Hotel Blackhawk
Davenport, Iowa

Upper Mississippi River Restoration Program Coordinating Committee

Quarterly Meeting

November 16, 2022

Agenda
with
Background
and
Supporting Materials

Hotel Blackhawk
Davenport, IA

Upper Mississippi River Restoration Program
Coordinating Committee

November 15-16, 2022

Preliminary-Agenda

Tuesday, November 15   Partner Quarterly Pre-Meetings

4:15 – 5:15 p.m.   Corps of Engineers

4:15 – 5:15 p.m.   Department of the Interior

4:15 – 5:15 p.m.   States

Wednesday, November 16   UMRR Coordinating Committee Quarterly Meeting

Time	Attachment	Topic	Presenter
8:00 a.m.		Welcome and Introductions	*Sabrina Chandler*, *USFWS*
8:05	A1-A16	Approval of Minutes of August 10, 2022 Meeting	
8:10		Regional Management and Partnership Collaboration	*Marshall Plumley*, *USACE*
	B1-B3	▪ FY 2022 Fiscal Update and FY 2023 Outlook	
		▪ 2022 Report to Congress	
		▪ Environmental Justice	
		▪ Implementation Issues	
		▪ Strategic and Operation Plan Review	
9:20		Break	
9:30		Status and Trends	
	C1-C2	▪ Long Rollout	*Andrew Stephenson*, *UMRBA*
9:40		Communications	
		▪ UMRR Communications Team	*Jill Bathke*, *USACE*
		– FY 22 COT Accomplishments	
		▪ External Communications and Outreach Events	*All*
10:15 a.m.		UMRR Showcase Presentations	
		▪ FY 22 LTRM Accomplishments	*Jennie Sauer*, *USGS*
		▪ FY 22 HREP Accomplishments	*Angela Deen, Julie Millhollin, and Brian Markert*, *USACE*

(Continued on next page)

Wednesday, November 16, 2022
UMRR Coordinating Committee
(Continued)

Time	Attachment	Topic	Presenter
11:15 a.m.		Program Reports	
		▪ Long Term Resource Monitoring and Science	*Jeff Houser, USGS*
	D1-D13	– LTRM FY 2022 4th Quarter Highlights	
	D14	– USACE LTRM Update	*Karen Hagerty, USACE*
	D15-D36	– A-Team Report	*Scott Gritters, IA DNR*
	D37-D40	– LTRM Implementation Planning Update	*Jeff Houser and Jennie Sauer, USGS and Karen Hagerty, USACE*
12:00 p.m.		Lunch	
1:00		Program Reports (Continued)	
		▪ Habitat Restoration	*District HREP Managers*
		– District Reports	
1:50		LTRM and HREP Special Reports	
		▪ Fish Community Response to Decreased Vessel Traffic on the Illinois Waterway	*Mike Spear, INHS*
		▪ Huron Island HREP Vegetation Monitoring	*Collin Moratz, USACE*
2:30		Other Business	
	E1	▪ Future Meeting Schedule	
2:40 p.m.		Adjourn	

ATTACHMENT A

Minutes of the August 10, 2022
UMRR Coordinating Committee Quarterly Meeting

(A-1 to A-16)

Minutes of the
Upper Mississippi River Restoration Program
Coordinating Committee

August 10, 2022
Quarterly Meeting

St. Paul, Minnesota

Brian Chewning of the U.S. Army Corps of Engineers called the meeting to order at 8:00 a.m. on August 10, 2022. UMRR Coordinating Committee representatives in attendance were Sabrina Chandler (USFWS), Mark Gaikowski (USGS), Chad Craycraft (IL DNR), Randy Schultz (IA DNR), Megan Moore (MN DNR), Matt Vitello (MO DoC), and Jim Fischer (WI DNR). A complete list of attendees follows these minutes.

Minutes of the May 25, 2022 Meeting

Randy Schultz moved and Matt Vitello seconded a motion to approve the draft minutes of the May 25, 2022 UMRR Coordinating Committee meeting as written. The motion carried unanimously.

Regional Management and Partnership Collaboration

FY 2022 Fiscal Update

Plumley reported that UMRR has obligated nearly $22 million, or just over 66 percent, of its $33.17 million FY 2022 funds as of August 1, 2022. Plumley said the Conway Lake HREP was completed faster and with less material than expected, resulting in approximately $439,000 of savings on the project. These funds will be transferred to the award of the McGregor Lake contract. A construction contract for Steamboat Island HREP in Rock Island District is also anticipated to aid in allocating remaining program funds. Plumley said he anticipates UMRR will obligate over 98 percent of its FY 2022 appropriation by the end of the fiscal year.

FY 2023 Fiscal Outlook

Plumley reported that the President's FY 2023 budget as well as the House and Senate FY23 energy and water appropriations bills include $55 million for UMRR. Plumley said final appropriations are not yet known. There is a high potential Congress will elect to move a continuing resolution for FY 2023 spending early in the fiscal year, extending current funding levels for the federal government.

The draft FY 2023 plan of work for UMRR at a $55 million funding scenario is as follows:

- Regional Administration and Program Efforts – $1,550,000
  - Regional management – $1,280,000
  - Program database – $100,000
  - Program Support Contract – $120,000
  - Public Outreach – $50,000
- Regional Science and Monitoring – $15,450,000
  - Long term resource monitoring – $5,500,000
  - Regional science in support of restoration – $8,350,000
  - Regional (Integration, Adapt. Mgmt) – $200,000

  - Habitat evaluation (split across three districts) – $1,275,000
  - Report to Congress – $125,000
- Habitat Restoration – $38,000,000
  - Rock Island District – $11,148,000
  - St. Louis District – $13,502,000
  - St. Paul District – $13,250,000
  - Model certification – $100,000

Plumley pointed out the most substantial changes that would result from UMRR being funded at $55 million in comparison with its recent $33.17 million appropriation, as follows:

- Increasing regional science in support of restoration from approximately $3.8 million to $8.3 million
- Increasing habitat restoration funding in each district from between $6 million to $7 million to between $11 million to $13 million.

WRDA 2022

Plumley said the draft Senate Energy and Public Works Committee's WRDA 2022 measure includes an annual appropriation authorization increase for the HREP element of UMRR from $40 million to $75 million. With LTRM's annual authorized appropriation level of $15 million annually, the total UMRR annual authorized funding level would be $90 million. Plumley reported the bill is in conference now and noted that UMRBA and some non-governmental partners have advocated for an increase to LTRM as well.

Plumley observed that, should this potential increased appropriations become reality, there would be dramatically elevated demands on personnel resources across the partnership.

Everglades

Plumley recalled his presentation during the May 25, 2022 UMRR quarterly meeting comparing UMRR to other national ecosystem restoration programs included in the President's FY 2023 budget. Of the eight ecosystem restoration projects included in the FY 2023 budget, UMRR received the second highest funding level. The South Florida Ecosystem Restoration (i.e., Everglades) received $406 million.

Plumley explained that the Everglades Program recently faced a question of when it would be done. That generated the estimate of a total federal cost for Everglades ecosystem restoration of $11,101,414,000 and the estimated total non-federal cost of $9,916,663,000. The remaining federal balance to complete restoration work is $5,467,119,000, indicating that the program is about half complete. In response to a question from Jennie Sauer, Plumley said he could report back on an acreage comparison for Everglades and UMRR.

UMRR Ten-Year Plan

Plumley reported that changes to the UMRR 10-year implementation plan include extending schedules for Reno Bottoms, Green Island, and Beaver Island Stages I and II; replacing Glades Refuge with Reds Landing; and adding Gilead Slough. Plumley said increased annual appropriations to $55 million would result in accelerated project schedules and expedited need for another project selection process. In response to a question from Matt Mangan, Plumley said the next HREP selection process under a $55 million funding scenario is anticipated to begin in calendar year 2024.

Acres Restored

Plumley said four projects are anticipated to be completed in 2022 that will collectively add 9,810 acres to UMRR's total restored or improved habitat. This estimate includes the clarification that Beaver Island Stages I and II are anticipated to be complete this year with follow-on forestry work to be completed in FY 2023.

2022 Report to Congress

Plumley reported that the draft 2022 UMRR Report to Congress has been reviewed twice by UMRR Coordinating Committee members and once by some non-governmental partners. The report authors have addressed the comments in consultation with the UMRR Coordinating Committee. MVD is currently reviewing the draft report. MVD has requested additional explanation regarding the legal or policy basis for the requirements at issue in the project partnership agreements. The second in-progress review with USACE Headquarters is scheduled for August 29, 2022. Plumley said the Corps remains on schedule to deliver the 2022 Report to Congress in December 2022. Following recent minor delays in the schedule, the Corps has identified some procedural efficiencies to ensure the deadline is met.

Environmental Justice

Plumley reflected on the UMRR Coordinating Committee's open conversation about environmental justice following the May 25, 2022 quarterly meeting. In concluding the discussion, the Coordinating Committee requested additional conversation about UMRR's role in advancing environmental justice. As a first step in follow up to that discussion, Plumley provided an overview of the history of environmental justice in federal policy and guidance and how UMRR has been addressing it in projects to set the stage for future conversations. Plumley said UMRR's partnership is broad, but there are important voices that have not traditionally been involved within UMRR.

Plumley said federal environmental justice programs started in 1970s, codifying associated principles and guidelines for water resource development programs in the 1980s via four accounts: national economic development, environmental quality, regional economic development, and other social effects. The Corps' feasibility reports include discussion of all four categories. The environmental quality account includes project elements relating to Habitat units and benefits. Environmental justice effects are included in the other social effects account.

In 1994, Executive Order 12898 defined environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." This Executive Order also spoke to how the Corps should incorporate environmental justice into its work. WRDA 2020 included specific language about the need to address all four accounts with an emphasis on environmental justice. Plumley said subsequent Executive Orders established environmental justice work groups and required coordination between OMB and ASA(CW) offices. In March 2022, ASA(CW) issued interim implementation guidance for the WRDA 2022 provisions. This interim guidance provides direction for analyzing environmental justice issues and encourages the Corps to develop engagement strategies with underserved communities.

Plumley said the Corps made environmental justice part its of mission. The Corps strives to be creative in how it reaches out to communities that have traditionally been underserved through the agency's programs and projects to learn from their perspectives and ensure that underserved communities are not adversely impacted. He noted that environmental justice is both a movement that reflects the desire by underserved communities to be recognized and included in decision making as well as the Corps' intention to be more inclusive. The Corps is moving toward a better model of improving participation in decision making by removing barriers (e.g., translation services for people with limited English proficiency), increasing access to benefits from projects, and reducing environmental burdens to communities. Plumley noted that most HREPs occur in relatively isolated areas.

Plumley outlined how the Corps six-step planning process for all HREPs aligns with the NEPA process and how environmental justice is woven into that process. Whereas the early years of the environmental justice movement called for simply doing no harm, the objectives now are to involve underserved communities more closely in decision making processes. Plumley pointed to the Corps' environmental justice policies that state the agency's intention to integrate environmental justice into all aspects of its work, including through UMRR. He encouraged future dialogue among UMRR partners regarding the tools and approaches that their respective agencies' use to advance environmental justice in their own work and to discuss options for ways in which UMRR can advance environmental justice. Plumley offered to convene additional structured discussions on this topic over the next several months and to consider how we communicate the benefits and value of UMRR going forward.

Lauren Salvato read Olivia Dorothy's comment provided in the meeting chat forum that the Civil Rights Act of 1964 be included in historical timelines of the environmental justice movement. Dorothy pointed to Title 6 of the Civil Rights Act that prohibits discrimination based on the basis of race, color, or national origin in any program or activity that receives federal funds or other federal financial assistance.

Jim Fischer expressed appreciation to Plumley for raising this topic and indicated his support for further dialogue as a program on how to advance environmental justice. Fischer noted environmental justice is critically important nationally and for UMRR. Fischer said it will be especially important that our actions reflect our words today, urging partners to keep environmental justice in mind when implementing UMRR and NESP projects under very compressed timelines.

Fisher reported that Governor Evers issued an executive order establishing the Wisconsin Department of Environmental Justice, which will collaborate with the Office of Sustainability and Clean Energy to promote collaboration across agencies through strategies that advance environmental justice. The Department is hiring a Chief Resilience Officer now. Fischer said the Office of Great Waters (OGW) established a performance objective for all staff to continue dialogue about environmental justice, diversity, equity, and inclusion on a quarterly basis. Rebecca Fedak, Lake Michigan Supervisor for Wisconsin DNR, recently led a case study to develop an engagement framework around the Milwaukee Area of Concern (AOC) organized around commitment to partnership, playing to strengths, investing in the AOC community engagement model, and centering on equity and justice. The draft framework may be applicable to efforts on the river as well. Additionally, Fischer said a project scoping framework tool is available that lays out steps to assess environmental justice in any OGW projects, which could apply to HREPs or other UMRR projects.

Megan Moore also commended Plumley for addressing the environmental justice and welcomed additional structured conversations going forward. Moore highlighted ongoing efforts in Minnesota to establish a Chief Inclusion Officer and Chief Equity Officer. The positions will be incorporated into the Walz-Flannigan Administration to promote diversity, equity, and inclusion as well as environmental justice across agencies. Moore noted that Minnesota DNR works under a culture of respect and incorporates within position descriptions the ability to think inclusively and consider how one's work impacts vulnerable communities. Sabrina Chandler said underrepresentation in the workforce is often overlooked in these discussions but is a very important aspect for consideration. It is important that the people working on UMRR and are involved in its decision making represent underserved communities so that there is a diversity of backgrounds and perspectives and ideas inherently brought into planning processes. The Service is actively working to better serve underserved communities by having those folks represented in their workforce.

Olivia Dorothy echoed Chandler's comments. Dorothy raised the issue that the UMRR Coordinating Committee meets at times and in places that are not accessible to all of the communities and potential partners along the Mississippi River. Dorothy suggested reviewing how decision making processes can be more accessible to underserved communities.

Brian Chewning expressed appreciation for Plumley's approach to the conversation and the comments raised by partners. Chewning noted that additional Corps guidance on environmental justice is forthcoming as it continues to be a priority for the Administration and said there may be useful tools from USEPA and others that help define disadvantaged communities geographically. In response to a question from Kirsten Wallace, Plumley suggested convening a small group to plan for a focused discussion on how UMRR's current approaches, tools, and opportunities incorporate environmental justice and can be improved as well as how UMRR can engage with communities that have not been traditionally served by the program. Mark Gaikowski said there is a NOAA/NOS fellow working with the midcontinent region who did post-graduate work on environmental justice issues in the Central Atlantic Coast who may be available to join the *ad hoc* group. Stephenson said he will send an email to the UMRR Coordinating Committee to designate staff from their respective agencies to participate in an *ad hoc* group on UMRR's roles in environmental justice.

Implementation Issues

Plumley reported that, on July 12, 2022, Andrew Stephenson sent revised draft implementation issue papers to the UMRR Coordinating Committee that reflected the Committee's input on earlier drafts. The Coordinating Committee is scheduled to meet on August 31, 2022 to discuss the revisions and identify the preferred actions to address each issue. In response to a question from Stephenson, Plumley said the revised PPA language in the Report to Congress states that OMRR&R and indemnification are based in law but does not change the message of the issue paper. The revised language will be available for inclusion in the August 31, 2022 discussion.

Inflation

Plumley reported that inflation is impacting HREP costs. Recent HREP contract bids have come in approximately 23 percent to 24 percent above the government estimate. Steamboat Island HREP bids were 18 percent to 40 percent above estimates. Plumley said that inflation is affecting all Corps projects and programs around the country. Jennie Sauer said LTRM has seen increased equipment costs including the water quality lab equipment costs. Jim Fischer said fleet rates in Wisconsin have increased. Plumley said UMRR will further assess impacts across program activities.

HREP and LTRM Integration

Plumley outlined recent initiatives related to HREP and LTRM integration. The Lower Pool 13 HREP in the Rock Island District was the first HREP to intentionally embed LTRM staff in the PDT due to it being in a trend pool. LTRM staff reported their involvement in the PDT provided valuable perspectives to them on how projects are developed. Plumley said the Lower Pool 13 PDT has a tentatively selected plan, and mentioned that he will request the PDT conduct an after-action review to identify what was supposed to happen, what did happen, and what could be done differently. These lessons learned would help to inform LTRM involvement on other PDT activities for projects in LTRM trend pools, such as Pool 4 Big Lake.

Plumley said the 2022 science meeting included a session focused on Lower Pool 13 for which a summary is forthcoming. Individuals involved in that discussion may also meet again over next several months to review how that conversation may help to inform integration of the program elements. Sabrina Chandler said the Service also held internal discussions to reflect on the Lower Pool 13 process and that the intentional inclusion of LTRM staff was critical to the success. Chandler said that, in efforts to replicate the success for the Pool 4 Big Lake project, questions arose such as who is responsible for inviting LTRM staff to the PDT and who is responsible for utilizing LTRM data to inform the planning process. Chandler expressed enthusiasm for progress on integration and said it will be important to set expectations and establish roles and responsibilities for those activities.

Plumley said integration has also been discussed throughout the LTRM implementation planning effort. Houser echoed Chandler's comments and said adding capacity to bridge LTRM and HREP may require additional staff rather than having existing staff expand their roles. Stephenson said lessons learned through UMRR may also apply to NESP projects in LTRM trend pools and suggested looking back on the Pool 8 Islands HREP for perspective on how LTRM monitoring post-HREP construction can help evaluate certain project features. In response to a question from Wallace, Plumley proposed soliciting a small work group this fall to plan for additional discussion on integration of the two UMRR elements.

Chandler said Sharonne Baylor is creating information packets for onboarding new staff and there is an opportunity to expose employees to both sides of program in a more integrated approach rather than as stovepipes. Jim Fischer said Wisconsin DNR developed a Mississippi River 101 guidance document to bring waterways permitting staff up to speed. Fischer noted that there may be entire staff turnover within 5-10 years that would result in the loss of substantial institutional knowledge, warranting a programmatic approach to prepare for knowledge transfer. Matt Mangan suggested that, and Plumley agreed, LTRM should be involved in the planning charette stage to identify potential information needs and LTRM support needs as well as other opportunities for collaboration. Houser and Chandler attributed success of the Lower Pool 13 project to early inclusion of LTRM staff. Hagerty said there are a number of resources on UMRR and LTMR websites available for new staff, such as the UMRR and LTRM 101 webinars.

