

# Restoring Coastal Marsh Habitat in West Bay, Louisiana with Beneficial use of Riverine Dredged Sediment

**Andrew McQueen, PhD**

Research Biologist

US Army Engineer Research and Development Center (ERDC)

Burton Suedel, PhD - ERDC

Justin Wilkens - ERDC

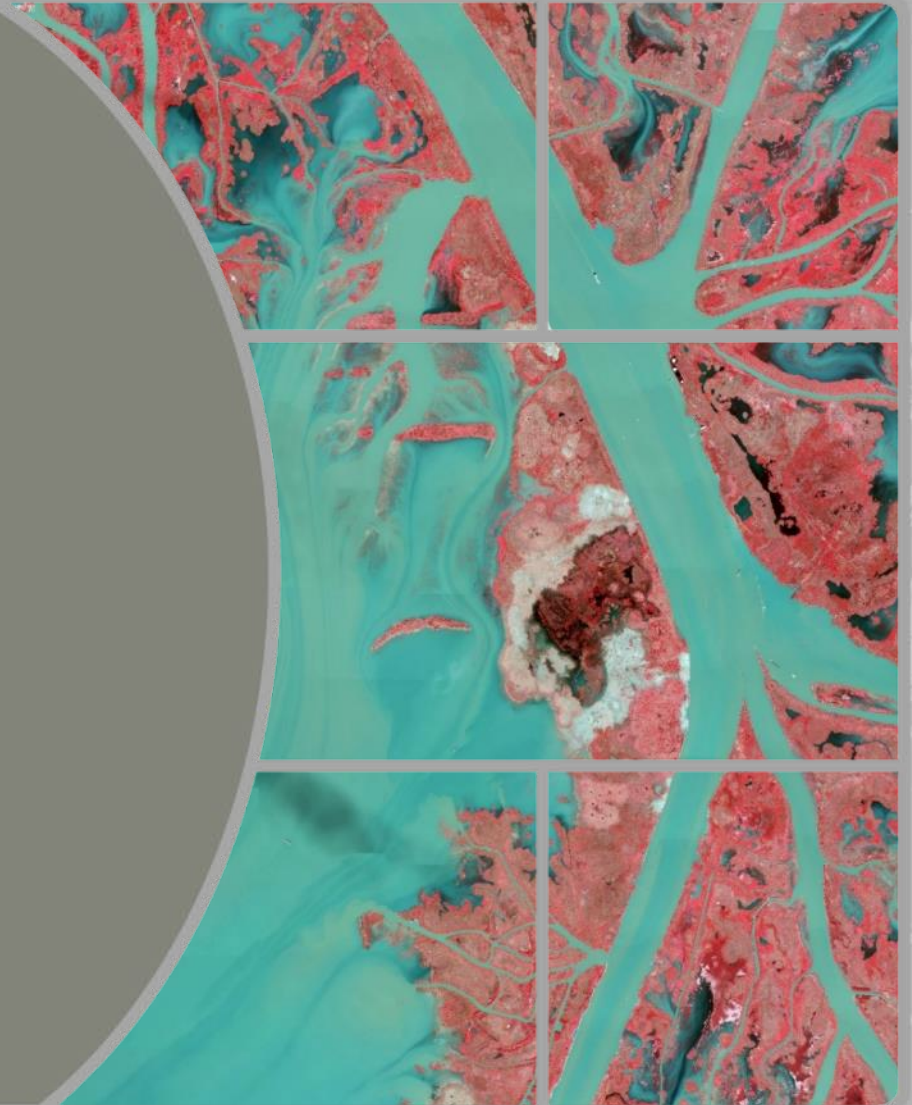
Christina Saltus – ERDC

Scott Bourne - ERDC

Joseph Gailani, PhD - ERDC

Jeffrey King, PhD - ERDC

Jeffrey Corbino – USACE MVN



**WEDA Webinar Series - October 2020**



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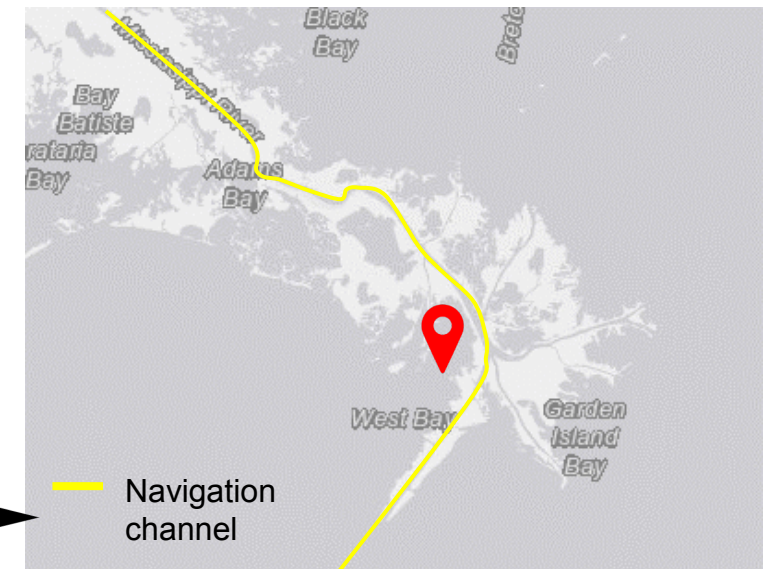


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# Introduction: Coastal Louisiana

- **Economic**

- Critical infrastructure worth billions of dollars
- Navigation and port infrastructure
  - 300 million tons of cargo – **1<sup>st</sup> in US**
  - **60%** of nation's grain: **17.2 Billion USD**
  - Commercial fisheries – **2<sup>nd</sup> in US**



