# Upper Mississippi River Restoration Program Coordinating Committee
# Joint Meeting with Upper Mississippi River Basin Association Board
# And Quarterly Meeting

## August 9, 2016

## Highlights and Action Items

## Joint Meeting with UMRBA Board

- The UMRR Coordinating Committee met jointly with the Upper Mississippi River Basin Association (UMRBA) Board. Marv Hubbell described the program's strategic vision and plan for 2015-2025, the partnership's work to prepare for selecting the third generation of habitat projects, and key messages and recommendations in the draft 2016 Report to Congress. Kristen Bouska provided observations of the UMRS's ecological health and resilience using long term resource monitoring data.
- Participants discussed the implications to UMRR habitat projects from challenges that non-federal sponsors face in executing project partnership agreements (PPAs).

## Quarterly Meeting

- The UMRR Coordinating Committee expressed appreciation to Janet Sternburg for steadfast dedication to the program. Sternburg has been integral to many important program decisions and in conceptualizing and implementing habitat projects.
- UMRR held a celebration on August 8, 2016 to commemorate its 30$^{th}$ year of success. Hubbell expressed appreciation to the partners involved in making the event successful.

### Program Management

- USACE is developing an FY 2018 budget proposal to submit to the Office of Management and Budget (OMB), per the typical process. However, OMB will wait for the new Administration to make any budget decisions.

### Habitat Restoration

- Brian Markert described how Rip Rap Landing's features address important resource issues in the area. While the draft feasibility study is complete, the Corps and NRCS are still considering legal issues under the existing wetland reserve easement requirements.
- **An HREP workshop is scheduled for September 27-29, 2016 in Davenport**. Workshop objectives include building relationships and facilitating dialogue, discussing insights gained, and strengthening UMRR's restoration efforts.
- The Steering Committee for the Habitat Needs Assessment (HNA) 2.0 was held on July 19-20, 2016 in Rock Island. **The November 16, 2016 meeting will include a recommended path forward for the effort.**
- **The UMRR Coordinating Committee agreed to hold an in-person meeting with implementing partners' leadership to discuss current challenges to project partnership agreements and discuss the scope for a continuous process improvement evaluation for the habitat project planning phase. The Committee agreed to hold a conference call to plan the details for this event.**

**Long Term Resource Monitoring**

- Molly Van Appledorn presented information regarding the use of flood inundation models to predict flooding dynamics and various inundation patterns affecting ecological characteristics.

- Accomplishments of the third quarter of FY 2016 include:
  - Publication of four manuscripts:
    1) Patchiness in a large floodplain river, associations among hydrology, nutrients, and fish communities;
    2) Contrasts between channels and backwaters in a large, floodplain river: testing our understanding of nutrient cycling, phytoplankton abundance, and suspended solids dynamics;
    3) Long-term changes in fish community structure in relation to the establishment of Asian carps in a large floodplain river; and
    4) Long-term decreases in phosphorus and suspended solids, but not nitrogen, in six Upper Mississippi River tributaries.
  - Online serving of a merged dataset of bathymetry and LiDAR, called topobathy.

- The August 1, 2016 A-Team meeting included a series of presentations focused on answering questions related to how water depth drives water quality and habitat outcomes.

**Other Business**

- **Upcoming quarterly meetings are as follows:**
  - **November 2016 — St. Paul**
    - UMRBA quarterly meeting — November 15
    - **UMRR Coordinating Committee quarterly meeting — November 16**
  - **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**

## Assessing the Ecological Resilience of the Upper Mississippi River System

**Joint UMRBA – UMRR CC Meeting**
**9 August 2016**


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## UMRR Vision Statement

"A healthier and more resilient Upper Mississippi River Ecosystem that sustains the river's multiple uses."

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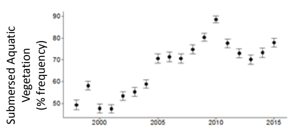
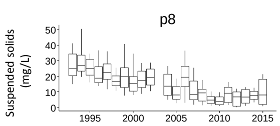
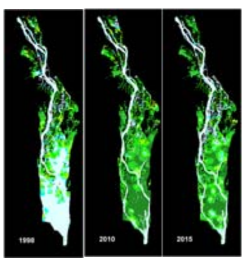
## Health of the UMRS: Some things have gotten better

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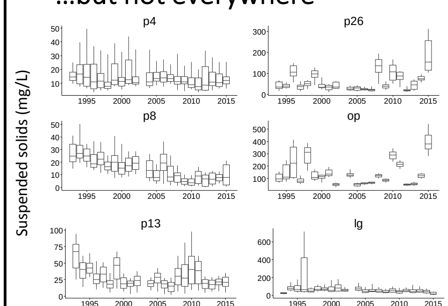
## …but not everywhere




- Vegetation remains scarce in Lower Impounded Reach, Open River reach, and the lower Illinois River
- 2015: highest SS concentration (lowest water clarity) yet in Pool 26 and Open River.

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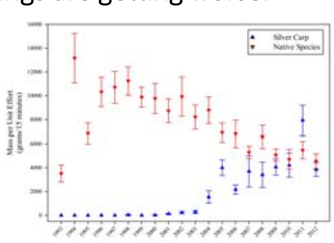
## Health of the UMRS: Some things are getting worse.




Ickes, B.S. April 21, 2014. The Irony of Carp. Institute of Advanced Studies, River of Life Program, University of Minnesota, Northrup Hall, Minneapolis, MN ( http://ias.umn.edu/2014/04/21/irony-of-carp/) Keynote lecture.

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## Resilience assessment: Purpose

- Improve our understanding of:
  - Current resilience of the UMRS
  - Potential for management and restoration actions to affect the resilience of the UMRS
- Identify potential indicators of resilience
- Identify areas of uncertainty where additional study is needed to inform management and restoration.


O'Connell et al. 2015.

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# Resilience: a definition

- "…capacity of a system to **absorb disturbance** and reorganize while undergoing change so as to **still retain essentially the same function, structure, identity and feedbacks** (Holling 1973, Walker et al. 2004)"

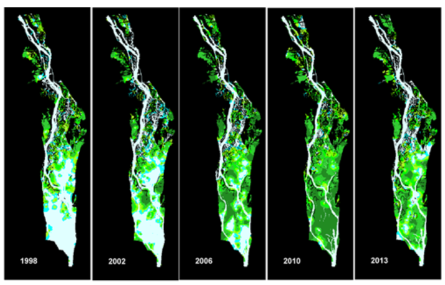
# Resilience: main concepts

- Thresholds – small changes in controlling variables can lead to rapid changes in major ecosystem services when system is near a threshold
- Multiple possible states
- Hysteresis -- can't always return to where you started
- Controlling variables and other components of the ecosystem can interact resulting in positive or negative feedbacks
- Key role of slow variables

# Resilience can be 'good' or 'bad'.

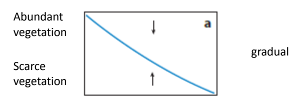
Upper Reaches:
- Vegetation crash and return

Lower reaches:
- No return
- Resilient, scarce veg. state?
  - Herbivory?
  - Lack of propagules?
  - Sediment characteristics?

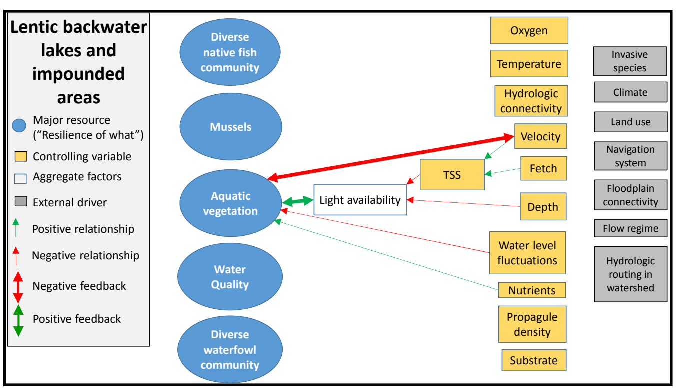



http://www.umesc.usgs.gov/data_library/vegetation/graphical/distribution_query.shtml

