

ABSTRACT

Title: Disperse and Decentralize

Location: Fulton, Illinois (unbuilt)

Entry Category: Student Work

The lock and dam system on the Upper Mississippi River was originally designed for the singular purpose of navigation. As dams across the nation continue to exceed their expected lifespan, the future of these landscapes must be considered in parallel with future climate and social needs. This project therefore aims to challenge the singularity and assumed permanence of mega-infrastructure through the diffusion of spatial, social, and ecological infrastructures.

NARRATIVE

'Disperse and Decentralize' functions under a speculative policy that requires the decommissioning of all locks and dams on the Upper Mississippi River by 2050. A proposed collaborative of activists, scientists, designers, and local specialists are incentivized to participate in the future of the surrounding landscape at US Army Corp Lock and Dam 13 in Fulton, Illinois. Focus on frameworks for sediment movement, phytoremediation of agricultural runoff via biomass production, and floodplain forest restoration are explored in three different zones on site.

Under the supposed 'Future Landscapes' Policy, the Upper Mississippi Collective forms to work between federal, state, and local governing bodies to provide the communities around Lock and Dam 13 with ways to be involved with the proposed changes to the landscape. Important emphasis is made on landscape processes - detailing the ways in which the movement of sediment, changing of watercourses, and tree planting is an effort made and maintained by people, while also restoring innate rights of our waterways to exist, thrive, and regenerate.

Pierre Belanger's book "Landscape as Infrastructure" guided the title's namesake and larger concepts behind redefining industrially engineered infrastructure. "As indicators of the limits of single-purpose infrastructure, bridge breakdowns and dam cracks are now informing a new generation of practitioners - urbanists - who are putting into question industrial economies of scale upon which the growth of the twentieth century contemporary society has been built on, asking important questions about the future. What infrastructure should be rebuilt? How should it be rebuilt? Should it be rebuilt at all?"¹

1 Belanger, Pierre. *Landscape as Infrastructure*. Routledge, 2017.



Site Analysis

Pool 13 in Fulton, Illinois is one of the widest stretches of the upper Mississippi River. Soil erodability, riverine sediment movement, and land use are overlaid to analyze existing site conditions. Teal area directly east of the lock and dam highlights moderate soil erodability risk, while not currently of high concern, may present future complications when lock and dam systems are decommissioned.

ENHANCEMENT OF BACKWATERS
 Existing backwaters habitat consists of water lily monoculture which denotes a water depth of 18-24'. The plan for Zone 1 proposes seasonal dredging to increase bathymetric diversity to promote ecological diversification. Dredged sediment will be reallocated to designated areas on site. Additionally, the capture of sediment flowing through newly activated backwaters will be used to build up specific areas of the floodplain to create more resilient edge conditions in preparation for future dam removal.

ZONE 1

JOHNSON CREEK RE-MEANDER
 Johnson Creek is currently a channelized agricultural drain with direct outflow to the Mississippi River. Zone 2 focuses on stream bed health and bioremediation of excess phosphorus and nitrogen. The re-meandering of Johnson Creek will slow the flow of water through Zone 2 and maximize contact with plant material for phytoremediation. These plants will then be harvested for biomass annually to remove excess nutrients from the ecosystem, which creates an upstream defense against eutrophication in the Gulf of Mexico. Once harvested, biomass is processed at nearby facilities which provide farmers with biochar soil amendment.

ZONE 2

FLOODPLAIN FOREST CANOPY RESTORATION
 Existing canopy cover along the Upper Mississippi Corridor has dwindled since Emerald Ash Borer and Dutch Elm Disease - today most of the canopy is made up of Silver Maples. Excess rainfall and farmland drainage are major contributors to continued canopy loss for high water. Currently USACE, DNR, and US Fish and Wildlife Service are developing projects for floodplain forest regeneration and diversification on the federal floodplain land purchased in the 1930's for the 9 Foot Channel Project. Zone 3 proposes the addition of community-led monitoring to increase project success rate and foster communal ownership of local waterways.

ZONE 3



Context Aerial

Providing initial background on Zone 1, Zone 2, and Zone 3 and locations in relation to one another at the Lock and Dam.