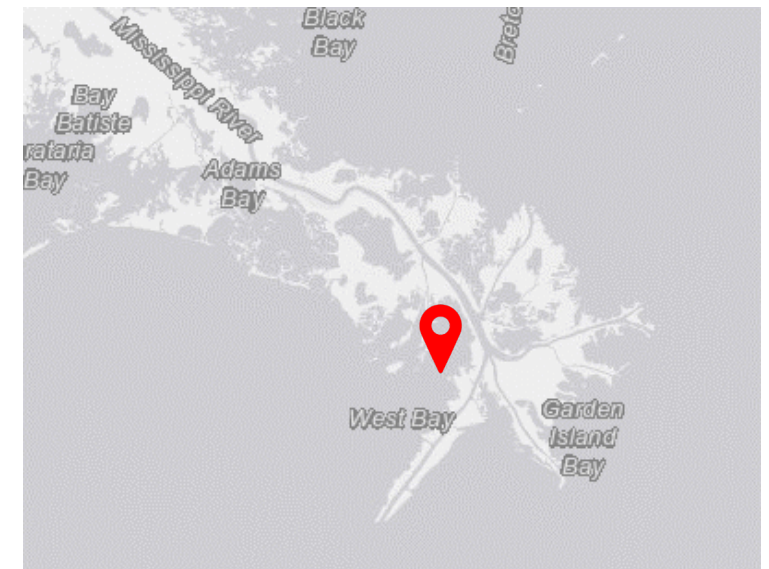
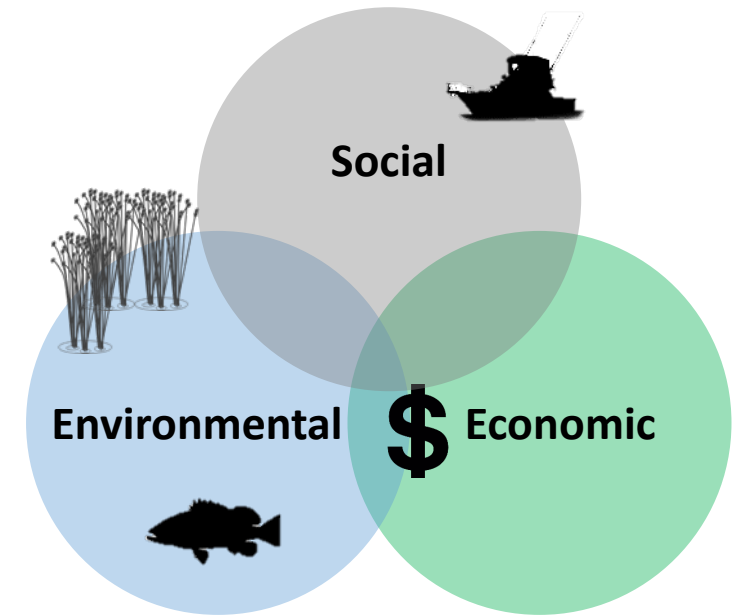
# Introduction: Coastal Louisiana

- **Environmental**

- Marsh habitat is a critical resource
- **75%** of commercial fin and shellfish depend on marsh for habitat
- **12 - 47 billion USD annual** asset value of Mississippi delta (Batker et al. 2014)

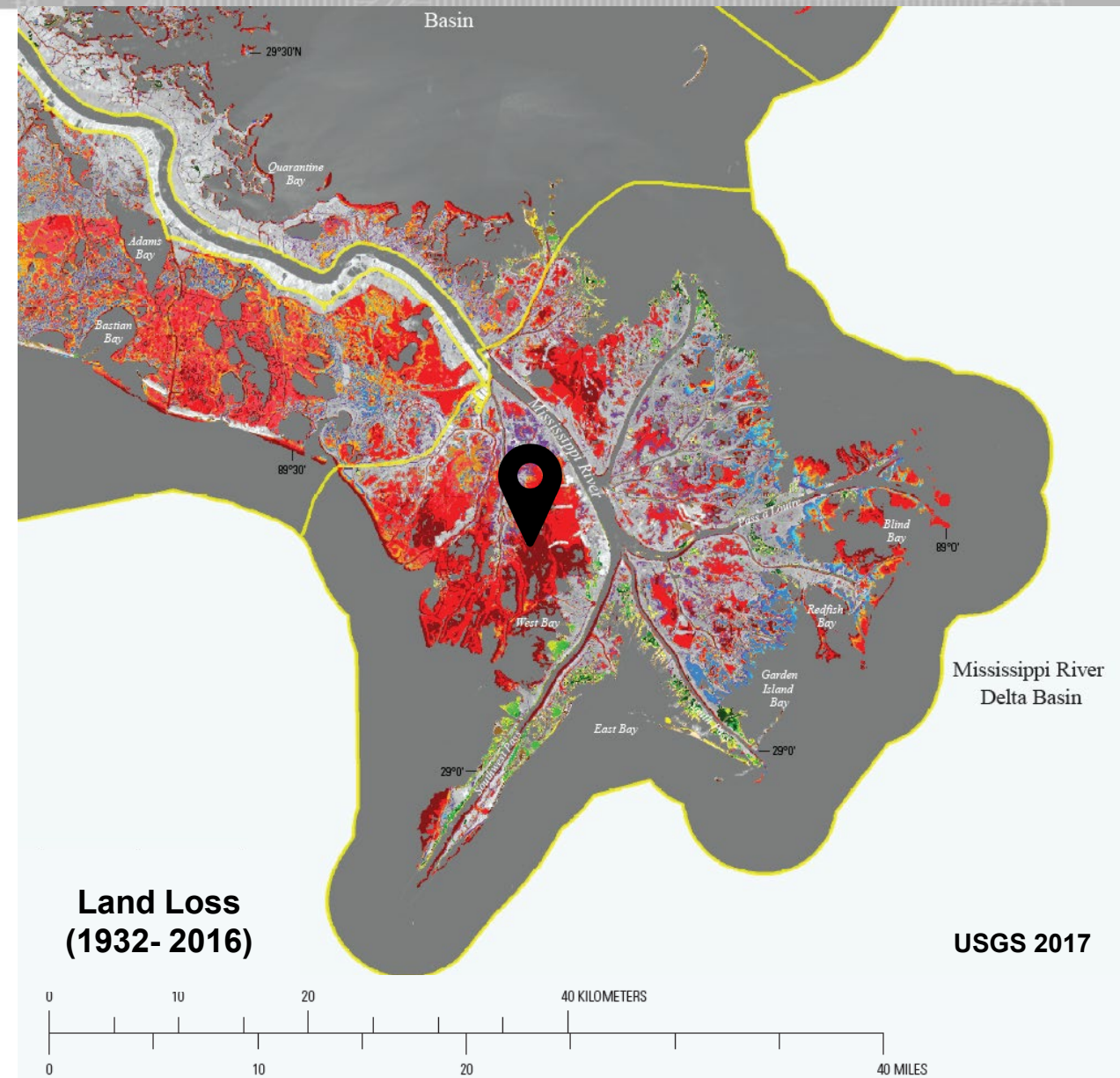
- **Social**

- Storm surge and flood risk protection
- Recreation
  - Hunting/ Fishing/ Boating



