Upper Mississippi River Restoration Program
Coordinating Committee

May 20, 2026
Quarterly Meeting

Highlights and Action Items

Regional Management and Partnership Collaboration

- The FY 2026 funding outcome is $53 million for the program. LTRM base monitoring is fully funded for FY 2026 with $7 million. The scope of work for Science in Support of Restoration and Management was approved in May, which will bring LTRM total funding to $9 million.

- The President's Budget for FY 2027 includes $55,487,000 for UMRR project costs with an additional $4,020,000 million for Corps staff salaries and expenses. This is the highest budget recommendation ever for the program.

- The *ad hoc* team has completed a draft 2025-2035 UMRR Strategic Plan, and has prepared to conduct a review by the broader partnership. The next step *ad hoc* team is to incorporate input from the Communications and Outreach Team (COT), Analysis Team (A-Team), and the stakeholder groups and nongovernmental organizations who participated in the strategic planning process, then conduct a public review of the plan in July.

- Given the financial uncertainty at the beginning of FY 2026, the UMRR Coordinating Committee developed scenarios for continuing to implement LTRM under a reduced budget. The UMRR Coordinating Committee has agreed to employ an after-action review on this process.

Habitat Rehabilitation and Enhancement Projects (HREPs)

- A few highlights of progress in implementing HREPs include:
  - The St. Paul District has kicked off planning for the Bankline Stabilization HREP.
  - The St. Paul District will hold a ribbon cutting for McGregor Lake HREP Stage 2 on September 22.
  - The Rock Island District will hold a kickoff meeting for the Lower Pool 11 HREP planning in August.
  - The St. Louis District expects to complete Stage 1 of the Yorkinut Slough HREP design in November.

Long Term Resource Monitoring (LTRM)

- Two manuscripts were published in the last quarter that were supported by UMRR funding and the programmatic infrastructure.

- The 2026 National Conference on Ecosystem Restoration in Omaha, Nebraska included two sessions on UMRR.

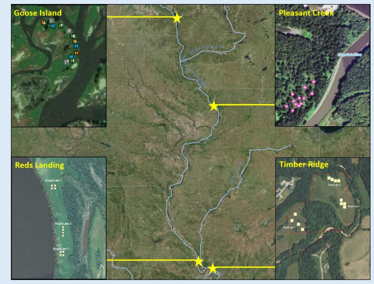
Future Meeting Schedule

- August 2026 to be held in St. Louis, Missouri
  - UMRBA quarterly meeting – August 4
  - UMRR Coordinating Committee quarterly meeting – August 5
- October 2026 to be held in the Quad Cities
  - UMRBA quarterly meeting – October 13
  - UMRR Coordinating Committee quarterly meeting – October 14
  - NESP Coordinating Committee quarterly meeting – October 15
- February 2027 to be held virtually
  - UMRBA quarterly meeting – February 16
  - UMRR Coordinating Committee quarterly meeting – February 17 or 18
  - NESP Coordinating Committee quarterly meeting – February 17 or 18

Reforesting Upper Mississippi River Floodplain Openings Colonized by Invasive Species

Guyon L, Weiss S, Tarleton A, and Cosgriff R (2026). Reforesting Upper Mississippi River floodplain openings colonized by invasive species. Invasive Plant Sci. Manag 19(e5): 1–13. https://doi.org/10.1017/inp.2025.10021

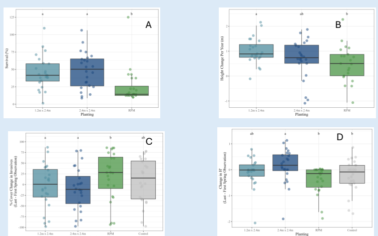
Key Questions:
1. Can artificial reforestation with early successional species be used to fill canopy gaps and reduce the abundance of invasive plant species such as reed canarygrass (*P. arundinacea*) and Japanese hops (*H. japonicus*)?
2. What are the most effective planting densities?
3. Can successful reforestation be achieved without standard maintenance (e.g., mowing, herbicide application)?

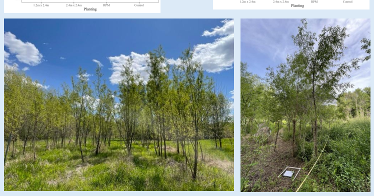


- Tree plantings included willow cuttings & cottonwood and sycamore RPM container stock at different densities
- Half of each plot received maintenance treatments (mowing & herbicide)
- Planted trees and other vegetation were monitored twice per growing season

Reforesting Upper Mississippi River Floodplain Openings Colonized by Invasive Species

Key Findings:
- Planting and maintenance had significant effects on tree survival, invasives cover, and plant community diversity
- Trees that received maintenance had higher survival than those that did not, and willow cuttings had higher survival than container stock [A]
- Annual tree height growth was greatest in willow cuttings planted at the highest density [B]
- Invasive species cover declined significantly in maintenance treatments and willow plantings [C]
- Change in plant community diversity was greater in maintenance treatments and in willow plantings [D]
- Overall vegetation patterns were strongly influenced by invasive species






Freshwater Biology

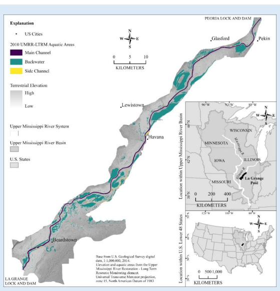
ORIGINAL ARTICLE OPEN ACCESS

Seasonal Environmental Conditions and River Morphology Shape Summer Phytoplankton Communities

Kathi Jo Jankowski | James H. Larson | John Manier

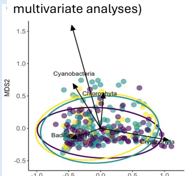
U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin, USA

Few studies have evaluated long-term dynamics of phytoplankton communities in large rivers. To address this gap, this study evaluated the inter-annual dynamics of phytoplankton and cyanobacteria communities in the Illinois River over 11 years, addressing the following questions:
1) How much do summer phytoplankton communities vary from year to year?,
2) What environmental conditions are associated with that variation?, and
3) Do cyanobacteria respond to different conditions than the full phytoplankton community?

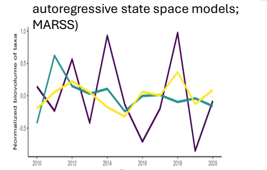


Dataset:
- **2010-2020;**
- Stratified random samples from **main channel, side channel, and backwaters**
- **Summer phytoplankton** (late July/early Aug)
- **Winter, spring, and summer environmental characteristics** (discharge, temperature, precipitation, nutrients, carp, turbidity)

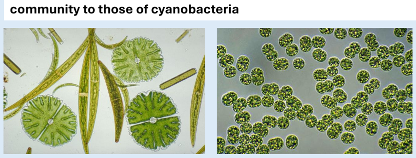
1. Evaluated similarity of communities across aquatic areas and over time (using multivariate analyses)



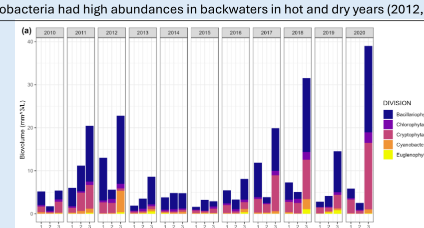
2. Assessed scale and role of environmental drivers by evaluating synchrony of inter-annual community dynamics (Multivariate autoregressive state space models; MARSS)



3. Compared environmental drivers of full phytoplankton community to those of cyanobacteria

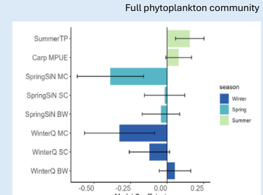


Phytoplankton biovolume was greatest in backwaters.
Communities were similar among areas and dominated by diatoms.
Cyanobacteria had high abundances in backwaters in hot and dry years (2012, 2018).

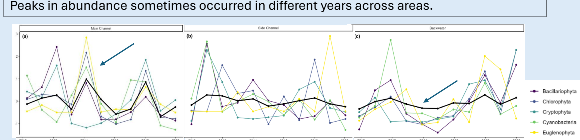


Differences in environmental variables associated with variation in the full community vs cyanobacteria

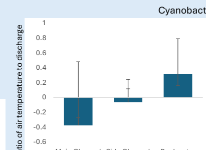
Full phytoplankton community



Year to year variation of the community was shaped by aquatic area, not specific to taxa. Peaks in abundance sometimes occurred in different years across areas.



