OVERVIEW OF THE MISSISSIPPI RIVER & TRIBUTARIES (MR&T) - ATCHAFALAYA BASIN PROJECT

Port Of Morgan City – Stakeholder Meeting

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11 February 2019

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TOPICS OF DISCUSSION

- Passing the MR&T Project Design Flood
  - The Jadwin Plan
  - The Morganza Floodway
  - The Old River Control Complex
- MR&T Atchafalaya Basin Flood Control Project
- Atchafalaya Basin Levee Construction
- Atchafalaya Basin O&M
- Atchafalaya River Dredging
- The Atchafalaya Basin Floodway System (ABFS) Project
- Sedimentation Issues
- Path Forward

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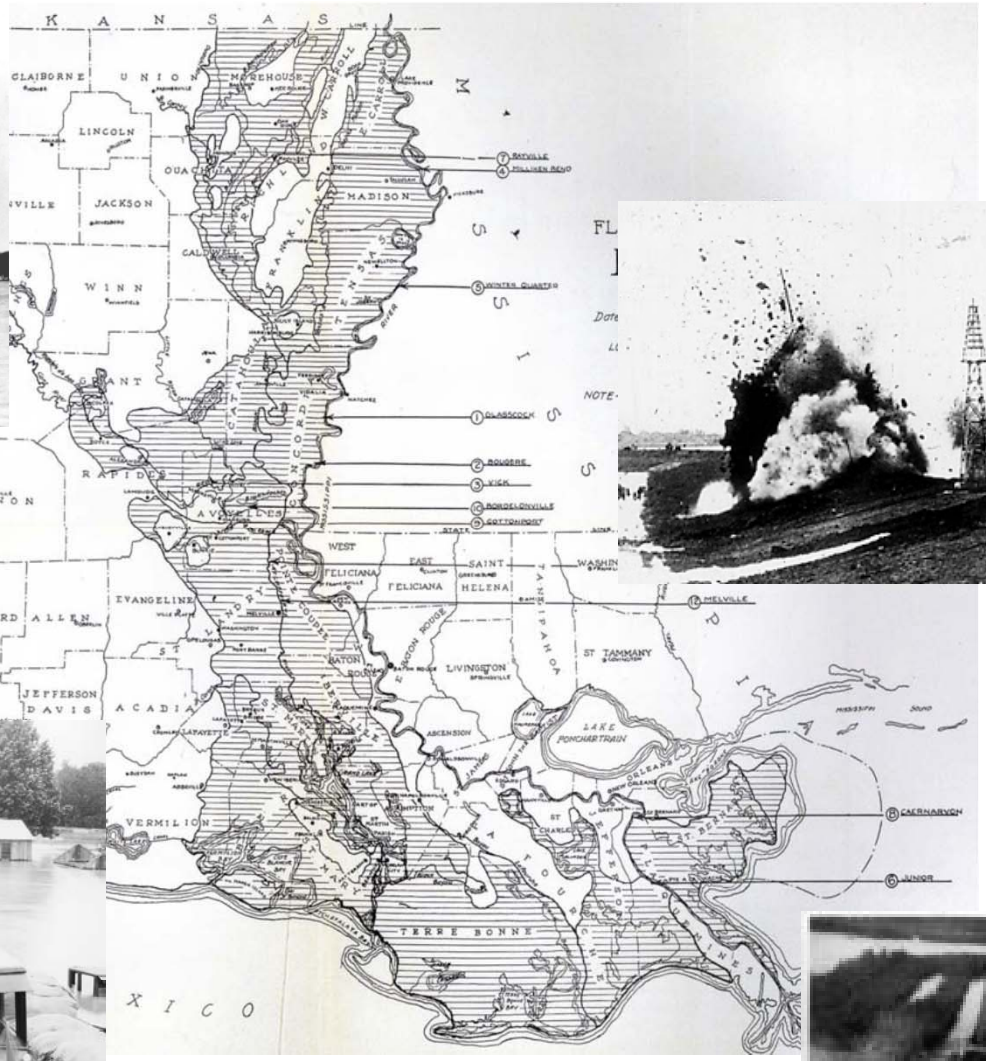
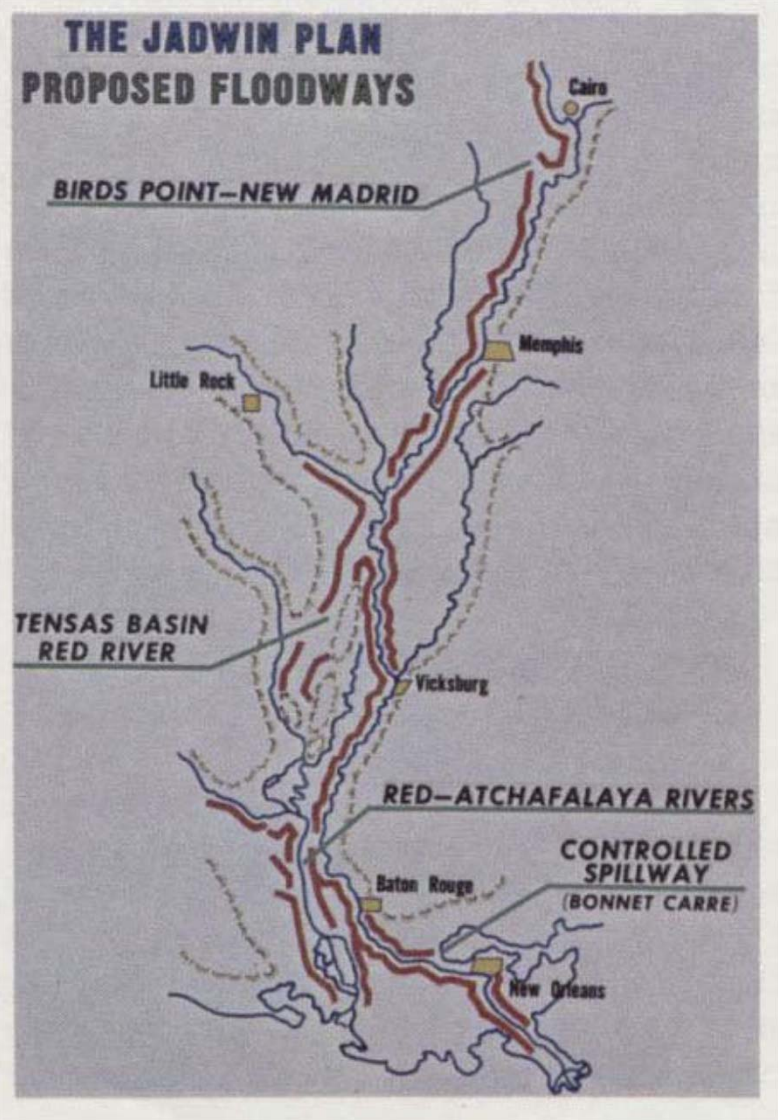
THE FLOOD OF 1927



