Addressing Science and Conservation Gaps in the Mississippi River Basin

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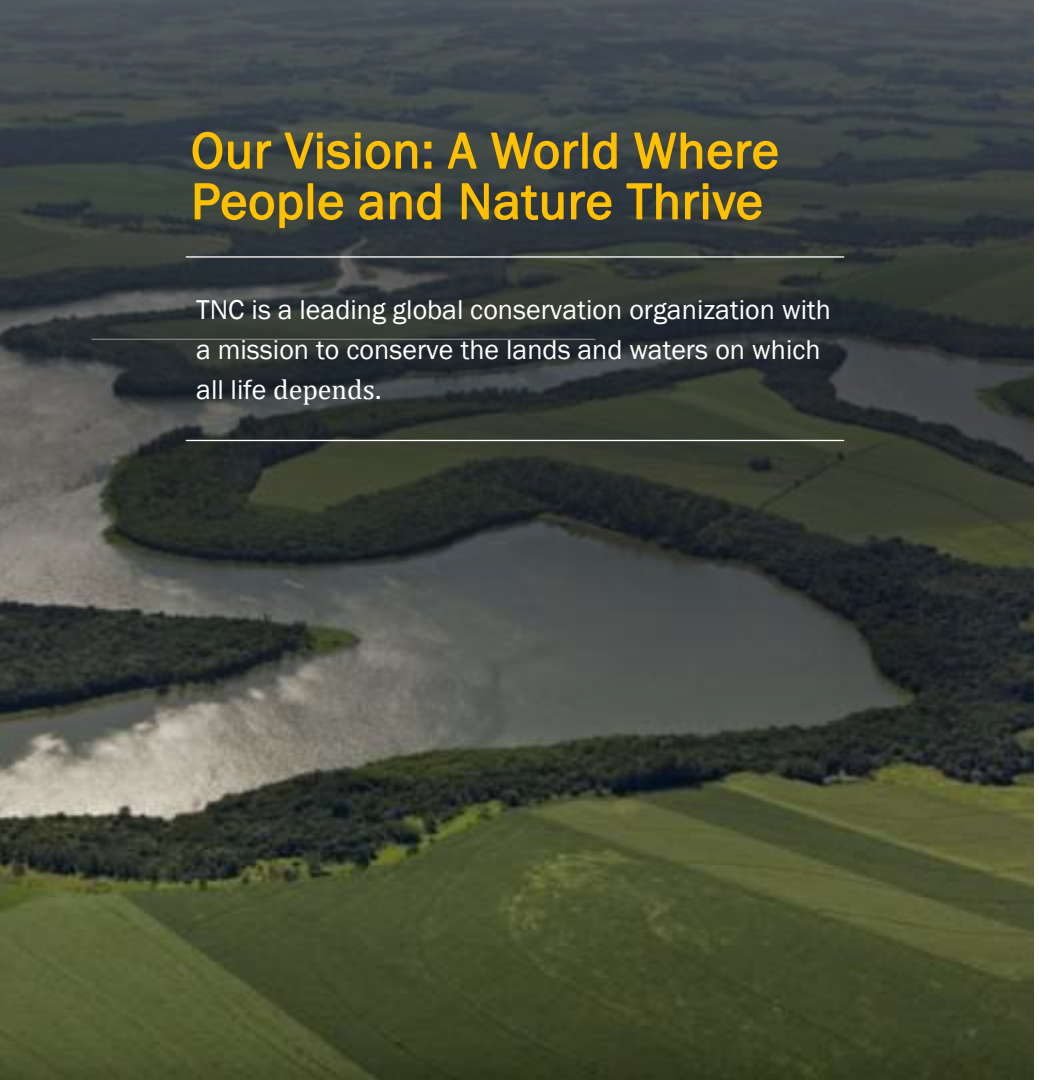


Our Vision: A World Where People and Nature Thrive

TNC is a leading global conservation organization with a mission to conserve the lands and waters on which all life depends.

3,600 conservationists

1,300 prominent volunteer leaders

72 countries

400 scientists

A FAR-REACHING ALUMNI NETWORK of leaders in the conservation community

50 U.S. states

1 MILLION dedicated members

TNC's 2030 Goals

FRESHWATER

1M KM OF RIVERS CONSERVED

30M HA OF LAKES & WETLANDS CONSERVED

THE TARGET: Conserve 1 million km of river systems and 30 million hectares of lakes and wetlands—enough river length to circumnavigate the globe 25 times.

