Upper Mississippi River Restoration
Habitat Rehabilitation and Enhancement Projects (HREPs) Workshop

September 27-29, 2016

Day 1

Welcoming Remarks

Marv Hubbell welcomed participants to UMRR's September 27-29, 2016 UMRR HREPs Workshop, providing an overview of the topics to be addressed. Hubbell discussed UMRR's historical significance as the nation's first large-river restoration and science program. Creation of UMRR occurred when regional partners proactively agreed to pursue as a compromise to the conflict over the expansion of Mel Price L&D in the 1980s. UMRR and a second, 600-foot lock at Mel Price were authorized in WRDA 1986, when Congress also declared the river to be "a nationally significant ecosystem and commercial navigation system" and directed the Corps to implement UMRR recognizing the river's other purposes and in consultation with DOI and the five UMRS states. UMRR's strong partnership collaborations throughout its history have been, and continue to be, fundamental to its numerous successes. UMRR has highly effective interagency coordination mechanisms that are unmatched. The program has a proven track record of delivering important benefits regionally and nationally. UMRR's accomplishments over its first 30 years were celebrated on August 8, 2016 in La Crosse where several important leaders in the Corps and partner agencies acknowledged the importance of UMRR as an effective collaborative approach to improving the river's ecosystem. Hubbell discussed UMRR's historical funding, increased competition nation-wide for Corps ecosystem restoration dollars, and Districts' messages about the program that demonstrate the capability and efficiency for it to execute funds towards achieving a larger strategic vision.

Partner Remarks

Tim Yager (USFWS) expressed the value of UMRR's partnership for building projects that enhance the overall ability to manage the system. Looking forward, Yager expressed the need to consider important ecological challenges associated with increased sediment and how to utilize the river's energy. Some past projects have been too expensive and not resilient, but we can learn from those as well as good examples being implementing in the Open River Reach.

Jeff Houser (USGS) explained how UMRR is focusing science to improve resource management. In the past, UMRR has focused on ensuring consistent methods for scientific rigor and availability and usability of the data. Over the past few years, restoration practitioners, engineers, and scientists have increasingly been engaged in learning from each other and discovering ways to utilize all aspects of the program in each area of UMRR's implementation.

Mike Griffin (Iowa DNR) asserted that "30 years of success" is the result of strong partnerships throughout the region. The partnership's bottom-up approach to creating projects is incredibly important to maintain. This contrasts with the Missouri River's constant conflict among river users that paralyzes projects from moving forward.

Dan Dieterman (Minnesota DNR) said Minnesota is a proud partner and supporter of UMRR. Minnesota DNR is very interested in the science to better understand resilience work and create projects that incorporate resilience concepts. The next generation of projects should address systemic ecological needs, water level management, and floodplain acquisition and restoration at the lower end of tributaries.

Janet Sternburg (Missouri DoC) emphasized the importance of UMRR's partnership implementation. Issues associated with the Corps' project partnership agreements (PPAs) need to be resolved for new cost-shared projects

to be advanced. Other issues, such as project scale and OMRR&R requirements, can be addressed throughout project planning and design. Sternburg said there is an outstanding need to implement restoration projects in the Open River Reach. Limited available public lands currently restricts UMRR's ability to do restoration there. She recognized the need for increased integration among restoration and science within the program, but said Missouri's field station scientists have always had a strong role in habitat work. Sternburg also pointed to UMRCC's directory for a listing of regional biologists.

Jim Fischer (Wisconsin DNR) discussed the agency's current realignment effort and how that might affect staff involved in Mississippi River management. The Mississippi River Team will now span multiple divisions within the agency. Fischer expanded on a few key messages, including the value of UMRR's partnership, using habitat projects create ecological complexes for multiple species rather than focusing on single species management, and needs to improve modeling capabilities. Fischer said island construction should be created with backwater material and not dredged material from the main channel, and projects involving deep water habitat may need to dredge backwaters deeper to ensure longer lasting benefits. UMRR is the only authorization available to dredge backwaters. Fischer said he supports the UMRR's 2015-2025 Strategic Plan, and current efforts involving integration, resilience, and the HNA II.

Dru Buntin (UMRBA) discussed UMRBA's historical origins, role in supporting and communicating the states' multi-purpose management efforts, and involvement in UMRR's conception and implementation. Ecosystem restoration, particularly related to UMRR, is a strong component of UMRBA's 2012-2017 Strategic Plan, and has always been central to UMRBA's priorities. UMRR is facing increasing pressure for funding, and it will be extremely important to communicate the benefits of the program in improving the ecosystem for multiple uses. Buntin welcomed partners to contact staff with any input on how we best communicate about the program.

Doug Blodgett (TNC) said there exists a great nexus between UMRR and TNC's vision and mission. There are significant benefits of TNC and other non-profit organizations being more involved in UMRR, particularly for cost-sharing habitat projects where public land is limited. Blodgett overviewed TNC's work with the Corps and TNC's organization chart. He explained TNC's work on America's Great River Initiative. He listed the UMRS state chapters to contact for input on habitat projects and involvement in the program. TNC also actively lobbies with UMRBA on behalf of UMRR as well as for resolving issues associated with the PPAs.

