Upper Mississippi River Restoration Program Coordinating Committee Quarterly Meeting

November 8, 2017

Highlights and Action Items

Program Management

- **UMRR achieved an execution rate of 92 percent in FY 17. Hubbell applauded the partnership for another successful year and thanked all those involved in program implementation.**

- **On September 8, 2017, Congress passed a continuing resolution authority (CRA) for FY 18 that expires on December 8, 2017. District staff are authorized to execute the program at $33.17 million.** The House and Senate Appropriations Committees both approved $33.17 million for UMRR in their respective FY 18 energy and water appropriations measures.

- At the $33.17 million planning scenario, UMRR's FY 18 internal allocations are as follows:
  - Regional Administration and Programmatic Efforts – $1,110,000
  - Regional Science and Monitoring – $9,325,000
    - Long term resource monitoring – $4,725,000
    - Regional science in support of restoration – $3,175,000
    - Regional science staff support – $150,000
    - Habitat project evaluations – $975,000
    - Habitat Needs Assessment II – $300,000
  - Habitat Restoration – $22,735,000
    - Model certification (i.e., AHAG) – $100,000
    - MVP – $10,922,000
    - MVR – $5,747,000
    - MVS – $5,966,000

  [Note: The FY 18 District HREP allocations above reflect repayment after transferring work among Districts in FY 17.]

- As typical, District staff have provided spending plans associated with several funding scenarios to USACE Headquarters for its use in developing the agency's FY 19 budget recommendations.

- **In response to a request from the UMRR communications team, the UMRR Coordinating Committee agreed to convene a conference call in late November to develop more detailed recommendations for implementing UMRR's communications strategy**.

UMRR Showcase Presentations

- Rob Burdis presented on proposed modifications to Peterson Lake HREP to better achieve its habitat goals and objectives. Peterson Lake HREP was completed in 1996 and a 2011 adaptive management evaluation was used to justify the improvement efforts.

Habitat Needs Assessment II

- Nate De Jager presented on the results of the HNA II's inventory of habitats and ecosystems conditions of the UMRS and discussed how information can be used to make more meaningful assessments. This is the first major effort in a two-part process**. Next steps include completing the development of the "Inundation and Forest Succession" modeling and associated indicators, drafting a "future directions" section of the HNA II report, and employ a peer-review of the data layers and report through USGS's standard process. In addition, a next step following data development will involve setting targets and criteria for the indicators.**

- Kat McCain explained that the HNA II Steering Committee is struggling with how to fully utilize the information and make conclusions about habitat needs. **In response to a question from McCain, the UMRR Coordinating Committee:**

  1) **Endorsed the notion of using the HNA II aquatic and floodplain functional classes to represent broad habitat categories for the system.**

  2) **Directed the Steering Committee to propose recommendations for acceptable ranges for the HNA II indicators.**

Habitat Restoration

- St. Louis District is considering alternative designs for Rip Rap Landing to avoid existing constraints resulting from an existing WRP easement. MVS is undergoing a robust planning effort to maintain an adequate pipeline of habitat projects, including Piasa and Eagles Nest Islands, Crains Open River Island, Harlow Open River islands, and Oakwood Bottoms. The District anticipates finalizing design work on Clarence Cannon's pump station this fiscal year and awarding a construction contract. Final punch list items are being completed on Ted Shanks.

- MVP is aggressively advancing work on McGregor Lake Islands, anticipating finalizing plans and design work and awarding a construction contract this fiscal year. The District is also developing plans for Bass Lake Ponds and is working with the District's Fish and Wildlife Work Group to select the next two to three UMRR habitat projects. The District also anticipates awarding a construction contract for Conway Lake and finalizing construction on Harpers Slough this fiscal year and turning the project over to USFWS.

- MVR is continuing planning work on Keithsburg and Steamboat Island habitat projects. Other projects previously in the planning queue have each encountered unique issues that prevent them from advancing. This has created a shortage of projects within the District. However, the District's Fish and Wildlife Work Group is evaluating 10 potential habitat projects to recommend for implementation. MVR focusing its design work on Beaver Island and may begin construction on the project this fiscal year. The District is also advancing construction on Pool 12 Overwintering, Huron Island Stages II and III, Rice Lake Stage I, and Beaver Island.

- **A UMRR HREP strategic planning meeting is scheduled for November 29-30, 2017 in Dubuque. A range of issues affecting UMRR implementation will be discussed. A report out will be provided at the UMRR Coordinating Committee's February 7, 2018 quarterly meeting**.

Long Term Resource Monitoring and Science

- Accomplishments of the fourth quarter of FY 17 include publication of five manuscripts:

  1) Hydrology controls recruitment of two invasive cyprinids: bigheaded carp reproduction in a navigable large river

2) Effects of flood inundation and invasion by *Phalaris arundinacea* on nitrogen cycling in an Upper Mississippi River floodplain forest

3) Lake sturgeon and shovelnose sturgeon environmental life history revealed using pectoral fin-ray microchemistry: implications for interjurisdictional conservation through fishery closure zones

4) An interdisciplinary human-environmental examination of effects consistent with the anthropocene in the Lower Illinois River Valley

5) Evaluating the fish community in a rare backwater habitat in the Middle Mississippi River

- UMESC staff are comparing the results of new water quality testing equipment to ensure consistency and accuracy. Such testing is standard practice when new equipment is obtained. Reports will be published that summarize the comparison results. UMESC is working with the equipment manufacturer to address issues regarding the ammonia testing.

- **The January 16-18, 2018 UMRR LTRM Science Meeting will focus on 1) assessing current research needs to improve the understanding, management, and restoration of the UMRS and 2) identifying specific research proposals with associated scopes of work for FY 18.** The meeting will be held at UMESC in La Crosse. **The proposed FY 18 research proposals will be presented to the UMRR Coordinating Committee for its consideration of endorsement at its February 7, 2018 meeting.**

- UMRR's anticipated FY 18 budget for LTRM is $5.75 million, including $4.75 million for base monitoring and $1.025 million for science in support of restoration (i.e., analysis under base monitoring). An additional $2.15 million is available for science-related efforts.

- The A-Team held an in-person meeting on October 3, 2017 in conjunction with the UMRCC Fish and Wildlife Tech Section. The agenda included an updates on UMRR's budget, LTRM-related efforts, ecological resilience, and HNA II. In addition, the A-Team discussed planning for science research in FY 18.

Other Business

- **The UMRR Coordinating Committee recognized Mike Griffin and Dan Stephenson for their contributions to river management and the UMRR program.** They have both announced their retirements in the near future. Griffin has been involved with UMRR since its first years, including building the program's foundation and fostering its partnership network.

- **Upcoming quarterly meetings are as follows:**
  - **February 2018 — Moline**
    - UMRBA quarterly meeting — February 6
    - **UMRR Coordinating Committee quarterly meeting — February 7**
  - **May 2018 — St. Louis**
    - UMRBA quarterly meeting — May 15
    - **UMRR Coordinating Committee quarterly meeting — May 16**
  - **August 2018 — La Crosse/UMESC**
    - UMRBA quarterly meeting — August 14
    - **UMRR Coordinating Committee quarterly meeting — August 15**

UPPER MISSISSIPPI RIVER RESTORATION (UMRR) PROGRAM COORDINATING COMMITTEE

NOVEMBER 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)

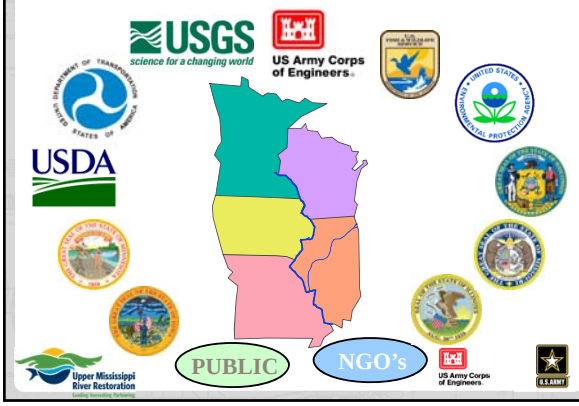
November 8, 2017

"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."

