PROCEEDINGS OF THE

MISSISSIPPI RIVER RESEARCH CONSORTIUM

VOLUME 55

16-18 April 2024

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http://m-r-r-c.org/

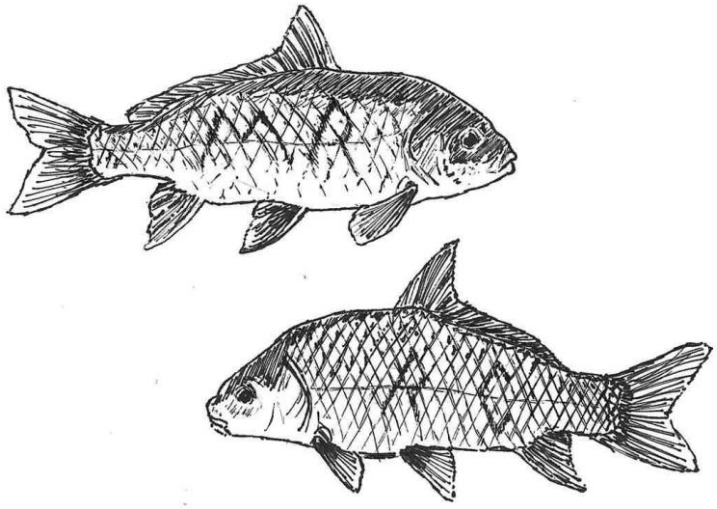
PROCEEDINGS OF THE MISSISSIPPI RIVER RESEARCH CONSORTIUM

Volume 55
April 16 - April 18, 2024
The Radisson Hotel, La Crosse

2023-2024 Board of Directors

RECOGNITIONS

The board would like to express its sincere appreciation for all the donors for the 2024 raffle! The funds go to support our student scholarships each year and will carry over to support additional scholarships next year. Thank you for your generosity and support of our annual raffle.



2024 MRRC Commemorative Pint Glass

This year, our winning submission for the traditional commemorative pint glass was by Valerie Thompson, a student at Eastern Illinois University. Congratulations, Valerie!

We had several great submissions and will likely use the same designs to hold a vote for future year's glasses. Thank you to all who participated and submitted a design! Please pick up your glass and have a complimentary drink. Cheers!

The MRRC operates under fiscal sponsorship from La Crosse Neighborhoods (LCNI), Inc. FEIN 47-4445115 since 2022.

LCNI
La Crosse Neighborhoods, Inc

ACKNOWLEDGMENTS

The 2023-2024 Board of Directors and Consortium members acknowledge the following persons or institutions for their contribution to the success of the 55th meeting of the Mississippi River Research Consortium.

Meeting Arrangements & Announcements
Kathi Jo Jankowski, U.S. Geological Survey
Danelle Larson, U.S. Geological Survey

Program & Proceedings
Danelle Larson, U.S. Geological Survey
2023-2024 MRRC Board of Directors

Online Submission Forms & Website
Colin Belby, Department of Geography and Earth Science, University of Wisconsin – La Crosse
Eric Strauss, River Studies Center, University of Wisconsin – La Crosse

Poster Boards
Stephen Winter, U.S. Fish and Wildlife Service, Winona District Office
Kris Maxson, on behalf of MRRC treasury
Danelle Larson, U.S. Geological Survey, transport, storage and long-term maintenance

Photography
Kim Dunnigan, Illinois Master Naturalist, Lewistown, Illinois

Awards and Raffle Arrangements
Jeremy King, Wisconsin Department of Natural Resources
Kathi Jo Jankowski, U.S. Geological Survey
Danelle Larson, U.S. Geological Survey

Registration Table
Kim Dunnigan, Illinois Master Naturalist, Lewistown, Illinois
April Burgett, Illinois River Biological Station, Illinois Natural History Survey

Student Activities
Vanessa Czeszynski, University of Minnesota

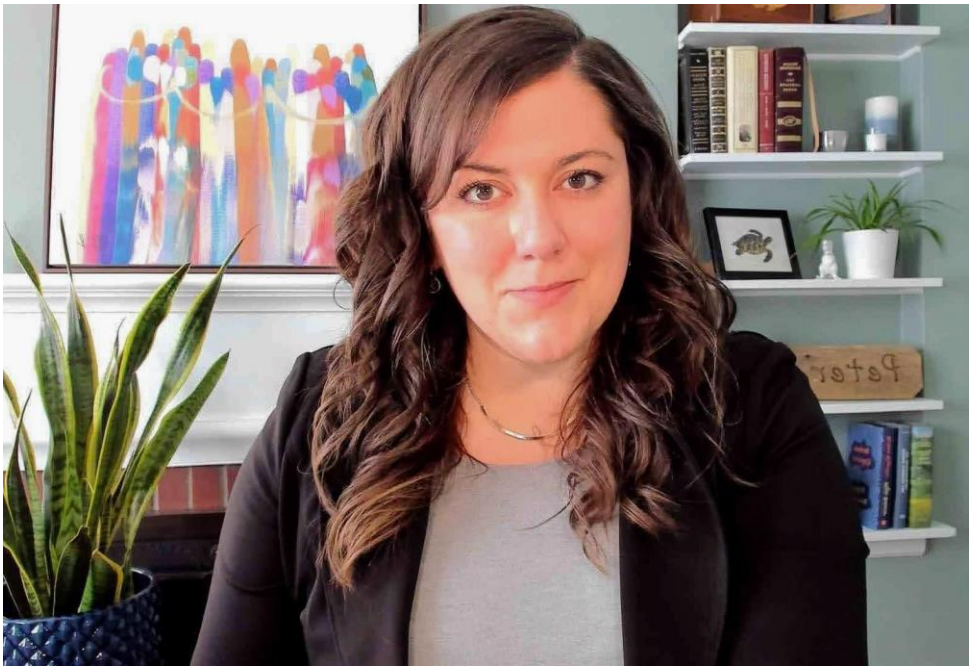
WORD CLOUD

ABSTRACT TOPICS 2024

MRRC 2024 KEYNOTE SPEAKER

TIMESCALES OF ALGAL BLOOMS: STORMS, RESILIENCE, AND LONG-TERM CHANGE

DR. GRACE WILKINSON



Dr. Grace Wilkinson is a limnologist and ecosystem ecologist. Her research focuses on the consequences of the dynamic links between lakes and their surrounding landscapes. The Wilkinson Lab uses a combination of long-term monitoring, comparative surveys, and whole-ecosystem experiments to understand nutrient cycling, harmful algal blooms, and greenhouse gas production in lakes. Dr. Wilkinson received her PhD in Environmental Sciences in 2015 from the University of Virginia. She was an assistant professor at Iowa State University until 2020 when she moved to the University of Wisconsin-Madison. Now, Dr. Wilkinson is an associate professor at the Center for Limnology and Department of Integrative Biology. She is also an Early Career Fellow of the Ecological Society of America, a Fellow of the Association for the Sciences of Limnology and Oceanography and was recently named a Vilas Research Associate at UW-Madison.

INVITED SPEAKERS

"A 100-YEAR CELEBRATION OF THE "UPPER MISS" REFUGE: COMMEMORATING A CENTURY OF REFUGE HISTORY IN 2024"
Hallie Schultz, U.S. Fish and Wildlife Service
https://www.uppermiss100.com/
Hallie Schulz has worked for the US Fish and Wildlife Service for 20 years as a "Refuge Ranger" at various sites and has been with the Upper Miss. River Refuge for 8 years. Her passion is all about connecting visitors with the resource and encouraging recreation on your public lands.

"WHAT IT REALLY TAKES TO SET THE MISSISSIPPI SPEED RECORD"
Judson Steinback, 2024 Team Member
https://www.mississippispeedrecord.com/
La Crosse, WI

Judson Steinback is part of a canoe team of five that set the Guinness World Record for the fastest canoe trip down the Mississippi River. He will discuss how they did it, share stories from along the river, and discuss what it really takes to set a World Record. Steinback spends hundreds of hours annually training on the Upper Mississippi River and its tributaries near his hometown of La Crosse, WI and has competed in and won numerous paddling races throughout the Midwest. Judson is currently the Master's Class Men's and Mixed USCA C-2 National Champion. He has competed in International Professional Canoe Races, placing 14th in the Ruta Maya Belize River Challenge with Mississippi Speed Record teammate Joe Mann and 29th (1st in the Rookie Class) in the AuSable River Canoe Marathon.

MRRC MEETING AGENDA

Tuesday, 16 April 2024

4:00–7:30 PM	REGISTRATION TABLE (Radisson Foyer)
5:00–6:00 PM	SETUP POSTER SESSION I (Radisson Foyer)
6:00–7:30 PM	WELCOMING ADDRESS (Radisson Ballroom)
	INVITED PRESENTATION: "A 100-YEAR CELEBRATION OF THE 'UPPER MISS' REFUGE: COMMEMORATING A CENTURY OF REFUGE HISTORY IN 2024" BY HALLIE SCHULTZ
	KEYNOTE PRESENTATION: "TIMESCALES OF ALGAL BLOOMS: STORMS, RESILIENCE, & LONG-TERM CHANGE" BY DR. GRACE WILKINSON
7:30–9:30 PM	POSTER SESSION I (Radisson Foyer)
7:30–10:00 PM	RECEPTION (Radisson Foyer & Ballroom) BEER AND SNACKS

Wednesday, 17 April 2024

7:15-9:20 AM	**CONTINENTAL BREAKFAST** (Radisson Foyer)
7:30 AM–5:00 PM	REGISTRATION TABLE (Radisson Foyer)
8:00–9:50 AM	ANNOUNCEMENTS AND **SESSION I** (Radisson Ballroom)
9:50–10:10 AM	BREAK (Radisson Foyer & Ballroom)
10:10–11:30 AM	**SESSION II** (Radisson Ballroom)
11:30 AM–1:30 PM	LUNCH (on your own)
12:30–1:30 PM	**STUDENT EVENT**: ICE CREAM @ The Pearl (207 Pearl St)
12:30–3:30 PM	SETUP POSTER SESSION II (Radisson Foyer)
1:30–2:50 PM	**SESSION III** (Radisson Ballroom)
2:50–3:20 PM	BREAK (Radisson Foyer & Ballroom)
3:20–4:20 PM	**SESSION IV** (Radisson Ballroom)
4:20–4:50 PM	**INVITED PRESENTATION:** Judson Steinbeck (Radisson Ballroom)
5:00–6:30 PM	POSTER SESSION II (Radisson Foyer)
5:00–6:30 PM	SOCIAL MIXER (Radisson Foyer & Ballroom)
6:30–9:00 PM	**BANQUET DINNER** (Radisson Ballroom)

Thursday, 18 April 2024

7:30–10:00 AM	REGISTRATION TABLE (Radisson Foyer)
7:15–9:20 AM	**CONTINENTAL BREAKFAST** (Radisson Foyer)
8:00–9:30 AM	ANNOUNCEMENTS AND **SESSION V** (Radisson Ballroom)
9:50–10:10 AM	BREAK (Radisson Foyer & Ballroom)
10:10–11:10 AM	STUDENT AWARDS & BUSINESS MEETING (Radisson Ballroom)
11:10AM –12:30 PM	**LUNCH AND RAFFLE** (Radisson Ballroom)
12:30 PM	FAREWELL! SEE YOU NEXT YEAR.

MRRC STUDENT PRESENTATION EVALUATIONS

Thank you to all our student presenters! We have 25 student-presenters this year, which is fabulous.

Student presenters may opt into a friendly competition for best presentation and to get feedback from professionals. The highest scoring presentations will receive recognition and awards at our Thursday Business Meeting. All presentation scores and written feedback will be provided to the student afterwards.

Volunteer judges will evaluate the student presentations through our online system using this link or QR code:

https://tinyurl.com/MRRC2024

JUDGES, please complete all your assigned evaluations by 10:00 a.m. on Thursday. This is required so that the winners can be announced during Thursday's 11:00 a.m. business meeting.

MRRC Meeting Agenda
Wednesday, 17 April 2024
Oral Presentations - Radisson Ballroom
(*Student Presenters)

7:15-9:20 AM CONTINENTAL BREAKFAST (Radisson Ballroom)

SESSION I (Moderator: Molly Van Appledorn)

8:00–8:15 Welcome and Announcements: Kathi Jo Jankowski, MRRC President

8:15–8:35 USING DENDROCHRONOLOGY TO UNDERSTAND AGE DYNAMICS IN UPPER MISSISSIPPI FLOODPLAIN FORESTS. Lydia Voth Rurup1, Marcella Windmuller-Campione1, Matthew Trumper1, Daniel Griffin1, Molly Van Appledorn2, Alan Toczydlowski1, Andrew Meier3, Daniel Nielson1. 1University of Minnesota. 2U.S. Geological Survey. 3U.S. Army Corps of Engineers.

8:35– 8:55 EXTREME EVENTS DRIVE FLOODPLAIN FOREST GROWTH SYNCHRONY ALONG THE UPPER MISSISSIPPI RIVER. *Daniel Griffin1,2, Matthew Trumper1, Daniel Crawford1, Andrew Meier3, Daniel Nielsen4, Lydia Voth Rurup4, Marcella Windmuller-Campione4 and Molly Van Appledorn5. 1Department of Geography, Environment & Society, University of Minnesota. 2Saint Anthony Falls Laboratory, University of Minnesota. 3U.S. Army Corps of Engineers, La Crescent, Minnesota. 4Department of Forest Resources, University of Minnesota. 5U.S. Geological Survey, Upper Midwest Environmental Sciences Center.

8:55–9:15 QUANTIFYING FLOODPLAIN FOREST COMMUNITY CHANGE FOLLOWING LARGE-SCALE FLOOD EVENTS IN THE UPPER MISSISSIPPI RIVER SYSTEM. Shelby A. Weiss1, Lyle J. Guyon1, Nathan R. De Jager2, Robert J. Cosgriff3, Molly Van Appledorn2. 1National Great Rivers Research and Education Center, 2U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 3U.S. Army Corps of Engineers

9:15–9:35 ATTRIBUTES OF FOREST LOSS ALONG THE UPPER MISSISSIPPI RIVER FROM 2010 TO 2020. Nathan R. De Jager1 and Jason J. Rohweder1 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

9:35-9:50 HABITAT PREFERENCES OF BIRDS USING THE FLOODPLAIN FORESTS OF THE UPPER MISSISSIPPI RIVER. Dale Gentry1, Tara Hohman1, Nicole Michel1. 1Audubon Upper Mississippi River

9:50-10:10 AM: BREAK (Radisson Foyer)

SESSION II (Moderator: Dale Gentry)

10:10-10:30 INVASIVE CARP ON THE MOVE: DECIPHERING LONGITUDINAL MOVEMENT PATTERNS IN THE UPPER MISSISSIPPI RIVER. *Douglas Appel1, Yu-Chun Kao2, Mark Fritts2, Andrea Fritts1. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI. 2U.S. Fish and Wildlife Service, Onalaska, WI.

10:30-10:50 BIGHEADED CARP USE AND MOVEMENT PATTERNS BETWEEN TRIBUTARIES AND BACKWATERS IN POOLS 17-19 OF THE UPPER MISSISSIPPI RIVER. Amanda Milde1, Mark Fritts2, Dan Gibson-Reinemer1, Douglas Appel1, Jon Vallazza1, Kyle Mosel1, William Budnick1, William Lamoreux1, Andrea Fritts1. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center. 2U.S. Fish and Wildlife Service, La Crosse Conservation Office.

10:50–11:10 MODELING WATERSHED BOUNDARY CONNECTIVITY TO MITIGATE THE SPREAD OF INVASIVE CARP. Peter J. Pfaff1, David P. Coulter2, Benjamin J. Schall3, Tanner Davis3, Steven R. Chipps4, Alison A. Coulter2. 1Saint Mary's University of Minnesota Department of Biology. 2South Dakota State University Natural Resource Management. 3South Dakota Game, Fish & Parks. 4South Dakota Cooperative Fish and Wildlife Research Unit

11:10–11:30 AGGREGATION FOR ERADICATION: AN EXPLORATORY GRASS CARP MANAGEMENT STRATEGY IN THE UPPER MISSISSIPPI RIVER. *Max F. Monfort1,2, James J. Wamboldt2, Matthew R. Acre3, David A. Schumann1, 1University of Wisconsin-La Crosse, Biology Department and River Studies Center. 2U.S. Geological Survey, Upper Midwest Environmental Science Center. 3U.S. Geological Survey, Columbia Environmental Research Center.