Tim Schlangenhaft (Audubon) said the organization is getting more actively involved in UMRR again after Dan McGinnis retired. In addition to Schlagenhaft's time on the river, Audubon is cost-sharing a forester position with USFWS. This is a pilot approach that he thinks is working successfully so far. Schlagenhaft explained that the UMRS is a very critical area for migrating bird species, and the floodplain forests are very important and threatened even though they are often overlooked. He echoed earlier comments re PPA concerns, stressing that the current obligations are a significant burden.

HREP Overview

District Highlights

Tom Novak, Kara Mitvalsky with Rachel Fellman, and Brian Markert discussed UMRR's habitat projects recently constructed, under construction, in feasibility, and in the queue for future work. They discussed ecological objectives, restoration techniques and approaches, design considerations and challenges, and insights gained for individual projects, and discussed goals for future restoration.

Feasibility to Closeout, the Corps' Planning Process

Marshall Plumley explained the requirements and process for all stages of HREP implementation, including project initiation, the feasibility phase and report review and approval, pre-construction engineering and design (plans and specifications), project implementation and construction, and operations and maintenance (OMRR&R). Plumley

also discussed the phases where there is sponsor involvement and that have major decision points. He noted that PDT culture will need to change to work within the Corps 3x3x3 SMART planning guidelines.

Gretchen Benjamin mentioned concerns expressed by the Administration about project close-outs. UMRR must more quickly close out projects, or do so in smaller increments, to demonstrate that these projects are in fact moving forward.

Fish and Wildlife Considerations in Project Development and Implementation

Tim Yager and Kraig McPeek discussed USFWS's perspectives for future UMRS restoration as the agency is an active partner in Mississippi River management. Yager overviewed the Refuge system on the Upper Mississippi and the agency's involvement in a management context. Yager said that, while restoration is difficult, and some saying impossible, proper management can result in a highly productive, resilient, and functional ecosystem. He stressed the need for frequent communication among the Corps and project sponsors in planning and throughout construction. There also needs to be adequate time for agency staff to review any new information. Yager explained that habitat projects often involve trade-offs among ecological resources, citing mussel beds and bald eagles nests as examples. The Refuges' purposes must be considered and will take priority over other habitat trade-offs. For example, Conway Lake's initial habitat design would have significantly impacted a freshwater mussel bed. There cannot be a trade-off for one habitat need against another. Prioritization is critical in strategically planning habitat conservation and enhancement. USFWS seeks to minimize disturbance in closed areas particularly during the waterfowl migratory season. Seasonal restrictions are imposed on project construction to reduce or eliminate disturbances. USFWS's goal is to create projects that have long term, sustainable benefits and that work with the river's energy rather than requiring a lot of O&M.

McPeek encouraged UMRR to think creatively when thinking about future restoration activities and creating projects. UMRR should be prepared to articulate how projects are proactively benefiting other larger ecological concerns, such as the monarch butterfly or other endangered species. While endangered species will not necessarily stop a project, they do indicate where valuable and rare habitat currently exists.

Floodplain Permit Considerations During Design

Toby Hunemuller provided an overview of the floodplain permit terminology, requirements, Corps' analysis procedures, and implications for project design.

Day 2

Ecosystem Resilience

Opening Remarks

In providing context for Day 2's discussion, Hubbell discussed the intention of the 2015-2025 UMRR Strategic Plan's goals and strategies. The Plan launched the work in examining the UMRS's ecological resilience, which will serve as a foundation for the HNA II and will inform the next generation of habitat projects. UMRR is a long standing national and international leader in large river restoration and science, and this effort to apply ecological resilience concepts will further that leadership role.

Applying Ecological Resilience Concepts to UMRS Restoration and Management

Kristen Bouska presented on the effort to-date to apply ecological resilience concepts to the UMRS, including describing the valued benefits of the UMRS (the factors that society depends upon for a healthy ecosystem),

characterizing the UMRS ecosystem, and assessing the functions and processes within the lotic, lentic, and floodplain areas. Bouska described the concepts of ecological resilience as they relate to these areas.

Climate Change Analysis

Lucie Sawyer explained the newly published requirements for Corps projects to consider climate change implications – ECB 2016-25 issued on September 20, 2016, replacing ECB 2014-10. This guidance applies to all Corps projects and involves answering: 1) is climate change relevant to the project and 2) if yes, how does climate change (as predicted) affect the project. Sawyer used Beaver Island as an example to place the considerations in context. Without quantitative guidance, PDTs will need to make judgment decisions regarding how best to build resilience into project designs based on qualitative assessments.

In response to a question, Sawyer said that the Corps has not yet considered how temperature changes associated with climate change affect fish but can do so in the context of a future project. In response to a question, Sawyer confirmed that the guidance would also apply to flood risk management projects.

Floodplain Forests

Floodplain Forest Enhancements

Ben Vandermyde presented on the successes, limitations, and techniques for tree plantings. Andy Meier presented on floodplain forests inventories and analysis of conditions. The first inventory phase tool place in 1990s to 2000s, with emphasis on defining management areas (or stands) and with data collected largely on stand based. The second phase started in 2007 and is ongoing, and is emphasizing on defining trends in forest growth and health for developing management prescriptions. Robert Cosgriff then described the development of stand prescriptions for forest management, which is a site-specific plan detailing forest management objectives and identifying management tools.

