# MS River Science Forum

## Overview of MS Delta Drainage & Flood Control


**February 16, 2023**

**www.msleveeboard.com**


**There are two (2) Levee Boards in the Mississippi Delta.**

**The MS Levee Board (shown in green) was established in 1865 as the first act of the MS Legislature following the Civil War. It is headquartered in Greenville, MS.**

**The YMD Levee Board (shown in light green) was established in 1884 following the flood of 1882. It is headquartered in Clarksdale, MS.**

**KENNETH RODGERS**
PRESIDENT
HUMPHREYS CO.
1993

**NOTT WHEELER, JR.**
VICE-PRESIDENT
BOLIVAR CO.
1994

**ROY NICHOLS**
ISSAQUENA CO.
1996

**HANK BURDINE**
WASHINGTON CO.
2010

# MS LEVEE BOARD
# Greenville, Mississippi
Organized: November, 1865

**PAUL HOLLIS**
SHARKEY CO.
2011

**KATHERINE CRUMP**
BOLIVAR CO.
2020

**DAVID COCHRAN, JR.**
WASHINGTON CO.
2020

**Levee Board Staff**

**Levee Board Crew**

Mississippi LEVEE BOARD
Where people come first.

## LEVEES

The Levee protects the Lives and Property of the Delta Citizens from MS River Floods

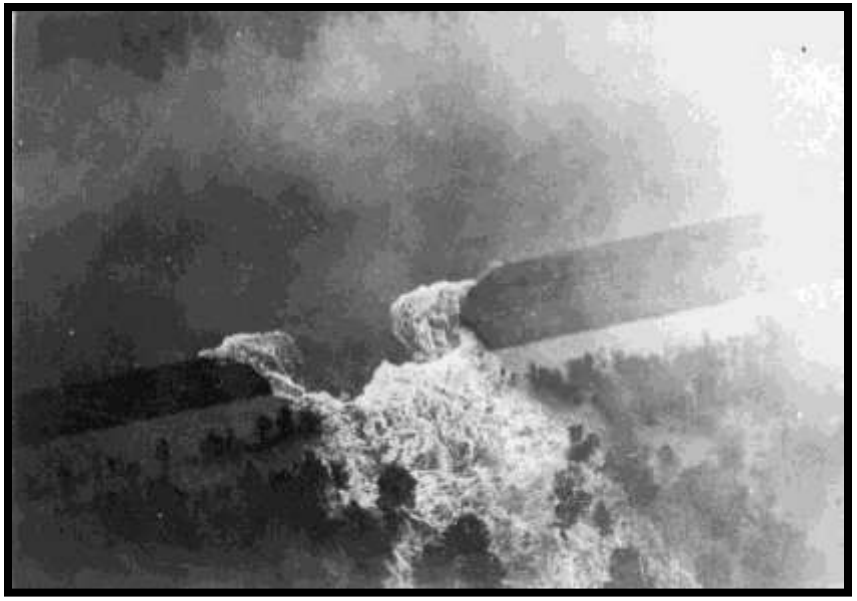
**The MS Levee Board is responsible for:**
**212 miles of Levee**
**350 miles of Interior Streams**

## INTERIOR STREAMS

The Levee Board is also the local sponsor for Corps of Engineers Projects on Interior Streams. These streams provide the major outlets for the MS Delta.


The MS River Drainage Basin includes 41% of the continental United States.
This is water from parts of 31 States and 2 Provinces of Canada.