US Army Corps of Engineers

U.S.ARMY

UMRR PARTNERS



FY 17

PBUD	$ 20,000,000
Omnibus Bill	$ 20,000,000
Appropriation	$ 20,000,000
FY17 Work plan	$ 13,170,000
FY17 Total	$ 33,170,000
FY17 Execution	92%

FY 18 PBUD

President's Budget	$ 33,170,000
House	$
Senate	$
FINAL APPROPRIATION	$

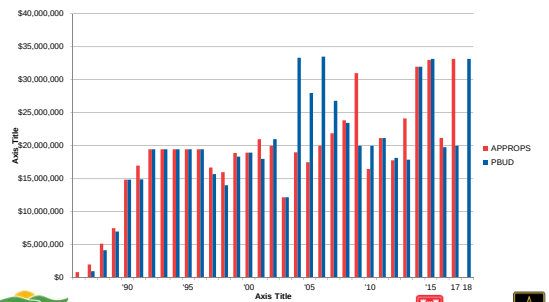
FY18 PLAN OF WORK

TOTAL FY18 Program	**$33,170,000**
Regional Administration and Program Efforts	$ 1,110,000
Regional Management	$ 825,000
Program Database	$ 100,000
Program Support Contract (UMRBA)	$ 110,000
Public Outreach	$ 75,000
Regional Science and Monitoring	$9,325,000
LTRM (Base Monitoring)	$ 4,725,000
UMRR Regional Science In Support Rehabilitation/Mgmt. (MIPR's, Contracts, and Labor)	$ 3,175,000
UMRR Regional (Integration, Adapt. Mgmt.)	$ 150,000
Habitat Evaluation (**split equally between MVS,MVR,MVP**)	$ 975,000
HNA II	$ 300,000
District Habitat Rehabilitation Efforts (Planning and Construction)	**$22,735,000**
Rock Island District	$ 5,747,000
St. Louis District	$ 5,966,000
St. Paul District	$ 10,922,000
Model Cert. (AHAG)	$ 100,000

FY 19 PBUD

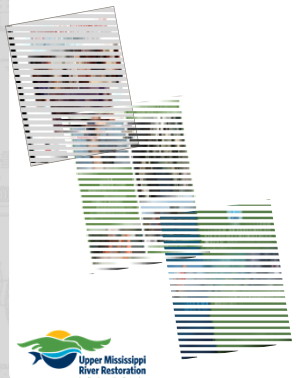
President's Budget	$?????
House	$
Senate	$
FINAL APPROPRIATION	$

UMRR PROGRAM APPROPRIATION/BUDGET HISTORY



FY1985 to FY2018

REPORTS TO CONGRESS



UMRR SIX YEAR PLAN

PUBLIC COMMUNICATIONS AND OUTREACH

PUBLIC COMMUNICATIONS AND OUTREACH

UMRR External Communications Strategy

- Team met on August 2, 2017
  - Angie Freyermuth – Lead
  - Karen Hagerty – Corps
  - Harland Hiemstra – MN
  - Randy Hines – UMESC
  - Kirsten Mickelsen – UMRBA
  - Marty Atkins - NRCS
  - Neal Jackson - FWS
  - Would like representatives from TNC, USEPA and another state

PUBLIC COMMUNICATIONS AND OUTREACH

UMRR External Communications Strategy

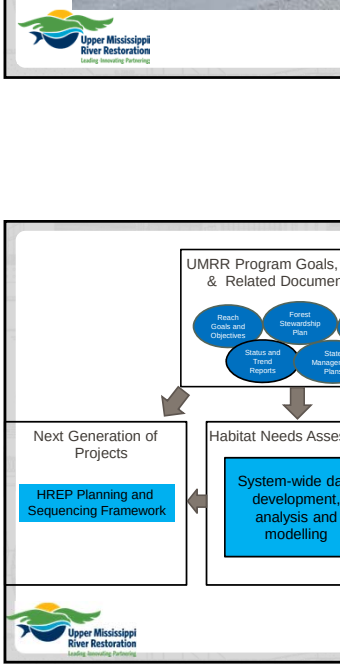
Potential tasks to improve communications:

- 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

FARMERS FOR UMRR

UMRR SHOWCASE

LTRM – Rob Burdis



HABITAT NEEDS ASSESSMENT II

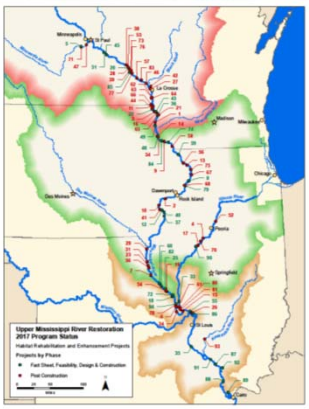
Overview and Schedule
- Key efforts:
  - HNA II what is it and
  - Revised Schedule

Science Details

HABITAT NEEDS ASSESSMENT II

Revised Schedule

Draft paper on scientific overview and rational	Aug. 15
Steering Committee webinar rational paper	Sept. 7
Functional Class working subgroup review	Aug. 15
Steering Co. webinar to review rational paper	
Complete review of FC existing conditions	Sept. 29
Agency review of rational paper	Sept. 29
Draft Systemic data layers complete	Sept. 29
Webinar on how to review systemic data	Oct. 7
Partnership review of systemic data layers	Oct. 31
Linking data layer with mgmt. needs	Oct - Dec



UMRR HABITAT REHABILITATION AND ENHANCEMENT PROJECTS

AS OF NOVEMBER 2017:

56 PROJECTS COMPLETED

BENNIFITING 106,000 AC

ST. PAUL DISTRICT (MVP)
FY18 HREP WORK PLAN (8 NOV 2017)

PLANNING –
McGregor Lake Islands, Pool 10, WI
- Complete Feasibility Report

Bass Lake Ponds (Mn River)
- Initiate Draft Feasibility Report

- FWWG working on selecting the next 2-3 HREP projects

DESIGN –
McGregor Lake Islands, Pool 10, WI
- Complete contract documents

CONSTRUCTION -
Harpers Slough Islands, Pool 9, IA
- Complete construction, O&M Manuals and turnover to USFWS. Project Dedication and tree plantings next spring

Conway Lake, Pool 9, IA and McGregor Lake Islands, Pool 10, WI
- Award contracts in FY 18.

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

ST. LOUIS DISTRICT (MVS)
FY18 HREP WORK PLAN (NOV 2018)

PLANNING
Rip Rap Landing, IL
- Final Draft Feasibility Revision

Piasa & Eagles Nest Islands, IL
- Complete ATR
- Initiate MVD Review
- Public Meeting

Crains Open River Island, IL
- Public Review
- Complete Final Report

Harlow Open River Islands, MO
- Complete Draft Report

Oakwood Bottoms, IL
Initiate Feasibility Study
- Initiate Feasibility

EVALUATION
Baseline Monitoring & Post Project Monitoring
Performance Evaluation – Calhoun Pt, Pharrs Is, Clarksville, & Dresser Is

DESIGN
Clarence Cannon Refuge, MO
- Complete Pump Station Design
- Initiate Riverside Levee Setback Design

CONSTRUCTION
Ted Shanks, MO
- Pump Station – punch list items
- Reforestation Contract
- Complete O&M Manual

Clarence Cannon Refuge , MO
- *Exterior Gravity Drain Water Control Structure – underway*
- *Interior Water Control Structures and berms - awarded*
- *Pump Station Contract Award FY18*

TED SHANKS REFORESTATION

CLARENCE CANNON HREP CONSTRUCTION

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

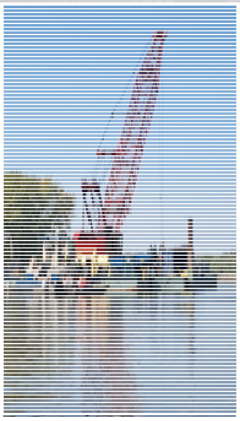
PLANNING
- Keithsburg Division, Pool 18, IL **($420K)**
- Steamboat Island, Pool 14, IA **($730K)**
- **Turkey River Bottoms, Pool 11, IA ($100K) ?**
- **Other ($200K) ?**

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

CONSTRUCTION
- Pool 12 Overwintering Stage II & III, Pool 12 IL **($575K)**
- Huron Island Stage II & III, Pool 18, IA **($500K)**
- Rice Lake Stage I, IL LaGrange Pool **($150K)**
- **Beaver Island, Pool 14, IA ($3M – 10M)**

EVALUATION
- FWS **($215K)**
- 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

POOL 12



Kehough - Upper channel being dredged.

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Who:

- DET = FWIC, FWWG, RRAT Tec., ILWG and RRCT, RRF, RRAT Exec.
- SET = System Ecological Team (scientists and managers with backgrounds in geomorphology, hydrology, forestry, wetlands, fish and wildlife, and limnology)
- PPT = UMRR CC

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Goals

- Ensure that habitat projects address UMRS ecological needs at pool to system scales and integrate with HNA
- Enhance public understanding and trust
- Retain flexibility to ensure efficient and effective program execution and apply adaptive management principles

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Stage I – DETs

- Natural river processes
- Ecological evaluation criteria
- Public involvement
- Use HNA

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Stage II – SET

- Meets needs of HNA
- Consistency with identified master plans
- Natural river processes
- Sequencing based on ecological and geomorphic processes
- Sustainability and long term durability

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Stage III – Program Planning

- Best ecological projects identified now time to apply administrative mix of projects
- Program planning team composed of UMRR CC and lead by UMRR Program Mgr.
- Administrative criteria

NEXT GENERATION OF PROJECTS

2003 Planning and Sequencing Framework

Stage IV – COE Management

- MVD has ultimate responsibility

Quiz Question – Only two people that signed the charter are here today. Who are they?

