Upper Mississippi River Restoration Program Coordinating Committee Quarterly Meeting

May 24, 2017

Highlights and Action Items

Program Management

- **The FY 17 Consolidated Appropriations Act was enacted on May 4, 2017 that included $20 million for UMRR and an additional $25 million for the Corps to allocate to its environmental restoration or compliance programs and projects, including UMRR. It is unknown whether the Corps would allocate any of the additional monies to UMRR. In addition, the FY 2018 budget has not yet been released**. [Note: Immediately following the meeting on May 24, the Corps released its FY 2017 work plan with an additional $13.17 million for UMRR bringing its total allocation to $33.17 million (its full annual authorized amount). The President's FY 18 budget was also published on May 25 and includes $33.17 million for UMRR.]

- **On May 24, 2017, the Office of the Assistant Secretary of the Army for Civil Works [ASA(CW)] approved the 2016 UMRR Report to Congress.** Next steps include printing hard copies of the full report and CDs (which includes the full report and brochure) and formal submission of printed materials to the Office of Management and Budget. Hard copies will be made available upon request to Marv Hubbell. Electronic copies of the full report and brochure are available on UMRR's web page.

- Individuals interested in being involved in UMRR's *ad hoc* external communications group should contact Angie Freyermuth (angela.m.freyermuth@usace.army.mil).

- In response to a request, updated one-page fact sheets for individual states will be made available to partners.

UMRR Showcase Presentations

- Molly Sobotka discussed research indicating that off-channel areas disconnected from the river in normal conditions do not contribute to the river ecosystem during flood events but that connectivity and quantity of off-channel areas is important to providing habitat during all river stages.

- Brian Markert discussed the issues challenging the habitat at the Ted Shanks site and how the suite of project features are designed to improve water drainage, management, and supply; improve aquatic habitat; increase bottomland and floodplain forest; and restore ecosystem functions by reconnecting the floodplain to the river.

Habitat Needs Assessment/Ecosystem Resilience

- The UMRR held a May 15-17, 2017 workshop to discuss the ecosystem resilience and HNA II efforts and how they relate to each other and inform habitat project selection. Next steps are:

  1) Develop a suite of general resilience metrics for inclusion in the HNA II

  2) Identify a series of additional queries or metrics to define general habitat characteristics across the UMRS

3) Complete the aquatic and floodplain data by September 30, 2017
4) Complete modeling work by September 30, 2017
5) Provide data summaries and scientific interpretation of current and projected future conditions using the suite of metrics identified in steps 1-2
6) Complete the HNA II in February 2018

The HNA II tri-team chairs will work with the HNA Steering Committee to develop a more detailed scope of work for going forward that includes various reviews and consultations with the District-based river teams.

Habitat Restoration

- Conway Lake habitat project is MVP's highest priority, with a fairly strict schedule to complete plans and specs and award a construction contract this fiscal year. This project is critical to maintaining full FY 17 execution.

- MVS continues planning on Rip Rap Landing, Piasa and Eagles Nest Islands, Crains Island, and Harlow Island habitat projects. The District recently held a site visit at Oakwood Bottoms. Construction is underway for Ted Shanks, Clarence Cannon, and Pools 25 and 26 Islands.

- MVR is finalizing the draft feasibility report for Beaver Island and Keithsburg. The District's construction effort is fairly aggressive with construction ongoing on the Lake Odessa flood damages, Pool 12 Overwintering Stages I-III, Huron Islands Stages I and II, and Rice Lake Stage I.

Long Term Resource Monitoring and Science

- Accomplishments of the first quarter of FY 17 include publication of:
  - Four manuscripts:
    1) Crustacean zooplankton dynamics in a natural riverine lake, Upper Mississippi River
    2) Spatial and temporal relationships between the invasive snail *Bithynia tentaculata* and submersed aquatic vegetation in Pool 8 of the Upper Mississippi River
    3) Long-term fish monitoring in large rivers: utility of "benchmarking" across basins
    4) Widespread and enduring demographic collapse of invasive common carp (*Cyprinus carpio*) in the Upper Mississippi River System
  - A technical report of the fish indicators of UMRS ecosystem health
  - A fact sheet describing the UMRS topobathy dataset
  - A summary of the LTRM sampling highlights in Pools 12 and 13

- Research funded in FY 17 includes the following:
  - Sediment transects
  - Backwater sedimentation from alluvial fan formation
  - Metabolism, nutrients, and fish in the Middle Mississippi River
  - Habitat requirements of fish assemblages
  - Mapping thermal landscapes in a pilot study

- **A similar scope of work process that occurred in FY 17 will occur again in FY 18, with a SOW developed for LTRM base monitoring and a second SOW developed for science in support of restoration and management.**

- The A-Team's April 26, 2017 meeting focused included a discussion on ecosystem resilience conceptual models and research presentations on standardized HREP fish monitoring protocols, Pettibone Lagoon water quality protocol, Maquoketa River floodplain connectivity study. In addition, the A-Team discussed its future goals and direction. **Matt Vitello is assuming the chairing position from Shawn Giblin. The UMRR Coordinating Committee expressed its appreciation to Giblin for his leadership in the Chair role.**

<u>**Other Business**</u>

- **Upcoming quarterly meetings are as follows:**
  - **August 2017 — Onalaska/UMESC**
    - UMRBA quarterly meeting — August 8
    - **UMRR Coordinating Committee quarterly meeting — August 9**
  - **November 2017 — St. Paul**
    - UMRBA quarterly meeting — November 7
    - **UMRR Coordinating Committee quarterly meeting — November 8**
  - **February 2018 — Quad Cities**
    - UMRBA quarterly meeting — February 6
    - **UMRR Coordinating Committee quarterly meeting — February 7**

UPPER MISSISSIPPI RIVER RESTORATION (UMRR) PROGRAM COORDINATING COMMITTEE

MAY QUARTERLY MEETING

Marvin E. Hubbell – MVR
Regional UMRR Program Manager
Mississippi Valley – Rock Island District (MVR)
Mississippi Valley – St. Louis District (MVS)
Mississippi Valley – St. Paul District (MVP)

May 24, 2017

US Army Corps of Engineers

U.S. ARMY

UMRR PARTNERS

UMRR FY 17

President's Budget	$ 20,000,000
Omnibus Bill	$ 20,000,000
Appropriation	$ 20,000,000
FY17 Work plan	$???
FY17 Total	$???

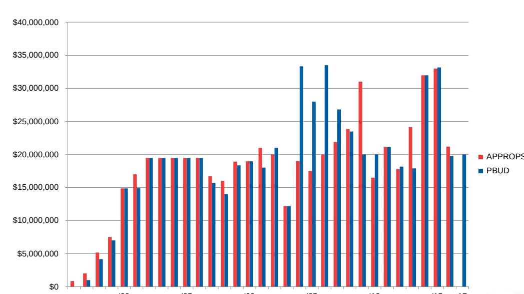
FY17 PLAN OF WORK

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

FY 18 PBUD

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

UMRR PROGRAM APPROPRIATION/BUDGET HISTORY



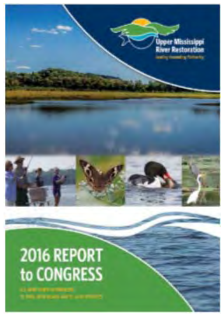
FY1985 to FY2017

Upper Mississippi River Restoration

US Army Corps of Engineers

U.S. ARMY

REPORTS TO CONGRESS



2016 Report to Congress

Final Schedule

- Nov. 23 – Submit electronic final RTC to MVD & HQ
- Dec. 12 – Officially submit final RTC to MVD & HQ
- Dec. 23 – MVD submit RTC to HQ
- Jan. 11 – HQ Office of Council comments
- Jan. 17 – Revised RTC to MVD & HQ
- Feb.10 –Transmitted to ASA(CW)
- May 10 – Overall ASA was very impressed but had one minor comment, received approval to print

PUBLIC COMMUNICATIONS AND OUTREACH

PUBLIC COMMUNICATIONS AND OUTREACH

UMRR External Communications Strategy

Team Met on January 12, 2017

- Angie Freyermuth – Lead
- Karen Hagerty – Corps
- Harland Hiemstra – MN
- Randy Hines – UMESC
- Kirsten Mickelsen – UMRBA

Would like representatives from FWS, TNC, NRCS, USEPA and another state

PUBLIC COMMUNICATIONS AND OUTREACH

UMRR External Communications Strategy

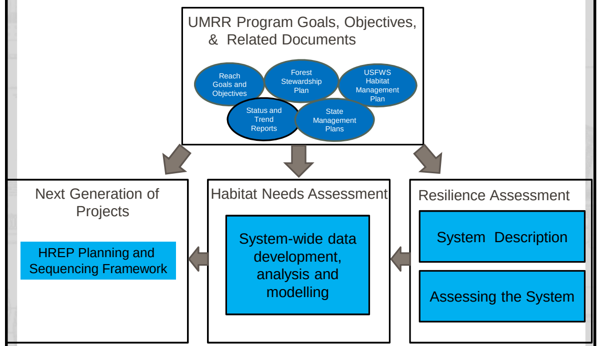
Potential tasks to improve communications:

- UMRR folder with talking papers on select issues
- Investigating a UMRR.org address
- Investigating a UMRR Facebook page
- Developing signage for projects and field stations
- Developing UMRR Program handouts

UMRR SHOWCASE

Ecosystem Metabolism in the UMR Open River Off-Channels - Molly Sobotka

Ted Shanks HREP – Brian Markert



WHERE ARE WE GOING?

