Myth-busting Coastal Louisiana with Coastal Science

John Lopez, Ph. D.
Lake Pontchartrain Basin Foundation

For
Society of Petroleum Engineers

At
LPBF - Pontchartrain Beach Office
New Orleans, La.

October 11, 2018
SaveOurLake.org

LPBF
SAVE OUR LAKE
SAVE OUR COAST
LAKE PONTCHARTRAIN BASIN FOUNDATION


Arkansas
Mississippi
Louisiana
Jackson
Pearl River
Pearl River
Bogue Chitto River
Greater-Pontchartrain
Basin (red outline)
TX
Mississippi
River
Amite River
Tickfaw River
Tangipahoa River
Hammond
Mandeville
Slidell
Baton Rouge
Lake Pontchartrain
New Orleans
Pontchartrain Basin in Louisiana (yellow outline)
Lake Borgne
Chandeleur Sound
Gulf of Mexico

Lake Pontchartrain Basin Foundation Background

- Formed 1989 by an Act of Louisiana State Legislature

- IRS determined as 501-C3 – i.e. Donations tax deductible

- Overseen by (14) Board of Directors elected by membership and four state appointments

- Executive Director, & 3 program Directors
  - Water Coastal Sustainability Program
  - Lighthouse/Education
- Total staff ~ 20 FTE

- Physical facilities:
  - Pontchartrain Beach Office & Lines Of Defense Lab
  - New Canal Lighthouse Museum and Education Center

OUR MISSION IS TO DRIVE ENVIRONMENTAL SUSTAINABILITY AND STEWARDSHIP THROUGH

SCIENTIFIC RESEARCH,

EDUCATION,

AND ADVOCACY.

LPBF

SAVE OUR LAKE

SAVE OUR COAST

LAKE PONTCHARTRAIN BASIN FOUNDATION

Values:

Truth Scientific fact drives everything we do. We are leaders of evidence-based science about the current and future state of our environment.

Integrity Our actions are based on solid data and integrity. We are not swayed by politics or emotion. We stand behind our work and results.

Respect Respect for the environment is essential to stewardship. We honor the contributions of all colleagues and stakeholders. True prosperity can be achieved when respect drives our motivations and actions towards the environment.

Collaboration We believe true impact can only be accomplished through cooperation. Respectful partnerships compel trust in our work, and achieve sustainable results for the region's environment.

Inclusion All in the region should benefit from our environment. Including each other and all of our stakeholders in the work we do increases the potential for impact. We believe inclusive access catalyzes stewardship, drives accountability for the environment's care, and leads to long-term sustainability.

TECHNICAL REPORTS

ARTIFICIAL REEF PROGRAM

PRESENTATIONS

Post-Katrina Sidescan Sonar Assessment of Reefs
2004 & 2005 Reef Monitoring Presentation

REPORTS

DEPLOYMENT

Artificial Reef Program Deployment 2000 to 2004
Phase II Pre-deployment Survey Report
Phase II Deployment Report
Phase II Post-deployment Report

MONITORING

2003 Reef Monitoring Report
2004 & 2005 Combined Monitoring Report
Lake Pontchartrain Reef Evaluation 2009-2010 Results
Whitmore UNO Thesis-Reef Monitoring

BASICS OF THE BASIN RESEARCH SYMPOSIUM

PRESENTATIONS

2013

Basics of the Basin 2013 Day 1
Basics of the Basin 2013 Day 2

2017

Basics of the Basin 2017 Day 1
Basics of the Basin 2017 Day 2

PROCEEDINGS

Basics of the Basin Proceedings 1992
Basics of the Basin Proceedings 1994
Basics of the Basin Proceedings 1996
Basics of the Basin Proceedings 2000
Basics of the Basin Proceedings 2002

MARDI GRAS PASS

Mardi Gras Pass Fact Sheet

COMMENTS

LPBF comments to Corps regarding Mardi Gras Pass Permit
LPBF comments to DNR regarding Mardi Gras Pass Permit

MAPS

Mardi Gras Pass Location Map
Map of river bank from Corps Atlas 2007

PRESENTATIONS

Formation of Mardi Gras Pass
Governor's Advisory Committee February 2013 Presentation
Mardi Gras Pass Biological Assessment

REPORTS

Mardi Gras Pass Summary Jan 2013
Evolution of Mardi Gras Pass: March 2012- Dec 2013
Patterns of Sediment, Nutrient and Salinity Distribution from Mardi Gras Pass: 2013-2014
Mardi Gras Pass Regional Influence: Sediment Distribution and Deposition, Salinity and Nutrients in 2017
Lateral Flow from the Mississippi River at Mardi Gras Pass and Flow Distribution June through October, 2017

SURVEYS

BANK AND BATHYMETRY

April - May 2012
August 2012
September 2012
January 2013
March 2013
August 2013
January 2014
August 2014

