Mekong River Commission
Mississippi River Commission

Common Challenges
Basinwide Strategies
Advancing Together

Flood Risk Management
Nature Based Solutions

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Mississippi River Commission

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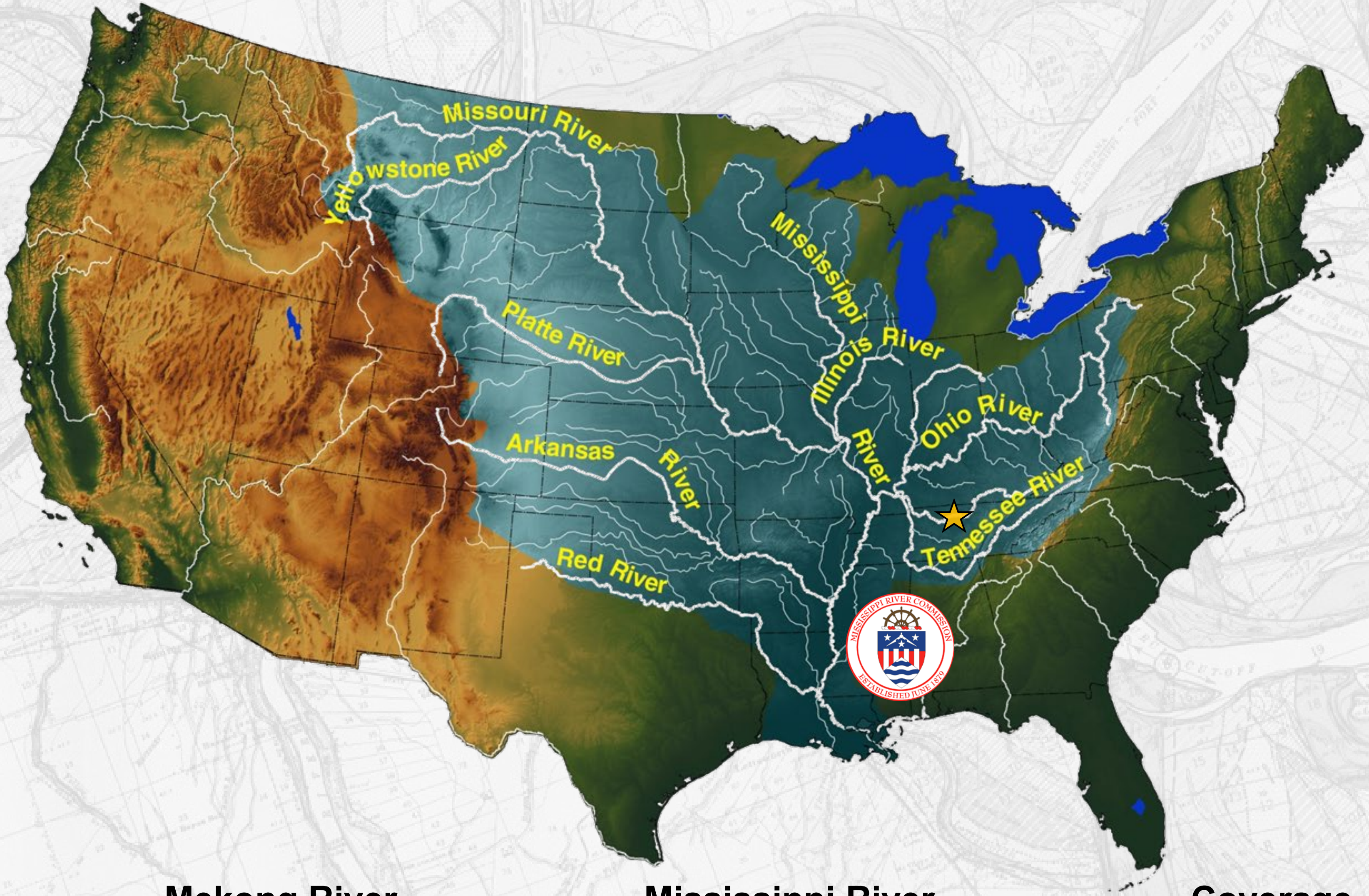
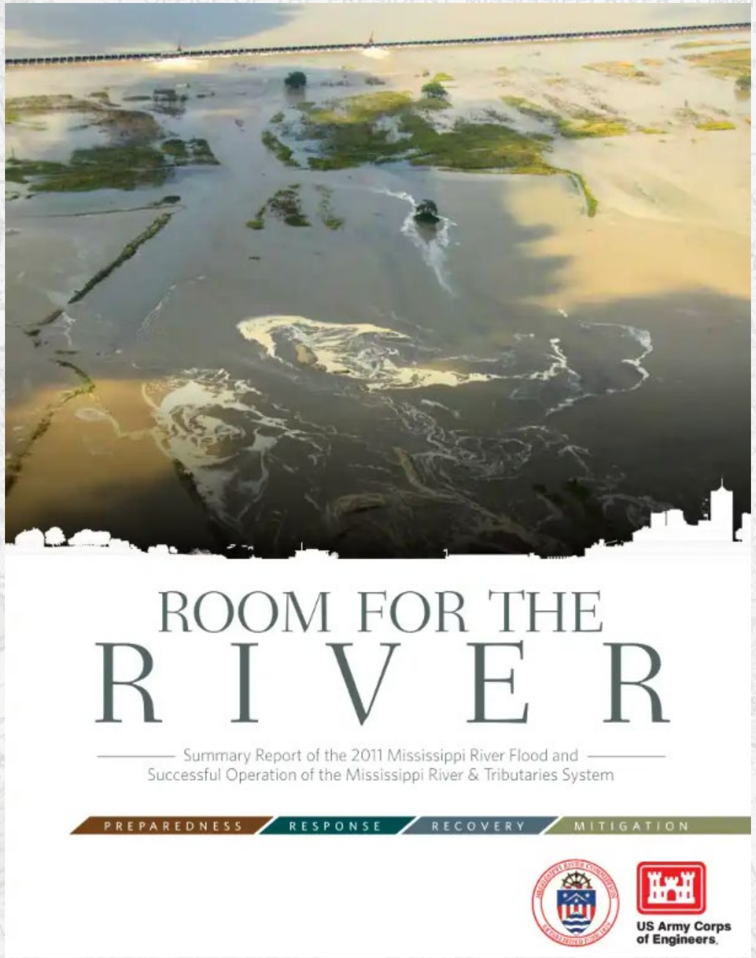
US Army Corps of Engineers®