Cyanobacteria



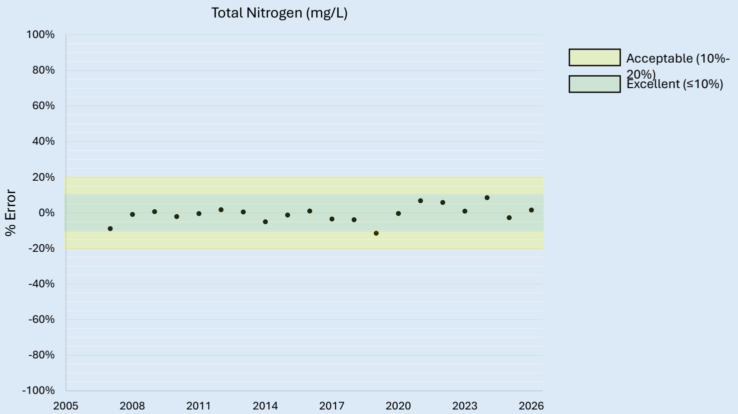
USGS
Upper Midwest Environmental Sciences Center

Inter-laboratory Comparison

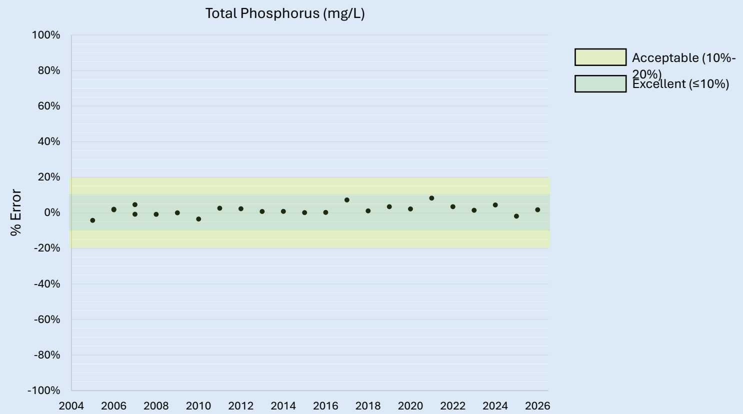
Upper Mississippi River Restoration, Long Term Resource Monitoring element
Water Quality Analytical Laboratory

Standard Reference Sample Project

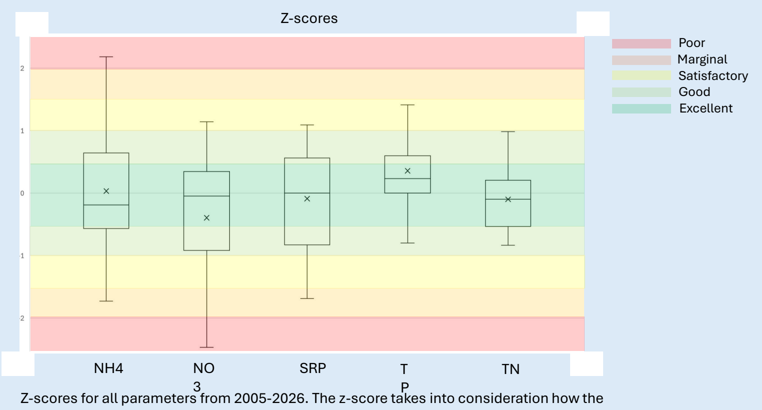
- Approximately 125 Laboratories from 40 states
- Federal, state, private and university labs
- The UMRR-LTRM water quality laboratory participates in this study every spring
- Samples are analyzed for NH_4, NO_3, TN, TP and SRP



Percent errors for total nitrogen analyses for the Standard Reference Sample Project (2005-2026).



Percent errors for total phosphorus analyses for the Standard Reference Sample Project (2005-2026).



Z-scores for all parameters from 2005-2026. The z-score takes into consideration how the UMRR-LTRM lab compares with other labs. The average z-score for each parameter is marked with an “x”.

USGS Powell Center Project

Are we experiencing a riverine silicon surge? Implications for the global carbon cycle

USGS Powell Center Project
Working Group Participants

Thank you to our amazing team of 25+ scientists to work on this project for past 6+ years

PI Team:
Joanna Carey, Kathi Jo Jankowski, Pamela Sullivan,
Core Team: Keira Johnson (post-doc), Lienne Sethna,
Sidney Bush (post-doc), Nick Lyon

Diane McKnight, University of Colorado Boulder
Ruth Heindel, Kenyon College
Jessica Corman, University of Nebraska-Lincoln
Hjalmar Laudon, Swedish University of Agricultural Sciences
Bill McDowell, University of New Hampshire
Pirkko Kortelainen, Finnish Environment Institute
Arial Shogren, University of Alabama
Adam Wymore, University of New Hampshire
Jeremy Jones, University of Alaska Fairbanks
Amanda Poste, Norwegian Institute for Nature Research
Wil Wollheim, University of New Hampshire
Paul Julian, Sanibel-Captiva Conservation Foundation
Daniel Conley, Lund University
Abra Atwood, Woodwell Climate Research Center
Marcia Macedo, Columbia University
Bryn Stewart, University of Arizona
Lauren Koenig, USGS
Tao Wen, Syracuse University
Zanchenling Wang, Syracuse University
Elizabeth Elmstrom, Marine Biological Laboratory
Nicole Fernandez, ETH Zurich
Antti Räike, Finnish Environment Institute
Patrick Thomas, University of Oldenburg
Benjamin Abbott, Brigham Young University
Linda Deegan, Woodwell Climate Research Center

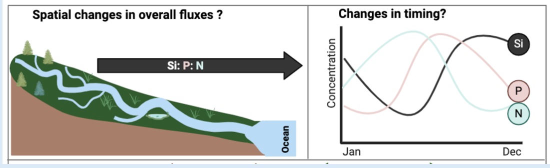
Many questions remain unanswered about river Si cycling

NCEAS funded synthesis 2020-2024

- **How do controls on river Si vary across spatial scales?**
- What is the role of terrestrial vegetation in controlling river Si dynamics?
- How have concentrations and exports changed over the last several decades?

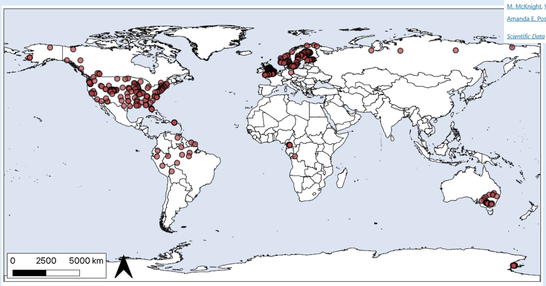
Powell Center funded synthesis 2024-2026

- **How do Si dynamics vary relative to nitrogen and phosphorus?**
- How variable is river Si seasonality across space? Are these patterns changing over time?
- How dynamic is river Si along the river longitudinal continuum?



Individual studies highlight inconsistencies in controls on river Si at small spatial scales

The Global Aggregation of Stream Silica (GlASS) dataset



scientific **data**

Explore content ⌄ About the journal ⌄ Publish with us ⌄

nature > scientific data > data descriptors > article

Data Descriptor | Open access | Published: 20 October 2025

GlASS - Global Aggregation of Stream Silica

Kathi Jo Jankowski, Keira Johnson, Nicholas J. Lyon, Sidney A. Bush, Paul Julian, Lienne R. Sethna, Diane M. McKnight, William H. McDowell, Adam S. Wymore, Pirkko Kortelainen, Hjalmar Laudon, Ruth C. Heindel, Amanda E. Poste, Arial Shogren, Fred Worral, Luke Mosley, Pamela L. Sullivan & Joanna C. Carey

Scientific Data **12**, Article number: 1658 (2025) | Cite this article

- >400 rivers, all 7 continents
- Daily streamflow, most rivers
- >10 years of data
- At least monthly chemistry data (Si, N, P)
- Compiled 28 watershed predictors for each river (e.g., lithology, climate, land cover, terrestrial productivity)
- Used WRTDS to model daily, monthly, annual Si concentration + yield

Using this dataset to characterize river Si dynamics, and evaluate how it is changing over time and relative to N and P

Jankowski et al. 2025

Planned products

Table 2. List of publications and target journals

Paper	Target Journal	Potential Title	Brief Summary
1	Ecology Letters	Headwaters to mouths - A global evaluation of river silicon stoichiometry along the river continuum	Outcome of Q1. This paper will examine Si stoichiometry across wide ranging river size to understanding the ecological processes driving Si along the pathway from land to sea.
2	Limnology & Oceanography Letters	Shifting timing of Si exports relative to N and P into coastal receiving waters over last three decades	Outcome of Q2. This paper will examining changes in the seasonality of exports, specifically highlighting what that may mean for spring and fall diatom blooms.
3	Proceedings of the National Academy of Sciences	River silicon exports to global oceans are increasing over time	Outcome of Q1. This paper will address changing river Si across biomes and continents and what this means for changing Si availability in coastal receiving waters.
4	Nature Geoscience	Shifting loads, timing, and paradigms of controls on river silicon exports	Outcome of Q1, Q2. This will be a synthesis paper summarizing papers to date, specifically how they change our understanding of river Si.

