Upper Mississippi River Restoration Program Coordinating Committee Quarterly Meeting

November 16, 2016

Highlights and Action Items

Program Management

- On September 29, 2016, Congress enacted a continuing resolution authority (CRA) for FY 17 that expires on December 9, 2016. The Corps-wide policy is to spend at the lowest amount included for UMRR in the either the FY 2017 President's budget or the House's or Senate's energy and water appropriations measures. **All three measures include $20 million for UMRR and thus it is the Corps current operating funding level under the existing FY 17 CRA.**

- **At the $20 million planning scenario, UMRR's FY 17 internal allocations are as follows**:
  - Regional Administration and Programmatic Efforts – $891,000
  - Regional Science and Monitoring – $6,567,000
    - Long term resource monitoring – $4,500,000
    - Regional science in support of restoration – $963,000
    - Regional science staff support – $129,000
    - Habitat project evaluations – $975,000
  - Habitat Restoration – $13,716,000
    - Regional project sequencing – $250,000
    - MVP – $3,631,600
    - MVR – $6,318,500
    - MVS – $3,515,900

  [Note: The District habitat restoration funds are not reflective of the historical split based on river mileage, and instead are allocated based on construction capability.]

- OMB's April 29, 2016 guidance to all federal agencies re the FY 18 budget development process is that the current Administration will not conduct a formal budget request from federal agencies to OMB and no formal respective pass-backs, and rather the new Administration will finalize the budget request. However, the Corps has been approaching the FY 18 budget development through its standard protocols. **On November 9, 2016, Marv Hubbell participated in a briefing with staff from OMB and ASA(CW) Jo-Ellen Darcy's office re UMRR's FY 18 budget**.

- OMB and ASA(CW) Darcy have taken a very detailed approach to evaluating budget proposals for Corps programs and projects, including for UMRR, that has required more detailed descriptions of accountability in spending and accomplishments. Hubbell said District staff developed a six-year plan for implementing HREPs, demonstrated accountability through a number of restoration- and science-related metrics, and explained UMRR's importance in the context of current rates of ecosystem degradation and success in restoring ecological health and resilience. Hubbell said he anticipates that future budget justifications will require greater demonstrations of accountability and success and will have less flexibility to adjust priorities among individual project and specific science

endeavors. It will require that new documentation approaches and tools be developed to track and report progress and accomplishments, as well as interesting, compelling, and consistent messages about the need for continued investment in UMRS ecosystem restoration and monitoring.

- **A final draft 2016 UMRR Report to Congress was formally submitted to MVD on November 21, 2016**. MVD is scheduled to submit the report to Headquarters in mid to late November, and then Headquarters will submit it to ASA(CW) Jo-Ellen Darcy, completing the Corps' RTC obligation. In addition, District staff are developing a four-page brochure to accompany the full report.

- **UMRBA sent a November 14, 2016 letter to House and Senate leadership explaining the states perspectives on several matters related to the 2016 water resources development act legislation, including the Corps' non-federal sponsor cost share agreements (PPAs)**. The letter stated the states preference for including an option to cap non-federal sponsors' OMRR&R obligations to 50 years and to create a more shared approach to liability. UMRR Coordinating Committee members discussed the possibility to proposing an alternative PPA template using a UMRR HREP for context that partners believe would be mutually acceptable by the states and Corps.

- Dru Buntin emphasized the importance for non-federal sponsors to deliver a shared message to the new Administration and UMRS delegation re the importance of UMRR. UMRBA plans to work with coalitions like MRCTI and ICWP to deliver these messages to key decision makers.

Habitat Restoration

- North and Sturgeon Lakes HREP is deferred until such time that a non-federal cost share sponsor is identified. MVP will continue to explore alternative options for advancing the project.

- Construction was recently initiated on Clarence Cannon. The project involves a series of award options to allow for flexibility depending on the appropriations process.

- Pools 25 and 26 Islands is in the process of closing out; MVS is finalizing the project's O&M and then will conduct a site visit with USFWS.

- Planning is being initiated on Delair Division, which is moving ahead of Boston Bay as the project lacks a non-federal sponsor.

- Lake Odessa is now considered closed-out, with the final inspection recently complete.

- MVR awarded construction contracts for Pool 12 Overwintering Stage III and Huron Island Stage II, and completed repairs to flood damages at Rice Lake.

- The Habitat Needs Assessment II (HNA II) is moving ahead with two concurrent activities: 1) a system-wide inventory of existing habitat resources and 2) a review of ecological objectives (or desired conditions) to ultimately identify habitat needs and associated restoration projects and other management actions. **Next, the HNA II Chairs will convene a conference call with the Steering Committee and consult the District-based river teams re reach-based ecological objectives. In addition, a long-range plan will be developed for integrating the information developed during the next year with current management objectives, providing opportunities to define new or modify existing objectives, and combining the system-wide habitat inventory results with the refined management objectives to determine habitat needs.**

- UMRBA will be working with an *ad hoc* committee to plan for a regional water level management workshop, including developing objectives and an agenda for partner review. A primary goal will be to foster dialogue about the challenges and opportunities for larger-scale water level management.

- The September 27-29, 2016 UMRR HREP Team Meeting included a series of presentations on the Corps project development projects, non-federal sponsors' perspectives related to habitat projects, and the opportunities, challenges, and technical aspects of restoration involving water level management, floodplain forests, backwater lakes, and longitudinal and lateral hydraulic connectivity. In addition, presentations were given on LTRMP's monitoring design and major findings as well as the ongoing resilience effort. The last day included facilitated discussion about improving HREP monitoring related to aquatic and wetland vegetation, fisheries, floodplain forest, mussels, sedimentation and geomorphology, water quality, and wildlife.

Long Term Resource Monitoring

- Accomplishments of the fourth quarter of FY 2016 include:
  - Publication of six manuscripts:
    1) A comparison of metabolic rates in off-channel habitats of the middle Mississippi River;
    2) A comparison of main and side channel physical and water quality metrics and habitat complexity in the middle Mississippi River;
    3) Long-term changes in fish community structure in relation to the establishment of Asian carps in a large floodplain river;
    4) Long-term decreases in phosphorous and suspended solids, but not nitrogen, in six upper Mississippi River tributaries;
    5) The Mississippi River: A place for fish
    6) Particle size distribution of main-channel-bed sediments along the upper Mississippi River.
  - Publication of a technical report: Documenting the use of the Long Term Resource Monitoring element's fish monitoring methodologies throughout the Midwest
  - The new Mussel Community Assessment Tool (MCAT) for the Upper Mississippi River
  - An updated fish graphical browser

- **The UMRR Coordinating Committee voted to endorse a $36,848 proposal to research trends in backwater sedimentation rates in a special meeting held via conference call on November 3, 2016. The A-Team recommended the proposal, which will utilize FY 16 carry-over funds and will compare the current bed elevations in Pools 4, 8, and 13 with sediment transect surveys completed in 1997 and 2001.**

- **On behalf of the UMRR LTRM management team, Jeff Houser sent a November 3, 2016 email to field station team leaders, A-Team members, and UMESC LTRM staff soliciting a request for research proposals. Proposals are due on December 9, 2016 and should be sent to the LTRM management team (Marv Hubbell, Karen Hagerty, Jennie Sauer, and Houser). The total available funding for projects in FY 17 is approximately $98,150.**

- The October 26, 2016 A-Team meeting included a series of presentations focused on answering questions related to how water velocity drives water quality and habitat outcomes. The meeting also included programmatic updates and a discussion and consideration of proposed fish indicators.

- Deanne Drake presented on recent findings suggesting that LTRM's sampling underestimates the abundance invasive curlyleaf pondweed in areas where it is somewhat abundant. This is because vegetation sampling occurs after its peak production. Drake presented on a possible way to correct abundance scores to more accurately reflect abundance.