THE HOW: Engaging in collaborative partnerships and promoting policies that improve the quality and amount of water available in freshwater ecosystems and communities.

LANDS

650M HECTARES CONSERVED

THE TARGET: Conserve 650 million hectares of healthy lands, such as forests and grasslands—an area twice the size of India.

THE HOW: Partnering to improve management of working lands, elevating the efforts of Indigenous peoples, and supporting better forest management to sequester carbon.

OCEAN

4B HECTARES CONSERVED

THE TARGET: Conserve 4 billion hectares of ocean—more than 10% of the world's ocean area.

THE HOW: Making sure that the ocean thrives through new and better-managed protected areas, sustainable fishing practices and positive policy changes.

CLIMATE

3 GT CO_2E REMOVED OR SEQUESTERED

THE TARGET: Remove or sequester 3 billion metric tons of carbon dioxide emissions (CO_2E) per year—the same as removing 650 million cars off the road.

THE HOW: Using the power of nature to store carbon, and the strength of policy to cut emissions equivalent to nearly a tenth of global emissions from fossil fuels.

100M PEOPLE BENEFITED

THE TARGET: Help 100 million people who are most likely to be affected by climate-related emergencies such as floods, fires and drought.

THE HOW: Investing in nature to improve the health of habitats such as mangroves and reefs that absorb wave energy and equitably protect people in coastal communities.

PEOPLE

45M PEOPLE SUPPORTED

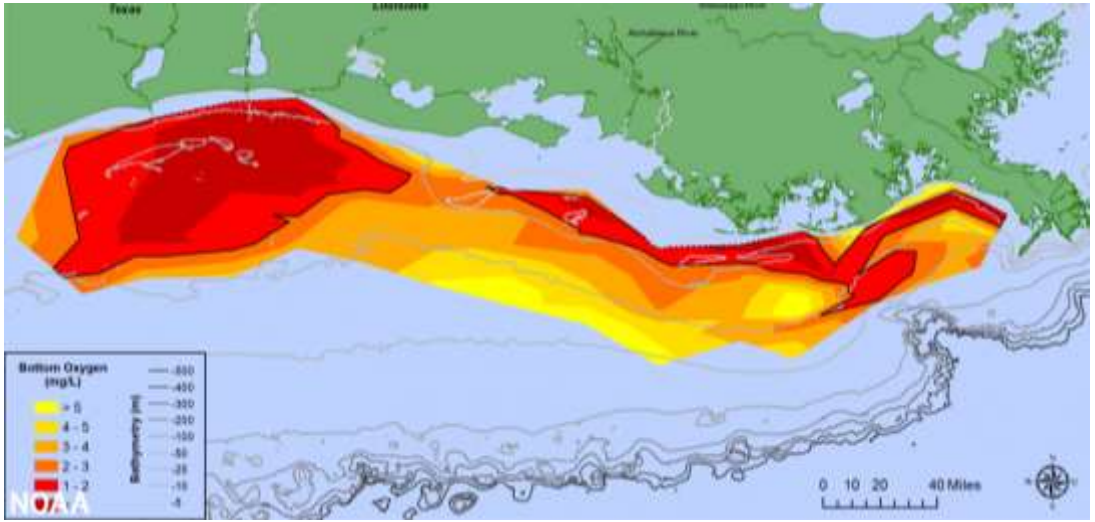
THE TARGET: Support 45 million people who depend on ocean, freshwater and lands for their wellbeing and livelihoods.

THE HOW: Ensuring equitable access for people who rely on landscapes and seascapes so they can improve their economic opportunities, secure rights to resources and better shape their future.


PRIORITY LANDSCAPES
Mississippi River Basin
20%
Reduction in nutrients
entering the Gulf by 2025

Critical Gaps

1. Science Gap
2. Financing Gap
3. Monitoring Gap



Targeting Agricultural BMPs for Water Quality and Biodiversity in the Upper Mississippi River Basin

Conservation Effects Assessment Program, Wildlife Assessment (CEAP-Wildlife)

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NRCS, CEAP-Wildlife Assessment

What does conservation on agricultural lands mean for water quality and aquatic biodiversity?

