UMRR LTRM Implementation Planning Update

Jeff Houser, Molly Sobotka

Upper Mississippi River Restoration
Leading · Innovating · Partnering

Implementation Planning

Why? To prepare for potential increased funding resulting from increased UMRR authorization under WRDA 2020

Goal: Develop a set of portfolios of actions that best address UMRR management and restoration information needs

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Process

- Identified **information needs** not being addressed by ongoing monitoring and science
- Developed **criteria** for assessing the expected benefit of addressing each information need
- Estimated **cost** of addressing each information needs
- Applied an **optimization** approach for identifying the collection of information needs that would produce the most benefit for a given cost if successfully addressed
- **Selected subset of information needs** for additional development
- **Recommend information needs** to address during FY24 – 26.

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Criteria for estimating expected benefit of addressing information need

- Relevance & Importance: Ecosystem Understanding/Assessment
- Relevance & Importance: Management and Restoration
- Depth of Current Knowledge
- Opportunity to Learn

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Optimization Worksheet

- Included:
  - Expected Benefit
  - Estimated Cost
  - Minimum number of years needed to obtain expected benefit
  - Annual funds available
- Allocated funds across years to maximize total expected benefit over 10 year period.
- Choose when to start on resolving information need
- Track costs and remain under budget cap
- Maximize total benefit

A	E	H	I	J	Q	R	S	T	U	V	W	X	Y	Z	
Information Needs	Control parameters				Portfolio allocation over 10 Years										
					Optimization Window										
IN Number	Select start year for IN	Benefit	Opportunity	Expected Benefit (Red=Hi Priority; Blue=Lo Priority)	1	2	3	4	5	6	7	8	9	10	Yea
1.1	0	4.78	0.82	3.90	$1,250,000	$0	$0	$0	$0	$1,250,000	$0	$0	$0	$0	
1.2	0	4.88	0.58	2.83	$0	$0	$0	$1,260,000	$0	$0	$0	$0	$0	$0	
1.3	0	4.90	0.60	2.92	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
1.4	0	4.98	0.63	3.14	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
2.1	0	5.33	0.79	4.21	$0	$1,258,000	$0	$0	$0	$0	$0	$0	$0	$0	
2.1a	1	4.88	0.67	3.25	$0	$1,258,000	$0	$0	$0	$0	$0	$0	$0	$0	

	B	C	D	E	F	G	H	I	J	K
1	N Numbe	IN Sort	Title	Expected Benefit (Red=Hi Priority; Blue=Lo Priority)	3 New Projects/Ye ar (3PY)	3PY modified (3PYm)	Top8	4 New Projects/Year (4PY)	5 New Projects/Year (5PY)	OptOnly (3.7 in yr 3)
2	2.1	2.1	Hydrogeomorphic change: Geomorphic trends	4.21	1	1	1	1	1	1
3	3.9	3.9	Aquatic ecology: lower trophic contribution	4.02	1	1	1	1	0	0
4	1.1	1.1	Floodplain Ecology: Vegetation Change Across the System	3.90	1	1	1	1	1	1
5	3.12	3.12	Aquatic ecology: river gradients	3.71	1	1	1	0	0	0
6	4.5	4.5	Restoration Applications: hypothesis testing	3.70	1	1	1	1	1	1
7	3.7	3.7	Aquatic ecology: macroinvertebrate contribution	3.61	1	1	1	1	1	1
8	4.3	4.3	Restoration Applications: floodplain vegetation change at HREP scales	3.56	1	0	1	1	1	1
9	3.1	3.1	Aquatic ecology: Aquatic plant distribution	3.53	1	1	1	1	1	1
10	4.1	4.1	Restoration Applications: habitat conditions	3.40	0	0	1	1	1	1
11	3.3	3.3	Aquatic ecology: mussel distribution	3.33	1	1	1	1	1	1
12	3.7a	3.75	Aquatic ecology: macroinvertebrate contribution	3.32	0	0	0	0	0	0
13	4.2	4.2	Restoration Applications: biotic response to HREPs	3.32	0	0	0	1	1	1
14	2.2a	2.25	Hydrogeomorphic change: implications and testing of process-based predictions of sediment dynamics…	3.30	0	0	0	1	1	1
15	4.4	4.4	Restoration Applications: soil dynamics and ecosystem processes at HREPs	3.30	0	0	0	0	1	1
16	2.1a	2.15	Hydrogeomorphic change: implications for improving restoration projects	3.25	0	0	0	1	1	1
17	1.4	1.4	Floodplain ecology: terrestrial and aquatic herpetofauna	3.14	0	1	1	0	1	0
18	3.9a	3.95	Aquatic ecology: lower trophic contribution	3.12	0	0	0	0	0	0
19	4.7	4.7	Restoration Applications: reduce invasive species impacts at habitat project sites	3.07	0	0	0	0	1	1
20	4.8	4.8	Restoration Applications: water level management	3.02	0	0	0	0	0	0
21	3.11	3.11	Aquatic ecology: tributary inputs	3.00	0	0	0	0	0	0
22	2.2	2.2	Hydrogeomorphic change: process-based predictions of sediment dynamics (erosion, transport, and deposition)	3.00	0	0	0	0	0	0
23	2.3a	2.35	Hydrogeomorphic change: implications of input, transport, and fate of large woody debris for restoration.	2.98	0	0	0	0	1	1
24	3.2	3.2	Aquatic ecology: fish community connectivity	2.96	0	0	0	0	0	0
25	1.3	1.3	Floodplain ecology: distribution of birds and bats	2.92	0	0	0	0	0	0
26	1.2	1.2	Floodplain ecology: Simulate alternative future conditions	2.83	0	0	0	0	0	1
27	4.6	4.6	Restoration Applications: Floodplain Connectivity	2.77	0	0	0	0	0	0
28	3.5	3.5	Aquatic ecology: fish populations	2.74	0	0	0	0	0	0
29	3.13	3.13	Aquatic ecology: Pollutants and habitat	2.74	0	0	0	0	0	0
30	2.3	2.3	Hydrogeomorphic change: evaluation of large woody debris source, transport, and fate	2.55	0	0	0	0	0	1
31					9	9	11	12	15	16