POLICY: UPPER MISSISSIPPI COLLABORATIVE

Just as the US Army Corp of Engineers has standardized river navigation since 1919, the Upper Mississippi River Collaborative will function to bring multiple perspectives into planning conversations for shared river resources. Particular attention is paid to sediment and pollution management practices. New policy operates under the understanding that **existing lock and dam infrastructures will be phased out** within the next 25 years. UMSPC will research, oversee, and plan with human degraded landscapes, starting at US Army Corp of Engineers Lock and Dam 13 located in Fulton, IL.

"UMSPC" will include expertise from land use specialists, floodplain and shoreland planners, local representatives, ecologists, engineers, and design specialists. Specific focus is given to the following efforts:



This policy and subsequent collaborative is designed to work in collaboration with the existing **Lower Pool 13 Habitat Restoration and Enhancement (HREP) Plan** authorized in 2020 which aims to, "maintain, enhance, restore, and emulate natural river processes, structures and functions to promote a sustainable ecosystem; and to maintain, enhance, and create quality habitat for all native and desirable plant, animal, and fish species."

The US Army Corp of Engineers will be partnering with local DNR and Parks staff to provide necessary research and equipment required for the following reclamation measures to go above and beyond existing proposed work with focus on engaging residents and visitors with site processes:

FLOODPLAIN ZONES

- Branched River Channel
- Backwaters Enhancement
- Bioengineered Breakwater

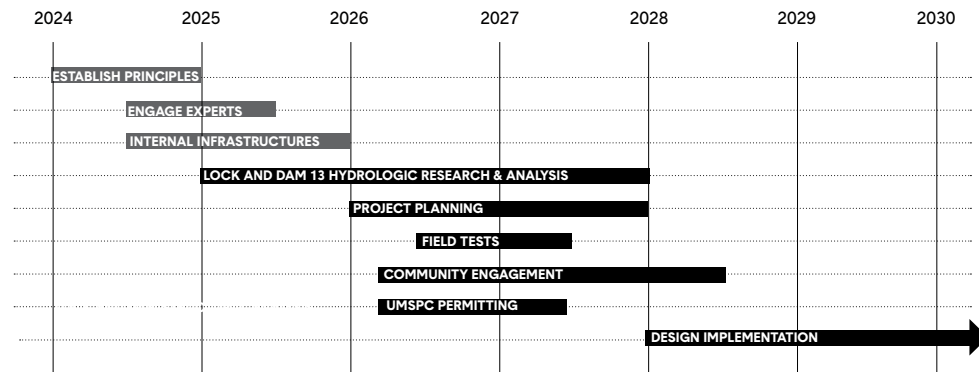
SEMI-NATURAL RIPARIAN MANAGEMENT

- Scour Holes & Sediment Traps
- Terraced Revetment
- Retention Basins

FLEXIBLE ENGAGEMENT

- Boulders & Stepping Stones
- Submergable Infrastructure
- Sand & Gravel Beaches