11:30 AM - 1:30 PM: LUNCH (on your own)
12:30 PM - 1:30 PM: STUDENT EVENT
(ice cream @ The Pearl; 207 Pearl St)

SESSION III (Moderator: Kristen Bouska)

1:30–1:50 HARMFUL ALGAL BLOOMS IN IOWA: A MULTIFACETED APPROACH TO UNDERSTANDING AND MITIGATING RISKS. Lyndy M. Holdt1. 1Iowa Lakeside Laboratory, University of Iowa

1:50–2:10 PHYTOPLANKTON ASSEMBLAGE DYNAMICS IN RELATION TO ENVIRONMENTAL CONDITIONS IN A RIVERINE LAKE. Rob Burdis1, Nicole Ward1, John Manier2. 1Minnesota Department of Natural Resources, Lake City Field Station. 2U.S. Geological Survey, Upper Midwest Environmental Sciences Center

2:10–2:30 METABOLIC RATES ACROSS VARIABLE ENVIRONMENTAL CHARACTERISTICS IN THE UPPER MISSISSIPPI RIVER. Patrick T. Kelly1. 1Wisconsin Department of Natural Resources, Office of Great Waters

2:30–2:50 PREVALENCE OF MICROPLASTIC PARTICLES IDENTIFIED IN GIZZARD SHAD *DOROSOMA CEPEDIANUM* IN THE UPPER MISSISSIPPI RIVER SYSTEM. *Courtney Baker1,2, Eric A. Strauss1,2. 1River Studies Center, University of Wisconsin - La Crosse. 2Department of Biology, University of Wisconsin – La Crosse

2:50-3:20 PM: BREAK (Radisson Foyer)

SESSION IV (Moderator: Vanessa Czeszynski)

3:20–3:40 RECENT ADVANCES IN THE EVALUATION OF FRESHWATER MUSSEL HEALTH. Eric M. Leis1, Jordan Richard2, Sara Dziki1, Isaac Standish1, Diane Waller3, Susan Knowles4, and Tony Goldberg2, 1La Crosse Fish Health Center (USFWS). 2Department of Pathobiological Sciences and Freshwater & Marine Sciences Program, University of Wisconsin-Madison. 3Upper Midwest Environmental Sciences Center (USGS). 4National Wildlife Health Center (USGS)

3:40–4:00 BOATER COMPLIANCE WITH THE LAKE ONALASKA VOLUNTARY WATERFOWL AVOIDANCE AREA. Michael J. Wellik1, Luke J. Fara1, Steven C. Houdek1, William S. Beatty1, Brian R. Gray1, Kevin P. Kenow1, Tim Miller2. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. 2U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, Wisconsin

4:00–4:20 THE IMPORTANCE OF THE UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE TO TUNDRA SWANS. Stephen L. Winter, U.S. Fish and Wildlife Service

4:20–4:50 WHAT IT REALLY TAKES TO SET THE MISSISSIPPI SPEED RECORD Judson Steinback, Coulee Region Ecoscapes and Mississippi Speed Record

5:00-6:30 POSTER SESSION I (Radisson Foyer)

5:00-6:30 SOCIAL MIXER (Radisson Foyer)

6:30-9:00 **BANQUET DINNER** (Radisson Ballroom)

MRRC Meeting Agenda
Thursday, 18 April 2024
Oral Presentations - Radisson Ballroom
(*Student Presenters)

7:15-9:20 AM CONTINENTAL BREAKFAST (Radisson Ballroom)

SESSION V (Moderator: Sam Schaick)

8:00–8:10 Welcome and Announcements: Kathi Jo Jankowski, MRRC President

8:10–8:30 CHANGES IN MACROINVERTEBRATE COMMUNITY COMPOSITION AND DIVERSITY ACROSS SIDE CHANNELS OF THE UPPER MISSISSIPPI RIVER SYSTEM. *Cheyana Bassham1, Kristen L. Bouska2, Molly Sobotka3, and Ross Vander Vorste1. 1University of Wisconsin La Crosse, 1725 State Street, La Crosse, WI 54601 2US Geological Survey, Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, WI 54601 3Missouri Department of Conservation, Big Rivers and Wetlands Field Station, 2302 County Park Drive, Cape Girardeau, MO 63701, USA

8:30–8:50 SPECTACLECASE HOST FISH, HIODON SPP., MOVEMENT PATTERNS IN THE ST. CROIX NATIONAL SCENIC RIVERWAY. Matthew Meulemans1, Michelle Bartsch1, Diane Waller1, Bernard Sietman2, Zeb Secrist2, Joel Strias3, & Marian Shaffer4. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI; 2Minnesota Department of Natural Resources, Center for Aquatic Mollusk Programs, Lake City, MN; 3Minnesota Department of Natural Resources, St. Paul MN; 4National Park Service, St. Croix National Scenic Riverway, St. Croix Falls, WI.

8:50–9:10 CHARACTERIZING THE NICHE OF REED CANARYGRASS IN FLOODPLAIN FORESTS OF THE UPPER MISSISSIPPI RIVER. John T. Delaney,1 Molly Van Appledorn1, Nathan R. De Jager1, Kristen L. Bouska1, Jason J. Rohweder1. 1United States Geological Survey, Upper Midwest Environmental Sciences Center.

9:10–9:30 EVALUATION OF AN UNDERWATER CAMERA METHOD TO SAMPLE FRESHWATER FISH ASSEMBLAGES UNDER THE ICE. *Benjamin D.

Patschull1. 1University of Wisconsin - La Crosse, Wisconsin Department of Natural Resources

9:30–9:50 EVALUATION OF THE LOCA-VIC-MIZUROUTE HYDROLOGY DATA PRODUCTS FOR SCIENTIFIC AND MANAGEMENT APPLICATIONS IN THE UPPER MISSISSIPPI AND ILLINOIS RIVERS. Molly Van Appledorn1, Lucie Sawyer2, Leigh Youngblood3, Jane Harrell4, John Delaney1, Chanel Mueller5, Brian Breaker6, and Chris Frans7 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2U.S. Army Corps of Engineers, Rock Island District, 3U.S. Army Corps of Engineers, St. Paul District, 4U.S. Army Corps of Engineers, Seattle District, 5U.S Army Corps of Engineers, Headquarters, 6U.S. Army Corps of Engineers, Little Rock District, 7U.S. Bureau of Reclamation.

9:50-10:10 PM: BREAK (Radisson Foyer)

10:10–11:10 STUDENT AWARDS & BUSINESS MEETING (Radisson Ballroom)

11:10–12:30 **LUNCH AND RAFFLE** (Radisson Ballroom)

12:30 FAREWELL! SEE YOU NEXT YEAR.

Poster Session I
Tuesday, 16 April 2024
Radisson Foyer

Poster set-up 5:00–6:00 PM
Authors present at posters 7:30–9:30 PM
(*Student presenters)

1) "BACKWATER CONNECTIVITY IMPACTS ON SELECTED RIVERINE FISHES ON THE LOWER ILLINOIS RIVER" Tovah Brooks, Olivia Salrin, Kristopher Maxson, Levi Solomon, and James Lamer, Illinois River Biological Station, Illinois Natural History Survey, Prairie Research Institute, University of Illinois

2) "USING EDNA AND ACOUSTIC TELEMETRY TO GUIDE SITE SELECTION FOR THE GRASS CARP BAIT AGGREGATION PROJECT" Theresa M. Schreier1, James J. Wamboldt1, Madeline E. Teale1, Max F. Monfort1,2, David Schumann2, and Steve F. Spear1. 1U.S. Geological Survey. Upper Midwest Environmental Sciences Center; 2University of Wisconsin – La Crosse

3) "AGE, GROWTH, RECRUITMENT, AND MORTALITY ESTIMATES OF UPPER MISSISSIPPI RIVER AND ILLINOIS RIVER FISHES" Kristen Bouska1, Hae Kim2, Jim Lamer3, Quinton Phelps2, Levi Solomon3. 1US Geological Survey, Upper Midwest Environmental Sciences Center, 2Missouri State University, 3Illinois Natural History Survey, Illinois River Biological Station

4) "PARTNER-BASED WINGED MAPLELEAF (QUADRULA FRAGOSA) PROPAGATION EFFORTS" Michelle Bartsch1, Diane Waller1, Steve Houdek1, Theresa Schreier1, Gage Valeri1, Doug Aloisi2, Megan Bradley2, Elizabeth Glidewell2, Mike Davis3, Bernard Sietman3, Madeline Pletta3, Lindsay Ohlman3, Zeb Secrist3, Dan Hornbach4, Mark Hove5, Dan Kelner6, Tamara Smith7, Nick Utrup7, Lisie Kitchel8, Jesse Weinzinger8, Nathan Eckert9, Katie Sickmann10, Lauren Brochtrup10, Marian Shaffer11. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center (UMESC), La Crosse, WI. 2U.S. Fish and Wildlife Service (USFWS), Genoa National Fish Hatchery (GNGH), Genoa, WI. 3Minnesota Department of Natural Resources, Center for Aquatic Mollusk Programs, Lake City, MN. 4Macalester College, Department of Environmental Studies, St. Paul, MN. 5University of Minnesota Department of Fisheries, Wildlife and Conservation Biology, St. Paul, MN. 6U.S. Army Corps of Engineers, St. Paul District, St. Paul, MN. 7USFWS, Minnesota-Wisconsin Ecological Services Field Office, Bloomington, MN. 8Wisconsin Department of Natural Resources, Madison, WI. 9USFWS, Neosho National Fish Hatchery, Neosho, MO. 10Wild Rivers Conservancy, Osceola, WI. 11St. Croix National Scenic Riverway, National Park Service, St. Croix Falls, WI

5) "REPRESENTATION OF MICROPLASTIC POLLUTION AND ABUNDANCE IN SILVER CARP FROM POOL 26 OF THE UPPER MISSISSIPPI RIVER" *Kassie Zimmer1, Eric A. Strauss1. 1University of Wisconsin, La Crosse, Department of Biology and the River Studies Center

6) "ANALYSIS OF MICROPLASTICS IN FRESHWATER URBAN WATERSHEDS" *Briana Reagan1, Brittany L. McCall1, and Michael Reisner1 1Augustana College

7) "MICROPLASTIC ABUNDANCE IN THE MAIN CHANNEL WATERS OF THE UPPER MISSISSIPPI RIVER POOL 8: PRELIMINARY DATA" *Megan C. Adams1, Eric Strauss1. 1University of Wisconsin- La Crosse, River Studies Center and Department of Biology.

8) "CULTIVATION OF NON-BITING MIDGES (CHIRONOMIDAE; ARTHROPODA) IN A CONTROLLED ENVIRONMENT" *David J. Ellefson1 , Matthew Waite1, Steven Verhaalen1, Ross Vander Vorste1. 1UW-La Crosse

9) "INVASIVE CARP GROWTH CHRONOLOGIES: MANAGEMENT TOOL TO HELP EVALUATE HARVEST SUCCESS?" *Kaiden Vinavich1, Levi Solomon1, Kris Maxson1, Sam Shcaick1, Jesse Williams1, Zack Witzel1, Allison Lenaerts1, Mark Fritts2, Ben Marcek3, Edward Sterling4, Michael Weber5, Christopher Sullivan6, James Lamer1. 1Illinois Natural History Survey, Illinois River Biological Station. 2U.S. Fish and Wildlife Service, La Crosse Fish and Wildlife Office. 3U.S. Fish and Wildlife Service, Carterville Fish and Wildlife Office. 4U.S. Fish and Wildlife Service, Columbia Fish and Wildlife Office. 5Department of Natural Resource Ecology and Management, Iowa State University. 6Department of Natural Resources & the Environment, University of Connecticut

10) "REIMPLEMENTATION OF THE LTRM MACROINVERTEBRATE COMPONENT IN THE MISSISSIPPI AND ILLINOIS RIVERS" Manisha Pant, Abigail Nordstrom, Kristopher Maxson, Levi Solomon and James Lamer. Illinois River Biological Station, Havana, Illinois.

11) "IMPACTS OF WEIRS ON THE CORRELATION OF METAL CONCENTRATION AND BIOLOGICAL INTEGRITY IN A SMALL SE MN STREAM" *Brooke A. Kline1&2, Peter Pfaff1, Nathan Lien2. 1Biology Department, Saint Mary's University of Minnesota. 2Chemistry Department, Saint Mary's University of Minnesota

12) "BUILDING MESOCOSMS FOR AQUATIC INVERTEBRATE RESEARCH AND CULTURING" *Matthew M. Waite1, *Steven Verhaalen1, David Ellefson1, Ross Vander Vorste1. 1University of Wisconsin - La Crosse

13) "INVESTIGATION OF A LABORATORY METHOD FOR MICROPLASTIC EXTRACTION FROM RIVERINE SEDIMENTS USING DENSITY SEPARATION" * Peyton M. Weckwerth1, Eric A. Strauss1. 1 UWL River Studies Center, University of Wisconsin-La Crosse

14) "ENVIRONMENTAL FACTORS INFLUENCING AQUATIC INSECT EMERGENCE IN POOL 8 OF THE UPPER MISSISSIPPI RIVER" *Skylar Voigt1, Cheyana Bassham1, Kate Patterson2, Sydney Paradise1, Ross Vander Vorste1. 1 University of Wisconsin-La Crosse. 2University of Wisconsin-Madison

15) "INVESTIGATING AN ELECTROSTATIC METHOD FOR THE REMOVAL OF MICROPLASTICS FROM WATER SAMPLES OF THE MISSISSIPPI RIVER"

*Sara M. Nerad1, Brianna L. Finnegan1, Kelly A. Grussendorf1, Adam R. Hoffman, Richard Smith. 1Department of Natural and Applied Sciences. University of Dubuque

16) "CELLULAR CADMIUM CONTAMINATION AND TOLERANCE IN CRAYFISH" *Emerson S. Wilson, Kelly A. Grussendorf, Adam R. Hoffman, University of Dubuque

Poster Session II
Wednesday, 17 April 2024
Radisson Foyer

Poster set-up 12:30–3:30 PM
Authors present at posters 5:00–6:30 PM
(*Student presenters)

1) "LAND USE FACTORS AFFECTING EROSION AND ENTRENCHMENT IN GOOSE CREEK WATERSHED, DAVENPORT IA" *Hannah L. McKoon1, Dr. Kevin Geedy1, Peyton E. Heisch1. 1Augustana College

2) "CHEMICALLY AND MICROBIALLY CHARACTERIZING RESTORED PRAIRIES IN DUBUQUE COUNTY ON A FORB TO GRASS ABUNDANCE GRADIENT" *Ryan P. Kiddle1, *Joseph W. Ensley1, and Adam J. Kleinschmit1. 1University of Dubuque

3) "RIPARIAN ZONE ASSESSMENT ACROSS A RURAL TO URBAN GRADIENT" *Anne Gill, Environmental Studies Department, Augustana College

4) "SPATIAL AND TEMPORAL VARIATION IN NUTRIENT AND TOTAL COLIFORM BACTERIA IN A MISSISSIPPI RIVER TRIBUTARY" *Makenzie R. Knapp1, *Alyssa L. Straka1, Adam R. Hoffman1. 1Department of Natural and Applied Sciences, University of Dubuque

5) "FACTORS AFFECTING URBAN STREAM METABOLISM PERFORMANCE IN GOOSE CREEK WATERSHED" *Jenna Sorenson1, Dr. Kevin Geedey1, 1Department of Biology & Environmental Studies, Augustana College

6) "PARASITE COMMUNITIES AS POTENTIAL BIOINDICATORS FOR URBAN AQUATIC ECOSYSTEMS" *Fynn Greene1, Brittany L. McCall2, Michael Reisner2. 1Augustana College, Department of Biology. 2Augustana College, Department of Environmental Studies

7) "RIPARIAN STRUCTURAL DIVERSITY AND LANDCOVER AS PREDICTORS OF WATER QUALITY: A COMPARATIVE ANALYSIS IN THE DUCK CREEK

WATERSHED" *Zack Horve1, Brittany L. McCall1, Michael Reisner1. 1Department of Environmental Studies, Augustana College

8) "PATTERNS OF BUMBLE BEE AND HONEY BEE ACTIVITY AND PLANT ASSOCIATIONS IN PATCHY RESTORED PRAIRIES ALONG THE MISSISSIPPI RIVER IN NORTHEASTERN IOWA" *Zachary F. Donath1, James A. Eberhardt1, Paige A. Peterson1, Gerald L. Zuercher1. 1 Wolter Woods and Prairies, University of Dubuque

9) "DIFFERENCES IN THE PRESENCE OF PARASITES, ON AND IN, PASSERINES OF RURAL AND URBAN ENVIRONMENTS ALONG THE MISSISSIPPI RIVER" *Abigail L. Boesen1, *Samantha G. Scodeller1, Kelly A. Grussendorf1, Adam R. Hoffman1, Adam J. Kleinschmit1, Gerald L. Zuercher1. 1Department of Natural and Applied Sciences, University of Dubuque

10) "FOREST PHENOLOGY RELATIONSHIP BETWEEN CANOPY DENSITY, GROND VEGETATION, AND MANAGEMENT PRACTICES" *Evan J. Wolter1, Jessica M. Dix1, David Koch1. 1Department of Natural and Applied Sciences, University of Dubuque

11) "FOREST TREE SPECIES AND AGE CLASS ANALYSIS AT WOLTER WOODS & PRAIRIES" *Jessica M. Dix1, Evan J. Wolter1, David Koch1. 1Department of Natural and Applied Sciences, University of Dubuque

12) "TOPOBATHY PILOT STUDY: VETTING NEW TECHNOLOGIES TO UPDATE TOPOBATHY FOR THE UPPER MISSISSIPPI RIVER SYSTEM" Jenny Hanson1, Davi Michl2, Ted Stanton3, Michael Dougherty2, Jason Rohweder1, Jennifer Dieck1, and Julia Cogan1. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center. 2U.S. Army Corps of Engineers, Rock Island District. 3 U.S. Army Corps of Engineers' Technical Center of Expertise, St. Louis District, St. Louis