# State changes: gradual, threshold, & hysteresis




(Scheffer et al. 2015)




| Subsystem | Major resources | Key Controlling variable | Relationship | Data availability | Citation |
|---|---|---|---|---|---|
| Lentic off-channel areas | Water quality | Hydrologic connectivity with main channel (delivery of TSS and nutrients) | | Available for LTRM reaches | Richardson et al. 2004, Giblin et al. 2010, De Jager and Houser 2012 |
| | Native mussel community | Hydrologic connectivity with main channel | | Mussel surveys for some pools; Rogala connectivity metrics | Tucker et al. 1996, Zigler et al. 2008 |
| | | Water quality | | Unavailable | Naimo 1995, Frazier et al. 1996, Augspurger et al. 2003 |
| | Aquatic vegetation | Light availability (depth, total suspended solids) | Threshold (Depth at 1% of surface light, TSS< 30 mg/L) | Available for LTRM reaches | Barko et al. 1986, Kreiling et al. 2007, Giblin et al. 2010, Giblin et al. 2014 |
| | | Velocity | Species specific response curves | Available for LTRM reaches | Koch 2001, Madsen et al. 2001, Giblin et al. 2014, Yao and Rogala unpub. |

# RA connection to Habitat Needs Assessment II

Conceptual models

↓

Key controlling variables

↳

Potential system-wide geospatial data layers

- Connectivity metrics of backwater areas at different discharge conditions
- Bathymetry at different discharge conditions
- Water level fluctuation magnitude by river mile
- Average number of days/year each L&D is open
- Wind fetch model
- Floodplain inundation - 1D hydrologic model output

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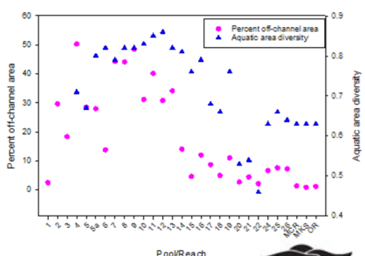
# General Resilience: Principles for Building Resilience

1. Maintain diversity and redundancy
2. Manage connectivity
3. Manage slow variables and feedbacks
4. Foster complex adaptive systems thinking
5. Encourage learning
6. Broaden participation
7. Promote polycentric governance

Biggs et al. 2015.

# General Resilience

1. Maintain diversity and redundancy
   - provide options for responding to change and disturbance
     - Geomorphic diversity
     - Biodiversity
   - Management tools can alter geomorphic diversity (e.g., dredging, island construction)

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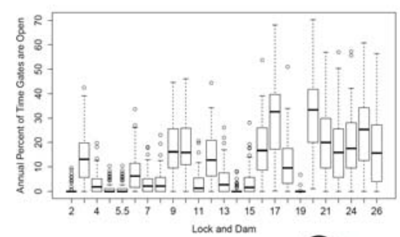
# General Resilience

2. Manage connectivity
   - provides access to a wide range of conditions
     - Longitudinal
     - Lateral
   - Management tools can alter connectivity (e.g., fish passage at dams)

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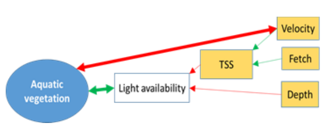
# General Resilience

3. Manage slow variables and feedbacks
   - Determine underlying structure of system
     - Hydrology
     - Sediment and nutrient accumulation
     - Spread of invasive species
   - Provide ability to strengthen or disrupt stabilizing feedbacks

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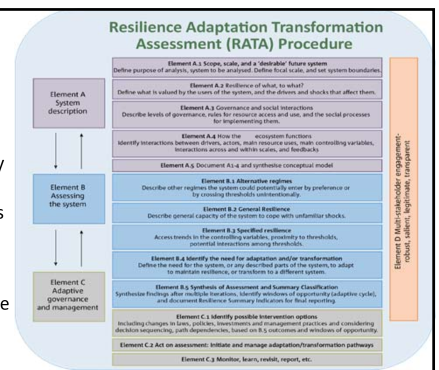
# Next steps

- Review of written description of the System Description by the RWG.
- Quantify relationships identified in conceptual models
- Coordinate with HNA II for general resilience analyses




O'Connell et al. 2015

# Expected Resilience Assessment outcomes

- Assess current state and resilience of system
  - Trends in controlling variables (where possible)
  - Proximity to thresholds of concern (where possible)
  - Additional indicators of ecological resilience for the UMRS
- Describe what this indicates about past and potential impacts of our management and restoration activities on the resilience of the UMRS.
  - Where is system state “acceptable”
    - How do we build resilience to keep it there?
  - Where is system state “unacceptable”
    - Can we reduce resilience to move it to an acceptable state?

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## Joint UMRR CC and UMRBA Meeting and the UMRR CC Quarterly Meetings August 9, 2016

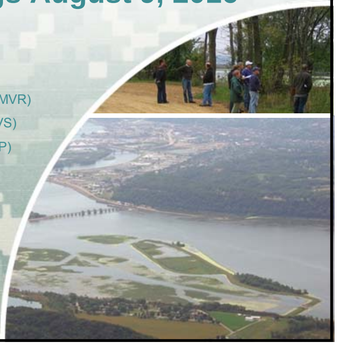

**Marvin E. Hubbell - MVR**

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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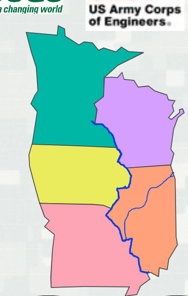
## UMRR Program Partners



USGS science for a changing world

US Army Corps of Engineers

USDA

PUBLIC

NGO's

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## 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

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## Operational Plan

- Purpose
  - Make recommendations for implementing Strategic Plan.
  - Objectives:
    - Establish priorities
    - Identify key policy and technical issues
    - Integration of science and restoration efforts
    - Identifying challenges for implementation

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## Operational Plan

- Challenges
  - Level of detail
  - How to clearly link to the Strategic Plan and budget.
- Some key recommendations considered:
  - Communication Plan/Strategy
  - Resilience
  - Update HNA
  - Transparency
  - Habitat Team

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## Next Generation of Habitat Projects

- Strategic Plan
- Operationalizing Ecosystem Resilience
- Habitat Needs Assessment II
- Next generation of habitat projects
  - 2003 Project Planning and Sequencing Framework
    - Use of resilience and HNA II tools
    - River Teams (DET)
    - System Team (SET)
    - UMRR CC

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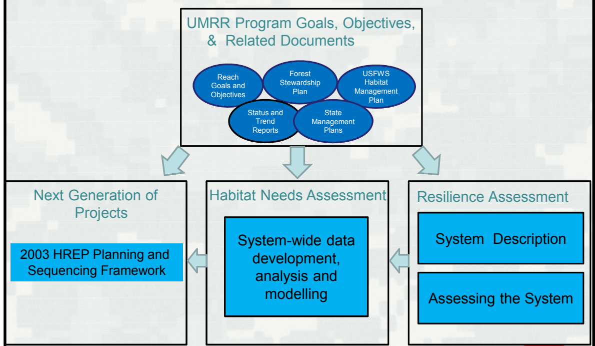




## Increasing Competition For Funding

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

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## 2016 Report to Congress

- 2016 Schedule
  - May 16 – Initiated 3rd Partnership review
  - May 19 – Initiated IPR for Official MVD and HQ review.
  - June 30 - Comments due
  - Sept. 15 – Final electronic copy due
  - Oct. 15 – Submit final RTC to MVD and HQ
  - Dec. 31 – Transmittal to Congress

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## Key Messages in the 2016 Report to Congress

- UMRS is a Nationally significant ecosystem and navigation system. The river needs both.
- UMRR Delivers (since 2010 RTC)
  - Projects –
    - Construction completed - 9 projects, 23,330 ac.
    - In Construction – 5 projects, 11,590 ac.
    - Completed Feasibility Reports – 9 projects
    - In Feasibility – 10 projects

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## Key Messages

- Science
  - 2010 LCLU
  - Bathymetry
  - Topobathy
  - Monitoring Network (six field stations five states)
  - Research
    - Development of Landscape Indicators
    - Documenting shift in fishes due to clearer water (Upper Riv.)

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## Key Messages

- Efficiency
  - Average cost per acre ~ $3,000
  - Six year average execution – 97%
    - Last three year average – 99%
- Policy Recommendations
  - Reiteration of the importance of a fully functioning UMRR if and or until a NESP transition occurs.
  - PPA

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## 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



## Project Partnership Agreements (PPA)

- June 30, 2016 Letter to Mr. Buntin
- 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



## 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.



## 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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## Recognition
## 30 Years of Service

- When – YESTERDAY
- THANKS TO EVERYONE FOR MAKING IT SO SUCCESSFUL!!!!!!!!!!!!!!!!