MISSISSIPPI RIVER COMMISSION ESTABLISHED JUNE 1879

Mississippi River



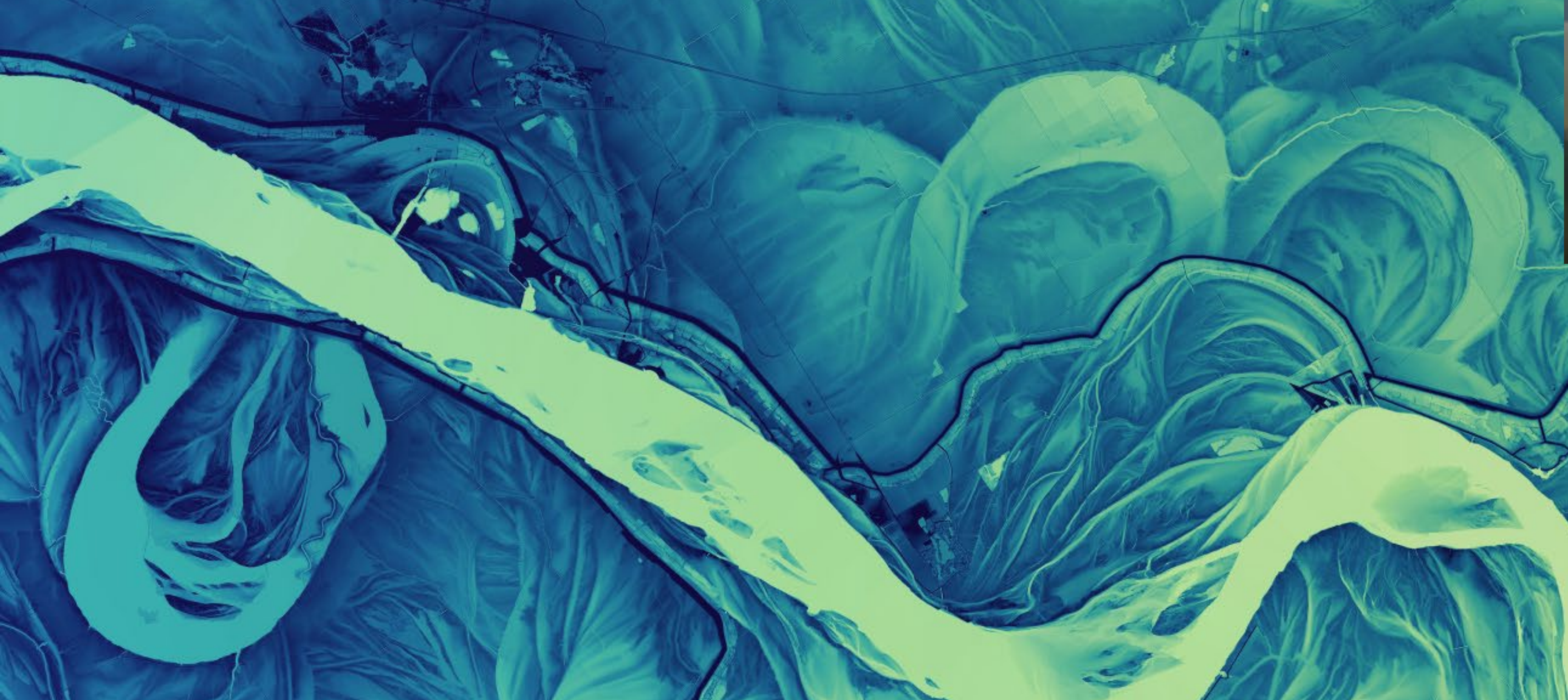


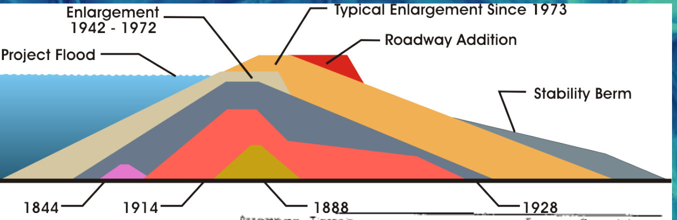
	Mekong River	Mississippi River
Length	4,900 km (3,050 mi)	3,765 km (2,340 mi)
Area	795,000 km² (307,000 mi²)	3,240,000 km² (1,25,000 mi²)

Coverage	**41% of the U.S. (31 U.S. states)**
Average Flow	**18,000 cms (640,000 cfs)**
Peak Flow	**70,000 cms (2.4 million cfs, 2011)**

ROOM FOR THE RIVER

Mississippi River & Tributaries Project



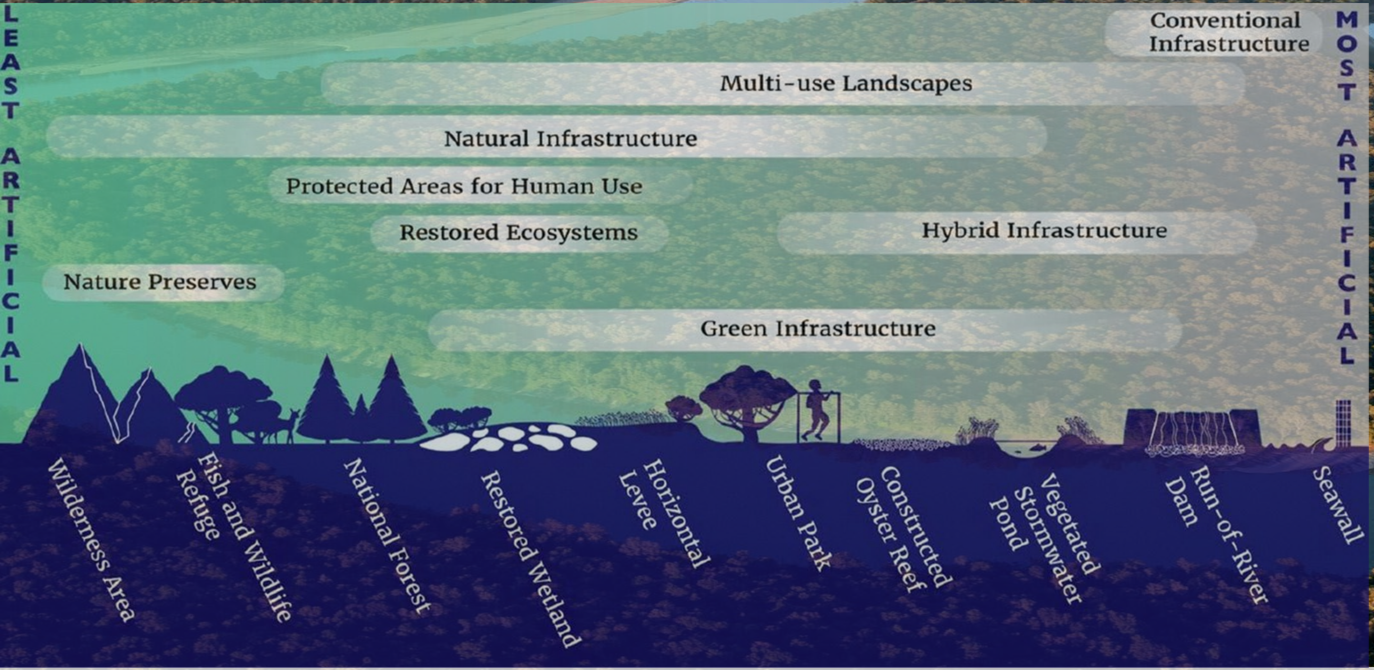


Year	Average Levee Heights, ft	Levee Construction, miles
1719	3.0	20
1735	4.0	42
1880	7.0	991
1890	8.0	1239
1905	13.0	1439
1910	14.5	1500
1920	20.0	1547
1927	24.0	1582
1931	30.0	1830

Photo Credit: Dan Coe

NATURE-BASED SOLUTIONS

Engineering With Nature



International Guidelines on the Use of Natural and Nature-Based Features for Flood Risk Management

To advance our use of nature-based solutions, Mississippi Valley Division is now USACE's latest Engineering With Nature proving ground. EWN is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaboration.