Megan Moore stated Minnesota DNR's predominate focus is for maple-elm. Vandermyde said the cover mix is about 80 percent of silver maple. Schlagenhaft asked how we can make sure that enough habitat is sustained? And, how do we prioritize that work and at which scale should we focus to make a positive difference? Might a systemic plan be developed? Vandermyde said the Corps is developing a systemic forest plan. Right now, staff are currently focusing on prioritization based on thresholds for sustainability, coordinating among the three UMRS Districts and USFWS. Meier added that, as more data is collected and analyzed, it is becoming more evident that there are few areas that are *not* in crisis mode. The work is currently funded through the Corps' O&M budget and, while it is significant, it is not enough to adequately address all of these areas needing attention. In response to a question, Meier said the Corps proactively determines where to place resources and leave forests in their current state. Some areas are not pursued because they are too costly or are in good condition. The Corps is exploring ways to mimic natural river processes in terms of which trees to plant and at which elevations.

Nate De Jager described research findings on developing quantitative measures useful in project planning and design, establishing management objectives by evaluating stressors (such as reed canary grass), and future research directions. This might include examining factors influencing floodplain forests for the entire UMRS and making predictions of future floodplain forests under alternative environmental and management scenarios.

Mike Griffin illustrated through a series of pictures that forests appear and disappear naturally – the ecosystem has a way of changing through time naturally. This means that UMRS management has to assume some level of risk and that forests cannot maintain themselves over time. The forest we have now is different than it once was and will be different in the future. UMRS management must be opportunity-driven. For examples, sediment dredged in backwater rehabilitation should be used to establish forests in a higher area.

Backwater Sedimentation Rates

Jim Rogala presented on analyses of sedimentation rates and the process of backwaters filling in, using information currently available from pre-UMRR studies, recent studies, and HREP-specific studies. That information can be used to forecast future conditions and use in evaluating the HNA II recommendations. Valid findings with sediment analysis are that there is a general filing of impounded areas and backwaters, in particular, although there is high spatial variability. This is somewhat quantified, but has overall resulted in a loss of habitat diversity. Alluvial fans are forming in backwaters that are particularly problematic and lead to long term challenges. Future studies to inform UMRS management might include rates and patterns of change, forecast conditions, sediment accumulation and processing, and restoration opportunities to address habitat rehabilitation needs.

There is an endless supply of sediment from many sources. No work has been done yet on sediment sourcing. It is highly variable, requiring studies for each project. Repeated bathymetric studies could allow for analyses on how UMRR habitat projects successful management sediment.

Ecosystem Dredging

Randy Kinney presented on ecosystem dredging techniques and approaches, using the Peoria Lake, Bertom and McCartney, Lake Chautauqua, Pool 11 Islands, Sunfish Lake habitat projects as examples. Kinney discussed constraints to mechanical and hydraulic dredging, and the benefits of geotextile containers. In response to a question, Kinney explained that the geotextile designs are highly durable and are able to support vegetation. Kinney said geotubes were spaced at maximum distance and only placed sporadically, and were only allowed to be filed over a period of time. Dredging did not need to be stopped for settling.

Construction Considerations

Scott Baker discussed the importance of building trust and understandings with project sponsors throughout project development, including through site visits, work plans, surveys, and permitting. Kara Mitvalsky discussed construction considerations in managed backwaters. Mitvalsky's primary messages involve:

- Carefully consider input from refuge and state managers who have intimate knowledge of project sites,
- Thoroughly evaluate projects – they do not involve a lesser design or funding to construct as other projects, and
- Fight for a good design – obtain all needed data, surveys, borings, etc. to minimize surprises and cost overruns late in implementation.

Hydraulic Connectivity

Jon Hendrickson explained that hydraulic connectivity is extremely high within the St. Paul District on the UMRS and is important to address because it facilitates high sediment deposition in backwaters as well as associated nutrients. For example, hydraulic connectivity to North and Sturgeon Lakes in Pool 3 increased from 30 percent in 1991 to 47 percent in 2010. Thus, UMRR's habitat projects in this region typically include features to reduce connectivity, such as with large barrier islands to reduce velocities and sediment inflow. Recent surveys indicate that flow into some backwaters has been stable or is decreasing where UMRR projects have been implemented. It will be important to understand the role of connectivity to delta formation and the loss of backwater habitat.

Kirk Hansen presented on how hydraulic connectivity drives water quality, habitat, and fish. Monitoring of backwater lakes has shown that centrarchids will seek out the warmest water with sufficient oxygen while avoiding flow. Pool winter water quality generally involves low dissolved oxygen and too much flow (because of associated low temperatures), with anoxic conditions harder on larger fish and low temperatures harder on smaller fish. Increased water elevation has effectively reduced island elevations, increased hydraulic connectivity through island dissection, and turned single- into multiple-connection lakes or side channels. High quality winter sites are

typically found surrounded by diverse forest, indicating high elevation, less frequent overland flooding, better sediment filtration, and lower sedimentation. Hansen said there is a strong tie between high quality terrestrial and aquatic habitat, calling for building like nature to create more resilient and healthy projects. In response to a question, this might mean restoring natural levees surrounding backwaters.