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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 |
| [illegible] | $ 250,000 |

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## FY 17 PBUD

| | |
|---|---|
| President's Budget | $20,000,000 |
| House | $ |
| Senate | $ |

- PBUD in Feb. 2016

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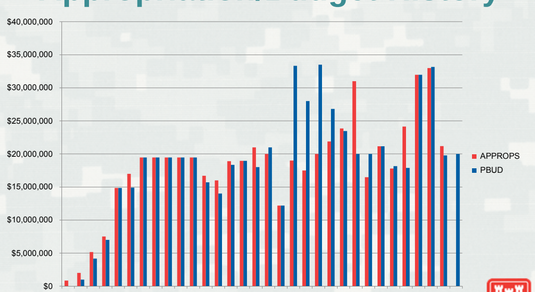
## UMRR Program
## Appropriation/Budget History




FY1985 to FY2016

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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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# UMRRP Habitat Rehabilitation and Enhancement Projects

As of May 2016:
55 Projects Completed
6 Projects in Construction
29 Projects in Design





## 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, …shiek, Weaver Bottoms & …ke 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



## ST. LOUIS DISTRICT (MVS) FY16 HREP Work Plan (August 2016)

**PLANNING**

**Rip Rap Landing, IL** *$15k*
- Final Draft Feasibility complete –
  - MVD Commander Concurrence with exception of RE
  - *HQ policy exception /waiver of standard estate rqrmts.*
  - *MOA with NRCS to address CUA*

**Piasa & Eagles Nest Islands, IL** *$320k*
- Starting Cost/Effectiveness Incremental Cost Analysis Process to Identify Tentatively Selected Plan

**Harlow & Open River Islands, IL & MO** *$400k*
- Tentatively Selected Plans identified, Moving into Detailed Design (planning level)

**Other studies in the Queue** *$30k*
- Open River fact sheet development

**EVALUATION** *$150k*

Baseline Monitoring & Post Project Monitoring (Stag & Pharrs Post Construction 4th Qtr.)

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

**DESIGN**

**Clarence Cannon Refuge, MO** *$975k*
- Gravity Drain
- South Unit Water Control & Channels

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

**CONSTRUCTION**

**Ted Shanks, MO** *$975k*
- Completed North Berm Setback, NS1,NS2, DS Water Control
- Pump Station – underway

**Pools 25 & 26 Islands, MO**
- Bolters Island *$50k*

**Batchtown, IL – Punch list** *$150k*
- *Action complete, OMRR&R Manual updated, Complete closeout by end of FY*

***Clarence Cannon Refuge , MO*** *$600k*
- *Water Control Structure*



## ROCK ISLAND DISTRICT (MVR) FY16 HREP Work Plan (August 2016)

**PLANNING**
- Beaver Island, Pool 14, IA **($260K)**
- Keithsburg Division, Pool 18, IL **($228K)**
- Delair, IL **($10K)**

**DESIGN**
- Huron Island Stage II, Pool 18, IA **($284K)**
- Pool 12 Overwintering Stage III, Pool 12 IL **($255K)**

**CONSTRUCTION**
- Lake Odessa Flood Recovery, IA Pools 17 and 18, IA3 **($357k)**
- Pool 12 Overwintering Stage I, Pool 12 IL **($47k)**
- Pool 12 Overwintering Stage II, Pool 12 IL **($95K)**
- Pool 12 Overwintering Stage III, Pool 12 IL **($1-5M)**
- Huron Island Stage I, Pool 18, IA **($171K)**
- Huron Island Stage II, Pool 18, IA **($1-6M)**
- Fox Island, Pool 20, MO **($40K) CW450**
- Rice Lake Stage I, IL LaGrange Pool **($590K + $1M) CW450**

**EVALUATION**
- **FWS ($238K)**
- Baseline Monitoring
- Post Project Monitoring
- Performance Evaluations **($236K)** Bay Island, Andalusia, Brown's Lake
- Adaptive Mgmt. Pool 12



## HREP: Rice Lake

RM 132.0 through 138.0 of the Illinois Waterway (LaGrange Pool)
Fulton County, Illinois

Stage I Contract awarded Sept 19, 2011 for $8.64 million to S&F, Inc.

- Team has identified and coordinated with ILDNR a preferred alternative for electrical and pump repair.
  - Service contract for pump repair- Award May 2, 2016
  - OD staff is waiting on shipping address to transport the pumps to the manufacture for assessment of damages and repair
  - Engineering is finalizing design of repair
  - Punch list items to be completed by the Contractor the week of May 16th

Pumps pulled by OD staff and ready for transport
05 Apr 2016





## UMRR Workshop

- When - September 27-29
- Co-chairs - Kara Mitvalsky and Sharonne Baylor
- Where - Moline, 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



## Habitat Needs Assessment II

- Workshop – July 19 – 20.



## Continuous Process Program Improvement

- Issues
- Follow-up meeting



## Public Communications and Outreach





Mud Lake Pool 11 July 2006

## UMRR Monitoring & Science for 2016

- 2 SOWs in FY16
  - SOW for LTRM base monitoring **$4.5M**
  - SOW for science in support (analysis under base) **$.963M**
- **Both SOWs together are equivalent to a fully funded UMRR LTRM element**

**$5,463,000 (FY 2016 funding)**



## UMRR Monitoring & Science for 2016

| | |
|---|---|
| MN | $511,766 |
| WI | $523,176 |
| IA | $453,463 |
| IRBS | $385,618 |
| NGREEC | $364,886 |
| BRWFS | $379,786 |
| States sub total | $2,618,694 |
| equip | $184,163 |
| field meetings | $6,834 |
| science meeting travel | $4,791 |
| added state travel | $3,502 |
| statistics workshop | $5,941 |
| **STATES TOTAL** | **$2,823,925** |
| UMESC sub total | $2,680,697 |
| field meetings | $815 |
| added UMESC travel | $5,791 |
| statistics workshop | $15,550 |
| **UMESC TOTAL** | **$2,702,853** |
| **Corps tech reps** | **$68,250** |
| **TOTAL FY16 LTRM BUDGET** | **$5,595,028** |



## UMRR Science in Support of Restoration & Monitoring

**Continuation of existing projects:**

- **Pool 12 AM** **$28,386**
- **Resilience (Corps staff)** **$52,000**
- **Spatial patterns of mussels (continuation)** **$55,980**
- **Fish trajectory analysis (continuation)** **$ 7,775**

**New project:**

- **Biological shifts due to invasion by curly-leaf pondweed** **$33,103**

**TOTAL UMRR SCIENCE SUPPORT** **$177,244**



## Habitat Needs Assessment II

- Recommendations
  - Build upon the 2000 HNA using:
    - New tools
    - Updated and new data
    - Knowledge and Lessons learned
  - Create a partner based team to develop the HNA II
    - Utilize the 2003 Habitat Sequencing Policy
    - Integrate River Teams into the entire process
  - Connect the HNA II to the Vision and Mission Statements and link directly to the resiliency work group
  - Strike an appropriate balance between the use of new tools and data with policy and management



## UMRR Monitoring & Science for 2016

- 2 SOWs in FY16

  **$4.5M** LTRM base monitoring

  **$.963M** Science in support (analysis under base)

- **Both SOWs together are equivalent to a fully funded UMRR LTRM element**

**$5,463,000 (FY 2016 funding)**



## UMRR Monitoring & Science for 2017

- 2 SOWs in FY17

  **$4.61M** LTRM base monitoring

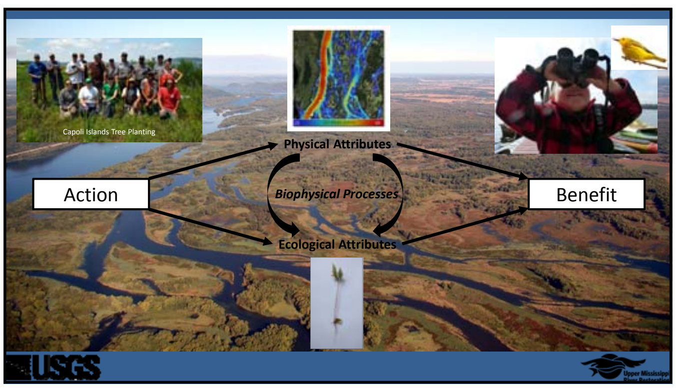
  **$1.0M** Science in support (analysis under base)