1. **Hydrological, sediment and nutrient modeling**
   How do Ag BMPs impact water quality?
   - University of Kansas, University of Minnesota, Texas A&M University, USDA, Agricultural Research Service, USGS

2. **Fish community analysis and modeling**
   Linking water quality benefits to local fish communities.
   - University of Missouri, Michigan State University

3. **Web-based decision support toolkit**
   Easy to use, designed by stakeholders and decision-makers for maximum use.
   - TNC

4. **Outreach and communication**
   Working with partners and decision-makers on the ground. Telling our story.
   - TNC

This work will be done across the Upper Mississippi Basin.

Making a big shared goal like nutrient reduction locally relevant.

Markets for Floodplain Reforestation

Financing reforestation in the Delta

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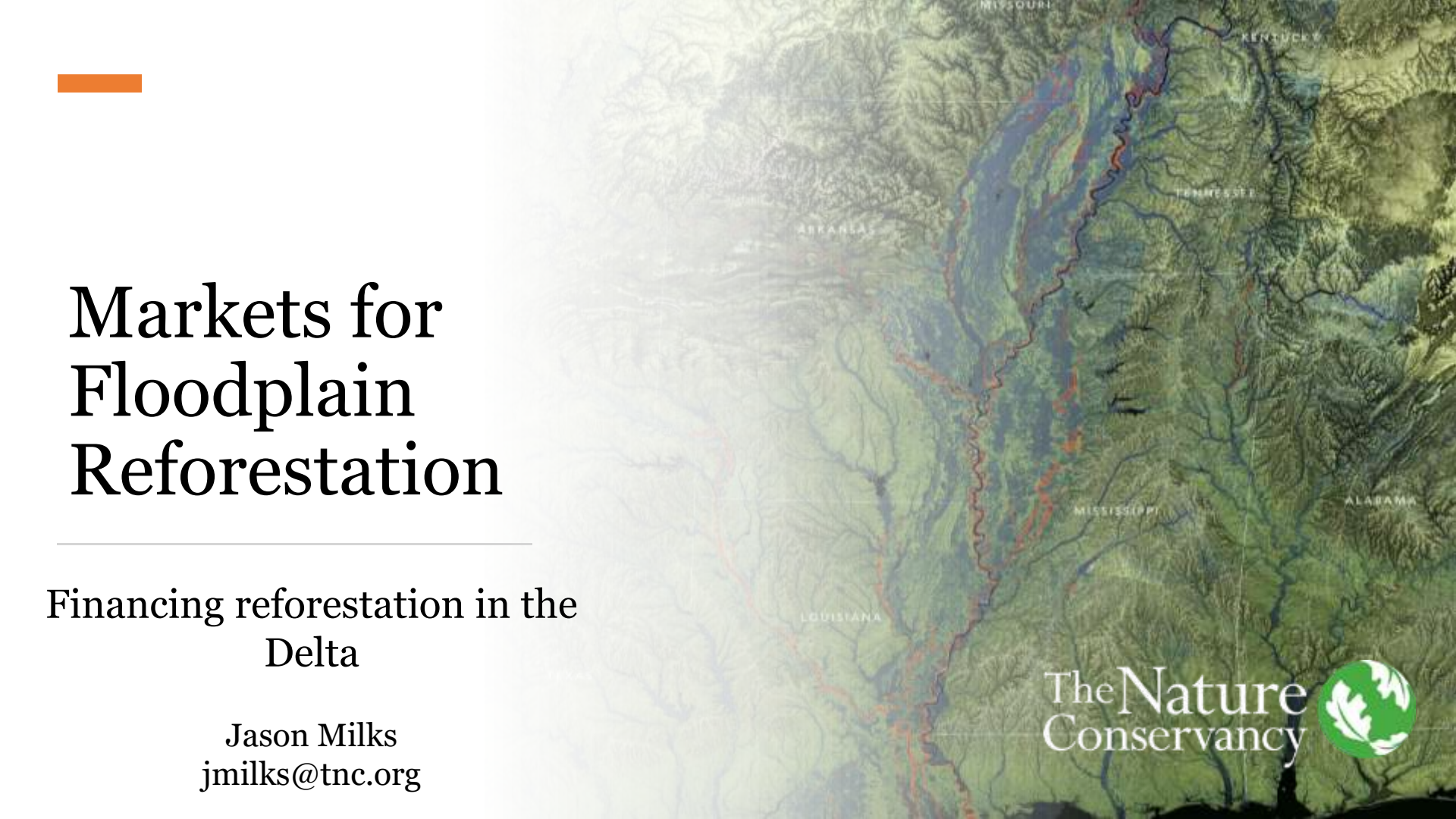