SALINITY

- September 23, 2018
- September 09, 2018
- August 26, 2018
- August 12, 2018
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- June 17, 2018
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- April 22, 2018
- April 08, 2018
- March 25, 2018
- March 11, 2018
- February 25, 2018
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WATER QUALITY

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BIOLOGY

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REPORT

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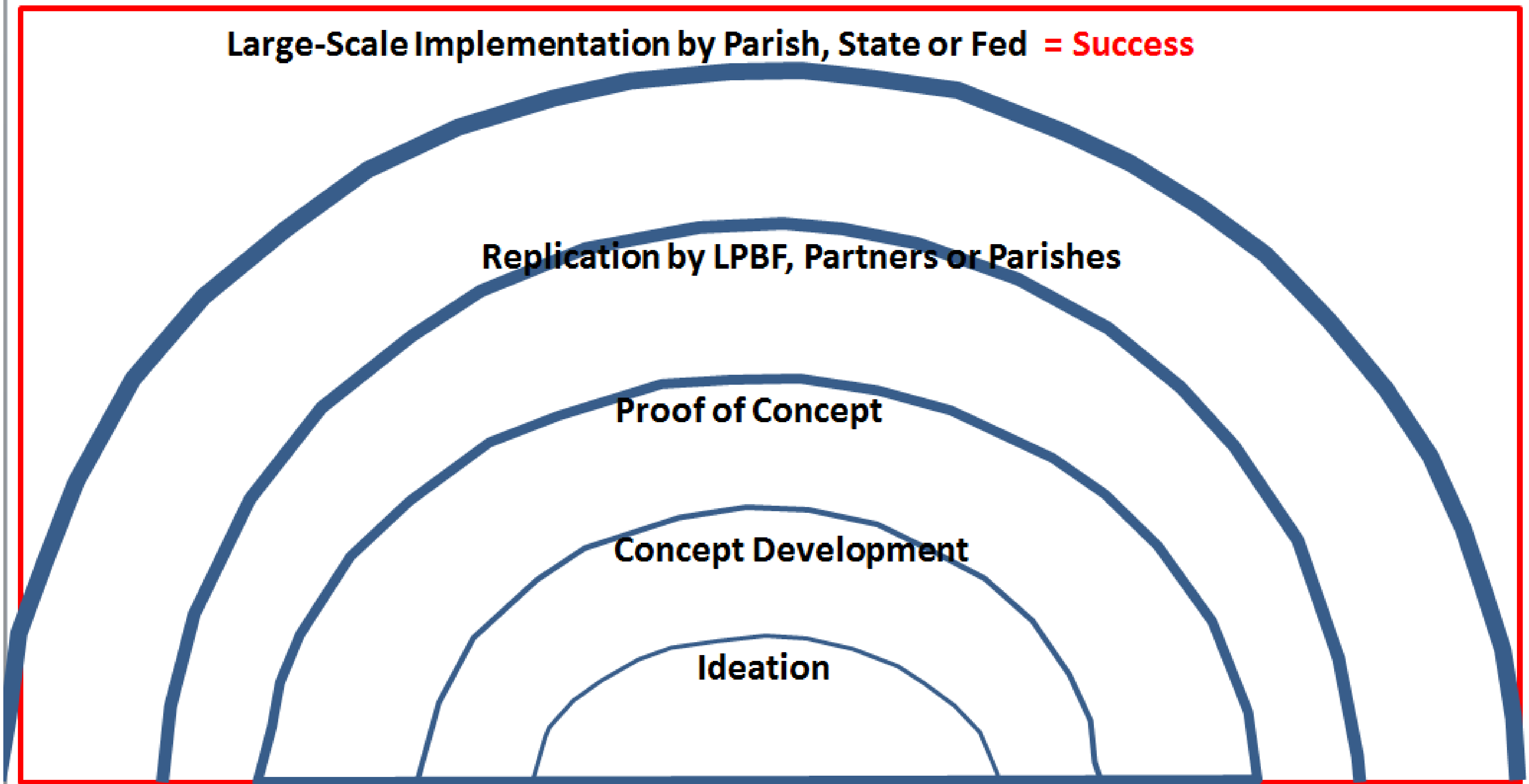
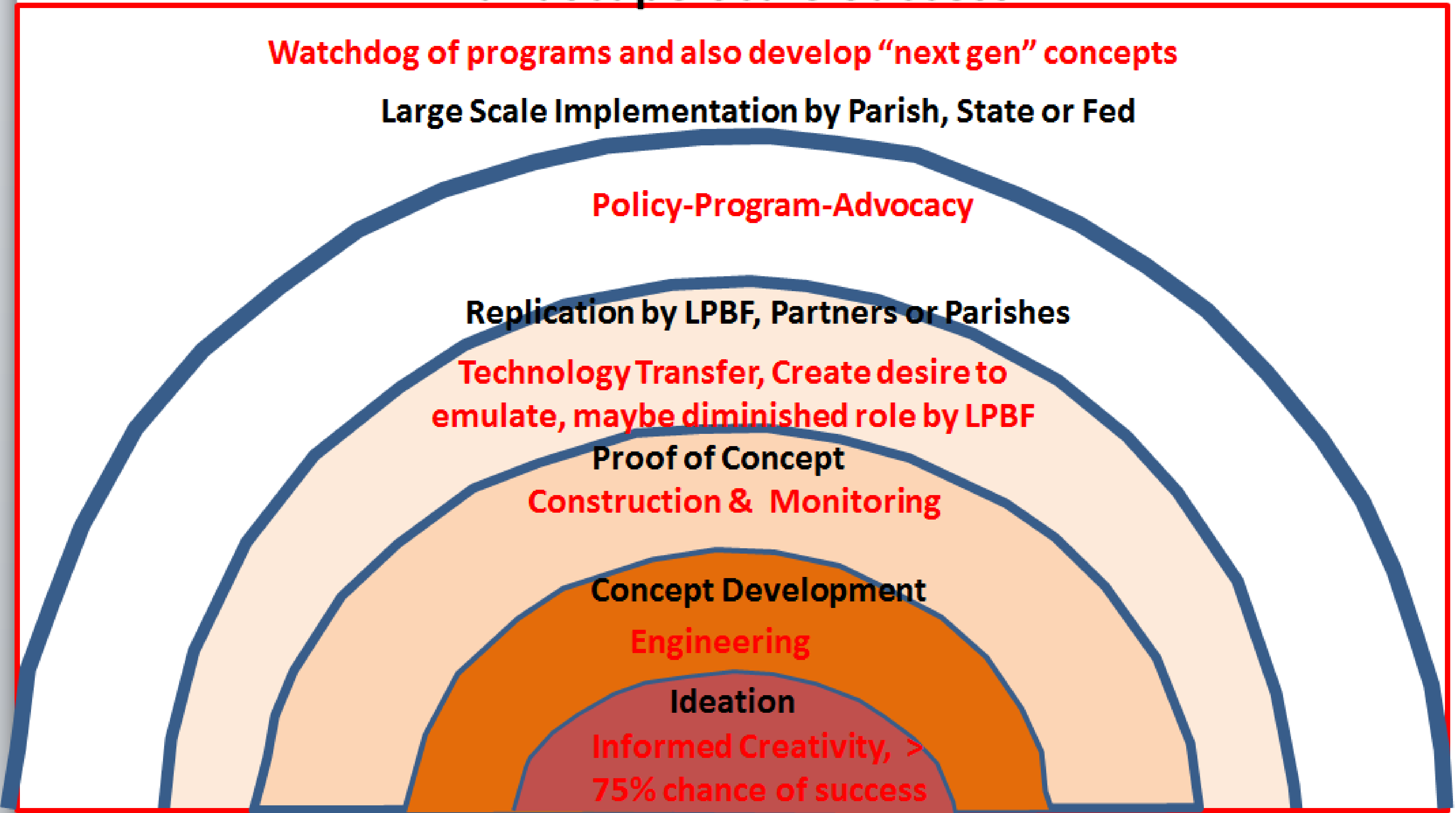
- Feb 26 – 2017
- Feb 12 – 2017
- Jan 29 – 2017
- Jan 15 – 2017
- Dec 4 – 2016
- Nov 20 – 2016