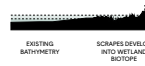
TIMELINE: ORGANIZATION STRUCTURING & LOCK AND DAM 13 INTERIM PHASE PLANNING



FRAMEWORK FOR RIPARIAN DESIGN STRATEGIES ON THE UPPER MISSISSIPPI FOR HEALTHY WATERWAYS & ACTIVE COMMUNITIES

1. FLOODPLAIN ZONES ENGINEERING / DESIGN

1A. BACKWATERS ENHANCEMENT

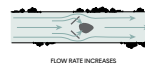


1B. BIOENGINEERED VEGETATED EDGE



2. SEMI-NATURAL RIPARIAN MANAGEMENT ECOLOGY / ENGINEERING / LAND USE / DESIGN

2A. SCOUR HOLES & SEDIMENT TRAPS



2B. TERRACED REVETMENT



3. AGRICULTURAL STREAM NATURALIZATION COMMUNITY / LAND USE / ENGINEERING

3A. BIOMASS HARVESTING

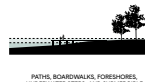


3B. RETENTION BASINS



4. FLEXIBLE ENGAGEMENT COMMUNITY / DESIGN

4A. SUBMERGIBLE INFRASTRUCTURE



4B. CITIZEN SCIENCE



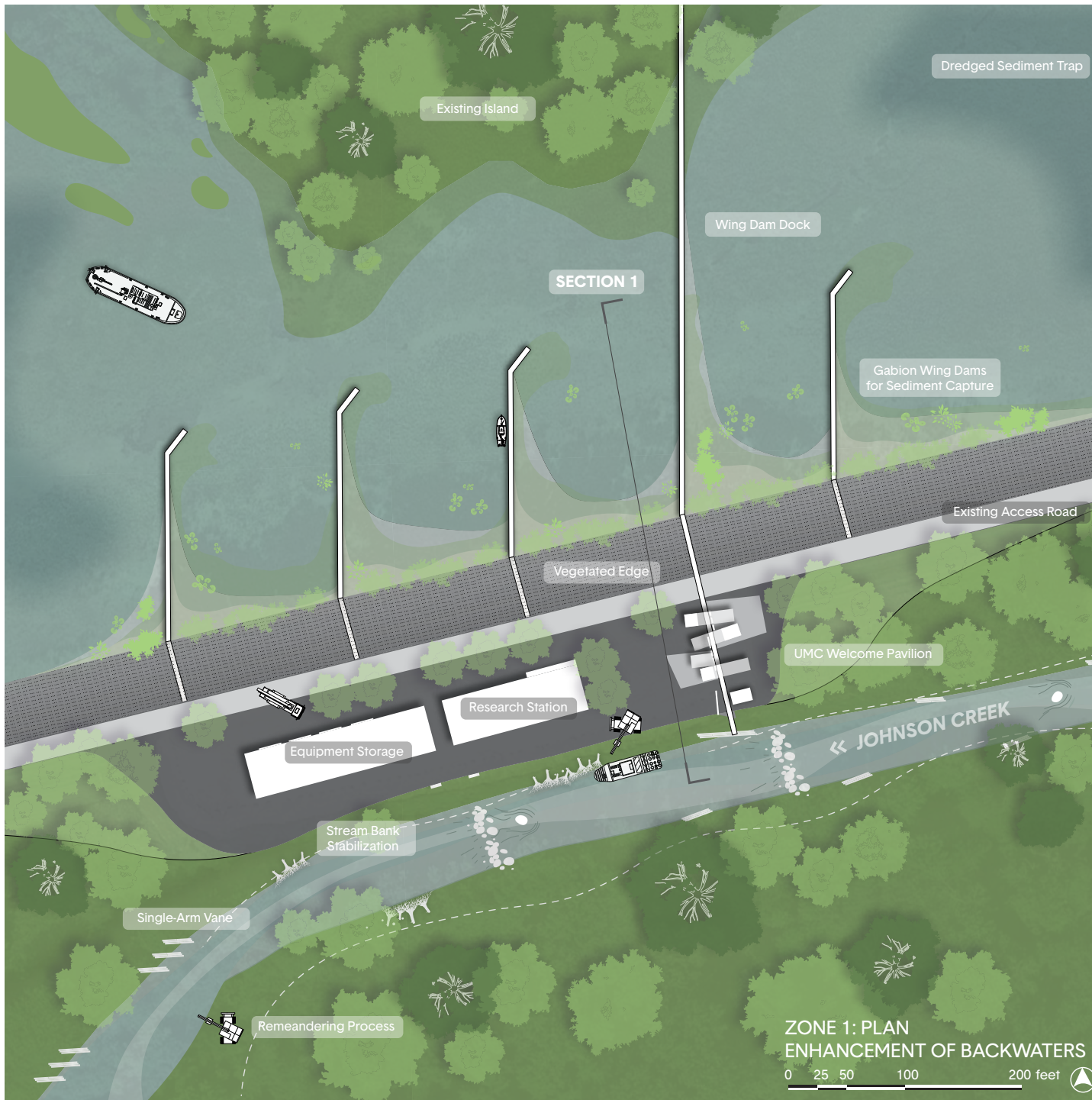
GET INVOLVED!

Upper Mississippi Collaborative has many paid and volunteer opportunities for those interested in our river system. Check out our website for future events: mississippirivercollaborative.org



Thank you for visiting Pool 13!

Speculative Policy & Design Framework for Riparian Design and Upper Mississippi Collaborative featured in Field Guide folders presented during final review for guests to get a sense of what working or volunteering at Pool 13 may consist of should they choose to contribute to project efforts. Diagrams inspired by book 'River. Space. Design' authored by Prominski, Stokman, Stimberg, Voermanek, Zeller, Bajc, Zheng.