13) "CARBON AS A WATER QUALITY ISSUE: HOW MICROBIAL CARBON PROCESSING CAN CONTRIBUTE TO OXYGEN DEPLETION IN FRESHWATER SYSTEMS" *Vanessa M. Czeszynski1, James B. Cotner1
1Department of Ecology, Evolution and Behavior, University of Minnesota - Twin Cities

14) "ECTOMYCORRHIZAL TREE AND FUNGAL ECOLOGY AND SOIL PROPERTIES IN THE KICKAPOO VALLEY WISCONSIN" *Jacob A.S. Hansel1, Anita Davelos1, Todd Osmundson1. University of Wisconsin La Crosse Biology Department

15) "DOES BARGE TRAFFIC IMPACT WATER CLARITY ON THE LA GRANGE REACH OF THE ILLINOIS RIVER?" Kaitlyn Mathews[1], Madison Davee[1], and Sara Sawicki[1] Illinois Natural History Survey

16) “MAPPING THREE DECADES OF SEDIMENTATION WITHIN THE LAKE ONALASKA DREDGE CUT” *Cade Szymanski1, Nick Horzewski1, Colin Belby1.
1Department of Geography and Environmental Science, University of Wisconsin – La Crosse

17) “SPATIAL MODELING OF FLOOD INUNDATION AND FOREST SUCCESSION UNDER DIFFERENT GEOMORPHIC AND HYDROLOGIC SCENARIOS IN THE UPPER MISSISSIPPI RIVER FLOODPLAIN” Matthew L. Trumper, Nathan R. De Jager, Molly Van Appledorn, Jason J. Rohweder, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI

FULL ABSTRACTS ARE AT THE END OF THE PROGRAM

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC

2024 BUSINESS MEETING AGENDA

Radisson Center, La Crosse, Wisconsin

April 18, 2024

1. Call to Order

2. President's Report by Kathi Jo Jankowski

a. Acknowledgments

b. Approval of the 2023 Business meeting minutes

c. 2024 attendance/participation information

3. Treasurer's Report by Kris Maxson

4. Old Business

a. Bylaws Revisions Committee Update- Steve Winter

5. New Business

a. Future meeting dates

April 15-17, 2025 (Radisson Ballroom, La Crosse, WI)

b. Presentation of Student Awards

c. Presentation of Best Student Platform Presentation and Poster Awards

d.. Student Representative and Student Involvement

e. DEIA Committee Introduction and Overview

e. Introduction of executive board nominees for Vice President and Secretary

f. Election of Vice President and Treasurer to the Board of Directors

g. Passing of the Presidency

h. Other new business

6. Adjournment

MISSISSIPPI RIVER RESEARCH CONSORTIUM TREASURER'S REPORT

Submitted by Kris Maxson (MRRC) on 29 March 2024

Checking account balance as of 30 June 2020		22,173.42
Checking account balance as of 30 June 2021		20,549.92
Checking account balance as of 31 December 2022		19,325.62
Transactions 1 January to 31 December 2023		
Income		
7/19/2023	Paypal transfer	13,04.000
10/2/2023	Raffle proceeds and Univ Dubuque reg	1,935.00
TOTAL INCOME		14,975.00
Expenses		
4/20/2023	Grants - 1Mississippi	200.00
3/30/2023	Conference - Mugs	570.14
3/28/2023	Award Plaques	182.40
4/14/2023	Raffle - Nikon Binoculars/K Dunnigan reg	243.34
4/17/2023	Raffle - Wenonah Canoe, Inc Kayak	550.00
5/1/2023	Conference - Radisson Hotel	10,933.64
5/1/2023	Paypal transaction fees	522.27
6/14/2023	Travel Award - Kara Phelps	200.00
12/31/2023	LCNI Administrative fees	200.00
TOTAL EXPENSES		13,601.79
Checking account balance as of 31 December 2023		20,698.83
Transactions 1 January to 31 March 2024		
Income		
3/29/2024	Paypal Registrations	6,885.67
TOTAL INCOME		6,885.67
Expenses		
3/14/2024	ULINE Posterboards (25)	297.01
3/20/2024	Easels (10)	210.99
3/29/2024	Paypal Expenses	285.59
TOTAL EXPENSES		793.59
Checking account balance as of 29 March 2023		26,790.91

MISSISSIPPI RIVER RESEARCH CONSORTIUM, INC

2023 BUSINESS MEETING MINUTES

The Radisson Center, La Crosse, Wisconsin

Call to Order

Business meeting called to order by President Eric Hine at 11:11 a.m., Friday April 21, 2023

Acknowledgments

Eric acknowledges everyone who worked hard to make the meeting happen and each board member was recognized. Eric thanked Meredith Thomsen for the student workshop. Hine recognized Kim Dunnigan and all the judges and moderators. Colin Bellby from Qualtrics was recognized as well as Eric Strauss for managing the website. Dr. Bonnie Keeler the keynote speaker was thanked as well. Dr. Zen Fawkes was acknowledged for the poster building workshop. David Mindel and Judd Steinback were both recognized as well, and last wanted to thank all who attended.

There were 126 registrants, 23 oral presentations, and 31 posters. Poster building workshop had 11 total students who registered and 9 who attended. Thanks to all.

John Chick moved and April Burgett seconded a motion to pass.

Treasurer's Report

Eric presents the Treasurer's report in place of Quinton Phelps (Treasurer). Eric states the checking account balance. Stephen Winter moves and April seconded.

Old Business

Eric passes over to Winter for bylaws community. Winter has revised version from 2018 organized by section. Revised bylaws by adding two board members with being elected in alternating years and will help with the current board being overworked. The two board positions don't have assigned duties but reviewing documents and helping coordinate. The revised bylaws will be reviewed by the board of directors and once they think it's good will then go to the membership for a larger vote.

Kathi-Jo suggests that we vote by email and Winter agrees. April suggested Qualtrics to set up a time to vote and it's okay with the Qualtrics contract. Steve was thanked for addressing this.

New Business

Eric brings up if we want to have future meetings in the conference or go back to the ballroom in the Radisson. Jeff wants it back to the Ballroom and Levi thought it was a good idea as well. Something to think about changing dates for 2025. Lamer suggested to leave Thursday for travel reasons since there are several attendees who come from out of state that have a lot of miles to travel. Talk began about rearranging the Wednesday-Friday schedule to get people on the road.

Winter brings up to the group that we need to let the Radisson know we need better projections because most presentations couldn't be read from the back of the room.

April motions to move back to Radisson ballroom to make it easier on out-of-state guests (Tuesday-Thursday) and John chick seconded. Eric had all vote to moving Radisson Hotel Ballroom up a day and if it's the same cost. Vote passes. April 16th- 18th next year is the plan (Tuesday-Thursday). Eric will keep us updated.

Presentation of Travel Awards

There was only 1 who applied. More should apply next year! Kathi Jo, suggest we think of other ways to get students to apply. Eric presents the winner (Kara Phelps). Congrats given to Kara. Winter suggests revising the bylaws to get a name change that is more appealing to students to apply. Eric Strauss suggests that he likes to name it as a reward and not a scholarship to get more applications. Winter seconds that and suggested that we revise it so that anybody can get the reward and get the 200$. Eric states that the board will include this in the bylaws revision and will tell the committee if it's good and discuss if so to membership.

Presentation of best student platform presentation and poster awards were given. First place was awarded to Sam Monk's presentation on microplastics. Second place was awarded to Kara Phelps.

First place for the poster presentation was awarded to Paige who was not there at the time but will get mailed. Second place was a tie given to Cheyana Bassham and Sam Baumgartner.

Nominees of Treasurer

Kris Maxson was nominated as Treasurer. Motion to approve was given by Sam Shike and Seth seconds. Motion passes. Congrats Kris.

Vice President nominee Danelle Larson was moved by Winter and Jeff seconds. Motion passes. Congrats Danelle.

Passing of Presidency was done. Eric passes it over to Kathi Jo. Kathi Jo gives Eric recognition for being President. Congrats to both!

Other New Business

Kathi Jo thanks all and recognized all who attended to make it a cool experience, good diversity, and a great opportunity.

Andrya suggests that we get new poster board easels for the group (maybe over the next couple of years to reduce costs). Winter thinks that's a great idea and just requires somebody to store them. Collin suggested that UWL may have a home for them. Eric Strauss seconds that there is room to store them. All vote yes.

Gwen Miller proposed that some form of DEI sub-committee be formed for MRRC. Winter suggested to contact the board and put into the revisions to make it clear.

Adjournment

Meeting was adjourned at 12:08 p.m. Respectfully Submitted, Jeremy D. King, MRRC Secretary

PAST RECIPIENTS OF THE MRRC *FRIEND OF THE RIVER* AWARD

Friend of the River	Organization	Year	Meeting	Presenter
Calvin R. Fremling	Winona State University	1992	24th	Neal Mundahl
Thomas O. Claflin	University of Wisconsin-La Crosse	1993	25th	Ronald G. Rada
Pamela Thiel	U.S. Fish & Wildlife Service	1997	29th	Terry Dukerschein
Richard V. Anderson	Western Illinois University	1998	30th	Michael A. Romano
Ronald G. Rada	University of Wisconsin-La Crosse	1999	31st	Terry Dukerschein
Marian E. Havlick	Malacological Consultants, La Crosse, Wisconsin	2008	40th	Brian Ickes
Carl Korschgen	USGS, Columbia Environmental Research Center, Columbia, Missouri	2009	41st	Roger Haro and Jim Wiener
Ken Lubinski	USGS, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin	2012	44th	Susan Romano
Neal Mundahl	Winona State University	2016	48th	Susan Romano
Michael Vanderfort	U.S. Fish & Wildlife Service	2018	50th	Pamela Thiel
Jennifer Sauer	Upper Midwest Environmental Science Center	2023	54th	Jeff Houser

PLATFORM PRESENTATION ABSTRACTS

IN ORDER OF PRESENTATION

(*Student Presenter)

USING DENDROCHRONOLOGY TO UNDERSTAND AGE DYNAMICS IN UPPER MISSISSIPPI FLOODPLAIN FORESTS. Lydia Voth Rurup1, Marcella Windmuller-Campione1, Matthew Trumper1, Daniel Griffin1, Molly Van Appledorn2, Alan Toczydlowski1, Andrew Meier3, Daniel Nielson1. 1University of Minnesota. 2U.S. Geological Survey. 3U.S. Army Corps of Engineers.

Floodplain forests in the Midwest provide crucial ecosystem services but are understudied. In the face of climate change, altered hydrologic regimes, and tree regeneration failures, a better picture of historical stand development is needed to refine future management recommendations. Thirteen sites were identified along the Upper Mississippi River (UMR) corridor where 500 silver maple (Acer saccharinum) and 450 additional trees of other floodplain species were cored. This sample provides detailed insights into the age and growth dynamics of these species over the last century.

High-resolution digitization and precise crossdating of the silver maple cores reveal that faint and false rings are common, which can lead to inaccurate age estimation in the field. Average silver maple age at most of the sites was between 60-90 years, with high variability within and among sites. Initial analyses uncovered a strong positive relationship between UMR river discharge and annual tree growth; future modeling will build upon this to inform managers about expected flood-forest relationships under a changing climate. Silver maple diameter and age showed only a weak relationship, suggesting that stand development patterns may not always be reflected by the visual forest structure. These preliminary results highlight assumptions about forest age and succession that managers should consider carefully when managing floodplain forest ecosystems.

EXTREME EVENTS DRIVE FLOODPLAIN FOREST GROWTH SYNCHRONY ALONG THE UPPER MISSISSIPPI RIVER. *Daniel Griffin1,2, Matthew Trumper1, Daniel Crawford1, Andrew Meier3, Daniel Nielsen4, Lydia Voth Rurup4, Marcella Windmuller-Campione4 and Molly Van Appledorn5. 1Department of Geography, Environment & Society, University of Minnesota. 2Saint Anthony Falls Laboratory, University of Minnesota. 3U.S. Army Corps of Engineers, La Crescent, Minnesota. 4Department of Forest Resources, University of Minnesota. 5U.S. Geological Survey, Upper Midwest Environmental Sciences Center.

The resilience of floodplain forests and their ecosystem services will be critical for climate change adaptation. Along the Upper Mississippi River (UMR), floodplain forests may continue to face changes in surface hydrology, with an increasingly variable discharge regime. Through collaboration among resource practitioners and scientists, we are working to co-produce new datasets and modeling to explore forest growth dynamics and ecosystem coupling to variability in hydroclimate. Here, we summarize the development and first order results from a dense network of tree-ring core samples collected from along the UMR floodplain between Saint Paul and Dubuque. Meticulous methods in dendrochronology, which are critical for accurate and precise dating and interpretation, were leveraged to crossdate and measure rings in over 1,800 tree cores from 108 plots at 13 sites. Preliminary analyses indicate a surprisingly strong degree of coherence in tree growth, within and among sites, which has

been increasing since the early 1970s. A first order comparison of the observed UMR discharge at Winona and the mean Acer saccharinum tree-ring data indicates a remarkably strong positive relationship that has strengthened over time (R2 = 0.19 for 1929–1973; R2 = 0.65 for 1974–2018). These results, statistically and practically significant, provide novel insight on the tight coupling between UMR hydrology and floodplain ecosystem dynamics, and are expected to inform future analyses of historical stand development. These relationships appear to be strengthening and also appear to be strongest during extreme event years, when tree growth was most synchronized. Our findings highlight questions about the stand dynamics, disturbance processes, and other biogeophysical mechanisms modulating tree growth in floodplain forests. When integrated into forward models of floodplain inundation and forest stand dynamics, our data and insights may inform adaptive management treatments intended to increase forest and ecosystem resilience to a changing climate.

QUANTIFYING FLOODPLAIN FOREST COMMUNITY CHANGE FOLLOWING LARGE-SCALE FLOOD EVENTS IN THE UPPER MISSISSIPPI RIVER SYSTEM.

Shelby A. Weiss1, Lyle J. Guyon1, Nathan R. De Jager2, Robert J. Cosgriff3, Molly Van Appledorn2. 1National Great Rivers Research and Education Center, 2U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 3U.S. Army Corps of Engineers

Impacts of large-scale flooding on floodplain forest communities are a function of flood duration, depth, and timing and influence forest community composition and structure. Throughout much of the Upper Mississippi River System (UMRS), floods in 1993 and 2019 were record-setting events and were followed by high rates of tree mortality. These events generated interest in better understanding how floodplain forest communities tolerate flooding and are subsequently shaped by large-scale floods. We investigated how the two floods differed spatially in the UMRS, associated patterns of tree mortality, and how floodplain forest communities have changed since 1993. Forest surveys were conducted in eight reaches of the Upper Mississippi and Illinois Rivers (pools 4, 8, 13, 17, 22, 26, La Grange reach, and Open River) in a 1995 study, documenting vegetation species composition, size and abundance. In 2021, 39-45 sites from each reach were resurveyed to quantify 2019 flood impacts. For each site, we extracted daily inundation data for the flood years and preceding decades from a surface water inundation model. Sites following similar trajectories in composition and structure were identified using a community trajectories analysis framework. Cumulative abundance profiles of species at each site were constructed and their location in multivariate space pre- and post-floods analyzed to assess community change through time. We found post-flood mortality varied spatially, reflecting inundation patterns; lower latitude reaches (pools 22, 26, Open River and La Grange reaches) experienced longer periods of inundation and greater percent tree mortality in 1993 than 2019, while higher latitude reaches experienced similar inundation duration and depth and comparable mortality between the two years. Decadal inundation attributes also differed; from 2009-2018, inundation duration was greater, and events occurred later than 1983-1992 in all reaches. Among forest trajectories, most were Acer saccharinum-dominated and changed relatively little in species composition and structure through time. The greatest change in composition occurred at sites with high 1993 flood mortality in more flood-prone locations or with smaller diameter individuals. In sites dominated by either Quercus spp. or Populus deltoides, species importance shifted toward more shade and flood-tolerant species after 1995 surveys, indicating ongoing flood regime shifts may be precluding regeneration of some once-dominant species. Overall, impacts on floodplain forests from large-scale flooding in the UMRS were heterogenous; forests underwent change post-flood at different rates, in some cases likely just as influenced by shifts in the flood regime over time as they were from singular flood events.

ATTRIBUTES OF FOREST LOSS ALONG THE UPPER MISSISSIPPI RIVER FROM 2010 TO 2020.

Nathan R. De Jager1 and Jason J. Rohweder1
1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI 54603

The loss of floodplain forest cover along the Upper Mississippi River (UMR) is a major concern among resource managers interested in maintaining critical bird habitat along one of North America's most important migratory routes, and for those who want to sustain the role forests play in nutrient and carbon sequestration and improving river water quality. Previous studies have documented a net decline in forest cover over most of the UMR since 1989, but in 2019, significant tree mortality was observed following a large magnitude flood, further increasing the rate of forest loss. We mapped areas of forest loss between 2010 and 2020 for select navigation pools of the UMR, using available land cover data (Pools 3, 4, 7, 8, 9, 10, 11, 12, 13 at the time of this writing) by overlaying the 2020 data set on the 2010 data set. Gross estimates of forest loss ranged from 478 ha in Pool 4 (10% of 2010 forest area) to as much as 1800 ha in Pool 13 (32%). Forest loss polygons were generally small, with 45% of the total forest loss area occurring in polygons less than 1 ha in size. The floodplain forest class (silver maple dominated) accounted for 81% of the forest that was lost, with Salix communities accounting for another 10%. Most of the forest that was lost had dense canopy coverage in 2010, with 50% of the forest loss area having greater than 90% forest canopy cover and another 35% having between 66% and 90% canopy cover in 2010. Formerly forested areas were mostly occupied by marsh communities (53% of the total forest loss area), open water (24%), and sand/mud (14%) in 2020. The historical flooding regime (1972-2011) in forest loss areas can possibly explain why forest was lost in certain areas and provide insights into the likelihood of future forest regeneration. The majority (68%) of forest loss areas had average growing season flood durations less than 55 days per growing season, with the remaining 32% of forest loss areas being situated in areas that flooded for longer than 55 days per growing season. As more data become available, we intend to update these numbers so that resource managers have quantitative estimates of the forest attributes that were lost from the ecosystem between 2010 and 2020 and so that they can begin to plan forest restoration actions in areas where they are most likely to succeed.