Flood Control Act of 1928 and the Jadwin Plan



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The Morganza Floodway

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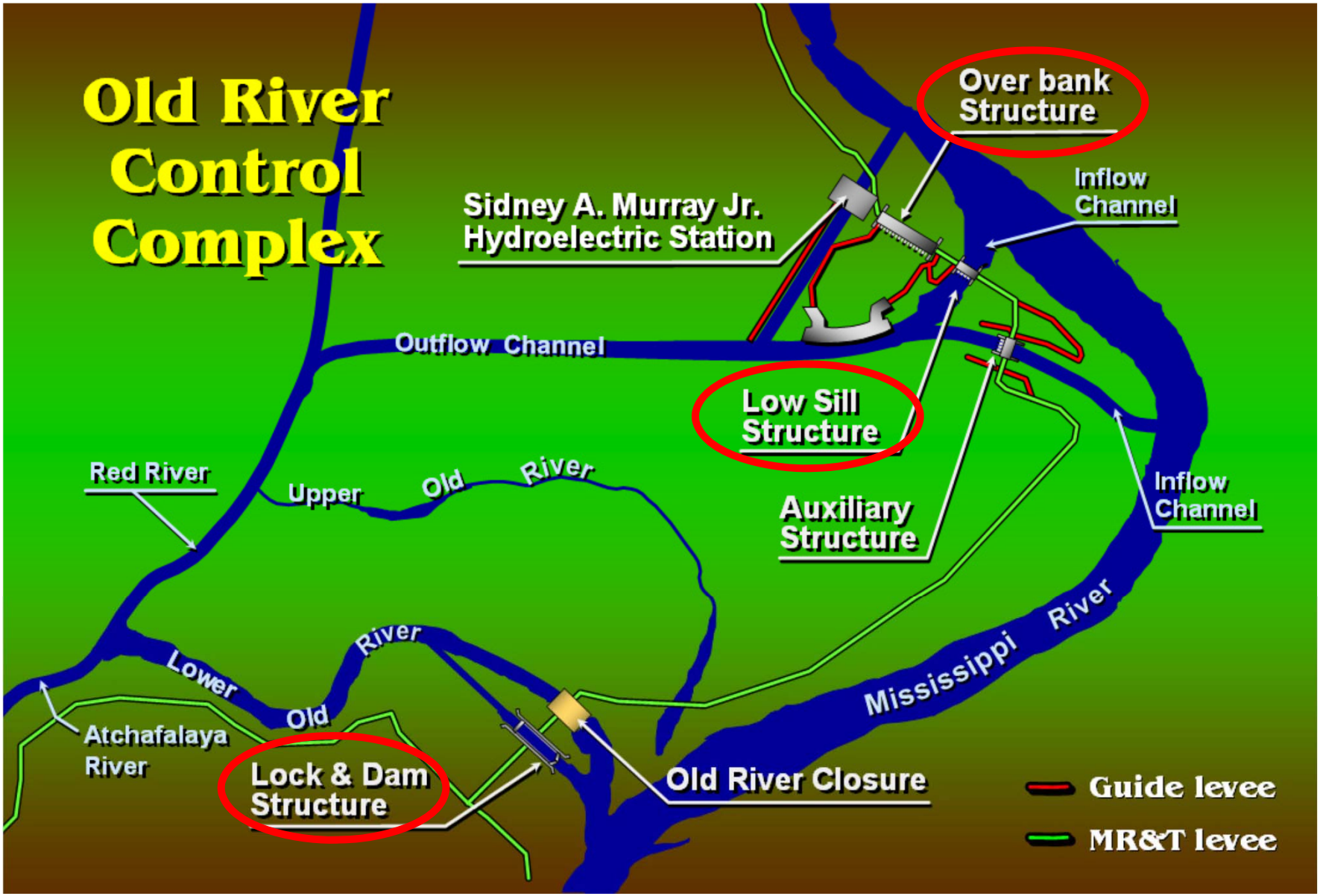
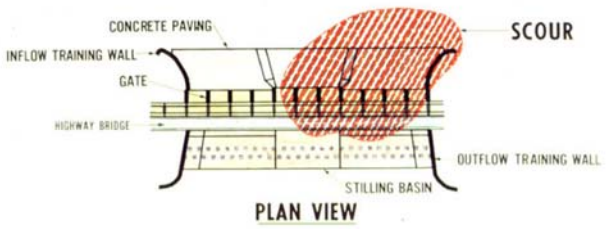
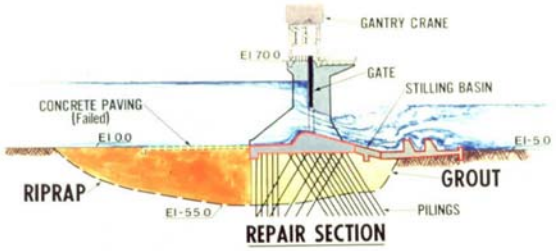
Old River Control Structures Authorized



1973 Flood

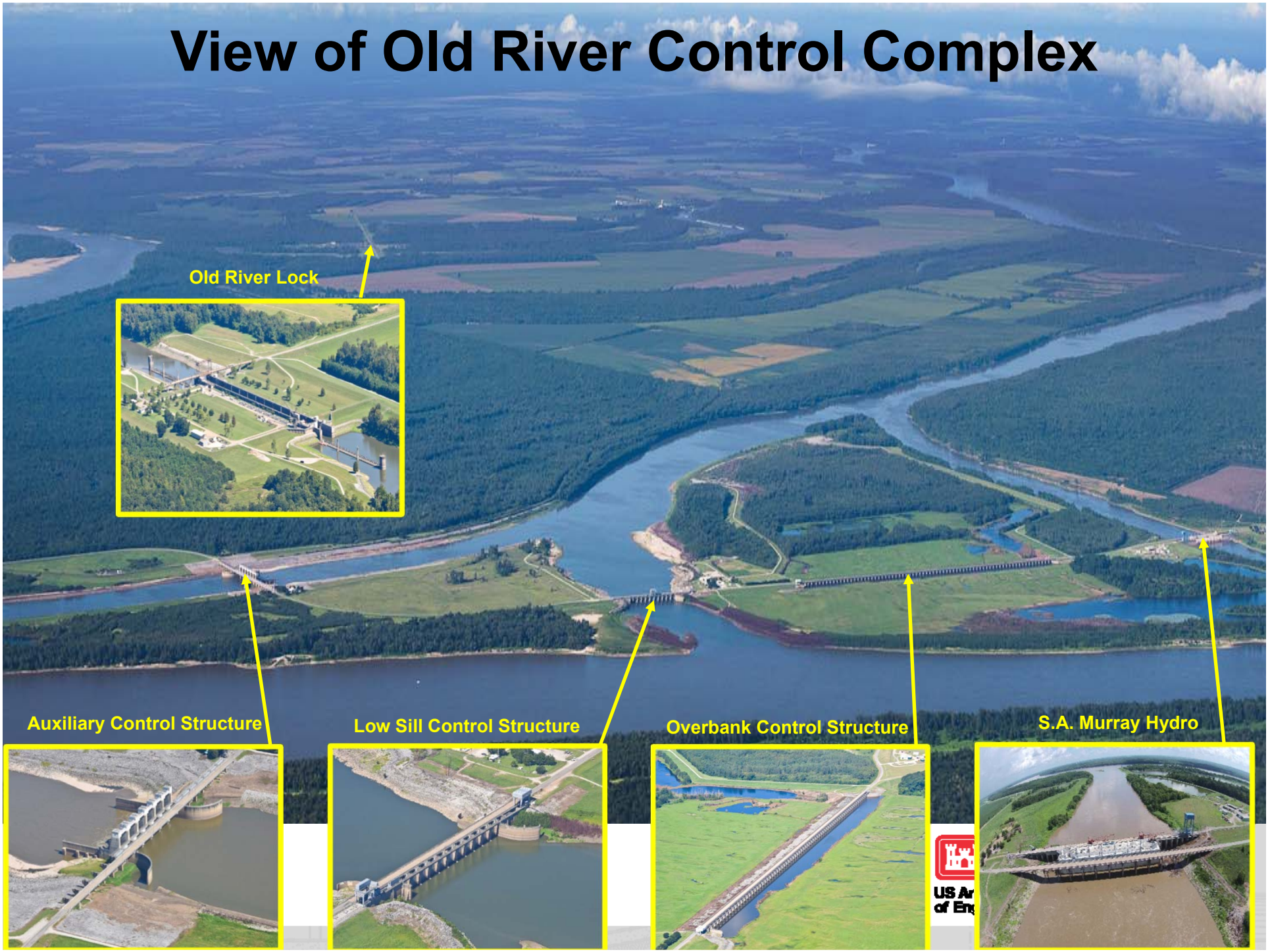
- The Low Sill Control Structure was undermined and the Wing Wall failed
- The Old River Overbank Control Structure and the Morganza Control Structure were opened to relieve stress on the Low Sill Control Structure
- Due to severe damage to the Low Sill Control Structure, USACE recommended construction of the Auxiliary Control Structure, which was completed in 1986