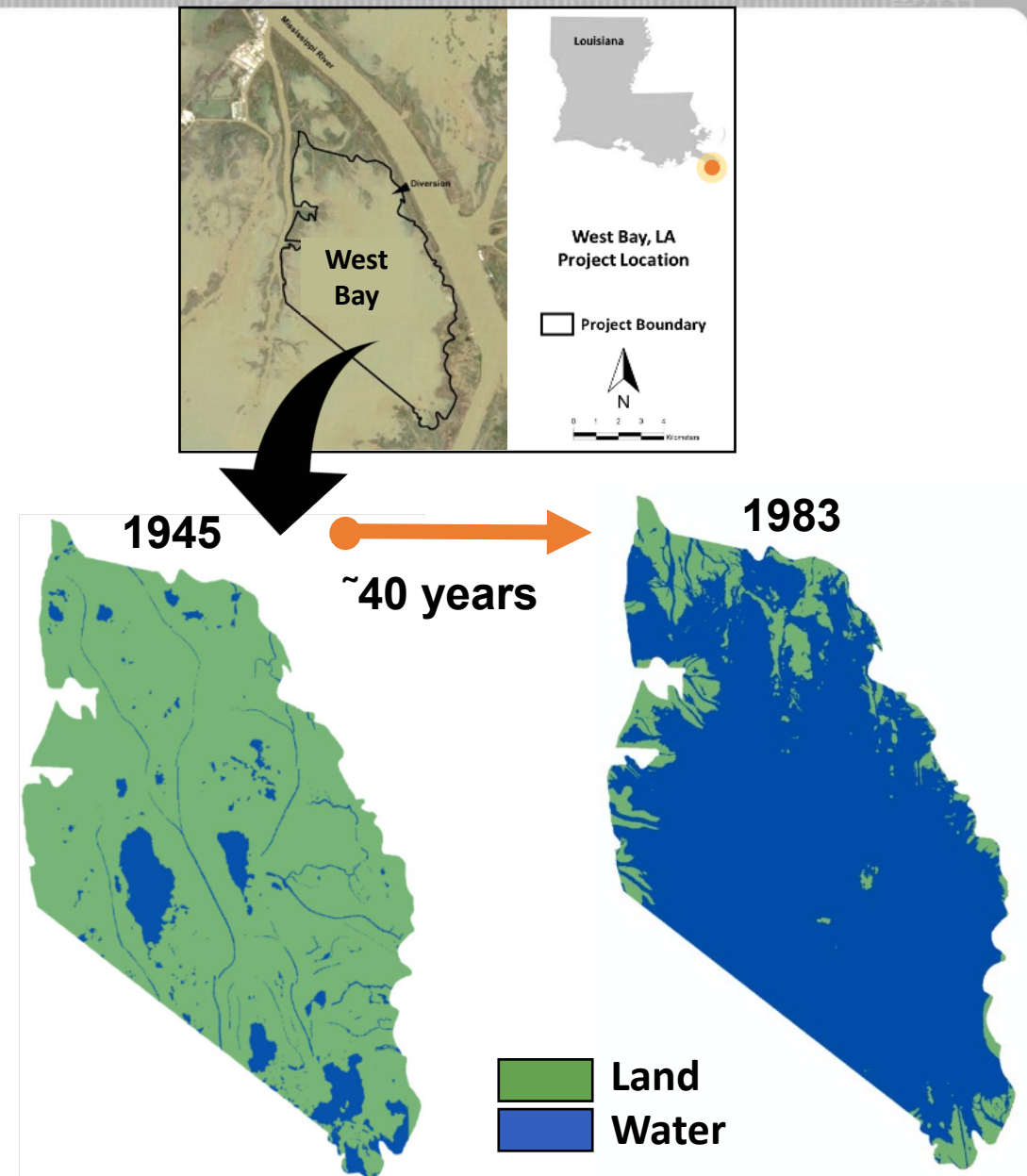
# But... Land Losses

- Coastal Louisiana has Sustained Immense Coastal Land Losses
- Erosion, Subsidence, Sea Level Rise
- ~16 sq Miles Lost/Year since 1985 (USGS 2017)
- **West Bay** is a Predominate Example of This...



# Introduction: West Bay

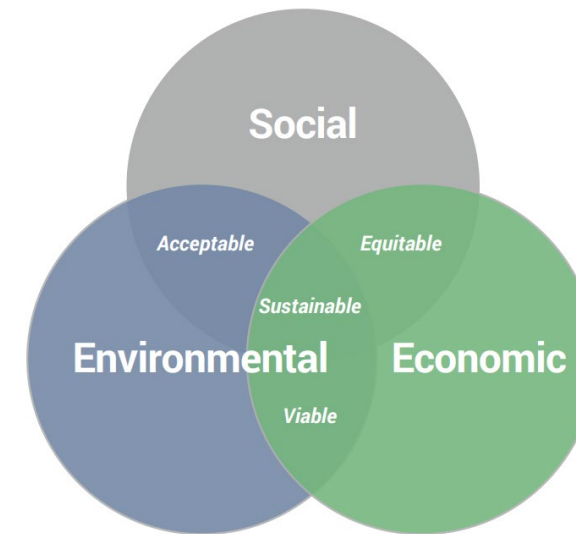
- **12,000 acre** sub-delta
- Lost **>70%** of land since the 1940's
- Stability of Federal navigation **bankline was threatened**
- In 2003 – approved for restoration under the **Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA)**
- **Restoration goals:**
  - 1) increase the land:water ratio
  - 2) increase mean elevation in the wetlands
  - 3) promote marsh habitat
- **Restoration at these scales require a different way of thinking....**



# Engineering With Nature...

*...the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.*

- **Key Elements:**
- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



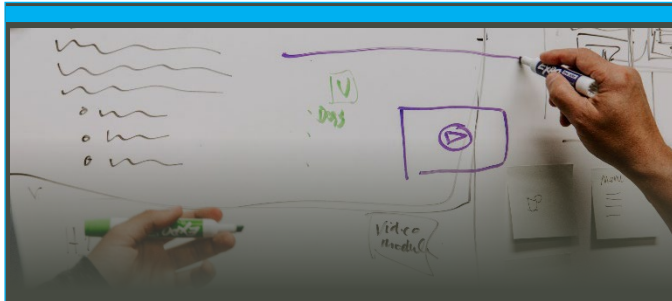
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# Objectives

1. Document restoration strategies used in West Bay:
  - a) Uncontrolled sediment diversion
  - b) Sediment Retention Enhancement Devices (SREDs)
  - c) Strategic and direct dredged sediment placement
2. Document changes in **land:water ratios** and **land classifications**
3. Identify **EWN concepts and principles** applied during the project with the goal of **informing future projects**

# Methods



## Stakeholders

Meetings with stakeholders and researchers to provide historical context of restoration