SIGNING OUR CHARTER

NOVEMBER PROGRAM WORKSHOP

Next Generation of Projects

HNA II

General Implementation Issues

Projects

PROJECT PARTNERSHIP AGREEMENTS

UMRR Leadership Summit

- Indemnification
- OMRR&R in perpetuity
- Crediting nonprofit organizations for the value of donated goods

Statutory requirements for Indemnification and OMRR&R are long standing and reaffirmed in WRDA86)

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

UMRR MONITORING & SCIENCE FY18

2 SOWs in FY18

- SOW for LTRM base monitoring
  $4.725M ($4.61 M in FY17)
- SOW for science in support (analysis under base)
  $1.025M ($1.0 M in FY17)

Both SOWs together are equivalent to a fully funded UMRR LTRM element $5.75M

Additional funding for Science
$2.15M

UMRR MONITORING & SCIENCE FY2018

	Budget (gross)
MN	$562,015*
WI	$536,939*
IA	$466,456
Great Rivers (IL)	$416,163
Big Rivers & Wetlands (MO)	$385,605
IRBS (IL)	$472,791
Science meeting travel	$ 7,363
STATES TOTAL	**$2,842,952**
UMESC TOTAL	**$2,840,624**
Corps tech reps	$ 80,000
TOTAL FY18 LTRM BUDGET	**$5,763,576**

UMRR MONITORING & SCIENCE FY2018

Fully funded LTRM budget $5,750,000

LTRM Monitoring $5,699,765

remaining $ 50,236

Science in Support funding $2,150,000

TOTAL SCIENCE $2,200,236

UMRR MONITORING & SCIENCE FY2018

Science in Support funding $2,200,236
- Aerial camera testing

(FY17 workplan, UMESC) $ 67,983

FY18 Science funding $2,132,253

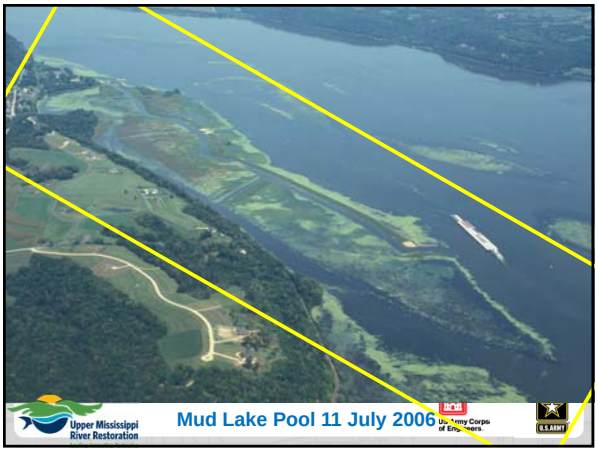
UMRR SCIENCE FY18 TIMELINE

Request for Major Themes
- **Themes from:**
  - **Strategic plan, research frameworks**
  - **Ecosystem health and resilience**
  - **Systemic effort/analyses**
  - **UMRR impacts to the UMRS**

UMRR Science Meeting
- **Week of 16 January 2018, at UMESC**
  - **Collaborate**
  - **System focus**
  - **Proposals as final product**

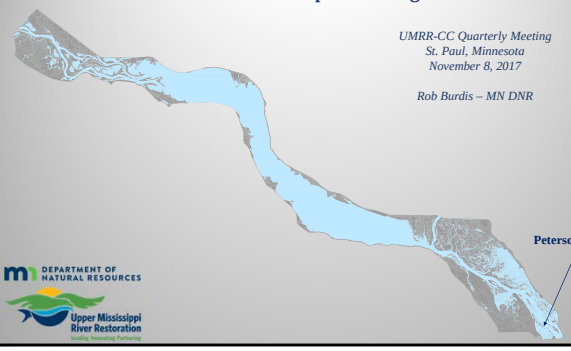
UMRR SCIENCE FY18 TIMELINE

Review & Coordination
- **A-Team in January 2018**
  - **As part of Science meeting**
- **UMRR CC in February**
  - **Draft proposals for endorsement**



Mud Lake Pool 11 July 2006

Peterson Lake HREP - Adaptive Management Evaluation

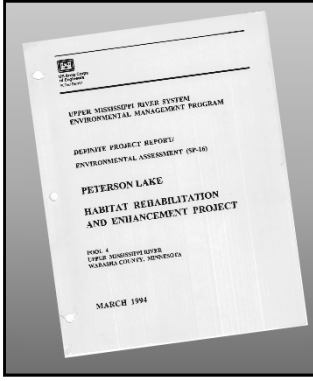


UMRR-CC Quarterly Meeting
St. Paul, Minnesota
November 8, 2017

Rob Burdis – MN DNR

DEPARTMENT OF NATURAL RESOURCES

Upper Mississippi River Restoration


UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

DEFINITE PROJECT REPORT
ENVIRONMENTAL ASSESSMENT (SP-16)

PETERSON LAKE
HABITAT REHABILITATION
AND ENHANCEMENT PROJECT

POOL 4
UPPER MISSISSIPPI RIVER
WABASHA CO NTY., MINNESOTA

MARCH 1994

General Goals
The general goals of the project were to reduce sedimentation in Peterson Lake, stabilize the barrier islands bordering the lake, improve migratory waterfowl habitat, and to improve winter habitat conditions for fish in the upper portion of the lake (USACE 1994).

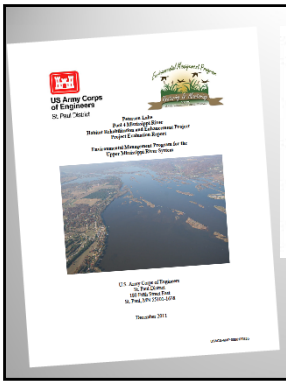
Habitat Goals
Three habitat goals were developed at the onset of this project. The following goals were identified: 1) Maintain Peterson Lake as a productive backwater resource. 2) Optimize habitat conditions for migratory waterfowl; especially fall migration feeding and resting habitat. 3) Optimize habitat conditions for fish species typical of Upper Mississippi River backwater habitats; e.g., largemouth bass, northern pike, bluegill, crappie, and associated species.

Channel closures

Weirs

Fish access channels

Completed: November 1995


US Army Corps of Engineers
St. Paul District

Peterson Lake
Pool 4 Mississippi River
Habitat Rehabilitation and Enhancement Project
Project Evaluation Report

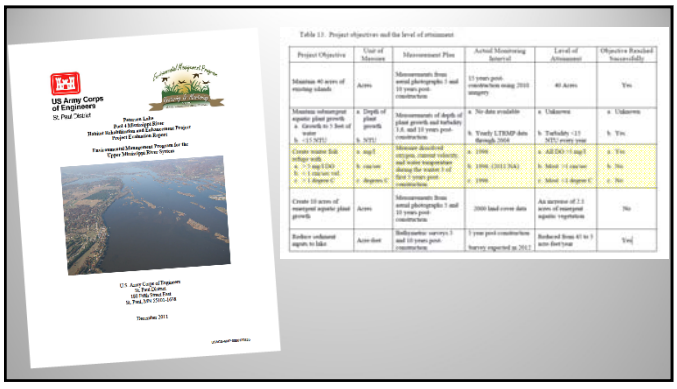
Environmental Management Program for the
Upper Mississippi River System

US Army Corps of Engineers
St. Paul District
180 7th Street East
St. Paul, MN 55101-1638

December 2011

Table 13. Project objectives and the level of attainment

Project Objective	Unit of Measure	Measurement Plan	Actual Monitoring Interval	Level of Attainment	Objective Reached Successfully
Maintain 40 acres of existing islands	Acres	Measurements from aerial photographs 5 and 10 years post-construction	15 years post-construction using 2010 imagery	40 Acres	Yes
Maintain submergent aquatic plant growth a. Growth to 3 feet of water b. <15 NTU	a. Depth of plant growth b. NTU	Measurements of depth of plant growth and turbidity 1,4, and 10 years post-construction	a. No data available b. Yearly LTRMP data through 2004	a. Unknown b. Turbidity <15 NTU every year	a. Unknown b. Yes
Create winter fish refuge with a. >5 mg/l DO b. <1 cm/sec vel. c. >1 degree C	a. mg/l b. cm/sec c. degrees C	Measure dissolved oxygen, current velocity, and water temperature during the winter 1 of first 3 years post-construction.	a. 1996 b. 1996, (2011 NA) c. 1996	a. All DO >5 mg/l b. Most <1 cm/sec c. Most <1 degree C	a. Yes b. No c. No
Create 10 acres of submergent aquatic plant growth	Acres	Measurements from aerial photographs 5 and 10 years post-construction.	2000 land cover data	An increase of 2.1 acres of submergent aquatic vegetation	No
Reduce sediment inputs to lake	Acre-feet	Bathymetric surveys 5 and 10 years post-construction.	5 year post-construction Survey expected in 2011	Reduced from 41 to 3 acre-feet/year	Yes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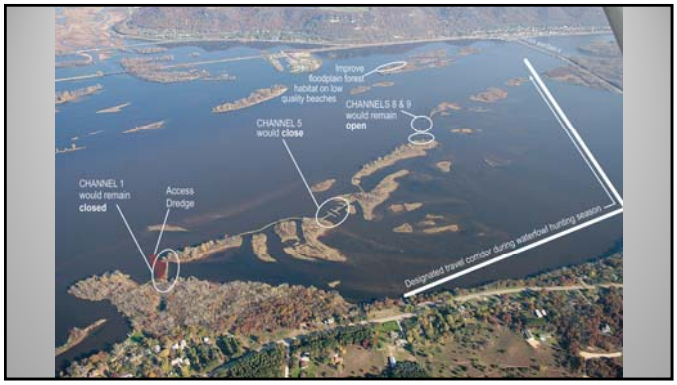
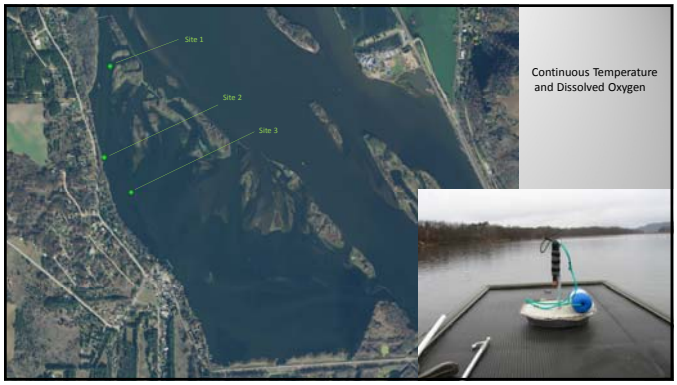
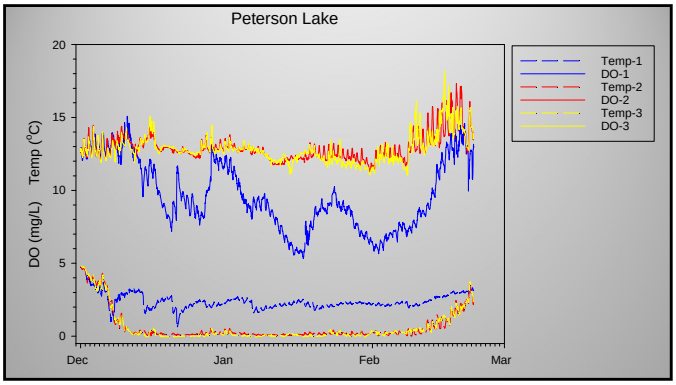