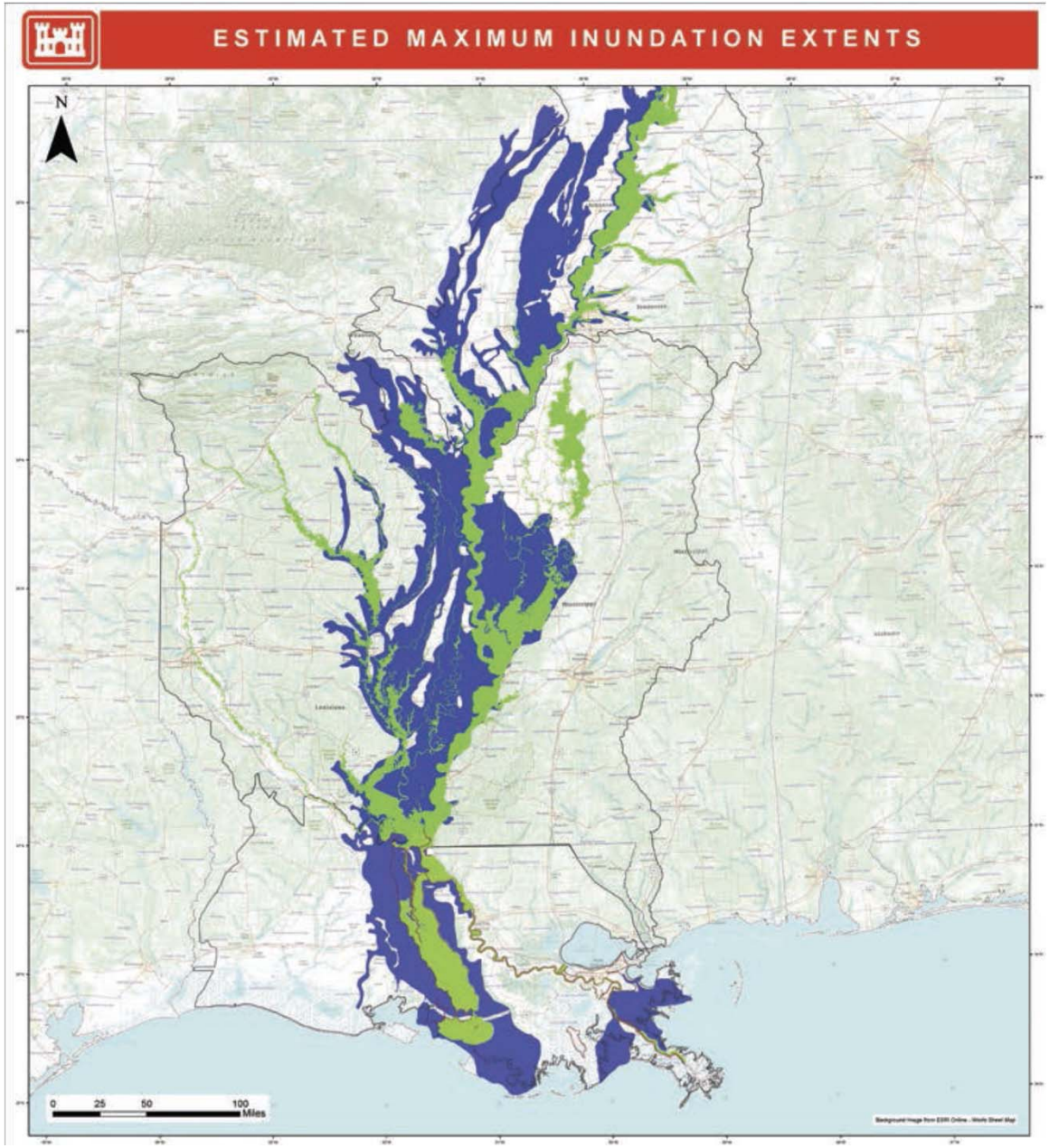



Morganza Control Structure Operated for First Time

View of Old River Control Complex



The Flood of 2011



Extent of 1927 Flood (in Blue) Versus 2011 Flood (in Green)

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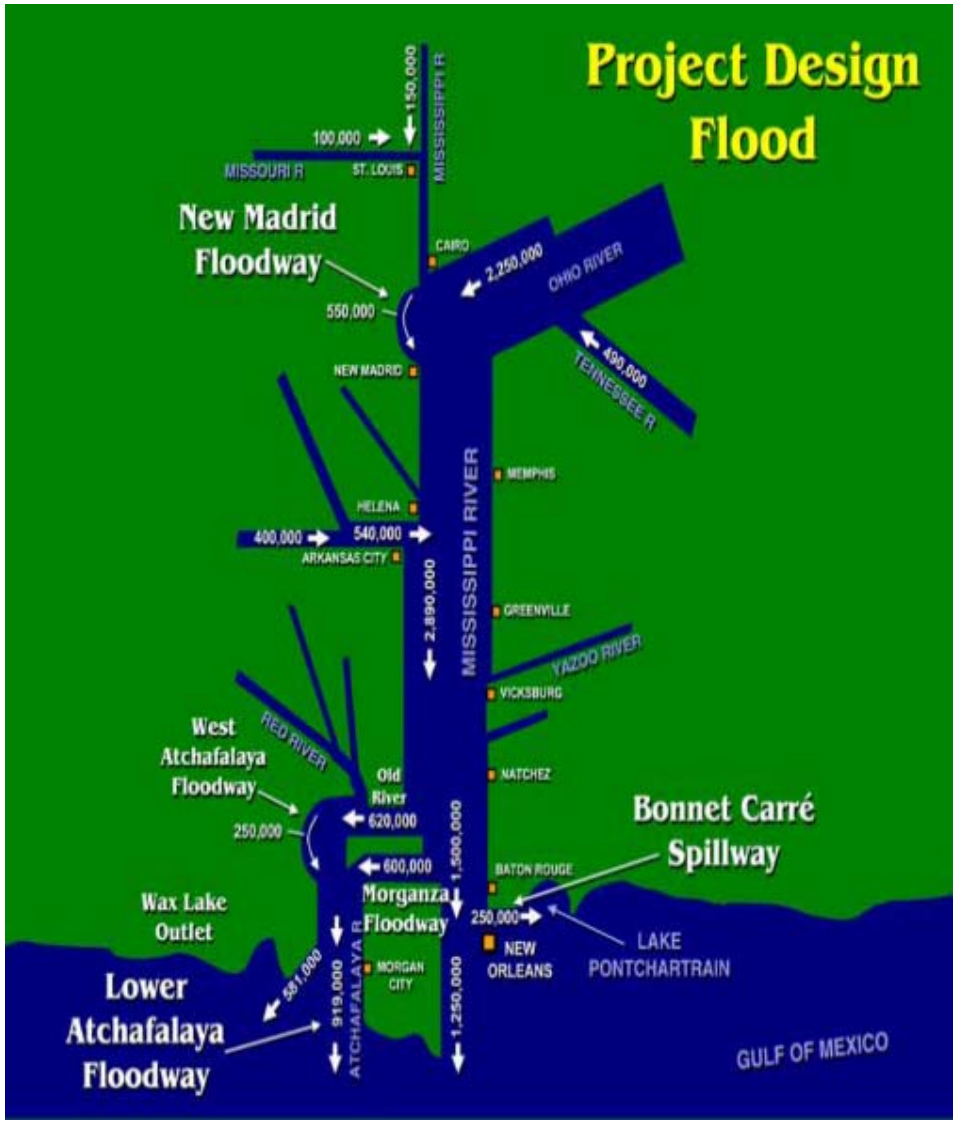
Passing the Project Design Flood