Key Steps for the Future of UMRR:

1) 2015 UMRR Strategic Plan - Established the strategic vision of a healthier and more resilient UMRS.
2) 2015 Resilience Initiative
3) 2016 HNA II Initiative
4) 2017 Next Generation of HREP's
5) 2018 formulation and design of HREP's around principles of Health and Resilience. Structuring project monitoring to evaluate contributions to Health and Resilience.
6) Use of base LTRM monitoring data to inform resilience metrics and indicators of ecosystem health.
7) Use of metrics and indicators for health, resilience, stressors and drivers to evaluate progress or change.

ECOSYSTEM RESILIENCE/HABITAT NEEDS ASSESSMENT WORKSHOP

Overall Assessment of the Workshop:

A much needed touch point for both efforts

Great updates on the progress that has been made on resilience and HNA II.

Questions were posed and feedback provided to researchers

Initiated discussions on the linkage of resilience and HNA II

Began discussions on relevance of 2009 reach objectives to the HNA II effort

There was a significant difference in the amount of familiarity to the overall resilience and HNA II efforts.

ECOSYSTEM RESILIENCE/HABITAT NEEDS ASSESSMENT WORKSHOP

Challenges identified at the workshop:

1) participants did not see a clear vision for the HNA II initiative,
2) we need to improve communications,
3) we should have discussed the existing schedule at the beginning of the workshop, and
4) decisions that have already been made by the program regarding these efforts should have been reviewed at the beginning of the workshop.

HNA II / RESILIENCE WORKSHOP WRAP-UP

Feedback from working groups

1. Liked resilience framework but interested in refinements
   a. Liked "spider web" and it's use for discussions with river teams
2. Liked aquatic area and floodplain classification improvements and wetted perimeter methodology.
   a. But needs to be finalized and made scale appropriate for HNA II
3. Want roadmap for how to use resilience and HNA II data for HNA II report.

HNA II / RESILIENCE WORKSHOP WRAP-UP

Feedback from working groups

4. Agree that there is a linkage between Floodplain Reach objectives, 5 EEC's, resilience metrics, and habitats. But, how that linkage will be used is not clear.

HNA II / RESILIENCE WORKSHOP WRAP-UP

Feedback from working groups

Next Steps

1. Finalize Resilience metrics – What input is needed from managers?
2. Finalize aquatic area and floodplain classification systems and wetted perimeter methods – what input is needed from managers?
3. Finalize data layers for the "spider web" for HNA II.
4. Develop detailed schedule for completion of HNA II

HNA II / RESILIENCE WORKSHOP WRAP-UP

Next Steps

5. Review resilience and HNA II metrics – Steering committee's endorse and get concurrence with UMRR CC.
6. HNA II Steering Committee develops standard approach to reach out to river teams to review and refine "spider web", HNA II metrics, within the context of the 2009 Floodplain Reach Objectives.
7. Hold webinar to discuss resilience and HNS II data layer with river teams.
8. Hold face to face meetings with river teams.
9. Finalize recommendations and complete report.

SOME EXAMPLES OF WHAT GUIDANCE THE PARTICIPANTS WERE LOOKING FOR

1) resilience metrics are intended to inform and be used for the HNA II,
2) there will be integration between resilience metrics, indicators of ecological health, and the selection, formulation, and evaluation of habitat projects,
3) resilience, HNA II, and the effort to identify the next generation of projects are all separate, but closely linked initiatives,
4) HNA II is not developing tools for HREP plan formulation (it will likely provide tools that will be used for plan formulation, but that is not its purpose),

EXAMPLES OF WHAT THE PARTICIPANTS WERE LOOKING FOR

5) the term "Habitat Needs Assessment" was given to us by Congress (we spent time during the workshop demonstrating the clear linkage between habitat and the other EEC's to make sure that everyone understood the relationships),
6) the "blueprint" for this effort is the first HNA, but better data and tools give us the opportunity to expand on the first effort (one of the reasons we had the workshop),
7) the HNA II is not restricted to following the process used for the development of HREP feasibility reports, and
8) the vision for this initiative is encapsulated in the vision statement developed for the Strategic Plan.

UMRR HABITAT REHABILITATION AND ENHANCEMENT PROJECTS

AS OF NOVEMBER 2016:
55 PROJECTS COMPLETED

5 PROJECTS IN CONSTRUCTION

30 PROJECTS IN DESIGN

ST. PAUL DISTRICT (MVP)
FY17 HREP WORK PLAN (24 MAY 2017)

PLANNING – in priority order…..

Conway Lake Floodplain forest and overwintering**, Pool 9, IA – ($250k)**
- Feasibility Report 30-day public review release on 5/16.

McGregor Lake Islands, Pool 10, WI – ($200k)
- Continue Draft Feasibility Report

FWWG working on prioritizing new 2-3 projects with approved fact sheets… Pool 10 Islands, Bass Lake Ponds (Mn River), Lake Winneshiek (Pool 9), Weaver Bottoms and Finger lakes

CONSTRUCTION

Harpers Slough Islands**, Pool 9, IA ($300k)**
- Stage 1 - Complete construction and turnover to USFWS this FY. Begin tree plantings next spring

Conway Lake, Pool 9**, IA (~$5-10m)**
- Stage 1 – Award first contract in FY 17.

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

ST. LOUIS DISTRICT (MVS)
FY17 HREP WORK PLAN (MAY 24, 2017)

PLANNING

Rip Rap Landing, IL *$40k*
- Final Draft Feasibility complete –
  - *HQ level discussions between USACE and NRCS (led by NWD and MO River*

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

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

Harlow Open River Islands, MO *$50k*
- Complete Draft Report of TSP

Oakwood Bottoms, IL *$50k*

Complete site visit

Complete Planning Functional Analysis (VE Workshop)

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 Riverside Setback Design

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

CONSTRUCTION

Ted Shanks, MO *$775k*
- Completed 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*

ROCK ISLAND DISTRICT (MVR)
FY17 HREP WORK PLAN (MAY 2017)

PLANNING
- Beaver Island, Pool 14, **IA ($255K)**
- Delair, IL **($143K)**

Keithsburg Division, Pool 18, IL **($440K)**
Steamboat Island, Pool 14, IA **($175K)**

DESIGN
- Beaver Island Stage I, Pool 14, IA **($200K)**

CONSTRUCTION
- Lake Odessa Flood Recovery, IA Pools 17 and 18, IA3 **($90K)**
- 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 **($75K)**
- Huron Island Stage II, Pool 18, IA **($100K)**
- Rice Lake Stage I, IL LaGrange Pool **($80K)**

EVALUATION
- FWS **($256K)**
- Baseline Monitoring
- Post Project Monitoring
- Performance Evaluations **($200K)**: Bay Island, Andalusia, Brown's Lake, Banner Marsh, Pool 11, Cottonwood Island, Lake Chautauqua
- Adaptive Mgmt. Pool 12

UMRR MONITORING & SCIENCE FY2017

2 SOWs in FY17
- SOW for LTRM base monitoring **$4.61M**
- SOW for science in support (analysis under base) **$1.0M**

Both SOWs <u>together</u> are equivalent to a fully funded UMRR LTRM element

$5.61M FY17 funds

UMRR MONITORING & SCIENCE FY2017

FY17 LTRM funds:

FY 2017 funding	$ 5,610,000
Carry in funding	$ 232,044
Pass thru adjust	$ 318
FY17 Budget	**$ 5,842,362**

UMRR MONITORING & SCIENCE FY2017

FY17 Total funding	$ 5,842,362
➢ LTRM	$ 5,656,166
➢ 5 science proposals	$ 186,196

UMRR MONITORING & SCIENCE FY2017 PROPOSALS

1. Sedimentation transects (Rogala) **$36,706**
2. Backwater sedimentation from alluvial fan formation (Rogala) **$23,875**
3. Metabolism, nutrients, & fish in the Middle Miss floodplain (Sobotka) **$30,349**
4. Habitat requirements of fish assemblages (Bouska, Gray) **$24,569**
5. Mapping thermal landscapes (pilot study) (Jankowski, Robinson) **$23,827**

UMRR MONITORING & SCIENCE FY2018

2 SOWs in FY18

- ➢ SOW for LTRM base monitoring
- ➢ SOW for science in support (analysis under base)

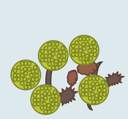
Mud Lake Pool 11 July 2006

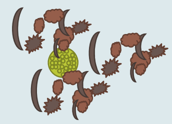
OFF-CHANNEL METABOLISM ON THE MIDDLE MISSISSIPPI RIVER

Molly Sobotka
UMRR
May 24 2017

LARGE RIVER METABOLISM

- Large turbid rivers are typically heterotrophic.
- Nutrient loading provides the potential for high metabolic rates if light is available.
- Autotrophic production has been found to be important in riverine food webs.
- We don't know where this productivity might be occurring in the MMR.