Improve floodplain forest habitat on low quality beaches
CHANNELS 8 & 9 would remain open
CHANNEL 5 would close
CHANNEL 1 would remain closed
Access Dredge
Designated travel corridor during waterfowl hunting season

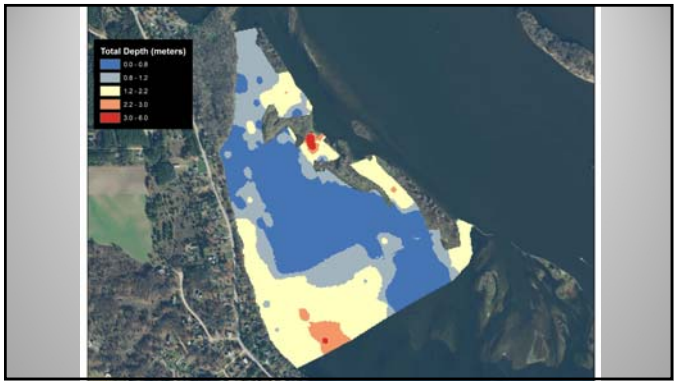

PROPOSED Fish and Wildlife Habitat Improvement Project
WORK COULD START AS EARLY AS 2018
Project Highlights
Improve fish habitat in Peterson Lake
Repair channels 1, 5, 8 and 9
Close channel 5
Partially close channels 8 & 9 while maintaining boat access
Improve floodplain forest habitat
Designated travel corridor will remain open for outboards
Draft report with plans available at:
Wabasha Public Library
Pioneer Club
CONTACTS
Public encouraged to provide comments by December 4, 2017
Dan Kelner
U.S. Army Corps of Engineers
Mary Stefanski
U.S. Fish and Wildlife Service
Dan Dieterman
MN DNR
651-345-3975
Upper Mississippi River Restoration
US Army Corps of Engineers

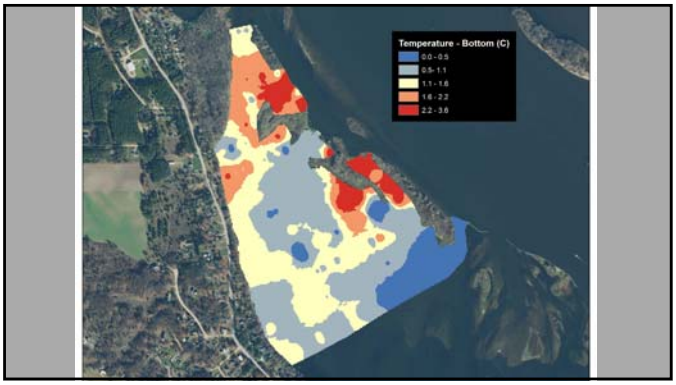

Site 1
Site 2
Site 3
Continuous Temperature and Dissolved Oxygen

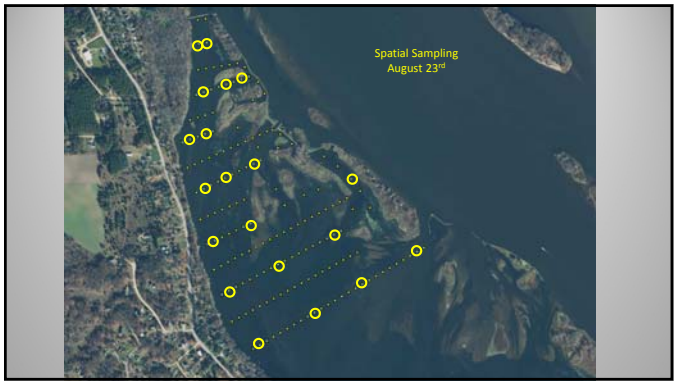

Peterson Lake
DO (mg/L) Temp (°C)
20
15
10
5
0
Dec
Jan
Feb
Mar
Temp-1
DO-1
Temp-2
DO-2
Temp-3
DO-3

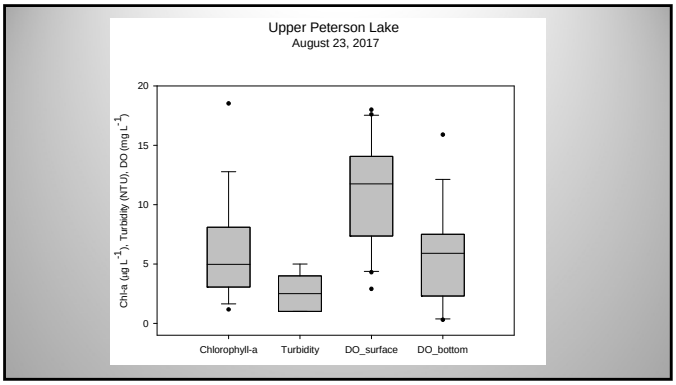

Spatial Sampling
February 14th-16th

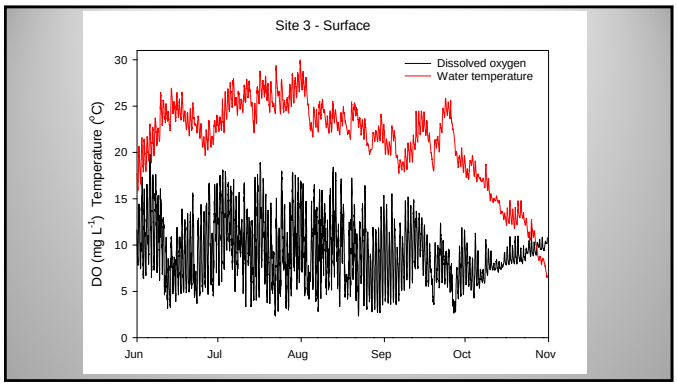

Bottom Velocity
0.28m/sec
0.07-0.15m/sec
0.03_0.05m/sec
0.02m/sec
0.01m/sec
NoFlow

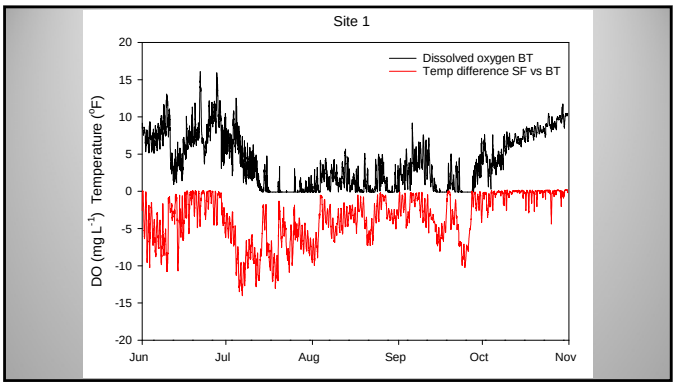

Total Depth (meters)
0.0 - 0.8
0.8 - 1.2
1.2 - 2.2
2.2 - 3.0
3.0 - 4.0

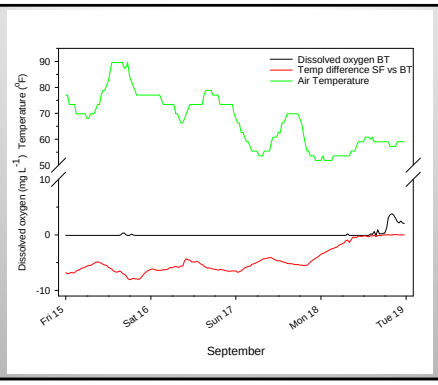

Temperature - Bottom (C)
0.0 - 0.5
0.5 - 1.1
1.1 - 1.6
1.6 - 2.2
2.2 - 3.6


Spatial Sampling
August 23rd


Upper Peterson Lake
August 23, 2017
Chl-a (µg L-1), Turbidity (NTU), DO (mg L-1)
0
5
10
15
20
Chlorophyll-a
Turbidity
DO_surface
DO_bottom


Site 3 - Surface
DO (mg L-1) Temperature (°C)
0
5
10
15
20
25
30
Dissolved oxygen
Water temperature
Jun
Jul
Aug
Sep
Oct
Nov


Site 1
DO (mg L-1) Temperature (°F)
-20
-15
-10
-5
0
5
10
15
20
Dissolved oxygen BT
Temp difference SF vs BT
Jun
Jul
Aug
Sep
Oct
Nov



Questions?