Jeff Janvrin presented on the geomorphology of the Upper Impounded Reach and how impoundment has influenced connectivity and sediment transport/deposition by altering flow distribution and floodplain roughness. Common goals for habitat projects in the Upper Impounded Reach include increasing and maintaining habitat quality for dabbling and diving ducks, neotropical migrants and shorebirds, turtles, fish, and mussels. This involves increasing emergent, submersed, and floating leaved aquatic vegetation. Janvrin then discussed how wind velocity and fetch affect the ability for vegetation to establish and grow. Janvrin said UMRR's first project dredged deeper, but then UMRR began dredging to shallower extents to facilitate vegetation growth. However, because of new drivers, there is too much vegetation growing in these sites. So now there is a push to dig backwaters deeper again. A participant ask if we need to dredge deeper if climate change may continue to raise water levels. Janvrin's answer is that deeper areas provide refuge for fish that currently is limited. And, that area will likely fill with sediment over time.

Jim Rogala described different ways to consider backwater connectivity – habitat, flood-related and non-flood related, main stem and tributary, and sub-surface, as well as longitudinal connectivity. Rogala showed how modeling hydraulic connectivity and incorporating information from long term monitoring can inform the HNA II and project selection – i.e., how to use connectivity to manage habitat. This could include adding connection to deliver channel water or building islands to shelter an area from flow.

Water Level Management

Water Level Management as a Restoration Tool

Joe Jordan discussed how water level management is used to meet objectives related to hydraulics, geomorphology, biogeochemistry, habitat, and biota. Water level management can focus on moist soil management, pool level changes, or backwater lakes. Of the 55 UMRR habitat projects, 41 have included water level management of some variety. Jordan explained lessons learned at Keithsburg habitat project. In response to a question, Jordan said pumps can operate in two different directions due to gate configurations.

Pump Design for Habitat Projects

John Behrens provided construction considerations for electrical and mechanical pump station designs. He described challenges related to contracting and subcontracting, timelines, lack of understanding of plans and specifications, site access and unique conditions (foundation, debris, ice), dewatering and flooding, and availability to electrical power, among other things. Behrens provided information about the various equipment and designs.

USFWS O&M Activities

Sharonne Baylor presented on USFWS's O&M activities, particularly related to managing water levels. Baylor described challenges and features that work well for staff maintaining UMRR project sites. She stressed the usefulness of O&M manuals for site managers. Unanticipated pump considerations have included changing hydrology, electrical cost structure changes, electric company peak demand shutdowns, and service and parts for older pumps.

Participant Discussion

Gretchen Benjamin highlighted the successful pool-scale drawdown effort in Pools 24-26 that has resulted in full bands of vegetation, including high diversity of perennial emergent plants. Those dams are all operated via hinge-

point. Schlagenhaft stressed the importance for figuring out how to do these types of drawdowns throughout the UMRS.

Hubbell noted that MVD has indicated a willingness to consider new UMRR project types in the context of a specific project proposal. UMRR's 2000 implementation guidance states it has the authority to do pool-scale drawdowns. Hubbell encouraged partners to think of new, innovative ideas for projects when identifying the next generation of projects. Partners expressed benefits of recent projects with less associated O&M obligations.

Dru Buntin mentioned that the states are working with the Corps and river stakeholders to pursue a watershed study that addresses flood risk reduction and channel maintenance management.

Project Partnership Agreements

Marv Hubbell, Dru Buntin, Kirsten Mickelsen, Gretchen Benjamin, and Tim Schlagenhaft explained the challenges facing non-federal cost share sponsors in executing project partnership agreements. UMRBA, TNC, and Audubon have teamed up to get these issues addressed in the 2016 water resources development measures. The House and Senate have included provisions in their respective bills, approaching the OMRR&R issue in slightly different ways, with the House limiting O&M to when ecological goals are met and the Senate limiting O&M to 10 years after the Corps determines that the physical features of a project are working as designed. The House also allows for a 50-year O&M limit. Indemnification is not included in either bill, but is still a primary concern for cost sharing. The outcome of the final legislation is not yet known. Minnesota and Illinois DNR have expressly stated that they will not cost share projects until these issues are addressed. The Corps has recently removed the provision for tribes to waive their sovereign immunity.

Day 3

Historical and Current Monitoring

Overview

Marv Hubbell said UMRR monitors physical and chemical parameters of its HREPs and sometimes biological outcomes, given key assumptions with external influences and annual variation in the river's system. He said project evaluations document outcomes over time while adaptive management evaluates those outcomes in the context of risk and uncertainty. Hubbell described the role of the Corps and project sponsors in monitoring for project evaluations and adaptive management.