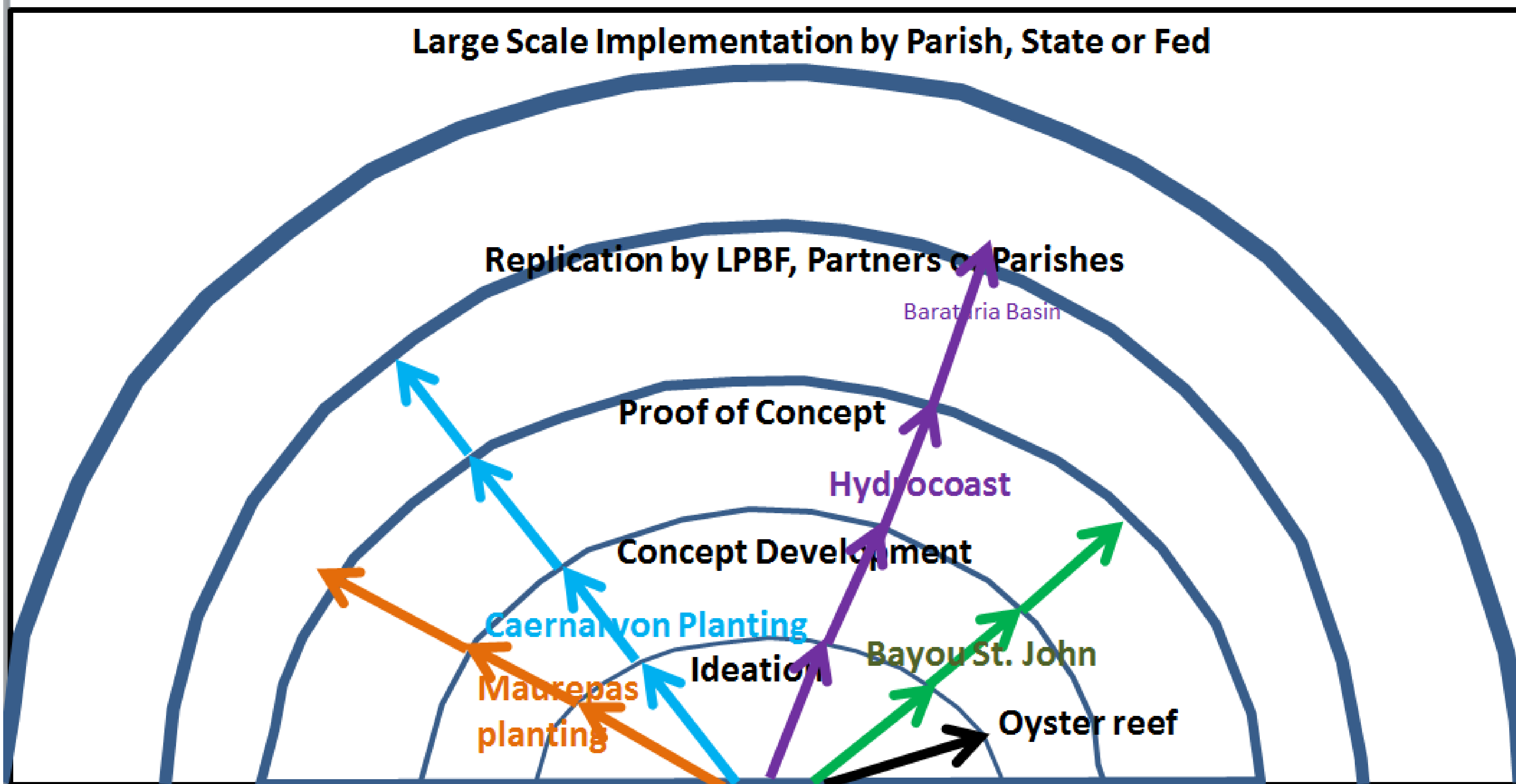
A Catalyst Project Model for LPBF & Coastal Restoration Landscape Scale Success