Other Business

- **Upcoming quarterly meetings are as follows:**
  - **February 2017 — Quad Cities**
    - UMRBA quarterly meeting — February 7
    - **UMRR Coordinating Committee quarterly meeting — February 8**
  - **May 2017 — St. Louis**
    - UMRBA quarterly meeting — May 23
    - **UMRR Coordinating Committee quarterly meeting — May 24**
  - **August 2017 — La Crosse**
    - UMRBA quarterly meeting — August 8
    - **UMRR Coordinating Committee quarterly meeting — August 9**

UMRR CC Quarterly Meeting
November 16, 2016 St. Paul, MN

Marvin E. Hubbell - MVR
UMRR Regional Program Manager

Mississippi Valley – Rock Island District (MVR)
Mississippi Valley – St. Louis District (MVS)
Mississippi Valley – St. Paul District (MVP)

US Army Corps of Engineers
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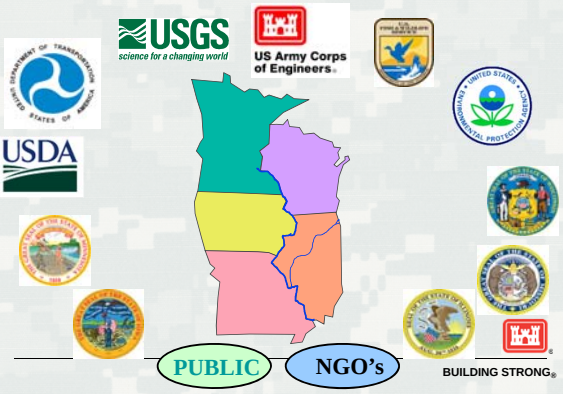
UMRR Program Partners



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FY 16

President's Budget	$ 19,787,000
House	$ 19,787,000
Senate	$ 19,787,000
Appropriation	$ 19,787,000
FY16 Work plan	$ 1,387,000
FY16 Total	$ 21,174,000

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FY16 Plan of Work

TOTAL FY16 Program	**$21,174,000**
Regional Administration and Program Efforts	**$ 891,000**
Regional Management	$ 595,000
Program Database	$ 95,000
Program Support Contract (UMRBA)	$ 76,000
Public Outreach	$ 60,000
2016 Report to Congress	$ 65,000
Regional Science and Monitoring	**$ 6,567,000**
LTRM (Base Monitoring)	$ 4,500,000
UMRR Regional Science In Support Rehabilitation/Mgmt. (MIPR's, Contracts, and Labor)	$ 963,000
UMRR Regional (Integration, Adapt. Mgmt, model cert.)	$ 129,000
Habitat Evaluation (**split equally between MVS,MVR,MVP**)	$ 975,000
District Habitat Rehabilitation Efforts (Planning and Construction)	**$13,716,000**
Rock Island District	$ 6,318,500
St. Louis District	$ 3,515,900
St. Paul District	$ 3,631,600
HNA II	$ 250,000

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FY 17

President's Budget	$ 20,000,000
House	$???
Senate	$???
Appropriation	$
FY17 Work plan	$
FY17 Total	$

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FY17 Plan of Work

TOTAL FY17 Program	**$20,000,000**
Regional Administration and Program Efforts	**$ 761,000**
Regional Management	$ 543,000
Program Database	$ 75,000
Program Support Contract (UMRBA)	$ 78,000
Public Outreach	$ 50,000
2016 Report to Congress	$ 15,000
Regional Science and Monitoring	**$ 6,714,000**
LTRM (Base Monitoring)	$ 4,610,000
UMRR Regional Science In Support Rehabilitation/Mgmt. (MIPR's, Contracts, and Labor)	$ 1,000,000
UMRR Regional (Integration, Adapt. Mgmt, model cert.)	$ 129,000
Habitat Evaluation (**split equally between MVS,MVR,MVP**)	$ 975,000
District Habitat Rehabilitation Efforts (Planning and Construction)	**$12,525,000**
Rock Island District	$ 4,363,600
St. Louis District	$ 4,005,700
St. Paul District	$ 4,005,700
HNA II	$ 150,000

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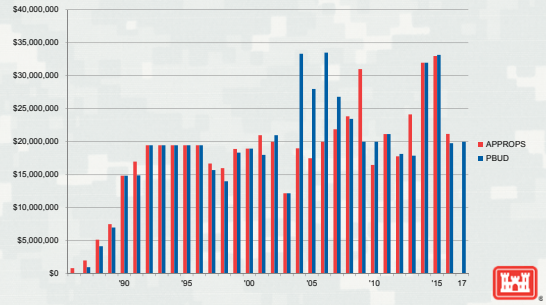
UMRR Program Appropriation/Budget History



FY1985 to FY2016

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FY 18 PBUD

- President's Budget $??????
- House $
- Senate $

- PBUD in Feb. 2017 $ 20,000,000

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FY18 Budget Guidelines

- Memorandum from OMB (Pages B6-B8)
  - ►States that the FY18 Budget will be submitted by the next President.
- We currently preparing our FY18 budget packages similar to past years and are prepared to make adjustments as directed.

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Increasing Competition For Funding

- FY18 – Articulate!
  - ►Accomplishments
  - ►6 years plan
  - ►Accountability
  - ►Why what we do is important

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Key Results

- Execution (Obligations)
  - ►2011-2013 Average 94.8%
  - ►2014-2016 Average 99.2%
- UMRR Delivers (since 2010 RTC)
  - ►Projects –
    - Construction completed – 7 projects, 26,610 ac.
    - In Construction – 5 projects, 14,400 ac.
    - Completed Feasibility Reports – 7 projects
    - In Feasibility – 11 projects
    - Average project cost per acre ~ $3,000
    - Average Total Program cost per acre ~ $5,238

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Key Results

- Science
  - Light Detection and Ranging (LiDAR) (2.7 m acres)
  - 2010 Land Cover and Land Use
  - Bathymetry
  - Topobathy
  - Monitoring Network (six field stations five states)
    - ▷ Annual SOW - 67 separate milestones
  - Research
    - ▷ Annual SOW - 45 separate milestones
    - ▷ Development of landscape, health, & resilience Indicators
    - ▷ Documenting impact of Asian carps

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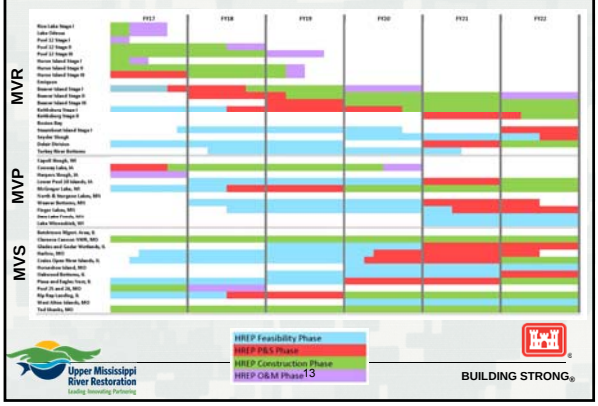
UMRR Six Year Plan



OMB and OASA Trends

- Accountability – Continuing to increase
- Flexibility - Decreasing
- More documentation and new tools to report and measure progress

Measuring Success

- Acres
- Indicators
  - ►Resiliency (developing)
  - ►Health (done)
- System is degrading at an estimated rate of 1% - 3%. UMRR restoring at less than 1%. HNA II should help quantify

UMRR Program Strategic Plan Key Points

- First formal Program Vision
- First formal Mission Statement
- Four Goal Statements
  - ►Enhance Habitat for Restoring and Maintaining a Healthier and More Resilient UMRS.
  - ►Advance Knowledge for Restoring and Maintaining a Healthier and More Resilient UMRS
  - ►Engage and Collaborate with Others
  - ►Utilize a Strong, Integrated Partnership

Reports to Congress

2016 Report to Congress

- 2016 Schedule
  - ►Nov. 18 – Submit final RTC to MVD and HQ
  - ►Dec. 31 – Transmittal to Congress

Project Partnership Agreements (PPA)

- Sept. 2014 UMRR Leadership Summit
- May 11, 2016 Letter to Mr. Stockton
  - ►Indemnification
  - ►OMRR&R in perpetuity
  - ►Crediting nonprofit organizations for the value of donated goods

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Project Partnership Agreements (PPA)

- June 30, 2016 Letter to UMRBA
- Statutory requirements for Indemnification and OMRR&R are long standing and reaffirmed in WRDA86)
  - ►Exception to indemnification for damages due to the fault or negligence of the US or its contractors
  - ►Corps can recognize that OMRR&R may change over time

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Project Partnership Agreements (PPA)

- Credit for in-kind contributions
  - ►If materials, services, or other things are donated by a third party, the non-federal sponsor incurs no cost and thus is not eligible for credit under Section 221.
    - Section 203 of WRDA92 allows a third party to contribute towards a project which would reduce the total cost benefiting both the Fed. Gov. and non-fed. sponsor proportionately.

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Project Partnership Agreements (PPA)

- Future Actions
  - ►Changes to these requirements would require legislative action because they are statutory.
  - ►Offer to “engage in detailed discussions” to find the best way to address concerns without negatively impacting the Civil Works program.

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Public Communications and Outreach

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UMRRP Habitat Rehabilitation and Enhancement Projects

As of November 2016:
55 Projects Completed
5 Projects in Construction
30 Projects in Design

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ST. PAUL DISTRICT (MVP)
FY16 HREP Work Plan (August 2016)

PLANNING – in priority order…..

North & Sturgeon Lakes Islands and overwintering, Pool 3, MN – ($250k) –reallocate $1.5M to MVR
- Complete Feasibility Report
- Complete P&S/award base contract in FY17

Conway Lake Floodplain forest and overwintering, **Pool 9, IA – ($250k)**
- Complete Draft Feasibility

McGregor Lake Islands, Pool 10, WI – ($50k)
- Continue Draft Feasibility

Other studies in the planning queue with approved fact sheets…Pool 10 Islands, [illegible], Weaver Bottoms & [illegible] Lake Ponds

CONSTRUCTION

Capoli Slough Islands, Pool 9, WI ($20k)
- Earth Day tree plantings
- Project dedication on 13 May 2016 in Ferryville, Wisconsin.

Harpers Slough Islands, Pool 9, IA ($300k)
- Stage 1 - Newt Marine – Remob in March.