Ribbon Cutting

Plumley reported that a new video celebrating the ribbon cutting of the Pool 12 Overwintering HREP is available at this link: https://www.youtube.com/watch?v=kJmUOQuOvqo. Chandler applauded the video for utilizing a free-flowing conversation format. Mark Gaikowski suggested that, and Fischer agreed, a video ribbon cutting of the renovated UMESC water quality lab would showcase the UMRR science and monitoring element. In response to a question from Fischer, Plumley said the Pool 12 HREP video was shared to social media but did not have a coordinated partnership effort similar to the recent LTRM status and trends report release. Fischer said the video would help generate conversation among the river users. Stephenson noted that the Communications and Outreach Teach is working on a process to better enable sharing of these products across the partnership.

2015-2025 Strategic and Operational Plan Review

Stephenson recalled that, on September 20, 2021, a survey was distributed to the UMRR partnership at-large regarding the 2015-2025 UMRR Strategic and Operational Plan. Stephenson reported that of 15 success criteria included in the survey, 10 returned majority agreement. The survey data are available in a format that will allow for relatively quick, additional analyses of partners' perspective on various aspects the program. In response to a question from Jeff Houser, Stephenson said open-ended responses will be included in a report appendix. In response to a question from Chandler, Stephenson said a finalized report on the survey results is anticipated to be submitted to the UMRR Coordinating Committee in the coming months. A meeting to review and discuss the results is anticipated to be convened in October 2022.

Status and Trends Report Release

Marshall Plumley reported that the Ecological Status and Trends of the Upper Mississippi and Illinois Rivers Report was published in June 2022. Plumley expressed appreciation to USGS for leading development of the report, to all contributors, and to those who helped to develop a communication and outreach strategy for the report release. Plumley noted the value of a concerted and coordinated communication effort around this report was clear and the report provides opportunities for follow-on products. Jeff Houser expressed appreciation to the broad array of contributors including chapter leads and authors as well as those involved in the data collection, analysis, and summarizing of information for the past 30 years. He expressed specific appreciation to Jason Rohweder for creating all the maps and to Sauer for coordination across many tasks. Houser thanked the A-Team, Andrew Stephenson, and Karen Hagerty for reviewing the report at various points. Houser echoed Plumley's appreciation for the communication teams efforts to share the report and noted the payoff in terms of resultant and ongoing inquiries and media coverage. Sauer expressed appreciation for the formal report reviews by USFWS staff and staff at the USGS Grand Canyon Monitoring and Research Center. Mark Gaikowski commended Houser and Sauer for their efforts to assemble the report and work through the publication process. Jim Fisher commended all those involved in accomplishing this quality report and acknowledge the tremendous reception of the report by those outside the program.

Stephenson said the third LTRM status and trends report release, jointly issued by the Corps and USGS, received considerable media attention including from regional and national news outlets. The press release was shared through multiple mediums, including print and radio media outlets, social media, and partner email distribution lists. The electronic press release was viewed 874 times. Sam Heilig said that, in comparison to other Corps press releases, this release has maintained greater longevity and has had a higher-than-normal distribution. Randy Hines said that, on July 26, 2022, USGS hosted reporters and the editor of the Mississippi River Ag and Water Desk. It was a unique opportunity to underscore the value of the regional partnership and UMRR. Hines noted the Ag and Water Desk can be a medium through which to share future success stories. Sauer expressed appreciation to the Wisconsin DNR field staff for demonstrations of monitoring methods during the visit. Megan Moore said the partnership coordination on the status and trends report rollout shows progress on goal three of the strategic plan. Stephenson said the COT reflected on successes and discussed opportunities for improvement in future similar efforts.

Sabrina Chandler said the Service is working hard nationally to increase the visibility and public's understanding of the National Refuge System. Chandler noted that many tours occur on the Upper Mississippi River National Wildlife and Fish Refuge, but the Refuge is not always acknowledged. As an example, the Pool 12 HREP ribbon cutting video does not acknowledge the Upper Mississippi River NWF Refuge. The Upper Mississippi River NWF Refuge helped lay the groundwork for UMRR and many of the positive changes on the river are closely associated with the presence of the refuge. Chandler said initial planning for the Upper Mississippi River NWF Refuge's 100th anniversary, to occur in 2024, is underway and requested that partners support the raising awareness of the refuges. Jennie Sauer and Karen Hagerty suggested developing talking points articulate the Refuges' role in UMRR. Megan Moore agreed, noting the opportunity to highlight how the Upper Mississippi River has benefitted from the Refuge and how the Refuge has benefitted from the river.

Status and Trends Report Long Rollout

Stephenson presented plans for a long rollout of the LTRM status and trends report to make the tremendous amount of information in the report accessible to key audiences as well as the interested public. The press release represented a handshake to media outlets with a high level digestion of materials. UMRBA will coordinate the development of a series of four two-page flyers related to findings presented in the status and trends report and create a plan for disseminating flyers to the UMRR partnership and media outlets. Topics will include fisheries, water quality and nutrients, floodplain forest loss, and sedimentation. Stephenson said key findings from the press release will be the basis for the flyers including:

— Forest loss: Floodplain forest loss has occurred across most of the system.

— Water quality: Concentrations of nutrients, notably nitrogen and phosphorous, remain high, exceeding U.S. Environmental Protection Agency benchmarks. However, total phosphorous concentrations have declined in many of the studied river areas.

— Fish Communities: The river system continues to support diverse and abundant fishes. However, invasive carps have substantially affected the river ecosystem where they have become common.

Stephenson said there was not a key takeaway for sedimentation included in the press release, but presented a draft version as follows:

— Sedimentation: Sediment accumulation has changed the river structure by creating new floodplain land areas and reducing depths in backwater areas. These changes affect the quality and availability of habitat for fish and wildlife.

  The loss of deep backwater areas can reduce suitable habitat for some fish species, especially for overwintering.

  New landforms with sandy substrates can be important habitats for shorebirds and waterbirds and offer ideal conditions for the establishment of important tree species such as willows and cottonwoods.

In response to a question from Karen Hagerty, Jennie Sauer said USGS is also developing a four-page glossy focusing on why the report was created and why the information is relevant. These documents may incorporate information related to recent questions from interviews. Hagerty encouraged collaboration in the development of the flyers and four-page glossy. Stephenson said tracking media questions will be helpful for informing future efforts. Kirsten Wallace said Goal 3 of the UMRR 2015-2025 Strategic Plan is to work with organizations that affect our vision for the river ecosystem. As an example, Wallace explained that the sedimentation flyer will likely be relevant to the Corps' consideration of a sediment budget for the UMRS.

Communications

Jill Bathke reported that the UMRR Communications and Outreach Team (COT) met on August 3, 2022 and reflected on what worked well in disseminating the third LTRM status and trends report and offered the following comments and improvements:

— Overall, the press release was widely used by various publications. It provided adequate information that attracted broad media attention. It worked well to have state-specific information, partnership participation, points of contact for media requests, and planning six to eight months in advance.

— Improvements include the focus of the press release, the availability of the press release or report in advance to states and partners, integrating information with river groups, and creating a standard of protocol for future efforts.

Bathke said UMRR COT fall 2022 activities center around learning, connecting, and sharing, including:

— Incorporate wider partnership participation and leadership

— Learn from the LTRM status and trends release to develop best practices

— Complete the UMRR video series

— Create communications inventory

Bathke reported that COT members were recently asked to provide feedback on a) agenda items for meetings, b) presentation topics for UMRR communications or cross-cutting communication topics, c) how to integrate HREP and LTRM science into communications, and d) how the COT can support UMRR partners' communications goals and needs.

Kirsten Wallace noted that the limited access to the draft report made it challenging for states and partners to prepare timely media releases. Houser said there was interest in the press release being distributed the day the report was publicly available. He suggested that future reports be posted discretely in advance of a timeframe for disseminating an associated communications campaign. Gaikowski said USGS did provide a courtesy review to aid in partner coordination, but explained that fundamental science practices could not be modified. Gaikowski and Wallace agreed that the report could be released on the publication warehouse with a planned delayed media coordination. Houser expressed appreciation to Bathke and the COT and noted that the program had not seen media coverage of this level on previous efforts.

Olivia Dorothy congratulated all involved in producing a quality report that shows how different indicators have changed over time. Dorothy noted that recommendations were not as strong in this report and suggested follow-on efforts highlight areas that need restoration efforts. Gaikowski expressed an interest in hearing any feedback on the report. While management recommendations could not be included in a USGS report, the information allows for the management agencies to make recommendations regarding future restoration efforts. In response to a comment from Dorothy, Gaikowski said future reports could include analyses of LTRM trends over differing time periods.

In response to a question from Angela Deen, Bathke said that producing concise videos take considerable effort and that two-minutes videos seems to be the right length. Deen asked the group what aspects of projects would be most impactful to include in videos. Jennie Sauer suggested including monitoring efforts for projects. Gaikowski suggested drafting a storyboard template for HREP videos that would include various stages of HREP development including pre-planning, monitoring, and construction. Bathke said that a video developed for the scoping stage could be re-released with a draft report later.

External Communications and Outreach

Wallace reported UMRBA met with Department of Interior Assistant Secretaries for Water and Science and for Fish and Wildlife and Parks. In making the request that DOI leadership provide the top-down support for partnership, Wallace said she discussed the LTRM status and trends report and the value of the Refuges and ecological services to UMRR, NESP, and UMRBA's other work. Wallace also underscored non-federal sponsor issues with PPAs.

Fischer said Wisconsin DNR has been interviewed regarding the LTRM status and trends report. Communications within the agency has raised interest in Mississippi River issues. On June 7, 2022, the Wisconsin DNR environmental management team visited La Crosse and discussed UMRR HREPs and LTRM as well as dredge material management. The visit included a tour of the Pool 8 Islands HREP. Fischer noted that the participants offered to carry forward concerns to the Governor's office. On July 19, 2022, Fischer and Brenda Kelly gave a boat tour of McGregor Lake HREP to the agency's wildlife leadership team and discussed opportunities associated with increased appropriations as well as implementation challenges of staff shortages and increased workload. Fischer said Jeff Janvrin presented to the Wisconsin DNR forestry team about floodplain forest restoration on the Mississippi River.

UMRR Showcase Presentations

LTRM Spatial Data Component

Nate De Jager, USGS UMESC, presented on the LTRM spatial data component, including land cover/land use imagery, topobathy, and landscape modeling as well as many analyses that utilize those datasets. The component is funded through base monitoring and provides data for Land Use/Land Cover (LU/LC), topobathy, and their derivatives such as models and tools. Staff run analyses, investigations, and produce reports such as HNA to identify future data needs. De Jager introduced key team members and their specialties: himself (models, data, reports, partnership), Ben Finley (geographer, UAS pilot, remote sensing), Jayme Strange (lab manager, topobathy), and Jason Rohweder (GIS, data development, server maintenance).

De Jager said LU/LC data are updated every decade and are the base of the topobathy and landscape modeling. August 2020 imagery was taken at peak biomass, flown with a FWS airplane. Imagery shows flowering rush is spreading rapidly. The data has new modifiers; "b" indicates flowering rush, "z" wild rice, and "s" floodplain forest mortality > 25 percent. Derived data products include core areas, forest blocks, and reed canary grass areas. De Jager said emerging technologies such as unmanned aerial systems (UAS) allow researchers to show change over time. De Jager reiterated the importance of topobathy because it is the base of so many analyses, including identification of geomorphic units, flood inundation, SAV model, and the wind and wave model. Multi-beam sonar provides high-resolution depth data to delineate substrates, flow velocity data, and shoreline elevation data. The group plans to update and expand the topobathy data. They aim to fill gaps and update topobathy data for key LTRM pools and estimate rates of change. Landscape modeling uses forest simulations, sedimentation in lentic areas, and forest/backwater condition forecasts. De Jager shared an example of forest simulations for Reno Bottoms to forecast forest loss. In Upper Pool 13, there is extensive floodplain forest loss. Around 1,450 acres have been lost, being replaced by shallow marsh annuals and mud flats.

Olivia Dorothy expressed appreciation for the spatial datasets and having integrated them with the new Harrison model that looks at emissions from reservoirs. Dorothy said American Rivers recently received additional funding to continue that work. In response to a comment from Matt Mangan, De Jager said spatial data is used at the outset of project development to delineate areas and take stock of current conditions. Additionally, some data may be needed to run hydraulic models. De Jager said there can be challenges with models being parameterized with one dataset and application to another dataset. In response to a question from Chandler, De Jager said models and platforms can be applied broadly but may need specific information from a location to run on a particular landscape. For example, the forest model applies to the whole system, but Reno Bottoms data was incorporated for finer scale modeling on the project. The sedimentation model is non-spatial but runs across the whole system and is current efforts are focused making the model more spatially explicit to map changes in depth over time. Chandler said this is an example of how LTRM information can be applied to non-trend pools and should be acknowledged when discussion LTRM and HREP integration.

De Jager reported that the forest model received regional certification, which will improve its application to various HREPs to assess project alternatives. In response to a question from Stephenson, De Jager said he had not yet been engaged on NESP-related forestry projects but that the model is regionally certified and widely available and could be used without his involvement. Chandler said many of the foresters involved in the model development were also involved in the systemic or multi-pool fact sheet development and likely considered application of the forest model.

Jim Fischer expressed appreciation for the work of the spatial data team and noted the data is ever present in presentations he sees and should be more widely acknowledged. De Jager said he struggles to articulate the importance of topobathy data because it is underneath everything else we do. In response to a question from Mark Ellis, De Jager said the LTRM data is unique amongst other land cover dataset in the resolution. The national landcover dataset is more coarse because it utilizes satellite imagery. However, De Jager noted some drawbacks of being unique, including having to address novel changing methods and map alignments over time. De Jager added that LTRM methods may be cost prohibitive for others.

Habitat Restoration

Angela Deen said MVP's planning priorities include Big Lake – Pool 4, Reno Bottoms, and Lower Pool 10. Feasibility planning continues for Big Lake – Pool 4 and Reno Bottoms. The final report for Lower Pool 10 to was approved in June 2022. MVP has four projects in construction, including Harpers Slough, McGregor Lake, Bass Ponds, and Conway Lake. A ribbon cutting ceremony for Bass Ponds is anticipated in September 2022. The UMRR Coordinating Committee is scheduled to tour Bass Pond on August 10, 2022 and the River Resources Forum on August 24, 2022. Deen also provided an overview of Bass Ponds in advance of the afternoon site visit.

Leo Keller said MVR's planning priorities include Lower Pool 13, Green Island, Pool 12 Forestry, and Quincy Bay. The District's design priorities are Steamboat Island Stages I and II. Design of Steamboat Stage I is complete, and bids are due on August 9, 2022. MVR has five projects in construction. The Pool 12 Overwintering Stage II ribbon cutting took place on July 6, 2022. The ribbon cutting video was posted on July 28th and can be found via the following link: https://www.youtube.com/watch?v=kJmUOQuOvqo. Marshall Plumley said that high covid cases locally prevented the Quincy Bay project from holding a public meeting in-person. He also said that exclosure efforts and submersed aquatic vegetation and emergent vegetation response at Huron Island provided new insights on how to restore vegetation, which will be shared during the next quarterly meeting.

Brian Markert said MVS's planning priorities include West Alton Islands and Yorkinut Slough. MVS's design priorities include Piasa & Eagles Nest, Harlow Island, and Oakwood Bottoms. MVS has three projects in construction. Construction at Crains Island Stage 1 is anticipated to be completed in the fourth quarter of FY 22. Stage I of Piasa & Eagles Nest was completed and stage II work is anticipated to begin in fall or winter 2022.

Long Term Resource Monitoring and Science

FY 2022 3rd Quarter Report

Jeff Houser reported that accomplishments of the third quarter of FY 2022 include publication of the following reports and manuscripts:

- *Resisting-Accepting-Directing: Ecosystem Management Guided by an Ecological Resilience Assessment*
- *Evidence of Alternative Trophic Pathways for Fish Consumers in a Large River System in the Face of Invasion*
- *Darter (Family: Percidae) Abundance in Deep-Water Habitats of the Upper Mississippi River*
- *What is a Stand? Assessing The Variability of Composition and Structure in Floodplain Forest Ecosystems Across Spatial Scales in the Upper Mississippi River*
- *A Case Study of Large Floodplain River Restoration: Two Decades of Monitoring the Merwin Preserve and Lessons Learned through Water Level Fluctuations and Uncontrolled Reconnection to a Large River*
- *Ecological Status and Trends of the Upper Mississippi and Illinois Rivers*

Houser reported that the LTRM Water Quality Lab has temporarily moved to the University of Wisconsin – La Crosse while renovations take place at UMESC. The laboratory renovation is expected to be completed in July 2023. Houser also reported that 2021 LTRM data is fully integrated into the online spatial data query tool.

USACE LTRM Report

Karen Hagerty said UMRR's LTRM FY 2022 budget allocation includes \$6.3 million (i.e., \$5.0 million for base monitoring and \$1.3 million for analysis under base) with an additional \$2.5 million available for "science in support of restoration and management." In the last quarter, execution of the FY 2022 budget is at \$8.76 million (out of \$8.8 million). Any unspent funds will be rolled into FY 2023.

Hagerty presented two FY 2023 budget options. If UMRR is funded at $33.17 million and LTRM receives $8.8 million, funds would be allocated consistent with the past five years. If UMRR is appropriated $55 million and LTRM receives $13.85 million, allocations would be as follows:

- — Base monitoring would increase to $5.5 million (from $5 million),
- — Science in support restoration would increase to $1.5 million (from $1.3 million).
- — Science in support of restoration and management would increase to $6.85 million (from $2.5 million)

In response to a question from Stephenson, Hagerty said FY 2022 budget numbers would not be modified now to address inflation. The LTRM element costs more than what was allocated in FY 2022, however, "science in support of restoration" funds were used to pay for the remaining LTRM balance. Hagerty said the FY 2023 increased LTRM amount reflects inflation as well as long-standing staff salaries.

Hagerty reported that field stations are developing FY 2023 budgets and scopes of work, which will be presented at the November 16, 2022 quarterly meeting. In response to a question from Lauren Salvato, Hagerty said the completion dates for Illinois Waterway monitoring activities can be found in Appendix C of today's meeting packet. Jennifer Dieck added that the aerial data collection report is scheduled to be published at the end of the fiscal year. The associated report should be distributed by the end of the calendar year.