A Catalyst Project Model for LPBF & Coastal Restoration at Landscape Scale Success



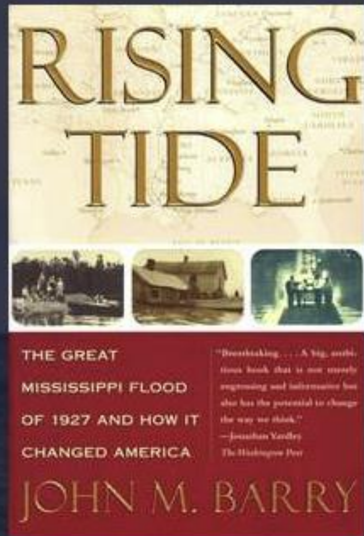
A Catalyst Project Model for LPBF & Coastal Restoration Landscape Scale Success



Myth-busting Coastal Louisiana with Coastal Science

Myth 1:

The Corps of Engineers built the Mississippi River levees after the 1927 flood.



Click here to order the book.

Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America

REVIEWS:

The Washington Post:
"Breathtaking... A big ambitious book that is not merely engrossing and informative but also had the potential to change the way we think."

The New York Times:
"Extraordinary... Rising Tide stands not only as a powerful story of disaster but as an accomplished and important social history, magisterial in its scope and fiercely dedicated to unearthing truth."

The New Yorker:
"This story of human defeat by a savage, unpredictable river has the power of an epic... A virtuoso piece of exposition."

The Chicago Tribune:
"A brilliant match of scholarship and investigative journalism."

The Los Angeles Times:
"An important contribution to history and literature... a rich deposit of passion and truth.