DEPARTMENT OF NATURAL RESOURCES

Upper Mississippi River Restoration

INDICATORS OF ECOSYSTEM STRUCTURE AND FUNCTION FOR THE UPPER MISSISSIPPI RIVER SYSTEM

Nathan R. De Jager, James T. Rogala, Jason J. Rohweder, Molly Van Appledorn, Kristen L. Bouska, Timothy J. Fox, Jeffrey N. Houser

All information is provisional at this time

10/31/2017

HNA-II has two parts:

- Part 1: Develop information to do an inventory of habitats/ecosystems/condition of the UMRS (UMESC)
  - Outcome: Draft report "Indicators of ecosystem structure and function for the Upper Mississippi River System". –Today's ppt.
- Part 2: Conduct a 'needs' assessment based on the information contained in Part 1 and with respect to Agency and Program goals and objectives.

Who has been involved?

- Members of the HNA-II management team:
  - Marvin E. Hubbell (USACE), Timothy P. Eagan (USACE), Kathryn McCain (USACE), and Sara Schmuecker (USFWS)
  - Semi-weekly meetings that guided the development of HNA-II
- Upper Mississippi River Restoration Coordinating Committee
  - Valuable feedback at quarterly meetings throughout the process
- HNA-II Steering Committee:
  - Stephen Winter (USFWS), Levi Solomon (INHS), Kirk Hansen (IADNR), Matt Vitello (MDC), Kathy Kowal (USEPA), Martin Adkins (USDA-NRCS), Jeff Janvrin (WIDNR), Kirsten Mickelsen (UMRBA), Mark Gaikowski (USGS), Dan Dieterman (MNDNR), and Megan McGuire (USACE)
  - Valuable guidance periodically throughout the data and indicator development process
- Aquatic Areas 'subcommittee'
  - Stephen Winter (USFWS), Jeff Janvrin (WIDNR), Kathryn McCain (USACE), Levi Solomon (INHS), Matt Vitello (MDC), Dan Dieterman (MNDNR), Kirk Hansen (IADNR), and Jon Hendrickson (USACE)
- Floodplain Forest Modelling 'subcommittee'
  - Benjamin J. Vandermyde (USACE), Lyle Guyon (NGRREC), Andrew Meier (USACE), Robert Cosgriff (USACE)

General Timeline

- November 2015: Kick-off meetings/presentation at UMRR-CC in St. Paul, MN.
- Winter-Spring 2016, Many questions…
  - HNA-I provided a lot of guidance for how to do it 'better' the next time.
  - UMRR has changed considerably since HNA-I
    - Reach Objectives take a much broader view of the UMRS (multiple Essential Ecosystem Characteristics, not just habitat)
    - New focus on ecosystem resilience
    - New data, new expertise…
- Fall 2016: UMESC Scope of Work to develop data for HNA-II (1 year)
  - 2010 Aquatic and floodplain areas (habitats) and some future projections
- Spring 2017: Face-to-face meeting in Quad Cities:
  - Preview of some of the data
  - Many questions about how to use the data in a system-wide assessment. How to incorporate resilience?
  - A lot of new stuff.
  - But a lot of great feedback using online polling questions. –Really helped to focus subsequent actions on the HNA-II document.
- Summer 2017-present: From data to indicators
  - Use the data to develop quantitative measures (i.e., indicators) that represent existing UMRS Goals and Objectives (2011)
  - Subject for today
- Winter 2017-2018: From data and indicators to management targets
  - Refine management objectives/develop targets, given the data and indicators
  - Subject for today and beyond

Outline for Presentation

- General conceptual approach for HNA-II
  - Reach Objectives – Ecosystem Management
  - General Resilience 'rules of thumb'
- Examples of individual indicators
- Synthesis of current conditions (across all indicators)

A Framework for an Ecosystem Integrity Report Card

Examples from South Florida show how an ecosystem report card links societal values and scientific information

Mark A. Harwell, Victoria Myers, Terry Young, Ann Bartuska, Nancy Gassman, John H. Gentile, Christine C. Harwell, Stuart Appelbaum, John Barko, Billy Causey, Christine Johnson, Agnes McLean, Ron Smola, Paul Templet, and Stephen Tosini

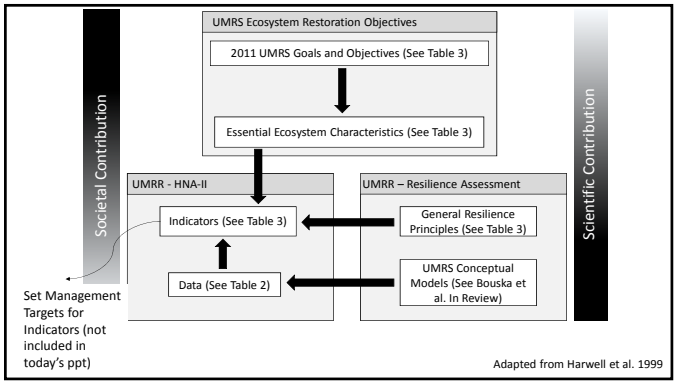
Ecosystem management is a structured process for society to define what ecological condition is desired at each part of a region and to develop and implement management policies designed to achieve that mosaic of desired sustainable ecological conditions (US MAB 1994, IEMTF 1995a, 1995b, Christensen et al. 1996, Harwell et al. 1996, Harwell 1998). Ideally, the establishment of ecological goals involves a close linkage between scientists and decision makers, in which science informs decision makers and the public by characterizing the ecological conditions that are achievable under particular management

This framework is driven from the top down by the societal goals for ecosystem integrity and from the bottom up by detailed scientific measurements of ecosystem conditions

agement is adjusted if necessary to

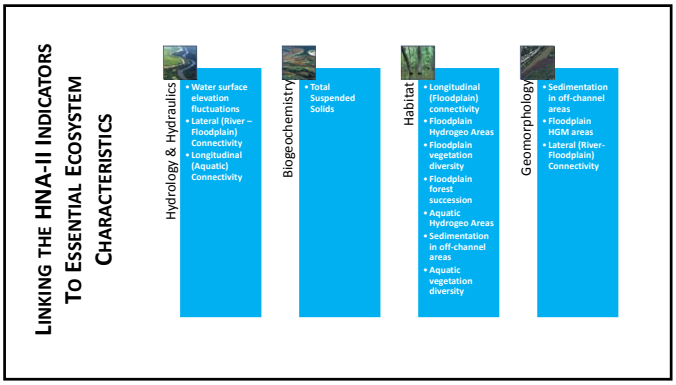
logical goals, that is, they need a "report card" on ecosystem conditions or integrity.