A-Team Report

Scott Gritters reported that the A-Team met on August 4, 2022. The A-Team reviewed and approved previous meeting minutes and received updates from UMRR leadership. The A-Team discussed adding recent highlights to the A-Team Corner on USGS's LTRM website as well as processes for ensuring that the A-Team has sufficient time to review future science proposals. Presentations included paddlefish diet after ice out, the design of HREPs to support species of greatest conservation need, and an overview of staff at the Lake City Field Station. As a result of the latter presentation, the A-Team agreed to continue featuring a field station during each meeting. Stephenson expressed appreciation for the field station feature. Gritters emphasized that people make the program possible. In response to a comment from Stephenson, Gritters said he will make a note to discuss turtle bycatch data at a future meeting. Gritters noted that, while bycatch data is recorded by field stations and presents a unique learning opportunity, there is a bias issue regarding species caught.

LTRM Implementation Planning

Jennie Sauer reported that the UMRR Coordinating Committee tasked the *ad hoc* LTRM implementation planning team with determining new research opportunities and priorities in light of the potential for increased funding. Through frequent meetings over the past several months, the implementation planning team has drafted objectives and identified information needs in four broad categories: floodplain ecology, hydrogeomorphic change, aquatic ecology, and restoration ecology. Descriptions of information needs include how the information will be used, measurements and endpoints, geographic extent, and research approaches to meet the need. The LTMR implementation planning team members are currently employing a review within their respective agencies regarding the draft information needs, with the deadline for input by August 25, 2022. On September 13-25, 2022, the implementation planning team will gather in-person to score and prioritize the information needs based on objectives and quality. The process will consider relevance, uncertainty, and ways to reduce the uncertainty, and costs of each information need. Sauer expressed appreciation to all participants in the LTRM implementation planning process.

In response to a question from Wallace, Sauer said crosswalks of the information needs, focal areas document, indicators report, and HNA-II report were completed to ensure known information needs were included. In response to a question from Gritters, Houser and Stephenson confirmed that a crosswalk was also done with the UMRR strategic and operational plan. In response to a comment from Fischer, Houser confirmed that the research frameworks were considered as well because the focal areas were distillation of research frameworks. Houser said the implementation planning process is operating at a scale between the focal areas, which are more specific, and the strategic plan, which is higher level. Houser said Kristen Bouska and Stephenson conducted a preliminary crosswalk of select focal areas but noted a finer scale review of the focal areas may be need with the more specific information needs.

Lauren Salvato read a question from Nick Schlesser in the online meeting chat forum regarding inflationary impacts to current program costs and how that relates to potential funding increase. Sauer said field station budget requests are anticipated in the coming weeks and will provide better perspective on FY 2023 requests. Plumley said more information from other contract actions this fall will better illustrate potential impacts to program. Houser said there is a need to anticipate out-year costs to better understand capability for new work.

In response to a question from Plumley, Sauer said that after information needs are prioritized, the team will identify approaches to address the needs. Following that, various portfolios of actions will be determined to assess and maximize return on investment of available funds. In response to a comment from Gaikowski, Sauer said the relevance to management outcomes could be a criteria for prioritization.

Navigation and Ecosystem Sustainability Program

Andrew Goodall reported that the Corps is arranging payments of $200,000 to the five states, UMRBA, USFWS, and USGS to provide financial support for their NESP consultation responsibilities per the program's authorizing legislation. UMRBA's roles and responsibilities include facilitating collaboration and strategic planning, leveraging resources, organizing programmatic communications, and planning and participating in various meeting and events. The state and federal agencies' roles and responsibilities revolve around their participation in strategic planning and communications and various programmatic activities as well as providing their technical expertise related to ecosystem restoration projects. Goodall said other items in development include a charter for the NESP consultative processes and standing up an advisory panel per NESP's authorization.

Goodall provided a status update on the two NESP projects funded through the 2022 Infrastructure Investment and Jobs Act. In September 2022, contract awards are expected for lockwall modifications on Lock 25 for the new 1,200-foot lock chamber. The Corps has conducted significant engagement with construction contractors and the navigation industry. Goodall said risk identification has begun, which involves identifying factors that could slow down the construction progress and mitigating those factors if possible. A request for proposal has been sent for completion of the project design for L&D 22 fish passage. The award is tentatively expected in the September 2022 timeframe. The final project information report was approved by the Chief of Engineers in early June 2022. Goodall reported that pre-project fish monitoring activities are beginning. USACE is working with USGS and USFWS to finish fish tagging efforts in the next few weeks. Goodall reported that the Corps continues its evaluation of NESP's NEPA compliance and reengaged USFWS regarding Endangered Species Act coordination was in June 2022. NESP project updates can be found on USACE's NESP webpage: https://www.mvr.usace.army.mil/Missions/Navigation/NESP/

In response to a question from Olivia Dorothy, Goodall said the Corps is still evaluating mitigation needs for L&D 25. Brian Johnson said locations identified in the past need to be updated. Johnson said utilizing wetland banks may be an option. Johnson added that systemic mitigation will primarily be located under the ordinary high water mark to address erosion, vegetation, and fish impacts. In response to a question from Dorothy, Goodall said he will report on whether L&D 25 requires independent external review.

Other Business

Upcoming quarterly meetings are as follows:

- **November 2022 – Quad Cities**
  - UMRBA quarterly meeting – November 15
  - **UMRR Coordinating Committee quarterly meeting – November 16**

- **February/March 2023 – Virtual**
  - UMRBA quarterly meeting – February 28
  - **UMRR Coordinating Committee quarterly meeting – March 1**

- **May 2023 – St. Paul, MN**
  - UMRBA quarterly meeting – May 23
  - **UMRR Coordinating Committee quarterly meeting – May 24**

With no further business, Jim Fischer moved, and Matt Vitello seconded a motion to adjourn the meeting. The motion carried unanimously, and the meeting adjourned at 2:08 p.m.

UMRR Coordinating Committee Virtual Attendance List
August 10, 2022

UMRR Coordinating Committee Members

Brian Chewning	U.S. Army Corps of Engineers, MVD
Sabrina Chandler	U.S. Fish and Wildlife Service, UMR Refuges
Mark Gaikowski	U.S. Geological Survey, UMESC
Chad Craycraft	Illinois Department of Natural Resources
Randy Schultz	Iowa Department of Natural Resources
Megan Moore	Minnesota Department of Natural Resources
Matt Vitello	Missouri Department of Conservation
Jim Fischer	Wisconsin Department of Natural Resources

Others In Attendance

Jim Cole	U.S. Army Corps of Engineers, MVD
Leann Riggs	U.S. Army Corps of Engineers, MVD
Angela Deen	U.S. Army Corps of Engineers, MVP
Jill Bathke	U.S. Army Corps of Engineers, MVP
Nathan Wallerstedt	U.S. Army Corps of Engineers, MVP
Kim Thomas	U.S. Army Corps of Engineers, MVR
Marshall Plumley	U.S. Army Corps of Engineers, MVR
Karen Hagerty	U.S. Army Corps of Engineers, MVR
Leo Keller	U.S. Army Corps of Engineers, MVR
Jodi Creswell	U.S. Army Corps of Engineers, MVR
Davi Michl	U.S. Army Corps of Engineers, MVR
Andrew Goodall	U.S. Army Corps of Engineers, MVR
Rachel Hawes	U.S. Army Corps of Engineers, MVR
Sam Heilig	U.S. Army Corps of Engineers, MVR
Col. Jesse Curry	U.S. Army Corps of Engineers, MVR
Greg Kohler	U.S. Army Corps of Engineers, MVS
Brian Markert	U.S. Army Corps of Engineers, MVS
Jasen Brown	U.S. Army Corps of Engineers, MVS
Kat McCain	U.S. Army Corps of Engineers, IWR
Chuck Theiling	U.S. Army Corps of Engineers, ERDC
Matt Mangan	U.S. Fish and Wildlife Service, IIFO
Kraig McPeek	U.S. Fish and Wildlife Service, UMR Refuges
Laura Muzal	U.S. Fish and Wildlife Service
Jeff Houser	U.S. Geological Survey, UMESC
Jennie Sauer	U.S. Geological Survey, UMESC
Jennifer Dieck	U.S. Geological Survey, UMESC
Kristen Bouska	U.S. Geological Survey, UMESC
Nate De Jager	U.S. Geological Survey, UMESC
Jen Hanson	U.S. Geological Survey, UMESC
Dave Glover	Illinois Department of Natural Resources
Scott Gritters	Iowa Department of Natural Resources
Kirk Hansen	Iowa Department of Natural Resources
Nick Schlesser	Minnesota Department of Natural Resources
Olivia Dorothy	American Rivers
Kim Lutz	America’s Watershed Initiative
Lindsay Brice	Audubon
Travis Black	Maritime Administration
Rick Stoff	Stoff Communications
Brian Stenquist	Meeting Challenges

Andrew Casper	Illinois Natural History Survey
Paul Dierking	HDR Engineering, Inc.
Doug Daigle	Lower Mississippi River Sub-basin Committee
Kirsten Wallace	Upper Mississippi River Basin Association
Andrew Stephenson	Upper Mississippi River Basin Association
Mark Ellis	Upper Mississippi River Basin Association
Lauren Salvato	Upper Mississippi River Basin Association
Natalie Lenzen	Upper Mississippi River Basin Association
Erin Spry	Upper Mississippi River Basin Association

ATTACHMENT B

Regional Management and Partnership Collaboration

- **UMRR Quarterly Budget Reports (10/31/2022)** *(B-1 to B-3)*

UMRR Quarterly Budget Report: St. Paul District

FY2022 Q4; Report Date: Tue Oct 11 2022

Habitat Projects

Project Name	Cost Estimates			FY2022 Financials			
	Non-Federal	Federal	Total	Carry In	Allocation	Funds Available	Actual Obligations
Bass Ponds, rsh, and tlande	-	$6,300,000	$6,300,000	-	$275,000	$275,000	$606,899
Conway Lake 4	-	$7, 13,000	$7, 13,000	-	$200,000	$200,000	-$3 6,925
Harpers Sloug		$13,675,000	$13,675,000	-	$2, 00,000	$2, 00,000	-$27,959
Lower Pool 10 4 Island and Backwater Complex	-	$17,000,000	$17,000,000	$93,793	$350,000	$ 3,793	$153,197
Lower Pool , Big Lake 4	-	-	-	-	$10,0004	$10,000	$ 28,2 1
Gregor Lake	-	$23,550,000	$23,550,000	-	$3,118,000	$3,118,000	$,200,615
Reno Bottoms	-	$10,000,000	$10,000,000	$52,323	$365,000	$ 17,323	$ 05,685 4
Total	-	$77,938,000	$77,938,000	$1 6,116	$6,718,000	$6,86 ,116	$5, 19,753

Habitat Rehabilitation

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
District Program nagement 4	-	-	-	$623,927
Total	-	-	-	$623,9274

Regional Program Administration

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Habitat Eval/Monitoring 4	-	-	-	$275,858
Total	-	-	-	$275,8584

	Carry In	Allocation	Funds Available	Actual Obligations
St. Paul Total	$1 6,116	$6,718,000	$6,86 ,116 4	$6,319,538 4

UMRR Quarterly Budget Report: Rock Island District

FY2022 Q4; Report Date: Tue Oct 11 2022

Habitat Projects

Project Name	Cost Estimates			FY2022 Financials			
	Non-Federal	Federal	Total	Carry In	Allocation	Funds Available	Actual Obligations
Beaver Island	-	$25,288,000	$ t 25,288,000	-	$1,038,000t	$ t 1,038,000	$200,139
Green Island, IA	- t	$16,600,000	$ 16,600,000	$ 12	$ 500,000	$ 500,012	t $604,023
Huron Island	-	$15,773,000	$ 15,773,000	-	$160,000	$ 160,000	t $92,189
Kei hsburg t Division	-	$29,643,000	$ 29,643,000	$ 19,488	$ t 3,829,000	$ 3,848,488	t $897,791
Lower Pool 13	-	$25,288,000	$ t 25,288,000	$ t 1,039	$ t 600,000	$ t 601,039	t $644,707
Lower Pool 13 Phase II	-	-	-	-	$50,000	$ 50,000	$10,637
Pool 12 (Fores ry)	-	-	-	$88,200	$ t 500,000	$ t 588,200	t $453,061
Pool 12 t Overwin ering t	-	$20,870,822	$ t 20,870,822	t-	-	-	-$2,602
Quincy Bay, IL t	-	-	-	$2,947	$ 500,000	$ 502,947	$489,117
Rice Lake, IL t	$7,280,000	$ 13,459,763	$ t 20,739,763	$ t 118,025	-	$118,025	t $5,520
S eamboat Island	-	$41,977,000	$ t 41,977,000	-	$325,000t	$ 325,000	$3,591,356
Total	$7,280,000	$ 188,899,585	$ 196,179,585	$ t 229,711	$ t 7,502,000	$ t 7,731,711	$6,985,938

Habitat Rehabilitation

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Dis ric Program Management	-	-	-	$480,037
Total	-	-	-	$480,037

Regional Program Administration

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Adap ive Management	-	$200,000	$ t 200,000	$88,145
Habi a Eval/Moni oring $ t	96	$ 1,125,000	$ 1,125,096	t $323,314
Model Cer ifica ion/Regional HREP - t		$100,000	$ 100,000	$15,421
Public Ou reach -		$50,000	$ 50,000	$28,919
Regional Program Management	-	$1,400,000	$ 1,400,000	$1,028,907
Regional Projec Sequencing - t		$125,000	$ 125,000	$57,419
Total	$96	$ t 3,000,000	$ t 3,000,096	$1,542,125

Regional Science and Monitoring

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Long Term Resource Moni oring	-	$5,000,000	$ t 5,000,000	$6,603,799 t
Science in Suppor of Res ora ion/Management	-	$3,800,000	$ 3,800,000	$3,728,464
Total	-	$8,800,000	$ t 8,800,000	$10,332,263

	Carry In	Allocation	Funds Available	Actual Obligations
Rock Island Total	$229,807	$ t 19,302,000	$ t 19,531,807	$ t 19,340,363 t

UMRR Quarterly Budget Report: St. Louis District

FY2022 Q4; Report Date: Tue Oct 11 2022

Habitat Projects

Project Name	Cost Estimates			FY2022 Financials			
	Non-Federal	Federal	Total	Carry In	Allocation	Funds Available	Actual Obligations
Clarence t Cannon	-	$29,800,000	$ t 29,800,000	- t	$750,000	$ 750,000	$244,967
Crains Island	-	$36,562,000	$ 36,562,000	$ 28,498	$ t 1,900,000	$ 1,928,498	t $375,767
Harlow Island	-	$37,971,000	$ 37,971,000	-	$325,000	$ 325,000	$24,458
Oakwood Bo oms	-	$29,000,000	$ t 29,000,000	-	$675,000t	$ t 675,000	$1,098,386
Piasa - Eagle's t Nes Islands	-	$26,746,000	$ t 26,746,000	-	$2,575,000t	$ 2,575,000	$3,524,831
Wes Al on Missouri t Islands	-	-	-	-	$450,000	$ 450,000	t $329,954
Yorkinut Slough, IL t	-	$8,500,000	$ t 8,500,000	$ t 9,343	$ t 425,000	$ t 434,343	t $569,198
Total	-	$168,579,000	$ 168,579,000	$ t 37,841	$ t 7,150,000	$ t 7,187,841	$6,167,561

Habitat Rehabilitation

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Dis ric Program Management	-	-	-	$709,457
Total	-	-	-	$709,457

Regional Program Administration

Subcategory	FY2022 Financials			
	Carry In	Allocation	Funds Available	Obligations
Habi a Eval/Moni oring t	-	-	-	$390,481
Total	-	-	-	$390,481

	Carry In	Allocation	Funds Available	Actual Obligations
St. Louis Total	$37,841	$ t 7,150,000	$ t 7,187,841	t $7,267,499

ATTACHMENT C

UMRR Fisheries Flyer 2022

(C-1 to C-2)

Upper Mississippi River Restoration
Leading · Innovating · Partnering

Upper Mississippi and Illinois Rivers Experience Widespread and Regional Changes in Fish Communities

Photo courtesy of Jason DeBoer

25 Years of Monitoring and Research Show the Fish Community Remains Resilient but Faces New and Ongoing Stressors

Fish in the Upper Mississippi and Illinois Rivers

The fish community remains diverse and functional despite impacts from human modifications and ecological changes. The river is home to at least 143 fish species and continues to support valuable recreational and commercial fisheries.

This community is changing for a variety of reasons including altered hydrology, habitat loss and degradation, and invasive species. These changes vary across the river ecosystem.

To date, the fish community remains resilient to many stressors, but in many parts of the river there remains a need to rehabilitate aquatic areas to ensure healthy habitats exist for the fish community.

UMRR is a unique, collaborative, science-based restoration program that uses state-of-the-art research and monitoring to understand changing environmental conditions of the river. By collecting and evaluating data over decades, scientists can assess the health of the river and target habitat restoration projects for the greatest benefit of the river and the public.

Challenges to a Healthy Fish Community

The Upper Mississippi and Illinois Rivers constitute a large and diverse river system with many regional differences. However, throughout the system, there is now more water in the river more of the time with high flows lasting longer and occurring more frequently.

Increased frequency, duration, and magnitude of flooding events may reduce the abundance of aquatic plants necessary to support the native fish community.

In other areas of the river, invasive bigheaded carps [silver carp and bighead carp] are having a large and negative impact on fish communities.

How Do Invasive Carp Impact the System?

Increases in invasive carp have caused the following trends:

- **Declines of native filter feeding species, such as bigmouth buffalo**
- **Declines of economically, recreationally, and socially important fish, such as largemouth bass and bluegill**
- **Declines in forage fish and overall native fish communities**
- **Increased competition for plankton resources**

Upper Mississippi River Restoration
Leading · Innovating · Partnering

Upper Mississippi and Illinois Rivers Experience

Widespread and Regional Changes in Fish Communities

This is a summary of the long-term trends in fish populations observed from 25 years of monitoring as reported in the Ecological Status and Trends of the Upper Mississippi and Illinois Rivers.