- **Both SOWs together are equivalent to a fully funded UMRR LTRM element**

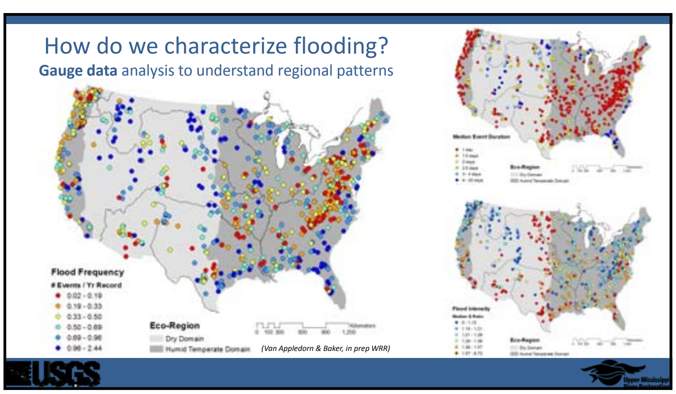
**$5,610,000 (FY 2017 funding)**

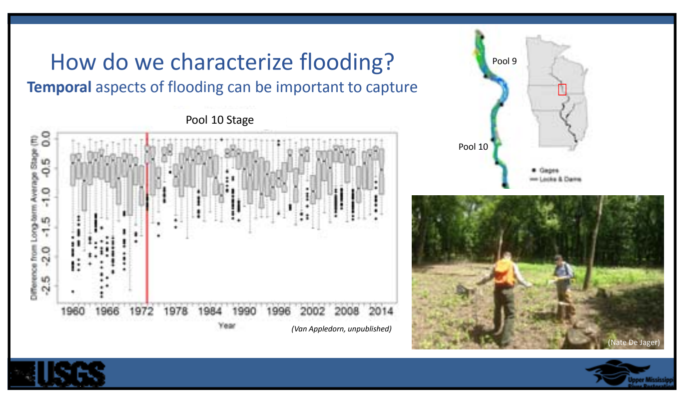

USGS
science for a changing world
Improving floodplain research and management by integrating inundation modeling, ecosystem studies, and ecosystem services assessments
Molly Van Appledorn
U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse WI
UMRR-CC Quarterly Meeting, LTRMP Showcase – August 9, 2016

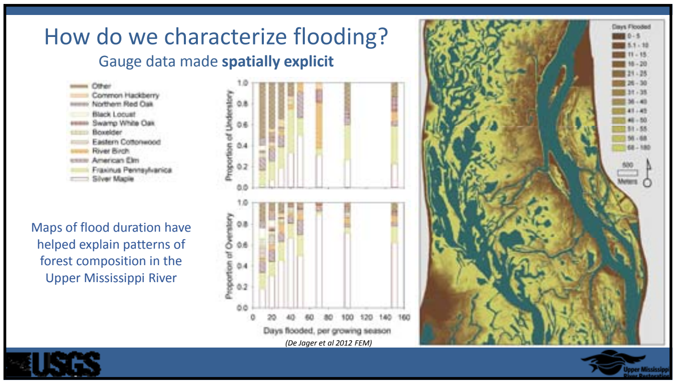

Capoli Islands Tree Planting
Action
Benefit
USGS

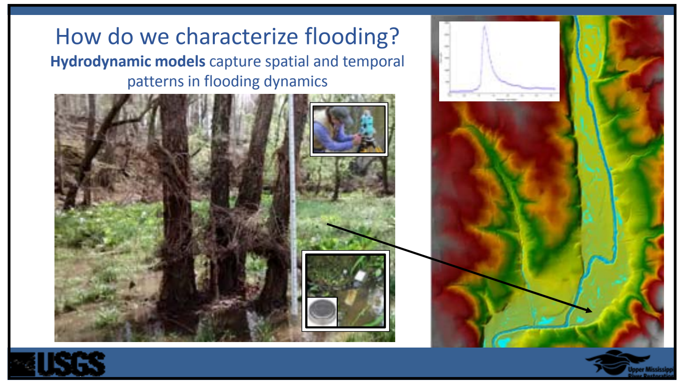

Capoli Islands Tree Planting
Physical Attributes
Action
Biophysical Processes
Benefit
Ecological Attributes
USGS

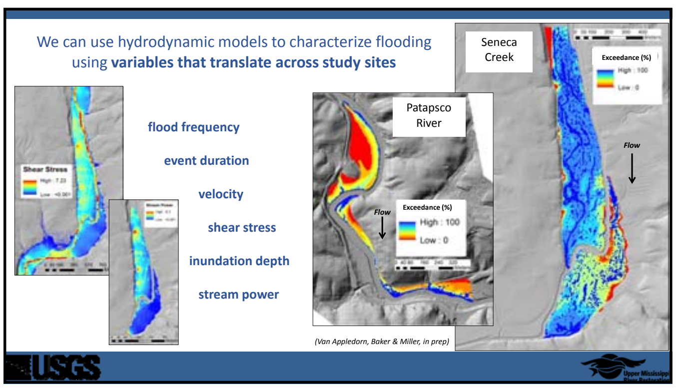

How do we characterize flooding?
Physical Attributes
Biophysical Processes
Ecological Attributes
How do we relate flooding characterizations to ecological attributes to learn how floodplains work?
USGS

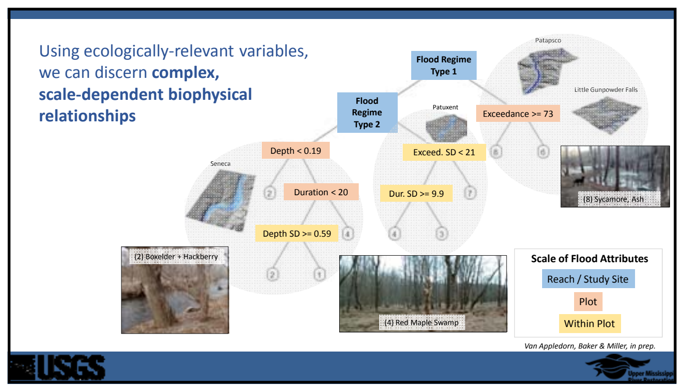

How do we characterize flooding?
Gauge data analysis to understand regional patterns
Flood Frequency
# Events / Yr Record
Eco-Region
Dry Domain
Humid Temperate Domain
(Van Appledorn & Baker, in prep WRR)
USGS

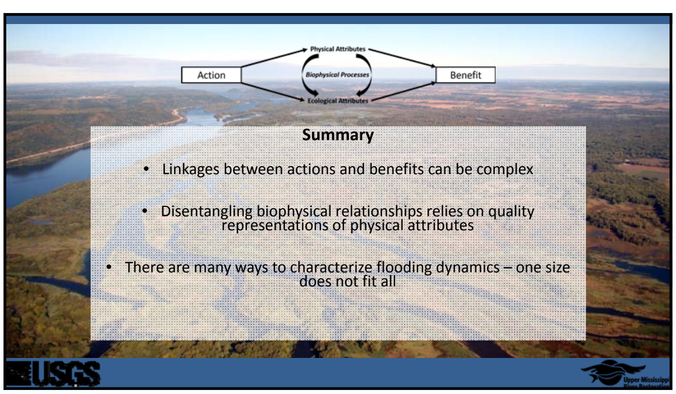

How do we characterize flooding?
Temporal aspects of flooding can be important to capture
Pool 10 Stage
Difference from Long-term Average Stage (ft)
1960 1966 1972 1978 1984 1990 1996 2002 2008 2014
Year
(Van Appledorn, unpublished)
Pool 9
Pool 10
(Nate De Jager)
USGS

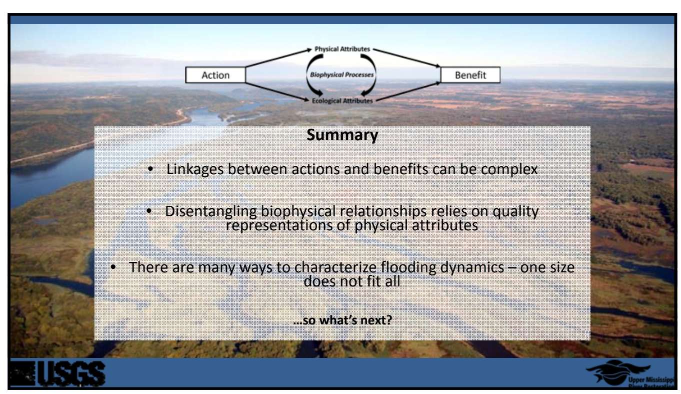

How do we characterize flooding?
Gauge data made spatially explicit
Other
Common Hackberry
Northern Red Oak
Black Locust
Swamp White Oak
Boxelder
Eastern Cottonwood
River Birch
American Elm
Fraxinus Pennsylvanica
Silver Maple
Proportion of Understory
Proportion of Overstory
Days flooded, per growing season
Maps of flood duration have helped explain patterns of forest composition in the Upper Mississippi River
Days Flooded
(De Jager et al 2012 FEM)