EVALUATION
- Baseline & Post Project Monitoring
- Performance Evaluations Ambrough Slough, Island 42, Polander, Trempealeau & Pool 8 Phase II

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ST. LOUIS DISTRICT (MVS)
FY17 HREP Work Plan (November 2016)

PLANNING

Rip Rap Landing, IL *$40k*
- Final Draft Feasibility complete –
  - MVD Commander Concurrence with exception of RE
  - *HQ level discussions between agencies (NRCS)*

Piasa & Eagles Nest Islands, IL *$250k*
- Complete Draft Report of the TSP
  - Complete Public Meeting
  - Complete ATR

Crains Open River Island, IL *$250k*
- Complete Draft Report of TSP
  - Complete ATR

Harlow Open River Islands, MO *$200k*
- Complete Draft Report of TSP
  - Initiate ATR

Other studies in the Queue *$30k*

EVALUATION *$150k*

Baseline Monitoring & Post Project Monitoring

Performance Evaluation – Stag Island & Pharrs Island final 1st Qtr. FY17.

DESIGN

Clarence Cannon Refuge, MO *$550k*
- Complete Pump Station Design
- Initiate Levee Setback Design

Ted Shanks, MO *$50k*
- Deadman Slough

CONSTRUCTION

Ted Shanks, MO *$775k*
- Complete Debris Shield SR1/HL1
- Complete Draft O&M Manual
- Pump Station – underway

Pools 25 & 26 Islands, MO
- Complete Closeout *$50k*
  - *Complete O&M Manual*

Clarence Cannon Refuge , MO *$2.0M*
- *Exterior Gravity Drain Water Control Structure - underway*

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Ted Shanks Construction

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Ted Shanks Construction

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ROCK ISLAND DISTRICT (MVR)
FY17 HREP Work Plan (November 2016)

PLANNING
- Beaver Island, Pool 14, IA **($150K)**
- Delair, IL **($153K)**
- Keithsburg Division, Pool 18, IL **($203K)**

DESIGN
- Beaver Island Stage I, Pool 14, IA **($130K)**

CONSTRUCTION
- Lake Odessa Flood Recovery, IA Pools 17 and 18, IA3 **($72k)**
- Pool 12 Overwintering Stage I, Pool 12 IL **($39k)**
- Pool 12 Overwintering Stage II, Pool 12 IL **($269K)**
- Pool 12 Overwintering Stage III, Pool 12 IL **($1.7M)**
- Huron Island Stage I, Pool 18, IA **($42K)**
- Huron Island Stage II, Pool 18, IA **($200K)**
- Rice Lake Stage I, IL LaGrange Pool **($16K)**

EVALUATION
- FWS **($240K)**
- Baseline Monitoring
- Post Project Monitoring
- Performance Evaluations **($93K)** Bay Island, Andalusia, Brown's Lake
- Adaptive Mgmt. Pool 12

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Habitat Needs Assessment II

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UMRR Workshop

- When - September 27-29
- Chairs - Kara Mitvalsky, Sharonne Baylor, Jon Hendrickson
- Where - Davenport, IL
- Who – Planners, scientists, managers, all

UMRR Workshop

- Topics
  - ►Broad agency rehabilitation/restoration priorities
  - ►HREP development process
  - ►Climate change analysis
  - ►Forestry
  - ►Sedimentation and Dredging
  - ►Construction issues
  - ►Hydraulic Connectivity
  - ►O & M
  - ►Monitoring and Adaptive Management

UMRR Monitoring & Science FY2017

- **2 SOWs in FY17**
  - ►SOW for LTRM base monitoring **$4.61M** ($4.5 M in FY16)
  - ►SOW for science in support (analysis under base) **$1.0M** ($963K in FY16)
- **Both SOWs <u>together</u> are equivalent to a fully funded UMRR LTRM element**

$5.61M FY17 funds

UMRR Monitoring & Science FY2017

- FY17 LTRM SOWs funded with:
  - ►FY 2017 funding $ 5,610,000
  - ►Carry in funding $ 183,244
- **Total funds available**

$5,793,244

UMRR Monitoring & Science FY2017

	Budget (gross)	Carry-in (gross)
MN	$528,519	$25,874
WI	$533,598	
IA	$465,050	
IRBS	$398,802	
Great Rivers	$391,532	
IRBS	$437,430	
Equipment	$100,716	
LTRM component meeting travel	$7,101	
States sub total	$2,862,748	$25,874
STATES TOTAL	**$2,862,748**	**$2,836,874**
UMESC sub total	$2,723,473	$157,370
UMESC TOTAL	**$2,723,473**	**$2,566,103**
Corps tech reps	**$71,000**	**$71,000**
TOTAL FY17 LTRM BUDGET	**$5,657,221**	**$5,473,977**

UMRR Monitoring & Science FY2017

- FY17 LTRM SOWs funded with:
  - ►FY 2017 funds $5,610,000
  - ►Carry-in funds $ 183,244
  - ►**LTRM SOWs** $5,657,221
  - ►**Funds remaining for science**
    $ 136,023

UMRR Monitoring & Science FY2017

- **Funds remaining for science**
  $ 136,023
  - ► **Sediment transect proposal**
    $ 36,848
  - ► **Remaining funds $ 99,175**
    - **Proposal solicitation underway**
    - **Due 9 Dec**

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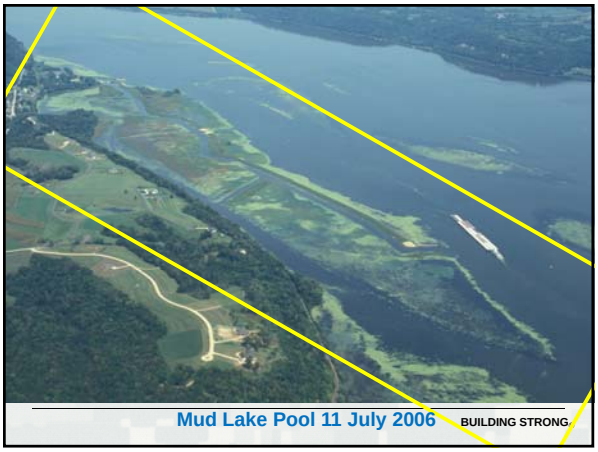


Mud Lake Pool 11 July 2006

HNA-II update

UMRR-CC November 2016 Quarterly Meeting

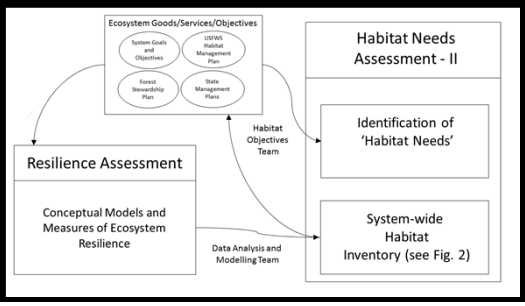
Major Activities (Oct. 2015-Nov. 2016)

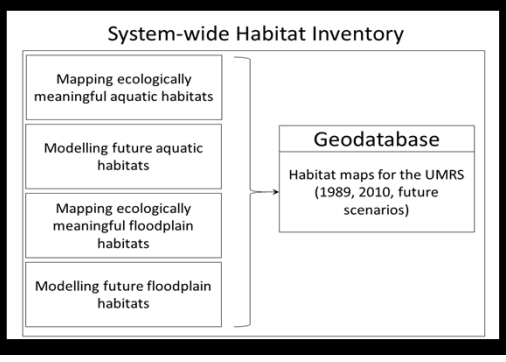
- Establishment of a Tri-Chair Committee (Oct. 2015)
  - Timothy Eagan (USACE, Project Management)
  - Nathan De Jager (USGS, Science)
  - Sara Schmuecker (USFWS, Resource Management)
- UMRR-CC meeting November 2015
  - Kick-off and introduce new data and ideas for HNA-II
- Bi-weekly conference calls among the Tri-Chairs (Winter 2015-2016)
- Establishment of a Steering Committee (Spring 2016)
  - Committee members represent the 'River Teams'
- Project Management Plan
  - Reviewed by Steering Committee and revised accordingly
- Steering Committee Face-to-face (September 2016)
  - Adoption of a two-tiered approach to implementation
    - Science/Information Development
    - Management Objectives/Identification of Habitat Needs

Tri-chair Planning Team:
Tim Eagan (USACE)
Sara Schmuecker (USFWS)
Nate De Jager (USGS)

Steering Committee Members:
Tom Novack (USACE)
Matt Vittello (MDC)
Joe McMullen (USFWS)
Mark Gaikowski (USGS)
Kathy Kowal (USEPA)
Dan Dieterman (MNDNR)*
Jeff Janvrin (WDNR)*
Kirk Hansen (IADNR)
Levi Solomon (IRNHS)*
Kat McCain (USACE)*
*Denotes a representative of a River Resource Team

Steering Committee Outcome #1: HNA-II is broken into two main activities: Conducting an assessment of the system (habitat inventory) and using that information, along with stated management objectives, to identify 'habitat needs' and associated restoration projects/management approaches.