The Need is Great

- The same counties and farmers are impacted every year.
- Only 1 of 9 applications for reforestation of flooded land are funded by NRCS.

The Delta's floodplains offer an opportunity to address major climate impacts

We have a strong science-based plan

Landowners are eager to participate

Increasing interest in carbon & co-benefits

Conservation Finance Plan

Funders

Invest in the reforestation finance effort

Landowners

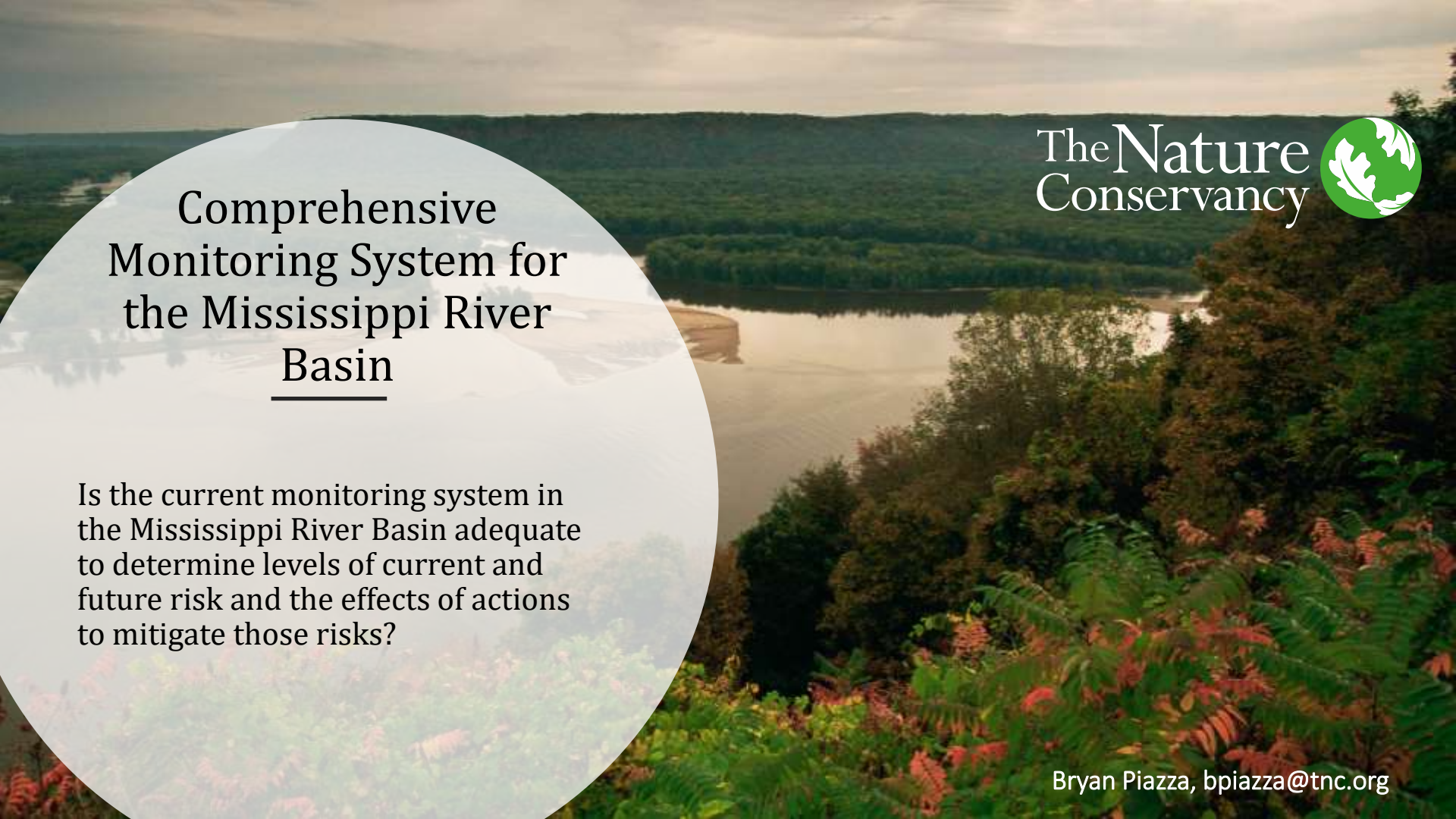
Receive payments for the use of frequently flooded land