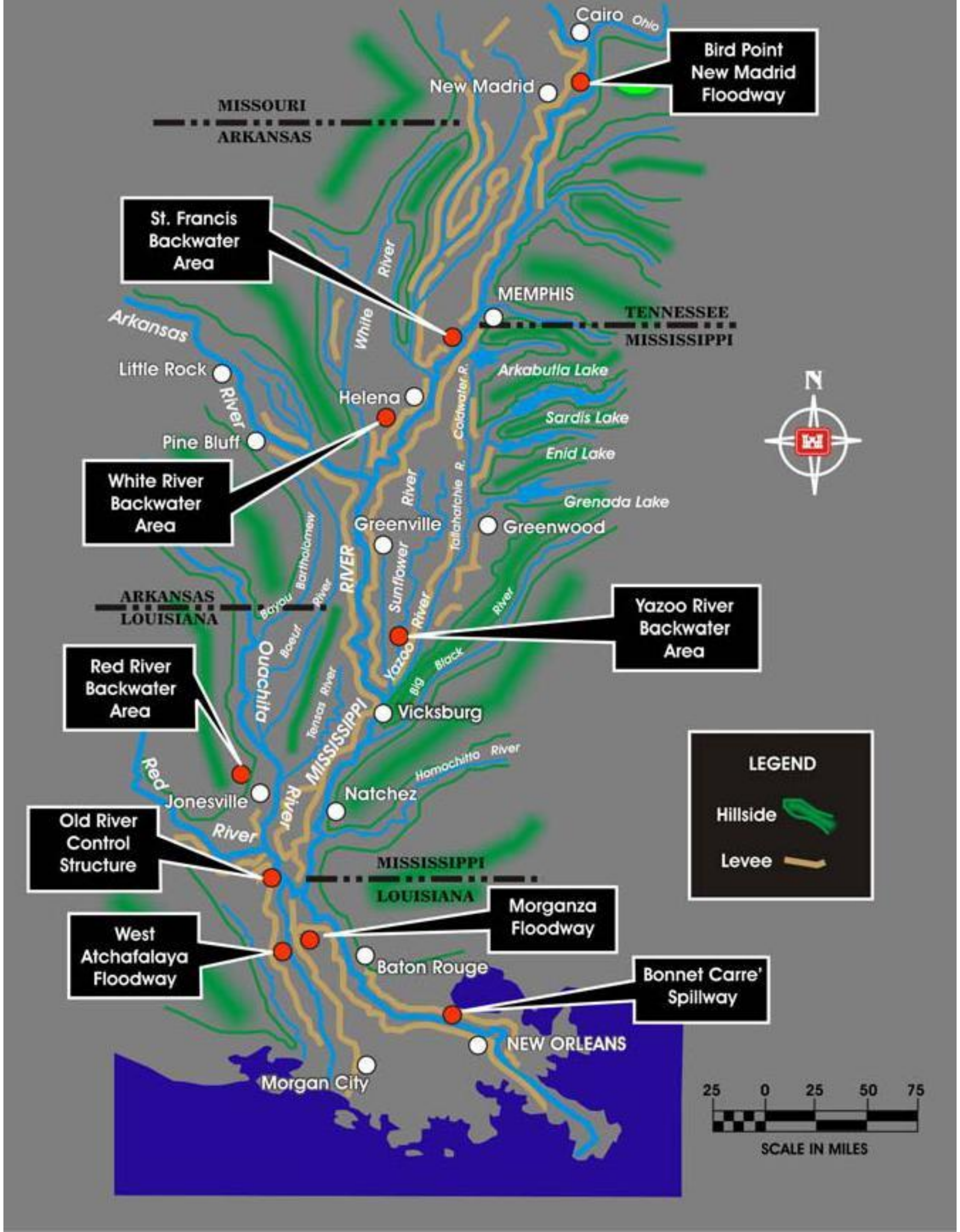
New Orleans Times-Picayune:
"Barry's brilliant new book is adroit at drawing his reader into complex political and scientific issues and rendering them with perfect clarity... After reading this book, you'll never look at the river the same way again."

Louisville Courier-Journal:
This is a book that I suspect will be recalled as one of the best books of the decade... To that hypothetical list of books that you intend to have when you are marooned on a desert island, please add Rising Tide."

Levees> higher river stages> higher levees> Higher river stages …..

The Corps absolute commitment to a “Levees Alone” policy for river flood management not only exacerbated the 1927 flood, but it was obvious to many before the flood that this was a bad policy contributing to rising flood levels for decades before 1927.

The 1927 flood did cause levees to be rebuilt but for the first time for the Corps to finally change policy and build river outlets such as Bonnet Carre Spillway and Morgana Floodway.


Cairo
Ohio
Bird Point New Madrid Floodway
New Madrid
MISSOURI
ARKANSAS
St. Francis Backwater Area
River
White
MEMPHIS
TENNESSEE
MISSISSIPPI
Arkansas
Little Rock
River
Helena
Arkabutla Lake
Sardis Lake
Enid Lake
Grenada Lake
Coldwater R.
Tallahatchie R.
Pine Bluff
White River Backwater Area
Greenville
Greenwood
River
Sunflower
RIVER
Bayou Bartholomew
River
ARKANSAS
LOUISIANA
Boeuf
Yazoo River Backwater Area
Yazoo
River
Big Black
River
Ouachita
Tensas River
MISSISSIPPI
Red River Backwater Area
Vicksburg
Homochitto River
Red
Jonesville
River
River
Natchez
Old River Control Structure
MISSISSIPPI
LOUISIANA
Morganza Floodway
West Atchafalaya Floodway
Baton Rouge
Bonnet Carre' Spillway
NEW ORLEANS
Morgan City
N
LEGEND
Hillside
Levee
25 0 25 50 75
SCALE IN MILES