Greenville, MS



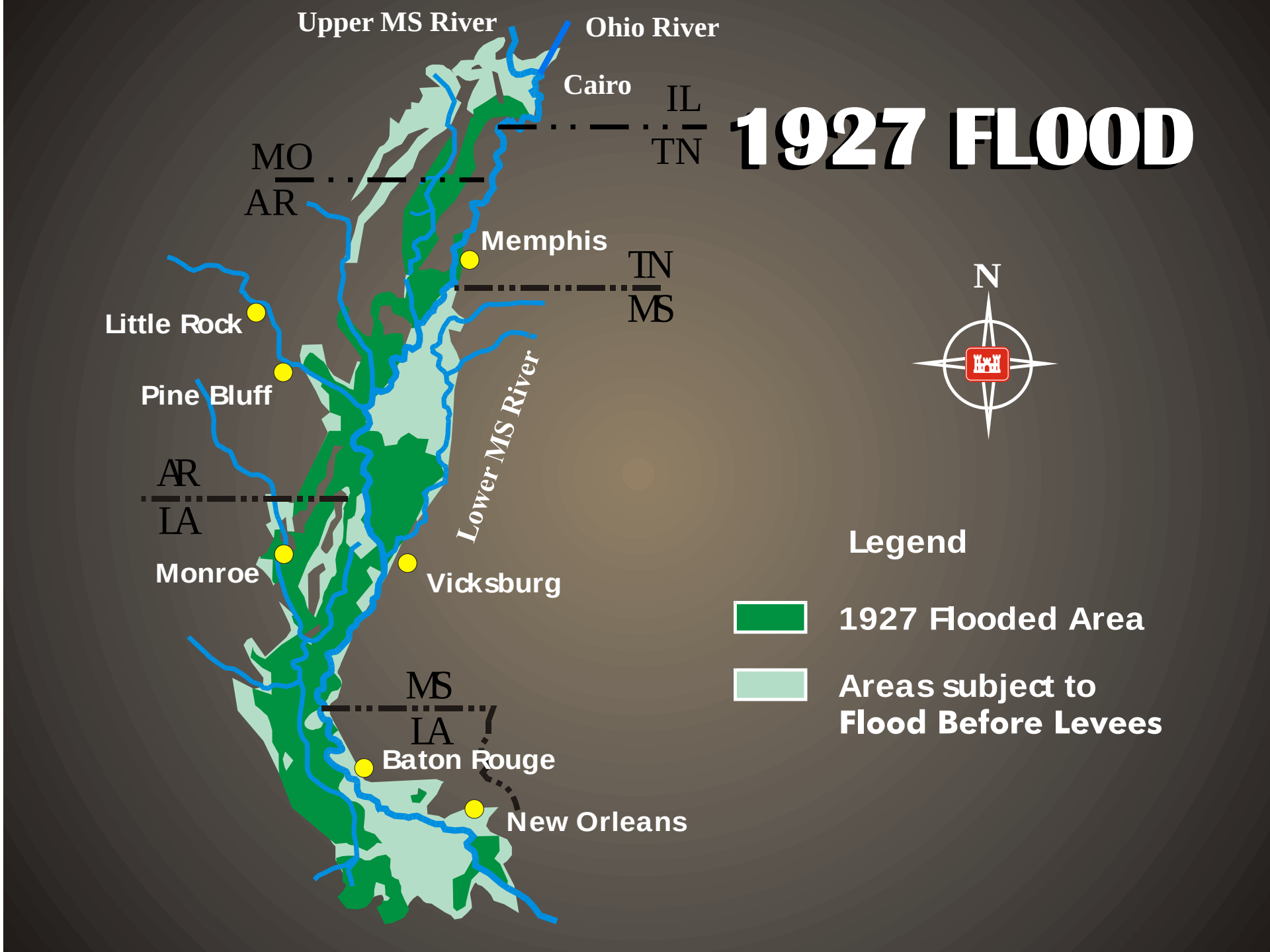
Cabin Teele Crevasse

# 1927 Flood

## April 21, 1927
## Mounds Landing Crevasse

Prior to the 1927 Flood, the MS Levee Board was responsible for the design, construction and maintenance of the Mainline MS River Levee utilizing it's local funds.

Vice-President's Train


Upper MS River
Ohio River
Cairo
IL
TN
MO
AR
Memphis
TN
MS
Little Rock
Pine Bluff
Lower MS River
AR
LA
Monroe
Vicksburg
MS
LA
Baton Rouge
New Orleans
1927 FLOOD
N
Legend
1927 Flooded Area
Areas subject to
Flood Before Levees

# The Great Flood of 1927

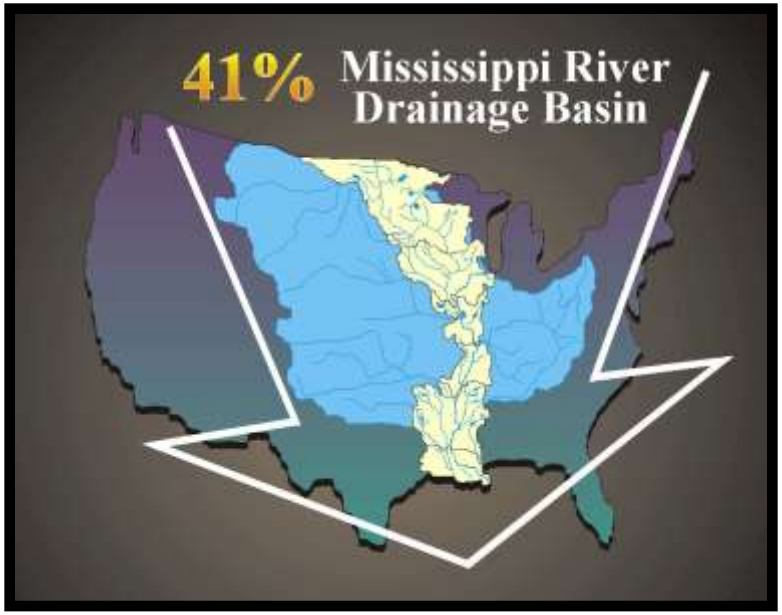
- 246+ Deaths
- 700,000 People displaced
- 325,000 Refugees
- 162,000 Homes Inundated
- 16.6 Million Acres Flooded
- 26,000 Square Miles Flooded
- River remained above Flood Stage for **153** days
- Lost ½ of the Wildlife Population
- Industry & Transportation paralyzed
- $1 Billion in Property Damages when the Federal Budget was $3 Billion