Recommended List of Information Needs

- 1.1 Fp Veg. change across system
- 1.4 Terr. and aquat. herpetofauna & ~~birds/bats~~
- 2.1 Geomorphic trends
- 3.1 Aquatic plant distribution
- 3.3 Mussels
- 3.7 Macroinvertebrates*
- 3.9 Lower trophic contribution
- 3.12 River gradients
- 4.1 Restoration: Habitat conditions
- 4.3 Restoration: FP HREP scale vegetation change
- 4.5 Restoration: Hypoth. testing

Recommended Information Needs for FY 24 - 26

- 1.1 Floodplain Veg. change across system
- 1.4 Terrestrial and aquatic herpetofauna
- 2.1 Geomorphic trends
- 3.1 Aquatic Plant distribution
- 3.3 Native Freshwater Mussel distribution
- 3.7 Macroinvertebrates*
- 3.9 Lower trophic contribution
- 3.12 River gradients
- 4.5 Learning from HREPs (4.1, 4.3, 4.5)

Implementation Planning Group

- Kirk Hansen IADNR
- Jim Lamer IRBS
- Molly Sobotka MDC
- Matt Vitello MDC
- Rob Burdis MDNR
- Nick Schlesser MDNR
- Neil Rude MDNR
- Andrew Stephenson UMRBA
- Davi Michl USACE
- Rob Cosgriff USACE

Facilitators:
David Smith (USGS, retired)
Max Post van der Burg (USGS)

- Karen Hagerty USACE (retired)
- Matt Mangan USFWS
- Steve Winter USFWS
- Kristen Bouska USGS
- Nate De Jager USGS
- Jeff Houser USGS
- Jennie Sauer USGS (retired)
- Robb Jacobson USGS
- Jim Fischer WDNR
- Madeline Magee WDNR

Additional expertise:
Danelle Larson (USGS)
Teresa Newton (USGS)

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Questions?

Upper Mississippi River Restoration
Leading · Innovating · Partnering

Floodplain Ecology: Floodplain vegetation change across the system

- **Goal**: A quantitative understanding of how the vegetation of the entire UMRS has changed since historical conditions (pre-lock and dam) as well as over the past 30 to 40 years.
  - How is the abundance of different species and age-classes changing across the system?
  - What are the main drivers of changes in floodplain vegetation communities?
  - How do different disturbances and management actions influence floodplain communities?
  - What are the long-term consequences of forest mortality on forest ecosystem resilience and landscape-scale diversity.
- **Approach**: Use existing data sets and tools to better understand and quantify long-term changes in plant communities, especially floodplain forest.
- **How results will be used**: Understanding how and why the floodplain vegetation communities have changed can identify effective management and restoration actions to sustain floodplain ecosystems of the UMRS

Floodplain Ecology: terrestrial and aquatic herpetofauna (amphibians and reptiles)

- **Goal**: Understanding the status of floodplain amphibian and reptile populations in relation to changing environmental conditions
  - What is the abundance, distribution, and status of reptile and amphibian species within the UMRS?
  - What drives reptile and amphibian abundances and distribution throughout the UMRS and individual reaches?
- **Approach**:
  - Assess LTRM fisheries turtle bycatch data
  - Amphibian acoustic monitoring
  - Camera traps to estimate abundance of amphibians and reptiles
- **How the results will be used**:
  - Assess ecosystem health and resilience
  - Improve management and restoration by identifying project features that could improve habitat condition and use
  - Prepare for emerging issues
  - Develop a management guide for amphibians and reptiles based on findings