← *Johnson et al, in review*

← *Jankowski et al, in prep*

2026 National Conference on Ecosystem Restoration
April 13 – 16
Omaha, Nebraska

- Two UMRR Special Sessions
- April 14

Connecting Research and Restoration in the Upper Mississippi River System

Jeffrey Houser
U.S. Geological Survey, La Crosse, WI

Introduction & Overview

Nathan De Jager
US Geological Survey, La Crosse, WI

Collaborative Modelling Improves Floodplain Vegetation Management Actions at Reno Bottoms: From Scenario Building to Flood Inundation Modelling to Forest Succession Model Outputs

Andrew Meier
USACE, La Crosse, WI

Collaborative Modelling Improves Evaluation of Proposed Floodplain Vegetation Management Actions At Reno Bottoms: Forest Succession Modeling, Habitat Evaluation, and Incremental Cost Analysis

Nicole Buckley
US Geological Survey, La Crosse, WI

Wind-Driven Sediment Resuspension in the Upper Mississippi River: Understanding Wave Dynamics to Guide Habitat Restoration

Jeffrey Houser
US Geological Survey, La Crosse, WI
(on behalf of Nicole Ward, Minnesota Department of Natural Resources, Lake City, MN)

A Systems Approach to the Science – Management Interface: Improving Both Research and Decision Making

Kristen Bouska
US Geological Survey, La Crosse, WI

A Restoration Science Framework for Linking Restoration Actions and Ecological Responses at Site to System Scales

Leveraging Data Analysis to Inform Implementation Actions for Habitat on the Upper Mississippi River

Benjamin Vandermyde
US ACE, Rock Island District, Rock Island, IL

Introduction & Overview

Molly Van Appledorn
US Geological Survey, La Crosse, WI

Leveraging Big Data and Expert Knowledge to Develop a Forest Classification System for Improved Stewardship of Mississippi and Illinois River Floodplain Ecosystems

Brian Stoff
USACE, West Alton, MO

Identifying Local Area Inundation Expectancy, Drainage Capacity, and Geomorphology Conditions to Correlate Suitable Forest Community Type to Manage

Bruce Henry
US Fish and Wildlife Service, Onalaska, WI

Considering Floodplain Forest Dynamics and Expectations of Growth and Structural Development Potential for Unique Forest Community Types

Alicia Carhart
Wisconsin Department of Natural Resources, La Crosse, WI

Using Simple Models to Understand the Distribution of Areas Suitable for Vegetation Restoration in a Large River

Benjamin Vandermyde
USACE, Pleasant Valley, IA

Landform Alteration to Enable Natural Function of Ridge and Swale Geomorphology to Establish Suitable Conditions for Forest Community Types

Implementation Planning Update

- All IP and many Science Meeting projects were paused in FY25
- Project Status Evaluations completed (Feb-Apr)
- In renewal or restart processes
  - Restoration Science Research Framework (soft start)
  - Macroinvertebrates intended FY27
  - Science Meeting projects, e.g. plants & phys. Forces

UMRR Analysis Team Draft Agenda April 22, 2026

Microsoft Teams Webinar
Connection information:
https://teams.microsoft.com/meet/286264302721147?p=5safsrBBxcGjsvZAP3

Meeting ID: 286 264 302 721 147
Passcode: kC6JL9xk
Join by phone
+1 608-571-2209, United States, Madison
Phone conference ID: 822 995 260#

Date: Wednesday April 22nd, 2026

Time: 1:00 pm – 4:30 pm

Chair: Shawn Giblin, Wisconsin Department of Natural Resources

1:00-1:15- Introduction and Roll Call- Shawn Giblin

1:15-1:25- Time, place, and type of next meeting (late July? next UMRR-CC is August 5th) and approval of January A-Team meeting minutes -Shawn Giblin

1:25-1:55- UMRR and LTRM update - Marshall Plumley and Davi Michl (Jim Fischer)

1:55-2:10- LTRM Science Update- Jeff Houser and Jim Fischer

2:10 –2:35- "Big River Bluegill: How and Why Population Dynamics Vary Along Large River Gradients" Kristen Bouska

2:35-3:00 "Development of a Machine Learning (ML)–Based Dashboard for Real-Time Monitoring and Adaptive Management of Aquatic Insect Populations in the Upper Mississippi River" Dipankar Mitra

3:00-3:10 Break

3:10- 3:30 "Towards an Integrated Framework for Floodplain Vegetation Monitoring, Research, and Modeling in the Upper Mississippi River System" Matthew Trumper

3:30-3:45 "Data visualization using RShiny and GitHub Repositories for Pool 8 of the UMR" Patrick Kelly

3:45-4:05 "Landform Alteration to Enable Natural Function of Ridge and Swale Geomorphology to Establish Suitable Conditions for Forest Community Types" Ben Vandermyde

4:05-4:30 Agency Updates

4:30- Adjourn

Methods

Data collection
- Leverage LTRM field stations
- Daytime electrofishing
- 10 individuals per cm length group
- June 15 – October 31, 2018-2020

Age estimation
- Species-specific procedures
- Otolith thin-sectioning & imaging

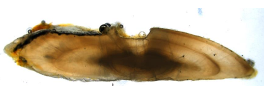
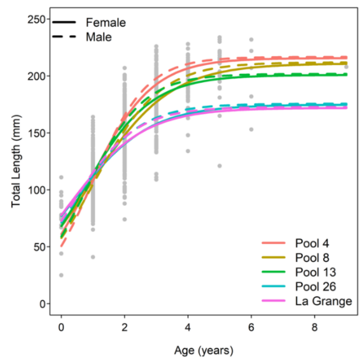


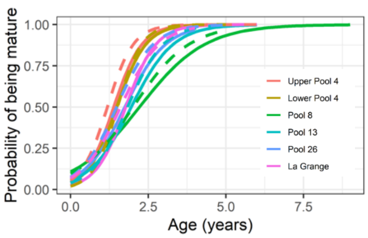
Photo: Illinois River Biological Station

Photo: Kristen Bouska, USGS

Photo: Jason DeBoer, INHS

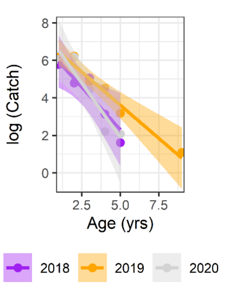
Results – growth and maturity





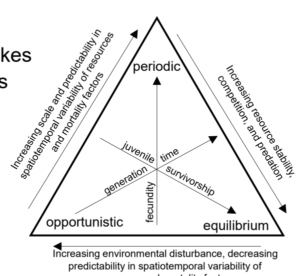
Results – mortality

Study reach	Year	Annual mortality (95% confidence interval)
Upper Pool 4	2018	51.4 (-197.3 – 92.1)
	2019	61.3 (-12.6 – 86.7)
	2020	-
Lower Pool 4	2018	39.3 (-243.5 – 89.3)
	2019	67.4 (45.0 – 80.7)
	2020	-
Pool 8	2018	59.7 (19.4 – 79.9)
	2019	50.7 (36.0 – 62.1)
	2020	68.6 (26.9 – 86.5)
Pool 13	2018	78.9 (45.7 – 91.8)
	2019	71.0 (43.5 – 85.1)
	2020	79.3 (54.1 – 90.7)
Pool 26	2018	81.0 (-168.8 – 98.7)
	2019	81.8 (21.1 – 95.8)
	2020	74.0 (-1051.9 – 99.4)
La Grange	2018	70.3 (-26.1 – 93.0)
	2019	69.2 (-8.2 – 91.3)
	2020	68.2 (10.6 – 88.7)