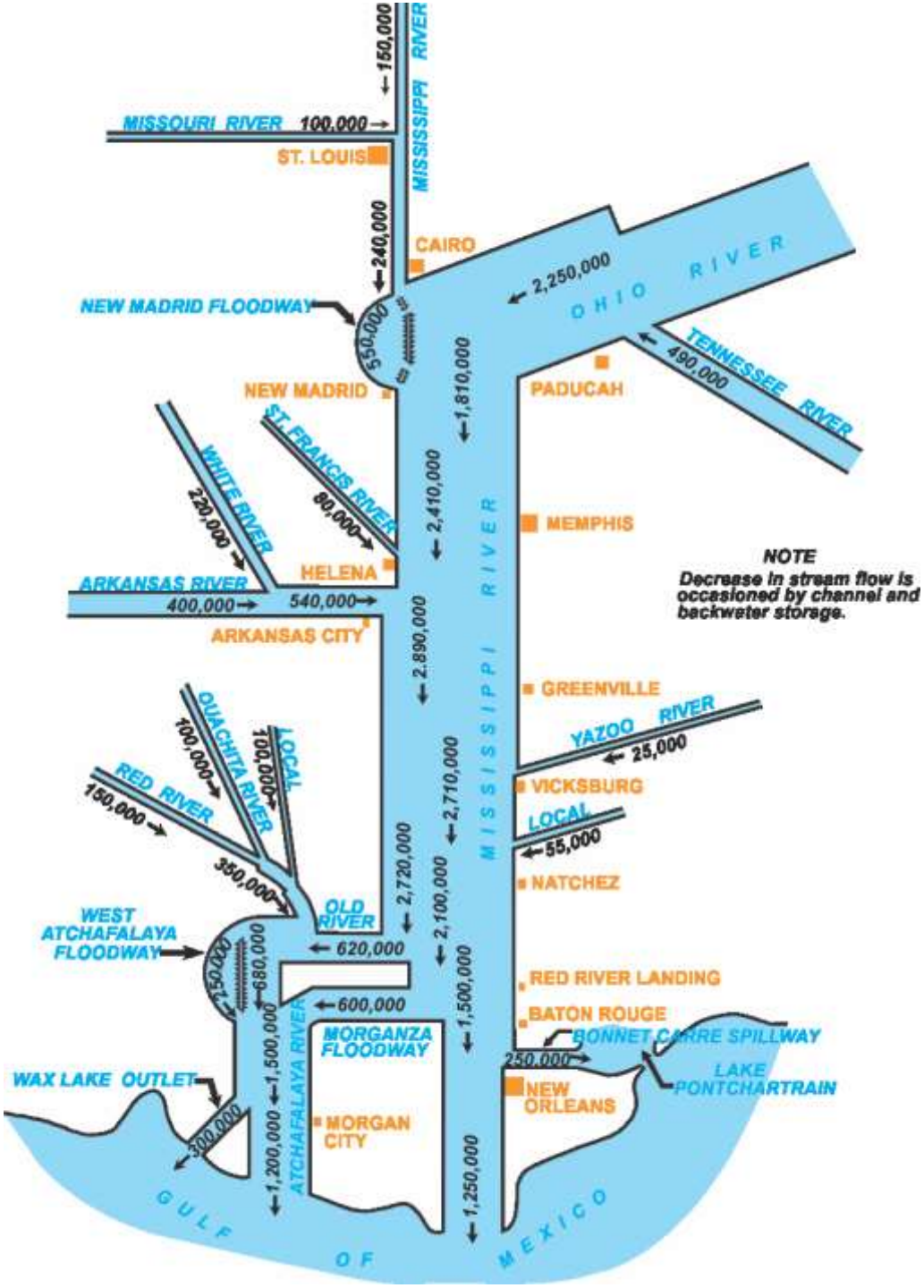
**"The Greatest Peacetime Disaster in our History" – Herbert Hoover**

# MR&T Project Features

The 1927 Flood awakened the Nation's conscience to the need for a comprehensive program to control the MS River. From destruction and ruin came the Flood Control Act of 1928 which authorized the Mississippi River & Tributaries Project (MR&T) - the nation's first comprehensive flood control system.