State of Louisiana  
Coastal Protection and Restoration  
Authority

**2016 Operations, Maintenance,  
and Monitoring Report**

for  
West Bay Sediment Diversion

## Literature Review

Peer-reviewed and grey literature of restoration actions

Data from CWPRRA sponsored field vegetation surveys



## GIS Analysis

Land:water analysis and land cover classifications

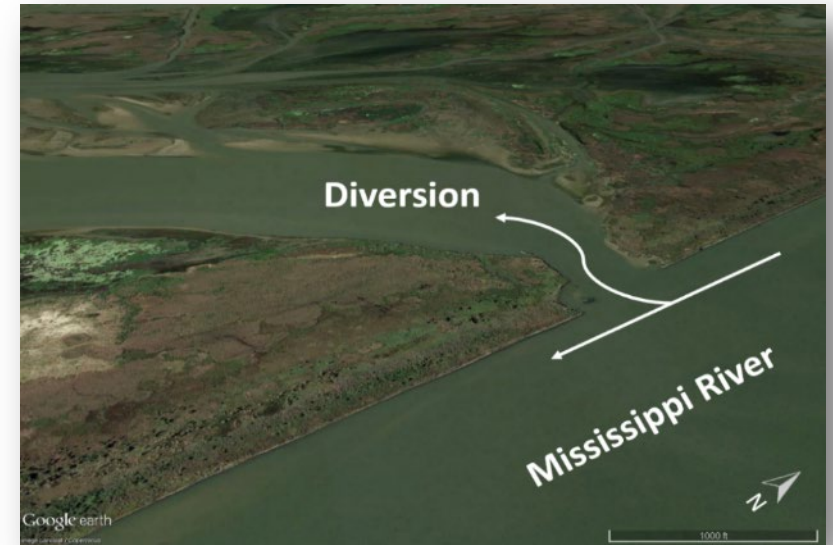
Image classification of Landsat satellite imagery using ENVI<sup>®</sup> software

Acreage totals using the ArcGIS<sup>®</sup> zonal statistics tool



# Results: Uncontrolled Diversion of Mississippi River

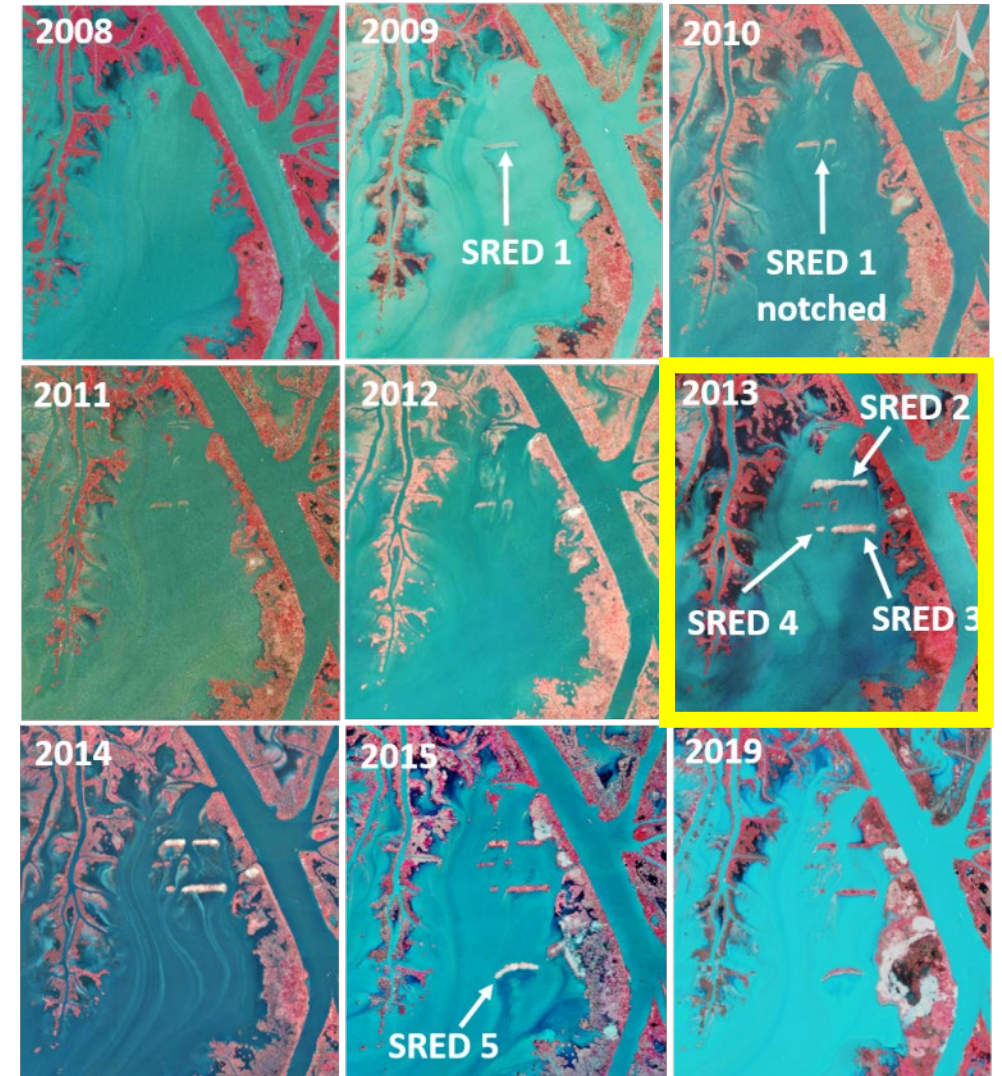
- Diversion strategy informed by:
  - Loss and Marsh Creation (LLMC) study determined that sediment diversions were potentially viable methods for marsh creation (USACE 1984)
  - Smaller scale diversions created in the 1980s and 90s in the lower Mississippi River delta region
- Bank notched in 2003 – target 20,000 cfs flow
  - Notch location was aimed to mimic a natural crevasse splay document circa 1838 (Allison et al. 2017).
  - The sand fraction is important to land building processes (Dean et al. 2014).
- **First 5 years – evidence of land building was minimal...**