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The MR&T Atchafalaya Basin Project

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The MR&T Atchafalaya Basin Project
Major Components

- 451 Miles of Levees and Floodwalls
- 4 Navigation Locks
  - Old River Lock
  - Bayou Sorrel Lock
  - Berwick Lock
  - Bayou Boeuf Lock
- 3 Navigable Floodgates
  - Charenton Floodgate
  - East Calumet Floodgate
  - West Calumet Floodgate
- 11 Pumping Stations
- 3 Drainage Structures
- Wax Lake Outlet
- Morganza Flood Control Structure

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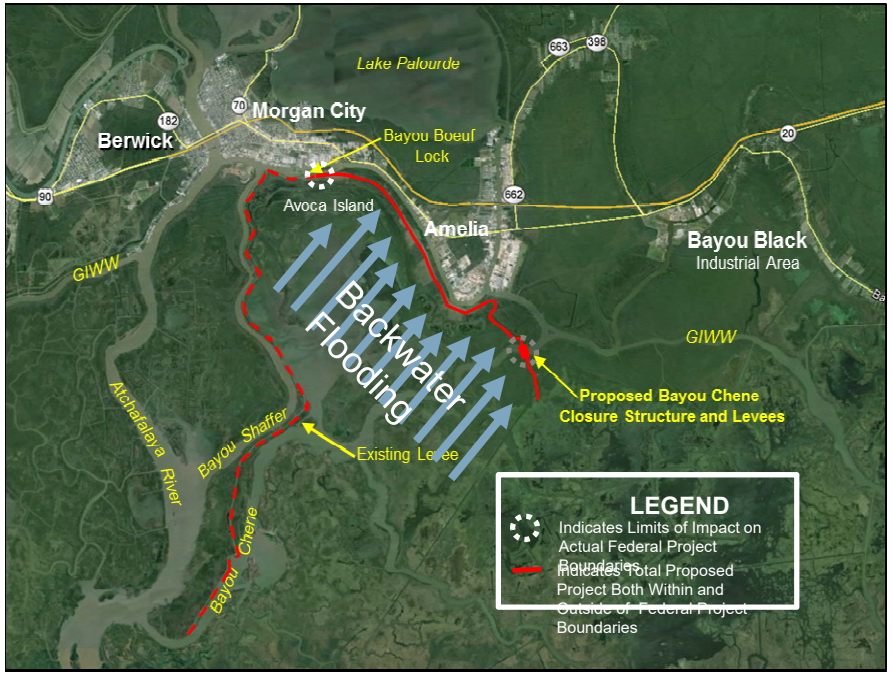
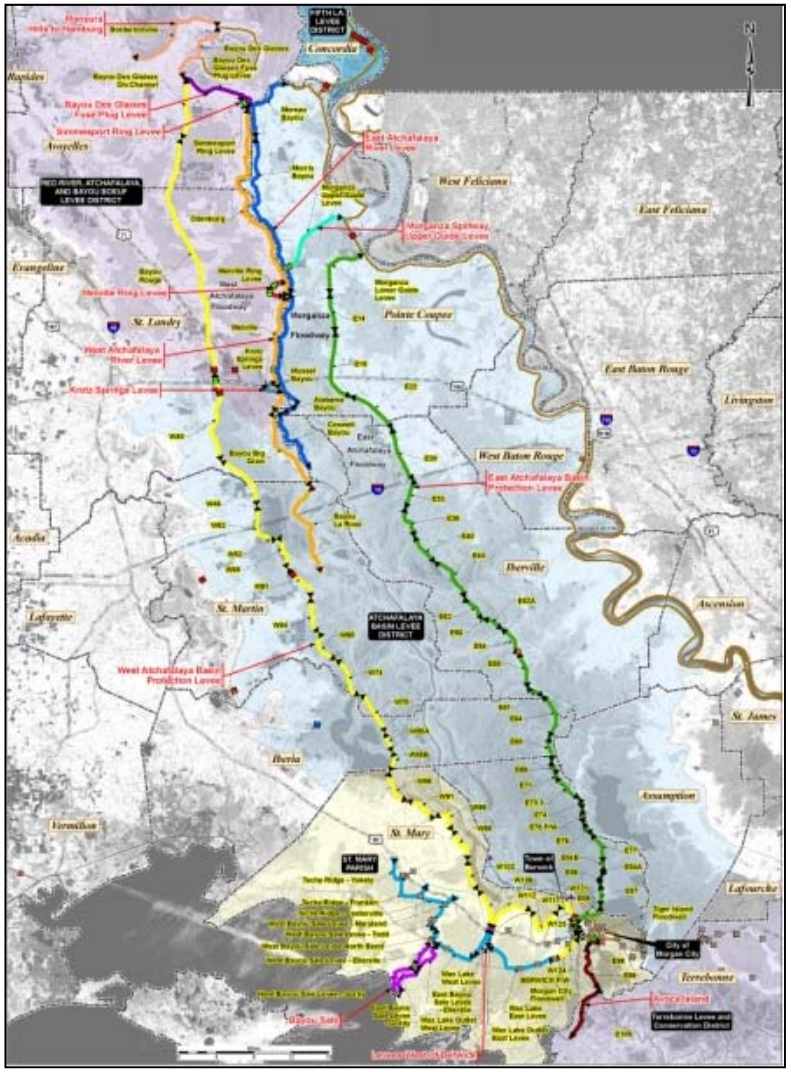
Atchafalaya Basin Construction

- 314 miles of the 451 mile system complete
- Significant Levee Deficiencies
- Backwater flooding east of Morgan City
- Insufficient funding
- Remaining Efforts: Approx. $2.4B





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Atchafalaya Basin O&M

- **NAVIGATION**
  - Dredging of the Lower Atchafalaya River and Bayous Chene, Boeuf and Black
  - Dredging of Berwick Harbor and Upper River
  - 3 Navigation Locks (Bayou Sorrel, Bayou Boeuf, Berwick)
  - 3 Navigable Flood Gates (East Calumet, West Calumet, Charenton)

- **FLOOD RISK MANAGEMENT**
  - Darbonne, Courtableau and Pointe Coupee Drainage Structures
  - Drainage Pump Stations (10 St Mary Parish) major maintenance and support
  - Point Coupee Pump Station operations and maintenance
  - Morganza Structure
  - Levee Maintenance – Major repairs

- **INSPECTION AND COMPLIANCE**
  - Section 10/404 and Section 408 permitting
  - Annual Levee Safety Inspections