Upper Mississippi River Restoration
Leading · Innovating · Partnering

Hydrogeomorphic change: Geomorphic trends

- **Goal**: A predictive understanding of how the mosaic of habitats of the UMRS will change over time.
  - 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?
  - How do these geomorphic changes relate to long-term changes in discharge and episodic weather events?
  - How are geomorphic changes affected by ongoing navigation channel operations, e.g., dredging and placement site operations, wing dikes, closing structures, revetments, etc.?
  - What are the implications for the future spatial and temporal distributions of habitat conditions?
- **Approach**:
  - Evaluate existing and new data sets for ability to detect change
  - Assess geomorphic change at system and pool scales
  - Assess geomorphic change in select areas of expected change or that are important habitat. Collect local scale data in select areas to do so.
- **How the results will be used**
  - Integrated understanding of changes in hydrology and geomorphology is fundamental to understanding the resilience of the UMRS and for planning sustainable research projects

Aquatic ecology: Aquatic plant distribution

- **Goal**: to better understand the current limitations of submersed, emergent and floating plants.
  - What are the factors which limit aquatic plant distribution and (re)establishment throughout the UMRS?
  - What is the role of tributatry inputs?
  - How does the hydrologic regime affect aquatic plant community dynamics? What are the implications of shifting seasonality and magnitude of hydrologic extremes?
- **Approach:**
  - Additional data collection in areas where vegetation remains scarce
- **How the results will be used**: a better understanding of what limits aquatic vegetation where it remains scarce can guide the location and type of appropriate actions for the restoration and management of aquatic vegetation

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Aquatic ecology: Native freshwater mussel distribution

- **Goal**: Quantify the distribution, abundance, and assemblage structure of native freshwater mussels throughout the UMRS ecosystem.
- **Approach**:
  - Leverage the existing poolwide surveys with by sampling additional pools and/or resample pools with existing poolwide data
  - Re-sample selected pools on a 5-year cycle
- **How the results will be used**:
  - Assess the health and resiliency of the UMRS
  - Predict how mussel assemblages may respond to changing environmental conditions (e.g., climate change; increased navigation traffic)
  - Identify hotspots for abundance and diversity that will facilitate prioritization of areas for restoration efforts and avoidance of areas for restoration projects
  - Track changes in species richness, including species of greatest conservation need.

Aquatic ecology: Lower trophic contribution (phytoplankton and zooplankton)

- **Goal**: Establish baseline conditions in the UMRS and investigate relationships between plankton and environmental conditions
  - What is the abundance, distribution, and status of zooplankton and phytoplankton in the UMRS?
  - How do they change in response to changes over time in the UMRS?
  - What are the implications for the health and resilience of the UMRS?
- **Approach**:
  - Phytoplankton work can be based on augmentation of ongoing LTRM phytoplankton sample collection
  - Zooplankton work will include additional field station staff to implement monitoring and data analysis
- **How the results will be used**:
  - Indicators of the health and resilience of the UMRR
  - Assessing ecological response to ongoing environmental changes

Upper Mississippi River Restoration
Leading·Innovating·Partnering

Aquatic ecology: Macroinvertebrate contribution

- **Goal**: Better understand the contribution of macroinvertebrates to the health and resilience of the UMRS to inform restoration and management
- **Approach**:
  - Initial work is being done through a 2022 Science Meeting proposal to resume macroinvertebrate monitoring using a modification of the LTRM methods that ceased in 2004.
- **How the results will be used**:
  - Indicator of the health and resilience of the UMRS.
  - Better understand the causes and consequences of changes in other components of the ecosystems (water quality, vegetation, fisheries, etc).
  - May broaden the aspects of habitat considered in selecting HREPS and designing their features.

Aquatic ecology: river gradients from Pool 14 to Pool 25

- **Goal**:
  - Short-term: Further develop this information need based on existing data and partnership information needs in this region of the UMRS.
  - Long-term: Better understand the gradients in WQ conditions, vegetation distribution and abundance and fish populations across Pools 14 to 25.
- **Approach**:
  - Hire a scientist to expand upon initial description of the information need, assess current data needs, synthesize what is known from existing data, and design sampling plans
- **How the results will be used**:
  - Inform assessment of UMRS ecosystem health and resilience
  - Inform selection and design of restoration projects and management decisions in the UMRS.

Restoration Applications: Learning from restoration and management

- **Goals**:
  - Build capacity to learn from restoration and management actions across the UMRS.
  - Reduce uncertainties regarding the response to those actions
  - Enhance the capacity of LTRM to provide technical expertise as part of HREP project development teams
- **Approach**:
  - Before/after studies of project areas
  - Retroactive assessments across projects and districts
  - Investigate species habitat relationships
  - Supported (funds and personnel) by LTRM and HREP elements
- **How the results will be used**:
  - To improve our understanding of how the UMRS responds to restoration and management actions and use that information to improve future action

Upper Mississippi River Restoration
Leading·Innovating·Partnering