# Results: Sediment Retention Enhancement Devices (SREDs)

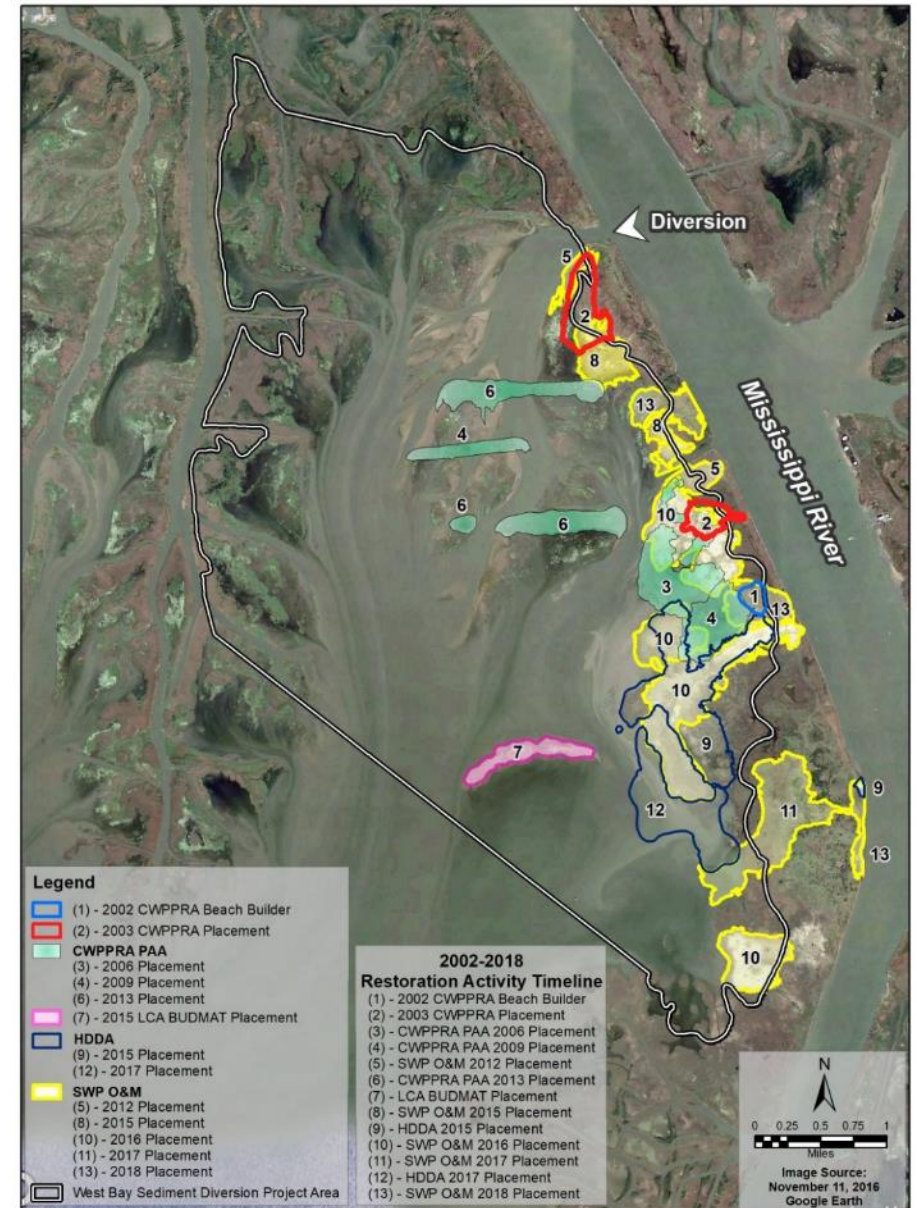
- Dynamic berms: Goal to increase sediment deposition
- **10 years post-diversion** - hydrodynamic and sediment transport modeling data indicated that the diversion shifted from **erosional processes** to **depositional processes** (Yuill et al. 2016)

Year	SRED	Cubic Yards of Dredged Sediment	Land Created (Acres)
2009	1	386,233	35
2013	2	1,325,614	97
	3	1,308,435	86
	4	328,567	13
2015	5	2,299,295	80