Discussion – riverine bluegill dynamics

- Fast growth
  - Mean length at age > midwestern lakes
- Early maturity
  - Age at which 50% maturity < midwestern lakes
  - Asymptotic mean length < midwestern lakes
- High mortality
  - Mortality = heavily exploited lakes
- Optimum set of life traits varies with environmental conditions



Adapted from Winemiller 2005

UMRR Analysis Team Meeting, April 22, 2026

Development of a ML–Based Dashboard for Real-Time Monitoring and Adaptive Management of Aquatic Insect Populations in the UMRR

Speaker: Dr. Dipankar Mitra

Associate Professor,
Department of Computer Science & Computer Engineering,
University of Wisconsin–La Crosse
La Crosse, WI

Talk arc

- Why Hexagenia monitoring needs an operational upgrade
- What our validated radar pipeline already does well
- Where machine learning enables nowcasting, forecasting, and anomaly detection
- How a dashboard can turn ecological signals into management actions

UW-LA CROSSE

Why this problem now?

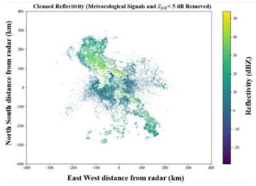
Monitoring gap

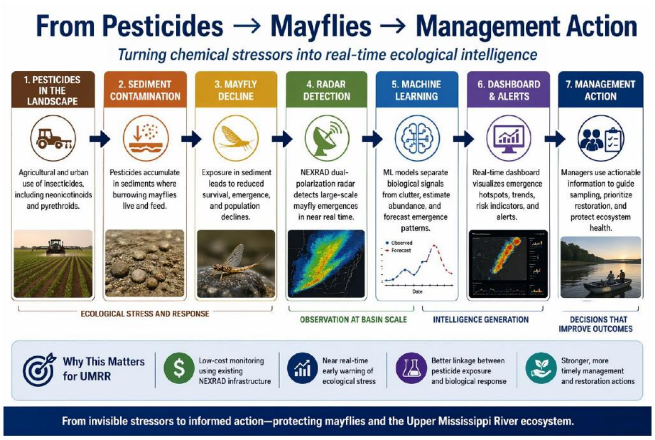
- Burrowing mayflies remain one of the clearest biological signals of sediment quality, dissolved oxygen, and ecosystem productivity.
- Yet management still relies heavily on episodic benthic surveys and delayed interpretation rather than near real-time ecological intelligence.
- That delay matters when restoration timing, field verification, and cross-reach prioritization are all time-sensitive.

52%	2.7B	5 min
decline reported in UMR mayfly populations (2012–2019)	mayflies detected aloft in one KARX case study (Aug. 1, 2024)	target latency for automated alerts and management products

Hexagenia makes a biological signal visible at basin scale

Hexagenia image adapted from user-provided presentation.





15

What We Need to Operationalize This

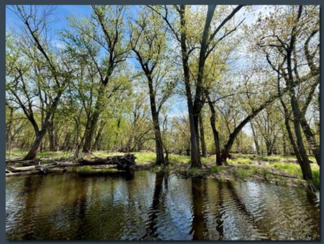
- **Student Support (Core Team)**
  - 2 M.S. students (24 months): ML pipeline, forecasting, system integration
  - 1 undergraduate student: data processing, visualization, dashboard support
- **Research & Data Collaboration**
  - Access to LTRM datasets and historical baselines
  - Coordination for targeted field validation during emergence events
  - Input on management thresholds and alert criteria
- **Pilot Deployment (UMRR Partnership)**
  - Selection of 1–2 river pools for pilot testing
  - Manager feedback on usability and workflow integration
- **Modest Funding Support**
  - Student stipends
  - Cloud computing and data infrastructure
  - Dashboard deployment and maintenance

16

USGS science for a changing world

Upper Mississippi River Restoration

The National Great Rivers Research & Education Center



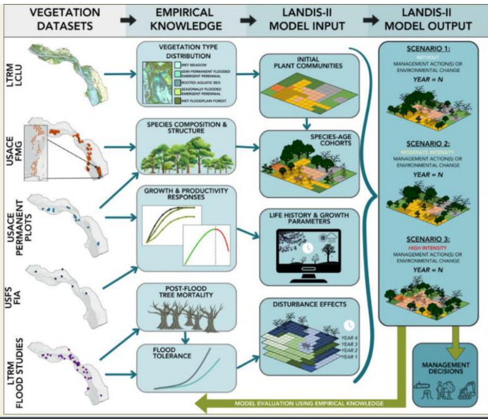
Towards an integrated framework for floodplain vegetation monitoring, research, and modeling in the Upper Mississippi River System

Matthew Trumper[1], Shelby Weiss[2], Nathan De Jager[1], Lyle Guyon[2], Molly Van Appledorn[1]

[1]U.S. Geological Survey Upper Midwest Environmental Sciences Center
[2]National Great Rivers Research and Education Center

U.S. Department of the Interior
U.S. Geological Survey

Integrated Floodplain Vegetation Monitoring, Research, and Modeling

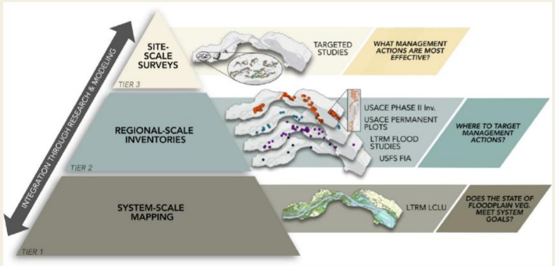


USGS

Upper Mississippi River Restoration

Future Directions

- A variety of datasets that continue to get collected
- A series of routine analyses
  - Status and trends
  - Targeted research
  - Process-based modeling
- Potential for expanded monitoring and research efforts
- Addressing management questions across scales



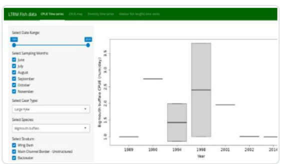
Adapted from Bricker and Ruggiero (1998)

Key Takeaways

- We have the datasets and inter-agency partnerships needed to take a hierarchical approach to monitoring floodplain vegetation in the UMRS—coordination is key moving forward
- Empirical research and modeling play complementary roles in identifying and filling data/knowledge gaps and integrating data across scales
- Integrating multiple datasets across scales can enrich insights and recommendations for management
- As new questions are raised, evaluating them within this framework can inform future efforts and priorities
- Additional work is ongoing related to floodplain vegetation in the UMRS
  - Floodplain Vegetation Working Group established
  - Targeted research using existing data
  - Tools for data visualization
  - LANDIS-II updates

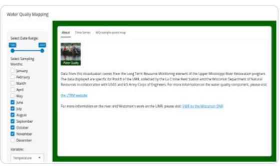
Questions?

saweiss@lc.edu
mtrumper@usgs.gov
ndejager@usgs.gov



LTRM Pool 8 Fish Data

5w

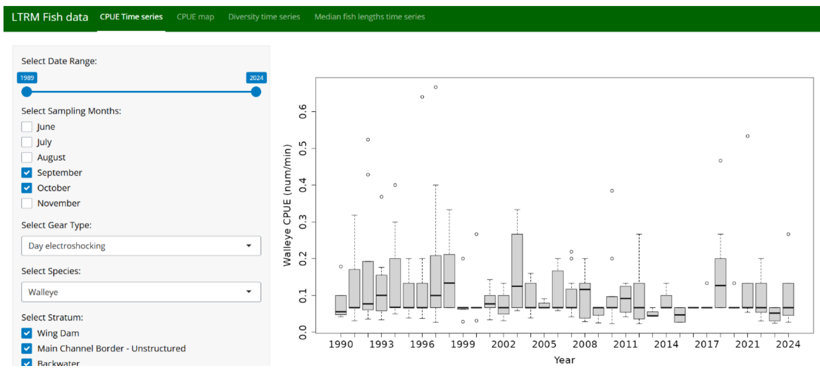


Pool 8 Water Quality Mapping

This app provides a time series of water quality data collected from both Fixed Sites and Stratified Random Sampling events for pool 8 given user specified time range and constituent of interest. The app also maps the locations and values ...