The concept of report cards or performance measurements to describe progress toward environmental goals has evolved over the past few decades as environmental legislation and the appropriation of public funds for environmental restoration, preservation, and management have increased. Over this time, reports have expanded from measurement of the effects of single initiatives (e.g., land acquisition goals for parks and protected areas) and progress toward pollution reduction in single media (e.g., reduction of air



Purpose:

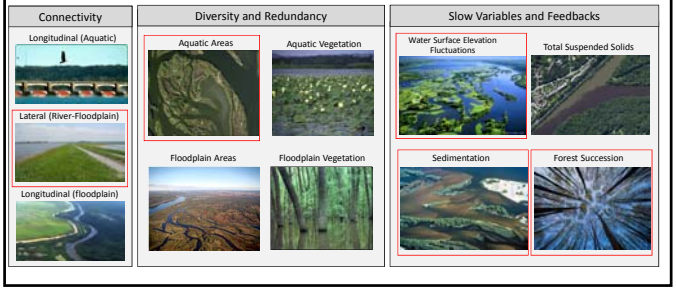
- Develop data sets and quantitative measures (i.e., indicators) for as many UMRS objectives as possible and for the entire system
- Focus on ecosystem structure, function, and resilience at a broad-scale (navigation pool and larger)
  - Future (beyond HNA-II) 'within reach' planning efforts could also make use of the data
- Make it possible to subsequently set management targets/ranges for indicators based on the information



Data and Indicators were developed to represent three aspects of General Resilience

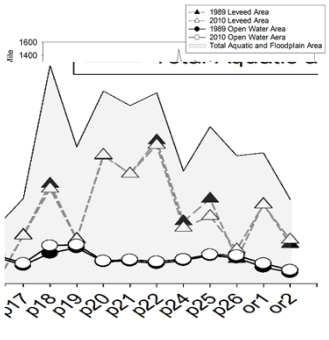
- Resilience: the amount of change a system can undergo and maintain its structure, function and feedbacks
- General Resilience:
  - Capacity of a system to cope with disturbances
  - Rules of thumb related to the ability of most systems to adapt and respond to disturbances
    - Managing Connectivity
    - Maintaining Diversity and Redundancy
    - Managing Slow Variables and Feedbacks

HNA-II Indicators by General Resilience Themes

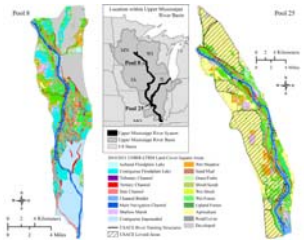


1. HNA-II Indicators
    1. Connectivity……
        1. Longitudinal (Aquatic)……
        2. Longitudinal (Floodplain) ……
        3. **Lateral (River-Floodplain)**……
    2. Diversity and Redundancy……
        1. General Aquatic Areas……
        2. **Aquatic Functional Classes**……
            1. **Lentic Functional Classes**……
            2. **Lotic Functional Classes**……
        3. Aquatic Vegetation……
        4. **Floodplain Functional Classes**……
        5. Floodplain Vegetation……
    3. Slow Variables and Feedbacks……
        1. **Water Surface Elevation Fluctuations**……
        2. Total Suspended Solids Concentrations……
        3. **Sedimentation in Off-Channel Areas**……
        4. **Floodplain Forest Succession**……

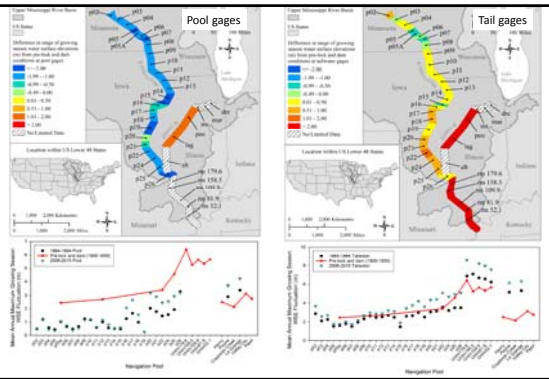
Questions on introductory material?



Connectivity)



Slow Variables and Feedbacks: Water Surface Elevation Fluctuations



Aquatic Functional Classes – data development

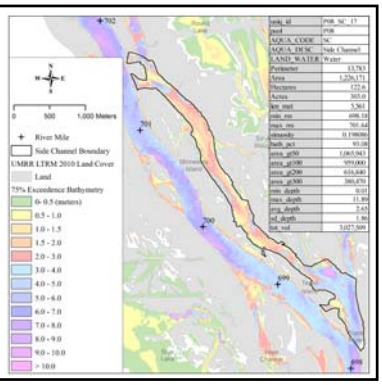
- Developed an aquatic areas data set for the year 2010
    - General classification is similar to Wilcox (1991) and matches the content from 1989 (for comparison studies).
- Further subdivided some classes and delineated new features. Generated individual "regions" (e.g., a segment of MCB, a lake)
- Added ~50 metrics describing physical attributes of each region.

Description of the methods and products is in an appendix. The full set of metrics will be delivered as a shapefile.

Aquatic Areas Data Set:

Water Depth Related Metrics

bath_pct	93.08
area_gt50	1,065,943
area_gt100	959,000
area_gt200	616,840
area_gt300	380,470
min_depth	0.01
max_depth	11.89
avg_depth	2.65
sd_depth	1.86
tot_vol	3,027,509



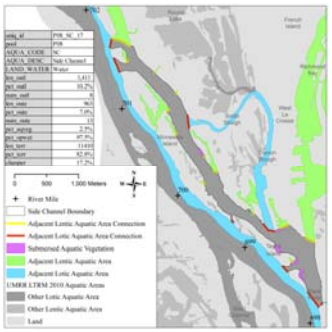
Aquatic Areas Data Set:

Connectivity and Aquatic Vegetation Metrics

- Side Channel Boundary
- Adjacent Lentic Aquatic Area Connection
- Adjacent Lotic Aquatic Area Connection
- Submersed Aquatic Vegetation
- Adjacent Lentic Aquatic Area
- Adjacent Lotic Aquatic Area

UMRR LTRM 2010 Aquatic Areas

- Other Lotic Aquatic Area
- Other Lentic Aquatic Area
- Land

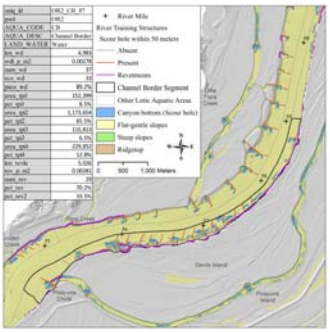


Aquatic Areas Data Set:

River Training Structure Metrics

Scour hole within 50 meters

- Absent
- Present
- Revetments
- Channel Border Segment
- Other Lotic Aquatic Areas
- Canyon bottom (Scour hole)
- Flat-gentle slopes
- Steep slopes
- Ridgetop



Aquatic Functional Classes

- Developed an aquatic areas data set for the year 2010
  - General classification is similar to Wilcox (1991) and matches the content from 1989 (for comparison studies).
- Further subdivided some classes and delineated new features. Generated individual "regions" (e.g., a segment of MCB, a lake)
- Added ~50 metrics describing physical attributes of each region.
- Using combinations of 11 of the ~50 metrics, created and mapped 13 aquatic functional classes for HNA-II that define fundamental aspects of UMRS habitats.

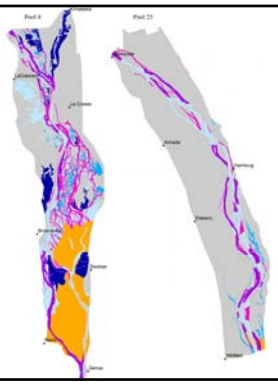
	Connectivity							depth (meters)			
Class name	econ	sill	PPC	TPI	str	fetch	size	forest	>0.5	>1	>3
Lentic											
shallow			<30%						<20%		
deep			<30%							>1	
depression		>0.1	<40%								
borrow pit		>0.1				<1					>1
wooded shoreline			<50%					>50%			
low connectivity	<5		<10%								
shallow w/flow	>5		>10%						<50%	<10	
large w/flow			>20%			>1	>25				
Lotic											
shallow										<25%	
structured w/scour				>1	>0						
structured					>0						
wooded shoreline								>50%			
deep											>80%

econ	Effective connections; a measure of flow through a water body
sill	Measure of morphometric depression
PPC	Percent perimeter that is channel
TPI	Topographic Position Index; using TPI1; measure of "canyon bottom"
str	Structures, both wingdams and closing dams
fetch	Weighted mean fetch
size	Areal extent of region
forest	Percent of perimeter that is forested
depth	Depth at the 75% exceeded discharge condition

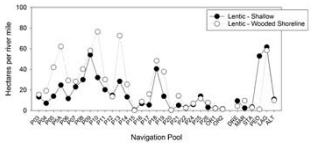
Aquatic Functional Classes

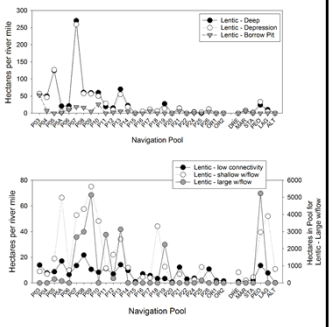
- Not in selected functional classes
- Lotic - Structured with scour
- Lotic - Shallow
- Lentic - Large flow through
- Lentic - Depression lake
- Lentic - Shallow
- Terrestrial

Delivered in a shapefile.

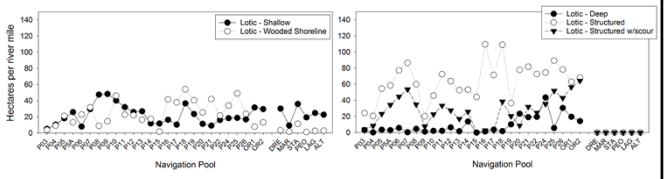


Lentic Functional Classes



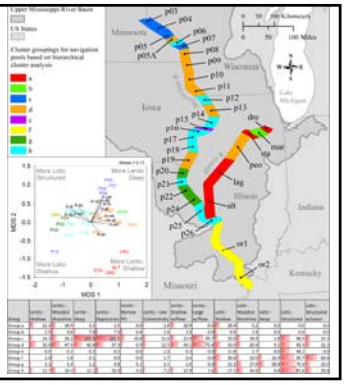


Lotic Functional Classes



Synthesis of aquatic functional classes

- Group C: Upper Pools - deep lentic areas
- Group D: Mid/Upper Pools+PEO: large lentic areas with flow (impounded areas), but with deep lentic areas with wooded shorelines.
- Group H: Mid Pools, structured channel area, but with more lentic area than Groups G and F (below).
- Group G: Lower Pools: structured channel area
- Group F: Open River Reaches: lack of lentic area/high amounts of structured lotic and structured scour areas.
- Group A: Most Illinois River Pools: lentic area with wooded shorelines, lentic shallow areas, lack of deep lentic or deep lotic.