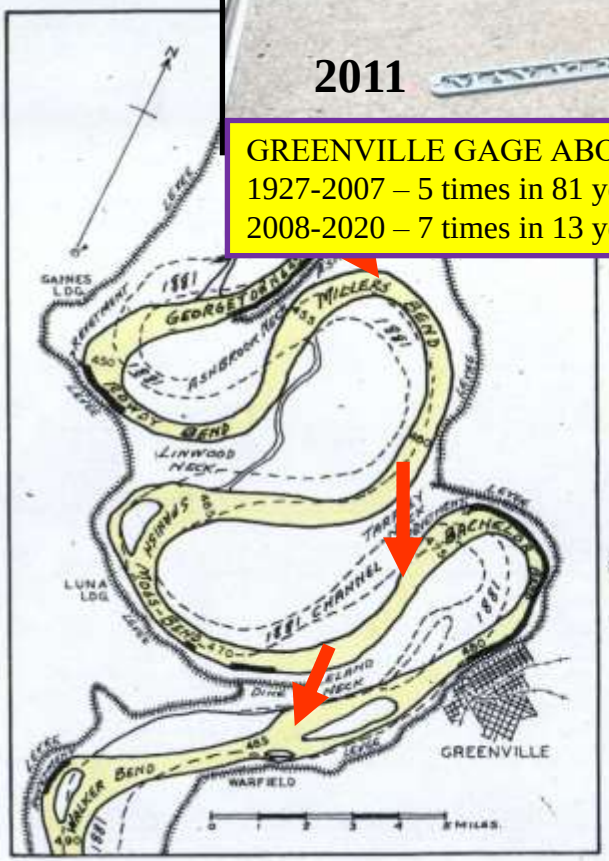



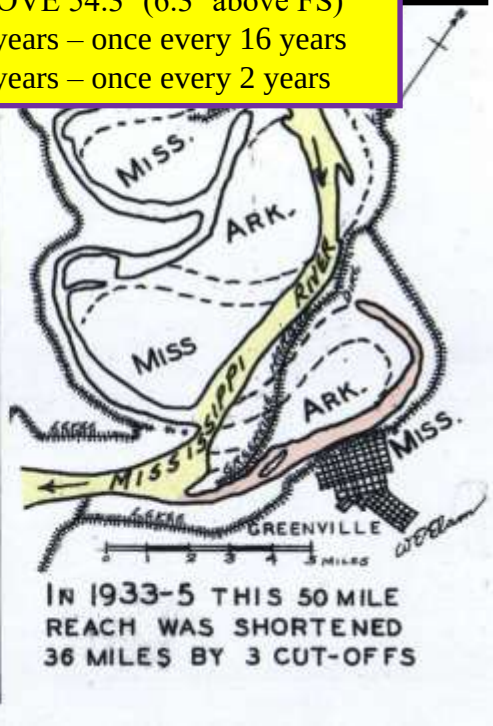

# MS RIVER FLOODS

# HISTORICAL HIGHWATER EVENTS GREENVILE GAGE

| | | |
|---|---|---|
| **1.** | **1927** | **65.4’** |
| **2.** | **2011** | **64.2’** |
| 3. | 1937 | 63.0’ |
| 4. | 1973 | 58.2’ |
| **5.** | **2008** | **57.4’** |
| **6.** | **2019** | **57.0’** |
| **7.** | **2016** | **56.2’** |
| 8. | 1983 | 55.8’ |
| **9.** | **2018** | **54.8’** |
| **10.** | **2020** | **54.5’** |
| 11. | 1997 | 54.5’ |
| **12.** | **2017** | **54.3’** |


GREENVILLE GAGE ABOVE 54.3’ (6.3’ above FS)
1927-2007 – 5 times in 81 years – once every 16 years
2008-2020 – 7 times in 13 years – once every 2 years




IN 1933-5 THIS 50 MILE REACH WAS SHORTENED 36 MILES BY 3 CUT-OFFS

# HISTORICAL HIGHWATER EVENTS VICKSBURG GAGE

| | | |
|---|---|---|
| **1.** | **2011** | **57.1’** |
| 2. | 1927 | 56.2’ |
| 3. | 1937 | 53.2’ |
| 4. | 1973 | 51.8’ |
| **5.** | **2019** | **51.4’** |
| **6.** | **2008** | **51.0’** |
| **7.** | **2020** | **50.4’** |
| **8.** | **2016** | **50.2’** |
| **9.** | **2018** | **49.9’** |
| 10. | 1983 | 49.3’ |
| 11. | 1997 | 49.2’ |
| **12.** | **2017** | **48.4’** |