Zone 1 Plan

Citizen Science Welcome Pavilion greets visitors as they enter the site on Lock Road. Currently stagnant backwaters have been systematically dredged to increase water flow in combination with earthen dam removal to reconnect backwaters south of the dam. Gabion Cage boardwalks extend into backwaters to capture sediment from increased water flow. Visitors are encouraged to measure sediment depths and log findings on the 'Sediment Movers' app.



Zone 2 Plan

A primary goal to capture excess nitrogen and phosphorus runoff from surrounding agricultural fields takes place in the Johnson Creek Re-Meander project. Johnson Creek is currently a channelized agricultural ditch with outflow directly into the Mississippi River. The re-meandering is important to slow the rate of water, provide additional time for phytoremediative plants to absorb ag runoff, and restore the creek a sense of freedom to contributing waterways.



Zone 3 Plan

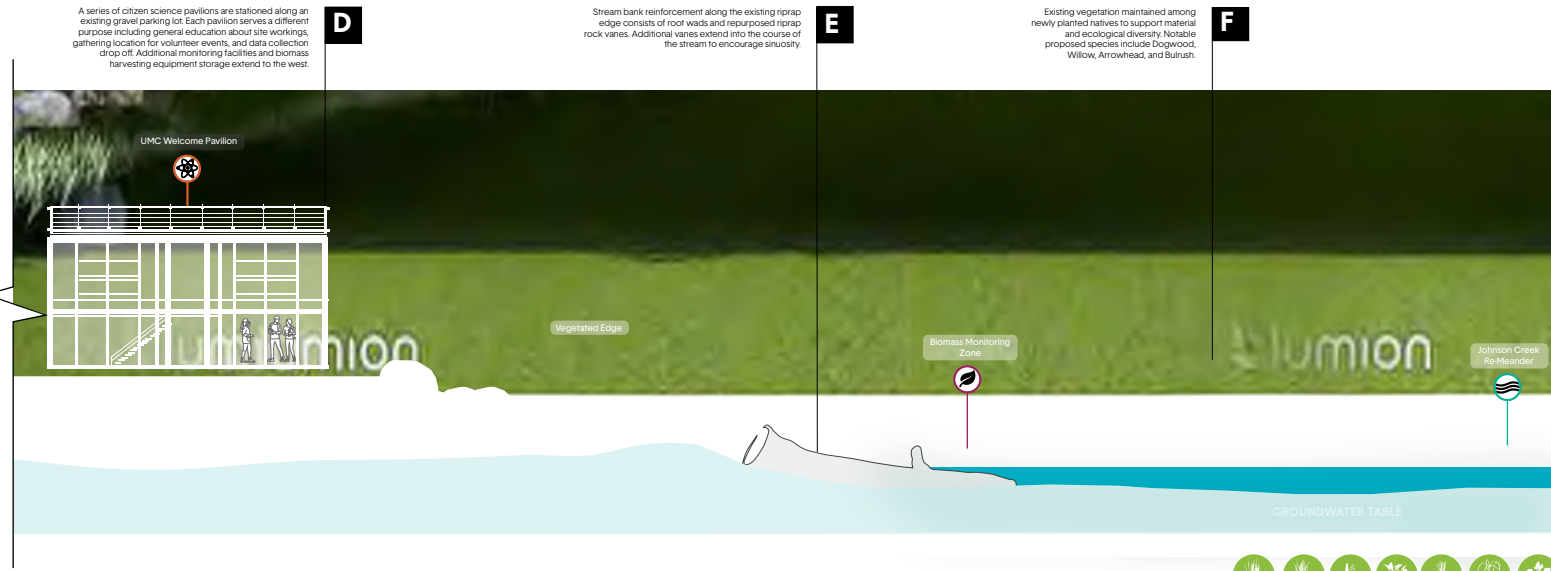
West of the lock and dam is a floodplain forest island. Certain areas of the canopy have degraded over time, likely due to the combined effects of pests, such as Meander Ash Borer and Dutch Elm Disease, and increased extreme flood events. While the lock and dam is still operational, visitors may enter Zone 3 by kayak to monitor and record wildlife sightings on the Wildlife Spotters App.

Multi-use gabion boardwalk functions as pedestrian access and wing dam to build up sediment along the structure over time as water flow increases through currently stagnant backwaters. Limestone riprap is repurposed in gabion cages to provide additional habitat for aquatic organisms.