MRC

Myth-busting Coastal Louisiana with Coastal Science

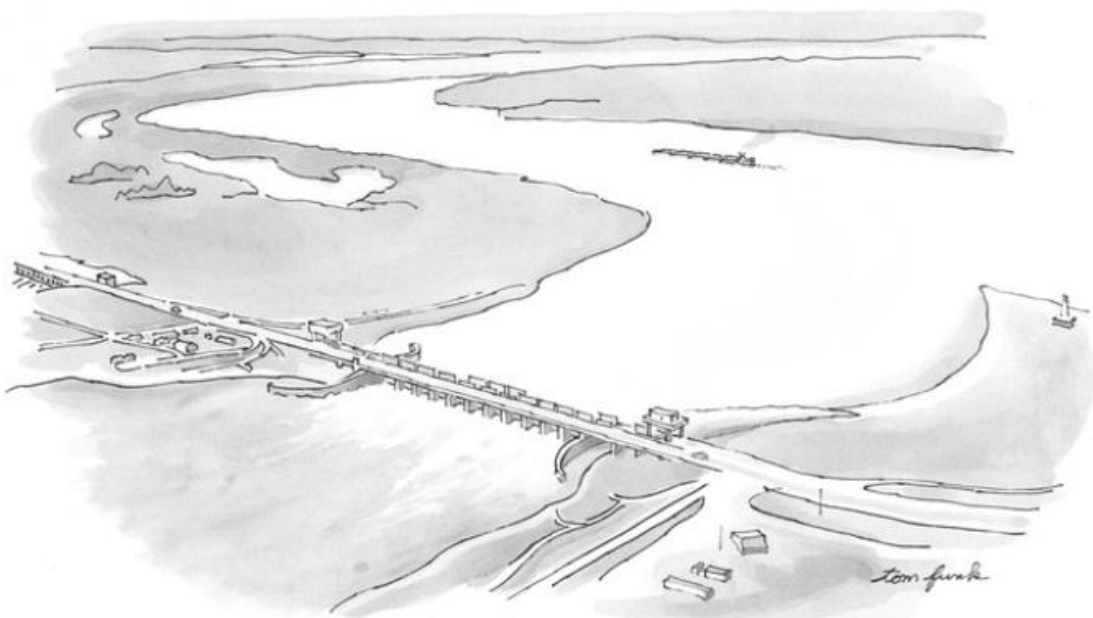
Myth 2:

The Corps of Engineers prevented the natural avulsion of the Mississippi River into the Atchafalaya River by building Old River Control Structure.

THE CONTROL OF NATURE FEBRUARY 23, 1987 ISSUE

ATCHAFALAYA

By John McPhee



The Low Sill at Old River Illustration by Tom Funk

Three hundred miles up the Mississippi River from its mouth—many parishes above New Orleans and well north of Baton Rouge—a navigation lock in the Mississippi's right bank allows ships to drop out of the

Historical changes of a major juncture: Lower Old River, Louisiana Joann Mossaa a
Department of Geography, University of Florida, Gainesville, FL 32611, USA
Published online: 31 Oct 2013.