Partners

Conserve and reforest the frequently flooded land, sell carbon credits

Carbon Buyers

Purchase carbon credits from the reforested land



Comprehensive Monitoring System for the Mississippi River Basin

Is the current monitoring system in the Mississippi River Basin adequate to determine levels of current and future risk and the effects of actions to mitigate those risks?

The Nature Conservancy

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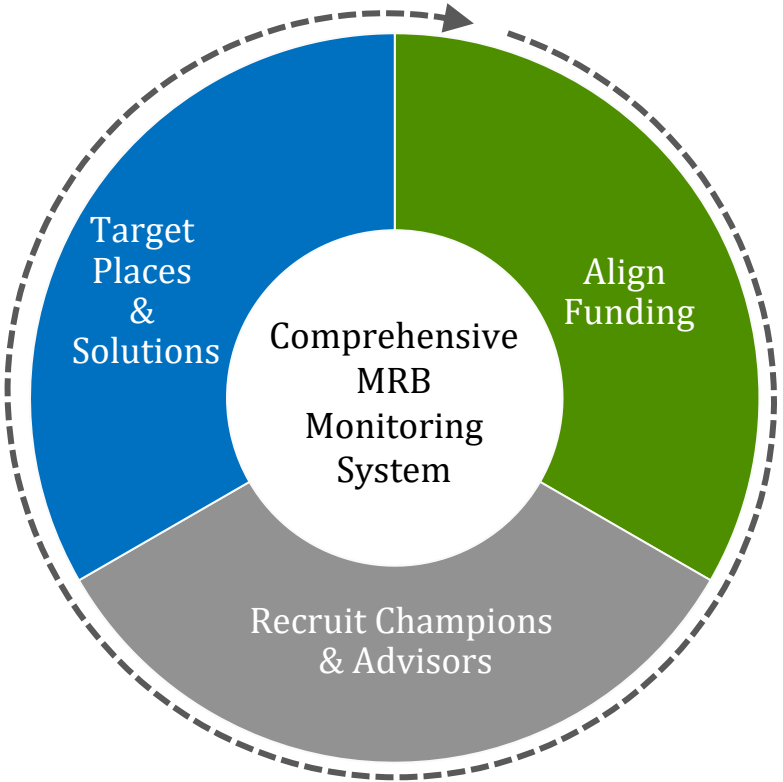
A fully-funded sentinel monitoring system across the Mississippi River in the next five years.

- Rapid “sprint” workshops
- Technical Design Teams
- Advocacy and Communications Team



Building a Coalition for Action

Goal

Speak as a unified voice and acquire the support and public funding necessary to meet monitoring goal for the MRB

- Began building and activating the coalition in Spring 2021
- Technical coalition members (bottom) designed and costed the system Fall 2022
- Advocacy coalition members (top) will advocate for funding in Spring 2023
- The coalition is still growing – come join us!

Priorities – as decided by the Coalition

Leverage systems in place and available funding

Water Quality & Hypoxia

Flood Risk Management & Resilience

Navigation safety

Ecosystems and Habitat Quality

Identified Core Objectives

1. Obtain consistent, comparable information on loads and trends in streamflow, water-quality , and sediment to understand how changes in climate, land-use, and landscape management are affecting the Mississippi River, major tributaries, and inputs to the Gulf of Mexico.