Mapping and Modelling Aquatic Habitats

- Delineate primary features from aerial photography (e.g. side channels, backwaters, etc…) for 1989 (make compatible with 2010) and 2010.
  - Key Pools completed, remainder of the system to be completed by July, 2017
- Develop enhanced aquatic areas using bathymetry, connectivity metrics, navigation structures
  - Currently developing this for LTRM key pools
- Test associations between enhanced aquatic areas and water quality, aquatic vegetation, fisheries, mussels, and waterfowl data sets in areas where we have data.
  - Water quality, aquatic vegetation, fisheries data from LTRM SRS (work will begin in Jan 17)
  - Mussel and waterfowl data from other efforts.
- Provide maps of the distribution of enhanced aquatic areas for the UMRS, with tables and statistics that define their associations with water quality attributes, aquatic vegetation, fish, mussel and waterfowl communities (by end of FY 2017).

Modelling Future Aquatic Habitats

- Sedimentation in off-channel areas
- How might observed rates of sedimentation/erosion change lentic habitats over the next 50 years?
  - What species/communities/processes will be most impacted (positively or negatively) ?
  - How should we think about current management objectives given the trajectory that the system is on?

Mapping Floodplain Habitats

- Use lidar and gage data to model flood inundation
  - Methods are developed, UMRS complete early 2017.
- Use LTRM land cover data, USACE Forest Inventory and Permanent Plot data to examine relationships between flood inundation, land use history, other factors and vegetation type, forest composition, age structure, etc…
  - Starting in Dec/Jan 2017.
- Develop maps of 'suitability' for various vegetation types, forest compositions, age structures, etc… for UMRS
  - Complete by end of FY 2017

Modelling future floodplain habitats

- Focus on the distribution and abundance of primary vegetation types (e.g., herbaceous marsh, willow, cottonwood, oak, and maple forests.
  - How might these communities changes over time, as they age and as other 'stressors' impact them?
  - How might our current management actions better address floodplain vegetation concerns, given the trajectory that the system is on?
  - Model is currently in development.

Next Steps:

- Steering Committee meeting(s) to go over specific work items and get input on methods/data/observations.
- Review and refine management objectives through the River Teams
- Develop a long-range plan for how to
  - Integrate the information developed during the next year with current management objectives
  - Provide opportunities for new objectives and modification of older ones
  - Combine System Wide Habitat Inventory results with refined management objectives to determine Habitat Needs.

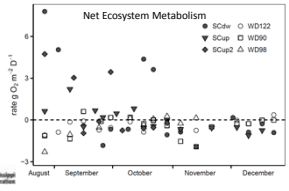
RIVER RESEARCH AND APPLICATIONS
River Res. Applic. (2016)
Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/rra.3097

A COMPARISON OF METABOLIC RATES IN OFF-CHANNEL HABITATS OF THE MIDDLE MISSISSIPPI RIVER

M. J. SOBOTKA* AND Q. E. PHELPS
Jackson, Missouri USA

Metabolic rates in the MMR

- Collected continuous temperature and oxygen data in off-channel habitats of the MMR from Aug to Dec 2013 in order to model primary production (GPP), respiration, and net ecosystem production (NEP).
- Compared rates in wing dike fields with those in side channels.



- Side channels had greater rates of NEP than wing dikes.
- NEP rates in side channels approached those found in the impounded UMR.
- NEP at wing dike sites was negatively correlated with discharge.

Metabolic rates in the MMR

- These results highlight the potential for high rates of primary production even in a large, turbid river and indicate the potential importance of primary production in the off channel areas of large river food webs

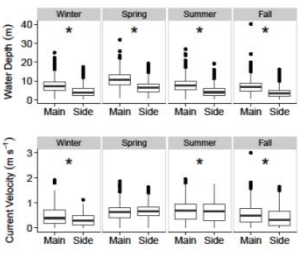
RIVER RESEARCH AND APPLICATIONS
River Res. Applic. (2016)
Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/rra.3061

A COMPARISON OF MAIN AND SIDE CHANNEL PHYSICAL AND WATER QUALITY METRICS AND HABITAT COMPLEXITY IN THE MIDDLE MISSISSIPPI RIVER

M. J. SOBOTKA* AND Q. E. PHELPS
Jackson, Missouri USA

Physical Characteristics

- Used LTRM data to compare conditions in the main and side channels of the MMR.
- Side channels provide shallower, lower velocity habitat compared to main channel areas.
- Organics make up a greater fraction of suspended solids in side channels.



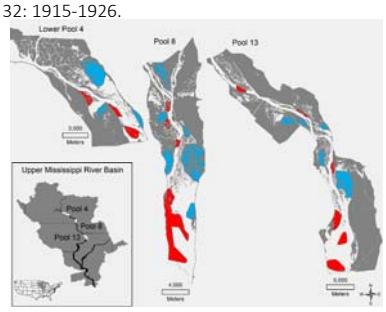
Variability

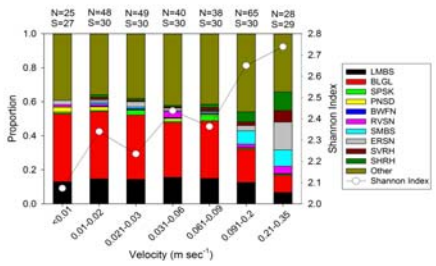
- Compared coefficient of variation between main and side channels and among seasons to asses the range of niches available.
- Variability was higher in side channels
- Both main and side channels were least variable and differences between them least in the spring.

		Levene's test $p < 0.05$			
		Winter	Spring	Summer	Fall
Depth COV	Main	0.39 ± 0.010^{a}	0.30 ± 0.007^{b}	0.37 ± 0.008^{a}	0.38 ± 0.010^{a}
	Side	$\mathbf{0.58 \pm 0.017^{a}}$	$\mathbf{0.38 \pm 0.008^{b}}$	$\mathbf{0.51 \pm 0.012^{a}}$	$\mathbf{0.57 \pm 0.017^{a}}$
Velocity COV	Main	0.76 ± 0.025^{a}	0.39 ± 0.009^{b}	0.48 ± 0.011^{c}	0.60 ± 0.018^{d}
	Side	0.69 ± 0.042^{a}	0.36 ± 0.012^{b}	$\mathbf{0.56 \pm 0.019^{a}}$	$\mathbf{0.96 \pm 0.050^{c}}$
Temperature COV	Main	$\mathbf{0.75 \pm 0.020^{a}}$	0.10 ± 0.002^{b}	0.06 ± 0.001^{c}	0.11 ± 0.003^{b}
	Side	0.61 ± 0.019^{a}	0.11 ± 0.002^{b}	0.06 ± 0.001^{c}	0.11 ± 0.003^{b}
SS COV	Main	1.38 ± 0.065^{a}	0.50 ± 0.016^{b}	0.61 ± 0.019^{b}	0.80 ± 0.036^{c}
	Side	$\mathbf{1.74 \pm 0.090^{a}}$	$\mathbf{0.63 \pm 0.019^{b}}$	$\mathbf{0.93 \pm 0.040^{c}}$	$\mathbf{1.12 \pm 0.048^{c}}$
DO COV	Main	0.05 ± 0.001^{a}	0.09 ± 0.002^{b}	0.10 ± 0.002^{b}	0.08 ± 0.002^{c}
	Side	$\mathbf{0.06 \pm 0.002^{a}}$	$\mathbf{0.10 \pm 0.003^{b}}$	$\mathbf{0.20 \pm 0.010^{c}}$	$\mathbf{0.11 \pm 0.004^{b}}$
Chl a COV	Main	1.04 ± 0.036^{a}	0.42 ± 0.015^{b}	$\mathbf{0.75 \pm 0.025^{c}}$	0.43 ± 0.010^{b}
	Side	1.00 ± 0.047^{a}	0.35 ± 0.011^{b}	0.67 ± 0.026^{c}	$\mathbf{0.47 \pm 0.014^{b}}$
% OM COV	Main	0.33 ± 0.007^{a}	0.19 ± 0.006^{b}	0.28 ± 0.008^{c}	0.22 ± 0.005^{d}
	Side	$\mathbf{0.51 \pm 0.022^{a}}$	$\mathbf{0.27 \pm 0.013^{b}}$	$\mathbf{0.58 \pm 0.028^{a}}$	$\mathbf{0.54 \pm 0.022^{a}}$

De Jager and Houser. 2016. Patchiness in a large floodplain river: associations among hydrology, nutrients, and fish communities. River Research and Applications 32: 1915-1926.

- In a previous study, De Jager and Houser (2012) identified a series of patches in the UMRS, defined by the ratio of TN:TP.
  - These patches reflect varying degrees of connectivity and associated rates and patterns of nutrient delivery and processing.
- In this study, we tested the hypothesis that fish communities differ between these two patch types.





Velocity was a better predictor of fish community metrics than nutrients, suggesting that connectivity is the primary driver of both nutrients and fish communities.