Physical Geography

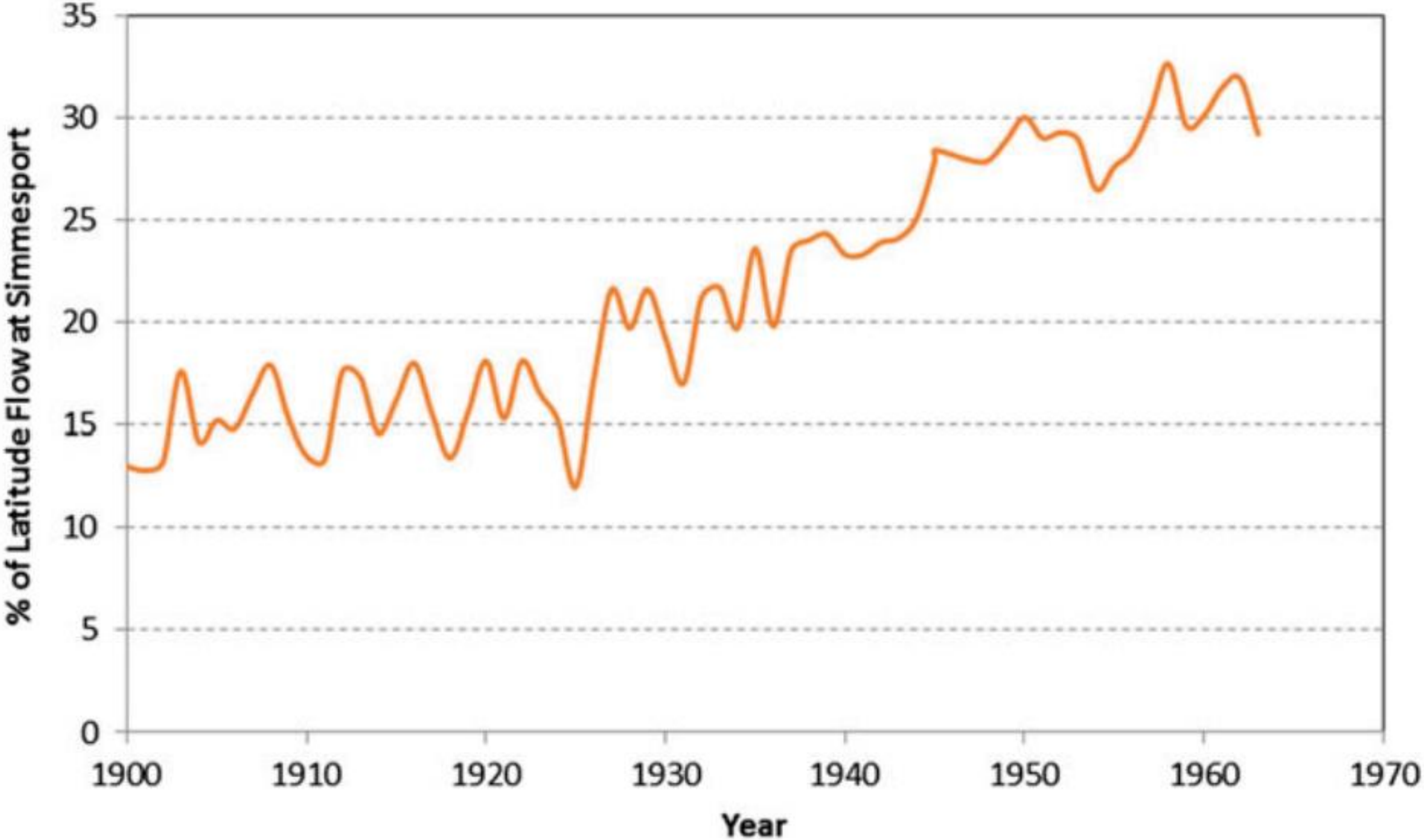


Table 1. Some natural events and human activities responsible for changes in Lower Old River.

Time	Event	Inferred effect on Old River
16th Century	Lateral migration of Mississippi River results in capture of Red, and creation of Atchafalaya below juncture	Old River not yet formed
1831	Shreve's Cut-off created	Forms Upper and Lower Old Rivers, reduced Mississippi length by appx. 30 km (>95%)
1833 and 1870s	Removal of Red River log jam	Increased importance of Red River flow in network
1839–1855	Removal of Atchafalaya River log jam	Atchafalaya River increased in importance and more of the Mississippi River flow diverted through Old River
1878–1937	Dredging of canal connecting Lower Old and Mississippi Rivers. Flow apparently maintained juncture after 1937	Prevented cut-off from becoming an oxbow lake. Lower Old River maintained size instead of filling. Flow was bidirectional for several decades
1896–1897	Construction of two submerged sills across the Atchafalaya River near Simmesport to prevent its further enlargement	Uncertain. May or may not have slowed growth of Atchafalaya
1927	The largest flood of record on the Mississippi. Caused extensive flooding and several crevasses	Likely increased the size of Lower Old River, and resulted in increased flows from the Mississippi River
1929–1942	Creation of 14 artificial cut-offs on Mississippi along 600 valley km above Old River, shortening channel length by nearly 400 km (approximately 20%)	Increased slope and stream power of Mississippi upstream of Old River
1944–1945	Local cutoff at Carr Point shortens path between Mississippi and Lower Old River (local slope increased 400%)	Locally higher slope promoted increased flow to Mississippi
1961–1963	Completion of Old River control Structure, including Inflow/Outflow Channels, Low Sill and Overbank Structures and Lock and Dam	Abandonment of Lower Old River as juncture that brought flow from Mississippi to Atchafalaya. Flow now routed upstream through Inflow/Outflow Channels. Lower Old River used for navigation

“Fluvial history could have unfolded quite differently without human intervention near Old River. Much importance is placed on the most recent interventions – the Old River Control Project and its subsequent additions – but very little attention is given to the earlier historical transformations that were integral in the development of this system. Without Shreve’s cut-off, there would be no Lower Old River. Removal of log jams on the Red and Atchafalaya Rivers increased flow in rivers that had been stagnant for centuries. Without decades of dredging, Lower Old River would have continued to fill with sediment and become an oxbow lake, perhaps with a tie channel active only during flood periods”.