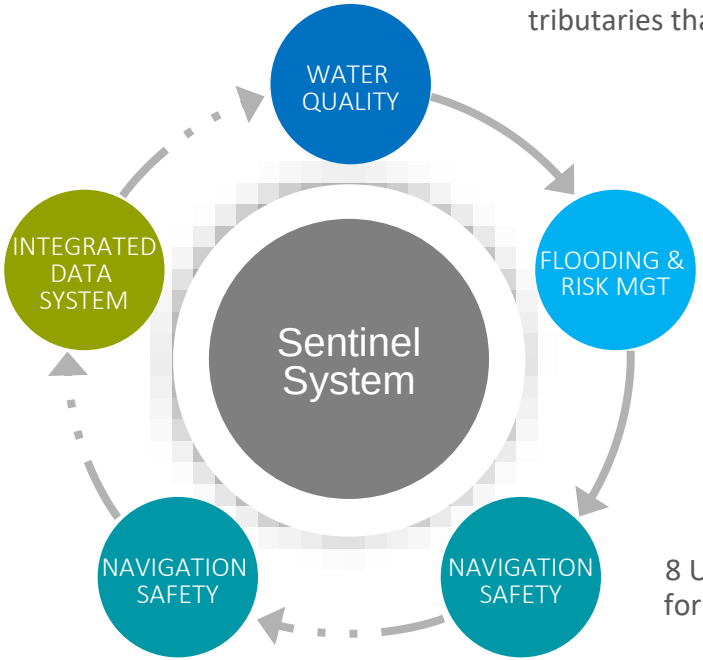
2. Provide real-time information needed to guide decisions on flood risk management and resilience, navigation safety, and diversions on the mainstem Mississippi River.

3. Develop a data interface for transparent and timely data availability and delivery to the public.

Design at a Glance

38 U.S. Geologic Survey stations along the Mississippi River mainstem and major tributaries that monitor streamflow, water-quality, and sediment.

Development of an integrated data interface that provides timely, consistent data and meets the needs of multiple users.



1,414 U.S. Army Corps of Engineers stations and gages within the Corps' 10 districts responsible for monitoring flooding and navigation along the Mississippi River mainstem and major tributaries.

12 National Oceanic and Atmospheric Administration stations in the Lower Mississippi River Basin that support navigational safety, coastal resource management, and storm flood forecasting.

8 U.S. Geologic Survey CODAR sensors for monitoring high priority navigation points along the Mississippi River mainstem and major tributaries.

Objective 1: Water Flow, Quality & Sediment

Parameters: Stage, Flow, Velocity, Nitrate probe, Nutrient Samples, Suspended sediment, bed material, sand breakdown & bedload samples, pH, Temp, SC, DO, Turbidity

- Priority sites at every 5% of the maximum load
- USGS: 35 existing sites, gage and infrastructure upgrades + 3 new sites
- Year One Startup Cost: $7.55 M (new funds)
- Total 25-year cost: $313 M

Objective 2: Flood Risk Management & Resilience

Flow and Q gages for flood modeling and navigation safety.

- Priority sites identified by USACE experts and NWS flood modelers.
- USACE: 1,414 existing flow and Q gages along major tributaries and the Mississippi Mainstem
- Year 1 Cost: $17.5 M (currently funded)
- Total 25-year cost: $675 M

Objective 2: Navigational Safety

CODAR systems, Air gap sensor systems, Flow gages

- Site needs identified from USGS and Big River Coalition proposals.
- Priority sites add to existing air gap station network already in place.
- USGS – 8 new CODAR systems at key navigational choke points.
- NOAA Ports System (lowermost river) – 3 new air gap gages and 6 new current meters at key bridges.
- Year One Startup Cost: $2.4 M (new funds)
- Total 25-year cost: $26 M

Objective 3: Data Interfaces

- Publicly accessible, supports multiple users
- Built by USGS Wetlands and Aquatic Research center
- Input data from multiple federal agencies
- Provides key data products (maps, charts, graphs, key stakeholders design key data products)
- All data must be collected and displayed to the USGS data standard

- Actual design will be done through a stakeholder process
- System will support machine (e.g., models) and human users.
- Year 1 Start-up Cost: $7.4 M
- Periodic Cost to Update: $4 M (every 6-7 years)
- Total 25-year cost: $117 M