Show more

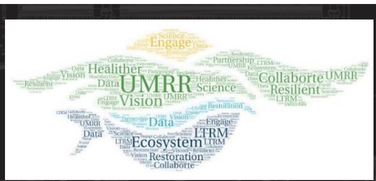
2w

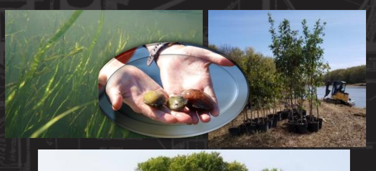


BENJAMIN VANDERMYDE
US ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT

National Conference on Ecosystem Restoration
13th to 16th April 2026

Landform Alteration to Enable Natural Function of Ridge and Swale Geomorphology to Establish Suitable Conditions for Forest Community Types





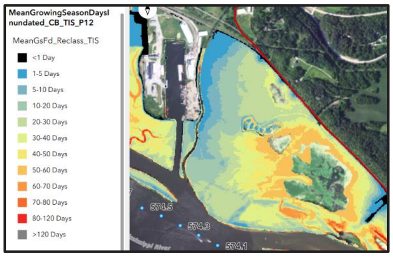
U.S. ARMY
US Army Corps of Engineers

UMR RAPID FOREST LOSS AFTER 2019

U.S. ARMY

Accretion has Resulted in Terrestrial Areas Holding Water at an Elevation that is Higher than the Main Channel Water Surface Elevation Several Months into the Growing Season

Pool 12 – Menominee River
Dead Zone in the Summer



Upper Mississippi River Restoration

UMR FOREST ECOLOGY NATURAL PROCESS

Floodplain Forest are Capable of Withstanding Seasonal Flooding
- Understanding what Promotes Growth and where to Expect Extensive Tree Mortality

Pool 13 – Green Island
Growing Season Flood

Trees to Focus On
1. Silver Maple
2. Eastern Cottonwood
3. Willow Species
4. Hard Mast Species
5. Light Seeded Species

Upper Mississippi River Restoration
Leading · Innovating · Partnering

U.S. ARMY

RESHAPING LANDFORM TO RIDGE AND SWALE

Ensure the Design is Representative of Natural Landform Mosaic of Variability
- Uniformly Pushing Excavated Material Parallel to Swale Limits Success of Growth

Pool 14 – Beaver Island
Dead Zone in the Summer

Pool 14 – Beaver Island
Dredge Placement in Summer

Upper Mississippi River Restoration
Leading · Innovating · Partnering

UMRR Analysis Team Draft Agenda April 22, 2026

Microsoft Teams Webinar
Connection information:
https://teams.microsoft.com/meet/286264302721147?p=5safsrBBxcGjsvZAP3

Meeting ID: 286 264 302 721 147
Passcode: kC6JL9xk
Join by phone
+1 608-571-2209, United States, Madison
Phone conference ID: 822 995 260#

Date: Wednesday April 22nd, 2026

Time: 1:00 pm – 4:30 pm

Chair: Shawn Giblin, Wisconsin Department of Natural Resources

1:00-1:15- Introduction and Roll Call- Shawn Giblin

1:15-1:25- Time, place, and type of next meeting (late July? next UMRR-CC is August 5th) and approval of January A-Team meeting minutes -Shawn Giblin

1:25-1:55- UMRR and LTRM update - Marshall Plumley and Davi Michl (Jim Fischer)

1:55-2:10- LTRM Science Update- Jeff Houser and Jim Fischer

2:10 –2:35- "Big River Bluegill: How and Why Population Dynamics Vary Along Large River Gradients" Kristen Bouska

2:35-3:00 "Development of a Machine Learning (ML)–Based Dashboard for Real-Time Monitoring and Adaptive Management of Aquatic Insect Populations in the Upper Mississippi River" Dipankar Mitra

3:00-3:10 Break

3:10- 3:30 "Towards an Integrated Framework for Floodplain Vegetation Monitoring, Research, and Modeling in the Upper Mississippi River System" Matthew Trumper

3:30-3:45 "Data visualization using RShiny and GitHub Repositories for Pool 8 of the UMR" Patrick Kelly

3:45-4:05 "Landform Alteration to Enable Natural Function of Ridge and Swale Geomorphology to Establish Suitable Conditions for Forest Community Types" Ben Vandermyde

4:05-4:30 Agency Updates

4:30- Adjourn

Questions?

UPPER MISSISSIPPI RIVER RESTORATION PROJECT SOIL ANALYSES

Aaron McFarlane
Biologist
St. Paul District
20 May 2026

aaron.m.mcfarlane@usace.army.mil

U.S. ARMY

COLLABORATORS AND THANKS

U.S. ARMY

Study Team:
Nia Hurst[2]
Aaron McFarlane[1]
Dr. Carina Jung[2]
Dr. Charles Theiling[2]
Dr. Jacob Berkowitz[2]
Lewis Wiechmann[1]

Thanks to Many Collaborators!
Andrew Meier[1]
Ben Vandermyde[1]
Steve Gustafson[1]
Allison Nickel[1]
Robert Cosgriff[1]
Megan McGuire[1]
Dr. Stephen Winter[3]
Jillian Harms[1]
Madelyn Roesch[2]
Tate Sattler[1]
and others….

1: USACE – St. Paul, Rock Island, and St. Louis Districts
2: USACE Engineer Research and Development Center, Vicksburg, MS
3: USFWS, Winona, MN

McFarlane, AM, Hurst, NR, Jung, CM, and CH Theiling. 2024. Evaluating Soil Conditions to Inform Upper Mississippi River Floodplain Restoration Projects. ERDC-EL TR-24-6. Vicksburg, MS: US Army Engineer Research Center. http://dx.doi.org/10.21079/11681/48451

Theiling, CH, McFarlane, AM, Hurst, NR, Berkowitz, JF, and BC Suedel. 2024 Conway Lake Ecosystem Restoration: Soil Investigations to Support Engineering With Nature and Beneficial Use of Dredged Sediment. ERDC-EL DOER-24-5. Vicksburg, MS: US Army Engineer Research Center. http://dx.doi.org/10.21079/11681/49473

Berkowitz, J.E. and Hurst, N.R., 2022. New initiatives improve wetland restoration outcomes: engineering with nature and the use of natural and nature-based features. https://ewn.erdc.dren.mil/wp-content/uploads/2022/04/WSP_EWN_NNBF_Berkowitz_Hurst_2022.pdf

FROM THIS…

U.S. ARMY

…TO THIS

U.S. ARMY

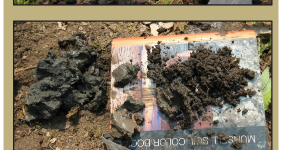
REPLACING THIS.

U.S. ARMY

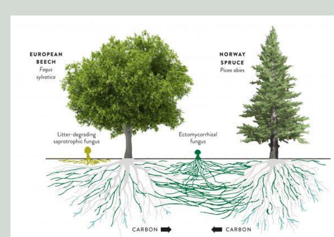
IT'S SOIL!

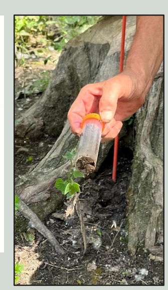
U.S. ARMY

Soil Physical / Chemical Properties

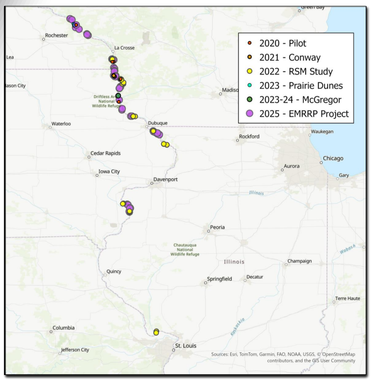


Soil Biology - Microbes





SOIL SAMPLING OVERVIEW



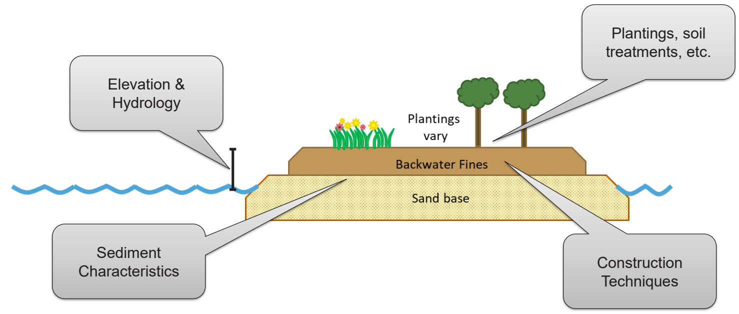
Sites Sampled 2020-2025:

Restoration sites – outcomes	(16)
Restoration sites – development	(2)
Natural reference sites	(24)
Historical dredged material placement	(19)

~ 300 soil evaluation plots.