How do we characterize flooding?
Hydrodynamic models capture spatial and temporal patterns in flooding dynamics


We can use hydrodynamic models to characterize flooding using variables that translate across study sites
flood frequency
event duration
velocity
shear stress
inundation depth
stream power
Shear Stress
Patapsco River
Seneca Creek
Exceedance (%)
High : 100
Low : 0
Flow
(Van Appledorn, Baker & Miller, in prep)


Using ecologically-relevant variables, we can discern complex, scale-dependent biophysical relationships
Flood Regime Type 1
Flood Regime Type 2
Patapsco
Little Gunpowder Falls
Patuxent
Seneca
Exceedance >= 73
Depth < 0.19
Exceed. SD < 21
Duration < 20
Dur. SD >= 9.9
Depth SD >= 0.59
(2) Boxelder + Hackberry
(4) Red Maple Swamp
(8) Sycamore, Ash
Scale of Flood Attributes
Reach / Study Site
Plot
Within Plot
Van Appledorn, Baker & Miller, in prep.

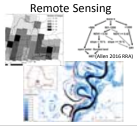

Action
Physical Attributes
Biophysical Processes
Ecological Attributes
Benefit
Summary
• Linkages between actions and benefits can be complex
• Disentangling biophysical relationships relies on quality representations of physical attributes
• There are many ways to characterize flooding dynamics – one size does not fit all


Action
Physical Attributes
Biophysical Processes
Ecological Attributes
Benefit
Summary
• Linkages between actions and benefits can be complex
• Disentangling biophysical relationships relies on quality representations of physical attributes
• There are many ways to characterize flooding dynamics – one size does not fit all
…so what's next?

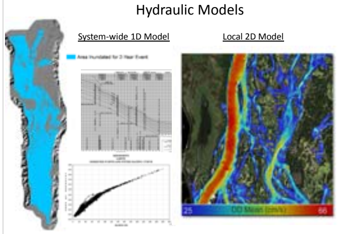
## 1) Develop methods for characterizing UMR flooding dynamics in ecologically-relevant ways

Planar Surface

Remote Sensing




Hydraulic Models




USGS

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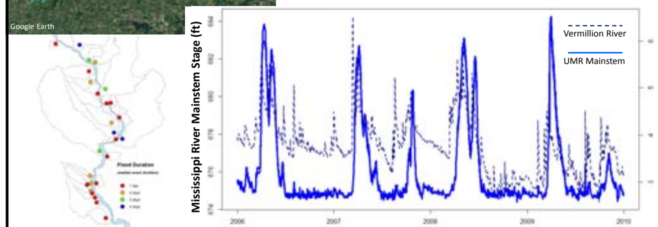
## 2) Tributary junctions as laboratories: characterizing complex inundation patterns and ecological responses


USGS

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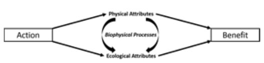


## 3) Ecological Floodplain Inundation Mapping (Eco-FIM) Initiative

USGS

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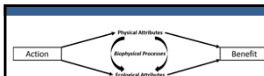
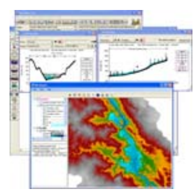



## 3) Ecological Floodplain Inundation Mapping (Eco-FIM) Initiative



Hydraulic Model Development

USGS

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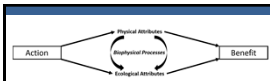
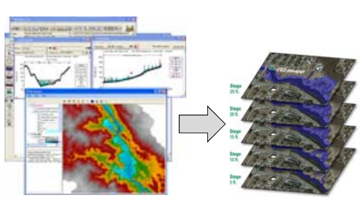



## 3) Ecological Floodplain Inundation Mapping (Eco-FIM) Initiative



Hydraulic Model Development

Map Library

USGS

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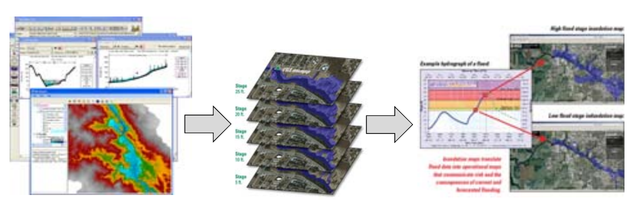
## 3) Ecological Floodplain Inundation Mapping (Eco-FIM) Initiative



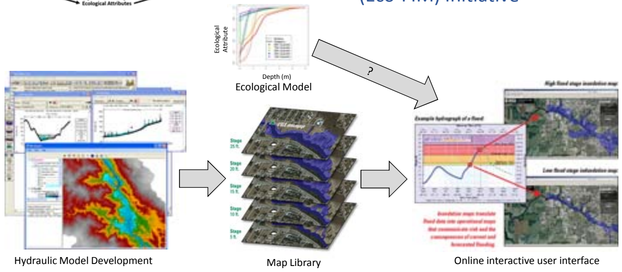
Hydraulic Model Development

Map Library

Online interactive user interface

USGS

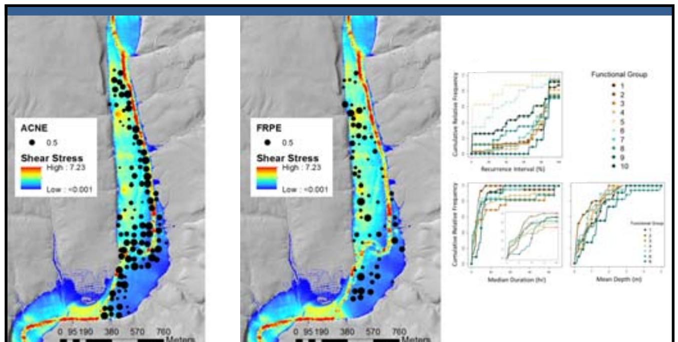
## 3) Ecological Floodplain Inundation Mapping (Eco-FIM) Initiative




**Nathan De Jager**, USGS Research Ecologist
**Kris Johnson**, The Nature Conservancy
**Scott Morlock**, USGS Acting Deputy Regional Director for Science and MWR Flood Science Technical Team
**Marie Peppler**, USGS National FIM Program Coordinator and Wisconsin Internet Mapping Team
**Jennie Sauer**, USGS LTRM Branch Chief



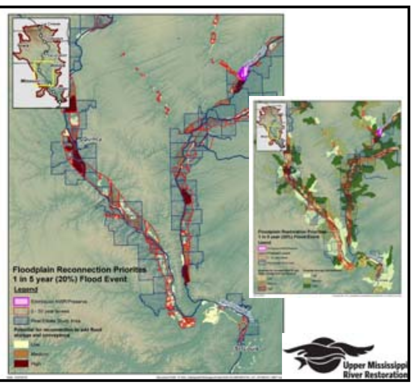





## Example: Regional Prioritization

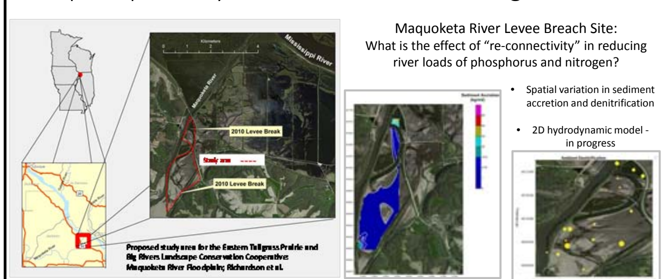
**The Nature Conservancy**

- 2-D Model @30m Resolution
- Scenario-based tool: route flood waves through landscape with & without levees





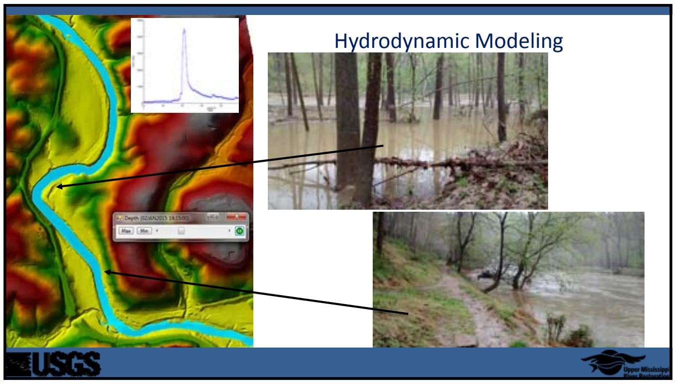

## Example: Spatial Dynamics of Sediment + Biogeochem




Maquoketa River Levee Breach Site:
What is the effect of "re-connectivity" in reducing river loads of phosphorus and nitrogen?

