 of the Proceedings. Neal indicated that the financial status of the organization remained about the same as last year with total holdings of $10,531 as of March 1, 2005 (after mailings), compared to $10,322 in 2004. A move to accept the report was seconded and approved by those present at the meeting.

Old Business

Booking Facilities for Annual Meeting

The 2008 meeting planned for Dubuque, Iowa was discussed. Bob Miller attempted to present a video describing the facilities at the National Mississippi River Museum, but technical difficulties prevented this viewing. It was agreed that the video would be served on the MRRC website to permit members to see the venue and its amenities. A question arose if it was possible to have the meeting outside of La Crosse, Wisconsin given that the bylaws of the consortium had stated that the meeting shall be held in La Crosse, Wisconsin. It was mentioned that in the 2004 business meeting a motion was made and passed to hold the MRRC meeting at sites other than La Crosse for special occasions. Some members were unaware of the passing of this motion. For clarity, Rick Anderson motioned that the meeting site of the MRRC be move to Dubuque Iowa for the 2008 meeting. The movement was seconded and approved by those in attendance. Therefore, the board had authority to plan and facilitate the 2008 MRRC meeting in Dubuque Iowa.

New Business

Nominations

President Mark Pegg noted that Vice President Mike Delong, will become President for next year, in accordance with the constitution. Mark reported that the Executive Board nominated John Chick for Vice President, and Lynn Bartsch will continue as the Secretary. Mark asked for further vice presidential nominations from the floor. None were offered, so President Pegg called for a vote. The vote was all in favor with none in opposition for Dr. Chick as the new Vice President. Mark then turned the meeting over to the new President, Michael Delong.

Other New Business

Marian Havlik asked for the dates of the 2008 Dubuque Iowa meeting? Bob Miller responded that he would secure the dates and send them to the board members for posting on the MRRC website.

President Michael Delong called for other new business. No other new business was brought to the floor. A move to adjourn the meeting was seconded and approved by those members present.

MISSISSIPPI RIVER RESEARCH CONSORTIUM
TREASURER'S REPORT

To be submitted prior to the start of the Business Meeting

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.
BUSINESS MEETING AGENDA

29 April 2005, 11:00 AM
Radisson Hotel, La Crosse, Wisconsin

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1. Call to Order
2. President's Report
    - Approval of 2005 minutes
    - Acknowledgments
3. Treasurer's Report
4. Old Business
5. New Business
    - Executive board nomination
    - Election of officers
    - Future meeting dates
    - Growth of MRRC – Should we grow? How should we grow?
    - Other new business
6. Adjournment

Business Meeting Notes

CONSTITUTION OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I. NAME AND OBJECT

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

2. The objective of this organization shall be:

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

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

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

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

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

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

ARTICLE II. ORGANIZATION

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

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

ARTICLE III. MEMBERSHIP AND DUES

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

ARTICLE IV. AMENDMENTS

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

BYLAWS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC.

ARTICLE I: NAME, PURPOSES AND DUTIES

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

6.02 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

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

*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.

ACKNOWLEDGEMENTS 2006

The following persons or institutions have contributed substantially to the planning, execution, support, and ultimately, the success of the 37th Annual Meeting of the Mississippi River Research Consortium. The 2005-2006 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

Lynn Bartsch, Upper Midwest Environmental Science Center, La Crosse, Wisconsin

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

Program and Proceedings

John Chick, Illinois Natural History Survey, Havana, Illinois

Michael Delong, Large River Studies Center, Winona State University, Winona, Minnesota

Lynn Bartsch, Upper Midwest Environmental Science Center, La Crosse, Wisconsin

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

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

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

Robin Tyser 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

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

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

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

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

Kevin Irons, Illinois River Biological Station, Illinois Natural History Survey, Havana, Illinois

Steve Zigler, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin

John K. Tucker, Great Rivers Field Station, Illinois Natural History Survey, Brighton, Illinois

Raffle Prizes

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

Dr. Calvin Fremling and University of Wisconsin Press

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

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

Photography

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

Poster Session and School Outreach

Kevin Callen, Logan High School, La Crosse, Wisconsin

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

Jeff Hansen, Longfellow Middle School, La Crosse, Wisconsin