Ecological and Management Implications

- Large floodplain rivers, such as the UMRS, are mosaics of current velocities, nutrients, and biotic communities.
- Understanding the distributions of these variables, and their relation to quantitative targets (e.g., flow velocities > 0.1 m/sec), could be used to define habitat restoration criteria.

Documenting the use of the Long Term Resource Monitoring element's fish monitoring methodologies throughout the Midwest

Levi Solmon and Andy Casper

LTRM Technical Report: https://pubs.er.usgs.gov/publication/70175438

- LTRM fish methods are often cited at both local and national conferences by scientist not affiliated with UMRR or LTRM
- Question: how often do scientists outside the UMRR use the LTRM fish methods?
  - Distributed survey to fisheries scientists around the Midwestern US to find out.
- Results of survey:
  - Reached ~ 2000 scientists, 227 respondents (~11% participation)
  - 42% of all participants were aware of LTRM methods
  - 35% of all participants have used LTRM methods in their career
- Take home message: use of the LTRM fish methods have spread far beyond the UMRR and are potentially widely used throughout the Midwestern US.

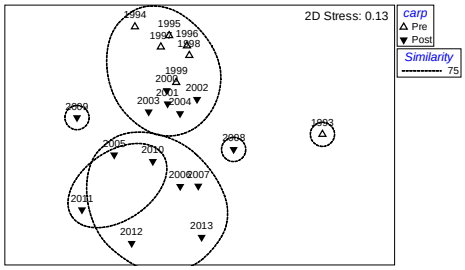
Long-term changes in fish community structure in relation to the establishment of Asian carps in a large floodplain river

Levi Solomon, Richard Pendleton, John Chick, and Andrew Casper

Biological Invasions, On-Line First DOI 10.1007/s10530-016-1180-8

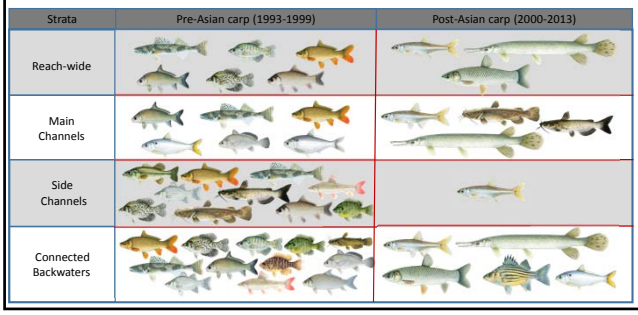
- Asian carps established in the La Grange Reach of the Illinois River in the year 2000 (caught in small numbers beginning in the early 1990's)
- Are now the dominant fish in the system
- What effects has this had on the existing fish community?
- LTRM routine monitoring data used to investigate

MDS plot: Pool wide day electrofishing



*Pre- and Post Asian carp fish communities significantly different using most LTRM gear

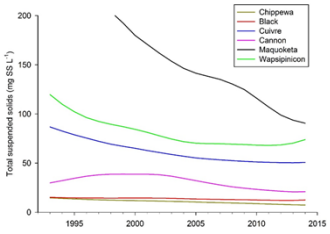
Fishes more numerically abundant pre- or post-Asian carp.



Long-term decreases in phosphorus and suspended solids, but not nitrogen, in six upper Mississippi River tributaries, 1991-2014

Becky Kreiling and Jeff Houser. Environmental Monitoring and Assessment 188:454

- Investigated trends in nitrogen, phosphorus, and total suspended solids in 6 UMR tributaries for the 23-year study period.
- TSS concentration and flux decreased in all 6 rivers.
- P concentration and flux decreased in the majority of the rivers.
- Not much change in TN in the majority of the rivers.
- Nitrate increased in 3 rivers.
- Possible explanation is that best management practices that target surface run-off have reduced TSS and P loads to the UMR.



- More restoration work is needed to target N leaching and run-off and nutrient loss through tile drains and groundwater infiltration.

The Mississippi River: A Place for Fish

Harold L. Schramm, Jr. and Brian S. Ickes

in Fishery Resources, Environment, and Conservation in the Mississippi and Yangtze (Changjiang) River Basins. Yushun Chen, Duane Chapman, John Jackson, Daqing Chen, Zhongjie Li, Jack Kilgore, Quinton Phelps, and Michael Eggleton, editors. American Fisheries Society Symposium 84:3–34.

- Describes current fisheries habitat throughout the Mississippi River.
- Identifies how management to achieve human benefits influences the fishes and their habitats
- Summarizes efforts to conserve and enhance fish habitat

Particle size distribution of main-channel-bed sediments along the upper Mississippi River, USA

Jonathan Remo, Reuben Heine, Brian Ickes

Geomorphology 264:118-131

- Rediscovered a 1925 study of bed sediments by Dr. Alfred Lugn in Augustana College's Library that provided a snapshop of pre-lock and dam sediment conditions.
- Conducted sample cruises 2011 – 2014 to collect main channel bed sediments for comparison with 1925 results.
- Study reach: 740 km from near Davenport, IA to Cairo IL.
- Found no overall differences in main-channel-bed sediment particle size and distribution between 1925 and present.
- Suggests:
  - Substrate conditions have not changed substantially in main channel
  - flow competencies within the modern navigation channel are similar to those within the historic channel.

Mussel Community Assessment Tool (MCAT) for the Upper Mississippi River

Teresa Newton (USGS-UMESC)
Steve Zigler (USGS-UMESC)
Heidi Dunn (Ecological Services, Inc.)
Jon Duyvejonck (USFWS, ret.)

Objective

- Objective: Develop and test a quantitative community assessment tool for native mussels that can be used to assess the health and mussel communities in the UMRS

MCAT Development

- Phase 1 (completed 2012) gathered data and identified 10 metrics for assessing relative health of communities
- Phase 2 (completed 2016) tested the MCAT using expert opinion (independent site scoring) and evaluated temporal variability in scores
- Compiled data was diverse (35 datasets; 14 pools; 2002-2014)

Metrics included in MCAT

Table 5. Description of final metrics used to develop the mussel community assessment tool in the Upper Mississippi River.

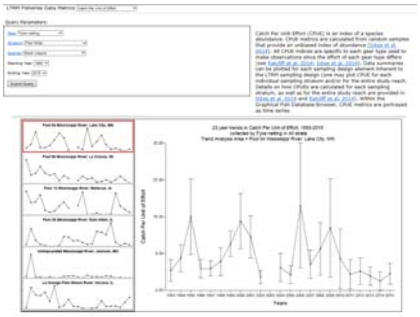
Metric	Description	Ecological significance
Conservation status/sensitivity		
% listed species	Percent of species listed by federal or state (IL, IA, MN, MO, WI) regulations as endangered, threatened or of special concern	Measure of the abundance of rare and sensitive species
% tolerant	Percent of species classified as tolerant (A. plicata, Q. quadrula, and O. reflexa)	Index of species that a relatively tolerant to human-induced changes to habitat or water quality
Taxonomic composition		
% tribe Lampsilini	Percent of mussels in the tribe Lampsilini	Index of balance in taxonomic composition (behavior, life history characteristics)
Population processes		
% fresh dead	Percent of fresh dead mussels	Index of recent mortality
% juveniles	Percent of aged mussels ≤ 5 years old	Index of recent recruitment to the community
% ≥ 15 years old	Percent of aged mussels ≥ 15 years old	Index of balanced age distribution
Abundance		
Abundance at 75th quartile	Abundance in the quadrats at the 3rd quartile (75th percentile)	Identifies abundance in high quality areas; may identify patches or if sampling occurs on the edge of a bed
Diversity		
Species evenness	Pielou's evenness index (J') estimated at the species level	Estimate of the dominance of the community by a few species
Evenness at the tribe level	Pielou's evenness index (J') estimated at the tribe level	Estimate of the dominance of the community by a tribe
ES_100	Expected number of species at a sample size of 100 mussels estimated via rarefaction	Estimate of species richness with equal sample sizes

Summary

- MCAT provided managers a quantitative means to evaluate the conservation value of native freshwater mussel assemblages in the UMR
- Opinions of mussel experts from State and Federal agencies, using their agencies procedures, generally agreed with rankings from the MCAT
- Metrics used to assess relative health did not vary appreciably over time

Updated Fish Graphical Browser

http://www.umesc.usgs.gov/data_library/fisheries/graphical/fish_front.html



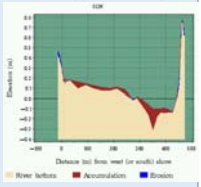
"Assessing recent rates of sedimentation in the backwaters of Pools 4, 8 and 13 to support river restoration and the Habitat Needs Assessment"

- Proposed work would assess changes in backwater depth since 2001
- Transects distributed across a range of backwater site conditions (depth, connectivity, etc)
- Improve our understanding of recent rates of sedimentation and relationship between sedimentation rates and backwater characteristics
- Improve forecasts of future conditions done as part of HNA II.