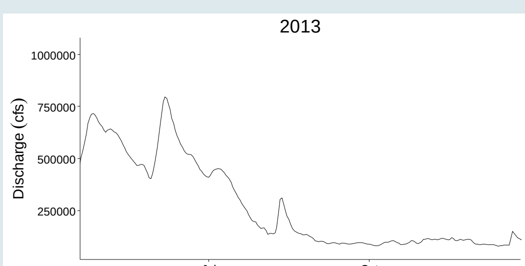
MIDDLE MISSISSIPPI RIVER

- Highly modified
  - Approximately 4.5 dikes per mile.
  - Almost continuous revetment.
  - Extensive levees.
  - Main channel of the river is disconnected from 80% of its floodplain.
  - Reduced off-channel areas: side channels, backwaters and other shallow water/slow velocity habitats.

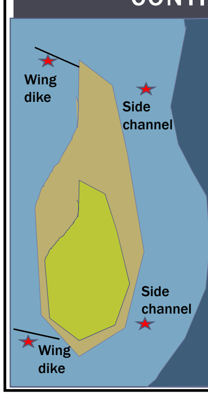
WING DIKES

- Wing dike fields may act as alternatives to lost habitats.
  - Provide variable depth and velocity regimes at individual dikes.
  - Dike fields are being used in place of off-channel habitats.
- At the landscape scale over long periods of time, dikes act to decrease habitat variability.

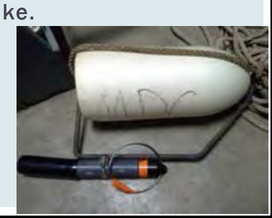
2013 LOW WATER PERIOD



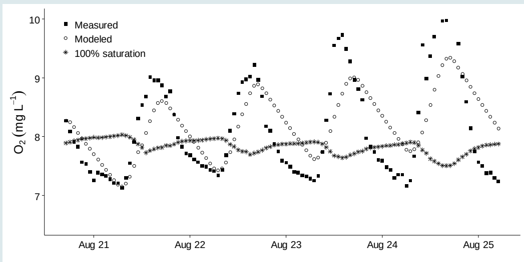
CONTINUOUS O_2 MONITORING



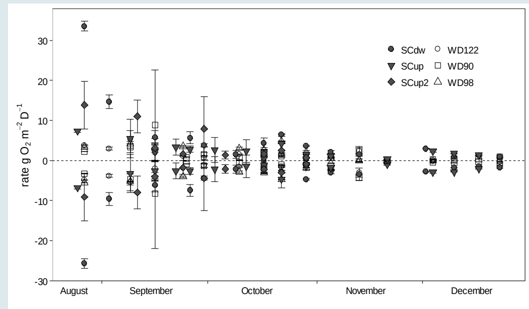
- Data collection from mid August to early January
- Sondes placed on inner edge of main channel flow around each dike.



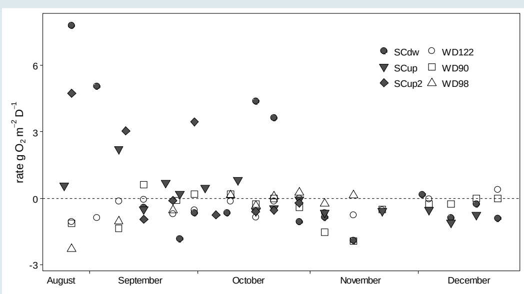
MODEL



2013 LOW WATER PERIOD – GROSS PRIMARY PRODUCTION AND COMMUNITY RESPIRATION



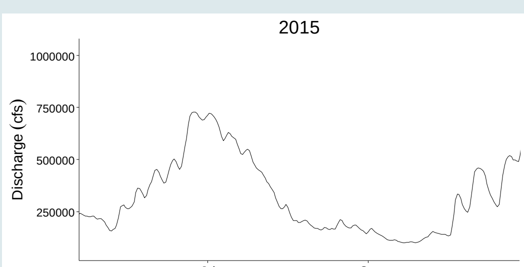
2013 LOW WATER PERIOD – NET ECOSYSTEM PRODUCTION

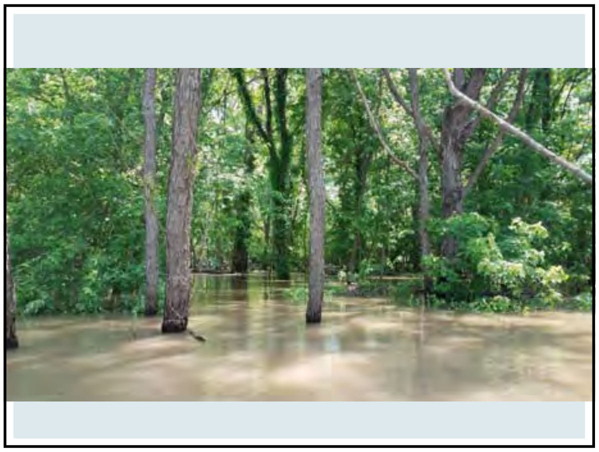


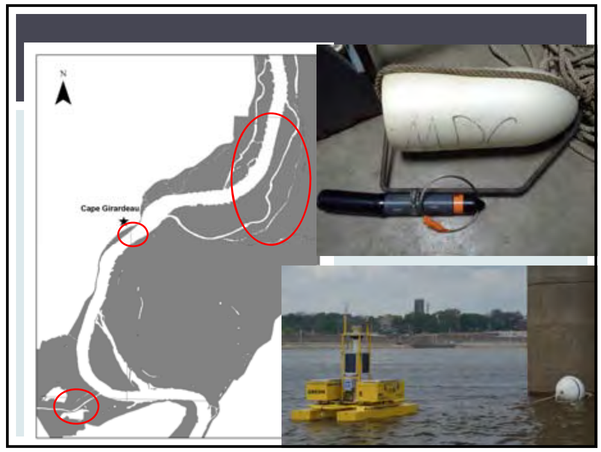
INITIAL CONCLUSIONS AND QUESTIONS RAISED

- Side channels in the Middle Mississippi can act as areas of increased primary production
  - Wing dikes may provide similar habitat and may be alternative habitat as off channel habitat becomes less common
  - Wing dike habitat is fragmented and separated by harsher main channel conditions.
- Does the modified river experience high productivity during floods?
- Or, how does water quality change laterally as we move out from the main flow channel?