**ZONE 1
SUMMER RECREATION & CITIZEN SCIENCE**

A series of citizen science pavilions are stationed along an existing gravel parking lot. Each pavilion serves a different purpose including general education about site workings, gathering location for volunteer events, and data collection drop-off. Additional monitoring facilities and biomass harvesting equipment storage extend to the west.



Zone 1 Section

Section cut runs through Lock Road looking east. Gabion boardwalk wing dams capture sediment in backwaters while the access road guides staff and visitors toward the Welcome Pavilion. Johnson Creek remains south of Lock Road with repurposed site materials, such as tree root wads, for bank stabilization.



Existing ponds along Johnson Creek become retention basins as the proposed remeander expands from its existing channel. Additional retention space allows contaminated sediment to fall out of suspension and be processed by facilities on-site.

A

Biomass vegetation planted along access corridors to be gathered for processing annually in early fall.

B

Biomass Corridor is a small rail track situated on piles to move through marshy areas. Small train for harvesting is repurposed from existing Army Corp Tow Rail system.

C

Excess riprap and concrete is installed into gabion cages installed as vanes in Johnson Creek to divert flow and encourage better sinuosity and support scour pools for habitat.

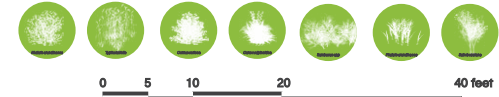
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E

Additional space for Johnson Creek to remeander provides additional opportunities for plants to take up and process excess phosphorus and nitrogen from adjacent agricultural fields.



**ZONE 2
EARLY FALL BIOMASS HARVEST**



Historically, the Upper Mississippi forests were composed of Elm, Ash, and Maple. Following Emerald Ash Borer and Dutch Elm Disease, the remaining Maples were quickly decimated by flood events. Still on ongoing issue, canopy cover between Bellevue and Clinton, Iowa dropped 18% between 2010 and 2020 according to Nathan De Jager, researcher for the U.S. Geological Survey. Source: Heim, Madeline, Wisconsin Watch, 2023.

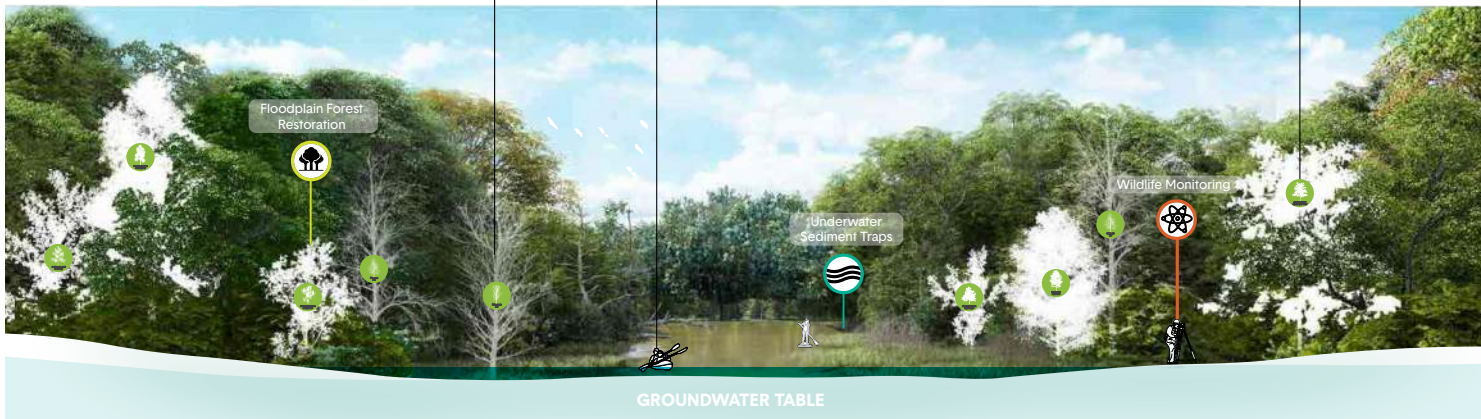
A

B

Zone 3 Floodplain Forest Restoration volunteers recording wildlife sightings by kayak through adjacent stream ecosystem

Additional tree species planted to diversify existing floodplain forest canopy.