## VICKSBURG GAGE
## MISSISSIPPI RIVER FLOW

**PDF 2,710,000 cfs**
**2011 2,272,000 cfs (84% PDF)**
**1927 1,806,000 cfs (66% PDF)**
**26% More Flow than in 1927!**

*The Epic 2011 Flood was the first true test of the Mississippi River & Tributaries Project (MR&T) System since being constructed after the 1927 Flood.*

*In 2011 the Mississippi River passed <u>26%</u> more water than the 1927 Flood!*

*<u>All</u> the Floodways were utilized, <u>all</u> the Reservoirs were filled to capacity, and <u>all</u> the MR&T Levees <u>held</u>! Not 1 acre was flooded that wasn't designed to be flooded!*

*The MR&T System prevented $246B in damages in 2011 alone!*

*The MR&T System was a COMPLETE SUCCESS! But we did have problems!*

*Since 1928, the MR&T Project has cost $20.5B to construct and has prevented over $2.7T in damages – this is a 131:1 Benefit to Cost (B/C) ratio!*

*The MR&T Project is only 89% Complete. We must <u>finish</u> the MR&T Project!*

# *THE EPIC 2011 FLOOD*

## *A Multi-Hundred Year Flood*

## *MR&T Project*




# MAINLINE MISSISSIPI RIVER LEVEE ENLARGEMENT PROJECT

1. Following the 1973 Flood we have **75** miles of deficient levees.
2. We have completed – **50.5** miles
   (Items 524L, 511L, 509L, 502L, 496L, 488L, 477L, 474L, 468L & 463L).
3. Currently, **12.8** miles under contract:
   - 526L – 0.9 miles – 91% Complete
   - 465L – 3.0 miles – 99% Complete
   - 462L - 2.7 miles - 84% Complete
   - 458L & 452L – 6.2 miles – 78% Complete
4. We have **2.4** miles scheduled to be awarded in 2023.
5. We have **4.4** miles scheduled to be awarded in 2024.
6. The final **5.0** miles scheduled to be awarded in 2025.

***526L - Wayside, MS 91%***
***0.9 miles*** *– started in 2021*

***521L – James - Longwood, MS***
***5.0 miles*** *– future job in 2025*

***524L, 511L, 509L, 502L, 496L, 488L, 100%***
***477L , 474L, 468L & 463L – 50.5 miles***

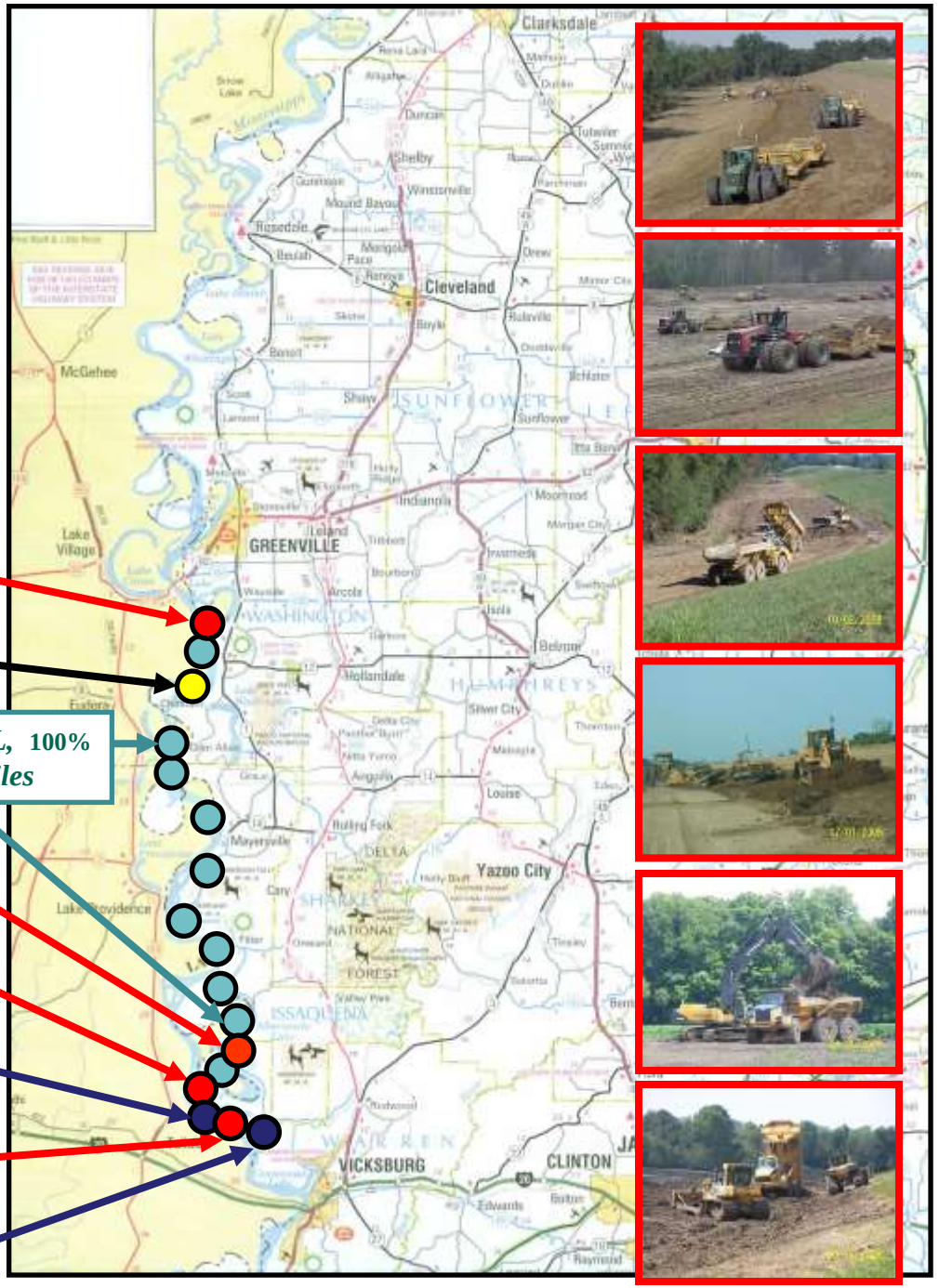
***465L – Albemarle, MS 99%***
***3.0 miles*** *– started in 2015*