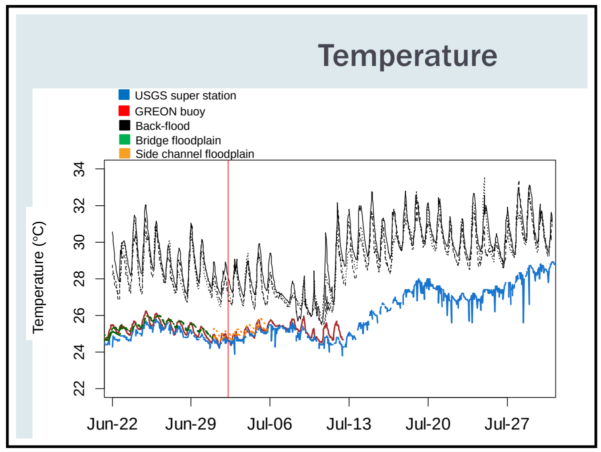
2015 HIGH WATER PERIOD

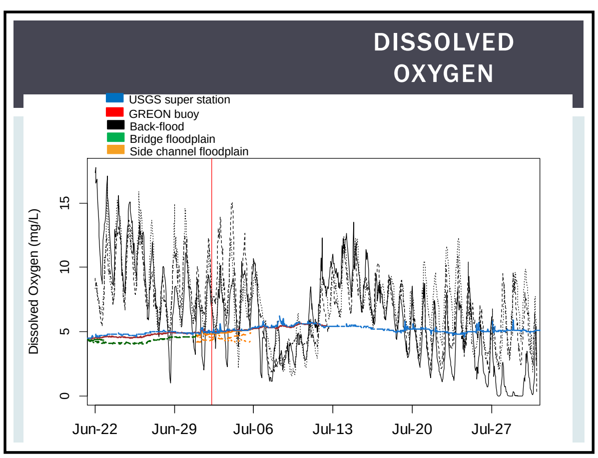


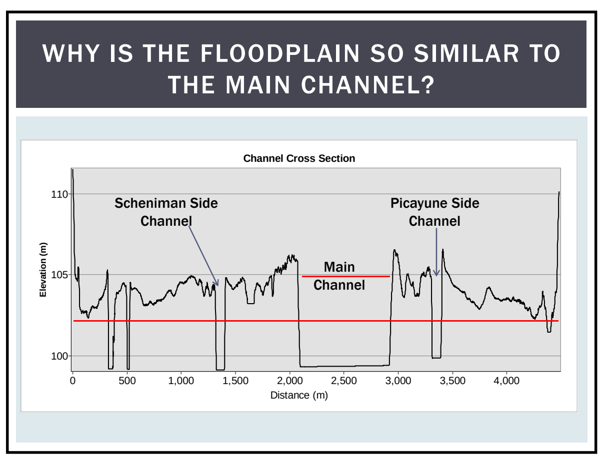



N
Cape Girardeau

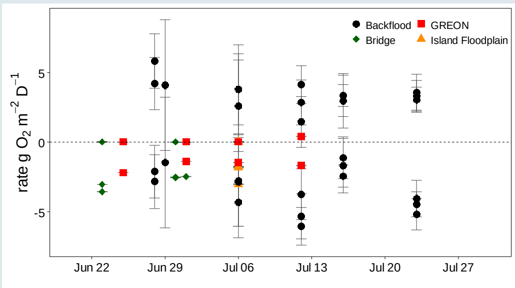

USGS super station
Bridge 2
Bridge 3
Bridge 1
GREON buoy


Temperature
USGS super station
GREON buoy
Back-flood
Bridge floodplain
Side channel floodplain
Temperature (°C)
22
24
26
28
30
32
34
Jun-22
Jun-29
Jul-06
Jul-13
Jul-20
Jul-27

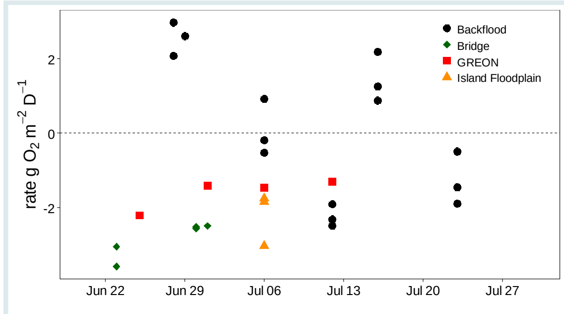

DISSOLVED OXYGEN
USGS super station
GREON buoy
Back-flood
Bridge floodplain
Side channel floodplain
Dissolved Oxygen (mg/L)
0
5
10
15
Jun-22
Jun-29
Jul-06
Jul-13
Jul-20
Jul-27


WHY IS THE FLOODPLAIN SO SIMILAR TO THE MAIN CHANNEL?
Channel Cross Section
Scheniman Side Channel
Picayune Side Channel
Main Channel
Elevation (m)
100
105
110
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Distance (m)

2015 HIGH WATER - GROSS PRIMARY PRODUCTIVITY AND COMMUNITY RESPIRATION



2015 HIGH WATER PERIOD - NET ECOSYSTEM METABOLISM



SO WHAT'S THE POINT?

- Open river off-channel habitats are capable of high productivity during low and high water periods.
- Connectivity and amount of these habitats might be pinch points to getting that productivity into the food web.
  - Does the food move to the consumers or do the consumers come to the food?
- Highly productive areas are a moving target and as managers we want to have these habitats available at all river stages.

THANKS!

- This work was funded by the United States Army Corps of Engineers through the Long Term Resource Monitoring element of the Upper Mississippi River Restoration Program administered by the United States Geological Survey.
- And by the Missouri Department of Conservation.

- http://www.umesc.usgs.gov/ltrmp.html

TED SHANKS CONSERVATION AREA

HABITAT REHABILITATION & ENHANCEMENT PROJECT
UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM

24 May 2017

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

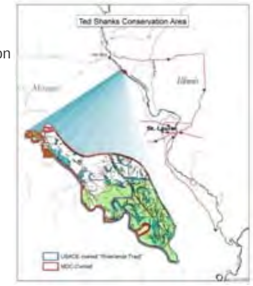
File Name

TED SHANKS CA

About the Site
Sponsor: Missouri Department of Conservation
Location: 2900 Acres in Pool 24, Mississippi River RM 284.5-288.5, Pike County, MO

Issues:

- Elevated ground water table
- Inability to manage water levels and drain water out - post flood ponding
- Forest decline, no regeneration, Habitat conversion to reed canary grass, invasive fish
- Loss of aquatic habitat diversity
- Sedimentation in Deadman's Slough

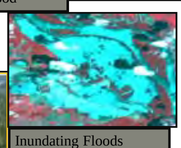


TED SHANKS CA

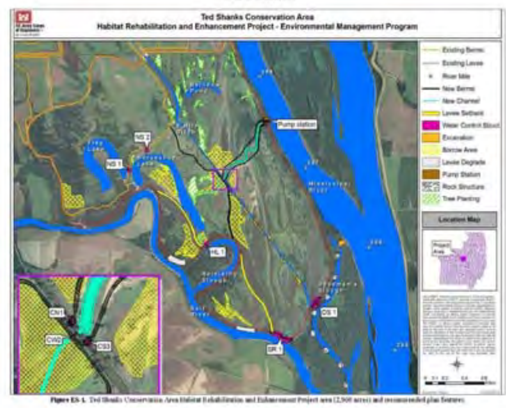
Solutions

- Improve water drainage, management, and supply
- Improve aquatic habitat
- Improve water drainage, management, and supply
- Increase in bottomland and floodplain forest
- Restore ecosystem functions by reconnecting the floodplain to the river through levee setbacks


Prior to 1993 flood


Inundating Floods


Tree mortality post flood



TED SHANKS CA

- Fact Sheet Approved 2005
- Feasibility Study Approved 2011 ($29,506,000)
- Construction Duration: 2011-2017
- Project Closeout: 2018
- Project Evaluation & Monitoring: 2019

TED SHANKS CA

- Completed CW 2 Water control and interior berms
- Completed South Berm, and North Berm setback
- Completed SR1, HL1
- Completed NS1, NS2, & DS1, CN1, CN3, and channel
- Pump Station Construction in Progress
- Deadman Slough & Reforestation in design (last remaining features)

Ted Shanks MO Construction

- Precast concrete water control structure with slide gate and sheet pile wing walls
- Precast Concrete Structure - *reduces time in the field for construction, increases speed of construction, reduces construction risk, increases efficiency and reduces costs*
- Foundations for wet areas
  - Multiple layers of geo-textile and crushed stone
  - Mud slabs

LEVEE SETBACK & ACCESS ROAD

- Access Road – flood tolerant design, large stone capped with smaller graded stone
- Borrow areas- beneficial reuse of brush and debris to create habitat for shorebirds and other wildlife in reclaimed floodplain (levee setback)

NS1

- Gate: 2 Gates – (48"x48" Slide Gate and 48"x24" Weir Gate)
- Pipe: Standard 48"x48" precast box culvert
- Precast concrete inlet and flared outlet structures

CS3

- Gate: 2 - 72"x72" Slide Gates
- Pipe: Standard 72"x72" precast box culverts
- Sheet pile wing walls with precast flared inlet and outlet structures

SR1

- Gate: 3 - 72"x72" Slide Gates
- Gated Structure
- Pipe: 72" Dia. RCP
- Walkway bridge with sheet pile walls

PUMP STATION

ANOTHER REASON WHY

In 2016-2017, 3900 waterfowl hunters utilized Ted Shanks

91.1 million U.S. residents fished, hunted, or wildlife watched in 2011 and they spent $145 billion on their activities (According to the National Survey of Hunting, Fishing, and Wildlife Associated Recreation – conducted every 5 years)

Our ecosystem restoration work helps conserve, maintain, and restore resource functions.

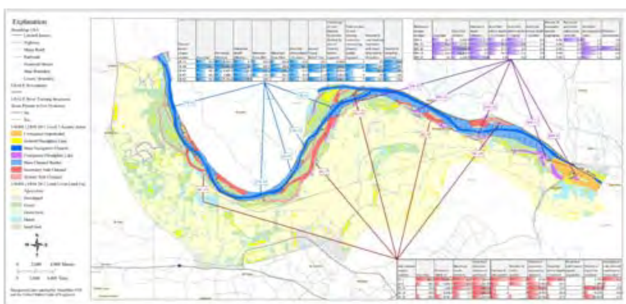
HNA-II Road map (UMESC-Science Portion):

1. Goal:
   - Conduct a broad-scale, system-wide assessment of the UMRS and determine how restoration of various habitats could improve its health and resilience.
2. Develop new data for aquatic and floodplain habitats (ongoing)
3. Develop models for future scenarios of backwater sedimentation, flooding regime, and floodplain forest succession (ongoing)
4. Integrate Resilience concepts into HNA-II to assess 'current conditions' (ongoing)
   - General Resilience Metrics (e.g., diversity indicators, connectivity indicators, slow variables and feedbacks)
5. Identify habitat types or metrics of ecosystem structure/function/resilience for inclusion in HNA-II (Starting)
6. Provide data summaries and scientific interpretation of 'current and projected future conditions ' using metrics identified in #4 and #5.