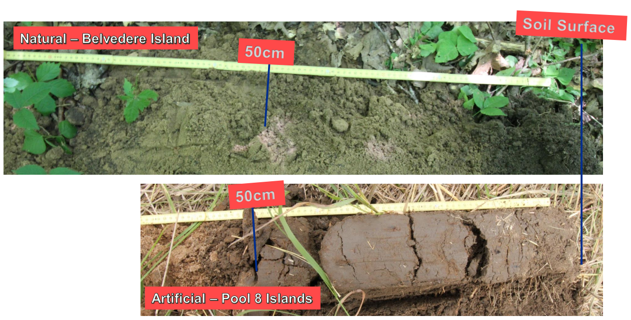
Largest project to date started in 2024 and is entering analysis phase now.

UMR RESTORATION ISLANDS

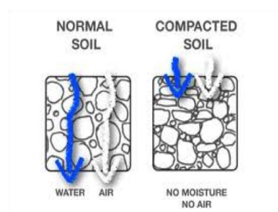


SEDIMENT CHARACTERISTICS

Representative Sediment Cores from 2020



SEDIMENT CHARACTERISTICS



Pool 8 Islands and Capoli vs. Natural

	Depth	Bulk Density (g/cm³)
Natural	0-10	1.13 ± 0.1
	10-20	1.17 ± 0.1
Manmade	0-10	1.35 ± 0.04
	10-20	1.52 ± 0.05

Table 1. General relationship of soil bulk density to root growth based on soil texture.

Soil Texture	Ideal bulk densities for plant growth (g/cm³)	Bulk densities that restrict root growth (g/cm³)
Sandy	< 1.60	> 1.80
Silty	< 1.40	> 1.65
Clayey	< 1.10	> 1.47

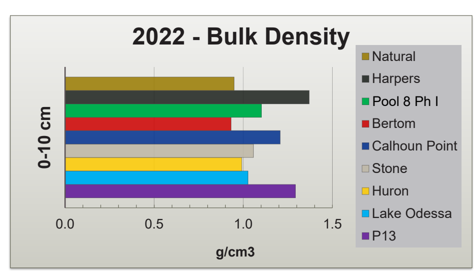
SEDIMENT CHARACTERISTICS

Compaction – localized and sitewide

SEDIMENT CHARACTERISTICS

Testing in 2022 indicated greater variability in some restoration sites…

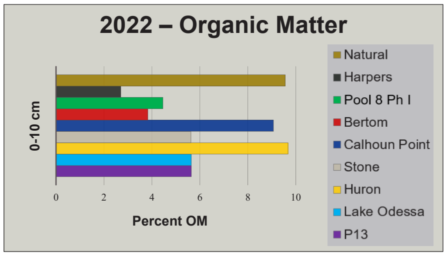
Will re-address in upcoming analysis.



SEDIMENT CHARACTERISTICS

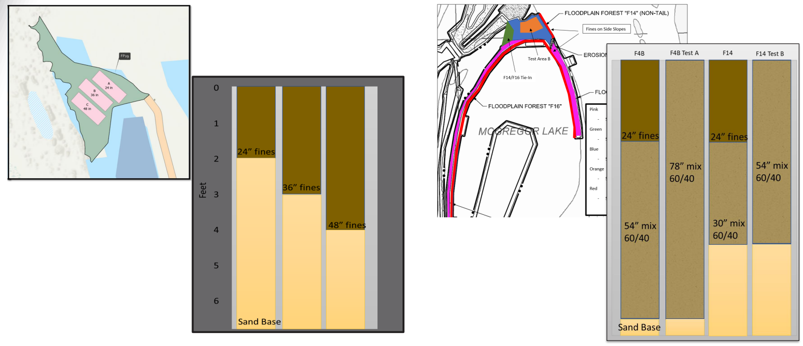
Organic matter significantly lower at most restoration sites compared to natural sites, both 2020 and 2022.

Organic matter reduces the bulk density, holds water, provides nutrients…

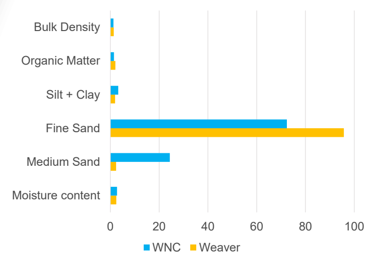


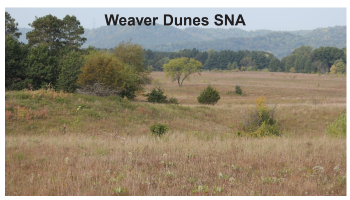
SEDIMENT CHARACTERISTICS

Conway and McGregor HREP – Soil Test Plots

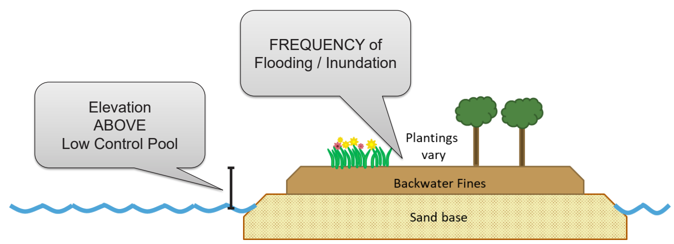


POOL 5 SAND DUNE PRAIRIE RESTORATION

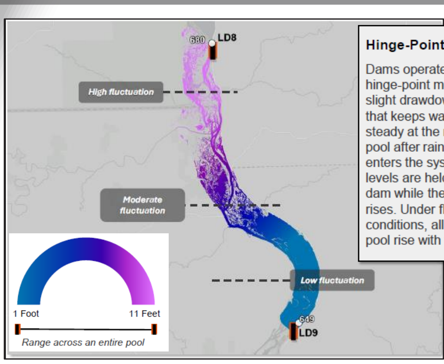




HYDROLOGY

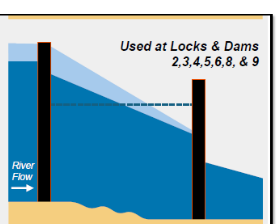


HYDROLOGY



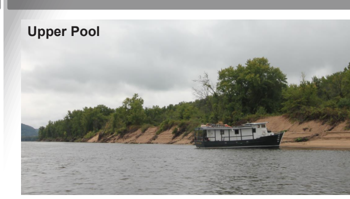
Hinge-Point

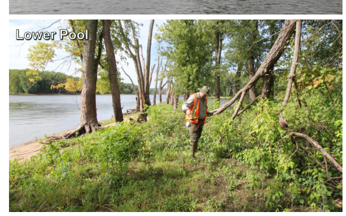
Dams operated with the hinge-point method use a slight drawdown at the dam that keeps water levels steady at the middle of the pool after rain. As more rain enters the system, the water levels are held steady at the dam while the upper end rises. Under flood conditions, all areas of the pool rise with the flood.



Figures available in McFarlane, Fasching, Keenan, and Case. 2025. Communication Materials to Support Implementation of Growing Season Drawdowns. Sustainable Rivers Program.

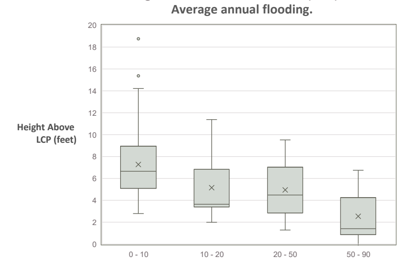
HYDROLOGY





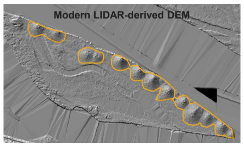
Soil sample locations 2025, n=108.