LTRM monitoring stations

Dark blue indicates long-term study areas within each floodplain reach

NATIVE FISH populations have increased in some pools with improved water clarity and more aquatic vegetation.

RECREATIONAL FISH have increased in some pools despite changes in fishing methods and technology as well as species targeted by anglers.

INVASIVE BIGHEADED CARPS now dominate the fish community in the lower reaches of the river system leading to declines in native fish.

FORAGE FISH are declining throughout much of the river network. They serve as an important food source for larger fishes and other animals and play an intermediate role in the food web eating plankton, invertebrates, and plants.

Top photo courtesy of Nick Schlesser, other photos courtesy of University of Illinois, Prairie Research Institute, Illinois Natural History Survey

Take a Closer Look at the Data

	INDICATOR	UPPER MISSISSIPPI RIVER					ILLINOIS RIVER
		Upper Impounded			Lower Impounded	Unimpounded	
		Pool 4	Pool 8	Pool 13	Pool 26	Open River	La Grange
FISHERIES	Lentic Fishes	▲	▲	■	■	▲	▼
	Nonnative Fishes (excluding common carp)	■	■	■	▲	■	▲
	Forage Fishes	▼	■	■	▼	▼	▼
	Recreational Valued Native Fishes	■	▲	▲	▼	■	▼
	Commercially Valued Fishes						
	Native	■	▲	▲	■	■	▼
	Nonnative	▼	▼	▼	▼	▼	▼

▲ Significant Long-Term Increase ▼ Significant Long-Term Decrease ■ No Trend

ATTACHMENT D

Program Reports

- **FY22 Milestones (8/30/2022)** *(D-1 to D-13)*
- **UMRR Science Support FY14 & FY15 (November 2022)** *(D-14)*
- **UMRR LTRM Draft Information Needs (10/24/2022)** *(D-15 to D-36)*
- **UMRR LTRM Implementation Planning Criteria (10/28/2022)** *(D-37 to D-40)*

Tracking number	Milestone	Original Target Date	Modified Target Date	Date Completed	Comments	Lead
Aquatic Vegetation Component						
2022A1	Complete data entry and QA/QC of 2021 data; 1250 observations.					
	a. Data entry completed and submission of data to USGS	30-Nov-2021		30-Nov-2021		Lund, Carhart, Fopma
	b. Data loaded on level 2 browsers	15-Dec-2021		15-Dec-2021		Schlifer
	c. QA/QC scripts run and data corrections sent to Field Stations	28-Dec-2021		28-Dec-2021		Sauer, Schlifer
	d. Field Station QA/QC with corrections to USGS	15-Jan-2022		15-Jan-2022		Lund, Carhart, Fopma
	e. Corrections made and data moved to public Web Browser	30-Jan-2022		30-Jan-2022		Larson, Schlifer, Caucutt
2022A2	Web-based: Creating surface distribution maps for aquatic plant species in Pools 4, 8, and 13; 2021 data	31-Jul-2022		28-Feb-22	https://umesc.usgs.gov/data_library/vegetation/graphical/veg_front.html	Larson, Schlifer
2022A3	Wisconsin DNR annual summary report 2021 that combines current year observations from LTRM with previous years' data, for the fish, aquatic vegetation, and water quality components.	30-Sep-2022		16-Sep-22		Bartels, Hoff, Kalas, Carhart
2022A4	Complete aquatic vegetation sampling for Pools 4, 8, and 13 (Table 1)	31-Aug-2022		31-Aug-2022		Lund, Carhart, Fopma
2022A5	Pool 4: Graphical summary and maps of aquatic vegetation current status and long-term trends.	30-Dec-2022		7-Oct-2022		Lund
2022A6	Pool 8: Graphical summary and maps of aquatic vegetation current status and long-term trends.	30-Dec-2022		16-Sep-2022		Carhart
2022A6	Pool 13: Graphical summary and maps of aquatic vegetation current status and long-term trends.	30-Dec-2022		23-Sep-2022		Fopma
Intended for distribution						
Manuscript: Estimated annual summer submersed aquatic macrophyte standing stocks (1998 - 2018) in three large reaches of the Upper Mississippi River. (2020A8; accepted by Journal of Fish and Wildlife Management, IP-122160)						
Fisheries Component						
2022B1	Complete data entry, QA/QC of 2021 fish data; ~1,590 observations					
	a. Data entry completed and submission of data to USGS	31-Jan-2022		31-Jan-2022		DeLain, Dawald, Bartels, Hine, Kueter, Gittinger, West, Solomon, Maxson
	b. Data loaded on level 2 browsers; QA/QC scripts run and data corrections sent to Field Stations	15-Feb-2022		15-Feb-2022		Ickes, Schlifer
	c. Field Station QA/QC with corrections to USGS	15-Mar-2022		15-Mar-2022		DeLain, Dawald, Bartels, Kueter, Hine, Gittinger, West, Solomon, Maxson
	d. Corrections made and data moved to public Web Browser	30-Mar-2022		30-Mar-2022		Ickes and Schlifer

Tracking number	Milestone	Original Target Date	Modified Target Date	Date Completed	Comments	Lead
2022B2	Update Graphical Browser with 2021 data on Public Web Server.	31-May-2022		31-May-2022		Ickes and Schlifer
2022B3	Complete fisheries sampling for Pools 4, 8, 13, 26, the Open River Reach, and La Grange Pool (Table 1)	31-Oct-2022				DeLain, Dawald, Bartels, Kueter, Hine, Gittinger, West, Solomon, Maxson
2022B4	IDNR Fisheries Management State Report: Fisheries Monitoring in Pool 13, Upper Mississippi River, 2020-2021. Includes Pool 12 Overwintering HREP Adaptive Management Fisheries Response	30-Jun-2022		30-Jun-2022		Kueter
2022B5	Sample collection, database increment on Asian carp age and growth: collection of cleithral bones	31-Jan-2022		31-Jan-2022		Solomon, Maxson
2022B8(D)	Database increment: Stratified random day electrofishing samples collected in Pools 9–11	30-Sep-2022		30-Sep-2022		Kueter
2022B9(D)	Database increment: Stratified random day electrofishing samples collected in Pools 16–18	30-Sep-2022		30-Sep-2022		Kueter
Intended for distribution						
LTRM Completion report, compilation of 3 years of sampling: Fisheries (2009R1Fish; Chick et al.) (Completed; https://umesc.usgs.gov/data_library/fisheries/historical_documents.html) page)						
Manuscript: A synthesis on river floodplain connectivity and lateral fish passage in the Upper Mississippi River (B. Ickes, 2021B11; Submitted to USGS review; IP-123678)						
LTRM Fact Sheet: Tree map tool for visualizing fish data, with example of native versus non-native fish biomass (2013B16) (Programming code for TreeMap being re-written; once completed Fact Sheet will be completed)						
Water Quality Component						
2022D1	Complete calendar year 2021 fixed-site and SRS water quality sampling	31-Dec-2021		31-Dec-2021		Jankowski, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
2022D2	Complete laboratory sample analysis of 2021 fixed site and SRS data; Laboratory data loaded to Oracle data base.	15-Mar-2022		15-Mar-2022		Yuan, Schlifer
2022D3	1st Quarter of laboratory sample analysis (~12,600)	30-Dec-2021		30-Dec-2021		Yuan, Manier, Burdis, Kalas, Johnson, L. Gittinger, Cook, Sobotka
2022D4	2nd Quarter of laboratory sample analysis (~12,600)	30-Mar-2022		30-Mar-2022		Yuan, Manier, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
2022D5	3rd Quarter of laboratory sample analysis (~12,600)	29-Jun-2022		29-Jun-2022		Yuan, Manier, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
2022D6	4th Quarter of laboratory sample analysis (~12,600)	28-Sep-2022		28-Sep-2022		Yuan, Manier, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
2022D7	Complete QA/QC of calendar year 2021 fixed-site and SRS data.					

Tracking number	Milestone	Original Target Date	Modified Target Date	Date Completed	Comments	Lead
	a. Data loaded on level 2 browsers; QA/QC scripts run; SAS QA/QC programs updated and sent to Field Stations with data.	30-Mar-2022		30-Mar-2022		Schlifer, Jankowski
	b. Field Station QA/QC; USGS QA/QC.	15-Apr-2022		15-Apr-2022		Jankowski, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
	c. Corrections made and data moved to public Web Browser	30-Apr-2022		30-Apr-2022		Schlifer, Jankowski
2022D8	Complete FY2020 fixed site and SRS sampling for Pools 4, 8, 13, 26, Open River Reach, and La Grange Pool	30-Sep-2022		30-Sep-2022		Jankowski, Burdis, Kalas, Johnson, L. Gittinger, Kellerhals, Sobotka
2022D9	WEB-based annual Water Quality Component Update w/2021 data on Server.	30-May-2022		30-May-2022		Schlifer, Jankowski
2022D10	Operational Support to the UMRR LTRM Element. Serve as in-house Field Station for USGS for consultation and support on various LTRM-wide topics	30-Sep-2022		30-Sep-2022		Kalas, Hoff, Bartel, Carhart
On-Going						
2019D12	Draft LTRM Completion Report: Assessment of Phytoplankton Samples collected by the Upper Mississippi River Restoration Program-Long Term Resource Monitoring Water Quality Component	30-Dec-2019	30-Jul-2023		Lead (Fulgoni) took new position	Jankowski
2020D12	Final LTRM Completion Report: Assessment of Phytoplankton Samples collected by the Upper Mississippi River Restoration Program-Long Term Resource Monitoring Water Quality Component	30-Mar-2021	30-Dec-2022			Jankowski
Intended for distribution						
Memo, compilation of 3 years of sampling: Water Quality (2009R1WQ; Giblin, Burdis) (ready to be posted on LTRM WQ page)						
Spatial Data Component						
2022SD1	Orthorectification of scanned photos (Rock Island District - Mississippi River)	30-Sep-2022		30-Sep-2022	In USGS review	Strange
2022SD2	Flight Plan Content/Data Pack	31-Dec-2021		31-Dec-2021		Finley
2022SD3	Fact Sheet or website text on UAS Rapid Response Imaging	30-Jun-2022		30-Jun-2022		Finley
2022SD4	Aerial Thermal Application Completion Report	30-Sep-2022		30-Sep-2022	Complete as an informational report	Finley
2022SD5	Spatial Point Repository Tool of UMRS	30-Sep-2022		30-Sep-2022	Complete as informational report. Points to be secured in-house and released as requested	Finley
2022SD7	Pattern of Wild Rice Colonization and Retreat Dataset	30-Sep-2022		30-Sep-2022	Draft report to be complete 31-Dec-2022	Finley
2022SD8	Maintenance ArcGIS server	30-Sep-2022		30-Sep-2022		Fox, Rohweder

Tracking number	Milestone	Original Target Date	Modified Target Date	Date Completed	Comments	Lead
2022SD9	3D Digital Environment from Aerial Imagery using Structure from Motion Workflow Documentation (Job aid)	31-Mar-2022		31-Mar-2022		Finley
2022LD10	Active Remote Sensing Capability Addition to Crewed Aerial Survey Assets 2022	30-Jun-2022		30-Jun-2022		Finley
2022SD11	Draft Report: Report to Congress Sections	30-Sep-2022		30-Sep-2022		De Jager
2022SD12	Data Set: Land Cover Change in the UMRS Key Pools 1989-2020	30-Sep-2022		30-Sep-2022		De Jager
2022SD13	Final 3D Vegetation Mapping Solution SOP (draft 2021SD2)	31-Mar-2022	31-Aug-2022	30-Sep-2022	Project complete, ARCGIS Pro will support current extension for 3D mapping.	Finley
2022SD14	Survey Capability and Historic Spatial Database for LCU Mapping in-house report (draft 2021D6)	31-Mar-2022		31-Mar-2022		Finley
On-Going						
2021SD7	Topobathy strategic plan	30-Sep-2022		27-May-2022		Strange, De Jager
2021SD10	Draft Report: Evaluating effects of alternative flooding scenarios on forest succession and landcover in the UMRS.	30-Sep-2021	30-Mar-2023		Changing to a manuscript	De Jager
Data Management						
2022M1	Update vegetation, fisheries, and water quality component field data entry and correction applications.	30-May-2022		30-May-2022		Schlifer
2022M2	Load 2021 component sampling data into Database tables and make data available on Level 2 browsers for field stations to QA/QC.	30-Jun-2022		30-Jun-2022		Schlifer
2022M3	Assist LTRM Staff with development and review of metadata and databases in conjunction with publishing of reports and manuscripts	On-going				Schlifer
Status and Trends 3rd edition						
2022ST4	Reconcile edits and review galley proofs	30-May-2022		4-May-2022		Authors, Sauer, Houser
2021ST4	Publish Status and Trends	15-Jun-2022		21-Jun-2022		Authors, Sauer, Houser
2020ST4	Draft S&T3 Fact Sheet; based on publishing report	31-Dec-2022				Authors, Sauer, Houser
Equipment Inventory						
2021ER1	Property inventory and tracking	15-Nov-2022		30-Aug-2022		LTRM staff as needed

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
Developing and Applying Indicators of Ecosystem Resilience to the UMRS						
2022R1	Updates provided at quarterly UMRR CC meeting and	Various				Bouska, Houser
2022R2	Submit manuscript that investigates associations between general and specified resilience for peer review publication	30-Sep-2022	30-Sep-2023		The order of manuscripts has changed with the recent Env. Mgmt publication coming before the synthesis manuscript & associated fact sheet; author decided to change the methods behind 2022R2 and has taken a lead role and prioritized the implementation planning effort over manuscript writing	Bouska
On-Going						
2021R3	Submit resilience assessment synthesis manuscript for peer review publication	30-Mar-2021	30-Sep-2023			Bouska
2021R4	Submit resilience assessment synthesis fact sheet for	30-Sep-2021	30-Sep-2023			Bouska
2021R5	Submit manuscript that investigates associations between general and specified resilience for peer review publication	30-Sep-2021	31-Dec-2021	31-Dec-2021	Changed from manuscript that investigates associations between general and specified resilience in FY21	Bouska
Landscape Pattern Research and Application						
2022LP1	Data Analysis: 2020 Land Cover Change					Rohweder and De Jager
2022LP2	Data Analysis: Reed canary grass habitat suitability modeling using forestry data, flood inundation metrics, and landscape patterns.	30-Sep-2022		30-Sep-2022		Delaney and Rohweder
2022LP3	Draft Report: Reed canary grass habitat suitability modeling using forestry data, flood inundation metrics, and landscape patterns.	30-Sep-2022		30-Sep-2022		Delaney, De Jager, Van Appledorn, Bouska, Rohweder
On-Going						
2021LP4	Data Development: Developing seasonal aquatic areas maps to support aquatic habitat mapping and	30-Sep-2021	On-going		Change to priority contiguous forset areas	Rohweder
2021LP1	Geospatial analyses in support of the Forest Gap project	30-Aug-2021	30-Sep-2022		Field work for analysis delayed due to Covid-19	Rohweder
Manuscript: Review of Landscape Ecology on the UMR; De Jager; 2016L3						
Eco-hydrologic Research						
2022EH1	Spatial analyses of backwater sedimentation patterns through time to support vulnerability	30-Sep-2022		30-Sep-2022		Van Appledorn, Rohweder, DeJager

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
2022EH2	Characterization of hydrologic/flooding regimes of non-forested areas to support eco-hydrologic modeling efforts	30-Sep-2022	30-Jun-23			Van Appledorn
On-Going						
2020EH02	Submit manuscript of temporal patterns in UMRS inundation regimes for peer review	30-Sep-2021	30-Jun-23		Delayed due to ST3 priority switch	Van Appledorn, De Jager, Rohweder
2021EH01	Draft manuscript of temporal and spatial trends of large wood in the UMRS and potential eco-hydrologic drivers	30-Sep-2021	30-Jun-23			Van Appledorn, Jankowski
2021EH02	Draft manuscript of UMRS floodplain forest classification	30-Sep-2021	30-Jun-23			Van Appledorn, De Jager
Development of UMRS inundation model query tool; Van Appledorn, Fox, Rohweder, De Jager; 2019EH03						
Manuscript: Van Appledorn, M., De Jager, N.R. Considerations for improving floodplain research and management by integrating inundation modeling, ecosystem studies, and ecosystem						
Intended for distribution						
Manuscript: Modeling and mapping inundation regimes for ecological and management applications: a case study of the Upper Mississippi River floodplain, USA; Van Appledorn, De Jager, Rohweder Research and Applications, Early View On-Line Special Edition. http://dx.doi.org/10.1002/rra.3628 Location of supporting data: https://doi.org/10.5066/F7VD6XRT)						
Acquisition and Interpretation of Imagery for Production of 2020 UMRS Land Cover/Land Use Data and Pool-Based Orthomosaics						
2020LCU3	Image processing, stereo model development, orthorectification, pool-based mosaicking, image interpretation, automation, QA/QC, and serving of 2020 LCU datasets for remaining 50% of Open River South, the Alton Pool of the Illinois River, and Pools 9-12	1-Sep-2022		30-Sep-22	In USGS review (Pool 11 Moved to FY23; Areas complete posted at https://www.sciencebase.gov/catalog/item/6102cbf7d34ef8d7055e7971	Dieck, Strassman
Aquatic Vegetation, Fisheries, and Water Quality Research						
Intended for Distribution						
Manuscript: Evidence of functionally defined non-random fish community responses over 25 years in a large river system (Ickes; 2019B13 replacing 2015B17 and 2016B17; (Not accepted at						
Manuscript: The ecology of ice across the river continuum (New tracking number 2021RC1) Sharma, S., Meyer, M.F., Culpepper, J., Yang, X., Hampton, S., Berger, S.A., Brousil, M.R., Fradkin, S.C., Higgins, S.N., Jankowski, K.J., Kirillin, G., Smits, A.P., Whitaker, E.C., Yousef, F., Zhang, S. 2020. Integrating Perspectives to Understand Lake Ice Dynamics in a Changing World. Journal of Geophysical Research: Biogeosciences. 125: e2020JG005799.						
Manuscript: Warmer winters increase phytoplankton biomass in a large floodplain river. Jankowski, K. J., J. N.Houser, M. D. Scheuerell, and A. P. Smits. 2021. Warmer winters increase the biomass of phytoplankton in a large floodplain river. Journal of Geophysical Research: Biogeosciences. Volume 126, Issue 9. https://doi.org/10.1029/2020JG006135. Data available at: https://umesc.usgs.gov/data_library/water_quality/water_quality_page.html						
Statistical Evaluation						
Intended for distribution						
Manuscript: Inferring decreases in among- backwater heterogeneity in large rivers using among-backwater variation in limnological variables (2010E1; IP-027392; Gray; in journal						
Manuscript: Model selection for ecological community data using tree shrinkage priors; Gray, Hefley, Zhang, Bouska; (2017FA2; IP-111931; in revision with Ecological Applications)						