HNA-II: Progress to date

- Incorporate new data and geospatial methods to better characterize aquatic and floodplain habitats
  - Use of topobathy and other ancillary data to identify differences within and among different aquatic areas (e.g. side channels, backwater lakes, main channel border).
  - Use of topobathy and system-wide gage data to characterize differences in flooding regime across the UMRS (e.g. flood frequency, duration, depth, rhythmicity, etc…)
- Establish methods to simulate alternative scenarios of sedimentation in backwater lakes and alternative scenarios of flooding and forest succession
- Incorporate Resilience Perspectives into assessing the UMRS…

HNA-II: Progress to date – Aquatic Areas



HNA-II Aquatic Areas Data (Workshop Q/A): What do you see as the greatest utility of the new enhanced aquatic areas data? What do you see as a potential weakness or limitation of the data?

Strength

*Planning Habitat Work

*Better habitat resolution

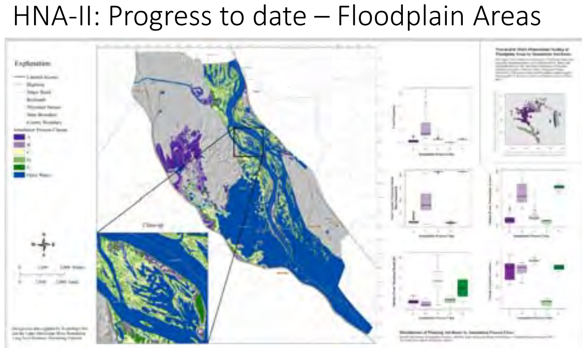
*Enables more detailed data analysis

*Better resolution and more standardized approach
*Better spatial relationship of microhabitats
*Utility for determining nutrient processing questions
*The ability to explore geomorphic/biotic relationships is huge.
*Scale independent query ability
*Better assessment of the habitat work that has been done
*Quantifying how all BWC are not created equal

Weakness

*Doesn't Cover Forests
*the many aspects of hydrology seem under available/utilized
*changes that occur in channel geometry as the result of sediment deposition or scour
*Not at a fine enough scale to be used in HREP or other project-scale applications.

HNA-II: Progress to date – Floodplain Areas



HNA-II Floodplain Areas Data (Workshop Q/A): What do you see as the greatest utility of the floodplain areas data? What do you see as a potential weakness or limitation of the data?

Strength

*Linking to fisheries year class strength and recruitment.

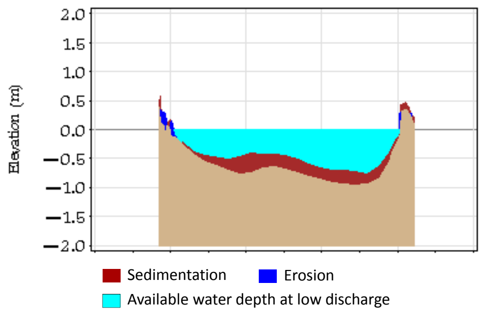
*Ability to assist with HREP planning of reforestation measures
*identifying which hydrologic variables are most important for plant communities.
*Using the model to model underwater photo zone depth.
*Ecological modeling
*Lots of great forestry applications, as well as HREP planning enhancements. Awesome stuff!
*Water levels, and changes in water levels… It is good to have a tool that takes them into account.
*identifying areas with different probabilities of supporting or sustaining different types of forests
I see no weakness!

Weakness

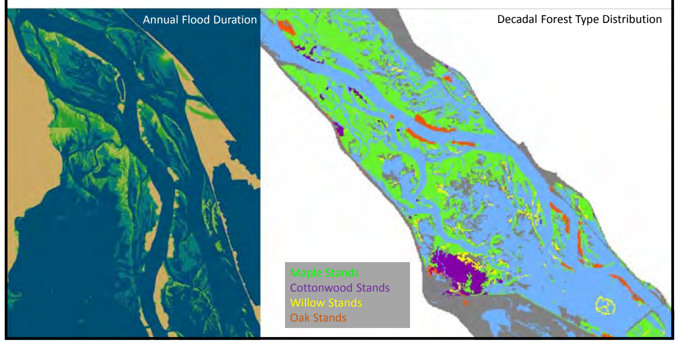
*Ecological modeling has high potential; but is limited by single data set inputs. Also there needs to be vision to
*examine hydraulic data (e.g. velocity).

*the variability in the model data and what really happens.

HNA-II: Progress to date – Modelling Backwater Sedimentation



HNA-II: Progress to date – Modelling Flooding and Forest Succession



HNA-II future scenarios modelling (Workshop Q/A): What future stressors or changing disturbance regimes are you most concerned about and what ecological endpoints do you see as most vulnerable to those changes?

Topic	# Citations	
Flooding	21	2 things we are modelling
Sedimentation	10	
Uniform tree age	4	
Invasives	4	
Insect Pests	1	
Mike Griffin's retirement	1	

USGS

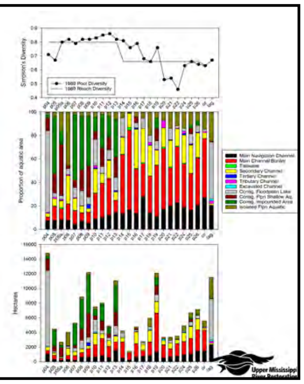
Upper Mississippi River Restoration

Integration of Resilience Concepts into HNA-II: Indicators of General Resilience

General resilience	How it allows system to adapt	Indicator
Maintain diversity and redundancy	Provides options & insurance for responding and adapting to change and disturbances	Aquatic area diversity Floodplain vegetation diversity Aquatic vegetation diversity Depth diversity & distribution Fish functional diversity & redundancy
Manage connectivity	Provides access to wide range of conditions and facilitates recolonization after disturbance, but also facilitates the spread of disturbance	Longitudinal connectivity Tributary connectivity Lateral connectivity Core forest area Water surface elevation fluctuations
Manage slow variables and feedbacks	Stabilizing feedbacks coupled with slowly changing variables maintain persistent conditions. When slow variables cross critical thresholds, the system may change rapidly.	Non-native species Sediment accumulation/erosion Watershed land use Nutrient loads Total suspended solids loads

Maintain Redundancy and Diversity: Aquatic area diversity

- Diversity of aquatic area classification (Wilcox 1993) within each pool
- Information could be used to evaluate how restoration would affect pool-scale diversity that supports aquatic vegetation, mussel, fish, & waterfowl communities

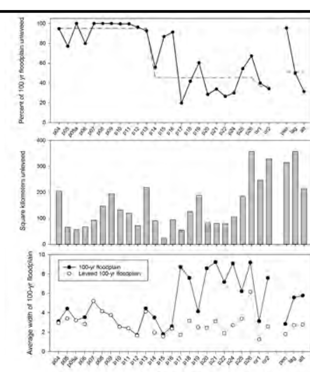


USGS

Upper Mississippi River Restoration

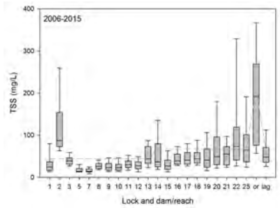
Manage Connectivity: Lateral connectivity

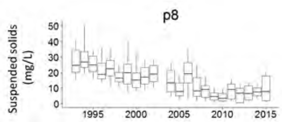
- Proportion of 100-yr floodplain (Theiling and Burant 2013) that is un-leveed in each pool
- Information relates to pool-scale connectivity between river and floodplain that affects floodplain vegetation community and aquatic communities
- Replace with indicator representing average proportion of floodplain seasonally inundated



Manage Slow Variables and Feedbacks: Total suspended solids concentrations

- The range of total suspended solids at/near each lock and dam during the growing season (May-September) between 2006-2015
- Describes water clarity
- Important driver of aquatic vegetation, fish and waterfowl communities
- Feedbacks exist between TSS, vegetation, and fish





Integration of General Resilience Indicators into HNA-II (Workshop Q/A):
Sort the following General Resilience indicators from most to least applicable to the Habitat Needs Assessment