HABITAT PREFERENCES OF BIRDS USING THE FLOODPLAIN FORESTS OF THE UPPER MISSISSIPPI RIVER.

Dale Gentry1, Tara Hohman1, Nicole Michel1. 1Audubon Upper Mississippi River

Floodplain forests of the Upper Mississippi River provide critical habitat for a diverse avian community. Yet dozens of bird species that use these forests are listed as priority species and/or Species of Greatest Conservation Need by state and national agencies including Red-headed Woodpecker, Cerulean Warbler, and Prothonotary Warbler. Partners in Flight, the U.S. Fish and Wildlife Service, and state agencies all identified the need to define habitat preferences needed to develop best management practices that conserve floodplain forest birds throughout their full annual cycle. In the summers of 2021-23 we conducted a total of 256 10-minute unlimited distance point counts between five different study sites in Minnesota in the Upper Mississippi River National Wildlife and Fish Refuge. We identified 69 bird species and, for species with an adequate sample size, calculated floodplain forest bird densities and bird-habitat relationship models. We also developed an Upper Mississippi River floodplain forest bird spatial prioritization to identify areas important for conservation and management. This identified the driftless region of Minnesota, Iowa, and Wisconsin as especially important to the conservation of floodplain forest birds of the Upper Mississippi River.

INVASIVE CARP ON THE MOVE: DECIPHERING LONGITUDINAL MOVEMENT PATTERNS IN THE UPPER MISSISSIPPI RIVER. *Douglas Appel1, Yu-Chun Kao2, Mark Fritts2, Andrea Fritts1. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI. 2U.S. Fish and Wildlife Service, Onalaska, WI.

In the Upper Mississippi River (UMR), acoustic telemetry has been a valuable tool used to better understand the bigheaded carp invasion. Using this tracking technology, the upstream progression of these invasive fishes has been recorded over time, but the movement patterns are not consistent among individuals within this fish group. Some individuals travel great distances, while others remain relatively immobile. There is also some association with seasonality, where there are periods of rapid migration and periods of relative stasis. It has become necessary to investigate these bigheaded carp movements further to better understand which biological differences or environmental variables might be influencing these observed movement disparities. We used 9 years of telemetry data (2014-2022) for 900 tagged bigheaded carps, and the R package riverdist to produce monthly homeranges for each individual. We then used a regression-modeling approach, with data on water level, water temperature, and fish biology metrics, to describe their homerange differences. The results show that some fish have much larger homeranges than others, with most of the differences attributable to individual variations. Notably, a significant relationship between homerange and fish total length was identified. Clear effects of seasonality and water level on bigheaded carp movement were also described, and the influence of a major dam on the UMR was recognized as a major factor affecting the homerange of these fishes. Our results can help managers identify times of predicted movement and thus identify periods when deterrents might have more influence on preventing the further spread of these invasive bigheaded carps.

BIGHEADED CARP USE AND MOVEMENT PATTERNS BETWEEN TRIBUTARIES AND BACKWATERS IN POOLS 17-19 OF THE UPPER MISSISSIPPI RIVER. Amanda Milde1, Mark Fritts2, Dan Gibson-Reinemer1, Douglas Appel1, Jon Vallazza1, Kyle Mosel1, William Budnick1, William Lamoreux1, Andrea Fritts1. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center. 2U.S. Fish and Wildlife Service, La Crosse Conservation Office.

Silver Carp and Bighead Carp (collectively referred to as bigheaded carps) have expanded their range throughout the Mississippi River basin since their introduction in the 1970s. These species are known to have deleterious effects on the native ecosystems they invade. In the upper Mississippi River (UMR), Lock and Dam 19 (LD19) has been a bottleneck for upstream expansion and therefore has slowed the establishment of bigheaded carp populations upstream of LD19. In recent years, new evidence of bigheaded carp spawning and recruitment upstream of LD19 (Pools 16-19) has suggested that bigheaded carp in the UMR exhibit protracted spawning, which can influence patterns of fish dispersal. To gain insight into bigheaded carp behavior in the UMR and to inform management strategies, it is important to examine bigheaded carp movement patterns and use of tributary and backwater habitats during spawning seasons. We used acoustic telemetry data from UMR Pools 17-19 from 2015 to 2019 to 1) characterize bigheaded carp presence and use of two UMR tributaries: Iowa River – Pool 18, Skunk River – Pool 19, and 2) examine movement patterns between these tributaries and backwater habitats. We explore the fidelity of tagged bigheaded carps to specific tributaries and backwaters and characterize recurring patterns of movement between tributaries and backwaters. Results from this study will increase our knowledge of the frequency and timing of bigheaded carp presence in habitats

that may be conducive for spawning in the UMR and improve current management strategies at the UMR invasion front.

MODELING WATERSHED BOUNDARY CONNECTIVITY TO MITIGATE THE SPREAD OF INVASIVE CARP.

Peter J. Pfaff1, David P. Coulter2, Benjamin J. Schall3, Tanner Davis3, Steven R. Chipps4, Alison A. Coulter2. 1Saint Mary's University of Minnesota Department of Biology. 2South Dakota State University Natural Resource Management. 3South Dakota Game, Fish & Parks. 4South Dakota Cooperative Fish and Wildlife Research Unit

Invasive carp have spread throughout much of the Missouri River Basin since their introduction. Due to the difficulty in eradicating established populations, mitigating the continued spread of invasive carp is a high priority throughout the basin to preserve the ecosystem integrity of uninvaded habitats. Certain dams and even watershed boundaries may be impassable for aquatic species during typical conditions. However, during periods of intense rainfall and high water levels, these areas may become passable for a time, potentially allowing the spread of invasive species between basins or past dams. The goal of this project was to develop a broad-scale risk metric using readily available geospatial data that can be used to identify areas of hydrologic connectivity along watershed boundaries that could facilitate the spread of invasive carp during flooding events in the eastern Dakotas. First, we developed an index using metrics of elevation, waterbody size, stream size, and geology at regular points along the watershed boundary and within adjacent HUC12 (hydrologic unit code) watersheds. We then used generalized linear mixed-effects models to test the performance of each index component using Dynamic Surface Water Extent data in conjunction with flooding events. We found that the presence of water on the watershed boundary could be predicted as an interaction between watershed boundary point elevation relative to the minimum adjacent HUC12 elevations, and watershed boundary point elevation relative to the neighboring point elevations. The locations identified within this analysis will be used in subsequent hydrologic models to develop individual management recommendations for high-risk areas to prevent the spread of invasive carp in the eastern Dakotas.

AGGREGATION FOR ERADICATION: AN EXPLORATORY GRASS CARP MANAGEMENT STRATEGY IN THE UPPER MISSISSIPPI RIVER.

*Max F. Monfort1,2, James J. Wamboldt2, Matthew R. Acre3, David A. Schumann1, 1University of Wisconsin-La Crosse, Biology Department and River Studies Center. 2U.S. Geological Survey, Upper Midwest Environmental Science Center. 3U.S. Geological Survey, Columbia Environmental Research Center.

Grass Carps *Ctenopharyngodon idella* can alter trophic dynamics via excessive aquatic macrophyte consumption when introduced to new areas. Increased commercial captures of Grass Carp in the Upper Mississippi River (UMR) and Great Lakes Basins paired with their ability to evade traditional fisheries gears represent a substantial challenge for management. An attractant and bait specific for Grass Carp has been evaluated in some invaded systems (e.g., Lake Erie), but their potential application in the UMR has not yet been fully recognized. We aim to refine methodology from previous studies and describe the ability of automated bait delivery systems to alter the Grass Carp behavior and aggregate them in pool 19 of the UMR. Specifically, our objectives are to: (1) describe Grass Carp movement ecology within the riverscape before, during, and after bait application, and (2) determine Grass Carp movement responses to feeding; use of the feeding area, time occupied at feeding area, and the attraction distance from the feeding area. Grass Carp behavior will be evaluated in response to the deployment of a Grass Carp-specific bait (n = 93) using acoustic telemetry arrays deployed at four locations in pool 19 during 2024 (March-November) If successful, these methods could provide an exploratory, yet innovative, Grass Carp management strategy for more efficient removals within the UMR and other invasion fronts.

HARMFUL ALGAL BLOOMS IN IOWA: A MULTIFACETED APPROACH TO UNDERSTANDING AND MITIGATING RISKS.

Lyndy M. Holdt1. 1Iowa Lakeside Laboratory, University of Iowa

This research aimed to assess the understanding of HABs, the perception of risk, current communication systems, and responses to a bloom event by both the public and officials in Iowa. A survey was disseminated and an exposure assessment was conducted to reach these aims. It was hypothesized that there were gaps in both the public's perception of risk and in toxin testing: the presence of other algal toxins that are not being routinely monitored, underreporting of results, and communication inconsistencies.

The results of the survey indicated moderate recognition and understanding of HABs, but a gap in perception of potential adverse health effects. The survey was able to reach a wide audience of highly educated recreators, concentrated in urban centers of Iowa. Recreators expressed frequent visitation to non-state parks, that are not routinely monitored. Many respondents indicated concern for Iowa's water quality. Results from the information section were consistent with other surveys done in Iowa, people use the DNR website and social media primarily. The results suggest that communicating information through multiple channels could enhance the understanding of and perception of risk surrounding HABs. The exposure assessment demonstrated the variability of toxin concentration that is present in Iowa's lakes. The saxitoxin results were negligible, two samples were over the anatoxin-a advisory level of 1 µg/L, and four samples were over the microcystin advisory level. Most were well under the advisory level, but the samples that were over revealed astonishingly high concentrations. The presence of a neurotoxin in high concentrations suggests a need for expansion of monitoring efforts. Overall, this study points to public concern for a growing environmental health issue, a concern that is evidenced by the results of toxin testing, as well as the identification of areas to improve risk communication and management in the state of Iowa.

PHYTOPLANKTON ASSEMBLAGE DYNAMICS IN RELATION TO ENVIRONMENTAL CONDITIONS IN A RIVERINE LAKE.

Rob Burdis1, Nicole Ward1, John Manier2. 1Minnesota Department of Natural Resources, Lake City Field Station. 2U.S. Geological Survey, Upper Midwest Environmental Sciences Center

Understanding drivers of phytoplankton assemblage structure is essential given the ecological, aesthetic, and health consequences that vary among taxonomic groups. In this study, we examined phytoplankton assemblage structure over a three-year period in Lake Pepin, a natural riverine lake on the Upper Mississippi River. Phytoplankton samples along with a suite of limnological variables were collected from April to October, at 4 sites along a longitudinal gradient of the lake spanning 35 kilometers. To investigate potential relationships, mechanisms, and drivers between environmental conditions and phytoplankton assemblage structure a distance-based linear model was utilized. We found over 100 phytoplankton taxa and assemblage structure varied between years, months, and sites. 32.6% of the total variation in phytoplankton assemblages was explained by a combination of chemical, hydrological, and physical variables. Additionally, we noted a one-year absence of the common diatom, Stephanodiscus hantzschii, that may have been related to an unusual spring of warm water temperature and very low soluble reactive phosphorus concentrations that suggests a possible nutrient limitation for this species in a large river system. Insights into the relationships between environmental conditions and individual and co-occurring species of phytoplankton should aid in developing a greater predictability of

assemblages and may enable large river scientists and managers to better anticipate and address water quality conditions under changing climate and hydrologic regimes.

METABOLIC RATES ACROSS VARIABLE ENVIRONMENTAL CHARACTERISTICS IN THE UPPER MISSISSIPPI RIVER.

Patrick T. Kelly1. 1Wisconsin Department of Natural Resources, Office of Great Waters

Estimates of ecosystem metabolism provide valuable insight into the availability of resources for higher-level consumer as well as the flux of carbon (C) into and out of a system. Gross primary production (GPP) is the product of C fixation by primary producers and serves a role both as basal resources to support the food web as well as potential sequestration of CO2. In contrast, ecosystem respiration (ER) represents the processing of C within the system by both autotrophs and heterotrophs as well as a source of CO2 to the atmosphere. Relative comparisons of GPP and ER (i.e. net ecosystem production or NEP) provide important context into energy flux within the system, as well as information on food web dynamics and environmental change. These rates can be highly variable in space and time and are often influenced by environmental characteristics. In rivers, these characteristics may be the delivery of sediment and nutrients from the landscape, the growth of submerged or emergent vegetation, water temperatures, and/or velocity. The Upper Mississippi River (UMR) system is a unique environment with significant habitat heterogeneity that is likely to influence ecosystem metabolism. We use established datasets of high frequency dissolved oxygen to estimate GPP and ER within the UMR to better understand the impact of environmental variability on C cycling in the river. We observe highly variable rates in areas with higher residence times and abundant vegetation relative to the main channel. We also observe high rates of respiration within backwaters and restored areas, suggesting the potential for reductions in oxygen availability. Additionally, we observe net negative NEP suggesting a source of C to the atmosphere despite high primary production in these areas. These estimates are important in understanding spatial variability in C cycling rates within a larger river system, as well as the role of the UMR in regional C cycling.

PREVALENCE OF MICROPLASTIC PARTICLES IDENTIFIED IN GIZZARD SHAD *DOROSOMA CEPEDIANUM* IN THE UPPER MISSISSIPPI RIVER SYSTEM.

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In 2019, microplastics were listed as one of the top 12 emerging threats to freshwater biodiversity. Microplastics are in the size range of 0.3-5.0 mm, allowing them to integrate into tissues once ingested. The consumption of microplastics by native fishes has been documented in several river systems, suggesting the same threat exists in the Upper Mississippi River System (UMRS). There is a need to establish a baseline dataset of microplastic abundance and patterns in the UMRS to determine the effect microplastics have on this unique ecosystem. To create this baseline, the gut contents of 150 Gizzard Shad Dorosoma cepedianum from the six Long Term Resource Monitoring Program's study reaches, Pool 4, Pool 8, Pool 13, Pool 26, Open River, and the Illinois River at LaGrange, were analyzed for the presence of microplastics. Fish were collected in 2018 and 2019 via electrofishing across three habitat strata: main channel, side channel, and backwater. For analysis, the digestive tract was removed from the fish and underwent KOH digestion. The remaining sample was filtered and visually analyzed for microplastics under a dissecting microscope. To confirm the presence of microplastics, Raman

spectroscopy was used to identify plastic polymers. Preliminary results indicate fibers being the majority of plastics consumed by fish and the abundance of microplastics per Gizzard Shad currently ranges from 0-38 particles/fish (mean = 9 particles/fish). These levels are consistent with other studies examining microplastics in riverine fish. Regression analysis comparing microplastic abundance in fish to water quality data, habitat strata, and fish body length and body mass will be used to establish predictive relationships. Potential longitudinal patterns and implications about the effects of varying landuse practices within the UMRS on fish gut microplastic content could also be uncovered. This amount of previously unavailable data on Gizzard Shad will be used to suggest different maintenance protocols and influence the development of new projects that are implemented along the UMRS.

RECENT ADVANCES IN THE EVALUATION OF FRESHWATER MUSSEL HEALTH.

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Since 2017, our group has utilized an epidemiological approach to compare healthy and moribund mussels from various river systems across the United States. To date, we have identified more than 600 novel viruses (some statistically correlated with disease), two bacterial genera associated with moribund mussels, novel gonadotropic microsporidian parasites, and identified metabolic markers correlated with health status designations made in the field. We are currently conducting in vivo trials and utilizing techniques that use chromogenic labeling of histological sections to further evaluate whether these microbes are indeed pathogenic. An overview of these mussel mortality events, the sampling techniques used, results, and planned future investigations will be discussed.

BOATER COMPLIANCE WITH THE LAKE ONALASKA VOLUNTARY WATERFOWL AVOIDANCE AREA.

Michael J. Wellik1, Luke J. Fara1, Steven C. Houdek1, William S. Beatty1, Brian R. Gray1, Kevin P. Kenow1, Tim Miller2. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. 2U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge, Onalaska, Wisconsin

Large numbers of waterfowl migrate during fall along the Mississippi River, stopping along the way to rest, forage, and build energy reserves. Disturbances during this critical time may impact migrating waterfowl, with increased energetic costs of flight and avoidance of preferred habitat. To mitigate potential disturbances, the Lake Onalaska Voluntary Waterfowl Avoidance Area (VWAA) was established by the Upper Mississippi National Wildlife and Fish Refuge within the closed no hunting area of Lower Navigation Pool 7. The VWAA was established in 1986 and is a 3,356-acre area intended to reduce boating disturbance to migrating waterfowl during peak migration. Along with public outreach, the VWAA is delineated by buoys from October 15 to mid-November to encourage boaters to avoid the area. To assess boater compliance, the VWAA was monitored in 1986-88, 1993, 1997, 2004, 2010-11, 2016, 2019-21 and 2023. Information about waterfowl distribution, boat movement, boat intrusions into the VWWA, and waterfowl disturbances from boats were documented. Waterfowl were heavily concentrated within the VWWA relative to the closed hunting area and the larger lower Pool 7 impoundment. Over the years the diversity and number of boating events have increased, along with overall waterfowl disturbances and intrusions into the VWWA. Some of these disturbances dispersed birds out of the VWAA to other pools along the river. Here, we provide preliminary results and other findings from monitoring efforts conducted from 1986 - 2023.