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
Manuscript: Probabilities of detecting submersed aquatic vegetation species using a rake method may vary with biomass; 2020E1; Completed; Aquatic Botany, 171:103375, https://doi.org/10.1016/j.aquabot.2021.103375						
Pool 12 Overwintering HREP Adaptive Management Fisheries Response Monitoring						
2022P13d	Age determination of bluegills	1-Feb-2022		1-Feb-2022		Kueter
2022P13e	In-house project databases updated	31-Mar-2022		31-Mar-2022		Kueter
Pool 4 - Peterson Lake HREP Water Quality Monitoring – Pre and Post-Adaptive Management Evaluation						
2022PL1	Summary letter: Describing 2022 monitoring and future work	Dec. 2022				Burdis, Lund
Science Meeting						
2022N1	UMRR Science Coordination Meeting	Feb. 8-11		Feb. 8-11		All
FY18 Funded Science in Support of Restoration and Management Proposals						
Conceptual Model and Hierarchical Classification of Hydrogeomorphic Settings in the UMRS						
2019CM4	GIS data base and query tool	31-Dec-2019	On-going		Prototype developed	Fitzpatrick, Hendrickson, Sawyer, Strange
2019CM5	Submit draft LTRM Completion report on hydrogeomorphic conceptual model and hierarchical	31-Dec-2019	30-Aug-2022	30-Aug-2022		Fitzpatrick, Hendrickson, Sawyer, Strange
2019CM6	Submit Final LTRM Completion report on hydrogeomorphic conceptual model and hierarchical	30-Jun-2020	30-Dec-2022			Fitzpatrick, Hendrickson, Sawyer, Strange
Water Exchange Rates and Change in UMRS Channels and Backwaters, 1980 to Present						
2019WE3	Submit draft LTRM Completion Report	30-Sep-2019	30-Jun-2022	28-Sep-2022		Hendrickson
2019WE4	Submit Final LTRM Completion Report	30-Mar-2020	30-Dec-2023			Hendrickson
Intrinsic and extrinsic regulation of water clarity over a 950-km longitudinal gradient of the UMRS						
2019IE3	Submit Draft manuscript	30-Mar-2020	30-Mar-23		PIs determined that to move forward biomass information is needed. Will continue work once biomass model complete. Original Lead author (Drake) resigned from WDNR.	Carhart and others
Systemic analysis of hydrogeomorphic influences on native freshwater mussels						
2019FM7	Complete statistical analyses and prepare geospatial	30-Sep-2021	30-Sep-2022			Teresa Newton, Jason Rohweder
2019FM8	Draft LTRM completion report	30-Sep-2021	30-Sep-2022			Teresa Newton
2019FM9	Final LTRM completion report	30-Jan-2023				Teresa Newton
Using dendrochronology to understand historical forest growth, stand development, and gap dynamics						
2022DD1	Draft manuscript: Floodplain forest structure and the recent decline of Carya illinoinensis (Wangenh.) K. Koch (northern pecan); Part 2	30-May-2022	TBD			Harley

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
Forest canopy gap dynamics: quantifying forest gaps and understanding gap – level forest regeneration						
Manuscript: Forest canopy gap dynamics: quantifying forest gaps and understanding gap - level forest regeneration in Upper Mississippi River floodplain forests (2019FG5, MEIER et al.); Gap data found at: https://www.sciencebase.gov/catalog/item/5f3299a682cee144fb30dd02						
Investigating vital rate drivers of UMRS fishes to support management and restoration						
2019VR8	Data set complete (data delivered to Ben Schlifer, physical structures delivered to BRWFS)	30-Sep-2021	30-Aug-22	Pandemic has slowed progress on many aspects of age and growth. Ageing complete, working to apply that to raw LTRM catch data in a standard and consistent way. We will have mean length at ages, catch curves, and growth curves for all species		Quinton Phelps
On-Going						
2019VR10	Submit draft manuscript (Drivers of vital rates)	31-Dec-2021	30-Sep-23			Quinton Phelps, Kristen
2019VR11	Submit draft manuscript (Microchemistry)	31-Dec-2021	31-Dec-22	Delayed by having to make several repairs to mass spectrometer; instrument down-time slowed our progress. In June completed analysis of otolith samples from all LTRM fish to be used in the project. The remaining steps data analysis and writing.		Greg Whitledge
Intended for distribution						
Manuscript: vital rates of Channel Catfish, led by Colby Gainer (MS student) in review with the North American Journal of Fisheries Management; 2019VR9						
FY19 Funded Science in Support of Restoration and Management						
Development of a standardized monitoring program for vegetation and fish response to Environmental Pool Management practices in the Upper Mississippi River System						
2019epm3/4	Thesis by Courtney Weldon (formerly LTRM Completion Report)	30-Jun-2021	30-Jun-22	30-Jun-22	Courtney successfully defended her thesis, and it will be deposited with the UIUC library and ACES (Department of Agriculture and Consumer Economics) library	Weldon, Chick, and Richter
Combining genetics, otolith microchemistry, and vital rate estimation to inform restoration and management of fish populations in the UMRS						
Intended for distribution						
Manuscript documenting the findings from genetic analyses of the six regional species has been accepted to the journal Molecular Ecology; Dr. Yue Shi						
Reforesting UMRS forest canopy openings occupied by invasive species						
2019ref3	Draft LTRM Completion	30-Apr-2021	30-Dec-22			Guyon and Cosgriff
2019ref4	Final LTRM Completion	30-Sep-2021	30-Jun-23			Guyon and Cosgriff

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
A year of zooplankton community data from the habitats and pools of the UMR						
2019zoo2	Draft LTRM Completion report on utility of zooplankton community monitoring for HREP assessment	30-Dec-2020	22-Dec-2022		Sample collection delayed because of Covid-19 state protocols; zooplankton ID delayed; Fulgoni took new position	Sobotka
2019zoo3	Final LTRM Completion report on utility of zooplankton community monitoring for HREP assessment	30-Jun-2021	30-Jun-2023			Sobotka
2019zoo4	Draft LTRM Completion report on detailing differences between pools and habitats. Report will also investigate the potential investigate the potential impacts of Invasive carp on the zooplankton community.	30-Dec-2020	22-Dec-2022			Sobotka
2019zoo5	Final LTRM Completion report on detailing differences between pools and habitats. Report will also investigate the potential investigate the potential impacts of Invasive carp on the zooplankton community.	30-Jun-2021	30-Jun-2023			Sobotka
FY19 Funded Illinois Waterway 2020 Lock Closure						
Pre- and Post-Maintenance Aerial Imagery for Illinois River's Alton through Brandon Lock and Dams, 2019-2021.						
2022IWW	Complete the imagery review and reporting	30-Aug-2022		30-Aug-2022	Imagery and report in USGS	Strassman
Fish Community Response to the 2020 Illinois Waterway Lock Closure						
2022FSH1	Draft Manuscript: Fisheries and WQ	31-Dec-22				Lamer
FY20 Funded Science in Support of Restoration and Management						
Mapping Potential Sensitivity to Hydrogeomorphic Change in the UMRS Riverscape and Development of Supporting GIS Database and Query Tool						
2021HG5	Complete annual project summary	31-Dec-2021	30-Mar-2022			Strange, Fitzpatrick
2021HG6	Submit draft LTRM Completion report on hydrogeomorphic change GIS database and query system	31-Dec-2021	30-Sep-2022			Vaughan, Strange, Fitzpatrick, Van Appledorn, USACE core team
2021HG7	Submit Final LTRM Completion report on hydrogeomorphic change GIS database and query tool.	30-Mar-2022	31-Dec-2022			Vaughan, Strange, Fitzpatrick, Van Appledorn, USACE core team
Improving our understanding of historic, contemporary, and future UMRS hydrology by improving workflows, reducing redundancies, and setting a blueprint for modelling						
2021HH1	Historic and Contemporary Hydrologic Database Release and Documentation	30-Sep-2021	31-Jul-2023		Delayed due to issues of data acquisition from USACE; expected submission of data and metadata to USGS Fundamental Science Practices 31-Dec-2022	M. Van Appledorn, L. Sawyer

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
2021HH2	Draft LTRM Completion Report: document database and documentation development steps, database capabilities, and quantitative summaries of the hydrologic regime through time	30-Dec-2021	31-Jul-2023	Dependent on data acquisition from USACE		M. Van Appledorn, L. Sawyer
2021HH3	Final LTRM Completion Report: document database and documentation development steps, database capabilities, and quantitative summaries of the	31-Mar-2022	30-Sep-2023			M. Van Appledorn, L. Sawyer
2021HH4	Developing Future Hydrologic Scenarios Workshop: topics include identify appropriate future climate and/or land-use scenarios for use in a UMRS watershed model, existing hydrologic modeling resources and capabilities, and logistics for completing a climate-changed hydrologic modeling	30-Dec-2021		27-Jan-2022		M. Van Appledorn, L. Sawyer
2021HH5	Draft LTRM Completion Report (Scenarios): This report will serve as the blueprint for modeling future hydrology to be undertaken with future funding opportunities.	31-Mar-2022	31-Aug-2022	11-Aug-2022		M. Van Appledorn, L. Sawyer
2021HH6	Final LTRM Completion Report (Scenarios): This report will serve as the blueprint for modeling future hydrology to be undertaken with future funding	30-Jun-2022	30-Mar-2023			M. Van Appledorn, L. Sawyer
Understanding physical and ecological differences among side channels of the Upper Mississippi River System						
2021SC3	Draft Manuscript on side channel classification scheme submitted for peer review	30-Sep-2022		22-Sep-2022		Sobotka, Strange, Bouska, McCain, Theel
2021SC4	Final report on UMRR management implications submitted for USGS review	30-Sep-2022		30-Mar-2023	Delayed with McCain moving to new position	Sobotka & McCain
2021SC5	Manuscript on benthic invertebrate associations with side channel characteristics submitted for USGS and peer review	30-May-2023				Sobotka & Vander Vorste
Refining our Upper Mississippi River's ecosystem states framework						
2021SS8	TDA Mapper, regime shifts	1-May-2022		1-May-2022		Bungula, student, Larson
2021SS9	Draft the STM, share with stakeholders	1-Sep-2022		30-Sep-2022		Larson
2021SS10	Technical report, vulnerability assessment tool, and	1-Sep-2022		30-Sep-2022		All

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
Augmenting the UMRR fish vital rates project with greater species representation for genetics and otolith microchemistry						
2021VR3	Submit draft manuscript (genetics)	31-Dec-2022				Davis, Tan, Lamer
2021VR4	Submit draft manuscript (genetics -	31-Dec-2022				Davis, Tan, Lamer
2021VR5	Submit draft manuscript (constructing management	31-Dec-2022				Bartels, Bouska, Davis, Lamer, Larson, Phelps, Tan,
Functional UMRS fish community responses and their environmental associations in the face of a changing river: hydrologic variability, biological invasions, and habitat						
2021FF2	Draft manuscript: "Has large scale ecosystem rehabilitation altered functional fish community expressions in the Upper Mississippi River	30-Sep-2021	30-Mar-2023		Delayed with other priorities such as S&T Report writing and Gatto moving to other agency	Ickes and Gatto
2021FF3	Draft Manuscript: "Why aren't bigheaded carps (*Hypophthalmichthys* sp.) everywhere in the Upper Mississippi River System?"	30-Sep-2021	30-Mar-2023			Ickes and Gatto
Understanding landscape-scale patterns in winter conditions in the Upper Mississippi River System						
2021WL1	System wide spatial layers of habitat conditions	30-Sep-2022	31-Dec-2022		Undergoing author review	Mooney, Dugan, Magee
2021WL2	Draft manuscript: Landscape scale controls on overwintering habitat in a large river	30-Sep-2022	31-Dec-2022			Mooney, Dugan, Jankowski, Magee
2021WL3	Draft manuscript: Response of oxygen dynamics to	30-Sep-2023				Jankowski, Dugan, Burdis, Kalas,
2021WL4	Draft Manuscript: Patterns in sediment characteristics and oxygen demand across a winter	30-Sep-2023				Perner, Kreiling, Jankowski, Giblin
Forest Response to Multiple Large-Scale Inundation Events						
2021FR3	Technical Report	1-Jun-2022	30-Mar-23		Delayed due to staffing shortages, hiring of new staff at NGREEC	Cosgriff, Guyon, De Jager
FY22 Funded Science in Support of Restoration and Management						
Assessing Forest Development Processes and Pathways in Floodplain Forests along the Upper Mississippi River using Dendrochronology						
2023dendro1	Finalize the scanning of 1,100 tree cores uploaded into DendroElevator	30-Nov-2023				Windmuller-Campione
2023dendro2	Annual summary	31-Dec-2023				Windmuller-Campione and Van Appledorn
2023dendro3	Coordination and scheduling for three to five virtual meetings; Meetings will address current objectives outlined in Activity 3 and future	1 March – 31 May 2024				Windmuller-Campione and Van Appledorn
2023dendro4	Draft manuscript – Age data of floodplain forests of the Upper Mississippi River	30-May-2024				Windmuller-Campione and Van Appledorn
2023dendro5	Draft Manuscript – Growth dynamics of silver maple of the Upper Mississippi River	30-Sep-2024				Windmuller-Campione and Van Appledorn
2023dendro6	Final report writing, edits on manuscript, and completion of all data storage	30-Nov-2024				Windmuller-Campione and Van Appledorn

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
Evaluating the LOCA-VIC-mizuRoute hydrology data products for scientific and management applications in the UMRS						
2023Hydro1	LOCA-VIC-mizuRoute data product evaluation	31 June 2023				Sawyer and Van Appledorn
2023Hydro2	LTRM project management team update on evaluation results	31 June 2023				Sawyer and Van Appledorn
2023Hydro3	ECB 2018-14 compliance completion	30-Sep-2023				Sawyer and Van Appledorn
2023Hydro4	Annual update: Year 1	31-Dec-2023				Sawyer and Van Appledorn
2023Hydro5	UMRS projected hydrology data and documentation release	30-Sep-2024				Sawyer and Van Appledorn
2023Hydro6	UMRR webinar on UMRS projected hydrology data release	31-Dec-2024				Sawyer and Van Appledorn
2023Hydro7	Virtual workshop or LTRM project team update for red pathway outcomes	31-Mar-2024				Sawyer and Van Appledorn
2023Hydro8	Draft LTRM completion report	30-Sep-2024				Sawyer and Van Appledorn
2023Hydro9	Final LTRM completion report	30-Dec-2025				Sawyer and Van Appledorn
Putting LTRM's long-term phytoplankton archive to work to understand ecosystem transitions and improve methodological approaches						
2023Phyto1	System-wide phytoplankton community dataset	30-Sep-2023				Jankowski
2023Phyto2	Draft Manuscript: Phytoplankton community composition over the past 20 years in the Upper Mississippi River: distribution of harmful taxa and relationships with environmental trends	30-May-2024				Jankowski and others
2023Phyto3	Draft Manuscript: Relating phytoplankton communities to distinct vegetation recovery trajectories in Pools 4 and 13	30-May-2024				Jankowski and others
2023Phyto4	Report: Assessment of FloCam for use on archived and fresh phytoplankton samples for	30-Mar-2024				Larson, James
2023Phyto5	Draft Manuscript: Comparison of trends captured by microscopy and FlowCam phytoplankton community analysis	30-May-2024				Larson, James
Assessing long term changes and spatial patterns in macroinvertebrates through standardized long-term monitoring						
2023inv1	Field collection of macroinvertebrates	14-Jun-2023				State field station staff
2023inv2	Laboratory identification of macroinvertebrates	30-Aug-2023				TBD
2023inv3	Screening level mayfly tissue analysis	30-Sep-2023				Giblin
2023inv4	Annual summary	31-Dec-2023				Lamer
2023inv5	a. Data entry completed and submission of data to USGS (Includes contaminant data)	31-Jan-2024				State field station staff, Giblin
2023inv6	b. Data loaded on level 2 browsers; QA/QC scripts	15-Feb-2024				Lamer, Schlifer
2023inv7	c. Field Station and contaminant QA/QC with corrections to USGS	15-Mar-2024				State field station staff, Giblin
2023inv8	d. Corrections made and data moved to public Web Browser	30-Mar-2024				Lamer, Schlifer

Tracking number	Milestone	Original Target Date	Modified Target	Date Completed	Comments	Lead
2023inv9	Field collection of macroinvertebrates	14-Jun-2024				State field station staff
2023inv10	Laboratory identification of macroinvertebrates	30-Aug-2024				TBD
2023inv11	Screening level mayfly tissue analysis	30-Sep-2024				Giblin
2023inv12	Annual summary	31-Dec-2024				Lamer
2023inv13	a. Data entry completed and submission of data to USGS (Includes contaminant data)	31-Jan-2025				State field station staff, Giblin
2023inv14	b. Data loaded on level 2 browsers; QA/QC scripts	15-Feb-2025				Lamer, Schlifer
2023inv15	c. Field Station and contaminant QA/QC with corrections to USGS	15-Mar-2025				State field station staff, Giblin
2023inv16	d. Corrections made and data moved to public Web Browser	30-Mar-2025				Lamer, Schlifer
2023inv17	Draft LTRM Completion report or manuscript on contaminant sampling	30-Sep-2025				Giblin
2023inv18	Field collection of macroinvertebrates	14-Jun-2025				State field station staff
2023inv19	Laboratory identification of macroinvertebrates	30-Aug-2025				TBD
2023inv20	Annual summary	31-Dec-2025				Lamer
2023inv21	a. Data entry completed and submission of data to USGS (Includes contaminant data)	31-Jan-2026				State field station staff, Giblin
2023inv22	b. Data loaded on level 2 browsers; QA/QC scripts	15-Feb-2026				Lamer, Schlifer
2023inv23	c. Field Station and contaminant QA/QC with corrections to USGS	15-Mar-2026				State field station staff, Giblin
2023inv24	d. Corrections made and data moved to public Web Browser	30-Mar-2026				Lamer, Schlifer
2023inv25	Draft LTRM Completion report or manuscript on macroinvertebrate sampling, trends, etc.	30-Sep-2026				Lamer

UMRR Science in Support of Restoration and Management
FY2014 and FY2015 Scopes of Work
November 2022 Status

Tracking number	Milestone	Original Target Date	Modified Target Date	Date Completed	Comments	Lead
Plankton community dynamics in Lake Pepin						
2015LPP1	Phytoplankton processing; species composition, biovolume	30-Dec-15		22-Oct-15		Burdis
2015LPP2	draft manuscript: Plankton community dynamics in Lake Pepin	30-Sep-16	31-Dec-22		first draft completed, anticipate submission to journal by Dec	Burdis, Manier
Predictive Aquative Cover Type Model - Phase 2						
2015AQ1	Develop 2-D hydraulic model of upper Pool 4	30-Sep-15		30-Sep-15		Libbey (MVP H&H)
2015AQ2	Apply model to Pool 4 and resolve discrepancies	31-Dec-15	31-Mar-16	31-Mar-16		Yin, Rogala
2015AQ3	Detailed summary of work for Phases I & II	31-Dec-15		NA	Work terminated with resignation of Dr. Yin. Danelle Larson will re-evaluate vegetation modeling in a future time frame	Sauer (for Yin), Rogala, Ingvalson

UMRR LTRM Implementation Planning
Information Needs and Criteria
1 November 2022

Beginning in March 2022, a core team representing the UMRR LTRM Partnership has been meeting to plan for LTRM implementation planning with the potential of an increase in funds under the Water Resources Development Act of 2020. If additional funds are appropriated, this would present an opportunity to expand our understanding of the UMRS and better inform restoration and management.