Photo Credit: The Nature Conservancy

NATURE-BASED SOLUTIONS

EWN Engineering With Nature ®

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Fluvial Systems and Flood Risk Management

Key Messages

1. Past modifications of rivers and their basins have increased the risk of flooding. Climate change, anthropogenic features, and land use changes have increased the stress on natural fluvial systems and their functions, asserting more pressure on flood risk management infrastructure.
2. Natural and nature-based features (NNBF) help mitigate these impacts, reducing both the level of flood risk and our dependence on engineered flood control structures while also restoring the natural environment, providing societal and ecological co-benefits.
3. As the benefits of NNBF are realized, more people are likely to see these benefits and want NNBF implemented in their watersheds. Monitoring and adaptive management of NNBF are needed to demonstrate the added benefits.
4. Adhering to the five fluvial NNBF general principles is key to ensuring sound fluvial applications.

Principle 1 – Use a Systems Approach to Leverage Existing Components and Projects and Their Interconnectivity

Principle 2 – Engage Communities, Stakeholders, Partners, and Multidisciplinary Team Members to Develop Innovative Solutions

Principle 3 – Identify Sustainable and Resilient Solutions That Produce Multiple Benefits

Principle 4 – Anticipate, Evaluate, and Manage Risk in Project of System Performance

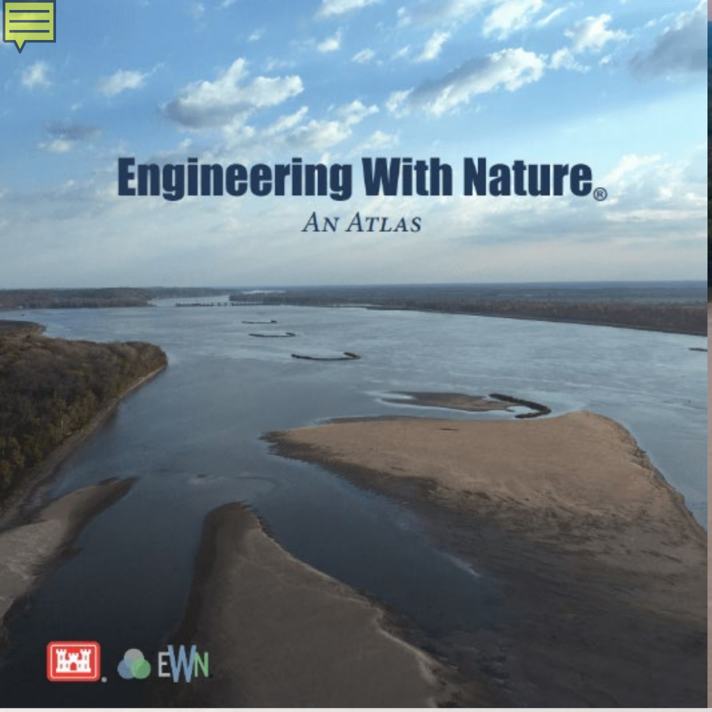
Principle 5 – Expect Change and Manage Adaptively

International Guidelines on the Use of Natural and Nature-Based Features for Flood Risk Management

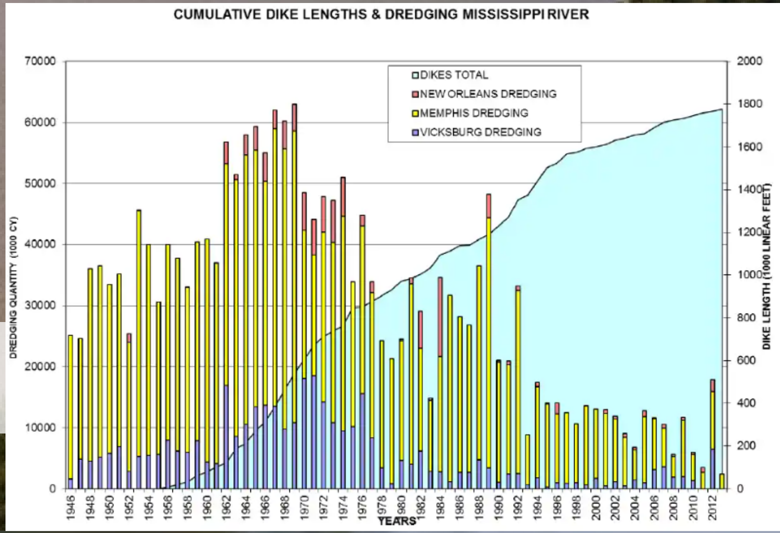
Guiding Principles

- Holistic
- A Systems Approach
- Sustainable
- Science-Based
- Collaborative
- Efficient & Cost Effective
- Socially Responsive
- Innovative
- Adaptive