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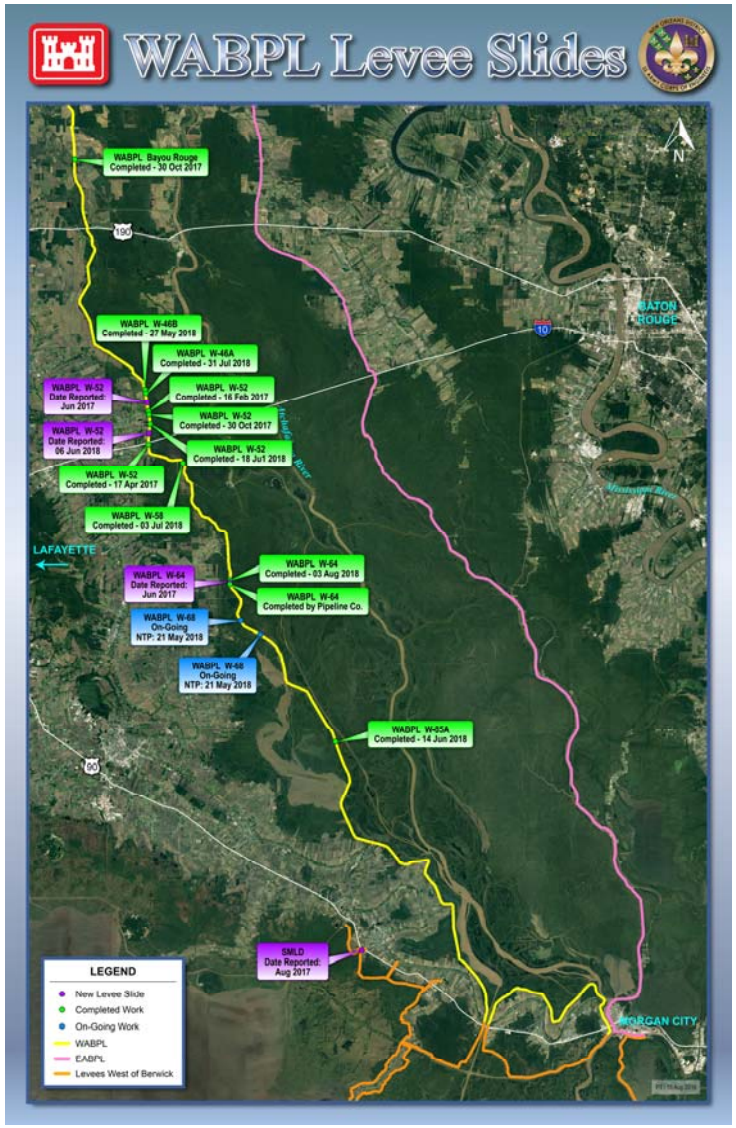
Levee Maintenance Activities

- Levee Districts responsible for routine maintenance
- Corps responsible for repairs
- Funding for repairs has been insufficient
- Levee slides on the West Atchafalaya Basin Protection Levee (WABPL) occur with regularity due to poor soil conditions and low factors of safety
- Supplemental funds are being used to repair three active slides
- Levee slides are surveyed and monitored: Engineering analysis concluded that none are currently considered critical for a flood event.

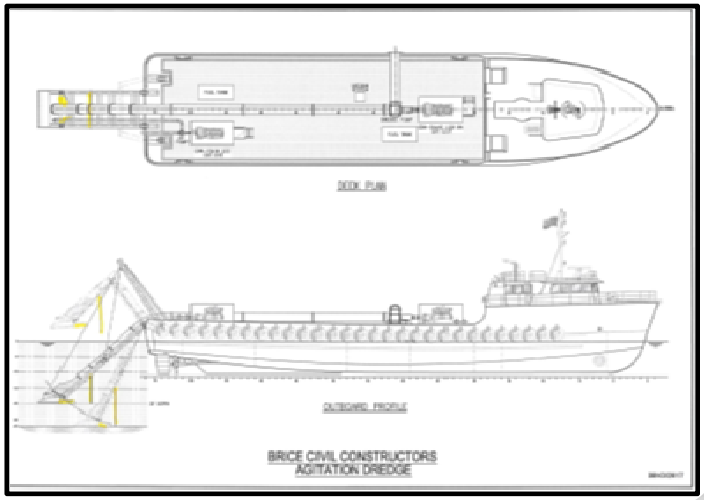


Atchafalaya River Dredging

- Federal funding has been inadequate to provide minimally acceptable project dimensions
- Unreliable channel depth prohibits regular international shipping business from utilizing port facilities. (Niche port market for small Caribbean and Gulf of Mexico ships)
- Maintaining Lower Bar Channel depth is challenging due to fluid mud or “fluff”
  - Continuous agitation dredging is required
- Corps is pursuing a multi-year “Special Purpose Dredge” Contract to effectively and efficiently manage Lower Bar Channel “fluff”
- Upper Bar Channel reaches are impacted by shoaling of sandy material
  - Annual cutterhead dredging is need to maintain the upper Bar and Bay Channels

Agitation Dredging in Atchafalaya Bar Channel 2016

Proposed Special Purpose Agitation Dredge



Atchafalaya Basin Floodway System (ABFS)

- Underpinned by a comprehensive analysis, WRDA 86 authorized the Atchafalaya Basin Floodway System (ABFS) Project, which included:
  1. Acquisition of Real Estate Interest for:
     - Flood Control
     - Environmental Protection
     - Recreational Development
     - Public Access
  2. Construction of Recreational Facilities
  3. Construction of Water Management Units
- Funding constraints continue to challenge the advancement of ABFS Project elements

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Atchafalaya Basin Floodway System

Designed to safely pass the project flood in an environmentally sound manner

We encourage Public Recreation
The Corps has purchased 50,000 acres of public access lands and is developing recreation facilities so the public can enjoy the basin's fish and wildlife.

We Protect the Environment
The Corps is purchasing 367,000 acres in the basin to control evelopment.

We reduce sedimentation in the floodway by constructing canal closures and improving water circulation. When there is too much sedimentation, it reduces the capacity of the floodway to pass flood waters, and it harms the wetlands.

We retain and restore the basin's unique environment of wetlands and woodlands by designing and building "water management units."

We allow continued agricultural, forestry and mineral development only when it does not interfere with flood control or the environment.

SEDIMENTATION

- Current operation of ORCC and Sidney Murray Hydropower Plant (SMHP) structures divert insufficient sediment to the Atchafalaya
- Distribution of sediment between the Mississippi and Atchafalaya rivers has impacted channel geomorphology
- Reduced Mississippi River channel capacity results in higher flood stages, impacting operation of the ORCC and Morganza Spillway
- USACE utilizing the Low Sill Structure during a rising river hydrograph to increase sediment transport through the complex

PATH FORWARD

- Sedimentation Issue
  - Short-Term: Revise water control plan to account for changing river conditions. Incorporate results of ERDC sediment study into operation.
  - Long-Term: Complete sediment diversion study on Old River (AROMA) to develop long-term solutions to sediment distribution.
- **Low Sill Assessment** – USACE developing a scope of work to assess the 1973 Flood scour damage to the Low Sill structure to ensure safe operations
- **System-wide assessment** to determine if system components are operating optimally in order to effectively pass the project flood.

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BACKUP SLIDES

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ORCC Sedimentation, Low Sill Structure, S.A. Murray Hydropower, OMAR

Status

- ORCC Sedimentation - Declining channel capacity resulting in higher flood stages have been noticed along the Mississippi River near the Old River Complex for many years. Concern over this change has been documented as far north as Vicksburg and as far south as Baton Rouge, LA.
- Operational Changes - USACE implemented a recommendation from the ERDC sediment diversion study to utilize the Low Sill Structure during a rising river hydrograph to increase sediment transport through the complex.
- SA Murray Hydropower is allocated approximately 75% of the flow diversion at ORCC on an annual basis. HP intake structure is high in the water column and does not pass much sediment by design. The ORCC structures are designed to pass bed load.

Challenges

- ORCC Sedimentation - Maintaining proper flow distributions under head limitations that are increasing in frequency due to sedimentation
- S.A. Murray Hydropower – enforcement of current MOA to move sediment
- Maintaining stable river systems – Mississippi is aggrading; Atchafalaya is degrading
- During Flood Events – reaching operational triggers earlier in event, which causes to operate earlier and pass more water causing more stress on structures

Path Forward

Work is being accomplished in 3 Phases:

- Phase I – Literature Review (complete)
- Phase II – Determining the Hydropower Plant's contribution to the sedimentation. 18 month duration. Estimated completion Sept 2019
- Phase III- System Evaluation. Scope not yet refined. Estimated duration = 3 to 5 years.