- Spatial variation in sediment accretion and denitrification
- 2D hydrodynamic model - in progress

Richardson, Nalley, Bartsch, Kreiling, Garrett & Bailey
(UMESC + IA-WSC)


Hydrodynamic Modeling
USGS

# UMRR LTRM Highlights

La Crosse, WI
August 2016

Upper Mississippi River Restoration
Leading Innovating Partnering

# SPECIAL THANKS TO:

WDNR
Sara Strassman
Ruth Nissen
Kurt Rasmussen

# SPECIAL THANKS TO:

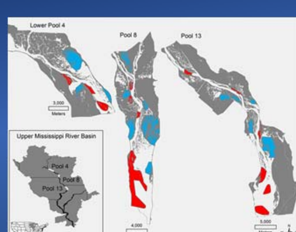
USFWS
Hallie Rasmussen
Katie Julian
Cindy Samples



## Patchiness in a Large Floodplain River: Associations Among Hydrology, Nutrients, and Fish Communities

Nate De Jager and Jeff Houser

River Research and Applications
River Res. Applications




## Contrasts between channels and backwaters in a large, floodplain river: testing our understanding of nutrient cycling, phytoplankton abundance, and suspended solids dynamics

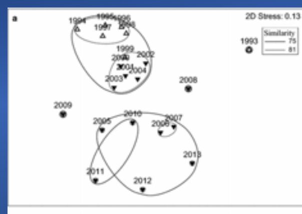
Jeff Houser

Freshwater Science.
35(2):457–473.

## 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
DOI 10.1007/s10530-016-1180-8

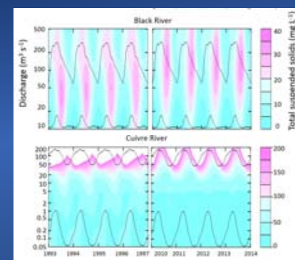



Upper Mississippi River Restoration

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

Kreiling and Houser

Environmental Monitoring and Assessment
188:454

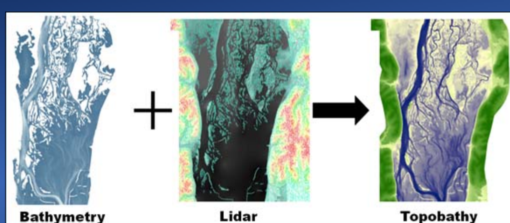



USGS
science for a changing world

Upper Mississippi River Restoration

## Topobathy Update

Lidar merged with bathymetry

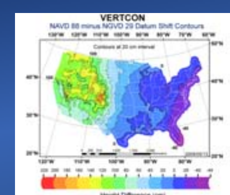



http://www.umesc.usgs.gov/data_library/topobathy.html

Upper Mississippi River Restoration

## Challenges

- Vertical Datum
- Old bathymetric surveys
- Lidar flown during flood
  - Difference in water levels




Upper Mississippi River Restoration



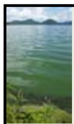
## Final Product

- UMRR Pool 03 Topobathy
- UMRR Pool 04 Topobathy
- UMRR Pool 05 Topobathy
- UMRR Pool 05a Topobathy
- UMRR Pool 06 Topobathy
- UMRR Pool 07 Topobathy
- UMRR Pool 08 Topobathy
- UMRR Pool 09 Topobathy
- UMRR Pool 10 Topobathy
- UMRR Pool 11 Topobathy
- UMRR Pool 12 Topobathy
- UMRR Pool 13 Topobathy
- UMRR Pool 14 Topobathy
- UMRR Pool 15 Topobathy
- UMRR Pool 16 Topobathy
- UMRR Pool 17 Topobathy
- UMRR Pool 18 Topobathy
- UMRR Pool 20 Topobathy
- UMRR Pool 21 Topobathy
- UMRR Pool 22 Topobathy
- UMRR Pool 24 Topobathy

Upper Mississippi River Restoration

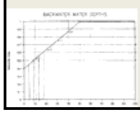
UMRR Analysis Team Agenda August 1, 2016

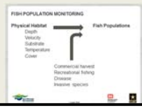
Chair: Shawn Giblin, Wisconsin Department of Natural Resources



**How Water Depth Drives Water Quality and Habitat Outcomes Session**

- Depth considerations for restoration and enhancement on the UMRS (bluegill model emphasis), Derek Ingvalson, USACE
- HREP backwater restoration with an emphasis on overwintering fish habitat, Jeff Janvrin, WDNR
- Water depth issues on the lower UMRS: perspectives from the Illinois River, Levi Solomon, INHS
- Fish Indicators, Alison Anderson, INHS
- Standardized fisheries monitoring of HREPS, David Potter, USACE
- Riparian vegetation simulation modeling and regional sediment management- beneficial use of Illinois River dredged material stockpiles, Chuck Theiling, USACE
- Habitat Needs Assessment Update, Nate DeJager, USGS
- Resilience Workgroup Update, Kristen Bouska, USGS





How Water Depth Drives Water Quality and Habitat Outcomes Session

# Depth Considerations for Restoration and Enhancement on the UMRS

**Derek Ingvalson**
**August 1, 2016**


US Army Corps of Engineers
BUILDING STRONG®

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With restoration and enhancement projects we are trying to make physical changes to get other physical, chemical, and biological responses.

Physical
- Depth
- Temp
- Velocity
- Substrate
- Connectivity
- Sediment Suspension
- Light Attenuation
- Sedimentation

Chemical
- Nutrients
- DO
- Alkalinity/Acidity
- Contaminants

Biotic
- Veg growth
- Population changes



---

## Bluegill Overwintering Model

- Variables
  - ►Velocity
  - ►Depth (based on **% of OW area >4ft**)
  - ►Water Temp
  - ►DO
- Even though variables used in the model are the same for every project, assumptions in the model and methods for applying the model differ.



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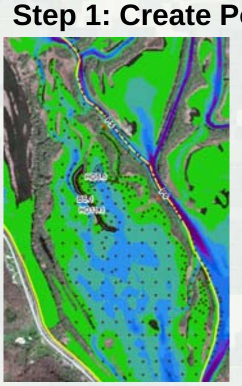
## Step 1: Create Points for Variables



- Values were added to each point for velocity, temp, and DO
- Values were based on winter survey data and professional judgement



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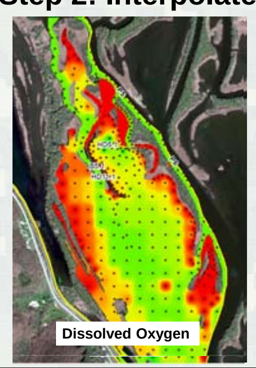
## Step 2: Interpolate Raster from Points



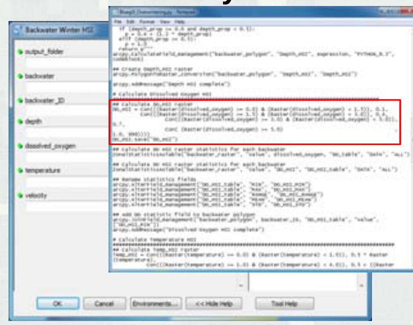

- Interpolation tool was used to create a continuous raster
- Additional iterations of rasters were produced if necessary

## Step 3: Delineate Overwintering Areas

- Identified areas with conditions that would support bluegill overwintering
- Delineating overwintering areas allows for calculation of "% of overwintering area > 4ft" without letting shallow areas drive down the value