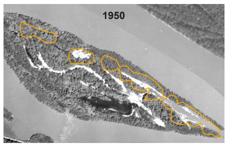
Height Above Low Control Pool (LCP) vs. Average annual flooding.



EMRRP 2024-26

Historical Dredged Material Placement Sites:
Extended Soil Development Trajectory



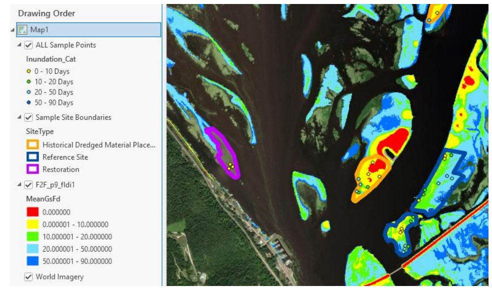


Ground Truthing

EMRRP 2024-26

Major advances from previous studies:

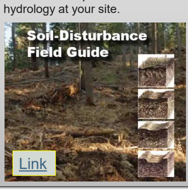
- Inundation site pairing (controls for one of the most critical floodplain vegetation variables, comparable between pool areas, focused on inundation ranges that restoration projects would best target for floodplain veg).
- Large-scale, randomized
- Historical placement (although not intended for restoration), represents longer-term soil development of DM



SUMMARY – SOILS AND UMR RESTORATION

Recommendations:

- Be mindful of compaction.
- Consider construction methods and equipment, mixing, etc.
- Characterize your source material, especially for fines, and consider ways to add organic matter.
- Consider all implications of hydrology at your site.



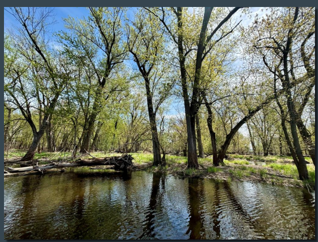
On Deck

- Large-scale analysis of 2025 sampling data.
- Database identifying historical DM placement sites.
- Design recommendations (via UMRR Handbook)

Future…

- Additional experimental designs (e.g., TSI blended topsoil, sandier blends, microbial inoculation, etc.)
- Soil development insights from repeated HREP monitoring.
- Studies to build on EMRRP project results.

USGS science for a changing world | Upper Mississippi River Restoration | The National Great Rivers Research & Education Center



Towards an integrated framework for floodplain vegetation monitoring and research in the Upper Mississippi River System

Matthew Trumper[1], Shelby Weiss[2], Nathan De Jager[1], Lyle Guyon[2], Molly Van Appledorn[1]

[1]U.S. Geological Survey Upper Midwest Environmental Sciences Center
[2]National Great Rivers Research and Education Center

U.S. Department of the Interior
U.S. Geological Survey

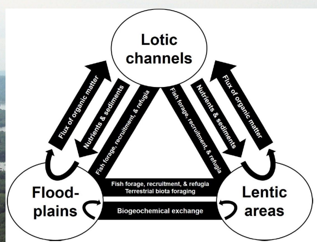
Upper Mississippi River Restoration
Leading · Innovating · Partnering

Floodplain vegetation working group:

Andy Meier, Ben Vandermyde, and Brian Stoff (USACE), Jim Lamer (INHS), Dave Bierman (IA DNR), Dave Herzog (MDC), Patrick Kelly (WI DNR), Nicole Ward (MN DNR), Stephen Winter and Lauren Larson (USFWS), Danelle Larson and John Delaney (USGS), Tara Hohman (Audubon)

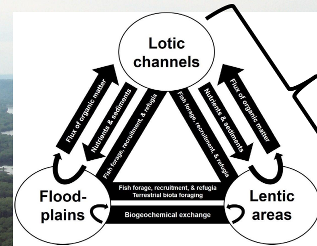
US Army Corps of Engineers | U.S. Fish & Wildlife Service | USGS | Iowa DNR | Wisconsin Dept. of Natural Resources | mn Department of Natural Resources | Missouri Department of Conservation | Illinois Department of Natural Resources | United States Environmental Protection Agency | Illinois Natural History Survey Prairie Research Institute | USDA | UMRBA Upper Mississippi River Basin Association | Audubon

Long Term Resource Monitoring in the UMRS



Bouska et al. (2018)

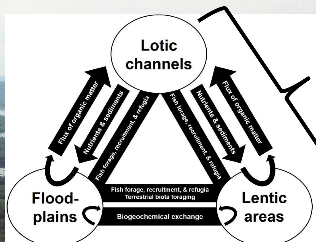
Long Term Resource Monitoring in the UMRS



Bouska et al. (2018)

Water quality | Fish | Aquatic veg | Invertebrate

Long Term Resource Monitoring in the UMRS



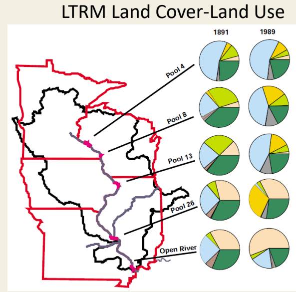
Bouska et al. (2018)

Water quality | Fish | Aquatic veg | Invertebrate

No component for floodplain vegetation

Floodplain Vegetation Monitoring in the UMRR Program

LTRM Land Cover-Land Use



Yin (1999)

LTRM Flood Study

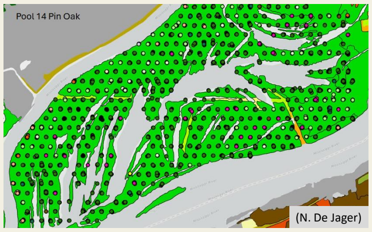
(R. Cosgriff)

(R. Cosgriff)

Floodplain Vegetation Monitoring in the USACE Operations and NESP Programs

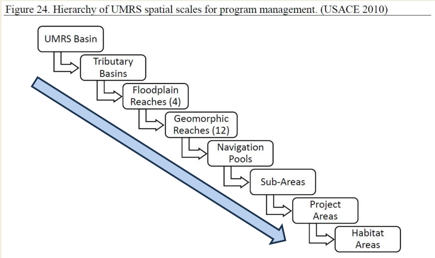
Permanent Plots

Phase II Inventory



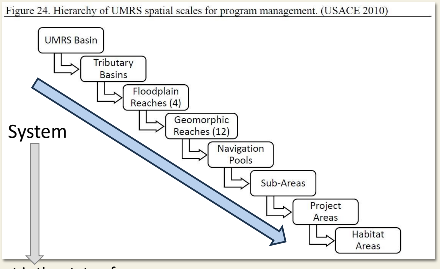
A Turning Point:

Guyon et al. (2012)



A Turning Point:

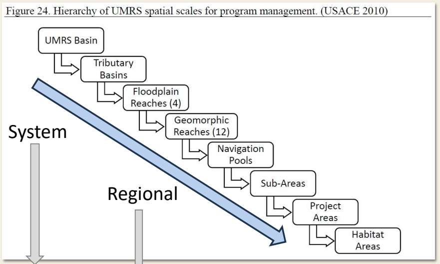
Guyon et al. (2012)



What is the state of floodplain veg?

A Turning Point:

Guyon et al. (2012)

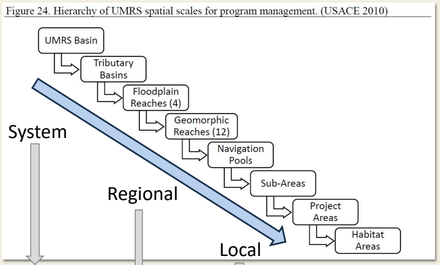


What is the state of floodplain veg?

Where should we target management actions?

A Turning Point:

Guyon et al. (2012)



What is the state of floodplain veg?

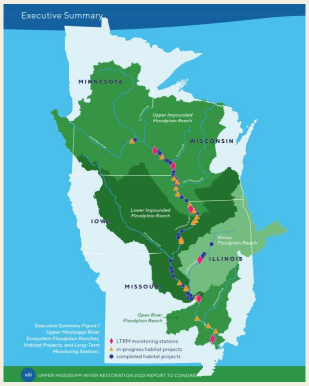
Where should we target management actions?

What treatments are most effective?