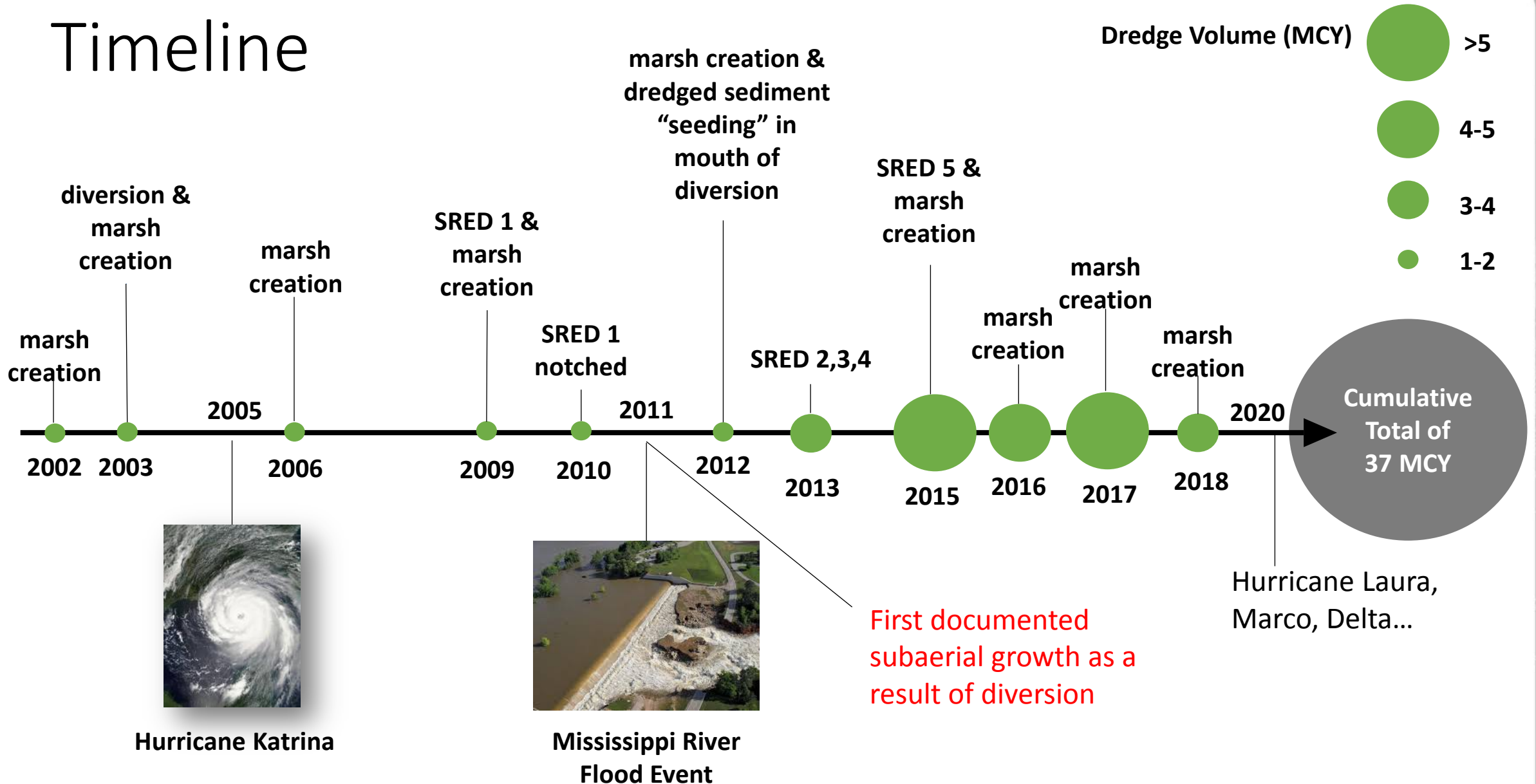


# Results: Dredged Sediment Placement

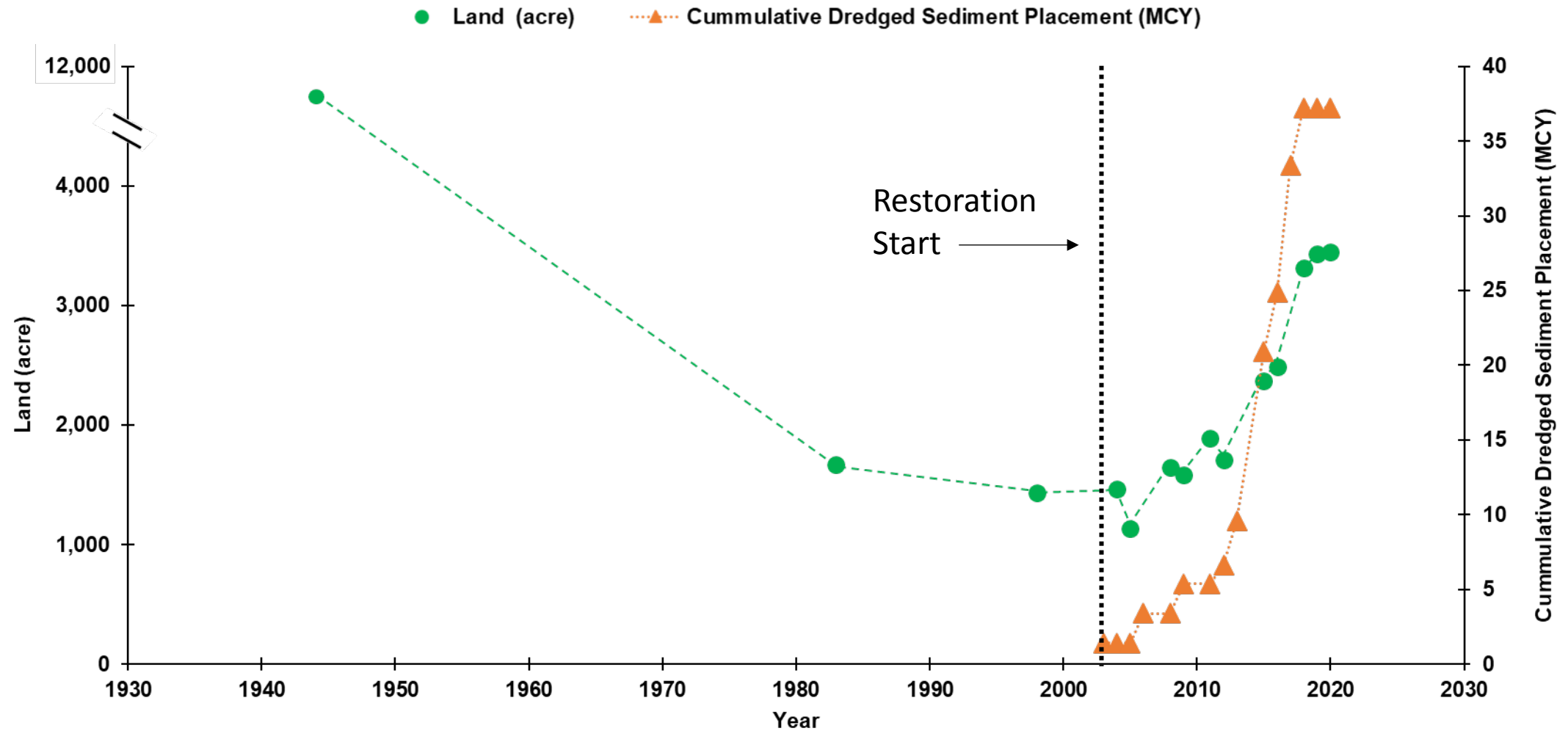
- Strategic Placement into the Diversion (2012)
  - Hydraulic pumping to mouth of diversion
  - Semi-confined using existing landforms
  - **600,000 CY**
  - Cost effective
  - **Goal to 'seed' bay**
- Direct Placement on Eastern Bank (2003 – 2019)
  - **37 MCY** of dredged sediment
  - **Estimated 2,300 acres of land created**