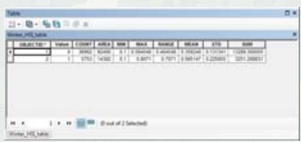


## Step 4: Use GIS to Calculate HSI Values on Pixel by Pixel Basis





## Step 5: Analyze Output and Interpret Results



## Habitat Rehabilitation and Enhancement Projects Backwater Restoration With an Emphasis on Over-wintering Fish Habitat

Ambro Slough/Gremore Lake, Pool 10

*Jeff Janvrin*
*Mississippi River Habitat Specialist*
*Wisconsin Department of Natural Resources*
*La Crosse, Wisconsin*

Upper Mississippi River Environmental Management Program
Habitat Rehabilitation and Enhancement Projects
in Pools 4 -11

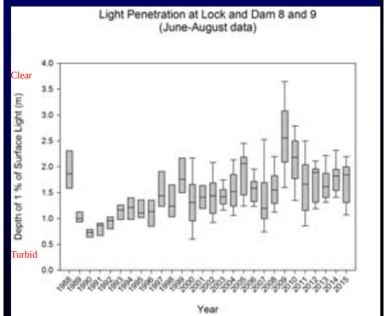
**66% of these HREPs have included an objective to improve or restore centrarchid habitat, primarily through providing overwintering habitat.**

*Spring Lake Islands and Peninsula HREPs, Pool 5*

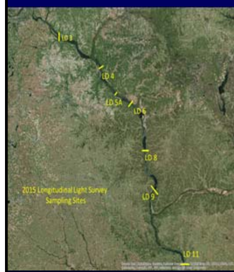

## HOW IS OVER-WINTERING HABITAT RESTORED?

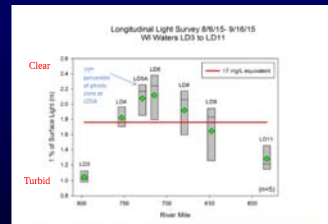
- **Protection (Bank Stabilization)**
- **Improve Water Quality**
  - **Flow Introduction**
    - **Channels**
    - **Culverts**
    - **Control Structures**
  - **Reduction or Elimination of Water Velocities**
    - **Partial Closures**
    - **Complete Closures**
    - **Control Structures**
    - **Weirs**
    - **Island Construction**
  - **Mechanical Aeration**
- **Increase Depth**
  - **Dredging**

**CHALLENGES AND LESSONS TO BE LEARNED**
*Water Clarity*




**CHALLENGES AND LESSONS TO BE LEARNED**
*Water Clarity*




| Pool | 75 % photic zone (m) | 75 % photic zone (ft) | Dredge to depth by Pool (75%+1 ft) |
|---|---|---|---|
| 3-Upper 4 | 1.17 | 3.84 | 4.84 |
| Lower 4 | 1.95 | 6.40 | 7.40 |
| 5 | 2.3 | 7.55 | 8.55 |
| 5A | 2.3 | 7.55 | 8.55 |
| 6 | 2.4 | 7.87 | 8.87 |
| 7 | 2.4 | 7.87 | 8.87 |
| 8 | 2.2 | 7.22 | 8.22 |
| 9 | 1.95 | 6.40 | 7.40 |
| 10 | 1.95 | 6.40 | 7.40 |
| 11 | 1.48 | 4.86 | 5.86 |

# Water depth issues on the lower UMRS: perspectives from the Illinois River

Levi Solomon, Andy Casper, Alison Anderson, Jason DeBoer, Dan Gibson-Reinemer, and Doyn Kellerhals

Illinois River Biological Station
Illinois Natural History Survey
University of Illinois

## Major issues

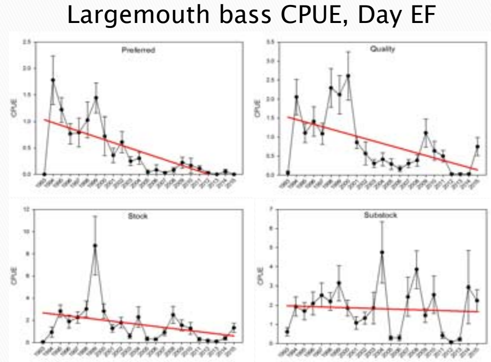
- Loss of backwater/side channel depth
  - Sedimentation
    - Lack of depth and depth diversity throughout off channel areas of La Grange Reach and much of Illinois River
- Lack of aquatic vegetation
  - Multitude of reasons
- Loss of connection to floodplain
  - Open River Reach
    - Illinois River
- All lead to loss of habitat/resources
  - Focus: Illinois River

## Why do we care?

- Off channel habitats (side channels and backwaters) necessary for many riverine species
- Several popular species of sportfishes
  - Largemouth Bass, Bluegill, crappies, etc.
    - Spawning, nursery, feeding, overwintering
- Also important for everything else!!!
  - Ducks, bugs, mammals…….
    - Healthy backwaters/side channels = healthy river
    - Unhealthy backwaters/side channels = ????

## LTRM data: 1993-2015

## Largemouth bass CPUE, Day EF

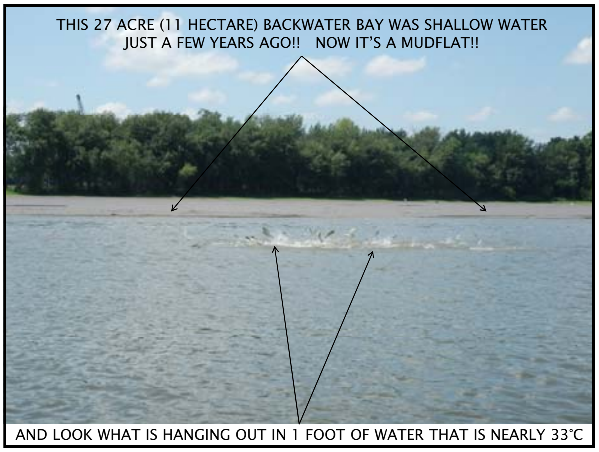


## Closing thoughts

- We know:
  - Sedimentation is filling in off channel areas
    - (Bellrose et al. 1983, LTRMP S&T 1998, and many others)
    - Loss of depth and depth diversity
    - Complete loss of some off channel areas
- Problem:
  - Riverine fish, including many popular sportfish, need off channel habitat.
    - Spawning, nursery, overwintering

## Closing thoughts

- Need:
- Illinois River and Lower impounded river
  - Restore off channel areas throughout
  - Control sedimentation
    - Complex issue!
    - Conversation needs to continue
- Open River Reach
  - Restore backwaters/side channels/connection to floodplain




## UMRS Indicators Draft Report: Options, Responses, and Corrections

Alison M. Anderson
Andrew F. Casper
Illinois River Biological Station
August 1, 2015

## Indicator Project Re-Cap

- Objective
  - Communicate the current ecosystem health status and trends
  - Additions to indicators previously used in S and T
- 2 Indicators recommended:
  - Backwater Assemblages
  - Migratory Species
- YOY added per working group
- Internal Reference: 5 year moving average & SD

## Comments:

- Removing sites with 0 total fish captured
  - This line of code was removed and further analysis was conducted including any sites which effort was expended but no were fish captured.
- Is a UMRS backwater assemblage list feasible? If so, how would it compare to the pool specific lists?
  - Indicator species analysis (ISA) was conducted System-wide using the entire LTRM electrofishing dataset.
  - Life History Database: Adult Habitat Preference indicated. 4.0=Backwaters and Lakes. **Results comparing the pool-specific, system wide, and adult habitat backwater assemblages follow.**
- **Note:** Original graphs will differ from the report for electrofishing data only. Original CPUE's were based on *per minute CPUE* rather than *per 15 minute electrofishing run*. This was an over-sight and has been corrected for the following graphs and in the R Code.