Information Need: Floodplain Vegetation Change Across the System

Purpose

- Utilize existing data sets and tools to understand and quantify long-term changes in floodplain plant communities



UMRR 2022 Report to Congress

Floodplain Vegetation Workshop
January 7-8, 2025, Moline, Illinois

US Army Corps of Engineers · U.S. Fish & Wildlife Service · USGS science for a changing world · IOWA DNR · Wisconsin Dept. of Natural Resources · mn Department of Natural Resources · Missouri Department of Conservation · Illinois Natural History Survey Prairie Research Institute · The National Great Rivers Research & Education Center · Audubon

Evaluating Existing Monitoring and Research Datasets

- Systemic land cover-land use
- Local-scale studies
- Forest inventory and monitoring plots

LTRM Flood Study
556 plots in 1995
347 plots in 2021, across 8 pools

USACE Phase II Inventory
~37,000 plots across 22 pools

USACE Permanent Plots
~330 plots across 22 pools

USFS FIA
~140 plots across 31 pools

Barriers to Monitoring

Weiss et al. (2026)

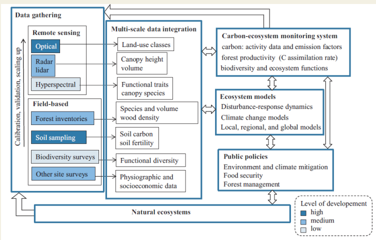
Proceedings of the Floodplain Vegetation Monitoring Workshop for the Long Term Resource Monitoring Element of the Upper Mississippi River Restoration Program, January 7–8, 2025, Moline, Illinois

By Shelby A. Weiss, Matthew L. Trumper, Nathan R. De Jager, Lyle J. Guyon, and Molly Van Appledorn

Weiss et al. (2026)

Integrated Monitoring Programs

- How to make use of existing sites and datasets?
- Conceptual frameworks can help by establishing links among sites and datasets, identifying gaps in monitoring, and developing a common understanding



Bustamante et al. (2016)

Hierarchical frameworks are useful in river-floodplain systems

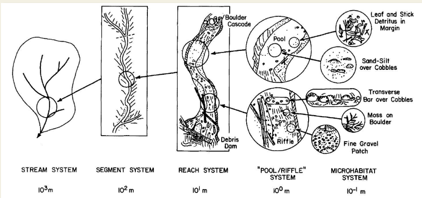
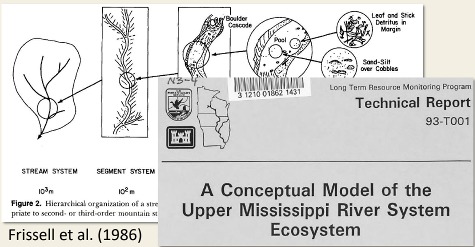


Figure 2. Hierarchical organization of a stream system and its habitat subsystems. Approximate linear spatial scale, appropriate to second- or third-order mountain stream, is indicated.

Frissell et al. (1986)

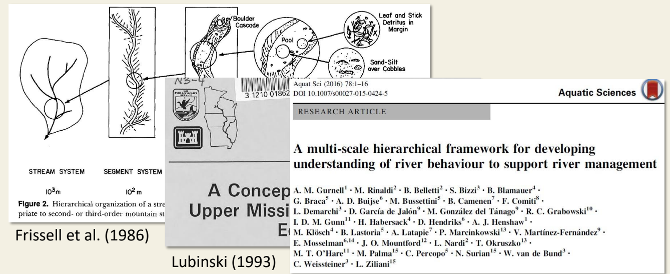
Hierarchical frameworks are useful in river-floodplain systems



Frissell et al. (1986)

Lubinski (1993)

Hierarchical frameworks are useful in river-floodplain systems

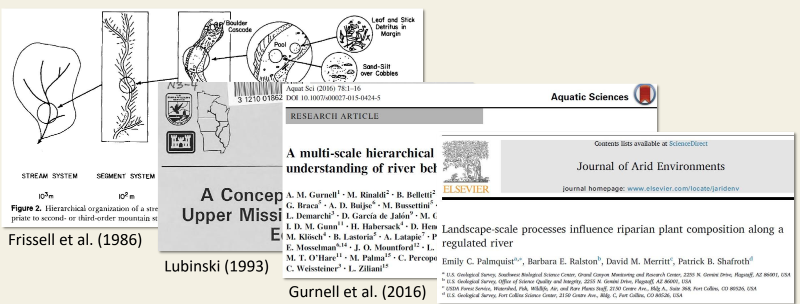


Frissell et al. (1986)

Lubinski (1993)

Gurnell et al. (2016)

Hierarchical frameworks are useful in river-floodplain systems



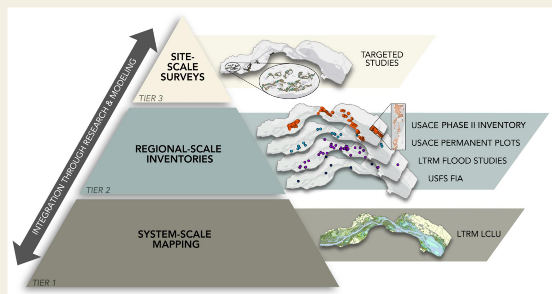
Frissell et al. (1986)

Lubinski (1993)

Gurnell et al. (2016)

Palmquist et al. (2018)

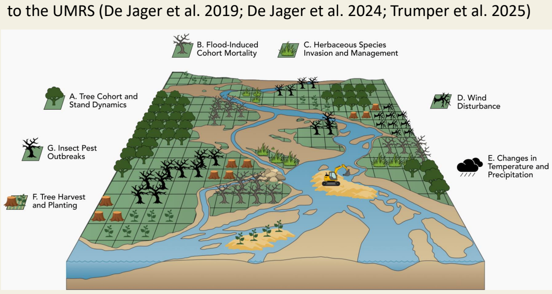
Multi-tier Monitoring Design



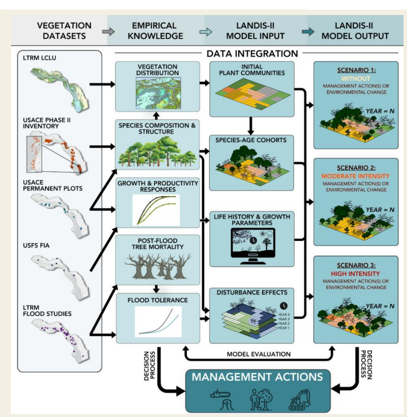
Adapted from Bricker and Ruggiero (1998)

Integration Through Research and Modeling

The LANDIS-II model has been adapted for floodplain ecosystems and applied to the UMRS (De Jager et al. 2019; De Jager et al. 2024; Trumper et al. 2025)

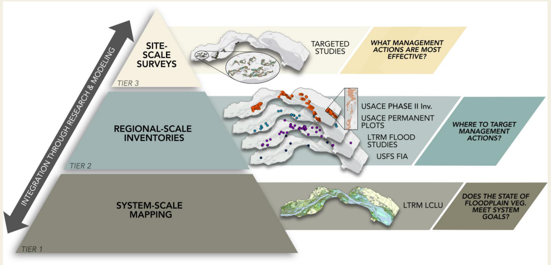


Integrated Floodplain Vegetation Monitoring, Research, and Modeling



Future Directions

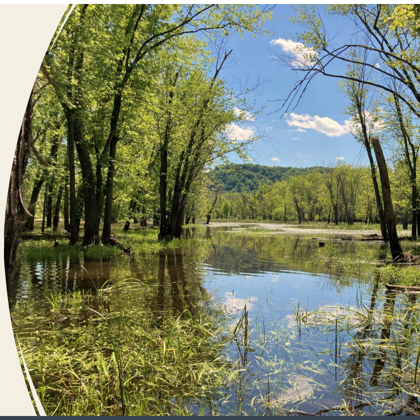
- A variety of datasets that continue to get collected
- A series of routine analyses
  - Status and trends
  - Targeted research
  - Process-based modeling
- Potential for expanded monitoring and research efforts
- Addressing management questions across scales



Adapted from Bricker and Ruggiero (1998)

Takeaway

We have the data and inter-agency partnerships needed to take a hierarchical approach to monitoring floodplain vegetation in the UMRS—coordination is key moving forward



Questions?

saweiss@lc.edu
mtrumper@usgs.gov
ndejager@usgs.gov

USGS