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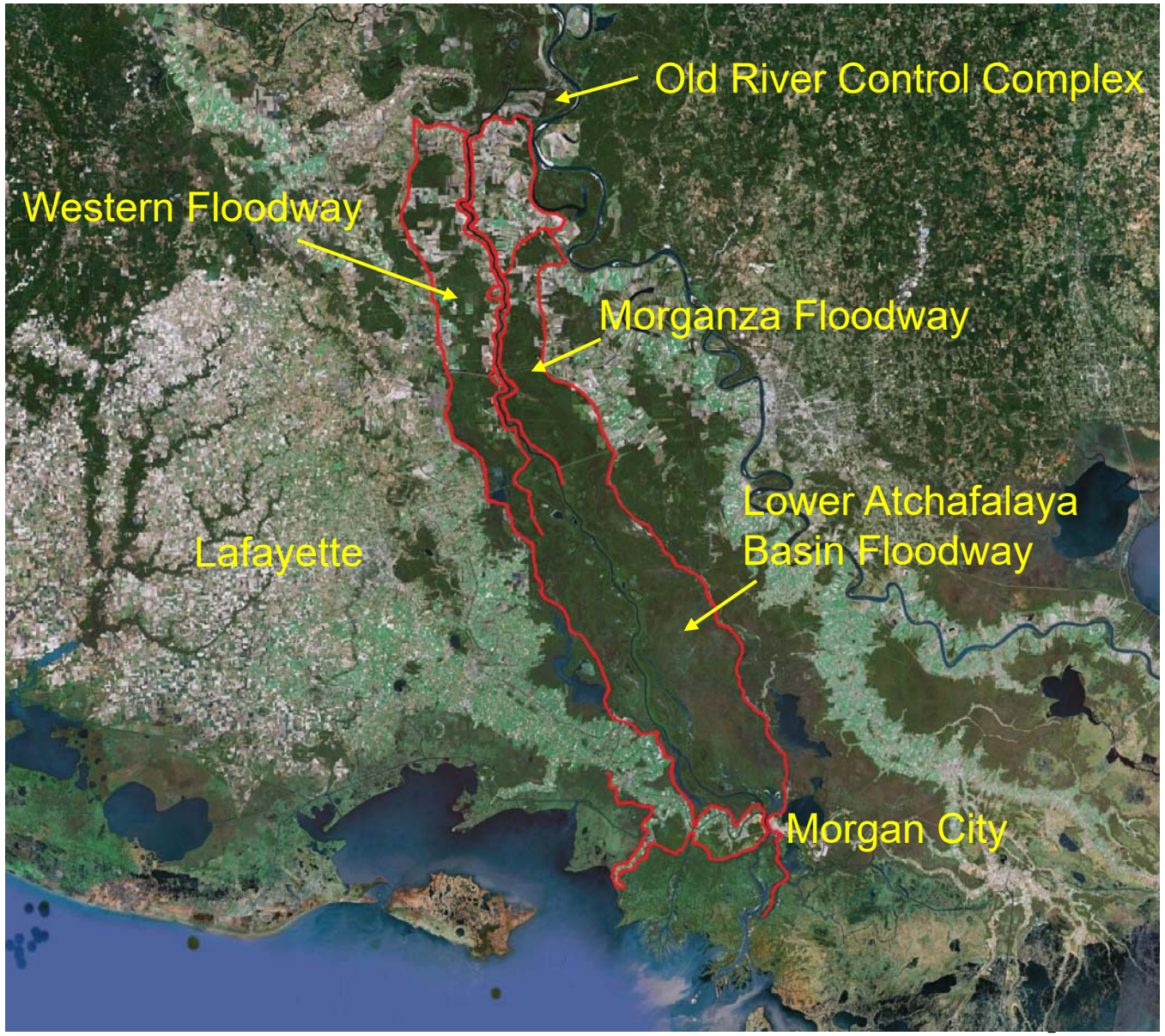
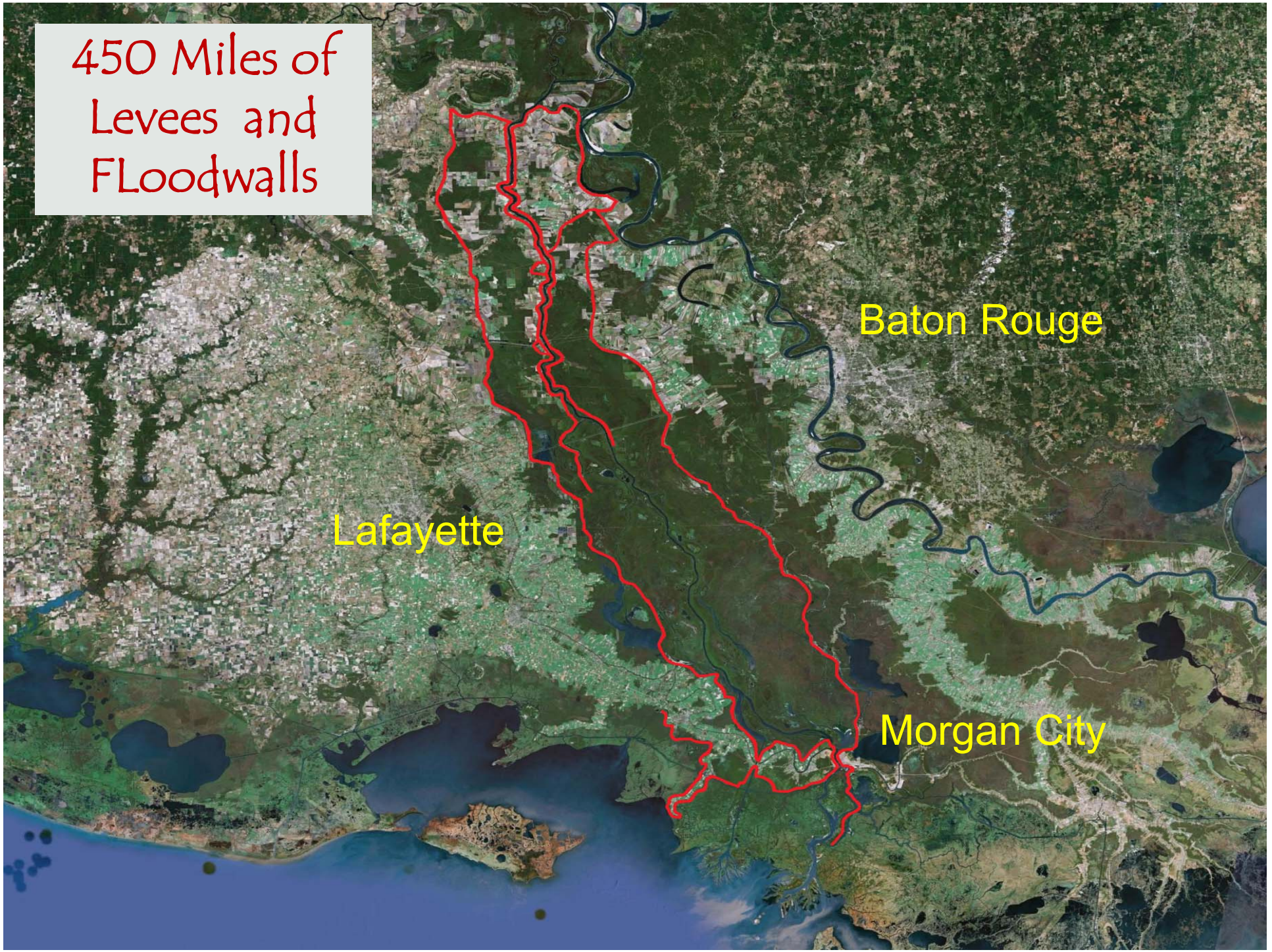
The MR&T Atchafalaya Basin Project