Indicator	Workshop Ranking	General Reslience Class Type	Data Type	Complete (Y/N)
lateral connectivity	1	Connectivity	Floodplain Areas Layer	N
Aquatic area diversity	2	Diversity	Aquatic Areas Layer	N
depth diversity & distribution	3	Diversity	Bathymetry Layer	Y
floodplain vegetation diversity	4	Diversity	Land Cover Layer	Y
water surface fluctuations	5	Connectivity	Gage Data	Y
aquatic vegetation diversity	6	Diversity	Land Cover Layer	Y
sediment accumulate/erosion	7	Slow Variables and Feedbacks	Field Measurements	Y
longitudinal connectivity	8	Connectivity	Gage Data	Y
fish functional diversity & redundancy	9	Diversity	LTRM and LTE Fish Data	Y
core forest area	10	Connectivity	Land Cover Layer	Y
watershed land use	11	Slow Variables and Feedbacks	NLCD Layer	Y
total suspended solids	12	Slow Variables and Feedbacks	Other non-gis data	Y
total suspended solids loads	13	Slow Variables and Feedbacks	Other non-gis data	Y
tributary connectivity	14	Connectivity	Other non-gis data	Y
nutrient loads	15	Slow Variables and Feedbacks	Other non-gis data	Y
non-native species	16	Slow Variables and Feedbacks	Other non-gis data	Y

2 Primary Data Layers being developed for HNA-II

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Upper Mississippi River Restoration

Integration of General Resilience Indicators into HNA-II (Workshop Q/A):
Are there any additional indicators that you would want to include in a habitat needs assessment?

Responses	Upvotes	Downvotes
Focus on ecosystem structure and function more rather than a given biota	10	0
Topographic Diversity	7	1
Land ownership	4	0
Forest habitat type analysis similar to guild analysis.	4	0
Fetch	3	2
channel incision (further disconnection of floodplain)	3	0
land ownership	2	1
Velocity/residency of water is important. Some reported indicators may be too simplified and need species information(e.g. core forest)to be meaningful.	2	0
Disturbance regimes	2	0
Topographic and benthic diversity	2	1
Forest regeneration	2	0
Forest age class diversity	2	0
index of hydrologic alteration	2	0
Wind fetch	1	1
all are important! Too hard to rank.	1	1

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Upper Mississippi River Restoration

Next Steps:

- Identify THE suite of General Resilience Metrics for inclusion in HNA-II
  - List to the River Teams in the next couple of weeks.
- Identify a series of additional queries/metrics to define general characteristics of habitats across the UMRS
  - UMESC to do some initial work and then interact with River Teams to decide on final list (next couple of months).
  - Workshop results suggest a focus on structure and function as opposed to habitat in the specific.
- Complete Aquatic and Floodplain data (30, September 2017)
- Complete Modelling Work (~~ 30, September 2017)
- Provide data summaries and scientific interpretation of 'current and projected future conditions' using metrics identified above.

USGS

Upper Mississippi River Restoration

UMRR LTRM Highlights

Upper Mississippi River Restoration Coordinating Committee Quarterly Meeting

May 24, 2017

St. Louis, Missouri

JOURNAL OF FRESHWATER ECOLOGY, 2017
VOL. 32, NO. 1, 240–258
http://dx.doi.org/10.1080/02705060.2017.1279080

Taylor & Francis

OPEN ACCESS

Crustacean zooplankton dynamics in a natural riverine lake, Upper Mississippi River

Robert M. Burdis[a] and Jodene K. Hirsch[b]

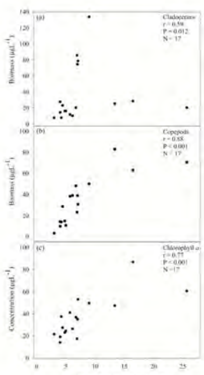
[a]Minnesota Department of Natural Resources, Lake City Field Station, Lake City, MN, USA; [b]Minnesota Department of Natural Resources, Division of Ecological and Water Resources, St. Paul, MN, USA

Daphnia from Lake Pepin

DEPARTMENT OF NATURAL RESOURCES

Zooplankton, phytoplankton and water residence time

Spearman's rank correlation between water residence time and (a) cladocerans during summer SRS episodes, (b) copepods during summer episodes and (c) chlorophyll *a* during summer episodes.



***Daphnia* stuck on the screen of tow net bucket**

Spatial and Temporal Relationships between the Invasive Snail *Bithynia tentaculata* and Submersed Aquatic Vegetation in Pool 8 of The Upper Mississippi River.

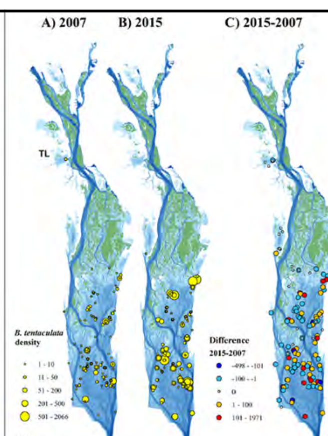
A. M. Weeks, N. R. De Jager, R. J. Haro. And G. J. Sandland. 2017. River Res. Applic. Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rra.3123

- Invasive snail
- Intermediate host for trematode parasites associated with waterfowl mortality
- What is the relationship between *B. tentaculata* abundance and distribution and submersed aquatic vegetation (SAV)?
- Compared changes in SAV and snail densities between 2007 and 2015.

Winona Daily News 11/17/16

Bithynia in Pool 8 (cont.)

- Between 2007 and 2015, *B. tentaculata* densities increased ~ 4X.
- Maximum B. tentaculata associated with intermediate SAV density
- *B. tentaculata* was associated with vegetation most often in the impounded region of Pool 8, specifically with wild celery
- Association between wild celery and B. tentaculata and feeding preference of some waterfowl for wild celery may partially explain high waterfowl mortality in lower Pool 8.



Long-Term Fish Monitoring in Large Rivers: Utility of "Benchmarking" across Basins

Ward, D.L., A. F. Casper, T. D. Counihan, J. M. Bayer, I. R. Waite, J. J. Kosovich, C. G. Chapman, E. R. Irwin, J. S. Sauer, B. S. Ickes, and A. J. McKerrow. 2017. Fisheries Vol. 42 , Iss. 2.

- **Leveraged work:**
  - **LTRM + 4 other programs**
    - **Columbia River**
    - **Colorado River**
    - **Upper Mississippi River**
    - **Illinois River**
    - **Tallapoosa River**
- **"Benchmarking" is a formal process of comparing your own business [or monitoring] processes to those of other companies [or programs] and then working to incorporate identified "best practices" to improve performance.**

Long-Term Fish Monitoring in Large Rivers: Utility of "Benchmarking" across Basins

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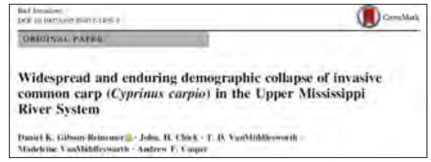
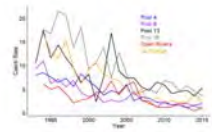
- Identified opportunities for learning across [monitoring] programs by detailing best monitoring practices and why these practices were chosen
- Long-term monitoring programs are critical for interpreting temporal and spatial shifts in fish populations for both established objectives and newly emerging questions
- Suggest that developing a broader collaborative network will facilitate development of more effective monitoring programs.

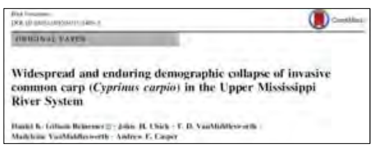

ORIGINAL PAPER

Widespread and enduring demographic collapse of invasive common carp (*Cyprinus carpio*) in the Upper Mississippi River System

Daniel K. Gibson-Reinemer · John H. Chick · T. D. VanMiddlesworth · Madeleine VanMiddlesworth · Andrew F. Casper

- LTEF and LTRM routine monitoring data
- Common carp have declined sharply since the 1970s
- Declines appear consistent across the UMRS, including Illinois River
- Evidence suggests a herpesvirus specific to common carp may be responsible

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Possible causes:

1. Cyclic change in population abundance – decades of consistent decline
2. Suppression by native predators – pattern of decline similar where native predators were abundant and scarce.
3. Resource exhaustion – no decline in body condition
4. Improved environmental conditions have increased competition from native species – Common carp populations don't track WQ conditions
5. **Negative effects of disease or parasites – Large breeding population, but little recruitment is consistent with highly lethal virus that affects fish in their first year of life (as cyprinid herpes virus does).**

Additional Reports and Fact Sheets

- Anderson, Alison M.; Casper, Andrew F.; McCain, Kathryn N.S. 2017. Fish Indicators of Ecosystem Health: Upper Mississippi River System INHS Technical Report 2017 (16)
  - Developed and described indicators based on migratory fish species and backwater fish assemblage.
- Stone, J.M., Hanson, J.L., and Sattler, S.R., 2017, The Upper Mississippi River System—Topobathy: U.S. Geological Survey Fact Sheet 2016–3097, 4 p., https://doi.org/10.3133/fs20163097
  - Provides a summary, data background, examples of uses and future work with topobathy data.
- Bowler, M. and colleagues. 2017. Highlights for LTRM sampling in Pools 12 and 13, Upper Mississippi River, 2016
  - Summarizes select highlights based on Pool 13 data through 2016.
  - E.g., Increased catches of shovelnose sturgeon in tailwater trawls.