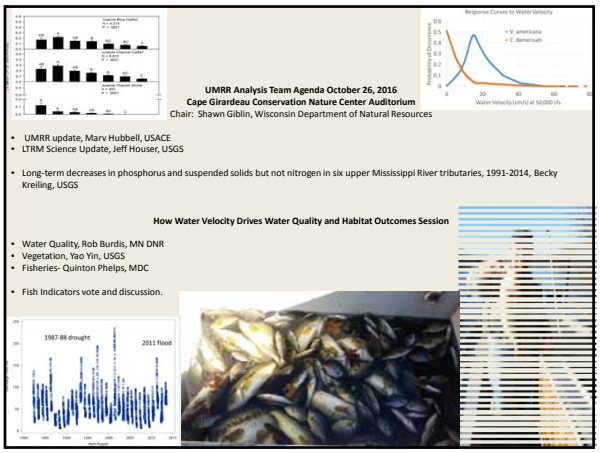
1997 – 2001 Backwater sedimentation study

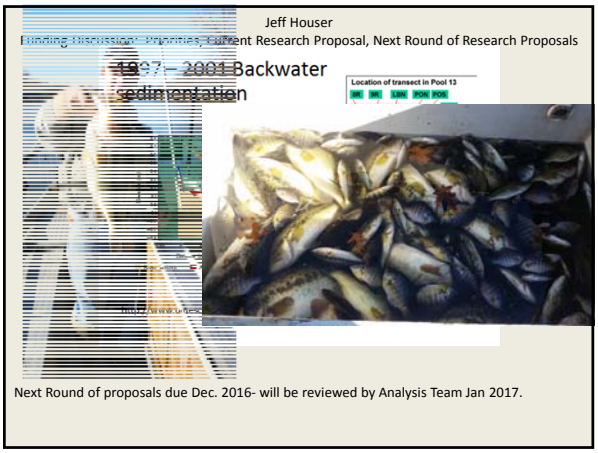
Map of Pool 13 Transects
(Similar distribution in Pools 4 and 8)

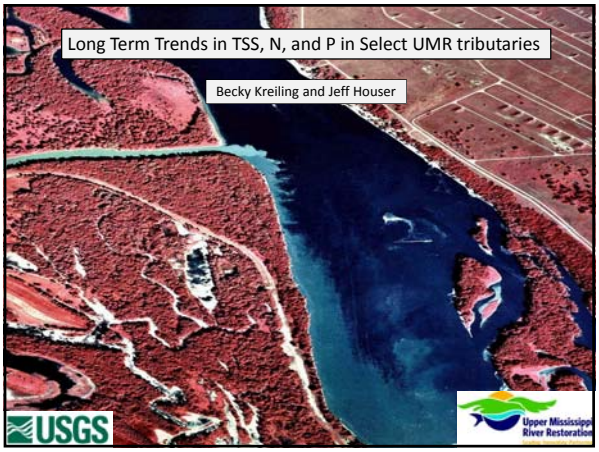
Results from Transect SLW
(Indicated by yellow box in left panel)

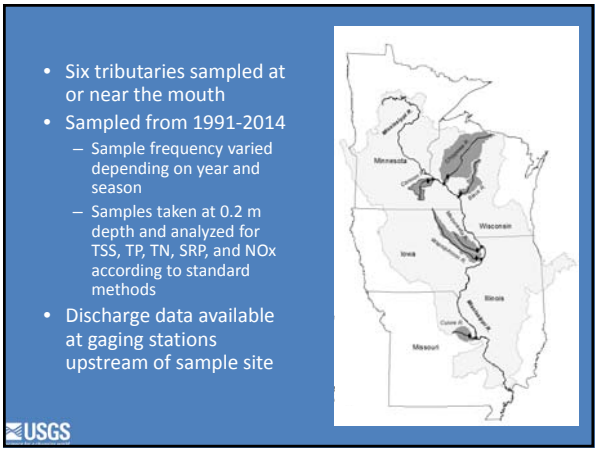


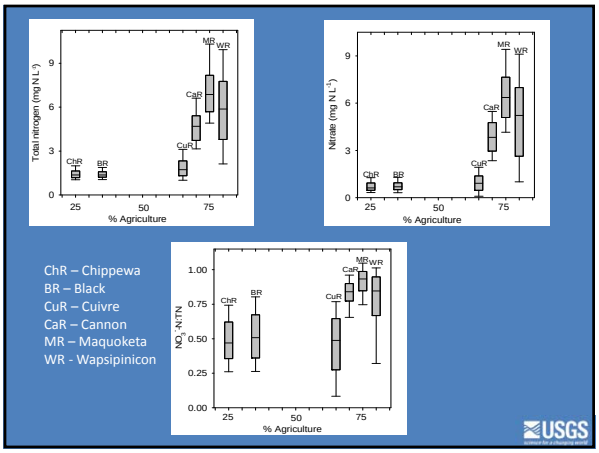
http://www.umesc.usgs.gov/data_library/sedimentation/backwater_rates.html

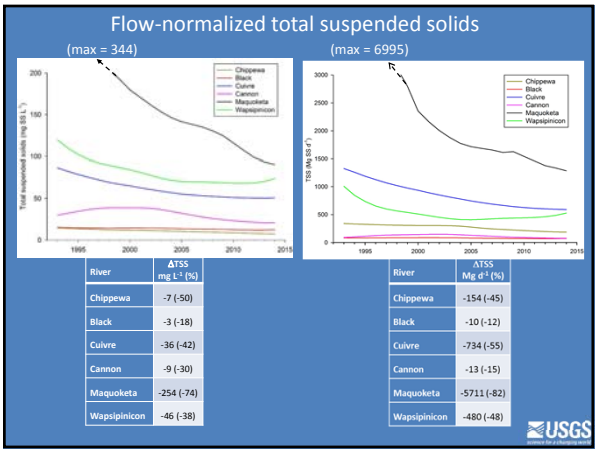

Response Curves to Water Velocity
V. americana
C. demersum
Probability of Occurrence
Water Velocity (cm/s) at 50,000 cfs
UMRR Analysis Team Agenda October 26, 2016
Cape Girardeau Conservation Nature Center Auditorium
Chair: Shawn Giblin, Wisconsin Department of Natural Resources
UMRR update, Marv Hubbell, USACE
LTRM Science Update, Jeff Houser, USGS
Long-term decreases in phosphorus and suspended solids but not nitrogen in six upper Mississippi River tributaries, 1991-2014, Becky Kreiling, USGS
How Water Velocity Drives Water Quality and Habitat Outcomes Session
Water Quality, Rob Burdis, MN DNR
Vegetation, Yao Yin, USGS
Fisheries- Quinton Phelps, MDC
Fish Indicators vote and discussion.
1987-88 drought
2011 flood


Jeff Houser
Binding Discussion Priorities, Current Research Proposal, Next Round of Research Proposals
1987 – 2001 Backwater sedimentation
Location of transect in Pool 13
MR
MI
LRR
PON
POR
Next Round of proposals due Dec. 2016- will be reviewed by Analysis Team Jan 2017.

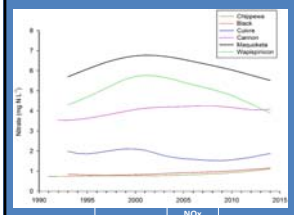

Long Term Trends in TSS, N, and P in Select UMR tributaries
Becky Kreiling and Jeff Houser
USGS
Upper Mississippi River Restoration

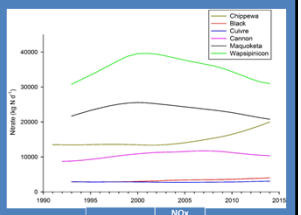

Six tributaries sampled at or near the mouth
Sampled from 1991-2014
Sample frequency varied depending on year and season
Samples taken at 0.2 m depth and analyzed for TSS, TP, TN, SRP, and NOx according to standard methods
Discharge data available at gaging stations upstream of sample site
Minnesota
Wisconsin
Iowa
Illinois
Missouri
USGS


Total nitrogen (mg N L-1)
Nitrate (mg N L-1)
NO3-N/TN
% Agriculture
ChR
BR
CuR
CaR
MR
WR
ChR – Chippewa
BR – Black
CuR – Cuivre
CaR – Cannon
MR – Maquoketa
WR - Wapsipinicon
USGS


Flow-normalized total suspended solids
(max = 344)
(max = 6995)
Chippewa
Black
Cuivre
Cannon
Maquoketa
Wapsipinicon
River | ΔTSS mg L-1 (%)
Chippewa | -7 (-50)
Black | -3 (-18)
Cuivre | -36 (-42)
Cannon | -9 (-30)
Maquoketa | -254 (-74)
Wapsipinicon | -46 (-38)
River | ΔTSS Mg d-1 (%)
Chippewa | -154 (-45)
Black | -10 (-12)
Cuivre | -734 (-55)
Cannon | -13 (-15)
Maquoketa | -5711 (-82)
Wapsipinicon | -480 (-48)
USGS

Flow-normalized nitrate





River	NOx mg L^{-1} (%)
Chippewa	0.38 (52)
Black	0.30 (36)
Cuivre*	-0.11 (-6)
Cannon	0.54 (15)
Maquoketa*	-0.18 (-3)
Wapsipinicon*	-0.4 (-9)

*essentially no change in NOx for these rivers

River	NOx kg d^{-1} (%)
Chippewa	6475 (48)
Black	1070 (36)
Cuivre*	175 (6)
Cannon	1597 (18)
Maquoketa*	-889 (-4)
Wapsipinicon*	190 (1)

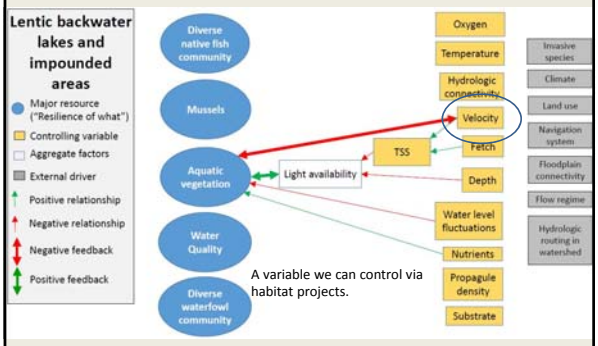
USGS

Conclusions/Implications for UMR

- Observed a general decrease in TSS and P and no change in N in the monitored tributaries
- Observed trends in agreement with other recent studies of other rivers in the basin
- Land use practices potentially reduced P and TSS run-off
- More restoration needed to target N leaching and run-off and nutrient loss through tile drains and groundwater infiltration.