The LTRM Implementation Planning Team (IPT) is developing a framework to annually choose project recommendations for funding to the UMRR Coordinating Committee that best supports partner management goals, while also taking advantage of the new opportunities such funding provides, from a decision analysis perspective. The following pages contain the information needs identified by the IPT following input from the various LTRM partner agencies and the criteria the IPT will be using to score these information needs.

Next steps:

- 10 Nov. 2022: Scoring the information needs by the IPT (with input from others within your agency/organization as you think through scoring)
- 17 Nov. 2022: Facilitators will present the results of the scoring to the IPT and discuss
- On-going: Develop cost estimates of information needs
- TBD: Run through an optimization exercise
- TBD: Review final products

1.0 Information needs related to Floodplain Ecology

The information needs under floodplain ecology address primary concerns of management agencies related to the resilience and restoration of native plant communities, related ecosystem functions, as well as habitat use and distributions for associated faunal communities. Two decades of observed forest loss (De Jager and Rohweder 2022) and recent observations of additional punctuated forest losses in 2019 across major parts of the system underscore the importance of this theme. There are also ongoing concerns about invasive species, nutrient enrichment, and the development of alternative stable vegetation-soil states (wet meadows), as well as continued changes in land/use and hydroclimatic conditions that should serve to continue to change the floodplain ecosystem over the next century. The questions in this section address how floodplain vegetation, soil processes, and faunal communities vary spatially and change temporally within the UMRS. There will also be newly collected forestry data, updated system-wide topobathy data, and new 2-D hydrodynamic models for the system that might make an existing flood inundation – forest succession model broadly applicable at both the system and HREP scales to evaluate potential alternative future floodplain vegetation dynamics.

1.1 Floodplain Ecology: Vegetation Change Across the System

Information need: System-level vegetation change assessments. What is the spatial distribution of different plant species and communities? How have plant species distributions changed over time? What are the main drivers of plant species distribution and change over time? What are the drivers of forest loss across the system? What are the consequences of vegetation change for spatial patterns of forest fragmentation or other general landscape habitat features?

Geographic extent: Reach/UMRS scale. This may need to include some data from south of the UMRS floodplain as we could be seeing range expansion of southern species into the UMRS.

How the information will be used: Better assess and understand past and current plant species distributions and major drivers of vegetation change. Improve management and restoration by understanding mechanisms of vegetation change and preparing for emerging issues. Extend to specific HREPs by identifying hydrogeomorphic conditions for plant establishment and growth (e.g., elevation, soils, inundation).

Measurement or endpoint: 1) Collect (continue collecting) floodplain vegetation data, including forestry data, invasive species, (e.g., reed canary grass, Japanese hops), native herbaceous communities (sedge meadows), possibly explore the use of UAS for specific monitoring of areas. 2) Analyze vegetation data for change over space and time and associated drivers of change, 3) write reports/summaries and deliver maps of forest loss/vegetation change.

1.2 Floodplain ecology: Simulate alternative future conditions

Information need: What are possible simulated future trajectories of plant species compositions following different management actions and/or hydroclimatic conditions? Reduce uncertainty in current flooding-forest succession model by incorporating newly collected forestry data, more recent topobathy data, updated hydrodynamic models, improved model parameters, and climate change scenarios for the system and apply them at HREPs. Improved input data and model parameters may make the model broadly useful for HREPs.

Geographic extent: UMRS (system) and local (project) scales

How the information will be used: Inform management agencies on possible future trajectories of flooding and vegetation change across the system and at HREP locations. Make better decisions about where to manage forests, and what project features are most likely to improve forests locally.

Measurement or endpoint: Improved model performance and improved management decisions.

1.3 Floodplain ecology: distribution of birds and bats

Information need: Better understand the spatial and temporal distribution of avian fauna (e.g., birds, bats) that depend on the floodplain during different life cycle phases. Determine habitat use by avian and bat communities through long-term monitoring. Develop habitat suitability models and map spatial prioritization of habitat throughout the UMRS.

Geographic extent: Reach/UMRS scale, and/or Reach between Pool 13 and Pool 26 is currently being sampled (Audubon), need for more data farther north.

How the information will be used: Assessing ecosystem health by documenting bird and bat abundance/use of the floodplain, improving management and restoration by identifying project futures that could improve habitat, and preparing for emerging issues by identifying drivers of bird and bat use and potential changes in them. Develop a management guide discussing results and management suggestions for birds and bats. Couple bird data with current forest inventory datasets and forest-flood interaction findings.

Measurement or endpoint: Data on bird and bat distribution and use of the floodplain. Before-after-control-impact study design to determine community shifts across management strategies and habitats. Fine-scale bird-habitat suitability models. Comprehensive model of faunal spatial prioritization as it pertains to the UMRS.

1.4 Floodplain ecology: terrestrial and aquatic herpetofauna

Information need: What is the abundance, distribution, and status of reptile and amphibian species within the Upper Mississippi River and Illinois Rivers? Better understand the spatial and temporal distribution of terrestrial and aquatic herpetofauna (i.e., reptiles and amphibians) that depend on the floodplain during different life cycle phases. What drives reptile and amphibian abundances and distribution throughout the UMRS and individual reaches? What, where, and how many non-native herpetofauna are present in the UMRS? Determine habitat use by focal communities through long-term monitoring. Develop habitat suitability models and map spatial prioritization of habitat throughout the UMRS.

Geographic extent: Reach/UMRS scale.

How the information will be used: Assessing ecosystem health by documenting herpetofauna abundance/use of the floodplain, improving management and restoration by identifying project futures that could improve habitat use, and preparing for emerging issues by identifying drivers of herpetofauna use and potential changes in them. Develop a management guide discussing results and management suggestions for reptiles and amphibians. Coupled with current forest inventory datasets and forest-flood interaction findings

Measurement or endpoint: Quantify the status of reptile and amphibian populations (abundance at LTRM study reach scale) and communities and identify relations with various other ecological attributes (e.g., habitat). Identify non-native species and potential/existing invasive status. Data on herpetofauna distribution and use of the floodplain and aquatic areas. A long-term component would establish a robust infrastructure for assessing trends and changes in reptile and amphibian abundances, distributions, and resilience (including species of concern) as well as infrastructure for targeted studies. Before-after-control-impact study design to determine community shifts across management strategies and habitats. Fine-scale reptile/amphibian suitability models. A comprehensive model of herpetofauna spatial prioritization as it pertains to the UMRS. Allow managers to relate habitat decisions to impacts on herpetofauna.

2.0 Information needs related to hydrogeomorphic change.

Hydrogeomorphology is the study of the interactions of water and channel-floodplain topography (geomorphology). One of the most important facets of hydrogeomorphology is its strong control over the spatial and temporal distributions of riverine habitats. Hydrogeomorphology changes over time on two overlapping time scales. The hydrodynamics timescale refers to variation in hydraulics and habitat metrics that results from changes in water discharge in the absence of significant change in channel-floodplain geomorphology. Hydrodynamic variation is dominated by seasonal hydrology, punctuated by rare events. With climate change, however, hydrodynamic variation may also become non-stationary and involve multi-decadal trends.

The morphodynamics timescale refers to variation attributed to changes in geomorphology as sediment is redistributed in a river corridor or watershed as a result of adjustments to factors like dams, channel engineering, land-use patterns, and climate change. Morphodynamic timescales tend to be longer than hydrodynamics timescales (typically multi-decadal to millennial) although geomorphic change can be rapid in areas where erosional energy is concentrated or where sediment accumulates. Geomorphic adjustments in the river corridor or propagated through drainage basins can create long-term and lagged responses as sediment and energy are redistributed. Hence, geomorphic trajectories can be complex and challenging to predict. In the Upper Mississippi River System, geomorphic changes fundamentally alter the mosaic of riverine habitats, for example in infilling backwaters or in areas of channel incision and bank erosion downstream from dams.

Prediction of the changes in hydrogeomorphology – that is, the integrated effects of changes in hydrology and changes in geomorphology – is fundamental to understanding long-term resilience of the Upper Mississippi River System and for planning sustainable restoration projects. The following sections describe information needs related to gaining predictive understanding of hydrogeomorphic change. We assume that the hydrology component of hydrogeomorphic change will be evaluated by the proposed LOCA-VIC-mizuRoute project, or something similar, and so emphasis is on geomorphic change and how change is integrated with future hydrology.

2.1 Hydrogeomorphic change: Geomorphic trends

Information need: These information needs relate to predictive understanding of geomorphic trends within the rivers and their floodplains and include: 1. Where, how, and to what degree is the geomorphology of the river and floodplain changing and expected to change over planning horizons of decades to centuries? 2. How do these geomorphic changes relate to long-term changes in discharge and episodic weather events? 3. How are geomorphic changes affected by ongoing navigation channel operations, e.g., dredging and placement site operations, wing dikes, closing structures, revetments, etc.? 4. What are the implications for the future spatial and temporal distributions of habitat metrics such as water depth, inundation frequency/depth/duration, water residence time, and physical, biological, and chemical properties of the system? It will be addressed as empirical evaluations based on observed changes in bathymetric (elevation) data (as opposed to -processed-based evaluations in 2.2)

Geographic extent: Reach/UMRS scale. There is a system-wide need, but it may be approached operationally by nesting acquisition at a reach/pool level and scaling up to the system scale. Systemic assessment may be more easily justified for some kinds of data, for example, lidar data for which economies of scale can be achieved in a regular schedule of flights. Because of the time and cost investments required for bathymetric data collection at scales applicable to a range of project needs, bathymetric data may be amenable to targeted, sequential collections. An example might be the prioritization of backwater sedimentation rate monitoring in select areas.

How the information will be used: Understanding geomorphic change, and how it is integrated with future hydrology, is fundamental to assessing ecosystem health and resilience. Understanding the spatial and temporal distributions of geomorphic change will provide essential context for restoration planning and management decisions. Because the geomorphic template of the UMRS will provide fundamental insight into system trajectory, it is likely to be applicable when identifying emerging issues.

Measurement or endpoints: 1. Topo-bathymetric data collected to evaluate geomorphic change are also the foundation for hydrodynamic modeling; hence, a basic endpoint is multiple updates of gridded topo-bathymetric digital elevation models (DEMs) at appropriate resolutions; 2. Raster-based datasets of differences of topo-bathymetric DEMs collected over multiple periods to calculate rates, magnitudes, and locations of recent change; 3. Evaluations of expected rates, magnitudes, and locations of future change based on trends evident in repeated topo-bathymetric DEMs; 4. Statistical models relating geomorphic change and rates of change to covariates including emergent and submergent vegetation communities, factors in contributing watershed areas, channel geometry variables, channel-training structures, restoration projects, and distance to dams.

2.1a Hydrogeomorphic change: implications for improving restoration projects

Information need: This need addresses the implications of the changes identified in 2.1 for selection, design, implementation, and sustainability of aquatic and floodplain restoration projects over multi-decade planning horizons. These evaluations will support assessments in section 4.

Geographic extent: This need is addressed at the HREP or local scale, and will consist of project-level analyses of physical, chemical, and biological responses to changes in hydrogeomorphology variables including erosion, deposition, hydroperiod, temporal and spatial habitat metrics including inundation timing, duration, and depth for floodplain areas. Local-scale learning may be best addressed by using HREPs as field-scale, hypothesis-driven, adaptive-management experiments.

How the information will be used: These assessments will be focused on improving project selection, design, and implementation within the context of hydrogeomorphic change. The analyses will address sustainability of projects over planning horizons of multiple decades. It will provide guidance for geomorphological settings for HREP selection and design. Understanding how, where, and how much the geomorphology of the rivers and their floodplains are changing and is likely to change – and how those changes affect project performance -- will allow identification of HREP sites and designs that are most likely to meet and sustain objectives.

Measurement or endpoint: The endpoint of this information need will be reports that synthesize how changes in channel-floodplain topography and hydrology will change over time and affect restoration results and strategies. We anticipate that the synthesis will be based on statistical models that evaluate project effects in the context of hydrogeomorphic change and other covariates. This approach is well suited to before/after control/impact (BACI) experimental designs.

2.2 Hydrogeomorphic change: process-based predictions of sediment dynamics (erosion, transport, and deposition)

Information need: Whereas section 2.1 addresses hydrogeomorphic change by assessing trends in measured topography and bathymetry, the need addressed here is prediction of geomorphic change based on process-based predictive models and empirical sediment budgets. The performance of the predictive models will be calibrated and evaluated by comparison to the topobathymetric measurements in section 2.1. These models will add value to the assessments in section 2.1, by extending the predictive time horizon for geomorphic changes by indicating likely future trends in where, when, and what types of sediment will be redistributed at pool and system scales.

Geographic extent: Reach/UMRS scale. Because of the (mostly) closed nature of UMRS pools with respect to sediment transport, most of the emphasis will be on routing sediment redistribution at the reach scale, including understanding sources from tributaries. Understanding may be approached at a reach level and rolled up to the system.

How the information will be used: This information need will inform assessments of ecosystem health and resilience and improve restoration planning by incorporating multi-decadal predictions of geomorphic change into planning.

Measurement or endpoint: The endpoint of this information need will be predictive models of sediment redistribution within selected reaches and projected sediment budgets that will indicate prospects for long-term management and resilience. Sediment budgets will need to be developed that evaluate major sources, sinks, and transport vectors.

2.2a Hydrogeomorphic change: implications of process-based predictions of sediment dynamics (erosion, transport, and deposition)

Information need: This information need addresses the implications of the results from process-based sediment dynamics models. What does our understanding of the distribution of areas of erosion and deposition mean for the selection, design, implementation, and long-term success of HREPs? Analyses developed under this information need will be based on hypotheses and attendant uncertainties identified from section 2.2.

Geographic extent: The scale of this effort will be generally local (HREP) to reach because of the resolution needed to understand local erosional and depositional phenomena. We anticipate that information collected, and models developed at the HREP scale (individual backwaters, for example), will provide a basis for extension to reach and system scales. Local-scale learning may be best addressed through working with HREPs as field-scale adaptive-management experiments.

How the information will be used: This information will be most directly applicable to planning, siting, design, and implementation of HREPs. The information could be used to determine applicability of passive or active restoration approaches and to evaluate resiliency and sustainability of projects within the context of ongoing geomorphic change. The information will also provide insights into general ecosystem health and resilience.

Measurement or endpoint: The endpoint of this information need will consist of process-based analyses and models for deposition and erosion at project scales and synthesis of those results to predict the trajectory of site elevations, habitat suitability, hydroperiod, and soil characteristics.

2.3 Hydrogeomorphic change: evaluation of large woody debris source, transport, and fate

Information need: This information need addresses improving understanding of woody debris dynamics (source, transport, fate) including the role of woody debris in providing habitats for various species and its effects on river geomorphology. Where is it coming from, where is it going, and where is it accumulating? This need includes a methods development component to evaluate the most efficient means to evaluate inventories and dynamics of large woody debris in the Upper Mississippi River System.

Geographic extent: Reach/UMRS scale. There is a system-wide need for this information, but it may be approached at a reach level and rolled up to the system.

How the information will be used: Large, woody debris in river systems can be instrumental in creating habitat for invertebrates, interacting with hydraulics to influence aquatic habitat diversity and floodplain sedimentation, and, when the wood eventually decays, contributing to the carbon base of the riverine ecosystem. Understanding large woody debris dynamics will contribute to general assessments of ecosystem health and resilience by indicating sources, sinks, and spatial distributions and trends in accumulation of wood. The information also can be applied to restoration management and planning by indicating how large woody debris can be incorporated into HREPs and/or anticipated to interact with HREP designs (section 2.3a).

Measurement or endpoint: The endpoint of this information need will be an assessment of large woody debris dynamics. The specifics of the assessment will depend on developing appropriate methods to evaluate and quantify dynamics. The method may include repeat remote-sensing of debris to map accumulations over time, radiotelemetry to evaluate transport and fate of individual pieces, or plot studies to inventory large woody debris. The assessment may also include comparison with geomorphic change data (section 2.1) to indicate the strength of interaction between large woody debris and erosional/deposition processes.

[Additional information:

2.3a Hydrogeomorphic change: implications of input, transport, and fate of large woody debris for restoration.

Information need: This information need will build on section 2.3 to expand understanding into implications for restoration designs and biological endpoints. Specifically, it addresses how large woody debris may be incorporated in HREP designs and seeks to predict resulting HREP evolution. In addition, this information need addresses how HREP designs may effectively trap and retain large woody debris and the biological consequences of incorporating large woody debris into HREPs, including results for invertebrate communities and aquatic and terrestrial habitats. Because wood eventually rots, this need also includes evaluation of how its geomorphic and biological functions vary over time.