LTRM 101

Jeff Houser provided a LTRM 101, describing the connections among monitoring, research, and habitat rehabilitation. Houser discussed LTRM's purpose of understanding the UMRS's complex system and challenges it faces in support of the river's management for multiple uses. Today, LTRM is focused on assessing and evaluating changes in the river's ecological health and resilience. Houser explained LTRM's infrastructure and monitoring data, as well as staff expertise involved. He showed how graphical browsers make the data readily available and can be used to determine trends over time and space to inform and evaluate management and restoration. Going forward, LTRM data can support analyses of river functions and responses to management actions, determine the largest sources of uncertainty, and look for opportunities to learn about restoration – e.g., Pool 12 overwintering studies.

Schlagenhaft emphasized the importance of understanding systemic effects of HREPs. Dan Dieterman suggested considering HREP benefits to social uses and interests.

HREP Performance Monitoring Today

Dave Potter reviewed the PERs completed to-date for HREPs and the projects with planned PER developments in the near term. Potter discuss the intended process of developing PERs and challenges to doing so, including data limitations. Section 2039 of WRDA 2007 allows for a more practical approach to project evaluations. Potter showcased the MODA (Oracle digital assets) MERMaid (formally ERMAM, Mitigation and Ecosystem Restoration Monitoring Aid) a database for enhancing project evaluations. Potter said that getting serious about declaring project success will require a more concerted effort of more resources.

Kara Mitvalsky presented on the way "traditional" reports have been completed, stating that resources have been allocated to them on an *ad hoc* basis as resources allow. Mitvalsky offered that the evaluations might be improved with bi-annual site inspections of completed reports, monitoring and evaluation of feature types, assessment of specific projects to determine better outputs, and ongoing monitoring and data collection. Mitvalsky overviewed evaluations completed for Princeton Refuge, Peoria Lake, Big Timber, Potters Marsh, Spring Lake, Bertom and McCartney Lakes, Pleasant Creek, Lock Island Division, and Fox Island. She also listed the schedule of MVR's planned evaluation reports.

Kat McCain said MVS also utilizes the traditional PER approach and outlined the District's expected schedule in FY 16 through FY 17. McCain presented the results of PERs for Cuivre Island, Calhoun Point, Pharrs Island, and Stag Island.

Future Monitoring

Participants formed break out groups to discuss monitoring needs and future opportunities related to aquatic and wetland vegetation, fisheries, floodplain forest, mussels, sedimentation and geomorphology, water quality, and wildlife. The questions and group report outs are below. More generally, participants requested that written reports are condensed and easily digestible for the end users. LTRM scientists can help set the baseline context, write objectives and study design, and improve accessibility of HREP monitoring data, among other things.

Question 1 – What are some aspects of HREP monitoring that we are currently doing that lend themselves well to a study design, execution, and assessment?

Question 2 – What are some aspects of HREP monitoring that we are currently doing that do not lend themselves well to a study design, execution, and assessment?

Question 3 – What are some HREP monitoring activities we are currently performing that help determine if a project is meeting the project objectives?

Question 4 – What are some HREP monitoring activities we are currently performing that do not help determine if a project is meeting the project objectives?

Question 5 – What are some HREP monitoring activities we are not currently performing, but could/should be doing?

Question 6 – Should we monitor the species or habitat we create to attract the species?

Question 7 – What is the most important monitoring we should be doing, but are not?

Question 8 – What monitoring should we stop doing?

Question 9 – What monitoring should we prioritize?

Question 10 – What are things we do well?

Question 11 – What are things we don't do well?

Question 12 – What are things we should start doing?

Mussels

- Mussel habitat has been an objective in only a few HREPs, and therefore, not much HREP monitoring has been done re mussel habitat restoration except for assessing impacts of construction
- There are opportunities to evaluate post-project benefits to communities related to physical features, including substrate and hydraulic conditions, and what habitat can occur in different scenarios – e.g., substrate stability
- Mussels can have long lag times before showing any community response
    - Will need to consider how to monitor for short-responses to questions, including effects of relocation and which features are effective and which are not
    - Can use mussels as indicators of longer term climate change impacts
    - There may be other, related variables to use in place to indicate short term responses
- UMRR can start to evaluate mussel relocation and mortality, vital rates, and recruitment as shorter term variables
- Evaluate whether the footprint of mussel beds persist over time, and mussels presence/absence there
- Quantitative success criteria are needed and may include time for mussels to reestablish and recolonize as well as footprint persistence and mitigation to those areas
- Use regularly measured hydraulic parameters to validate models
- Monitor at regular intervals and after catastrophic events
- Consider propagation/fish stocking of mussel habitat features, although it may be costly

Aquatic and wetland vegetation

- Need to connect water quality monitoring with vegetation (turbidity, clarity, and vegetation), and to assess the role of invasive species
    - Form aquatic vegetation project objectives that are directly related to specific water quality parameters
- Use LTRM data as a baseline condition to the extent possible
- Better connect pre- and post-HREP monitoring data; consult LTRM staff re how best to assess project responses
- State the learning objectives (what we want to know and can learn) early in a project's development, then design monitoring to answer those questions
- Better utilize other, related, available data
- Use LTRM reach data to place individual projects within a systemic context

Fisheries

Question 6 (Modified to: "Should we monitor the species or habitat we create to attract the species?")