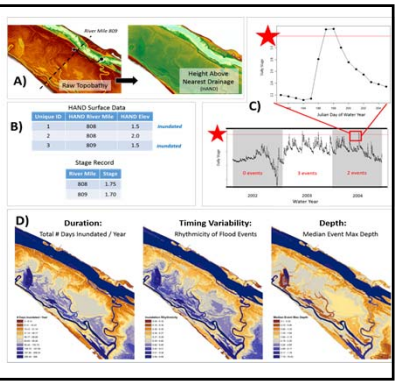
Questions on Results so far?

Floodplain Functional Classes

Flood Inundation Model = Surface Water Connectivity

Multiple Attributes of Inundation: Frequency, depth, duration, timing, timing variability

Description of the methods and products is in an appendix

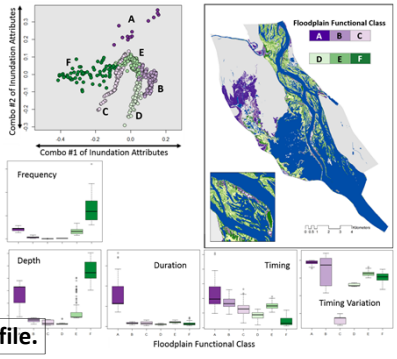


Example output of Floodplain Functional Classes

-Multivariate cluster analysis identifies unique areas that experience combinations of flooding attributes

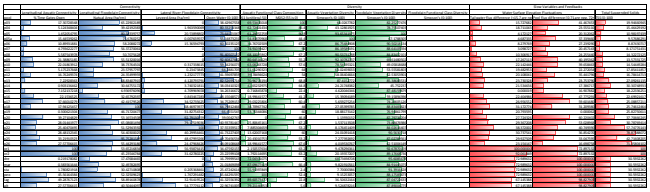
-Near Completion.

Delivered in a shapefile.



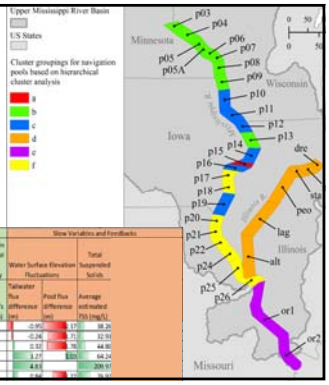
Synthesis of Results: Current Conditions (2010)

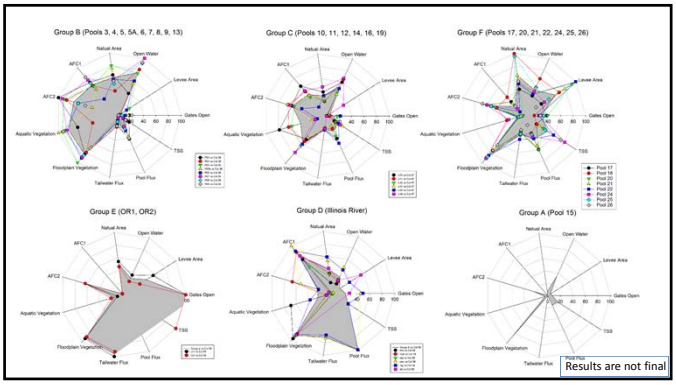
- Longitudinal (Aquatic) Connectivity
- Longitudinal (Floodplain) Connectivity
- Lateral (River-Floodplain) Connectivity (2)
- Aquatic Functional Classes Composition (2)
- Aquatic Vegetation Diversity
- Floodplain Functional Class Diversity
- Floodplain Vegetation Diversity
- Water Surface Elevation Fluctuations (2)
- Total Suspended Solids Concentrations



Synthesis of Results: Current Conditions (2010)

Results are not final





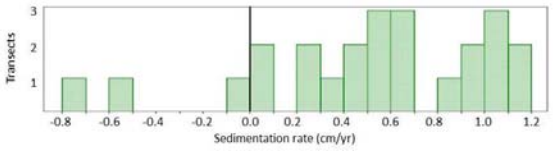
Questions on Current Conditions Analysis?

Sedimentation Model

(forecasting the effects of water depth loss in backwaters)

General approach/methods in an **appendix**

- Utilizes data obtained from LTRM sedimentation transects (20-yr period)
- Random extrapolation of lake-scale rates in areas deeper than 0.5 m



Sedimentation Model

- **Results in Report** (change over 50-yr period)

Predicted changes for two depth-related functional classes:

- > 0.5m
- > 1.0m

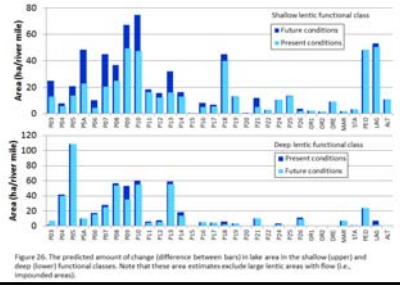
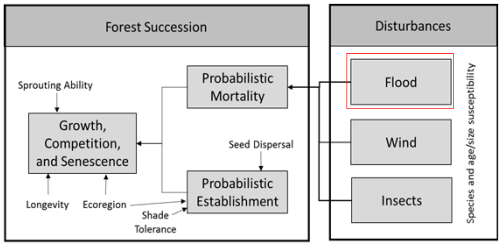
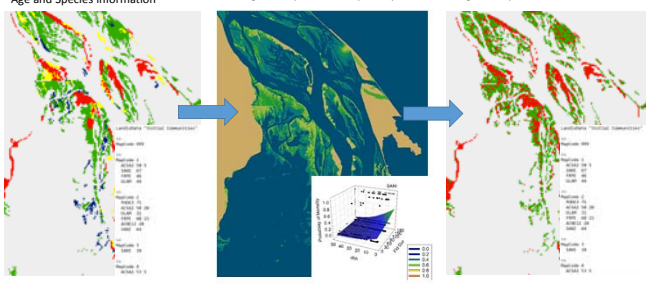


Figure 26. The predicted amount of change (difference between bars) in lake area in the shallow (upper) and deep (lower) functional classes. Note that these area estimates exclude large lentic areas with flow (i.e., impounded areas).

Floodplain Forest Succession





Primary Questions:

- How might the area of forest cover change over time?
  - Are there areas where the flooding regime simply does not support forest regeneration?
- How might the area of different forest types change over time?
  - Cottonwood, willow, maple, oak dominated communities

Next Steps

- Complete Inundation and Forest Succession modelling and associated indicators
- Draft a 'future directions' section
- Have data layers and report peer-reviewed through USGS-FSP
- Begin discussions about setting targets/criteria for different indicators

LTRM Highlights

8 Nov 2017

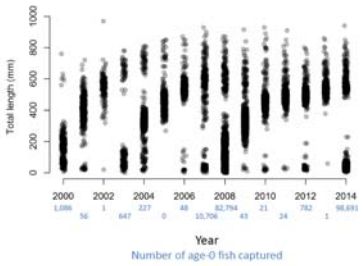
St. Paul, MN

Davi Michl

Hydrology controls recruitment of two invasive cyprinids: bigheaded carp reproduction in a navigable large river

Gibson-Reinemer DK, Solomon LE, Pendleton RM, Chick JH, Casper AF. 2017. PeerJ 5:e3641

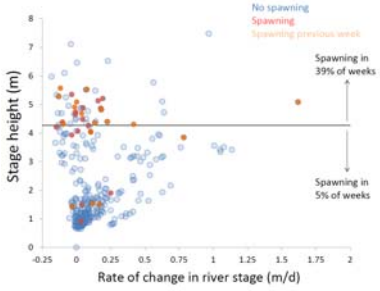
- Analysis of LTRM fisheries data from La Grange Pool of the Illinois river.
- Annual fish size distributions suggest Bigheaded carp (silver + bighead) in the La Grange Reach is dominated by occasional, but large, year classes.
  - 2000, 2003 & 2004, 2007 & 2008, 2014



Hydrology controls recruitment of two invasive cyprinids: bigheaded carp reproduction in a navigable large river

Gibson-Reinemer DK, Solomon LE, Pendleton RM, Chick JH, Casper AF. 2017. PeerJ 5:e3641

- Spawning is common in weeks when river is flooding, not common when it doesn't.
- Successful year class appears to depend on flood events, but flood events don't guarantee a strong year class.
- Dependence of reproduction on hydrograph suggests changing climate and hydrology may affect reproductive success

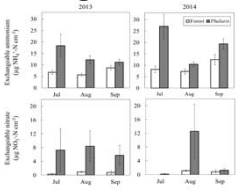


Effects of flood inundation and invasion by *Phalaris arundinacea* on nitrogen cycling in an Upper Mississippi River floodplain forest.