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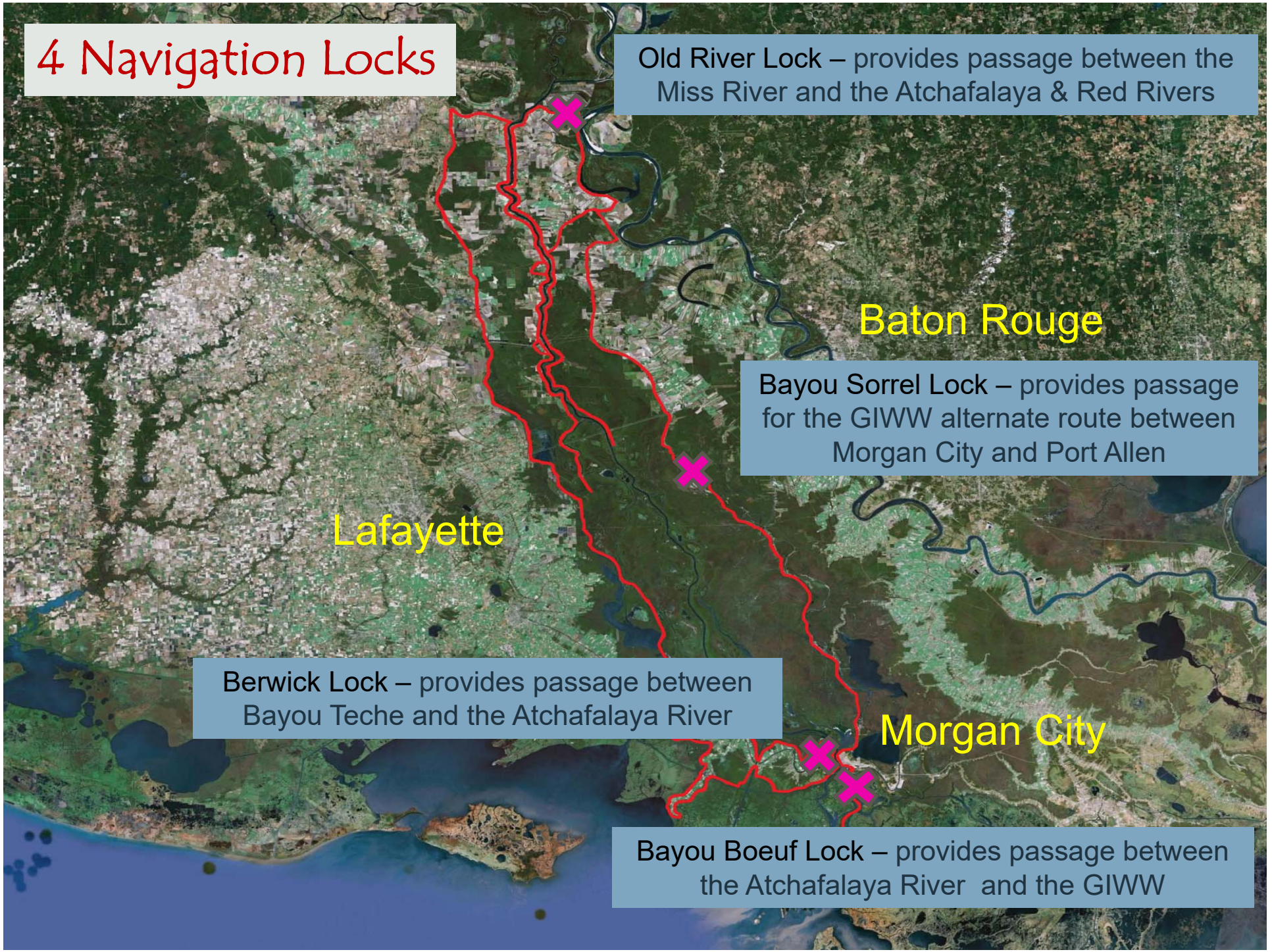
Baton Rouge
Lafayette
Morgan City

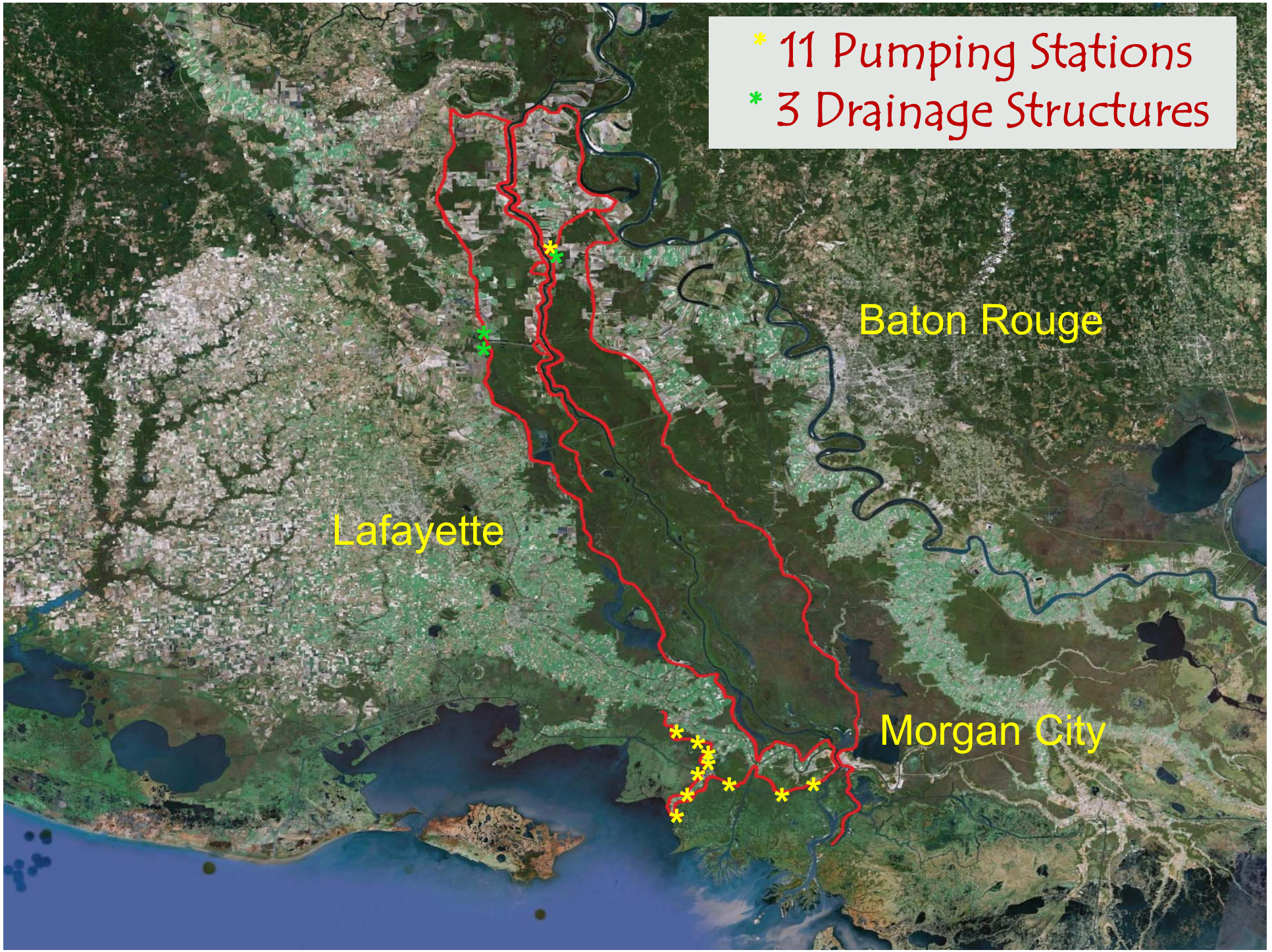

4 Navigation Locks
Old River Lock – provides passage between the Miss River and the Atchafalaya & Red Rivers
Baton Rouge
Bayou Sorrel Lock – provides passage for the GIWW alternate route between Morgan City and Port Allen
Lafayette
Berwick Lock – provides passage between Bayou Teche and the Atchafalaya River
Morgan City
Bayou Boeuf Lock – provides passage between the Atchafalaya River and the GIWW