- There is a lot of evidence to suggest that HREPs create new habitat, but questions remain regarding whether projects attracting existing populations from other areas or create new populations – this needs scientific research to say this with more certainty
- Need to better communicate about findings, observations, and projects better among the partnership

- Better link species, habitat, and communities
- When possible and it makes sense, evaluate fish based on community-level rather than species-level
- Monitor the new habitat itself, and then evaluate species response to it
- Address perceived and real challenges to using LTRM data as a baseline control to HREP monitoring, given that project monitoring and LTRM monitoring are set up differently – when does it becomes statistically significant to evaluate HREP trends with longer LTRM trends in other pools; how can the two monitoring approaches be "merged"
- Adequate pre- and post-project construction monitoring is required to get valuable information; there are many ways to improve fisheries monitoring
- Challenge: monitoring is restricted to accessible locations
- Define manager-driven priorities for monitoring, involving public input
- Challenge: numerous HREPs require monitoring for learning, but there is limited resources to do so – what approaches can address this effectively – e.g., monitoring every other year, select priority projects

Questions 5 and 7

- Add angler counts to include social aspects of HREPs
- Better integrate fisheries monitoring with water quality and other monitoring components to get a more comprehensive understanding of HREP benefits
- Develop more quantitative, specific monitoring objectives (SMART) that tell more than presence/absence – CPU or population structure targets
    - Recognize that each project is different and will require tailored monitoring objectives; however, need to strive for commonality among project objectives to make comparisons
- Utilize graduate students
- Address uncertainties
- Address questions of "when will UMRR be done" with monitoring that shows degradation occurs at faster rates than restoration
- Need to be able to compare restoration efforts with other factors occurring in the river and assess cumulative benefits of projects in a concentrated area, such as Pool 8 Islands
    - Pool 8 Islands created habitat at a time when backwaters collapsed in other areas of the pool – concurrent monitoring of other backwaters would have helped determine whether the project replaced that habitat or actually added habitat
- Do more telemetry monitoring

<u>Floodplain Forests</u>

- There are many questions about the health and resilience of floodplain forests that are broader than UMRR and may require coordination beyond the program – there is a lot unknown at this point
    - Many of the questions affect HREPs and UMRR should identify and prioritize what we want to learn and select projects to monitor and define monitoring goals based on those questions

- Suggestion: Host a regional meeting to define coordinated, systemic approaches to monitoring floodplain forests
  - Include schools, universities, friends groups, who could assist in monitoring and research
- Illinois Waterway is limited re baseline forest inventory data and management actions; the Upper Mississippi benefits from a good, systemic baseline of forest monitoring/inventory data

- Floodplain forests are not often an essential component of HREPs, so limited experience and lot of uncertainties exist; HREPs are lending themselves well to studying
  - There are a lot of plantings outside of UMRR, but that are not monitored
- The things UMRR does well includes permanent plots and inventory work as well as contracts to restore hard wood forests
- Foresters are now part of PDTs for HREPs and can help with project design and developing the monitoring strategy – this should help to identify SMART monitoring objectives
- UMRR needs a formalized monitoring approach and analysis tools
- UMRR will need to standardize sampling methods and better store and share data among HREPs and with other reforestation efforts (beyond UMRR); and standardize among multiple species and sites
  - Need a coordination lead and team, with experience with study design, planning, and monitoring to develop an overall approach for forest restoration and monitoring on the UMRS
  - Blend systemic monitoring approach with project-specific questions for unique circumstances to answer larger questions – e.g., Huron Island was designed at a specific site, but monitoring can be applied to multiple species and sites
  - Need more, better coordination among Districts and agencies re forest restoration and monitoring
  - The Corps' forestry database could potentially be utilized as a central database
  - Incorporate lessons learned from contractors re survivability into future efforts
- HREPs have used a terrestrial guidebook that uses a plot-based approach, which is useful for older forests but not HREPs because it does not capture new restoration; instead a transect-based sampling approach would be more useful
  - Foresters are currently developing better protocols for UMRR's consideration
  - Should be monitoring for establishment, growth rates, mortality rates; survival rates in various substrates and conditions – soil, flooding, herbivory, invasive species
  - Should evaluate functions rather that primarily monitoring structures in order to better asses HREPs' abilities to achieve project objectives
- Timing is a big factor – reforestation may take 5-7 years to get it right, and 10 years to ensure success (that trees are at the height and maturity to escape herbivory and flood impacts
  - Use first couple of years to determine whether additional work is needed with follow up treatments
  - Employ transect-based surveys in years 5-10 to determine restoration success
- Integrate wildlife responses to reforestation – neotropical migrants, bats, others