C

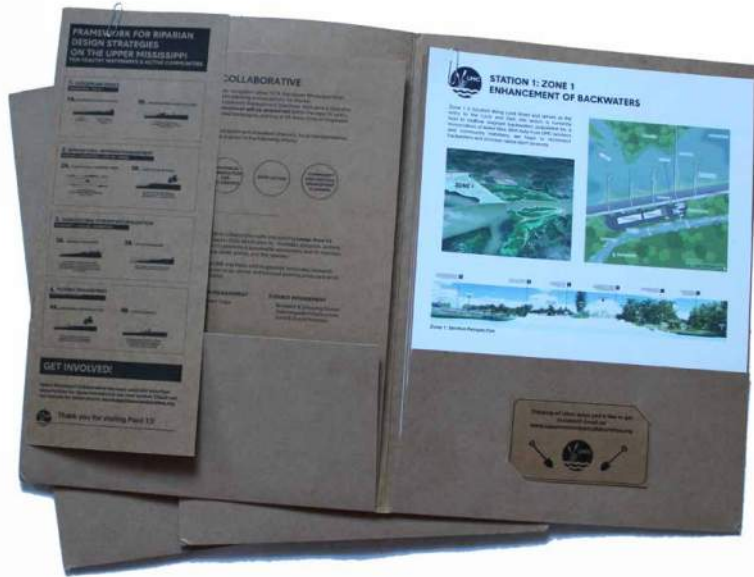


**ZONE 3
SUMMER WILDLIFE MONITORING**



Zone 2 Section (Above)
Highlights the Biomass Corridor in action during early fall harvest along the re-meandering Johnson Creek.

Zone 3 Section (Left)
Citizen Scientists on kayak, paddleboard, and by foot are on the lookout for wildlife to log in the restored floodplain forest canopy.



Field Guide Packets (Right)

Citizen Science Field Guide packets presented to reviewers include an overview of policy, framework strategies, collaborative background, three zones, and how they may get involved in volunteering or working with the collaborative.

Monitoring Guides (Below)

Instructions provided in the packets for elective participation in each zone.

STATION 1_ZONE 1: BACKWATERS SEDIMENT QUALITY MONITORING ON THE UPPER MISSISSIPPI RIVER

Thank you for dedicating your time to assist UMC's ecological research at Station 1 in Fulton, Illinois on the Mississippi River.

Please scan the QR code below to download the UMC Sediment Movers App and get started measuring sediment depth and quality in the backwaters along Pool 13. This app will allow you to:

- 1) Determine sediment composition
- 2) Measure depth of sediment at marked locations in backwaters habitat
- 3) Record findings in Sediment Movers App

YOU WILL NEED:

Monitoring Locations Map Sediment Probe Smart Phone & Sediment Movers App

SCAN HERE

SUBMIT YOUR FEEDBACK!

Share comments about your experience on our Healthy Waters team in the box below. Once complete, tear at the dotted line and leave it in the submission box at the Welcome Pavilion.

Name: _____

Contact: _____

Feedback: _____

STATION 1_ZONE 2: WATER NUTRIENT MONITORING ON THE UPPER MISSISSIPPI RIVER

Thank you for dedicating your time to assist UMC's ecological research at Station 1 in Fulton, Illinois on the Mississippi River.

Please scan the QR code below to download the UMC Healthy Waters App and get started measuring nitrogen and phosphorus runoff in Johnson Creek. This app will allow you to:

- 1) Check out UMC nutrient monitoring equipment at the Welcome Pavilion
- 2) Take spot sample measurements of nitrogen and phosphorus quantities along Johnson Creek and surrounding marshland habitat
- 3) Record measurements in Healthy Waters app

YOU WILL NEED:

Monitoring Locations Map Water Sample Test Kit Smart Phone & Healthy Waters App

SCAN HERE

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Feedback: _____

STATION 1_ZONE 3: WILDLIFE MONITORING ON THE UPPER MISSISSIPPI RIVER

Thank you for dedicating your time to assist UMC's ecological research at Station 1 in Fulton, Illinois on the Mississippi River.

Please scan the QR code below to download the UMC Wildlife Spotter App and get started logging wildlife. This app will allow you to:

- 1) Record observations of various wildlife sightings
- 2) Track a hike or kayak where you may see wildlife along the Mississippi River in Pool 13
- 3) Geolocate photographs and video recordings of animal, insect, fish, and herbaceous life sightings

YOU WILL NEED:

Restoration Sites Map Binoculars Smart Phone with Camera & Wildlife Spotters App

SCAN HERE

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