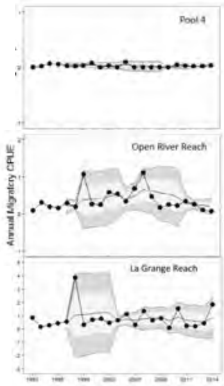
Fish Indicators of Ecosystem Health: Upper Mississippi River System

Anderson, Alison M.; Casper, Andrew F.; McCain, Kathryn N.S. 2017. Fish Indicators of Ecosystem Health: Upper Mississippi River System INHS Technical Report 2017 (16)

- 2013 Indicators Report recommended developing:
  - Migratory fish indicator
  - Backwater assemblage indicator

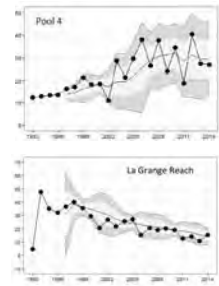
Fish Indicators of Ecosystem Health: Upper Mississippi River System

- Migratory fishes indicator
  - Long distance migrants as well as fish that are likely to move among Nav. Pools and/or tributaries in its lifetime
  - Provides information regarding conditions for faunal groups affected by restricted fish passage (i.e., mussels)
  - Few migratory fishes in Pools 4, 8, and 13



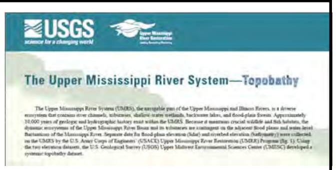
Fish Indicators of Ecosystem Health: Upper Mississippi River System

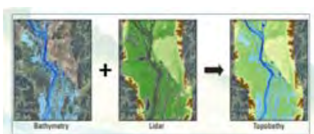
- Backwater assemblage
  - Provide evidence for changing conditions in backwaters.
  - Generally increased from 1993 – 2014 in pools 4, 8, and 13.
  - Declined in La Grange



Topobathy Factsheet

- Published on March 22nd authored by Jayme Stone, Jenny Hanson, and Stephanie Sattler; USGS UMESC Geospatial Sciences Branch
- Provides a summary, data background, examples of uses and future work with topobathy data. E.g.,
  - Hydrology models
  - HREP planning
  - HNA

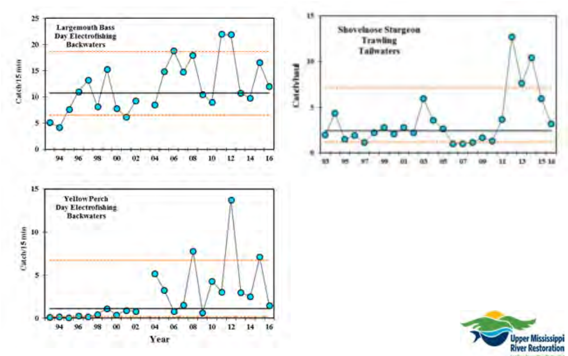




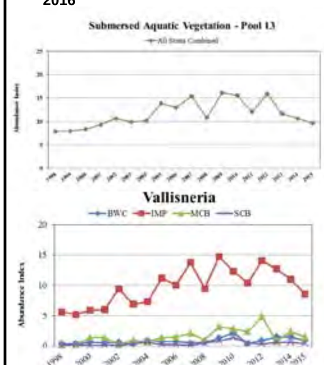
- Fact sheet: https://pubs.usgs.gov/fs/2016/3097/fs20163097.pdf
- Topobathy data and addn'l info: https://www.umesc.usgs.gov/data_library/topobathy.html

Highlights for LTRM sampling in Pools 12 and 13, Upper Mississippi River, 2016

Mel Bowler and colleagues. Iowa Department of Natural Resources Iowa DNR Mississippi River Monitoring



Highlights for LTRM sampling in Pools 12 and 13, Upper Mississippi River, 2016



UMRR Analysis Team Agenda April 26, 2017
UMESC Large Conference Room, Upper Segment D, La Crosse, WI
WebEx/Call-in information:

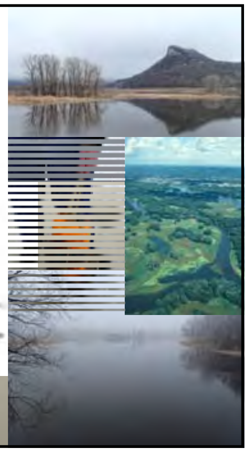
Date: Wednesday, April 26th, 2017
Time: 1 PM- 4 PM

When it is time to attend the meeting, please visit this link:

Chair: Shawn Giblin, Wisconsin Department of Natural Resources

1300-1310 PM- Introductions and roll call, Shawn Giblin
1310-1315 PM- Time and place for next meeting- (Online) July 31st chair change begins 2017- Matt Vitello (MO)
1315-1320 PM- Approval of minutes from January meeting (Group)
1320-1330 PM- UMRR Update, Marv Hubbell, USACE
1330-1350 PM- LTRM science/Resilience Workgroup update, Jeff Houser, USGS

1350-1410 PM- Proposal ranking discussion
1410-1440 PM- Discussion regarding comments received from standardized HREP fish monitoring protocol, Dave Potter, USACE
1440-1510 PM- Pettibone Lagoon Water Quality Evaluation 2015-2016: A Case Study in Optimizing Water Quality and Habitat Utilizing Lateral Connectivity Modifications, Shawn Giblin, WDNR
1510-1540 PM- Maquoketa River Floodplain Connectivity Study- Bill Richardson, UMESC
1540-1600 PM- Future A-Team goals discussion- are people happy with current direction, things we should be working on, etc.
Adjourn



Pettibone Lagoon Water Quality Evaluation 2015-2016: A Case Study in Optimizing Water Quality and Habitat Utilizing Lateral Connectivity Modifications

- Applied study of lateral connectivity
- 21.4 acre backwater
- Popular shore angling, ice angling and aquatic recreation destination- especially for children and elderly
- Within park managed by the City of La Crosse
- Deep, steep sided basin with minimal aquatic vegetation- Mean depth ~9 ft.

Historical Context

- In November 2010, a pump system was installed to deliver high O_2 water into Pettibone Lagoon- part of mitigation for LAX airport expansion
- Project objectives:
    - Alleviate winter hypoxia
    - Improve recreational angling opportunities
    - Reduce fish kill frequency
- 2015-2016 Study Objectives:
    - Perform a comprehensive evaluation of water quality conditions within Pettibone Lagoon under summer and winter conditions.
    - Identify optimal water inflow and water residence time rates to improve water quality, aquatic habitat, and recreational fishing during summer and winter.

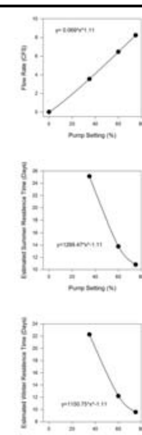
Pump System

Methods

- Eight sampling sites- 1 control site

Parameters

- Depth
- Conductivity
- Secchi Depth
- Water Temp
- DO
- pH
- TP, TN, SRP, DIN, CHLa (at a subset of sites)
- Continuous Temp/DO (at a subset of sites)



Using pump flow rating curves

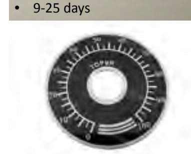
Residence time was estimated for summer and winter (with ice sheet)

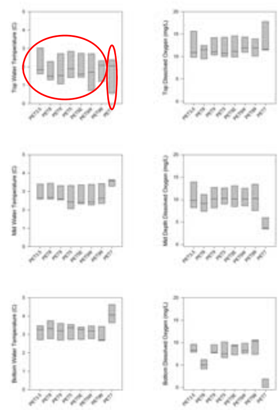
Experimental Flow Rates:

- 0- 8.24 CFS

Residence Time (estimated):

- Winter and summer
- 9-25 days

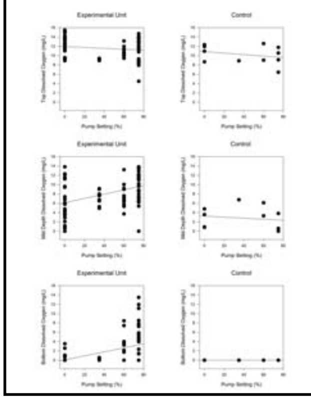




Next Winter 2015-2016
Pump Reduced to 35% (3.54 CFS)

Summer Experimental Settings
(In response to poor summer angling reported)

Pump setting 35%= 3.54 CFS; 60%= 6.46 CFS; 75% =8.24 CFS.