# More Comments:

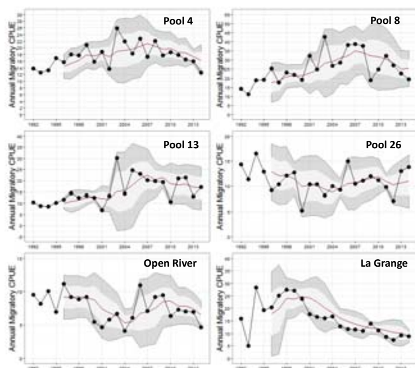
- Migratory species list should be restricted to UMR System-wide migrants.
  - The original migratory species list (LTRM) was reduced to *only include* species whose migration or life history is impacted by the navigational dams and *no longer includes* species that only move from a river or reservoir into neighboring tributaries or streams (UMRS). **New species list compare to original and graphics follow.**
- Request to remove YOY from other indicators
  - YOYs removed from Migratory and Backwater Assemblages. **Graphics displaying with and without YOY follow.**

# UMR System Migrants

| Common Names | Full List | UMRS List |
|---|---|---|
| Alabama shad | x | x |
| American eel | x | x |
| Black redhorse | x | -- |
| Blue catfish | x | -- |
| Bigmouth buffalo | x | -- |
| Blue sucker | x | x |
| Channel catfish | x | -- |
| Flathead catfish | x | -- |
| Freshwater drum | x | -- |
| Goldeye | x | -- |
| Golden redhorse | x | -- |
| Highfin carpsucker | x | -- |
| Lake sturgeon | x | x |
| Largemouth bass | x | -- |
| Longnose gar | x | -- |
| Mooneye | x | -- |
| Northern hog sucker | x | -- |
| Northern pike | x | -- |
| Paddlefish | x | x |
| Pallid sturgeon | x | x |
| Quillback | x | -- |
| Sauger | x | -- |
| Shorthead redhorse | x | -- |
| Skipjack herring | x | x |
| Smallmouth buffalo | x | -- |
| Smallmouth bass | x | -- |
| Shovelnose sturgeon | x | x |
| Spotted sucker | x | -- |
| Silver lamprey | x | -- |
| Silver redhorse | x | -- |
| Walleye | x | -- |
| White bass | x | -- |
| White sucker | x | -- |
| Yellow bass | x | -- |

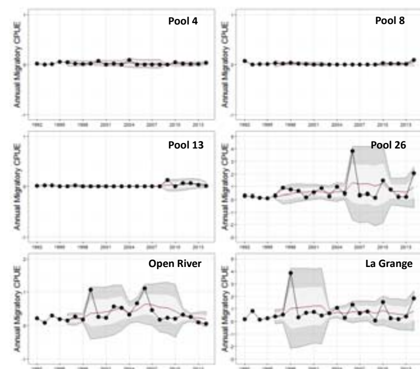
# Full Migratory: Adults Only

| Common Names |
|---|
| Alabama shad |
| American eel |
| Black redhorse |
| Blue catfish |
| Bigmouth buffalo |
| Blue sucker |
| Channel catfish |
| Flathead catfish |
| Freshwater drum |
| Goldeye |
| Golden redhorse |
| Highfin carpsucker |
| Lake sturgeon |
| Largemouth bass |
| Longnose gar |
| Mooneye |
| Northern hog sucker |
| Northern pike |
| Paddlefish |
| Pallid sturgeon |
| Quillback |
| Sauger |
| Shorthead redhorse |
| Skipjack herring |
| Smallmouth buffalo |
| Smallmouth bass |
| Shovelnose sturgeon |
| Spotted sucker |
| Silver lamprey |
| Silver redhorse |
| Walleye |
| White bass |
| White sucker |
| Yellow bass |




# UMRS Migrants: Adults Only

| Common Names |
|---|
| Alabama shad |
| American eel |
| Blue sucker |
| Lake sturgeon |
| Paddlefish |
| Pallid sturgeon |
| Skipjack herring |
| Shovelnose sturgeon |



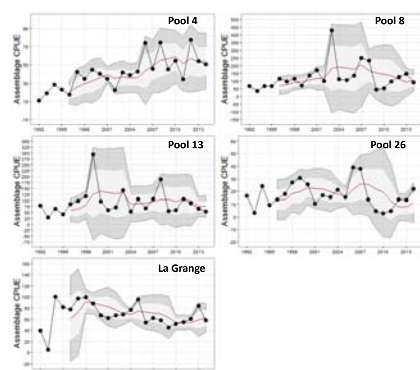

# UMR Backwater Indicators (UMRS-wide list)

| Fish Code | IndVal | p.value | Common Name |
|---|---|---|---|
| BKCP | 0.521 | 0.001 | Black crappie |
| BLGL | 0.633 | 0.001 | Bluegill |
| BMBF | 0.336 | 0.001 | Bigmouth buffalo |
| BNBH | 0.122 | 0.001 | Brown bullhead |
| BTTM | 0.12 | 0.001 | Blackstripe topminnow |
| BWFN | 0.383 | 0.001 | Bowfin |
| CMMW | 0.062 | 0.015 | Central mudminnow |
| FWDM | 0.415 | 0.001 | Freshwater drum |
| GDSN | 0.321 | 0.001 | Golden shiner |
| JYDR | 0.203 | 0.002 | Johnny darter |
| LMBS | 0.535 | 0.001 | Largemouth bass |
| MDDR | 0.131 | 0.002 | Mud darter |
| MQTF | 0.252 | 0.001 | Western mosquitofish |
| NTPK | 0.279 | 0.001 | Northern pike |
| OSSF | 0.44 | 0.001 | Orangespotted sunfish |
| PGMW | 0.225 | 0.001 | Pugnose minnow |
| PRPH | 0.095 | 0.001 | Pirate perch |
| RESF | 0.075 | 0.002 | Redear sunfish |
| SMBF | 0.428 | 0.003 | Smallmouth buffalo |
| SPSK | 0.443 | 0.001 | Spotted sucker |
| STGR | 0.112 | 0.001 | Spotted gar |
| WDSN | 0.187 | 0.004 | Weed shiner |
| WLYE | 0.226 | 0.002 | Walleye |
| WRMH | 0.209 | 0.001 | Warmouth |
| WTCP | 0.418 | 0.001 | White crappie |
| WTSK | 0.112 | 0.001 | White sucker |
| YWBS | 0.19 | 0.001 | Yellow bass |
| YWPH | 0.356 | 0.001 | Yellow perch |

| Common Name |
|---|
| Banded killifish |
| Black crappie |
| Bluegill |
| Bloater |
| Bigmouth buffalo |
| Burbot |
| Bowfin |
| Common carp |
| Chain pickerel |
| Cisco |
| Emerald shiner |
| Flier |
| Golden shiner |
| Gizzard shad |
| Lake chubsucker |
| Largemouth bass |
| Longnose gar |
| Mimic shiner |
| Mooneye |
| Muskellunge |
| Northern pike |
| Pumpkinseed |
| Redear sunfish |
| River carpsucker |
| Sauger |
| Shortnose gar |
| Spottail shiner |
| Mississippi silvery minnow |
| Slimy sculpin |
| Walleye |
| Warmouth |
| Western silvery minnow |
| White crappie |
| Yellow bullhead |
| Yellow perch |

LTRM Life History Database: **Adult** Habitat Preference (4) Backwaters and Lakes

# Backwater Assemblage: Original



# Backwater Assemblage: Adult Habitat Preference

| Common Name |
|---|
| Banded killifish |
| Black crappie |
| Bluegill |
| Bloater |
| Bigmouth buffalo |
| Burbot |
| Bowfin |
| Common carp |
| Chain pickerel |
| Cisco |
| Emerald shiner |
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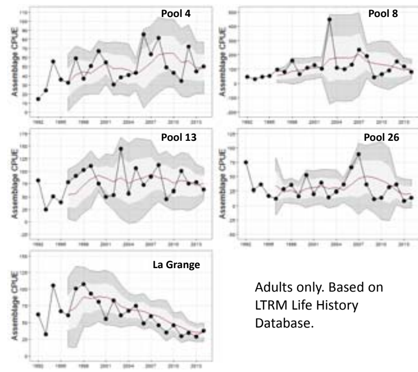
| Yellow perch |




Adults only. Based on LTRM Life History Database.

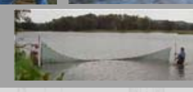
# HREP STANDARDIZED MONITORING - FISH

Presentation for the

**A-Team**

David Potter

1 August 2016



Upper Mississippi River Restoration

US Army Corps of Engineers St. Paul District

U.S. ARMY

# STANDARDIZED MONITORING

- Supports UMRR Strategic Plan
- Benefits
  - Quantify status and trends of individual HREPs
  - Facilitates comparisons across HREPs
  - Facilitates comparisons to trend pools
  - Rapid, repeatable, & quantitative methods
  - Assists in planning & documenting success

1 August 2016

# HREPS – PROPOSED METHODOLOGY

- Rely heavily on LTRM protocol (Ratcliff et al. 2014; Ickes et al. 2014).
- Site selection – 50 m2 grids using fixed, random, & stratified random
- 4 periods
- Gear types- boat electrofishing, hoop netting, fyke netting, seine netting, trawling
- Fish assessment – abundance, community structure, size structure

1 August 2016