Geographic extent: This information need is best addressed at a local or project scale, potentially in field-scale adaptive management experiments. Information gleaned at the local scale will be amenable to scaling up to reach and system scales. Reach and system scale information gathered in section 2.3 will provide context for local-scale efforts

How the information will be used: Understanding large woody debris dynamics will contribute to improving HREP aquatic and floodplain project design by improving understanding of the costs and benefits of incorporating woody materials into the designs.

Measurement or endpoint: The endpoints for this information need will be multiple assessments of project performance in field-scale adaptive management experiments. Experiments will include a variety of aquatic and floodplain habitats and will evaluate physical and biological performance over diverse applications of large woody debris in designs.

3. Aquatic Ecology

The information needs in the Aquatic Ecology category deal with fully aquatic organisms living in the UMRS (as opposed to semi-aquatic or floodplain organisms such as waterfowl). Needs fall into three broad groups: status and trends in populations, contribution to resiliency, and how these groups respond to outside drivers. Status and trends in populations are assessed in terms of changes in abundance of organisms at either the entire system level, the level of the LTRM study reaches, or at the local scale. Reach scale information needs also address questions of movement and connectivity between populations. Status and trends of groups considers changes in community (e.g., changes in species diversity or richness and changing patterns in species distribution) across space and time. Needs addressing contribution to resiliency consider how populations will (and have) respond to changes in habitat, especially response to climate change and established and emerging contaminants and invasive species. Information needs addressing outside drivers examine other local scale questions. Local-scale questions would address issues of how a group might respond to an HREP project or other local management action such as reconnecting a side channel or dredging a backwater. For the most part, information collected in addressing the information need could be used to better plan HREPS and other management actions in the future, but more specific issues are addressed in category 4. Restoration Ecology.

LTRM has historically collected data on two major groups mentioned here: aquatic turtles (incidental catch) through the LTRM fish component, and phytoplankton, through the LTRM water quality component. These data have been minimally analyzed. For turtles see Johnson and Briggler 2012 and in the case of phytoplankton, organism ID has been accomplished in smaller studies [Decker, J.K. 2012; Manier et al. 2021] with other subsets of samples recently being identified) however, there is opportunity to examine past conditions and trends. Other sources of data already existing include numerous mussel surveys completed by state and federal agencies, LTEF data collection in non-LTRM study reaches, and shorter-term studies by universities on a variety of topics. These data could provide some context as planning to address specific needs is implemented.

Decker, J. K. 2012. Nutrient controls on phytoplankton composition and ecological function among hydrologically distinct habitats in the Upper Mississippi River. Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Biology Department at Fordham University.

Johnson, T.R. and Briggler, J.T., 2012. Turtles of the upper Mississippi River system. Jefferson City: Missouri Department of Conservation Report.

Manier, J.T., R. J. Haro, J. N. Houser, E. A. Strauss. 2021. Spatial and temporal dynamics of phytoplankton assemblages in the upper Mississippi River. River Res Applic., 1-12. DOI: 10.1002/rra.3852

3.1 Aquatic ecology: Aquatic plant distribution

Information need: What are the factors which limit aquatic plant distribution and (re)establishment throughout the system, especially the unsampled portions of the lower impounded reach (P14-25). Is it individual factors e.g., lack of backwater or shallow areas or a combination of several physical/chemical (natural and/or anthropogenic) factors? What, if any, inputs from the tributaries in this reach contribute to the lack of aquatic plants? How does the hydrologic regime affect aquatic plant community dynamics? What are the implications of shifting seasonality and magnitude of hydrologic extremes? How do invasive species (of aquatic plants or other groups) impact native plant distribution?

Geographic extent: Reach/UMRS scale.

How the information will be used: Assessing status and trends, assessing ecosystem health and resilience. Improving management and restoration.

Measurement or endpoint: same endpoints as in LTRM aquatic vegetation sampling protocol (Yin et al. 2000; plant abundance, plant density, species composition, diversity metrics) and LTRM's water quality protocol (Soballe and Fischer 2004; at least 10 water quality parameters), aquatic plant presence/absence through time, and associated [bathymetry, water level fluctuation] herbivory, turbidity, flocculent sediment, flow, (flow refuge), water level fluctuations, other drivers (association with invasive species), herbicide concentrations, turbidity, flow, sediment composition) above and below tributary confluences.

3.2 Aquatic ecology: fish community connectivity

Information need: What is affecting broad-scale fish movement? Is this impacted by locks and dams? What physical, ecological, and anthropogenic changes impact fish movement?

Geographic extent: Reach/UMRS scale; Species like skipjack may be more system-level, while other species like Lake Sturgeon, Paddlefish, and White Bass may operate as a population in a pool or set of pools and their tributaries. Many river species (particularly members of the sucker family) may have populations currently utilizing or potentially utilizing multiple pools that have not been documented due to the non-game classification typically applied to this group. Results from the genetics and microchemistry portions of the vital rates project may provide a starting point or template for further study if it strongly indicates movement or lack thereof that might imply barriers in the system

How the information will be used: Assessing ecosystem health and resilience by improving understanding of where fishes are when. Improving management and restoration by allowing managers to tie together state-level projects to address populations across boundaries. Project goals could be to support native species of concern or impede invasive species.

Measurement or endpoint: movement patterns, transition probabilities, and home ranges of native and nonnative fishes and their controlling variables.

3.3 Aquatic ecology: mussel distribution

Information need: What are the status and trends of mussel species within the Upper Mississippi River and Illinois Rivers? What, where, and how many non-native mussel species are present within the UMRS?

Geographic extent: Reach/UMRS scale

How the information will be used: Assessing ecosystem health and resilience. Improving management and restoration.

Measurement or endpoint: quantify the status and trends of mussel populations and communities and identify relations with various other ecological attributes (e.g., habitat, water level). Additional metrics (recruitment, survival, growth, diversity) may be needed.

3.5 Aquatic ecology: fish populations

Information need: What are the current age and spatial structure of fish populations across the system?

Geographic extent: Reach/UMRS scale

How the information will be used: Improve management and restoration; north-south gradient can affect how quickly a species may exhibit a detectable response to restoration actions. Provide context and interpretive value to existing LTRM fish CPUE data. When used in conjunction with information need 3.2 this can be used to target critical life stages/sizes of fish with habitat projects. Preparing for emerging issues. Changes in growth or age characteristics in a population can also be indicative of factors such as invasive species, climate change, or other anthropogenic disruptions sooner than changes in abundance might. Examining and quantifying presence and impact of invasive species on native communities, and drivers of growth and recruitment on a local and system-wide scale can model expected species-level responses. This data also captures invasive species information and helps managers track the spread of species like bighead and silver carp.

Measurement or endpoint: age, growth, recruitment, mortality, population structure, metabolic rate; transition probabilities for inter-pool movement, metapopulation, and stock structure dynamics, tie to variable drivers along gradient of the river, bottleneck to recruitment and incorporate into larger spatially explicit models to measure the resilience of these communities and provide more tenable management targets for game and non-game species)

3.6 Aquatic ecology: Implications of changing hydrologic regime on biota.

Information need: How does the hydrologic regime and water temperature affect fish population dynamics? For example, Why do the biggest year classes of common carp in Pool 4 occur during drought years? How do winter floods affect fish survival or community composition? What are the implications of shifting seasonality and magnitude of hydrologic extremes? How do water level fluctuations affect aquatic plants and their restoration? How might invasive species populations move or change in response to forecasted changes in climate?

Geographic extent: Reach/UMRS scale

How the information will be used: Assessing ecosystem health and resilience. Improving management and restoration. Preparing for emerging issues (e.g., climate change or invasive species resistance or adaptation built into HREP design and placement)

Measurement or endpoint: model climate factor associations with long-term catch data, growth recorded in otolith or mussel shell increment width, mortality and recruitment.

3.7 Aquatic ecology: macroinvertebrate contribution.

Information need: What is the status (composition, abundance, and distribution) of native and non-native macroinvertebrates in the UMRS? What is the contribution and response of macroinvertebrates to ecosystem health and resilience? How will aquatic macroinvertebrates, and the ecosystem services they provide (biofiltration, nutrient cycling, fish forage) be affected by climate-induced changes and future river modifications?

Geographic extent: Reach/UMRS scale. Note: Species composition, structure, and tolerance levels will change across reaches

How the information will be used: Assessing ecosystem health and resilience.

Measurement or endpoint: community-level macroinvertebrate data on large (LTRM-inclusive and outpool reaches of UMRS) spatial and temporal scales capturing soft-substrate communities using benthic ponar and EPT communities using rock bag/plate samplers); trends and changes in macroinvertebrate abundances, distributions, and resilience. Shifts in community composition, abundance, and MBI tolerance values can reflect habitat and reach-wide resilience. Long-term component establishes robust infrastructure for targeted studies (e.g., contaminants, adult emergence, genetics, and microplastics).

3.7a Aquatic ecology: macroinvertebrate contribution

Information need: How do macroinvertebrate communities and associated habitat and environmental needs/characteristics change at the individual project or HREP scale and how can these changes better inform HREP design and implementation throughout the UMRS

> Geographic extent: Local Scale. Could be measured at project or individual HREP scale. [Note: Species composition will change across reaches] Sets infrastructure for targeted studies within reaches or aquatic areas (contaminants, emergence, genetics, microplastics)
>
> How the information will be used: Assessing ecosystem health and resilience. Improving mgmt & restoration
>
> Measurement or endpoint: Trends and changes in macroinvertebrate abundances, distributions, and resilience. Long-term component and individual project-scale evaluation, establishes robust infrastructure for targeted studies on the influence of rock used in HREP construction, contaminants, timing and magnitude of adult insect emergence, genetic structure, and microplastics, and local level associations between macroinvertebrates and habitat characteristics

3.9 Aquatic ecology: lower trophic contribution

Information need: What are the abundance, distribution, and status of lower trophic organisms (zooplankton and phytoplankton)? What is the lower trophic base contribution and response to ecosystem health and resilience? What, where, and how many non-native plankton are present in the UMRS?

> Geographic extent: Reach/UMRS scale. Use existing phytoplankton samples from field stations. And consider specific outpool samples in the future that may have connections to other LT monitoring efforts (e.g., LTEF) or expansion of LTRM. Zooplankton and other lower trophic (e.g., microbes) investigations would require additional sample collection.
>
> How the information will be used: Assessing ecosystem health and resilience.
>
> Measurement or endpoint: Establish baseline abundance, community composition, and spatiotemporal change for lower trophic base and investigate relationships with environmental conditions. Identify non-native species and potential for or existing invasive status.

3.9a Aquatic ecology: Implications for lower trophic contribution

Information need: How do phytoplankton and zooplankton respond to local water quality conditions and HREPs, including attention to responses of toxin producing cyanobacteria. How do plankton respond to the presence of invasive species (including invasive plankton and invasives from other groups)? What factors influence invasive plankton spread throughout the UMRS?

Geographic extent: Local scale. Within outpools and LTRM study reaches at project scale (e.g., at strata specific aquatic areas, backwaters and HREPs).

How the information will be used: Assessing ecosystem health and resilience relative to plankton communities at project scale.

Measurement or endpoint: Assessment of community composition and abundance of lower trophic base (zooplankton and phytoplankton) at smaller spatiotemporal scales relative to habitat and environmental conditions.

3.11 Aquatic ecology: tributary inputs

Information need: How do tributary inputs* of water discharge, sediment, and nutrients change over time? What are the impacts of these changes on the UMRS and what areas within-pool are most impacted? (*broader set of tributaries than currently monitored). Where are tributary influences greater than upstream mainstem influences? Which tributaries act as important habitat refugia for aquatic organisms?

Geographic extent: Reach/UMRS scale

How the information will be used: Assessing ecosystem health and resilience. Improved management and restoration decisions. Identify additional tributaries of interest for targeting with short-term studies. Better evaluation of the effectiveness of conservation actions and projects: If a tributary has a large influence or is contributing a pollutant (sediment, nutrient, etc.) action within the tributary may be more effective than action within the mainstem UMRS.

Measurement or endpoint: 1. Water quality monitoring at additional tributary confluences or upstream at important locations. 2. Loading estimates of water quality variables. 3. Assessment of the spatial impact of tributaries within pools.

3.12 Aquatic ecology: river gradients

Information need: Understand status of fish, veg, (including invasive species present in monitoring) and water quality in the stretch of river between Pools 13 and 26.

Geographic extent: Reach/UMR scale

How the information will be used: Assessing ecosystem health and resilience.

Improving management and restoration by expanding understanding.

Measurement or endpoint: LTRM base monitoring data structure and/or other monitoring sources (e.g., FLAMe sensor or satellite data) across similar spatial scales and strata designations. The goal would be to expand LTRM data collection to the understudied reach though with likely less temporal intensity.

3.13 Aquatic ecology: Pollutants and habitat

Information need: **What impacts do excess nutrients (i.e., harmful algal blooms) and contaminants (i.e., road salt, pharmaceuticals, microplastics, legacy contaminants [lead]) have on native species and habitats?** Is the frequency or magnitude of harmful algal blooms changing? If so, what factors are contributing? How do the impacts of pollutants alter the effects of invasive species on native populations?

Geographic extent: Reach/UMRS scale. Species composition will change across reaches as will pollutants of interest and greatest impact.

How the information will be used: assessing ecosystem health and resilience by allowing stakeholders to predict future conditions and attempt to mitigate. Improving management and restoration by allowing managers to target vulnerable areas or species for protection or remediation.

Measurement or endpoint: Understand existing conditions and how this can be used to evaluate the impact of contaminants on native communities. Establishing effects of contaminants including HAB toxins on biota. This monitoring could occur in conjunction with already occurring LTRM sample collection.

4.0 Information needs related to restoration applications

The information needs contained in the Restoration Applications theme relate to needs identified that would directly improve the selection, design, performance, and capacity to learn from Habitat Rehabilitation and Enhancement Projects. Several information needs listed may resolve uncertainties regarding the ecological role of HREP features and thus improve UMRR's use of HREPs to meet specific objectives. Given the diversity of taxonomic groups found in the UMRS, an emphasis was placed on priority species, guilds, communities, and habitat types in several of the information needs. Several information needs are strategic in the sense that they represent broad knowledge gaps that require attention. Moving forward on strategic needs may necessitate the development of working groups to specify the initial direction for how the need could best be addressed. Lastly, several needs that emphasized the programmatic need for integration between Long Term Resource Monitoring staff, resources, and expertise and HREP planning staff and processes were ultimately removed from this list to allow the UMRR CC to determine how to best meet that need.

4.1 Restoration Applications: habitat conditions

Information need: What are the conditions needed to support species, guilds, and communities that are prioritized for conservation?

For example: What are the critical variables (e.g., substrate stability, velocity, host fish presence/absence, dissolved oxygen, temperature, food availability) driving the distribution and abundance of mussel species? What are the seasonal movement patterns, home ranges, and population bottlenecks of native and non-native fishes? Do fish in the river stay in the river consistently, or do they use tributary habitat during different seasons or life stages?

Geographic extent: Reach/UMRS scale (but products should be useable at project scale)

How the information will be used: Improving management and restoration

Measurement or endpoint: The endpoint of this information need is an improved understanding of the habitat conditions that support the life history needs of priority species (state and federal T&E; state species in greatest need of conservation; USFWS Trust species; national wildlife refuge priority resources of concern). This is a broad need and a working group would ideally be formed to determine which guild(s) and/or community(ies) to be the initial focus of targeted sampling and habitat assessments. Examples include lotic mussels, migratory fish such as blue sucker, paddlefish, and sturgeon, herps, etc. Methods will be taxa-dependent; for example, pit tags and pit tag readers could provide locational information on fish at different times of the year and different life stages.

4.2 Restoration Applications: biotic response to HREPs

Information need: How do species, guilds, and communities that are prioritized for conservation and habitat conditions respond to conventional or commonly implemented HREP measures/features?

For example: How can HREPs influence critical variables to benefit mussels and how do mussels respond? What is the response to placement of woody debris? What ages/life stages of fish are using project features? What spatial distribution of habitats/features/projects is optimal? How do bird communities shift in response to HREP features/measures?

Geographic extent: Local scale because the information need is concerned with the HREP-scale issues and applications. Data will be collected from multiple projects to support broad-scale analyses.

How the information will be used: Improving management and restoration

Measurement or endpoint: Improved understanding of how prioritized species, guilds, and communities (state and federal T&E; state species in greatest need of conservation; USFWS Trust species; national wildlife refuge priority resources of concern) are expected to use HREP features. Pre- and post-HREP monitoring could include presence/absence, abundance, reproductive output, survivorship, etc., of the target species or guilds as well as the associated environmental/habitat conditions.

4.3 Restoration Applications: floodplain vegetation change at HREP scales

Information need: Project-level monitoring to adaptively manage sites and improve forest simulation model parameters (see 1.2). What are the rates of mortality by age of different plant species in relation to built project features (e.g., soil types, elevations, inundation periods)? What are the establishment rates of unplanted species? How do invasives respond to built features?

Geographic extent: Local scale

How the information will be used: Adaptively manage HREP site conditions and plant assemblages as needed. Improve model parameters for future model applications.

Measurement or endpoint: Targeted floodplain vegetation measurements at HREP and other small-scale management sites pre- and post-project across a range of site conditions, HREP feature designs, and floodplain vegetation species and ages. Improved model parameters (reduce uncertainty), improved site conditions for HREPs and better project alternatives selected by improved modelling. Information, lessons learned transferred to other HREPs.

4.4 Restoration Applications: soil dynamics and ecosystem processes at HREPs

Information need: Project-level understanding of soil nutrient content, composition, and depth in existing and created floodplain soils as well as; 'natural' deposition or erosion of project features or project areas. How does soil composition (OM and texture), nutrient availability and turnover rates relate to patterns of connectivity/inundation and above ground plant communities? Where are the opportunities to amend floodplain soils for restoration?

> Geographic extent: Local Scale. HREP scale because the information need is concerned, in part, with vegetation/soil relationships that would be needed for HREP planning. the other part is understanding the capacity of HREPs to sequester nutrient and sediments. And it is not feasible to measure nutrient processing rates at broader scales.
>
> How the information will be used: Improving management and restoration
>
> Measurement or endpoint: Data on nutrient content, soil composition (OM and texture), depth of existing soils and created soils, and nutrient processing rates across a range of built and natural hydrogeomorphic conditions.