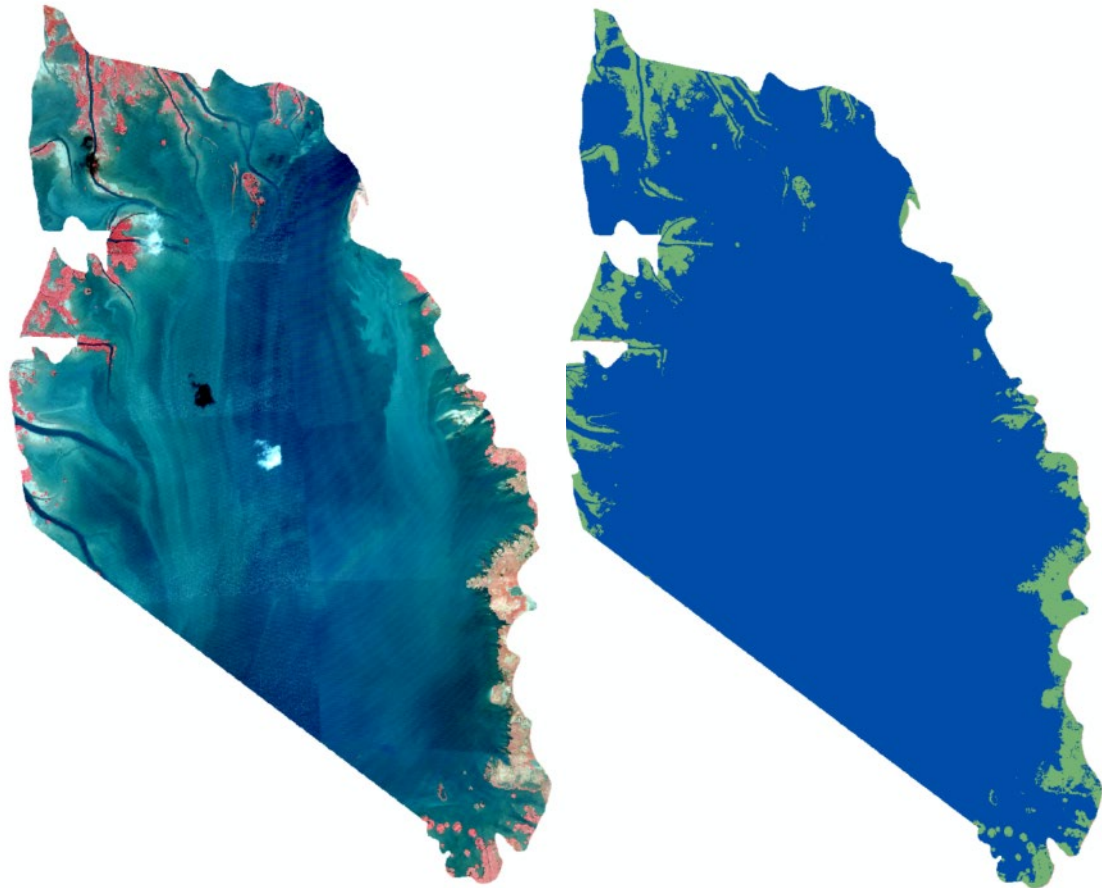
# Timeline



# Results: Land:Water Analysis



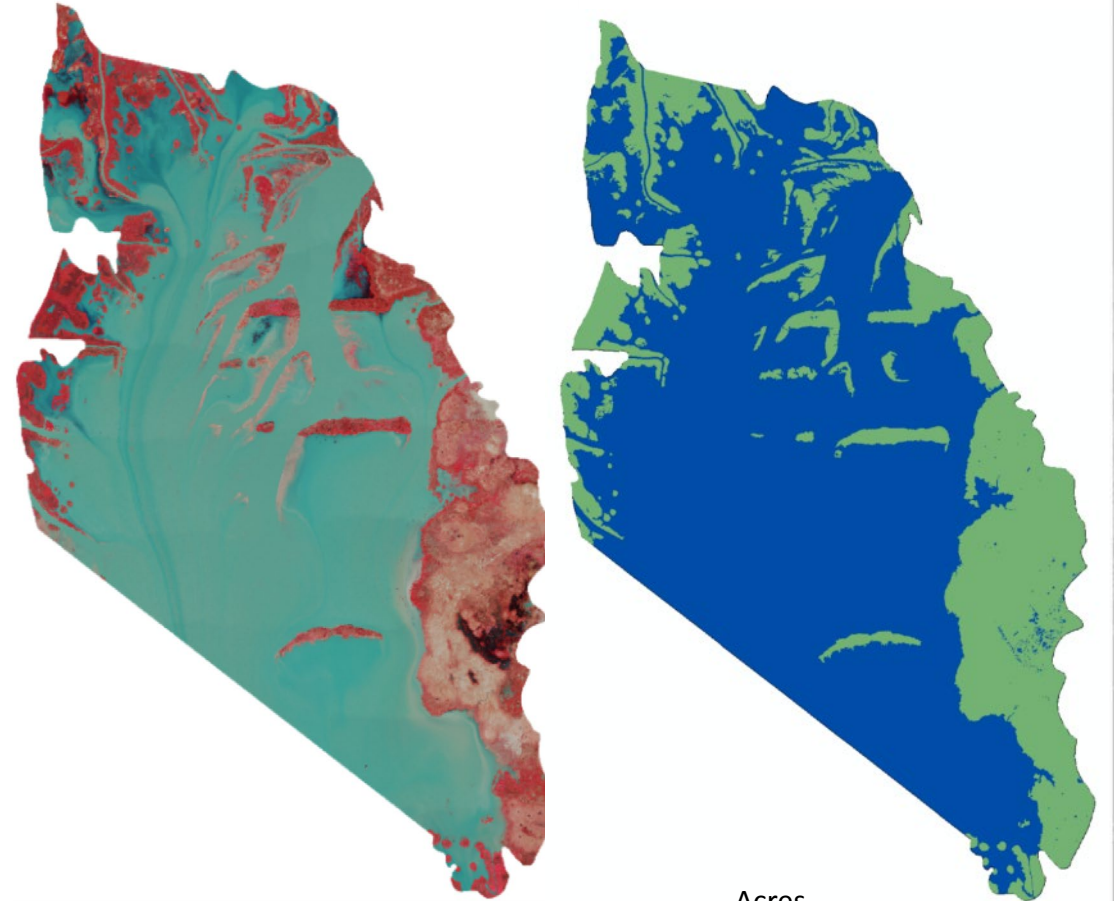
2005





	Land	<u>Acres</u>
	Water	<b>1,133</b>
		11,132



2020

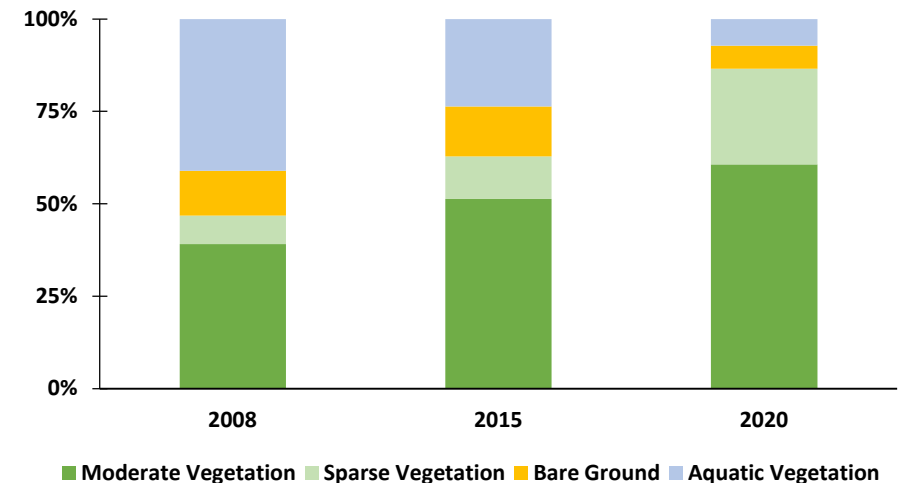


	Land	<u>Acres</u>
	Water	<b>3,457</b>
		8,808

**Land Gain  
+ 2,300 ac**

# Results: Land Classification and Vegetation

- Ground vegetation surveys (Plitsch 2017)
- New land vegetated quickly
- Fresh to intermediate marsh
- Floristic Quality Index (FQI) indicate better than region average habitat quality
- Trending increase of vegetation
- Dominate species:
  - Common reed (*P. australis*); delta bulrush (*S. deltarum*); wildrice (*Z. aquatic*)