***462L - Brunswick, MS 84%***
***2.7 miles*** *– started in 2019*

***Item 460L on the BEL***
***Advertising***
***2.4 miles - to be awarded in 2023***

***458L & 452L - Brunswick, MS 78%***
***6.2 miles*** *– started in 2021*

***Item 443L***
***Surveys, Borings & Design***
***4.4 miles – to be awarded in 2024***











Updated December 1, 2022

# YAZOO BASIN

**In 1950, the MS Legislature authorized the Delta's two Levee Boards to act as the local sponsor for Corps of Engineers Projects on Interior Streams.**

**The MS Levee Board is responsible for 350 Miles of Interior Streams within it's Levee District**

# YAZOO BASIN - SEDIMENTATION REDUCTION PROJECT

**Steele Bayou Sedimentation Reduction Project**

7 Phases completed – **<u>77</u> sites** completed

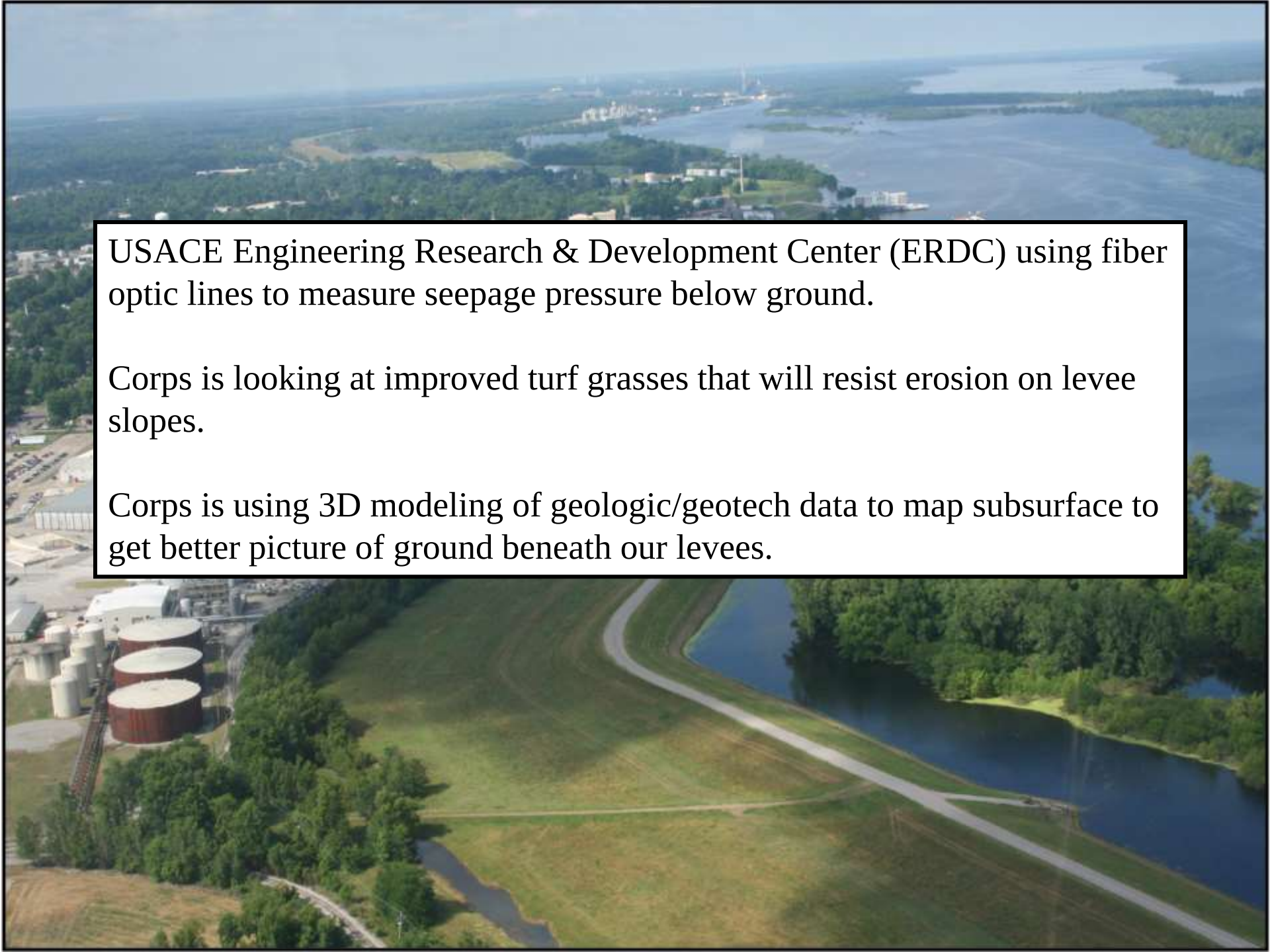
**Big Sunflower River Sedimentation Reduction**