Photo Credit: The Nature Conservancy



Redman Point– Loosahatchie Bar Environmental Restoration Mississippi River near Memphis, Tennessee



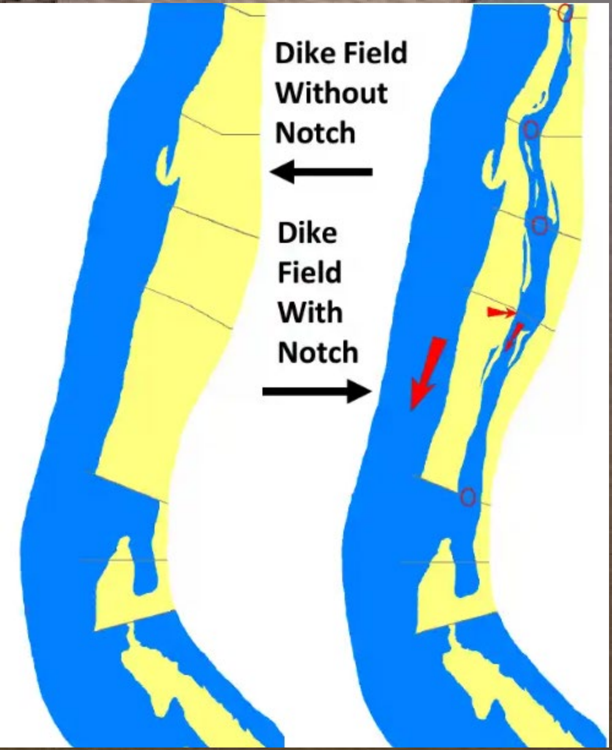
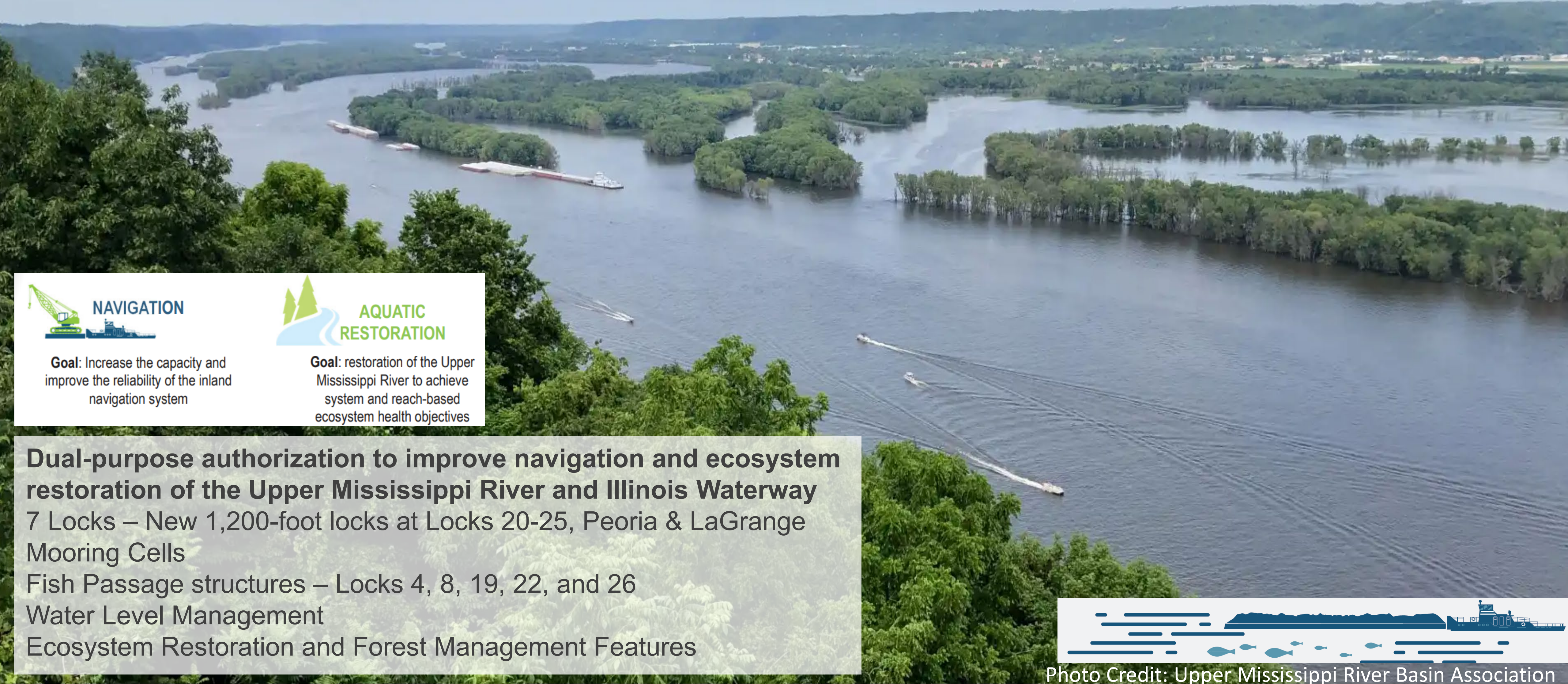