Sedimentation

- Common HREP objectives include: reduce erosion of existing islands/land forms, reduce sediment deposition, reduce suspended sediment (improve light penetration)
  - Dredge cuts should be monitored to determine effectiveness and compare approaches
  - Some new techniques that are less expensive may not be effective in shallow water
- HREPs monitoring should include:
  - Flow rates (has been done and is useful for study design)
  - Sediment transect monitoring to determine whether sediment objectives are being met – vertical and horizontal control is critical – make sure monitoring is able to answer what is occurring in the project sites
  - Have good controls to compare data
  - Continuous total suspended solids data (ISCO Sampler) should be employed for water quality and aquatic vegetation monitoring
    - N/S gradient in TSS
    - Impacts of TSS on aquatic vegetation
    - Do we want more or less aquatic vegetation? Better species composition?
  - Better link with water quality and aquatic vegetation, including:
    - Aerial extent and species composition of aquatic vegetation – to assess impacts on species and habitat
    - Annual, in-point depth water quality monitoring is useful, as opposed periodic surveys – greater chance of missing events with infrequent surveys (sedimentation is an event-based factor - floods); other input included monitoring 3 years post-construction and then 5-year intervals following
  - Standardize methods (even uniform contractor) to ensure consistency
  - Water resident time
  - Influence of eddies on habitat, especially overwintering habitat with introduction of cold water – where are they occurring, what are they doing, and what can we do to prevent or induce eddies
- There are trade-offs in survey techniques – monitoring designs and baseline data should be established early in the HREP development process
- Need to monitor broader trends in sedimentation – delta formations – and how HREPs affect geomorphology (islands)
  - Use maps and aerial photographs
  - Use information about system and reach scale sedimentation trends to determine project locations
  - Determine how orientations of channels influence sedimentation into backwaters
  - Reach or pool-scale HREP evaluations or a sediment transport study could lend very important insights
  - Monitor substrate, river structures, and large woody debris
  - Opportunities exist to partner with others interested in this work
  - Is it worth the effort?
- Consider updating PERs for early HREPs to learn about sediment transport, but prioritize monitoring of past HREPs based on those having better, more data

Water Quality

- HREP monitoring is doing well at spot measuring of temperature, dissolved oxygen, and velocity, especially in the winter
- Pre-project monitoring is good in most cases, but continuous (post-project) monitoring is spotty, with some areas covered well and others not so much
    - Pre-project monitoring should occur years ahead of project construction, and perhaps before fact sheet development
- LTRM is a valuable baseline of the entire system, allowing for comparison of projects to the grand scheme; its use should be expanded beyond study reaches
- HREP monitoring could do a better job of continuous monitoring for temperature, dissolved oxygen/oxygen demand, nutrients, daily swings, and summer and winter conditions, as well as nutrient cycling, fate transport through projects, duck weed mats, and bacterial blooms, phosphorous release
- HREP monitoring should examine relationships between biological responses and water quality
- A dedicated water quality staffer should be positioned in every state (Wisconsin DNR has a dedicated staffer)
- Use Brown's Lake proposal

Wildlife

- HREPs are discrete in time and space, and therefore lend themselves well to pre- and post-monitoring comparisons
    - In some cases, projects are not discrete in space – with the area of influence of restoration difficult to delineate
- HREP planning process is sometimes lengthy, allowing for sufficient pre-project monitoring (including establishing the monitoring plan)
- Objectives need to be SMART; past project monitoring has been limited because they lacked SMART objectives
    - Use physical or other factors that link to biological objective – e.g., increase average amount of wild celery as an indicator of increased canvasbacks
- Sampling or monitoring has sometimes been half hazard, giving a lot of room for improvement
- Whether monitoring for a habitat or species will depend…. Evaluating habitat is easier than evaluating species, but quality habitat may not be indicative of species presence
- HREP monitoring should occur over a long time period to ensure that any responses are not just temporary

Upper Mississippi River Restoration Program
Habitat Rehabilitation and Enhancement Projects (HREPs) Team Meeting

September 27-29, 2016
Attendance List

Tim Schlagenhaft	Audubon
Jeff Horn	Illinois Department of Natural Resources
Lawrence Patterson	Illinois Department of Natural Resources
Levi Solomon	Illinois Natural History Survey
Dave Bierman	Iowa Department of Natural Resources
Andy Fowler	Iowa Department of Natural Resources
Mike Griffin	Iowa Department of Natural Resources
Scott Gritters	Iowa Department of Natural Resources
Kirk Hansen	Iowa Department of Natural Resources
Karen Osterkamp	Iowa Department of Natural Resources
Andy Robbins	Iowa Department of Natural Resources
Adam Thiese	Iowa Department of Natural Resources
Dan Dieterman	Minnesota Department of Natural Resources
Megan Moore	Minnesota Department of Natural Resources
Deanne Drake	Wisconsin Department of Natural Resources
Jim Fischer	Wisconsin Department of Natural Resources
Shawn Giblin	Wisconsin Department of Natural Resources
David Heath	Wisconsin Department of Natural Resources
Jeff Janvrin	Wisconsin Department of Natural Resources
Brenda Kelly	Wisconsin Department of Natural Resources
James Killian	Wisconsin Department of Natural Resources
Kurt Rasmussen	Wisconsin Department of Natural Resources
Keith Weaver	Wisconsin Department of Natural Resources
Gretchen Benjamin	The Nature Conservancy
Doug Blodgett	The Nature Conservancy
Dru Buntin	Upper Mississippi River Basin Association
Kirsten Mickelsen	Upper Mississippi River Basin Association
Scott Baker	U.S. Army Corps of Engineers
Andy Barnes	U.S. Army Corps of Engineers
Ken Barr	U.S. Army Corps of Engineers
Charles Bauer	U.S. Army Corps of Engineers
John Behrens	U.S. Army Corps of Engineers
Greg Bertoglio	U.S. Army Corps of Engineers
Charles Bishop	U.S. Army Corps of Engineers
Charles Boyd	U.S. Army Corps of Engineers
Scott Bullock	U.S. Army Corps of Engineers
Charlene Carmack	U.S. Army Corps of Engineers
Aleris Casataner	U.S. Army Corps of Engineers
Robert Cosgriff	U.S. Army Corps of Engineers
Chris DePooter	U.S. Army Corps of Engineers
Michael Dougherty	U.S. Army Corps of Engineers
Tim Eagan	U.S. Army Corps of Engineers
Rachel Fellman	U.S. Army Corps of Engineers