9 Phases completed – **<u>91</u> sites** completed

Phase I completed in 2017 – 6 sites
Phase II completed in 2017 – 14 sites
Phase III completed in 2019 – 13 sites
Phase IV completed in 2020 – 6 sites
Phase V completed in 2020 – 8 sites
Phase VIII completed in 2022 – 12 sites
Phase IX completed in 2022 – 11 sites
Phase X completed in 2021 – 9 sites
Phase XI completed in 2022 – 12 sites
*Phase XII will get awarded in 2023 – 6 sites*

# YAZOO BASIN - SEDIMENTATION REDUCTION PROJECT


**Yazoo Basin waters are tributaries of the Mississippi River. Steele Bayou & Big Sunflower River Sedimentation Reduction Projects have both contributed in reducing sediment loads in our interior streams. A byproduct of these structures has been a reduction in nutrient loading in our streams and in the Mississippi River.**

USACE Engineering Research & Development Center (ERDC) using fiber optic lines to measure seepage pressure below ground.

Corps is looking at improved turf grasses that will resist erosion on levee slopes.

Corps is using 3D modeling of geologic/geotech data to map subsurface to get better picture of ground beneath our levees.

# Dredging the MS River Ports

Greenville Port

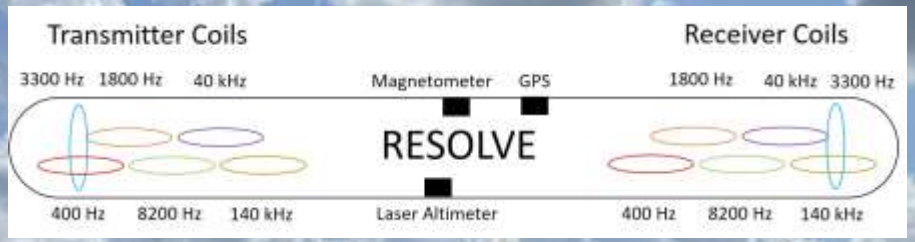
Vicksburg Port


Rosedale Port

# Sediment Diversion Projects


**Mid-Barataria Sediment Diversion Project**
**Rebuild and sustain up to 26,000 acres of wetlands.**

# Corps & USGS Partner to Fly Mississippi Valley







**Airborne Geophysical Survey**

The Corps used a helicopter flying at 200' pulling a geophysical sensor (a RESOLVE airborne electromagnetic instrument) 100' above the ground at 75 mph.

A 30' long Kevlar tube carried the electronic sensors.