Photo Credit: LMRCC

Photo Credit: The Nature Conservancy

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM (NESP)



NAVIGATION

Goal: Increase the capacity and improve the reliability of the inland navigation system

AQUATIC RESTORATION

Goal: restoration of the Upper Mississippi River to achieve system and reach-based ecosystem health objectives

Dual-purpose authorization to improve navigation and ecosystem restoration of the Upper Mississippi River and Illinois Waterway

7 Locks – New 1,200-foot locks at Locks 20-25, Peoria & LaGrange

Mooring Cells

Fish Passage structures – Locks 4, 8, 19, 22, and 26

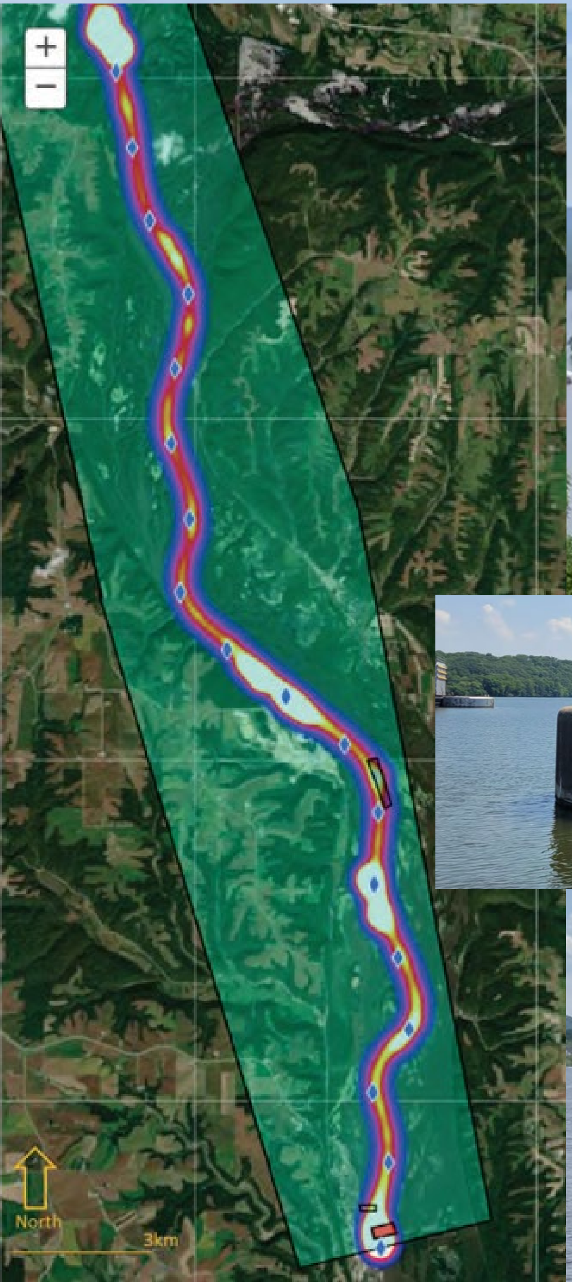
Water Level Management

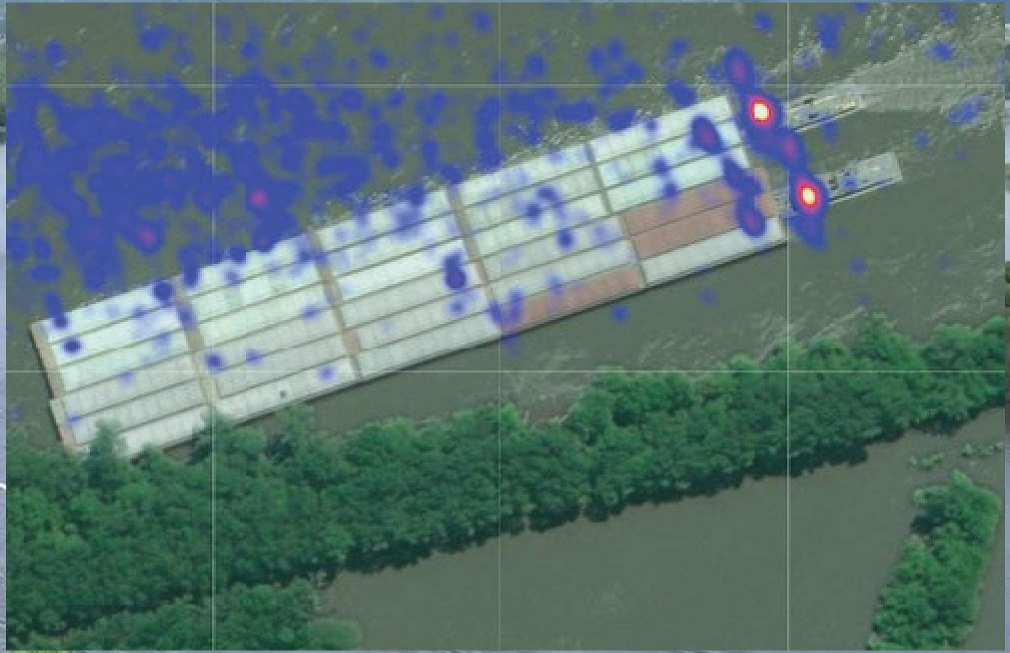
Ecosystem Restoration and Forest Management Features