Cost Detail

System Design Element	A. Total Current Annual Funding Provided for Existing Network	B. Year 1: Additional One time Infrastructure Cost to Add Probes | Meters	C. Year 1: Estimated One time Cost to Build New Stations	D. Total Year 1 Sentinel System Start Up Costs (B + C)	E. Total year 1 Annual Operating & Maintenance Costs for New System	Gap Between Current and Proposed Year 1 Start Up and O&M Costs (D + E) (A)	Total 25 year cost with 3% compounded inflation
Water flow, quality and sediment gages (USGS)	$2,448,252	$1,200,000	$6,350,000	$7,550,000	$7,921,097	$13,022,845	$312,932,387
Key navigation air gap gages and current meters (NOAA)	$60,000	$0	$804,000	$804,000	$288,000	$1,052,000	$11,907,276
Key navigation air gap gages (USGS)	$0	$0	$1,600,000	$1,600,000	$320,000	$1,920,000	$13,936,974
Flooding & navigation gages (USACE)	$17,500,000	$0	$0	$0	$17,500,000	$0	$674,678,239
MSR Data interfaces and Services	$0	$0	$4,800,000	$4,800,000	$2,600,000	$7,400,000	$116,737,910
Total Annual Cost in Current Dollars	**$20,008,252**	$1,200,000	$13,554,000	$14,754,000	$28,629,097	**$23,394,845**	**$773,692,167**
Total 25 Year Cost						**$356,500,619**	**$1,130,192,786**

Estimated Costs at a Glance

- Year one cost to maintain the current piecemeal system: $20 M
- Year one additional investment to build the ‘sentinel system: 23.4 M

- Operating and maintaining the current system over 25 years: $773.6 M
- Building and O&M for a ‘sentinel system’: $1.13 B

Investing another $356.5 M over 25 years will create an integrated monitoring system that meets quality standards and provides timely, readily accessible data to multiple public users.

Recommendations

1. Sustain current levels of funding to operate and maintain all existing monitoring capacity of the U.S. Geological Survey, U.S. Army Corps of Engineers, and National Oceanic and Atmospheric Administration PORTS® Systems.

2. Appropriate $23.4 M in in new funds in year 1 to build, operate, and maintain upgrades to existing infrastructure & gages, new stations to fill critical monitoring gaps, & development and implementation of an integrated government-hosted, public-facing data portal.

3. Evaluate the additional cost the U.S. Army Corps of Engineers will need to fund data managers to work with the U.S. Geological Survey data portal development team so that their data are accessible and maintained.

4. Appropriate additional funding, $333 M (356.5 M total) over 25 years, to cover the cost of 3% annual inflation to operate and maintain the full system over that time frame.

5. Convene a non-partisan stakeholder group to determine the specifications of the design of the integrated data interfaces and guide the design and development of the system.

6. Create a process to ensure that funds allocated to the ‘Sentinel System’ are dedicated to the priority needs identified in this report.

State of Science	Gaps	Next Steps
• Lots of research and studies on the effectiveness of BMPs in the agricultural system at field scale.	• We've learned that field-by-field and catchment by catchment actions are not enough. Need optimized, landscape-level assessment of conservation impacts and benefits (including economics and climate benefits), to improve water quality. • Need more studies linking BMPs to aquatic habitat and carbon sequestration at sites and landscape scales.	• Build on the current efforts to expand the study area (e.g. Missouri, Ohio basins, lower MRB) and analyses to include optimization modeling, climate benefits, and socio-economic effects.
• Lots of research and studies of carbon sequestration at plot level and site level.	• Scalable projections of carbon sequestration to support carbon projects/verification that retain accuracy of plot-level studies. • The ability to assess management impacts on carbon sequestration at multiple spatial and temporal scales to enable investigation of historical impacts and future scenario projections to help make decisions on lands to protect and restore.	• Synthesize data at the national scale and develop maps for use in models to produce spatially-explicit carbon sequestration datasets at national and finer spatial scales.
• Good examples of monitoring (e.g., UMR) and several good monitoring efforts (e.g., USGS, NWQN) in the MRB.	• Need standardization and data harmonization across monitoring efforts, where practical (e.g., states/federal) to get the most out of all systems and add to the collective whole. • Need to design and implement the ecosystems/habitat portion of the sentinel monitoring system.	• Implement the sentinel monitoring system project. • Design ecosystems/habitat portion of the sentinel monitoring system.


Thank you!
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