THE IMPORTANCE OF THE UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE TO TUNDRA SWANS.

Stephen L. Winter, U.S. Fish and Wildlife Service

Tundra swans were recorded in relatively low numbers on the Upper Mississippi River National Wildlife and Fish Refuge (refuge) in the mid-1900s but their numbers increased substantially in the 1980s and 1990s, when thousands were observed each year during fall migration. From 1997 to 2012, aerial surveys utilizing strip transects over Pools 4-14 of the refuge recorded peak swan counts in the tens of thousands each fall; the total number of swans present on the refuge during each of the survey years would have been even greater because aerial surveys only recorded a subset of all swans present.

Tundra swans continue to be abundant on the refuge, and the refuge is known to be an important spring and fall staging area for the eastern population of tundra swans. This presentation will demonstrate the great importance of the refuge to tundra swans by highlighting published research data from range-wide telemetry studies, as well as historic (1997–2012) and recent (2017–2019) aerial survey data.

WHAT IT REALLY TAKES TO SET THE MISSISSIPPI SPEED RECORD.

Judson Steinback, Coulee Region Ecoscapes and Mississippi Speed Record
https://www.mississippispeedrecord.com/

Judson Steinback is part of a canoe team of five that set the Guinness World Record for the fastest canoe trip down the Mississippi River. He will discuss how they did it, share stories from along the river, and discuss what it really takes to set a World Record. Steinback spends hundreds of hours annually training on the Upper Mississippi River and its tributaries near his hometown of La Crosse, WI and has competed in and won numerous paddling races throughout the Midwest. Judson is currently the Master's Class Men's and Mixed USCA C-2 National Champion. He has competed in International Professional Canoe Races, placing 14th in the Ruta Maya Belize River Challenge with Mississippi Speed Record teammate Joe Mann and 29th (1st in the Rookie Class) in the AuSable River Canoe Marathon.

CHANGES IN MACROINVERTEBRATE COMMUNITY COMPOSITION AND DIVERSITY ACROSS SIDE CHANNELS OF THE UPPER MISSISSIPPI RIVER SYSTEM.

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The Mississippi River is inherently diverse in habitat types and the biological communities it supports. Adjacent to the highly modified main channel, side channels of the Upper Mississippi River System (UMRS) may provide more favorable and heterogeneous habitats for organisms such as macroinvertebrates. However, few studies have quantified their biological communities and explored differences among side channels, particularly across large geographical scales, leaving their biodiversity value and function unknown. Our objective was to quantify aquatic macroinvertebrate community composition within side channels (n = 23) of six study reaches (Pools 4, 8, 13, La Grange, 26, and the Open River reach) in the UMRS along a 2000 river km longitudinal gradient. We tested for longitudinal patterns in taxonomic and functional diversity and community composition. Macroinvertebrates were collected using rock baskets and Hester-Dendy samplers following a 30-day colonization period (n = 134 samples) and a total of 76,448 were identified to genus. Macroinvertebrate abundance ranged from 50

– 38,400 individuals/m^2 across side channels but there were no longitudinal trends in abundance among reaches. We found longitudinal trends for both taxonomic richness and composition, in which richness decreased and percentage of Ephemeroptera, Plecoptera and Trichoptera increased from upstream to downstream. Our results suggest that side channels may be more important habitat for certain taxa, such as EPT, in downstream reaches of the UMRS where off-main channel habitats are less abundant. We also compared the relative effectiveness of our two sampling methods. Rock basket and Hester-Dendy samplers produced similar abundance measures, while rock baskets produced greater taxonomic richness. However, both methods sampled unique taxa, indicating the need for multiple sampling methods to fully capture the diversity of the UMRS. Throughout the UMRS, side channels appear to support diverse macroinvertebrate communities suggesting this habitat type contributes importantly to overall macroinvertebrate biodiversity.

SPECTACLECASE HOST FISH, HIODON SPP., MOVEMENT PATTERNS IN THE ST. CROIX NATIONAL SCENIC RIVERWAY.

Matthew Meulemans1, Michelle Bartsch1, Diane Waller1, Bernard Sietman2, Zeb Secrist2, Joel Strias3, & Marian Shaffer4. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI; 2Minnesota Department of Natural Resources, Center for Aquatic Mollusk Programs, Lake City, MN; 3Minnesota Department of Natural Resources, St. Paul MN; 4National Park Service, St. Croix National Scenic Riverway, St. Croix Falls, WI.

The St. Croix National Scenic Riverway (SACN) harbors populations of unionid mussels declining elsewhere in the United States. Currently, five federally listed mussel species reside in the SACN, including the Spectaclecase (Cumberlandia monodonta). Spectaclecase were endemic to 44 streams in the Mississippi, Ohio, and Missouri River basins, but now scarcely inhabit only 20 streams. The St. Croix River still support adequate recruitment, making it one of the few strongholds of these endangered mussels remaining. Spectaclecase have a complex reproductive cycle including an obligate parasitic larval stage (glochidia) on specific fish hosts. In 2017, Goldeye (Hiodon alosoides) and Mooneye (H. tergisus) were identified as suitable hosts. Sustained recovery of Spectaclecase populations in the SACN depends on co-occurring Hiodon populations during the mussel's larval release. This study aims to determine movement patterns of Hiodon in the SACN to better understand their range, seasonal behavior, spawning site fidelity, and co-occurrence with Spectaclecase. To our knowledge, Hiodon spp. have never been tracked with acoustic transmitters. We implanted Vemco V8 (8mm Ø, 2.0 g) transmitters in wild caught Mooneye (n=15) from the SACN. Tagged Mooneye were held 3 days in situ before release to ensure retention of tags. In year two, we tagged and released 26 Mooneye and are currently tracking them using an existing network of Vemco receivers deployed in stretches of the SACN and Mississippi River. Telemetry data found mooneye moved through the lower undammed portion of the SACN downstream to Pool 4 in the Mississippi River and back upstream into tributaries of the Mississippi River. Some of these fish moved up to 80 river miles, suggesting they are highly mobile. This evidence of large-scale migrations suggests that movement and habitat preferences of Mooneye may be important factors to consider when 1) identifying suitable reintroduction sites for Spectaclecase, 2) searching for unknown Spectaclecase populations in the SACN and UMR, and 3) explaining the documented genetic diversity within Spectaclecase populations nationwide.

CHARACTERIZING THE NICHE OF REED CANARYGRASS IN FLOODPLAIN FORESTS OF THE UPPER MISSISSIPPI RIVER.

John T. Delaney,1 Molly Van Appledorn1, Nathan R. De Jager1, Kristen L. Bouska1, Jason J. Rohweder1. 1United States Geological Survey, Upper Midwest Environmental Sciences Center.

Reed canarygrass (*Phalaris arundinacea* L.) is one of the most common invaders of floodplains in North America. In the Upper Mississippi River floodplain, invasion by reed canarygrass in forest understories can inhibit forest regeneration when gaps in the overstory form. Understanding the optimal conditions for reed canarygrass is important for management and to develop models to project potential changes in distribution. We used a niche modeling approach to analyze the patterns of species distributions along gradients of influential environmental variables. Observations of reed canarygrass presence were used to construct a generalized additive model with predictor variables consisting of overstory cover, forest stress (estimated by relative standing dead trees per acre) tree species richness, distance to invaded wet meadows, distance to forest edge, island isolation, along with recent estimates of inundation depth, frequency, and duration. Many ecological datasets may have incomplete coverage across the environmental gradients, infrequent sampling in some conditions, insufficient time for an invasive species to occupy all sites, and complex interactions among environmental variables (measured or unmeasured) that may result in species response curves that are difficult to interpret and may be ecologically misleading. To ensure the model and species response curves aligned with ecological niche theory, shape constraints were imposed to guarantee relationships are monotonic and concave to reflect the fundamental niche (where a species could occur). We compared a shape constrained to an unconstrained model and interpret the species response curves from the constrained model to better characterize the ecological niche of reed canarygrass in floodplain forest of the Upper Mississippi River. There were not large differences in performance between the constrained and unconstrained models. We found the probability of reed canarygrass decreases with increasing tree canopy cover, tree species richness, distance from forest edge, distance from invaded wet meadows, and island isolation. The hydrology (inundation depth, frequency, and duration) and forest stress metrics exhibited bell-shaped curves indicating an optimum with less favorable conditions on either end of the ecological gradients. This information could be used to prioritize restoration efforts and enhance landcover change research across the floodplain of the UMRS.

EVALUATION OF AN UNDERWATER CAMERA METHOD TO SAMPLE FRESHWATER FISH ASSEMBLAGES UNDER THE ICE.

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Ice cover has long restricted our understanding of the habitat use patterns of fishes in temperate aquatic ecosystems by preventing the use of conventional sampling methods. Standardized underwater camera surveys are not frequently applied in freshwater environments; however, technological advancements may now permit the use of this gear in freshwater systems especially during winter – when water clarity is generally highest. Using methods developed for shallow marine ecosystems, where underwater camera surveys have been utilized for decades, we described the suitability of camera sampling for fish assemblages in two backwaters on the Upper Mississippi River (i.e., Stoddard Island Complex and Lawrence Lake). To assess the effectiveness of the gear in various environments, viewing radius (cm), vegetation cover indices, sky cover, ice depth (cm), and water depth (cm) were measured at randomly selected sampling points throughout each lake (n = 42 per lake). Each lake was stratified into three longitudinal regions, and further stratified into deep (depth > 1 m) and shallow sites (depth < 1 m). Species-specific relative abundances were estimated using the maximum number of individuals present in a single frame of the 10 – minute recording (i.e., MaxN). Using AICc model selection techniques the top performing model to estimate viewing radius (mean: 128.6 ± 3.1 [SE]) included only visual secchi (AIC wt = 0.3); although substantial support for three additional models was apparent: visual secchi + sky cover, visual secchi + ice depth, and visual secchi + vegetation cover (ΔAICc < 2).

Visual secchi (Σw = 0.99), sky cover (Σw = 0.35), ice depth (Σw = 0.32), and vegetation score (Σw = 0.28) all showed a positive direction of effect with respect to viewing radius. These results suggest that turbidity is the major influencing factor on viewing radius; while sky cover, ice depth, and vegetation density may also influence viewing radius. The most abundant species across all sampling points (n = 84) was Bluegill (Lepomis machrochirus) (MaxN mean: 2.55 ± 0.47 [SE]); while four other species were also identified during this study: Yellow Perch (Perca flavescens) (MaxN mean: 0.61 ± 0.15 [SE]), Largemouth Bass (Micropterus salmoides) (MaxN mean: 0.49 ± 0.10 [SE]), Black Crappie (Poxomis nigromaculatus) (MaxN mean: 0.05 ± 0.02 [SE]), and Bowfin (Amia calva) (MaxN mean: 0.01 ± 0.01 [SE]). The results from this study provide evidence to suggest that the underwater camera viewing radius varies based on environmental conditions, but additional analyses must be conducted to assess whether the variation in viewing radius impact the suitability of the underwater camera sampling method in freshwater.

EVALUATION OF THE LOCA-VIC-MIZUROUTE HYDROLOGY DATA PRODUCTS FOR SCIENTIFIC AND MANAGEMENT APPLICATIONS IN THE UPPER MISSISSIPPI AND ILLINOIS RIVERS.

Molly Van Appledorn1, Lucie Sawyer2, Leigh Youngblood3, Jane Harrell4, John Delaney1, Chanel Mueller5, Brian Breaker6, and Chris Frans7 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center, 2U.S. Army Corps of Engineers, Rock Island District, 3U.S. Army Corps of Engineers, St. Paul District, 4U.S. Army Corps of Engineers, Seattle District, 5U.S Army Corps of Engineers, Headquarters, 6U.S. Army Corps of Engineers, Little Rock District, 7U.S. Bureau of Reclamation.

The hydrology of the Upper Mississippi River System (UMRS) is a fundamental driver of ecosystem patterns and processes. Quantitative hydrologic data for the mainstem of the Upper Mississippi and Illinois Rivers underlies numerous scientific investigations, statistical models, and decision-making processes. Although historical hydrologic data exist, there is a lack of data that could represent potential future conditions of the UMRS, thus limiting the ability to anticipate possible biotic and abiotic responses to altered hydrology and determine resilient management actions. An off-the-shelf set of hydrologic data products, the LOCA-VIC-mizuRoute (LVM) data products, includes simulated discharges for historical and future time frames and is a possible source of future UMRS hydrologic scenarios. The objective of our study was to assess the reliability of the LVM data products for their use in UMRS applications. We asked: 1) do the LVM products reliably simulate observed hydrologic characteristics? 2) are there geographic biases in LVM product performance? We selected eight characteristics of UMRS hydrology related to flow magnitude, seasonality, and regime for evaluation. We calculated the eight characteristics using historical and simulated hydrologic data at nineteen U.S. Geologic Survey streamgages throughout the UMRS basin; four gages were located on the mainstem of the UMRS. Statistical comparisons between historical and simulated characteristics indicated that the LVM products did not reliably represent historical hydrologic conditions in the UMRS basin or mainstem. We observed poor correspondence across all 19 gages suggesting little apparent geographic bias. LVM data products could not reliably capture the overall hydrologic regime or flow magnitudes well, the latter evidenced by substantial underestimates of discharge at most gages. Seasonal hydrologic characteristics were captured more reliably than flow magnitude, but overall correspondence was low for most gages. A weak latitudinal pattern in correspondence for seasonal characteristics suggested the LVM chain of models poorly accounts for snowmelt processes. Discrepancies in magnitude, seasonality, and regime indicate the potential for multiple sources of error, including biases associated with hydrologic model inputs, parameterization, and process fidelity. We conclude that LVM data products appear unsuitable for applications tied to habitat and ecosystem restoration and management in the UMRS. Plans to

develop a future hydrology dataset for the UMRS would benefit from ongoing work to improve climate downscaling methods, regional hydrologic models, machine-learning approaches for projecting hydrology, and other efforts. Our evaluation framework is a transferrable approach that could applied to other data products and river systems.

POSTER PRESENTATION ABSTRACTS IN ORDER OF PRESENTATION

(*Student Presenter)

Poster Session I

"BACKWATER CONNECTIVITY IMPACTS ON SELECTED RIVERINE FISHES ON THE LOWER ILLINOIS RIVER" Tovah Brooks, Olivia Salrin, Kristopher Maxson, Levi Solomon, and James Lamer, Illinois River Biological Station, Illinois Natural History Survey, Prairie Research Institute, University of Illinois

Backwater habitat is an important component of riverine fishes' life history, providing refuge from flow, rearing grounds for young of year fishes, and overwintering habitat. Backwater habitat is especially important for many species of highly desirable recreational (i.e., largemouth bass, bluegill, crappie sp.) and commercial fishes (i.e. buffalo sp.). The lower Illinois River, specifically the La Grange pool, has a variety of fully connected and semi-connected backwater lakes varying in size, depth, number of connections to flowing water, etc. The Long Term Resource Monitoring element of the Upper Mississippi River Restoration Program has sampled fish communities of La Grange pool backwaters with a multi-gear approach from 1993-present day. While backwaters have received quite a bit of study in the past, the differences in fish communities in fully connected vs. semi-connected backwaters has not been fully investigated. As such, the purpose of this study is to investigate the differences in the fish community (catch per unit effort, size structure) of Matanzas Lake (a large semi-connected backwater) compared to Treadway and Lilly lakes (each large and fully connected). Initial analysis suggests Matanzas is a superior habitat for largemouth bass, white crappie, and bigmouth buffalo while producing more than twice the proportion of largemouth bass preferred size and above (15+ inches) compared to Treadway and Lilly lakes. Silver carp are also more common in Matanzas. The overall goal is to utilize routine monitoring data to inform potential future restoration on the lower Illinois River or similar large river habitats.

"USING EDNA AND ACOUSTIC TELEMETRY TO GUIDE SITE SELECTION FOR THE GRASS CARP BAIT AGGREGATION PROJECT" Theresa M. Schreier1, James J. Wamboldt1, Madeline E. Teale1, Max F. Monfort1,2, David Schumann2, and Steve F. Spear1. 1U.S. Geological Survey. Upper Midwest Environmental Sciences Center; 2University of Wisconsin – La Crosse

Invasive Grass Carp (*Ctenopharyngodon idella*) threaten native fish and wildlife populations of the Upper Mississippi River (UMR) by excessively foraging aquatic macrophytes resulting in a disruption of the food

web. Increased captures of Grass Carp in the UMR have elevated the need for control. Scientists are evaluating a Grass Carp bait to attract Grass Carp to target locations where they can be more easily removed. Laboratory research identified a Rapeseed (Brassica napus) based bait as an effective attractant for Grass Carp in behavioral and feeding response studies. The effectiveness of the baiting approach will be evaluated in Pool 19 of the Mississippi River, a location where Grass Carp are known to occur. Confirmation that Grass Carp are present in and around the proposed sites is critical. Two methods of monitoring Grass Carp were used: acoustic telemetry and environmental DNA (eDNA). Acoustic telemetry was used to track fish movement throughout the UMR and eDNA was used to determine site occupancy throughout the season. Sampling results helped confirm presence of Grass Carp in these areas and expanded the testing area to other areas in the river where Grass Carp presence was unknown. An overview of the project will be presented along with Year 1 results tracking the movement and temporal site occupancy of Grass Carp in the study area in Pool 19 of the Mississippi River.