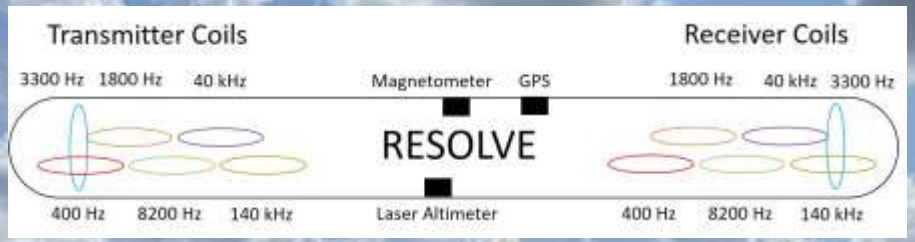
The RESOLVE system transmits an electromagnetic field (radio waves) into the ground and measures the response. The strength of the response changes as the geology of the earth changes telling what kind of geology is underground to a depth of **200' deep**.

In 2021 they flew the entire Mainline MS River Levee and the Yazoo Backwater Levee.

They flew the Bogue Phalia looking for potential groundwater aquifer recharge and infiltration.

The Corps will analyze the data to know where to go take soil borings if they find a problem.

# Corps & USGS Partner to Fly Mississippi Valley




**Airborne Geophysical Survey**

Airborne Electromagnetic Survey was performed in Summer of 2021 on some MR&T levees from Cape Girardeau, MO to south of Baton Rouge, LA. Areas that include heavy infrastructure and/or have previously had 300 ft. seepage berms constructed may have not been flown.

5,896 line-kilometers were captured including flight lines at the Riverside toe, Landside toe, and 300 ft offset from Landside toe to help "map" the subsurface data below and near the levees.

Provides more continuous data than the traditional subsurface investigation techniques such as drilling borings and taking CPTs.

Will help model clay blanket thickness and identify areas of concern that may be previously unknown or not fully investigated. The hope is to use this information to make more risk-informed decisions on which MRL areas require work by being a tool for engineers when determining where to further investigate and analyze.

Working on finishing final products (PDF plots of processed data, Google Earth .kmz files, etc.) to be used by USACE Memphis, Vicksburg, and New Orleans Districts in the coming months.

# MS RIVER SCIENCE FORUM – MS LEVEE BOARD

## STATUS OF SCIENCE:

**2009 - 2022** - LiDAR Data flown on the entire Mississippi River Valley (10m versus 30m) and data collected at low river stages .
**2021** - Airborne Geophysical Survey - The Corps used a helicopter flying at 200' pulling a geophysical sensor (a RESOLVE airborne electromagnetic instrument) 100' above the ground at 75 mph. A 30' long Kevlar tube carries the electronic sensors. The RESOLVE system transmits an electromagnetic field (radio waves) into the ground and measures the response. The strength of the response changes as the geology of the earth changes telling what kind of geology is underground to a depth of 200' deep. They flew MR&T levees from Cape Girardeau, MO to below Baton Rouge, LA . They also flew the Bogue Phalia looking for potential groundwater aquifer recharge and infiltration locations to help recharge our depleting groundwater aquifer.
**Sedimentation Reduction Project** – Corps has installed drop-pipe structures where lateral ditches tie into major interior streams. This is helping reducing the amount of sediment getting into streams which in turn lessens the sediment getting into the MS River.
**Dredging the MS River/Sediment Diversion Projects**– The Corps discharges the dredge material directly into the MS River. The Corps is rebuilding marshland in Louisiana with sediment diversion projects.

## GAPS IN DATA:

The Mississippi River & Tributaries Project is not complete. The levee base areas have been extensively drilled and analyzed and great effort has been put into prioritizing work in areas that have shown performance/underseepage issues at lower stages. However performance cannot be predicted at higher stages like a Project Design Flood simply because we have not reached those stages.

The Airborne Geophysical Survey flew the Bogue Phalia looking for potential groundwater aquifer recharge and infiltration - we need help to interpolate the data.

We are missing data on all our Mississippi Delta Streams to find more potential groundwater aquifer recharge and infiltration locations.

## FUTURE DIRECTION/NEXT STEPS:

An Airborne Geophysical Survey needs to be performed on the entire Mississippi River Levee System in the Lower Mississippi River. This will help identify potential underseepage problem areas so that we can be proactive and fix them before they jeopardize a levee system. Finish final products (PDF plots of processed data, Google Earth .kmz files, etc.)

An Airborne Geophysical Survey needs to be performed over all our Mississippi Delta Streams to find more potential groundwater aquifer recharge and infiltration locations to help recharge our depleting groundwater aquifer and to augment low stream flows.

Sedimentation Reduction Projects need to be built throughout the MS River Valley to lessen the sediment getting into the MS River.

The Corps needs to find good uses for dredge material – build-up land for riverside ports and economic development.

Please visit our web site for additional information.

**www.msleveeboard.com**

# QUESTIONS???

**THE MS LEVEE BOARD:**
**PROUD TO SERVE THE DELTA**