4.5 Restoration Applications: hypothesis testing

Information need: Capacity to use HREPs as opportunities to reduce uncertainties through research designed to test specific hypotheses. One approach is to ask which questions identified in the Research Frameworks can be addressed through intentional study of HREPs. Specific examples include understanding mussel velocity/substrate/shear stress requirements and validating wind fetch/wave models in Pool 13

> Geographic extent: Reach/UMRS scale (project-level learning with systemic applications)
>
> How the information will be used: Improving management and restoration
>
> Measurement or endpoint: Improved understanding of assumptions regarding how HREP features/design influence physical and ecological processes. Ideally, a working group would be formed to identify the hypothesis to be tested and design research.

4.6 Restoration Applications: Floodplain Connectivity

Information need: What effect does re-establishing different extents of floodplain connectivity have on the flora, fauna, and water quality of large river ecosystems. Can berms/levees and control structures be constructed/degraded in a manner that allows for a level of connectivity or residence time that maximizes the benefit to flora and fauna of large river ecosystems? Where might land acquisition opportunities by partners capable of doing so have the greatest impact and benefit for current or future project locations?

Geographic extent: Local scale. Impact would be more localized to reach or river pool. There could potentially be a cumulative impact.

How the information will be used: Assessing ecosystem health, improving management and restoration, and preparing for emerging issues

Measurement or endpoint: Determining the relationships between flora/fauna and the extent of floodplain connectivity can provide a better understanding of the quantity of connected floodplain needed to benefit flora and fauna. Assessments of residence time, water quality, and inundation patterns at floodplain reconnection sites can inform how connections can be designed to improve water quality.

4.7 Restoration Applications: reduce invasive species impacts at habitat project sites

Information need: What are the life history needs of invasive species? How can habitat projects be designed to promote native populations while also discouraging non-native species (For example: bigheaded carp, reed canary grass, flowering rush)? Have habitat project characteristics resulted in increased invasive species establishment within pools compared to background establishment rates?

Geographic extent: UMRS and local scale

How the information will be used: Improved Management and restoration.

Measurement or endpoint: Life history needs, habitat associations (e.g., depth, velocity, residence time, DO, substrate) and propagule dispersal mechanisms of targeted invasive species. One-time analysis of established HREPs and data to look at pre- and post-implementation invasive species populations. Information will be used in design of future HREPs to incorporate invasive-species prevention strategies into project design. Long-term monitoring of HREP sites and corresponding pools to determine the effects of new HREPs on establishment of invasive species. Outpool sampling could expand the early detection and monitoring of invasive species.

4.8 Restoration Applications: water level management

Information need: What is the optimal frequency and timing of water level management for meeting different ecological objectives (Heglund et al. 2022)? Are there specific water level thresholds to consider for different biotic groups (i.e., emergent vegetation, mussels)?

Geographic extent: Reach /Systemic

How the information will be used: Improved management and restoration

Measurement or endpoint: Various potential metrics are detailed in a recent report (Heglund et al. 2022) including, but not limited to, total suspended solids, distribution of native plants, native mussel mortality, tuber biomass, young-of-year native fish catch rates, and invertebrate diversity and abundance.

Relevance Criteria

Relevance or Importance	**Ecosystem Understanding and Assessment**	**Management and Restoration (UMRR Outcome)**
Irrelevant (0)	Ecosystem understanding is insensitive to the information need	Outcomes are insensitive to the information need
Somewhat (1)	Ecosystem understanding is indirectly linked to the information need and is thus predicted to improve marginally by addressing the information need.	Outcomes are somewhat determined by the information need and are thus predicted to improve marginally by addressing the information need.
Moderate (2)	Ecosystem understanding is directly linked to the information need, but other information needs should also be addressed to significantly improve understanding. Thus, ecosystem understanding is predicted to improve moderately by addressing this information need.	Outcomes are largely determined by the information need, but other information needs should also be addressed to significantly improve outcomes. Thus, outcomes are predicted to improve moderately by addressing this information need.
Significantly (3)	Ecosystem understanding is directly and predominantly linked to the information need. Thus, ecosystem understanding is predicted to improve significantly by addressing this information need.	Outcomes are largely and predominantly determined by the information need. Thus, outcomes are predicted to improve significantly by addressing this information need.
Highly Relevant (4)	Ecosystem understanding is directly linked to the information need AND addressing this information need is necessary to improving ecosystem understand.	Outcomes are directly determined by the information need. Thus, outcomes can only be improved by addressing this information need.

Depth of Current Knowledge Criteria

Depth of current knowledge	Confidence that the underlying question or topic to be addressed by the information need is already well supported
Certain	Unquestioned confidence that the topic is fully understood and well-studied based on multiple and reliable evidence types
High	Topic is mostly understood and well-studied based on multiple and reliable evidence types
Moderate	Topic is partially understood and moderately studied based on multiple evidence types but with mixed results (variability in observed results)
Partial	Topic is poorly understood and moderately studied based on evidence that may not include multiple types and with low consistency in results (high variability in observed results).
Uncertain	Topic is poorly understood and little studied with limited to no evidence

Opportunity to Address Information Need Criteria

Opportunity to learn	Degree to which learning is anticipated based on reliability of inference
Infeasible	Learning is not feasible because 1) impractical to collect data for a robust study, or 2) inherently weak inference due to low signal-to-noise ratio (confidence in data is low)
Somewhat	Learning is feasible, but constrained by 1) important data collection limitations, or 2) challenging inference due to low signal-to-noise ratio
Moderate	Learning is feasible because methods for robust study are available AND signal-to-noise ratio is moderate
Strong	Learning is feasible and expected because methods for rigorous data collection and research design are available AND signal-to-noise ratio is strong (confidence in data is high)

Urgency and Unique Capacity Criteria

Urgency and Unique Capacity	Degree to which addressing the information need is urgent	Requires the unique capacity of the LTRM element
Not Urgent or Not Unique	The need is not pressing within the next 5 years	The need would likely be addressed by others adequately
Urgent or Unique	Information would support decisions or inferences that must be made in the near-term (within the next 5 years)	LTRM is most appropriate to address the information need.

ATTACHMENT E

Additional Items

- **Future Meeting Schedule** *(E-1)*
- **Frequently Used Acronyms (4-29-2022)** *(E-2 to E-8)*

Quarterly Meetings
Future Meeting Schedule

February-March 2023	
Remote Meeting	
February 28	UMRBA Quarterly Meeting
March 1	UMRR Coordinating Committee Quarterly Meeting

May 2023	
St. Paul, MN	
May 23	UMRBA Quarterly Meeting
May 24	UMRR Coordinating Committee Quarterly Meeting

Acronyms Frequently Used on the Upper Mississippi River System

AAR	After Action Report
A&E	Architecture and Engineering
ACRCC	Asian Carp Regional Coordinating Committee
AFB	Alternative Formulation Briefing
AHAG	Aquatic Habitat Appraisal Guide
AHRI	American Heritage Rivers Initiative
AIS	Aquatic Invasive Species
ALC	American Lands Conservancy
ALDU	Aquatic Life Designated Use(s)
AM	Adaptive Management
ANS	Aquatic Nuisance Species
AP	Advisory Panel
APE	Additional Program Element
ARRA	American Recovery and Reinvestment Act
ASA(CW)	Assistant Secretary of the Army for Civil Works
A-Team	Analysis Team
ATR	Agency Technical Review
AWI	America's Watershed Initiative
AWO	American Waterways Operators
AWQMN	Ambient Water Quality Monitoring Network
BA	Biological Assessment
BATIC	Build America Transportation Investment Center
BCOES	Bid-ability, Constructability, Operability, Environmental, Sustainability
BCR	Benefit-Cost Ratio
BMPs	Best Management Practices
BO	Biological Opinion
CAP	Continuing Authorities Program
CAWS	Chicago Area Waterways System
CCC	Commodity Credit Corporation
CCP	Comprehensive Conservation Plan
CEICA	Cost Effectiveness Incremental Cost Analysis
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
CG	Construction General
CIA	Computerized Inventory and Analysis
CMMP	Channel Maintenance Management Plan
COE	Corps of Engineers
COPT	Captain of the Port
CPUE	Catch Per Unit Effort
CRA	Continuing Resolution Authority
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program

CSP	Conservation Security Program
CUA	Cooperative Use Agreement
CWA	Clean Water Act
CY	Cubic Yards
DALS	Department of Agriculture and Land Stewardship
DED	Department of Economic Development
DEM	Digital Elevation Model
DET	District Ecological Team
DEWS	Drought Early Warning System
DMMP	Dredged Material Management Plan
DNR	Department of Natural Resources
DO	Dissolved Oxygen
DOA	Department of Agriculture
DOC	Department of Conservation
DOER	Dredging Operations and Environmental Research
DOT	Department of Transportation
DPR	Definite Project Report
DQC	District Quality Control/Quality Assurance
DSS	Decision Support System
EA	Environmental Assessment
ECC	Economics Coordinating Committee
EEC	Essential Ecosystem Characteristic
EIS	Environmental Impact Statement
EMAP	Environmental Monitoring and Assessment Program
EMAP-GRE	Environmental Monitoring and Assessment Program-Great Rivers Ecosystem
EMP	Environmental Management Program [Note: Former name of Upper Mississippi River Restoration Program.]
EMP-CC	Environmental Management Program Coordinating Committee
EO	Executive Order
EPA	Environmental Protection Agency
EPM	Environmental Pool Management
EPR	External Peer Review
EQIP	Environmental Quality Incentives Program
ER	Engineering Regulation
ERDC	Engineering Research & Development Center
ESA	Endangered Species Act
EWMN	Early Warning Monitoring Network
EWP	Emergency Watershed Protection Program
FACA	Federal Advisory Committee Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FDR	Flood Damage Reduction
FFS	Flow Frequency Study
FMG	Forest Management Geodatabase
FONSI	Finding of No Significant Impact
FRM	Flood Risk Management

FRST	Floodplain Restoration System Team
FSA	Farm Services Agency
FTE	Full Time Equivalent
FWCA	Fish & Wildlife Coordination Act
FWIC	Fish and Wildlife Interagency Committee
FWS	Fish and Wildlife Service
FWWG	Fish and Wildlife Work Group
FY	Fiscal Year
GAO	Government Accountability Office
GEIS	Generic Environmental Impact Statement
GI	General Investigations
GIS	Geographic Information System
GLC	Governors Liaison Committee
GLC	Great Lakes Commission
GLMRIS	Great Lakes and Mississippi River Interbasin Study
GPS	Global Positioning System
GREAT	Great River Environmental Action Team
GRP	Geographic Response Plan
H&H	Hydrology and Hydraulics
HAB	Harmful Algal Bloom
HEC-EFM	Hydrologic Engineering Center Ecosystems Function Model
HEC-RAS	Hydrologic Engineering Center River Analysis System
HEL	Highly Erodible Land
HEP	Habitat Evaluation Procedure
HNA	Habitat Needs Assessment
HPSF	HREP Planning and Sequencing Framework
HQUSACE	Headquarters, USACE
H.R.	House of Representatives
HREP	Habitat Rehabilitation and Enhancement Project
HSI	Habitat Suitability Index
HU	Habitat Unit
HUC	Hydrologic Unit Code
IBA	Important Bird Area
IBI	Index of Biological (Biotic) Integrity
IC	Incident Commander
ICS	Incident Command System
ICWP	Interstate Council on Water Policy
IDIQ	Indefinite Delivery/Indefinite Quantity
IEPR	Independent External Peer Review
IGE	Independent Government Estimate
IIA	Implementation Issues Assessment
IIFO	Illinois-Iowa Field Office (formerly RIFO - Rock Island Field Office)
ILP	Integrated License Process
IMTS	Inland Marine Transportation System
IPR	In-Progress Review
IRCC	Illinois River Coordinating Council

IRPT	Inland Rivers, Ports & Terminals
IRTC	Implementation Report to Congress
IRWG	Illinois River Work Group
ISA	Inland Sensitivity Atlas
IWR	Institute for Water Resources
IWRM	Integrated Water Resources Management
IWS	Integrated Water Science
IWTF	Inland Waterways Trust Fund
IWUB	Inland Waterways Users Board
IWW	Illinois Waterway
L&D	Lock(s) and Dam
LC/LU	Land Cover/Land Use
LDB	Left Descending Bank
LERRD	Lands, Easements, Rights-of-Way, Relocation of Utilities or Other Existing Structures, and Disposal Areas
LiDAR	Light Detection and Ranging
LMR	Lower Mississippi River
LMRCC	Lower Mississippi River Conservation Committee
LOI	Letter of Intent
LTRM	Long Term Resource Monitoring
M-35	Marine Highway 35
MAFC	Mid-America Freight Coalition
MARAD	U.S. Maritime Administration
MARC 2000	Midwest Area River Coalition 2000
MCAT	Mussel Community Assessment Tool
MICRA	Mississippi Interstate Cooperative Resource Association
MDM	Major subordinate command Decision Milestone
MIPR	Military Interdepartmental Purchase Request
MMR	Middle Mississippi River
MMRP	Middle Mississippi River Partnership
MNRG	Midwest Natural Resources Group
MOA	Memorandum of Agreement
MoRAST	Missouri River Association of States and Tribes
MOU	Memorandum of Understanding
MRAPS	Missouri River Authorized Purposes Study
MRBI	Mississippi River Basin (Healthy Watersheds) Initiative
MRC	Mississippi River Commission
MRCC	Mississippi River Connections Collaborative
MRCTI	Mississippi River Cities and Towns Initiative
MRRC	Mississippi River Research Consortium
MR&T	Mississippi River and Tributaries (project)
MSP	Minimum Sustainable Program
MVD	Mississippi Valley Division
MVP	St. Paul District
MVR	Rock Island District
MVS	St. Louis District

NAS	National Academies of Science
NAWQA	National Water Quality Assessment
NCP	National Contingency Plan
NIDIS	National Integrated Drought Information System (NOAA)
NEBA	Net Environmental Benefit Analysis
NECC	Navigation Environmental Coordination Committee
NED	National Economic Development
NEPA	National Environmental Policy Act
NESP	Navigation and Ecosystem Sustainability Program
NETS	Navigation Economic Technologies Program
NGO	Non-Governmental Organization
NGRREC	National Great Rivers Research and Education Center
NGWOS	Next Generation Water Observing System
NICC	Navigation Interests Coordinating Committee
NPDES	National Pollution Discharge Elimination System
NPS	Non-Point Source
NPS	National Park Service
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRDAR	Natural Resources Damage Assessment and Restoration
NRT	National Response Team
NSIP	National Streamflow Information Program
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O&M	Operation and Maintenance
OHWM	Ordinary High Water Mark
OMB	Office of Management and Budget
OMRR&R	Operation, Maintenance, Repair, Rehabilitation, and Replacement
OPA	Oil Pollution Act of 1990
ORSANCO	Ohio River Valley Water Sanitation Commission
OSC	On-Scene Coordinator
OSE	Other Social Effects
OSIT	On Site Inspection Team
P3	Public-Private Partnerships
PA	Programmatic Agreement
PAS	Planning Assistance to States
P&G	Principles and Guidelines
P&R	Principles and Requirements
P&S	Plans and Specifications
P&S	Principles and Standards
PCA	Pollution Control Agency
PCA	Project Cooperation Agreement
PCX	Planning Center of Expertise
PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
PgMP	Program Management Plan

PILT	Payments In Lieu of Taxes
PIR	Project Implementation Report
PL	Public Law
PMP	Project Management Plan
PORT	Public Outreach Team
PPA	Project Partnership Agreement
PPT	Program Planning Team
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RCP	Regional Contingency Plan
RCPP	Regional Conservation Partnership Program
RDB	Right Descending Bank
RED	Regional Economic Development
RIFO	Rock Island Field Office (now IIFO - Illinois-Iowa Field Office)
RM	River Mile
RP	Responsible Party
RPEDN	Regional Planning and Environment Division North
RPT	Reach Planning Team
RRAT	River Resources Action Team
RRCT	River Resources Coordinating Team
RRF	River Resources Forum
RRT	Regional Response Team
RST	Regional Support Team
RTC	Report to Congress
S.	Senate
SAV	Submersed Aquatic Vegetation
SDWA	Safe Drinking Water Act
SEMA	State Emergency Management Agency
SET	System Ecological Team
SMART	Specific, Measurable, Attainable, Risk Informed, Timely
SONS	Spill of National Significance
SOW	Scope of Work
SRF	State Revolving Fund
SWCD	Soil and Water Conservation District
T&E	Threatened and Endangered
TEUs	twenty-foot equivalent units
TIGER	Transportation Investment Generating Economic Recovery
TLP	Traditional License Process
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TSP	Tentatively selected plan
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWG	Technical Work Group
UMESC	Upper Midwest Environmental Sciences Center

UMIMRA	Upper Mississippi, Illinois, and Missouri Rivers Association
UMR	Upper Mississippi River
UMRBA	Upper Mississippi River Basin Association
UMRBC	Upper Mississippi River Basin Commission
UMRCC	Upper Mississippi River Conservation Committee
UMRCP	Upper Mississippi River Comprehensive Plan
UMR-IWW	Upper Mississippi River-Illinois Waterway
UMRNWFR	Upper Mississippi River National Wildlife and Fish Refuge
UMRR	Upper Mississippi River Restoration Program [Note: Formerly known as Environmental Management Program.]
UMRR CC	Upper Mississippi River Restoration Program Coordinating Committee
UMRS	Upper Mississippi River System
UMWA	Upper Mississippi Waterway Association
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VTC	Video Teleconference
WCI	Waterways Council, Inc.
WES	Waterways Experiment Station (replaced by ERDC)
WHAG	Wildlife Habitat Appraisal Guide
WHIP	Wildlife Habitat Incentives Program
WIIN	Water Infrastructure Improvements for the Nation Act
WLM	Water Level Management
WLMTF	Water Level Management Task Force
WQ	Water Quality
WQEC	Water Quality Executive Committee
WQTF	Water Quality Task Force
WQS	Water Quality Standard
WRDA	Water Resources Development Act
WRP	Wetlands Reserve Program
WRRDA	Water Resources Reform and Development Act