"AGE, GROWTH, RECRUITMENT, AND MORTALITY ESTIMATES OF UPPER MISSISSIPPI RIVER AND ILLINOIS RIVER FISHES" Kristen Bouska1, Hae Kim2, Jim Lamer3, Quinton Phelps2, Levi Solomon3. 1US Geological Survey, Upper Midwest Environmental Sciences Center, 2Missouri State University, 3Illinois Natural History Survey, Illinois River Biological Station

Vital rates (i.e., recruitment, growth, and mortality) are the processes responsible for changes in abundance and biomass of a population through time. Knowledge of vital rates and the factors that contribute to interannual variability in vital rates can provide critical information in determining why fish population abundances increase or decrease across time and space. Between 2018 and 2020, nearly 20,000 individuals of 12 species were collected from five study reaches on the Upper Mississippi River and one study reach on the Illinois River. From these individuals, otoliths were extracted, and ages were estimated. Hierarchical growth models were used to estimate growth model parameters and mean-length-at-age for each species and study reach. Study reach-specific age-length keys were created to assign ages to unaged fish collected during standardized sampling and used to estimate indices of recruitment variability, year-class strength, and annual mortality. Spatial patterns of parameter estimates varied by species. For example, some species had no spatial differences in estimates of mean asymptotic length (L_∞) while other species exhibited latitudinal patterns, and other species likely have local factors driving patterns. Ongoing work aims to synthesize vital rate information with population structure and natal origin information within and among species.

"PARTNER-BASED WINGED MAPLELEAF (QUADRULA FRAGOSA) PROPAGATION EFFORTS" Michelle Bartsch1, Diane Waller1, Steve Houdek1, Theresa Schreier1, Gage Valeri1, Doug Aloisi2, Megan Bradley2, Elizabeth Glidewell2, Mike Davis3, Bernard Sietman3, Madeline Pletta3, Lindsay Ohlman3, Zeb Secrist3, Dan Hornbach4, Mark Hove5, Dan Kelner6, Tamara Smith7, Nick Utrup7, Lisie Kitchel8, Jesse Weinzinger8, Nathan Eckert9, Katie Sickmann10, Lauren Brochtrup10, Marian Shaffer11. 1U.S. Geological Survey, Upper Midwest Environmental Sciences Center (UMESC), La Crosse, WI. 2U.S. Fish and Wildlife Service (USFWS), Genoa National Fish Hatchery (GNGH), Genoa, WI. 3Minnesota Department of Natural Resources, Center for Aquatic Mollusk Programs, Lake City, MN. 4Macalester College, Department of Environmental Studies, St. Paul, MN. 5University of Minnesota Department of Fisheries, Wildlife and Conservation Biology, St. Paul, MN. 6U.S. Army Corps of Engineers, St. Paul District, St. Paul, MN. 7USFWS, Minnesota-Wisconsin Ecological Services Field Office, Bloomington, MN. 8Wisconsin Department of Natural Resources, Madison, WI. 9USFWS, Neosho National

Fish Hatchery, Neosho, MO. 10Wild Rivers Conservancy, Osceola, WI. 11St. Croix National Scenic Riverway, National Park Service, St. Croix Falls, WI

The St. Croix National Scenic Riverway (SACN) in Minnesota and Wisconsin supports the only known self-sustaining population of federally endangered Winged Mapleleaf mussels (WML) (Quadrula fragosa) in the upper Mississippi River Basin. This WML population has high value because it is physically isolated and genetically distinct from southern populations. The life cycle of unionids includes a parasitic larval stage (glochidia) on specific fish hosts. In the SACN, Channel Catfish (CCF) (Ictalurus punctatus) are the only known host for WML. The parasitic stage for WML is assumed to occur from fall, after release of glochidia from the female mussel, through winter until detachment from the fish in spring. Past efforts to hold hatchery-reared CCF that were inoculated with WML glochidia in cages, either in situ or in a hatchery, over winter often resulted in high fish mortality. Post-transformation mortality of juvenile WML has also been high, indicating that propagation methods need further investigation. Over the past three years, USGS and partners have successfully inoculated hatchery-reared CCF during the fall, held the fish overwinter in ponds at the USGS Upper Midwest Environmental Sciences Center, and produced viable juveniles the following spring. These juvenile WML have been held at multiple facilities under various rearing conditions with varying success. As an alternative method for augmenting WML populations, we also artificially inoculated wild-caught CCF in the SACN, surgically implanted them with Lotek® transmitters, and passively tracked the host fish movements within the riverway to identify potential juvenile release locations. The partnership plans to continue working together to develop a successful propagation method for the WML to aid in their recovery efforts.

"REPRESENTATION OF MICROPLASTIC POLLUTION AND ABUNDANCE IN SILVER CARP FROM POOL 26 OF THE UPPER MISSISSIPPI RIVER"

*Kassie Zimmer1, Eric A. Strauss1. 1University of Wisconsin, La Crosse, Department of Biology and the River Studies Center

Pollution is a growing concern among aquatic and terrestrial systems due to the increasing prevalence of plastic in biotic and abiotic factors. Microplastic pollution has shown an increasing accumulation of particles smaller than 5mm in numerous aquatic and terrestrial systems. These particles are often consumed by aquatic species and pose threats to public health, food chain disruption, and loss in biodiversity. Accumulation of microplastics in vertebrate tissues have shown negative health issues including tissue damage, an increase in neurotoxicity, stunted growth, and abnormalities in behavior. Little is known about the ingestion of microplastics by fish species in the Upper Mississippi River. This project studied the abundance and characterization of microplastics found in the invasive filter feeding Silver Carp (Hypophthalmichthys molitrix). All fish analyzed (n=100) were collected via electrofishing in 2019 from Pool 26 located near St. Louis, Missouri. Digestive tracts from each fish were removed and tissues and contents were digested using KOH to break down organic matter. Microplastics were separated from the remaining heavier materials through density separation in a CaCl solution. Microplastics were then isolated on a filter for enumeration. The microplastics were counted and measured via microscopy. Further plastic verification and polymer identification was completed through Fourier Transform Infrared (FTIR) Spectroscopy. In total, 680 microplastic particles were found in the 100 Silver Carp digestive tracts (mean = 6.8 particles/fish) and ranging from 0-60 particles/fish. The size of the microplastic particles ranged in length (or largest dimension) from 250µm-5mm. These results confirm that Silver Carp are consuming microplastics from the river, however the effects of microplastics on Silver Carp are unknown, Regardless, the prevalence of microplastics in fish highlights the importance of reducing plastic pollution and need for monitoring microplastic abundances and consumption in the Upper Mississippi River.

“ANALYSIS OF MICROPLASTICS IN FRESHWATER URBAN WATERSHEDS”

*Briana Reagan1, Brittany L. McCall1, and Michael Reisner1 1Augustana College

Microplastics (MP) are defined as particles <5 mm in diameter and can accumulate in urban water streams, potentially causing harm to the ecosystems they reside in. With microplastics being an ongoing concern for our environment, the impact that they have on organisms needs to also be analyzed. We collected and dissected *Semotilus atromaculatus* (Creek Chub; N = 15), an opportunistic feeder and top predator, from three urbanized tributaries in the Duck Creek watershed in Davenport, IA. Specimens were weighed, measured for standard length, and assessed for MP presence and abundance in their gills, gut, and muscle. Triplicate water and sediment samples were taken from the same sites to assess for the presence and abundance of MPs. Preliminarily, a total of 5274 MPs were collected from the Duck Creek watershed (average ± SD; 1758 ± 192/tributary). A total of 7535 MPs were extracted from S. atromaculatus specimens (2512 ± 116/tributary). There was a significant difference in the abundance of MP among fish samples (F 2 = 1.18, p = 0.04 ANOVA) with Goose Creek consistently having the lowest MP abundance. There was no significant difference in where MP accumulated in S. atromaculatus. More samples are still needed and identifying the potential accumulation of MP within tissues and water systems will help create a better understanding of MPs role within freshwater systems and the potential hazards they can create within ecosystems. It is also important to acknowledge how MPs can impact freshwater fish health and potentially pose a threat for human consumption.

“MICROPLASTIC ABUNDANCE IN THE MAIN CHANNEL WATERS OF THE UPPER MISSISSIPPI RIVER POOL 8: PRELIMINARY DATA”

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Microplastics have become a prevalent and recognized source of contamination in marine and freshwater environments worldwide. Over the past 50 years, microplastic pollution has raised concerns regarding water quality, aquatic biota, and human health. Recent microplastic research has mainly focused on marine environments and aquatic vertebrates, yet implications regarding freshwater ecosystems such as lakes and rivers needs further investigation. In this study, we collected surface water samples (n=20) along the main channel of Pool 8 in the Upper Mississippi River in November 2023 to assess microplastic pollution. Water samples (10L) were preliminarily filtered on site to concentrate microplastics into specimen cups and taken to the lab for secondary filtration and analysis. Microscopy was used for identification and enumeration of microplastics, and a subsample was verified with a Fourier Transform Infrared (FTIR) spectrometer to determine polymer type. An additional water sample from each site was collected to evaluate turbidity via nephelometry. Turbidity was used as a surrogate for turbulence and sediment resuspension. In total, 360 microplastic particles were identified ($\bar{x}$ = 17.95 particles per 10L) and ranged from 157µm to 5000µm at their largest dimension ($\bar{x}$ = 1265µm). Fibers were the most prevalent type of microplastic found across sites accounting for 96.7% (n=348) of examined particles and 3.3% were identified as fragments (n=12). The most common colors of microplastics were clear, black, blue, and red. Microplastic abundance increased significantly with distance (m) downstream (R^2=0.4056, p-value=0.0015). Turbidity was not correlated with microplastic abundance (Spearman, $p<0.05$), however, turbidity combined with distance downstream produced the best multiple regression model predicting microplastic abundance (Adj. R^2=0.566, $p<0.001$). This research suggests hydrologic influences on microplastic abundance and will likely affect distribution of microplastics across habitats in the Upper Mississippi River. Further, hydrologic influence on

microplastic abundance should be considered in future microplastic studies in river ecosystem, including those related to consumption of microplastics by organisms.

"CULTIVATION OF NON-BITING MIDGES (CHIRONOMIDAE; ARTHROPODA) IN A CONTROLLED ENVIRONMENT"

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Mesocosms are artificial habitats used to replicate natural environments in a controlled setting. Researchers can precisely manipulate conditions in a mesocosm, and studies can be replicated more easily than field-based observational studies. For these reasons, mesocosms are a promising way to cultivate large amounts of macroinvertebrates for use in scientific and commercial applications. Non-biting midges (family Chironomidae) are viable for laboratory cultures due to their availability, tolerance to water quality, and fast life cycle. In this study, we prepared a mesocosm system consisting of 18 mesocosms (61x38x19-cm) to determine the ideal conditions for chironomid growth and reproduction. Chironomid larvae were collected locally and placed into mesocosms. We then tested the effect of various water temperatures (18, 23, 25°C) and different feed (fish flakes, compost) on the growth and reproduction rates. Identifying ideal conditions for cultivating chironomids in mesocosms may make it possible to raise large stocks of chironomids for use in scientific research, as fish food in fish hatcheries and other aquaculture and aquarium settings.

"INVASIVE CARP GROWTH CHRONOLOGIES: MANAGEMENT TOOL TO HELP EVALUATE HARVEST SUCCESS?"

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Invasive carp, composed of bighead, silver, grass, and black carp, have negatively impacted the food webs and native biota of the Mississippi River since their introduction in the late 1970s. Harvest is the primary management strategy to reduce invasive carp populations, however, due to their complicated life history and absence of robust population estimates, additional assessment tools are needed to help evaluate the effectiveness of harvest. Therefore, we are exploring variation in invasive carp annual growth as a surrogate for invasive carp density in response to management and removal efforts. This will be accomplished through two main objectives: 1) build master chronologies and characterize invasive carp annual growth within discrete, spatially-explicit management units across a spectrum of invasion densities in the Mississippi River Basin and 2) model growth response to management (harvest) and ecological/environmental drivers (e.g., zooplankton abundance, temperature, year-class strength, and hydrology). We will evaluate growth through incremental lapillus otolith measurements from bighead carp, silver carp, and grass carp across reaches of the Upper and Lower Mississippi River, Illinois River, Missouri River, Ohio River, and Wabash and select tributaries ranging from 2014-2023 (n=50; 25 male, 25 female per species, per reach, per year). A mixed effects modeling approach will be used to estimate annual growth in response to management and external drivers, while adjusting for allometric and individual-specific growth intraclass variation. The results of this work will yield master invasive carp chronologies across their invaded range, capturing several stages of their invasion throughout the

Mississippi River Basin and hopefully serve as a baseline for future collections and tool to help evaluate management success.

"REIMPLEMENTATION OF THE LTRM MACROINVERTEBRATE COMPONENT IN THE MISSISSIPPI AND ILLINOIS RIVERS"

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Macroinvertebrates are good indicators of ecosystem health and transfer most of the organic matter from various sources inside or outside of the stream through the stream food web. The benthic macroinvertebrate component of the Upper Mississippi River Restoration Program's Long-Term Resource Monitoring element (LTRM) was a vital program that allowed detection of spatiotemporal trends in macroinvertebrate community structure in the Upper Mississippi River System (UMRS) but was discontinued in 2004. This component was reinstated in 2023 across five states in the Mississippi (Pools 4, 8, 13, 26, and the Open River Reach) and Illinois rivers (La Grange Pool) adopting the original design to permit comparisons with the historic data. This will allow us to better understand the macroinvertebrate community response to biotic and abiotic changes in the (UMRS) over the past 30+ years and into the future. Passive gears (rock bags and Hester-Dendy) were introduced in 2023 to evaluate main channel macroinvertebrate colonizer communities, which are largely understudied across LTRM river reaches. Additionally, during the first year, we collected burrowing mayflies using suction dredge sampling to quantify body burden of polycyclic aromatic hydrocarbons (PAHs), current use pesticides and neonicotinoid insecticides across the LTRM reaches. We will discuss major aspects of the macroinvertebrate component and show preliminary results comparing 2023 samples with historic data. So far, it seems that the indicator taxon Ephemeroptera (mayflies) are less abundant in most habitat types in 2023 than historically, potentially indicating a decline in river water quality, though more work is needed for confirmation.

"IMPACTS OF WEIRS ON THE CORRELATION OF METAL CONCENTRATION AND BIOLOGICAL INTEGRITY IN A SMALL SE MN STREAM"

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In recent years there has been a significant increase in environmental pollutants. When pollutants enter waterways, they can accumulate in sediment above dams and weirs which can impact the health of aquatic ecosystems including the macroinvertebrate assemblage. Sediment cores were obtained from various locations above and below several weirs along Gilmore Creek, a tributary of the upper Mississippi River located in Winona, MN. Samples were extracted using DTPA and analyzed by Microwave Plasma-Atomic Emission Spectroscopy. Invertebrate samples were collected from the same location to measure biological quality of the stream using an index of biological integrity. Our results indicate a correlation was found for location throughout the stream and zinc, iron, manganese, and lead, though no correlation was found with macroinvertebrate assemblages or indices. While much is known about these dynamics in larger rivers and reservoir systems, relatively little is known about this accumulation in small, headwater streams.

“BUILDING MESOCOSMS FOR AQUATIC INVERTEBRATE RESEARCH AND CULTURING”

*Matthew M. Waite1, *Steven Verhaalen1, David Ellefson1, Ross Vander Vorste1. 1University of Wisconsin - La Crosse

Aquatic mesocosms are artificial habitats that can be used to conduct experiments or culture populations of economically important organisms. Studies performed using mesocosms offer advantages over field studies because they allow for control of environmental variables, such as temperature, water level, feed, and substrate type, and provide replication of experimental units. We designed and built a novel laboratory mesocosm system for use in aquatic invertebrate research and culturing. Our system is modular, consisting of three units, each with dimensions of 2.5 x 0.6 x 1.8 m, that hold 6-12 mesocosm each. Six mesocosm with a combined volume of 3400 liter are in each rack, while 2 smaller mesocosms can be installed in each to allow 12 mesocosms per rack. Grow lights across each rack can be programmed to mimic the day and night cycle. Water temperature in each unit can be controlled, with a range of about 15-28℃. Dissolved oxygen is measured and adjusted to appropriate levels. Water flow is controlled by individual adjustable ball valves. Water quality in each unit is maintained by a three-stage water filtration system within a large bulk tank. A continuous water quality monitoring system for water temperature, pH, dissolved oxygen, and conductivity is used alongside each unit to keep track of each individual tank. Our mesocosm system can be modified as a flow-through system or a recirculating system to increase water conservation. Planned use of the mesocosm system includes developing a sustainable bloodworm culture (Chironomidae; Insecta) and experiments using freshwater amphipods. One major advantage of our mesocosm system is the ability to expand or modify mesocosms and environmental conditions to best suit future applications.