Photo Credit: Upper Mississippi River Basin Association

NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM (NESP)

Mooring Cells for Navigation Efficiency & Shoreline Protection





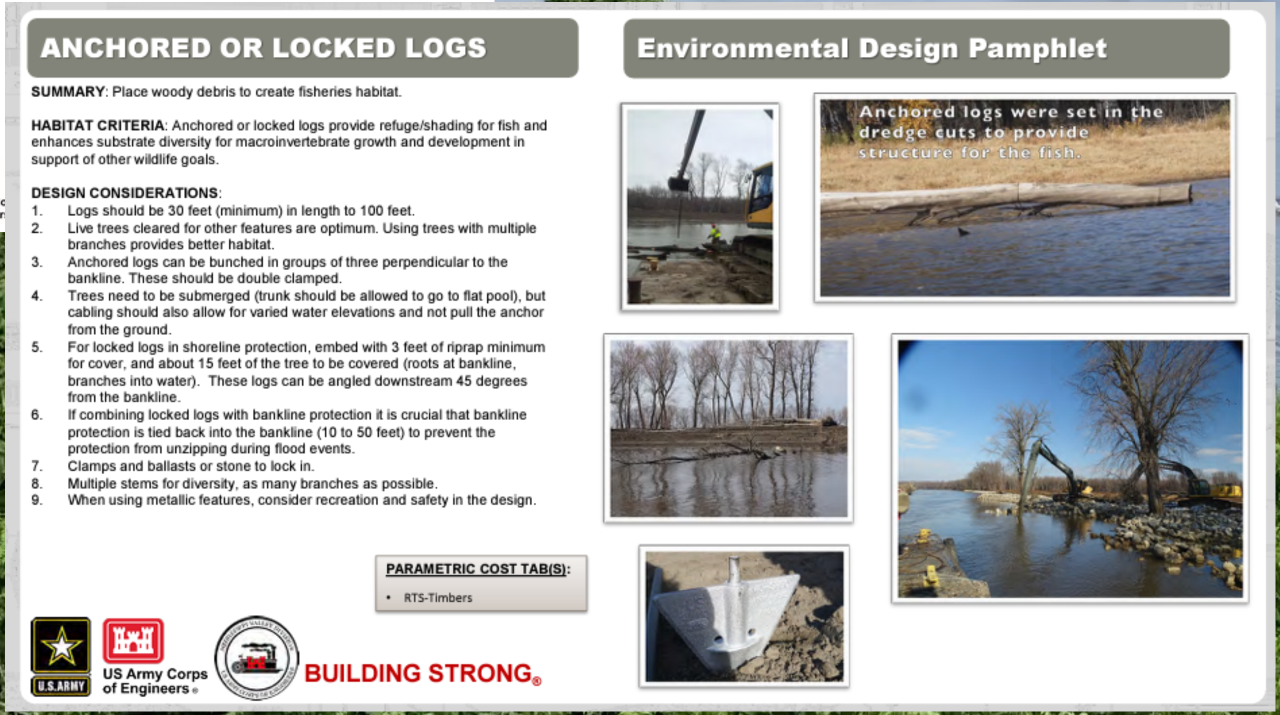
NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM (NESP)


NAVIGATION AND ECOSYSTEM SUSTAINABILITY PROGRAM

ENVIRONMENTAL DESIGN TOOL KIT

JULY 2023

US Army Corps of Engineers


ANCHORED OR LOCKED LOGS

SUMMARY: Place woody debris to create fisheries habitat.

HABITAT CRITERIA: Anchored or locked logs provide refuge/shading for fish and enhances substrate diversity for macroinvertebrate growth and development in support of other wildlife goals.