Final Recommendation
(presented to and accepted by the City of La Crosse)

Timeline	Pump Setting (%)	Pump Flow Rate (CFS)
Ice on- ice off	35	3.51
Ice off- June 1st	Turn off	0
June 1st- September 15th	60	6.46
September 15th- ice on	Turn off	0

- Winter Setting- 3.51 CFS- (estimated residence time- ~22 days)
- Producing very high quality winter conditions for overwintering centrarchids (warm water temp and high DO)
- Summer Setting- 6.46 CFS- (estimated residence time- ~14 days)
- Strikes and adequate balance between adequate dissolved oxygen without overproduction of phytoplankton

Quantifying the effect of floodplain-river connectivity: sediment, nitrogen, phosphorus and carbon removal by flooding on the Maquoketa River floodplain, Iowa.

William Richardson[1], Greg Nalley[2], Lynn Bartsch[1], Rebecca Kreiling[1], Jessica Garrett[2], Sean Bailey[1].

[1]U.S.Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI

[2] U.S.Geological Survey, Iowa Water Science Center, Iowa City, IA

MRRC, 4/27/17

USGS science for a changing world
EASTERN TALLGRASS PRAIRIE & BIG RIVERS LANDSCAPE CONSERVATION COOPERATIVE

The multidimensional nature of Connectivity

Lateral – overbank flow – flooding – important transport of both dissolved and particulate materials into the floodplain

Longitudinal - downstream flux of material, especially during floods. Interupted by dam building.

Vertical – hyporheic flux – subsurface flows associated with flooding – important for transport of dissolved materials

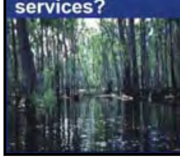
The Big Question Before Us:

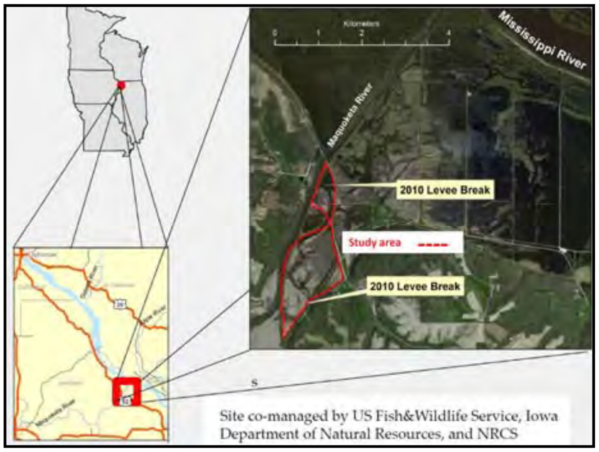
How do we as managers/practioners re-establish these functions?

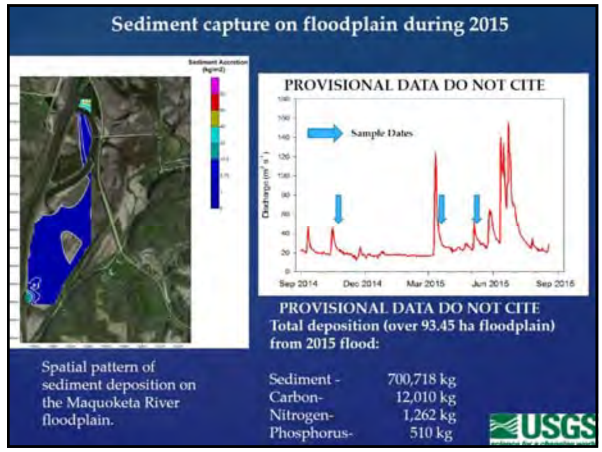
What are the modern rates of deposition and nutrient cycling (N-cycling , P retention, Carbon sequestration) ?

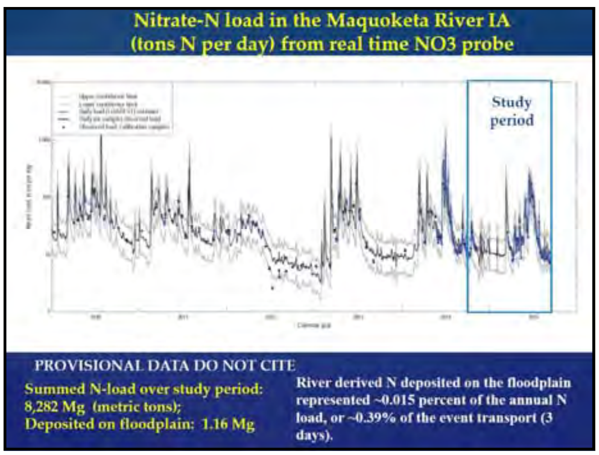
What is the effect of "reconnectivity" in reducing river loads of N and P?

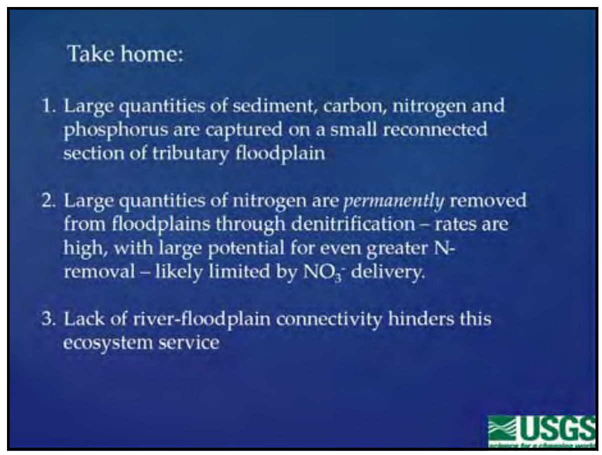
How do we balance water quality services with production services?

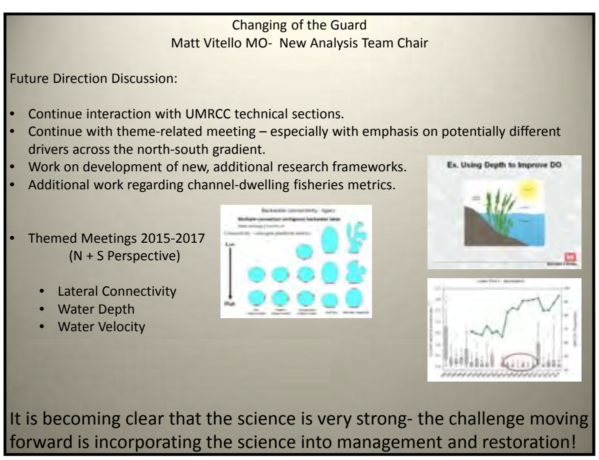



Kilometers
0 1 2 4
Mississippi River
Maquoketa River
2010 Levee Break
Study area
2010 Levee Break
Site co-managed by US Fish&Wildlife Service, Iowa Department of Natural Resources, and NRCS


Sediment capture on floodplain during 2015
PROVISIONAL DATA DO NOT CITE
Sample Dates
Sep 2014
Dec 2014
Mar 2015
Jun 2015
Sep 2015
PROVISIONAL DATA DO NOT CITE
Total deposition (over 93.45 ha floodplain) from 2015 flood:
Spatial pattern of sediment deposition on the Maquoketa River floodplain.
Sediment - 700,718 kg
Carbon- 12,010 kg
Nitrogen- 1,262 kg
Phosphorus- 510 kg
USGS


Nitrate-N load in the Maquoketa River IA (tons N per day) from real time NO3 probe
Study period
PROVISIONAL DATA DO NOT CITE
Summed N-load over study period: 8,282 Mg (metric tons); Deposited on floodplain: 1.16 Mg
River derived N deposited on the floodplain represented ~0.015 percent of the annual N load, or ~0.39% of the event transport (3 days).


Take home:
1. Large quantities of sediment, carbon, nitrogen and phosphorus are captured on a small reconnected section of tributary floodplain
2. Large quantities of nitrogen are *permanently* removed from floodplains through denitrification – rates are high, with large potential for even greater N-removal – likely limited by NO_3^- delivery.
3. Lack of river-floodplain connectivity hinders this ecosystem service
USGS


Changing of the Guard
Matt Vitello MO- New Analysis Team Chair
Future Direction Discussion:
• Continue interaction with UMRCC technical sections.
• Continue with theme-related meeting – especially with emphasis on potentially different drivers across the north-south gradient.
• Work on development of new, additional research frameworks.
• Additional work regarding channel-dwelling fisheries metrics.
Ex. Using Depth to Improve DO
• Themed Meetings 2015-2017 (N + S Perspective)
• Lateral Connectivity
• Water Depth
• Water Velocity
It is becoming clear that the science is very strong- the challenge moving forward is incorporating the science into management and restoration!