USGS

How Water Velocity Drives Water Quality and Habitat Outcomes Session



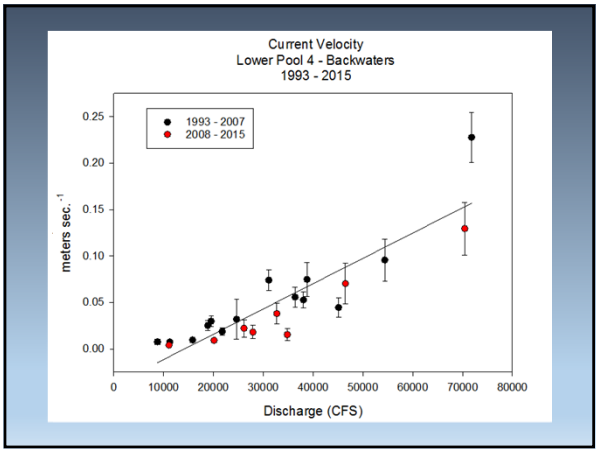
A variable we can control via habitat projects.

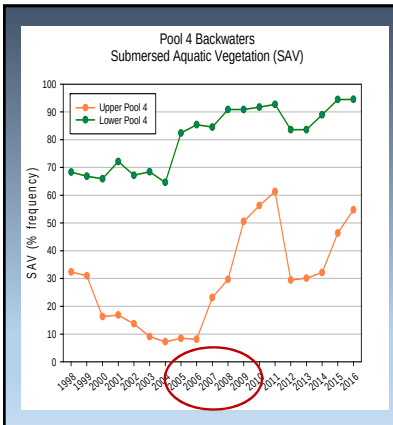
Water Discharge, Residence Time & Current Velocity Examination of Pool 4 LTRM Data

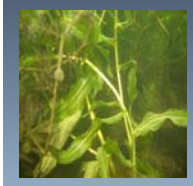
UMRR-LTRM Analysis Team Meeting
Cape Girardeau, Missouri
October 26, 2016

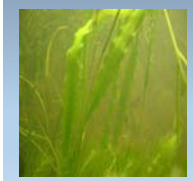
Rob Burdis - MN DNR

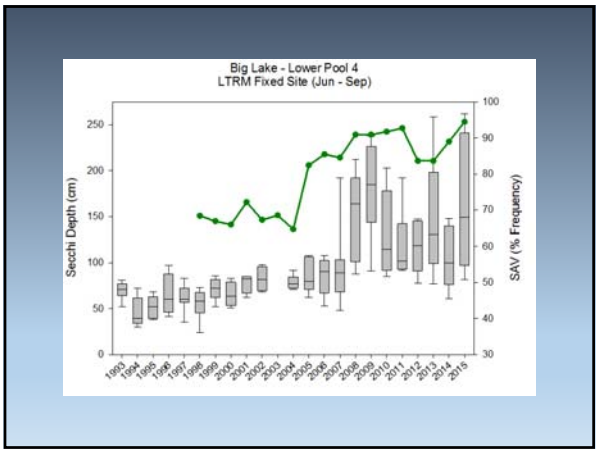
Upper Mississippi River Restoration
MNDNR









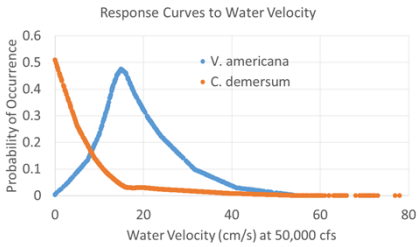


USGS

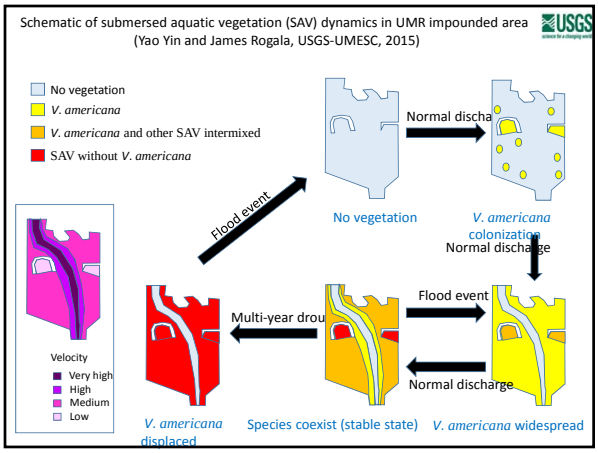
Water velocity and SAV patterns and dynamics in the Impounded UMR

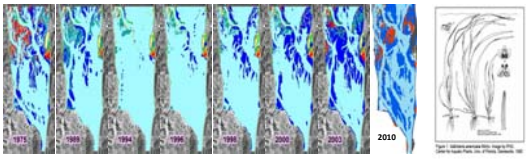
Yao Yin and Jim Rogala
US Geological Survey Upper Midwest Environmental Sciences Center, La Crosse,

Upper Mississippi River Restoration
USGS
Restoring and Monitoring the Upper Mississippi River System



USGS





Impounded UMR SAV dynamics: a working hypothesis

Many of the navigation dams in the upper Mississippi River created a vast aquatic area that has a wide range of water depth and water velocity conditions. The deep and/or high energy zones would not support submersed aquatic vegetation (SAV) in the absence of American wildcelery (*Vallisneria americana*) , as this species can anchor firmly in sediments by roots and reach up high in the water column by elongated leaves for sunlight. The combination of good water clarity and moderate summer flow in the upper reach between Lake City, Minnesota and Bellevue, Iowa enables *V. Americana* to persist steadily in most years. Major changes in SAV community, such as the crash observed during 1989-1994, appear to be triggered by extended droughts more likely than by large floods. In the absence of moderate to sometime strong currents, *V. Americana* will be displaced by macrophytes like *Ceratophyllum demersum* and *Elodea Canadensis*, filamentous alga, and duckweeds. Shading is a likely mechanism for this displacement, although change in water chemistry and nutrient depletion are possible causes also. When flood events return after an extended drought, the SAV colonies without *V. americana* are washed away easily, leaving a void that can take up to ten years for sizable colonies of *V. americana* to develop to sustain a steady SAV community again.

USGS

Summary

- The effects of water velocity on SAV are detectable yet complicated;
- Water velocity can uproot SAV and suspend particles therefore reduces light penetration in the water column;
- How water velocity variations during a growing season and between growing seasons affect SAV patterns and dynamics remains blurry;
- **In the upper impounded reaches, we suspect consecutive droughts followed by a high flood pulse would trigger SAV collapse that will take 5-10 years to recover.**

The Importance of Shallow, Low-Velocity Habitats to Juvenile Fish in the Middle Mississippi River

SETH LOVE, QUINTON PHELPS, SARA TRIPP, AND DAVE HERZOG
MISSOURI DEPARTMENT OF CONSERVATION
ILLINOIS NATURAL HISTORY SURVEY
SOUTHEAST MISSOURI STATE UNIVERSITY

Negative Impacts of Anthropogenic Manipulation

Habitat Manipulations ≠

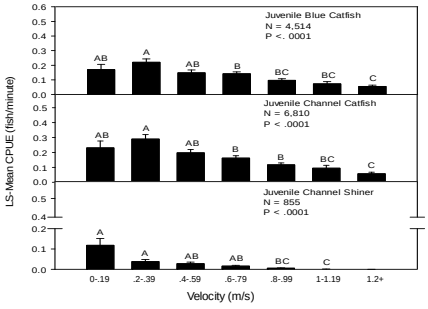
Study Area

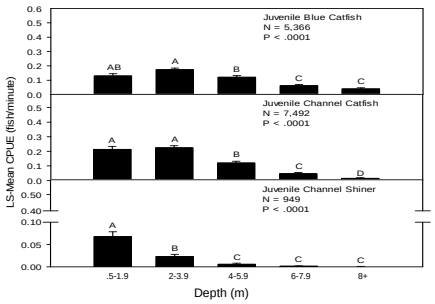
Field Methods

A mini-Missouri Trawl was used to collect fish specimens from 2002-2015

Trawling duration was 3 minutes

At each site velocity, depth, and substrate data were recorded





Shallow, low velocity habitat is critical.