DESIGN CONSIDERATIONS:

1. Logs should be 30 feet (minimum) in length to 100 feet.
2. Live trees cleared for other features are optimum. Using trees with multiple branches provides better habitat.
3. Anchored logs can be bunched in groups of three perpendicular to the bankline. These should be double clamped.
4. Trees need to be submerged (trunk should be allowed to go to flat pool), but cabling should also allow for varied water elevations and not pull the anchor from the ground.
5. For locked logs in shoreline protection, embed with 3 feet of riprap minimum for cover, and about 15 feet of the tree to be covered (roots at bankline, branches into water). These logs can be angled downstream 45 degrees from the bankline.
6. If combining locked logs with bankline protection it is crucial that bankline protection is tied back into the bankline (10 to 50 feet) to prevent the protection from unzipping during flood events.
7. Clamps and ballasts or stone to lock in.
8. Multiple stems for diversity, as many branches as possible.
9. When using metallic features, consider recreation and safety in the design.

PARAMETRIC COST TAB(S):

- RTS-Timbers

Environmental Design Pamphlet

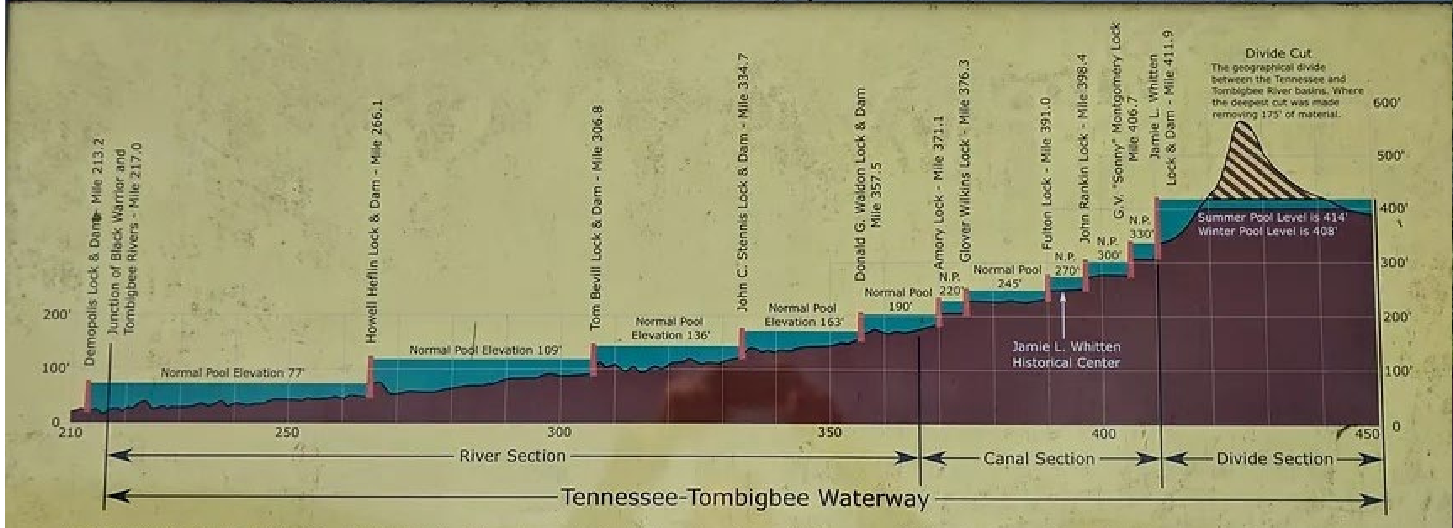
Woody Bundles: Installing separate woody bundles in pools or incorporating wood into stone structures dissipate flow energy, resulting in channel stability and improved fish habitat. Bundles provide refuge and enhances substrate diversity for macroinvertebrate growth in support of wildlife goals.

Photo Credit: Upper Mississippi River Basin Association

TENNESSEE-TOMBIGBEE WATERWAY

Key Facts

- Opened January 1985
- Connects the Tennessee River to the Tombigbee River via a 29-mile-long (47 km) channel cut across the terrain dividing the two watersheds
- 234 miles (377 km) long, 300 feet (90m) wide by 9 feet (3m) deep transportation artery
- 10 locks, each measuring 110 feet (34m) by 600 feet (183m), providing a lift of 341 feet (104m)
- Shortened shipping distances for many inland ports by over 800 miles (1287 km)
- 150 million cubic yards of earth had to be removed, about 1.5x more than for the Suez Canal.



The Tennessee Tombigbee Waterway was the largest earth moving project in history, removing one third more earth than the Panama Canal. The Waterway took 12 years to complete removing 310 million cubic yards of soil, which is equivalent to about 100 million dump truck loads. This chart shows the elevation change along the Waterway and the locks that were constructed to allow boats to navigate it. From start to finish a boat traveling North up the waterway will be lifted 341 feet by 10 locks to navigate the waters of the Tenn-Tom.

Photo Credit: Tulane University