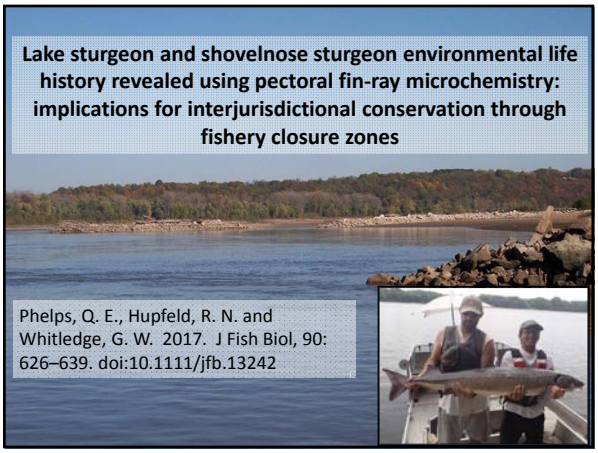
Swanson W, De Jager NR, Strauss E, Thomsen M. Ecohydrology. 2017.

Primary Findings

- FP elevation affected soil properties--Higher soil organic matter, porosity, and total nitrogen and carbon at low FP elevations
- Nutrient processes and NH_4^+ and NO_3^- availability affected by vegetation type and time after flooding.
- Higher N found in RCG soils.
  - Slower rates of mineralization in forest soils
- Higher N concentrations in areas invaded by RCG may reinforce its persistence -- it is known to thrive in N-rich environments.
- RCG may decrease floodplain N storage capacity.



Lake sturgeon and shovelnose sturgeon environmental life history revealed using pectoral fin-ray microchemistry: implications for interjurisdictional conservation through fishery closure zones



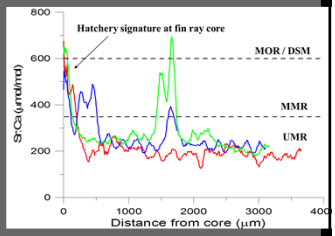
Phelps, Q. E., Hupfeld, R. N. and Whitledge, G. W. 2017. J Fish Biol, 90: 626–639. doi:10.1111/jfb.13242

Objectives

- **Use fin-ray chemistry to**
  - **Estimate importance of 3 potential sources of adult shovelnose sturgeon to Pools 20-26 of the UMR (UMR, Missouri R, or MMR) by determining natal river of origin**
  - **Estimate the magnitude of movement of shovelnose and lake sturgeon among these three rivers**

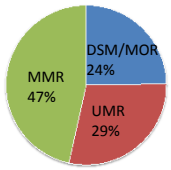
Environmental History of LKSG derived from fin ray chemistry

- **Representative transects**
- **Dashed lines represent river signature.**
- **77% of LKSG in UMR after stocking,**
- **18% moved into MMR at least once post-stocking**
- **5% had been into either the DSM or MOR at least once after stocking.**



Origin of shovelnose sturgeon collected from the UMR

- **The real unexpected find was the high immigration rate from the MMR into the UMR.**
- **Majority of the stock is coming from locations that do not allow commercial harvest**



An Interdisciplinary Human-Environmental Examination of Effects Consistent with the Anthropocene in the Lower Illinois River Valley

Carole E. Colaninno, John H. Chick, ***et al.***, 2017. Midcontinental Journal of Archaeology

- Funded through an NSF Research Experience for Undergraduates grant
- 5 students interested in archaeology and 5 students interested in ecology paired into interdisciplinary teams
- Teams compared archaeology data of skeletonized fish remains with modern fish monitoring data from LTRM and LTEF (long-term electrofishing program on the Illinois River)
- The paper presents a comprehensive analysis of these data to test for temporal shifts in fish communities across archaeological time periods (50 BC – 1300 AD), and the modern time period.

Findings

- No evidence of changes consistent with the Anthropocene among the archaeological periods examined (50 BC through 1300 AD)
- No shifts in community structure of fishes between the Middle (50 BC – 250 AD) and Late Woodland (250 – 1300 AD) periods
- Community structure of fishes from for all archaeological periods (50 BC – 1300 AD) differed significantly from the modern period

Excellent Learning Experience for Students - Improved STEM Skills
(We are accepting undergraduate applications for summer 2018; ccolani@siue.edu)

Evaluating the Fish Community in a rare Backwater Habitat in the Middle Mississippi River
John West
Big Rivers and Wetlands Field Station, Jackson MO.

- In 2016, electrofished and fyke nets, in 3 backwater habitats.
  - One older backwater: RM 34.2E "Blew Hole" (result of 1993 flood)
  - 2 new backwaters created during winter flood January 2016:
    - River Mile 35.5W
    - Len Small Backwater (Apprx RM 33.0E).


Len Small backwater

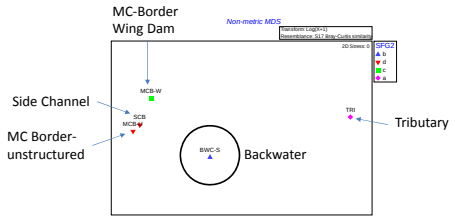

RM34.2E "Blew Hole"

Evaluating the Fish Community in a rare Backwater Habitat in the Middle Mississippi River

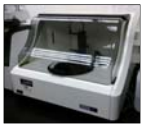
Preliminary Results

Electrofishing results from Open River backwaters:

- 1,472 individuals from 41 species
- 49% Gizzard Shad
- Compared fish assemblage of backwater habitat to other LTRM sampling strata showed backwater fish community is distinct.



Behind the curtain: Keeping up with equipment and technology changes in the UMESC WQ lab



- Comparison study: AQ400 vs Technicon.
  - Xiaoli Yuan, John Manier, and Derek Craig.
- Careful comparisons of results are needed whenever new equipment is purchased for the WQ lab.
- Report summarizing a comparison study of two WQ analytical machines.
- Issues remain with analyzing ammonia on new machine. Ongoing work with manufacturer to figure out why.

FY2018 UMRR Science

UMRRCC
8 November 2017
St. Paul, Minnesota

2018 Science Meeting as a forum for developing Science in Support of Management projects

- Foster collaborative approach and larger projects
- More effectively incorporate UMRR LTRM's unique strengths
- Facilitate a more direct interaction between management/restoration practitioners and researchers during proposal development process

Approach

- Assess current research needs for the understanding, management, and restoration of the UMRS (within the context of the mission of the UMRR Program).
- Assemble specific proposals/scopes for work to be done in 2018.

Assess current research needs for the understanding, management, and restoration of the UMRS

Sources

- UMRR LTRM research frameworks
- Sedimentation/geomorphology—reports and recommendations from two previous workshops (Gaugush & Wilcox). Additional recent work conducted by Rogala and others.
- Information needs / research opportunities derived from ongoing work on HNA II and UMRS resilience
- Information needs inferred from objectives identified in 2009 reach planning documents

Assemble specific proposals for work to be done in 2018

- Identify focal areas
- Before science meeting
  - Leaders for each focal area
  - Assemble at least initial members of working groups
  - Rough outline of proposal/topic for each group
- During science meeting
  - Working groups further develop and refine proposals.
    - Further specify questions to be addressed for each project
    - Identify main tasks that need done, the expertise required, and staffing needs
    - Good draft of proposals completed
- Present summaries of resulting proposals/scopes at UMRRCC quarterly meeting in February 2018.

Overview of (*draft!*) structure for focal areas [*a work in progress*]

- Understanding changes in hydrology and geomorphology and their implications for the structure and function of the UMRS
  - Sediment erosion/transport/deposition
  - Ongoing changes in hydrology
- Identifying and understanding critical associations between hydrologic/geomorphic conditions and the distribution/abundance of biota
  - Aquatic vegetation
  - Fisheries
  - Floodplain forest
  - Mussels
- Understanding the biological processes behind the temporal and spatial patterns observed in the LTRM long term biological and water quality data
  - Vital rates of biotic communities (recruitment, growth, mortality)
  - Critical biogeochemical rates (nutrient cycling, dissolved oxygen dynamics)

Approximate timeline

- October/November: Initial synthesis of current guidance documents, recent discussions into a small number of focal areas (Houser and others).
- November 21 UMRR webinar:
  - Present and explain:
    - The rationale behind the draft list of focal areas
    - The role of these focal areas and the 2018 UMRR LTRM Science Meeting in developing projects for 2018 funding.
  - Present the draft list of focal areas and solicit feed-back from the partnership on this draft list and our approach to developing Science in Support of Restoration projects for 2018 funding.
- November/December:
  - Incorporate input from webinar into revision of focal areas & questions
  - Final draft of focal areas
- December
  - Leaders for each focal area
  - Assemble at least initial members of working groups
  - Rough outline of proposal/topic for each group
- During science meeting [Week of 15 January]:
  - Working groups further develop and refine proposals.
    - Further specify questions to be addressed for each project
    - Identify main tasks that need done, the expertise required, and staffing needs
    - Good draft of proposals completed
- Present resulting proposals/scopes to UMRR CC in February

Upper Mississippi River Restoration

Questions?

Upper Mississippi River Restoration