“ENVIRONMENTAL FACTORS INFLUENCING AQUATIC INSECT EMERGENCE IN POOL 8 OF THE UPPER MISSISSIPPI RIVER”

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Many aquatic insects live as juveniles in the water before emerging as winged adults. Both juvenile and adult forms of aquatic insects are an important food source for fish and terrestrial animals. However, there is a growing concern that aquatic insect emergence is declining on the Upper Mississippi River (UMR). Currently, environmental factors that influence emergence on the UMR are not well understood, in part, because there has been no consistent monitoring of populations. Between June-July 2023, we deployed 27 floating emergence traps (0.3 m2) throughout Pool 8 of the UMR and collected adult insects and environmental data to examine the relationships between emergence rate (insects/day), taxonomic richness, and environmental conditions, including temperature, dissolved oxygen, pH, and conductivity. This effort is part of a long-term project that began in 2020 aimed at quantifying spatial and temporal trends in aquatic insect emergence. Of the 99 processed samples from 2023, there was an average emergence of 34±44 insects/day and a richness of 2.3±1 unique orders/sample. Across the 27 sites there was high variability in the number of individuals as well as richness. Significant relationships were found between rate of emergence and water temperature, dissolved oxygen, and pH. Most notably, emergence rate increased greatly at water temperatures >23°C and when dissolved oxygen

was >8 mg/L. There was no significant correlation between environmental factors and overall taxonomic richness or the emergence rate of Ephemeroptera, Plecoptera, and Trichoptera. These results suggest that dissolved oxygen and water temperature may be limiting factors on emergence with an approximate threshold. Managing riverine habitat for insect emergence in the future could potentially be informed from these thresholds of the environmental conditions critical to emergence rates. The high variability in emergence across sites indicates a need for further future study in order to better identify what habitats promote the highest emergence rates. Combining our results with previous and future years of sampling will help detect trends in insect emergence on Pool 8.

"INVESTIGATING AN ELECTROSTATIC METHOD FOR THE REMOVAL OF MICROPLASTICS FROM WATER SAMPLES OF THE MISSISSIPPI RIVER" *Sara M. Nerad1, Brianna L. Finnegan1, Kelly A. Grussendorf1, Adam R. Hoffman, Richard Smith. 1Department of Natural and Applied Sciences. University of Dubuque

Microplastics are very small, ranging from 100 nanometers to 5 millimeters in size. Due to their small size, the average person eats, drinks, and breathes in approximately 78,000 to 211,000 microplastic particles every year. In plastic bottles, there are roughly 94 particles per liter, compared to a glass beer bottle, in which there are roughly 62 particles per liter. The mean annual flux of microplastics out of the Mississippi River (0.5 mm–5.00 mm) is estimated to be 328 billion particles. The development of methods to remove these microplastics is imperative. Different techniques proposed have included ultrafiltration, reverse osmosis, and distillation, which unfortunately can cause other negative effects on the environment. This project aimed to look at a less damaging technique to remove microplastic -- electrostatic charges. Microplastics generally have a positive charge, and therefore we examined the feasibility of using electrostatic methods to remove microplastics from the environment. During this project, we worked on a way to electrically remove microplastics from Mississippi River water. Our results from this project were inconclusive, however further analysis needs to be carried out.

"INVESTIGATION OF A LABORATORY METHOD FOR MICROPLASTIC EXTRACTION FROM RIVERINE SEDIMENTS USING DENSITY SEPARATION" *Peyton M. Weckwerth1, Eric A. Strauss1. 1University of Wisconsin, La Crosse, Department of Biology and the River Studies Center

"CELLULAR CADMIUM CONTAMINATION AND TOLERANCE IN CRAYFISH" *Emerson S. Wilson, Kelly A. Grussendorf, Adam R. Hoffman, University of Dubuque

Over the past few decades, microplastics (MPs) have become a growing concern due to their increasing prevalence in various ecosystems, including rivers and streams. Many of the primary concerns relate to the impact of MPs on organisms that reside in these ecosystems. Until recently, the influence of MPs within the Mississippi River has not been well studied and many important questions remain unanswered. One understudied area includes the patterns of MP deposition and abundance in the Upper Mississippi River. Through analysis of sediments, we can further investigate the impact of these anthropogenic contaminants on riverine ecosystems. In order to accurately quantify and classify MPs in sediment analysis, an effective and efficient laboratory method is needed to extract and isolate the plastics from sediment particles of various sizes and densities. In this study, a density separation technique's efficacy was investigated for the isolation of polyethylene microspheres spiked into natural sediments. Three different sediment types were tested (silt/clay, sand, and a 50:50 mixture of silt/clay:sand). After the addition of the polyethylene microspheres, the mixture was treated with CaCl to density separate the plastics from the sediments. The plastic spheres were then filtered onto a

membrane filter and counted via microscopy. Analysis of recovery rate of the microspheres will help in determining the effectiveness of this technique for isolation and quantification of MPs from sediment. Results of this experiment will be useful in future research of soil cores, and more specifically, for investigating how the presence of MPs in the Mississippi has changed throughout time.

Poster Session II

"LAND USE FACTORS AFFECTING EROSION AND ENTRENCHMENT IN GOOSE CREEK WATERSHED, DAVENPORT IA"

*Hannah L. McKoon1, Dr. Kevin Geedy1, Peyton E. Heisch1. 1Augustana College

The Urban Stream Syndrome (USS) is a series of symptoms displayed in many urban streams, including significant erosion that leads to entrenchment. In this study, we measured entrenchment in the Goose Creek Watershed (Scott Co, IA), which spans a rural to urban gradient. Entrenchment in watersheds can cause many problems including flash floods, poor water quality, loss of species diversity, and others. Although storm water is the most commonly studied driver of high entrenchment, this is not the case for every watershed. Entrenchment Ratio (ER) is a ratio system developed by Rosgen with the goal of determining how much erosion has occurred at each site along the stream, by measuring how connected a stream bank is to its own floodplain. ER is defined as the ratio of the width of the flood-prone area to the surface width of the bankfull channel, which we measured at 10 sites across the watershed in fall of 2023. Within the Goose Creek watershed, ER numbers were found to be quite poor overall, however there was variation (1.15-2.3, mean 1.39) among sites. Low numbers indicate highly eroded conditions and poor floodplain connectivity.This ratio can further be investigated by comparing ER results with percent land use data. ER in the Goose Creek Watershed has a significant relationship with both Impervious Surface and Cultivated Crop land use. However, contrary to other published work on USS, impervious surfaces percent was positively associated with sites with less eroded banks and greater floodplain connectivity. ER and Cultivated Crops were shown to have a strong negative correlation which is more similar to the expected correlation of ER and Impervious Surface as described by USS. We hypothesize that in Goose Creek Watershed erosion and low ER numbers are caused more by Cultivated Crops than by impervious surfaces. Land used for cultivating crops upstream can be the driving factor of erosion and entrenchment watersheds. The City of Davenport could use this insight to focus their efforts on helping sustainable agriculture with many different solutions, which would likely help improve ER throughout the whole stream.

"CHEMICALLY AND MICROBIALLY CHARACTERIZING RESTORED PRAIRIES IN DUBUQUE COUNTY ON A FORB TO GRASS ABUNDANCE GRADIENT"

*Ryan P. Kiddle1, *Joseph W. Ensley1, and Adam J. Kleinschmit1. 1University of Dubuque

Dubuque County, Iowa is largely composed of agricultural land, which has replaced native prairie. Within the past forty years, multiple public and private stakeholders have worked to convert a small portion of agricultural land back into restored native prairies to increase diversity and ecosystem health. The goal of this project is to compare the restored prairies in Dubuque County. The comparison will focus on correlations among soil chemistry, observed plant species diversity metrics, and soil microbial

community analysis on three prairies with varying diversity ratios because of money constraints. To determine which prairies we were to perform microbial analysis, we decided to establish a gradient encapsulating all the prairies quantifying them on their respective forb to grass abundancy ratio. Previous studies have documented divergent bacterial microbiomes in grass and forb-based prairie soil; thus, we were interested in looking more into this association along a gradient of grass to forb ratio. We decided to sequence DNA extracted from soil using a prairie from the high, middle, and low end of an observed established gradient. This was to ensure that we could compare the microbial fauna of three prairies which were distinct regarding forb to grass abundancy. Additionally, we quantified the three prairies through the mean number of unique plant species found within each 2x2 sampling plot. When comparing alpha diversity within each of the soil sample microbial communities, the WWP soil microbiome exhibited significantly lower species richness compared to SV and MOS (Kruskal-Wallis; q=0.0076), while there were no detectable pairwise significant differences in evenness or phylogenetic diversity. Beta diversity analysis between microbial communities through Weighted UniFrac distance analysis indicated significant composition differences between the communities (PERMANOVA, q<0.003), with over 70% of the variation captured by three PCoA plot axes. Additionally, we performed differential taxonomic abundance analysis of microbes between the three prairies to determine which tax were driving the significant differences in beta diversity. Future studies will be performed with a longitudinal sampling approach to discover any temporal dependence regarding relative taxonomic abundance of targeted taxa over a year.

“RIPARIAN ZONE ASSESSMENT ACROSS A RURAL TO URBAN GRADIENT” *Anne Gill, Environmental Studies Department, Augustana College

Riparian zones are a vital habitat that provide ecosystem services such as water quality protection, biodiversity, flood and erosion control, nutrient cycling and aesthetic values. These ecosystems are vulnerable due to human activities such as agricultural runoff, construction, urbanization, and pollution that contributes to the erosion of riparian zones.This study focuses on the assessment of riparian vegetation in the Goose Creek watershed (Scott Co, IA), examining 24 sites across an urban and rural landscape. Sites were evaluated using point quarter, line point intercept, and line point. A 50m line was placed perpendicular to the stream on both banks. Point quarter was used to measure abundance and diversity of trees and invasive shrubs in the area, and was conducted with set quadrants at 5m, 25m, and 45m. Line point intercept was used to assess land use percentages along the 50 m transect and line intercept was used to determine the percent of land use. Black Walnut emerges as a dominant species in the Goose Creek watershed, in both the mature tree and sapling class, impacting the diversity of these forests. Goose Creek watershed contained relatively low invasive shrub densities, with only 1 out of 24 sites displaying a fair amount of invasive shrub density (defined as between 301 and 999 shrubs/ha). There was a negative trend towards less moisture-tolerant riparian tree species with none of the sites consisting of a healthy population of iconic riparian tree species. Finally, we found a negative correlation between mature tree diversity and the percentage of agriculture, emphasizing the importance of considering land use practices in managing riparian health. The Black Walnut's juglone toxin influences the germination and growth of competing species. This could lead to a shift in the riparian community structure favoring Black Walnut growth. This dominance raises concerns about long-term tree diversity within the area and prevents iconic riparian zone tree species such as willows, silver maple, cottonwood, and river birch from maintaining healthy populations. Careful management to balance its impact on diversity and potential native tree plantings to maintain ecosystem resilience is recommended. Ultimately, this research aims to provide insight for the city of Davenport to make informed decisions in riparian zone management. By understanding the current state of Goose Creek's

riparian ecosystem and future trends, this study contributes to discussion on effective conservation strategies for riparian environments.

“SPATIAL AND TEMPORAL VARIATION IN NUTRIENT AND TOTAL COLIFORM BACTERIA IN A MISSISSIPPI RIVER TRIBUTARY”

*Makenzie R. Knapp1, *Alyssa L. Straka1, Adam R. Hoffman1. 1Department of Natural and Applied Sciences, University of Dubuque

Nitrogen and phosphorous are often the limiting nutrients in aquatic systems and play an important role in eutrophication processes. High levels of these nutrients in surface waters can pose a risk to aquatic life, ecosystem function, recreational use, and human health. From a pollution perspective the primary risk to human health from the Mississippi River are fecal coliform bacteria, such as Escherichia coli (E. coli). Spatial variation of nutrients and bacteria exists between main channels and side channels of the Mississippi River and the streams draining its watersheds due to land use characteristics and instream biochemical conditions. Rain and runoff events also impact the timing of transport and cause variation in the amount of nutrients being transported into and by the Mississippi River. In our research, we studied the spatial and temporal variation of nutrients and coliforms in the Mississippi River and surrounding streams in Dubuque County. In our study, we used nutrient and E. coli concentrations to assess the overall water quality as it is important to the health of the surrounding ecosystem. We collected water samples from the Mississippi River, including sites along the main channel and side channel and streams emptying into the Mississippi River throughout Dubuque County. These were collected on multiple occasions throughout the summer of 2022, during baseflow and after rainfall/runoff events. We noted water temperature, pH, nitrate, nitrite, and chloride levels as the samples were collected. Samples brought back to the laboratory were analyzed for total phosphorus (P), dissolved P, total suspended solids, and total coliform and E. coli. There was no statistically significant difference between pre and post rainfall concentrations of nitrates or total P in the main channel, nor were there differences noted between concentrations of nitrates or total P when comparing the main channel of the Mississippi River to the side channels. There were statistically significant differences (p < 0.05) between total P and E. coli between the Mississippi River ($\bar{x}$ = 0.17 mg/L; $\bar{x}$ = 1,794 counts/100ml) and the tributaries ($\bar{x}$ = 0.436 mg/L; $\bar{x}$ = 8,471 counts/100 ml). Catfish Creek had the highest average concentration of total coliforms, 15,642 counts/100 ml. Future work to be done includes microbial analysis to directly identify bacterial species present in water samples and continued quantification of the impacts of rainfall/runoff events.

“FACTORS AFFECTING URBAN STREAM METABOLISM PERFORMANCE IN GOOSE CREEK WATERSHED”

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The rate of gross primary production (GPP) and ecosystem respiration (ER) in temperate urban streams are influenced by multiple ecological and anthropogenic factors. However, these rates, and the environmental factors that control them, have not been investigated in the Goose Creek watershed. In this research, we used a multi-parameter water quality instrument to measure temperature and oxygen levels for 10 minute intervals at five sites in the watershed. We calculated ER and GPP by using the diel oxygen method and used the Energy Dissipation model to estimate the diffusion of oxygen. We compared ER and GPP with existing water quality data. We found a small range of values of ER and GPP across all sites, with an average ER of -2.922 (g/m2/day) and an average GPP of 0.48 (g/m2/day). The percentage of forest within 50 m of the stream positively influenced ER. There was also a noticeable positive correlation between ER and herbaceous grassland as well as mature tree density. These findings

are consistent with literature that predicts an influence of natural land use surrounding a stream. These results are consistent across sites that varied greatly in oxygen saturation. While these findings are consistent with the notion that shaded water from a tree canopy and grasslands influence respiration rates, further research is recommended to explore more variable in-stream factors as well as consideration of longer data retrieval across more sites.

"PARASITE COMMUNITIES AS POTENTIAL BIOINDICATORS FOR URBAN AQUATIC ECOSYSTEMS"

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Parasite communities in fish are affected by environmental stress associated with urban land use, making them a potential resource as biomonitoring tools in urban streams. The purpose of this study is to assess the relationship between parasite communities associated with Semotilus atromaculatus (Creek Chub), the top predator of our target watershed, and habitat quality to determine whether parasite communities and health conditions in S. atromaculatus could be used as a biomonitoring tool for urban streams. We collected S. atromaculatus (N = 60) across three tributaries in the Duck Creek watershed in Davenport, IA. Specimens were dissected and assessed for parasite composition and abundance. Host health was assessed using HAI (health assessment indices) scores. Water quality data were collected three times throughout the summer from three reaches in each tributary. Preliminarily, we found Silver Creek to have the highest abundance of parasites (N = 313), followed by Goose (N = 213) and Pheasant (N = 175) Creeks. Nematodes and trematodes were the most prevalent parasites among the tributaries (Neascus sp. = 21.54% and Digenean sp. = 4.58%). A MANOVA was used to assess for differences in parasite load, HAI, and water quality data. There was no significant difference in mean parasite load nor HAI among the tributaries. There were significant differences in water quality, however, with Goose Creek consistently having lower water quality (F18= 4.07, p < 0.001). These data show that water quality may be driving parasite abundance among these streams, but parasite load is not influenced by abundance within a stream. Preliminarily, these data suggest that parasite communities may serve as a successful biomonitoring tool for monitoring environmental health of urban streams. These data will be used to inform local management decisions of urban watersheds

"RIPARIAN STRUCTURAL DIVERSITY AND LANDCOVER AS PREDICTORS OF WATER QUALITY: A COMPARATIVE ANALYSIS IN THE DUCK CREEK WATERSHED"

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As urbanization accelerates, urban watersheds face a variety of complex challenges due to human activity stemming from changes to geomorphology, the influx of pollutants, and degradation of riparian vegetation. While riparian vegetation has long been acknowledged as important to the health of urban streams, assessing riparian health using field-based methods remains difficult. The objective of this study is to assess the relationship between riparian vegetation and urban watershed health by comparing riparian structural diversity to the water quality and land cover estimates of the watershed. Water quality was measured at 38 sites located along 4 major tributaries in the Duck Creek watershed in Davenport, IA from 2008 - 2023. USGS 3DEP LiDAR datasets were used to estimate riparian structural diversity metrics such as mean height and number of trees using the lidR R package at the site scale and watershed scale. Landcover was estimated using NLCD datasets resampled to the riparian bounds and tabulated at the site scale and watershed scale. We will be assessing the relationship between land

cover, riparian structure diversity, and water quality of Duck Creek with regression models in R. LiDAR derived assessments of riparian canopy structure have the potential to further understandings of the complex ecosystem processes that occur in riparian zones, leading to more effective management practices.