Middle Mississippi River

(Phelps et al., 2010)

Evaluated habitat use of age-0 Shovelnose and Pallid Sturgeon

Found that velocities around .1 m/s and depths between 2-5 m were positively related to relative abundance

Does it make biological sense??

Take Away Message

*Juvenile fishes were caught more frequently in shallow, low-velocity habitats

*Channelization decreases the availability of these habitats

*Implies channelization has negative effect on these juvenile fish species

*Find a balance between economic needs and environmental requirements?

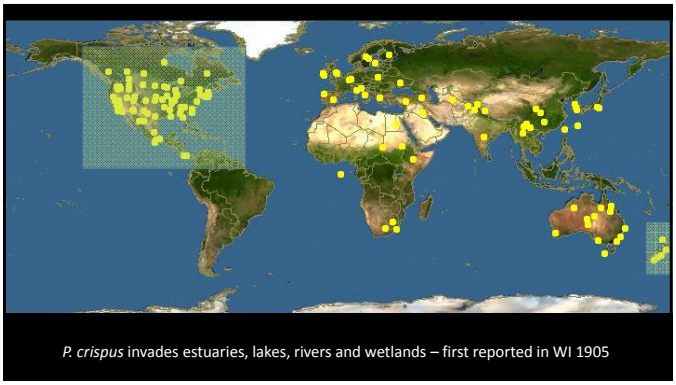
Fish Indicators Report Update

Invasive curlyleaf pondweed dynamics in the UMR: Implications for dissolved oxygen and nutrients

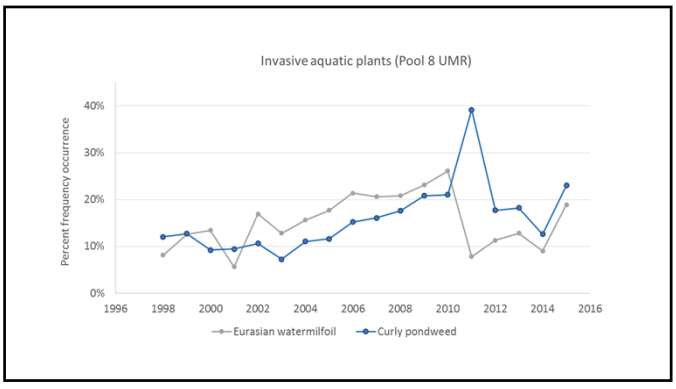
Deanne Drake, Shawn Giblin, John Kalas

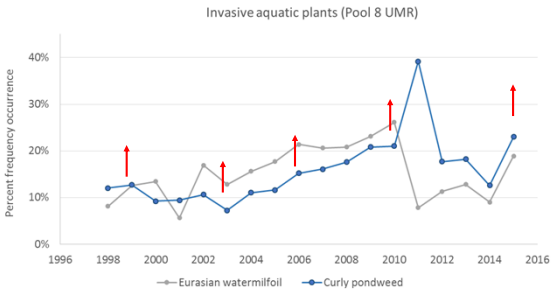
Wisconsin Department of Natural Resources

Upper Mississippi River Restoration



P. crispus invades estuaries, lakes, rivers and wetlands – first reported in WI 1905





Goals

1) Develop a correction for *P. crispus* abundance

2) Understand seasonal biomass and N/P standing stocks

3) Describe seasonal patterns in DO and other water quality associated with dense growth of *P. crispus*

Methods

30 sites surveyed using LTRM standard methods (Yin et al. 2000)

May, July and October 2016

Plant biomass on rakes and in sample quadrats

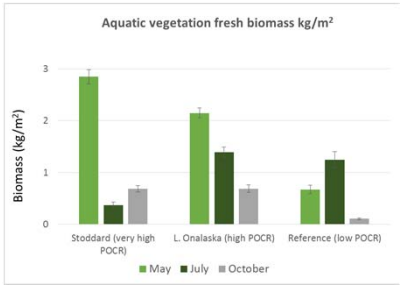
Water quality measurements/ O_2 logging

Plant nutrient analyses

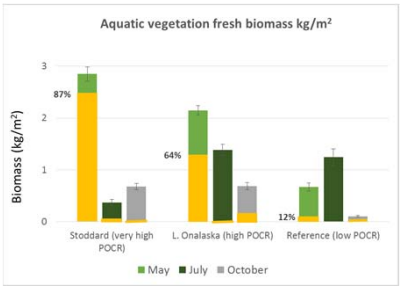
1) A correction for *P. crispus* abundance - ~1.4

Curlyleaf pondweed		Stoddard (of 10)	Lake Onalaska (of 10)	Reference (of 10)
Detection	May	10	10	4
	July	10	6	0
	October	10	7	3
July estimation		**100%**	**60%**	**0%**

2) Quantify seasonal biomass and N/P standing stocks estimate nutrient sequestration and release



Seasonal aquatic vegetation biomass including all submersed, emergent and rooted floating-leaf species. N = 10 for each bar



The biomass of *P. crispus* in July was ~1% of May values and undetectable at reference sites

Initial Findings

Best guess at this point:

P. crispus % frequency occurrence is underestimated by ~40%

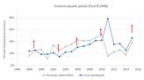
Our concept of *P. crispus* biomass is poor

biomass is ~100x higher in early spring

Total biomass in May was high in areas dominated by *P. crispus* –

suggests a fundamental shift in the timing of primary production

Corrected Occurrence

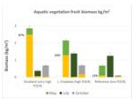


X

Area Richardson et al. 2004

X

Biomass

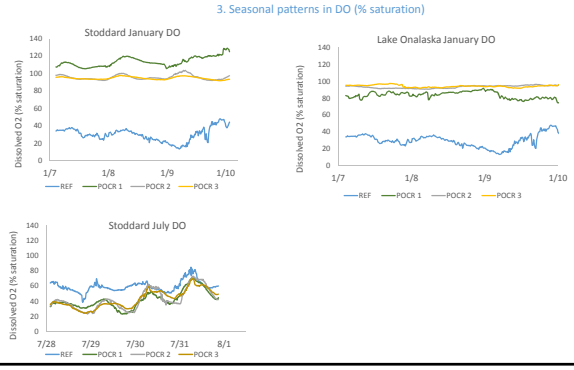


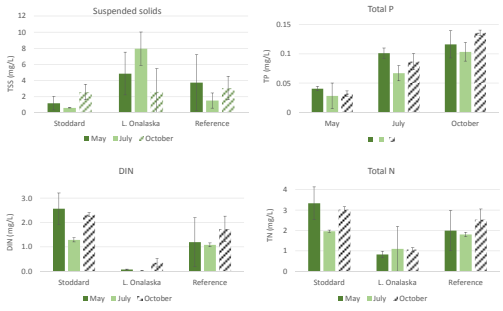
X

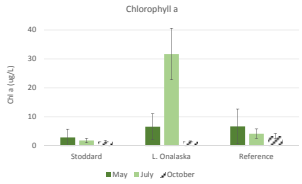
[Nutrient]	%N	%P
Leaf	3.45	0.46
Root	2.14	0.42

P. crispus sequestration estimates (May):

	Low (kg)	High (kg)
N	1,200	70,000 kg
P	160	8,300 kg







Additional information generated

Comparison of rake data vs. “whole plot”

Winter biology of aquatic plants – some native species overwinter as green plants too.

Feedbacks between water clarity and AV in winter

Funding provided by the US Army Corps of Engineers UMRR Program

Contributors

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Ginny Young (WDNR)
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Ann Runstrom (USFWS)
Brian Gray (USGS)

					Conservative				Not conservative			
POCR3 detected	Total sites	% Freq Occ	Corrected % Freq Occ	Area km² (Richardson et al 2004)	Fresh biomass kg (using 20 g/m2)	Dry biomass	N standing stock	P standing stock	Fresh Biomass (using 1000 g/m2)	Dry biomass kg	N standing stock	P standing stock
44	110	40%	56%	19.4	217280	15644	546	72	12602240	907361	31667	4174
40	185	22%	30%	36.9	223395	16084	561	74	12956886	932896	32558	4291
8	65	12%	17%	13.2	45489	3275	114	15	2638375	189963	6630	874
3	70	4%	6%	12.6	15120	1089	38	5	876960	63141	2204	290
					Fresh biomass (using 1 kg/m2)						70855	9339
					10864000	782208	27299	3598				
					11169730	804221	28067	3699				
					2274462	163761	5715	753				
					756000	54432	1900	250				

	Kg N sequestered in POCR3 in May	Kg P
minimum	**1260**	**166**
maximum	**62981**	**8301**

Seasonal standing stocks, % N and %P of other species