3 Navigable Floodgates

Charenton Floodgate – Located on the Charenton Canal in St Mary Parish

Morgan City

East & West Calumet Floodgates – Located at the intersection of Bayou Teche and the Wax Lake Outlet (AKA Calumet Cut)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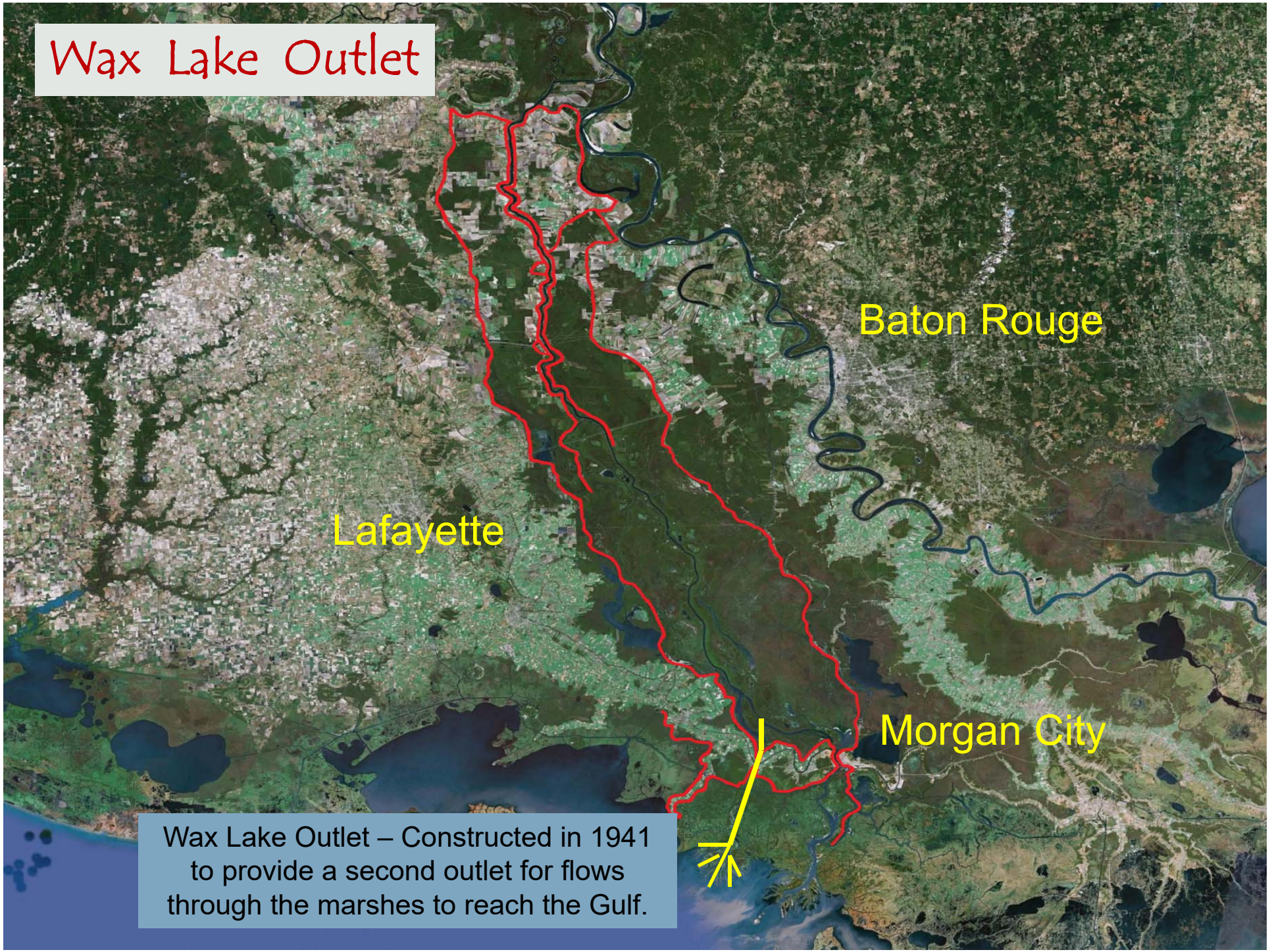
Wax Lake Outlet
Baton Rouge
Lafayette
Morgan City
Wax Lake Outlet – Constructed in 1941 to provide a second outlet for flows through the marshes to reach the Gulf.

1 Flood Control Structure

Morganza Flood Control Structure– Completed in 1954

Lafayette

Define Assignment or Challenge:
LSU report argues that current changes in the river channel pose a threat to the successful management of the Miss. River distribution at the Old River Control Structure. Local media's interest was captured by the severe impacts presented by the report.

Key Stakeholders: Local and regional media, general public, navigation industry

Communication Goal: To provide greater understanding and awareness of the importance of ORCS, the current conditions of the Mississippi River and risks present in an open and transparent manner.

Key messages and corresponding talking points

The Mississippi River, like all rivers, is a dynamic system of water and sediment that exists in a state of constant change.

- Approximately every 1000 to 1500 years, the combination of flow, hydrology and sediment displacement has caused the Mississippi River to alter its course.
- During the 19th and 20th centuries, a course change was underway with more and more of the Mississippi River being captured by the Atchafalaya River.
- The Old River Control structures were designed and constructed to pause this process by holding the flow distribution to that identified in the 1950s.
- Every day, the Old River Control Complex is operated to maintain a 70/30 distribution of flow between the Mississippi and Atchafalaya Rivers, respectively.

The current systems approach for river management has a degree of flexibility and adaptability to promote safe passage of Mississippi River high water events.

- The Old River Control complex, operating as a component of the Mississippi River and Tributaries flood risk management project, provides a systems approach to managing Mississippi River high water events.
- The flood management features of the MR&T such as the Morganza Floodway provide the capacity and flexibility to relieve pressure by diverting river water into designed floodways. In 1973, this flexibility was exercised when the Morganza Floodway was operated to relieve pressure on the damaged Old River Low Sill structure. The Old River Auxiliary Structure was constructed in response to the events and damage experienced during the 1973 Flood.
- In 2011, the systems performed as designed by safely passing the project flood below Morganza, helping to prevent more than $170B in damages in Louisiana alone.
- During the 2011 flood, we experienced river elevations at the Morganza Control Structure that were higher than anticipated for the rate of river flow. USACE has refined the Morganza Control Structure operational procedures to account for these conditions during future operations. The adaptability of our water management procedures allows us to adjust operations to changing conditions.

Over time, the effectiveness of our river management structures to pass high water events will diminish as more sediment accumulates in the lower river.

- Under existing conditions, the risk of failure to manage future high water events remains relatively low.
- As conditions continue to evolve and sediment accumulates in the river below Old River, our flexibility and capacity to adjust to these conditions will diminish.

We must use the best science and engineering available to comprehensively understand the change in river conditions and the causes of this change.

- We are currently assessing the Mississippi River to better understand the changes within the river system as well as the causes for these changes.
- This study will better prepare us for identifying long term solutions for passing future large scale high water events as well as ensuring the Mississippi River remains on its current course.

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The Old River Control Structure (ORCS) is operated to stem the capture of the Mississippi River by the Atchafalaya River by maintaining the current distribution of flow between the rivers. The flood management features of the Mississippi and River Tributaries project currently provides the capacity and flexibility necessary to relieve pressure on the Mississippi River system and ensure safe passage of high water events. However, as future sediment accumulation and change in river conditions below the ORCS occurs, USACE's flexibility and capacity to adjust to these conditions will be reduced.

USACE must use the best science and engineering available to comprehensively understand the change in river conditions as well as the cause for this change. We are in the process of assessing the river which will better prepare us for identifying long-term solutions for passing future high water events and ensuring the Mississippi River remains on its current course. Until these long-term solutions are identified, approaches such as clearing the ORCS complex of built-up sediment through periodic flushing, dredging critical areas of sediment build up and adaptability in operational procedures are methods that can employed to slow the rate of diminishing capabilities.

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