David Gossett	U.S. Army Corps of Engineers
Steve Gustafson	U.S. Army Corps of Engineers
LaShell Harper	U.S. Army Corps of Engineers
Jon Hendrickson	U.S. Army Corps of Engineers
Kat Herzog	U.S. Army Corps of Engineers
Karen Hagerty	U.S. Army Corps of Engineers
Marvin Hubbell	U.S. Army Corps of Engineers
Jennie Hoover	U.S. Army Corps of Engineers
Toby Hunemuller	U.S. Army Corps of Engineers
Derek Ingvalson	U.S. Army Corps of Engineers
Mark Jacobson	U.S. Army Corps of Engineers
Emily Johnson	U.S. Army Corps of Engineers
Joe Jordan	U.S. Army Corps of Engineers
Leo Keller	U.S. Army Corps of Engineers
Randy Kinney	U.S. Army Corps of Engineers
Terri Kirkeeng	U.S. Army Corps of Engineers
Tom Kirkeeng	U.S. Army Corps of Engineers
Rebecca Laugen	U.S. Army Corps of Engineers
Alex Le	U.S. Army Corps of Engineers
Joseph Lundh	U.S. Army Corps of Engineers
Nicole Manasco	U.S. Army Corps of Engineers
Brian Markert	U.S. Army Corps of Engineers
Garrett Mattila	U.S. Army Corps of Engineers
Kat McCain	U.S. Army Corps of Engineers
Benjamin McGuire	U.S. Army Corps of Engineers
Andy Meier	U.S. Army Corps of Engineers
Julie Millhollin	U.S. Army Corps of Engineers
Kara Mitvalsky	U.S. Army Corps of Engineers
Kyle Nerad	U.S. Army Corps of Engineers
Darron Niles	U.S. Army Corps of Engineers
Tom Novak	U.S. Army Corps of Engineers
Katie Opsahl	U.S. Army Corps of Engineers
Brad Palmer	U.S. Army Corps of Engineers
Rachel Perrine	U.S. Army Corps of Engineers
Marshall Plumley	U.S. Army Corps of Engineers
Bre Popkin	U.S. Army Corps of Engineers
David Potter	U.S. Army Corps of Engineers
Jotham Povich	U.S. Army Corps of Engineers
Nate Richards	U.S. Army Corps of Engineers
Lucie Sawyer	U.S. Army Corps of Engineers
Scott Schaeffer	U.S. Army Corps of Engineers
Kaileigh Scott	U.S. Army Corps of Engineers
Karla Sparks	U.S. Army Corps of Engineers
Erica Stephens	U.S. Army Corps of Engineers
Jessie Steslow	U.S. Army Corps of Engineers
Michael Tarpey	U.S. Army Corps of Engineers
Chuck Theiling	U.S. Army Corps of Engineers
Randy Urich	U.S. Army Corps of Engineers
Ben Vandermyde	U.S. Army Corps of Engineers
Kathy Kowal	U.S. Environmental Protection Agency

Sharonne Baylor	U.S. Fish and Wildlife Service
Ed Britton	U.S. Fish and Wildlife Service
Russell Engelke	U.S. Fish and Wildlife Service
Cathy Henry	U.S. Fish and Wildlife Service
Aleshia Kenny	U.S. Fish and Wildlife Service
Kraig McPeek	U.S. Fish and Wildlife Service
Mathew Mangan	U.S. Fish and Wildlife Service
Billy Reiter-Marolf	U.S. Fish and Wildlife Service
Cathy Nigg	U.S. Fish and Wildlife Service
Kendra Pednault	U.S. Fish and Wildlife Service
Ann Runstrom	U.S. Fish and Wildlife Service
Sara Schmuecker	U.S. Fish and Wildlife Service
Steve Winter	U.S. Fish and Wildlife Service
Tim Yager	U.S. Fish and Wildlife Service
Kristen Bouska	U.S. Geological Survey
Nate De Jager	U.S. Geological Survey
Jeff Houser	U.S. Geological Survey
KathiJo Jankowski	U.S. Geological Survey
Jim Rogala	U.S. Geological Survey
Jennie Sauer	U.S. Geological Survey
Steve Zigler	U.S. Geological Survey
Yao Yin	U.S. Geological Survey