# Results: Land Classification and Vegetation

2008

1,091 ac moderate  
vegetation ground cover



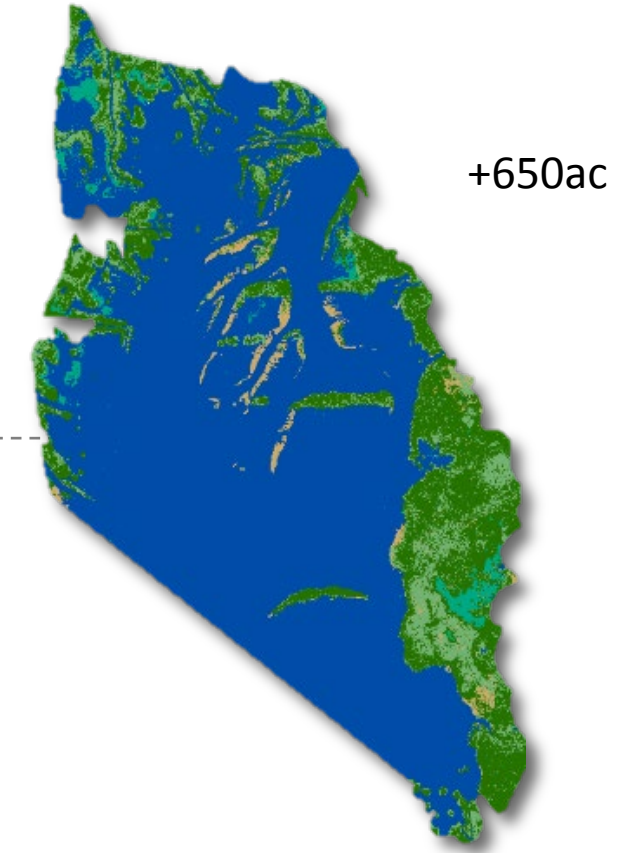
2015

1,595 ac moderate  
vegetation ground cover



2020

2,252 ac moderate  
vegetation ground cover



- Moderate Vegetation
- Sparse Vegetation
- Bare Ground
- Open Water
- Aquatic Vegetation



# Summary

- Uncontrolled diversions can take decades before subaerial creation of land is fully realized - future project goals should reflect these realities
- SREDs constructed using strategic and direct placement of dredge sediment directly contributed to increase the rate and extent of sediment retention
- Strategic and beneficial use of dredged sediment were ecologically meaningful contributions to land restoration
- Coastal Louisiana is poised to invest **billions of dollars on restoration**, thus lessons learned from projects like West Bay are critical to inform future work

# Resources

## WEDA Journal of Dredging

“Restoring Marsh Habitat with Beneficial Use of Dredged Sediment from a Riverine Environment.”

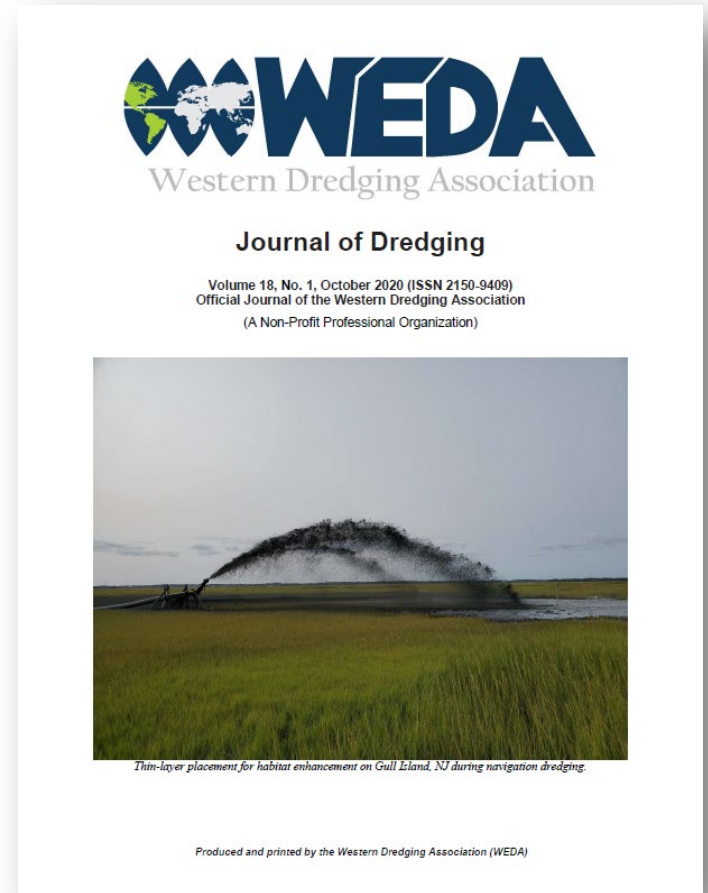
WEDA Journal of Dredging. 18(1):1-19.

<https://www.westerndredging.org/journal>

## IEAM Publication (Stay Tuned)

“Beneficial Use of Dredged Sediment as a Sustainable Practice for Restoring Coastal Marsh Habitat.”

Integrated Environmental Assessment and Management (IEAM)



## Episode 2

Using Natural Forces and Sediment to Restore Coastal Marsh Habitat

Guest: **Jeff Corbino**, Chief, Environmental Function, Operations Division - Technical Support Branch, New Orleans District, US Army Corps of Engineers

EWN website: [www.engineeringwithnature.org](http://www.engineeringwithnature.org)

Apple Podcast link: <https://podcasts.apple.com/ca/podcast/ewn-engineering-with-nature/id1528233207>

# Dredging Partners

- Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) partnered with
  - **Weeks Marine, Bean Dredging, and Mike Hooks**
  - Initial construction of diversion, SRED construction, and maintenance of the Pilottown Anchorage site
- Hopper Dredge Disposal Area (HDDA) maintenance dredging and Federal O&M of Southwest Pass dredging
  - **Great Lakes Dredge and Dock, Weeks Marine, and Manson Construction**



THANK YOU!

QUESTIONS?

Contact Information

Andrew McQueen, PhD  
Research Biologist  
USACE ERDC

[Andrew.d.mcqueen@usace.army.mil](mailto:Andrew.d.mcqueen@usace.army.mil)