"PATTERNS OF BUMBLE BEE AND HONEY BEE ACTIVITY AND PLANT ASSOCIATIONS IN PATCHY RESTORED PRAIRIES ALONG THE MISSISSIPPI RIVER IN NORTHEASTERN IOWA"

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Bumble bees (Bombus spp.) are important pollinators for native prairie wildflowers. Native prairies in the upper midwestern United States have largely been replaced by agriculture and now exist as remnants. In some areas, prairies have been restored through intentional management efforts. One way to assess the success of restoration efforts is to survey for expected native prairie-associated animals and to monitor them once detected. The University of Dubuque's Wolter Woods and Prairies property along the Mississippi River in northeast Iowa has 20 acres of restored prairies and has been surveying bumble bee pollinators since 2020 to assess their populations and plant associations. During 2023 honey bees (Apis mellifera) were included in the surveys because of the presence of maintained beehives on site. The aim of this project was to assess phenology and spatial variability of bumble bee activity, preferences for wildflowers, and potential competition with honey bees for wildflower resources. In order to assess bee pollinators, nine 100-meter transects on five restored prairies were surveyed between May and October. Transects were randomly surveyed for 1-hour either in the morning or the afternoon. For each bee capture, the species, exact time, and plant of capture were noted and a photograph was taken. Environmental data (temperature, humidity, wind speed, air quality) for each survey were obtained. At least 10 bumble bee species were detected during the surveys with additional species possible pending evaluation of photographs by external experts. Much temporal and spatial variation exists among bumble bee species across the property. Bumble bee species exhibited great diversity of wildflowers used and Chi-square tests suggest little competition for those resources. Chi-square tests indicate that honey bees are not competing with bumble bees for wildflower resources. These results suggest that spatial heterogeneity of restored prairie patches and plant diversity benefit bumble bee diversity. Further, the presence of cultivated honey bees does not appear to represent a negative impact on foraging opportunities for native bumble bees.

"DIFFERENCES IN THE PRESENCE OF PARASITES, ON AND IN, PASSERINES OF RURAL AND URBAN ENVIRONMENTS ALONG THE MISSISSIPPI RIVER"

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Birds can host a wide variety of different parasites, and the presence and prevalence of these parasites can vary due to many ecological and environmental factors. This can be of high concern to the health of the birds, but also the potential to act as a vector and reservoir of pathogens that can be transmitted to other organisms. The goal of this research is to identify parasites present, on and in, songbirds in the Dubuque, Iowa area, along the Mississippi River. The geographical differences in the parasite presence of rural and urban songbirds have been the targeted subject of this study. Birds were caught using a mist net, and processed to collect the following samples: blood, fecal, conjunctival, cloacal, and buccal swabs

along with flight and down feathers. 157 birds were caught over a month in the Summer of 2022. Of the 157 birds, 100 were caught in a rural area, and 57 were caught in an urban area. 21 different species were observed with goldfinches, house sparrows, and woodpeckers being the most prevalent species. Ectoparasites were found on two birds. Work has been done to determine the presence of avian blood parasites. Blood smears were collected and prepared in the field. The smears were then analyzed via microscopy after being stained with a Giemsa-staining solution, and abnormalities were detected during the observations. Currently, molecular work is being carried out to test for the presence of three commonly found avian blood parasites; Plasmodium, Haemoproteus, and Leucocytozoon via a multiplex PCR. Birds that are infected with these parasites often exhibit symptoms of decreased productivity in avian species and can increase their mortality rates. Certain Plasmodium and Haemoproteus species often result in avian malaria. Leucocytozoon are diverse blood parasites that only infect birds and cause emaciation, dehydration, and congestion in the liver, lungs, and spleen. Our study will be the first known study of this type in the area and will increase the knowledge and health of songbirds in the local area.

"FOREST PHENOLOGY RELATIONSHIP BETWEEN CANOPY DENSITY, GROND VEGETATION, AND MANAGEMENT PRACTICES"

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The relationship between the phenology of a forest's canopy and ground vegetation is an important factor in the understanding of regulating forests' microclimates and ecosystems. Canopy cover can influence the understory as the growing season persists; less photosynthetically active radiation reaches the ground level. This study was conducted at the University of Dubuque's Wolter Woods and Prairies (WWP). Measurements were taken once every two to three weeks from May through August. This study aimed to improve the WWP's management practices by understanding the gap characteristics of the canopy and ground vegetation phenology, including flowering stages. The forest area has been divided into fourteen management units and three sites were randomly selected for each unit, which gave us 42 sampling sites. The canopy density data was collected by a densiometer in each cardinal direction (N, E, S, and W). Ground cover data was then collected using Daubenmire squares placed two meters from the central point in the four cardinal directions, detailing each square's approximate percentage of leaf, wood, bare soil, and green vegetation cover. Identifying plant species and phenological stage was within five meters of the point. For 97.6% of the points (41/42), the canopy was deemed to be closed at or above 70% canopy density, with only one being moderately closed at 62% at its growth peak. Six invasive plants were also identified: Amur honeysuckle, Common Burdock, Garlic Mustard, Multiflora rosebush, Musk thistle, and Reed canary across eleven out of the fourteen management units, with the Multiflora rosebush with the highest prevalence. This information will aid in the control of invasive species in the future. For future recommendations, the continued monitoring of timber stand improvements, control burning, invasive species control, and the phenology of the canopy and ground vegetation to document the dynamics of each and the possible influences each one has for improved management practices.

"FOREST TREE SPECIES AND AGE CLASS ANALYSIS AT WOLTER WOODS & PRAIRIES"

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This research project, conducted at the University of Dubuque's Wolter Woods and Prairies (WWP) in northern Dubuque County, is focused on evaluating the current state of the forest tree species diversity

and age class across its 121 acres of forest, prairies, and gardens. One of the major goals of the managers at WWP is for high species diversity. They have observed specific areas in the forest where maple trees seemed to be the predominant species in the regeneration process, raising concerns about potential dominance by a single species or age class. Wolter Woods and Prairies is divided into fourteen management units. In each unit 30 point-quarter plots were randomly placed and three age classes of trees were measured (DBH <5cm, 5cm-20cm, and >20cm). We found that Sugar Maple (Acer saccharum) is the dominant species overall, constituting 31.1% of the total trees. The second and third most dominant species are Hackberry (Celtis occidentalis) at 13.2% and Ironwood (Ostrya virginiana) at 12.8%. FMU 4, 5, 7, and 10 have Sugar Maple density above 50%, indicating a high prevalence of Sugar Maple trees in these units. FMU 14 has the lowest Sugar Maple percentage at 0.008%, but it has the second-highest diversity, suggesting a more balanced distribution of various tree species. This survey will serve as a valuable tool for developing an effective management plan to ensure the long-term health and sustainability of Wolter Woods and Prairies.

"TOPOBATHY PILOT STUDY: VETTING NEW TECHNOLOGIES TO UPDATE TOPOBATHY FOR THE UPPER MISSISSIPPI RIVER SYSTEM"

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As the Upper Mississippi River Restoration Program plans future ecosystem assessments, updating the systemic topobathy using more recent data is becoming increasingly important. Updated elevation data for the upper Mississippi River system (UMRS) would allow for a variety of analyses not previously available to researchers or managers, such as systematically monitoring changes in riverbed and floodplain elevations and structural and functional aspects of the river system that are connected to elevation. These analyses have the potential to address questions about how the UMRS ecosystem is changing through time, the drivers of those changes, and their effects on the distribution of species and their habitats.

Survey technologies have made vast improvements since the original UMRS topobathy was developed. Advancements in topographic and hydrographic sensors have resulted in increased accuracy and precision and decreased uncertainty measures. Additional methods exist that were not previously available for inland rivers, such as aerial bathymetric lidar, dual-frequency parametric single-beam sonar systems, high-resolution multibeam echosounders, and ground penetrating radar (GPR). Testing the efficacy of these sensors is prudent before attempting to obtain new elevation datasets to update the systemic UMRS topobathy.

The objective of this pilot study was to select study areas of different aquatic habitats and environmental conditions and sensors that could work best in these conditions. Two study sites were selected: a moderate-sized area in Pool 8 and a smaller-sized area in Pool 4. Both sites have backwater aquatic areas with varying levels of turbidity, depth, and submersed aquatic vegetation growth. Additionally, Pool 8 has narrow, shallow braided channels that are considered hard to survey using traditional hydrographic methods. The U.S. Army Corps of Engineers' Technical Center of Expertise contracted the acquisition of topographic and hydrographic data. For each study site, two different sensors were selected for aerial bathymetric lidar and hydrographic surveys, respectively. The U.S. Geological Survey (USGS) would like to test one additional sensor — GPR, an innovative technology that

requires further investigation on whether it will obtain depth information for isolated and contiguous "backwater lakes," where submersed aquatic vegetation is present. After all data have been acquired, the USGS plans to update methods previously used to integrate lidar and bathymetry into a seamless elevation dataset. The findings of this study can be used to determine the best shallow-water survey methods and technical methods for merging various input data types into a topo-bathymetric dataset.

"CARBON AS A WATER QUALITY ISSUE: HOW MICROBIAL CARBON PROCESSING CAN CONTRIBUTE TO OXYGEN DEPLETION IN FRESHWATER SYSTEMS"

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The global estimated freshwater dissolved organic carbon (DOC) pool is 729 Tg and represents a large proportion of global carbon storage. The microbial community is a regulator of carbon consumption, production, and release from freshwater systems. A large proportion of the degradation processes occur in oxic and/or sub-oxic environments and deplete the dissolved oxygen (DO) pool, resulting in many water quality and biodiversity issues in these systems. 'Browning' and increased methane production in freshwaters are two processes that are potentially accelerating the loss of DO from freshwaters. In Cedar Bog Lake, the small pond that Ray Lindeman used to introduce the world to ecosystem ecology, we are attempting to 1) determine how browning might be affecting the availability of DO and carbon degradation dynamics and 2) to evaluate the significance of methanotrophy as a sink for DO in systems where methane concentrations can accumulate to relatively high levels. Over the course of a 21-day incubation, DOC concentration decreased as highly labile carbon was consumed rapidly, shifting the carbon pool towards more recalcitrant composition signatures over time and depleting DO. DOC concentration decreased from 14.6 to 13.8 mg/L (0.1 meters), and from 15.0 to 13.5 mg/L (1.0 meters). DO decreased from 9.69 to 4.39 mg/L (0.1 meters) and 1.60 to 0.86 mg/L (1.0 meters). Although there was a nearly 1:1 DOC degradation to DO loss ratio, high methane concentrations could also consume significant DO, and we will be evaluating the importance of these two processes in the future.

"ECTOMYCORRHIZAL TREE AND FUNGAL ECOLOGY AND SOIL PROPERTIES IN THE KICKAPOO VALLEY WISCONSIN"

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The Kickapoo River Valley in southwest Wisconsin, U.S.A. is a unique ecosystem comprised of old growth and early successional forests, located in the greater Mississippi River watershed, that rely on symbioses with ectomycorrhizal (ECM) community to thrive. This symbiosis increases soil and water quality, improving the health of the Mississippi River watershed by preventing excessive soil runoff and allowing aquifer recharge. To understand how the ECM symbiosis affects the ecosystem and watershed, soil characteristics; tree, soil bacterial, and ECM community composition was surveyed in 23 plots in the Kickapoo Valley. The surveys identified 6 distinct tree communities, which varied along a north to south gradient, with significant differences observed among slope aspects. Soil texture varied among loam, sandy loam, and silt loam. Carbon utilization metabolic assays of the soil bacterial communities showed high functional diversity amongst the surveyed plots. The greatest range of carbon substrate utilization was found in tree communities with significant understory debris. Future analyses include identifying ECM fungi isolated from tree roots in the soil samples to determine ECM fungal community composition on the levels of individual trees, individual soil cores, and entire plots. Tree, fungal, and soil bacterial communities will be identified using Illumina sequencing. Results of these analyses will provide an

overview of the factors that affect the interactions of ECM trees, fungi, and soil bacteria of the forested ecosystems within the Kickapoo Valley, and thereby the Mississippi watershed, that can be applied to other temperate forested ecosystems and their associated watersheds worldwide.

"DOES BARGE TRAFFIC IMPACT WATER CLARITY ON THE LA GRANGE REACH OF THE ILLINOIS RIVER?"

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The LaGrange Reach of the Illinois River has been an integral and unique part of the U.S. Army Corps of Engineers' Upper Mississippi River Restoration Program (UMRR) Long Term Resource Monitoring (LTRM) project implemented by the U.S. Geological Survey since 1993. This reach of the Illinois River is between the Peoria Lock and Dam and La Grange Lock and Dam, where barge traffic is heavy. Barges can cause several hours of disturbance in water quality on the Illinois River, with some observed effects on clarity (Butts and Shackleford, 1992). Unfortunately, studies like these are often dated; therefore, we look at the effect of passing barges on Turbidity, Total Suspended Solids (TSS), and Secchi readings on select sample sites in the La Grange Reach of the Illinois River from 1993 to 2022. Four out of eleven LTRM Fixed Sites had frequent barge traffic and were therefore chosen for this study. All data was collected using LTRM methods (Soballe and Fischer, 2004) and downloaded using the LTRM Data Download Tool via USGS (https://umesc.usgs.gov/ltrm-home.html). The mean turbidity, TSS, and secchi values were significantly worse in barge samples for site I121.2W, suggesting lower water clarity. There is no significant difference for the other three sites. Site I121.2W is located near Havana, Illinois and has silty substrate which represents a large portion of the La Grange Reach. On the other hand, the other three sites are at lock and dams which represents two specific areas of the reach. This suggests additional main channel sites throughout the La Grange Reach that are not near lock and dams can provide better representative water clarity data for the LTRM program.

"MAPPING THREE DECADES OF SEDIMENTATION WITHIN THE LAKE ONALASKA DREDGE CUT"

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Four decades of sedimentation following construction of Lock and Dam 7 in the mid-1930s reduced the flat pool volume of Lake Onalaska near Rosebud Island by 37%, resulting in homogenous depths of less than 1 meter by 1976. In 1989, the US Army Corps of Engineers dredged 765,000 cubic meters of sediment from the channel immediately north and east of Rosebud Island to increase depths and enhance fish habitat. While the dredge cuts improved conditions, sediment from Halfway Creek and the Mississippi River continued to be deposited in these areas. For this study, we quantified how much sediment has accumulated in and adjacent to the dredge cuts over the past 33 years. We used an acoustic doppler current profiler and survey-grade GPS to collect ~348,000 georeferenced depths throughout the dredge cut area. The dataset was thinned to ~136,000 points using a 1-meter radius prior to performing change detection analysis. Randomly distributed depth validation points that were manually measured in the field had a mean absolute difference of 0.12 meter from the bathymetric TIN created from our survey data. Approximately 1 meter of sedimentation occurred in the dredge cuts since a bathymetric survey was conducted in 1990 by the U.S. Geological Survey, with the greatest amounts found near the upstream entrance to the dredge cuts and near the mouth of Halfway Creek.

Nearly 3 meters of material accumulated at the Halfway Creek confluence, indicating the deep sediment trap created there is helping to reduce sediment delivery to the dredge channels.

"SPATIAL MODELING OF FLOOD INUNDATION AND FOREST SUCCESSION UNDER DIFFERENT GEOMORPHIC AND HYDROLOGIC SCENARIOS IN THE UPPER MISSISSIPPI RIVER FLOODPLAIN"

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The hydrologic regime of the Upper Mississippi River (UMR) has shifted towards wetter conditions characterized by more frequent and prolonged growing season flooding. These wetter conditions have been linked to declines in both historical and projected forest cover across the UMR, underscoring the need to restore and maintain floodplain habitat with inundation durations that support healthy forests. However, little is known about how management actions intended to restore floodplain habitat at localized site scales may scale up to influence broader landscape-level patterns of inundation and forest cover. Here, we assessed changes in flood inundation duration and forest cover over the next 100 years in a 14,000-acre portion of the UMR using a coupled flood inundation – forest succession model. Floodplain inundation and forest succession were simulated with and without geomorphic modifications that would increase the elevation at various floodplain sites and hydraulic modifications that would create several side channel closures. We also considered two different future hydrology scenarios: one that maintains average flooding conditions over the past 40 years (random), and one that projects an upwards trend in flooding conditions observed over the past 40 years into the future (trending). Total growing season flood duration decreased across the study area in scenarios including geomorphic and hydraulic modifications. Areas with the greatest decreases in flood duration were localized to sites with geomorphic modifications. In contrast, changes in flood duration were more negligible in areas outside of these sites and in scenarios with hydraulic modifications alone. Further analyses will evaluate differences in forest cover and community composition across the geomorphic and hydrologic scenarios. Our findings may be used to better understand how changes in flood inundation at local scales influence forest successional dynamics across broader landscapes.