Historical changes of a major juncture: Lower Old River, Louisiana Joann Mossaa a Department of Geography, University of Florida, Gainesville, FL 32611, USA Published online: 31 Oct 2013.

tion and destroyed a 67-foot-high concrete wing wall on the south end that guided the flow into the structure. A large scour hole also developed in front of and beneath the structure, exposing approximately 50 feet of the 90-foot-long steel pilings supporting the Low Sill Structure. Emergency repairs during the

Flood waters undermine the south wing wall of the Low Sill Structure, causing it to collapse. Emergency repairs involve construction of a stone dike at the end of the ramp to replace the failed wall.

Myth-busting Coastal Louisiana with Coastal Science

Myth 2:

The Corps of Engineers did prevent a <u>pre-mature</u> avulsion of the Mississippi River into the Atchafalaya River by building Old River control Structure.

Myth-busting Coastal Louisiana with Coastal Science

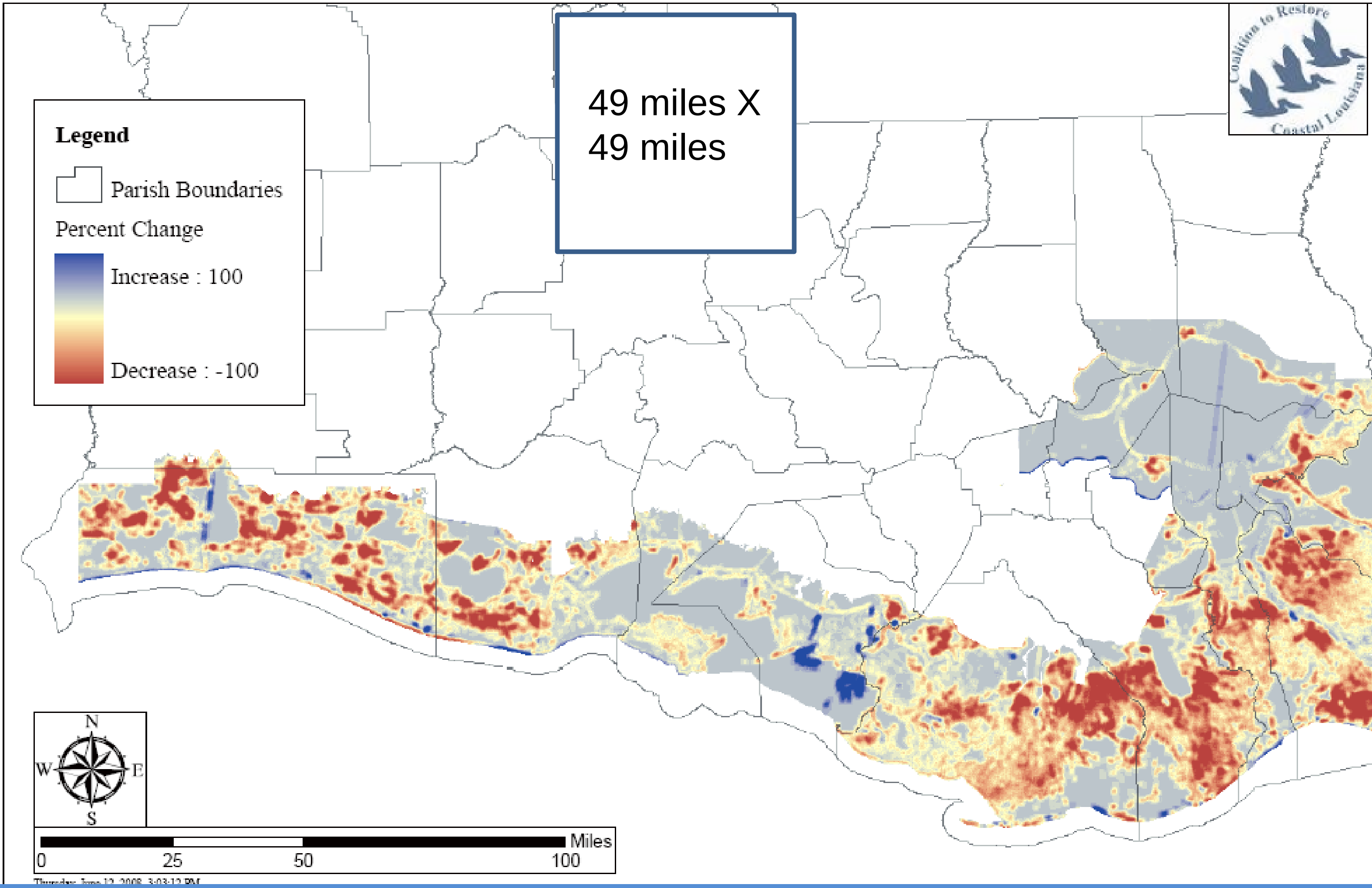
Myth 3:

Oil and Gas Canals caused all of Louisiana’s wetland loss.

FEMA

Land Cover Change: USACE 1932 - USGS 2005

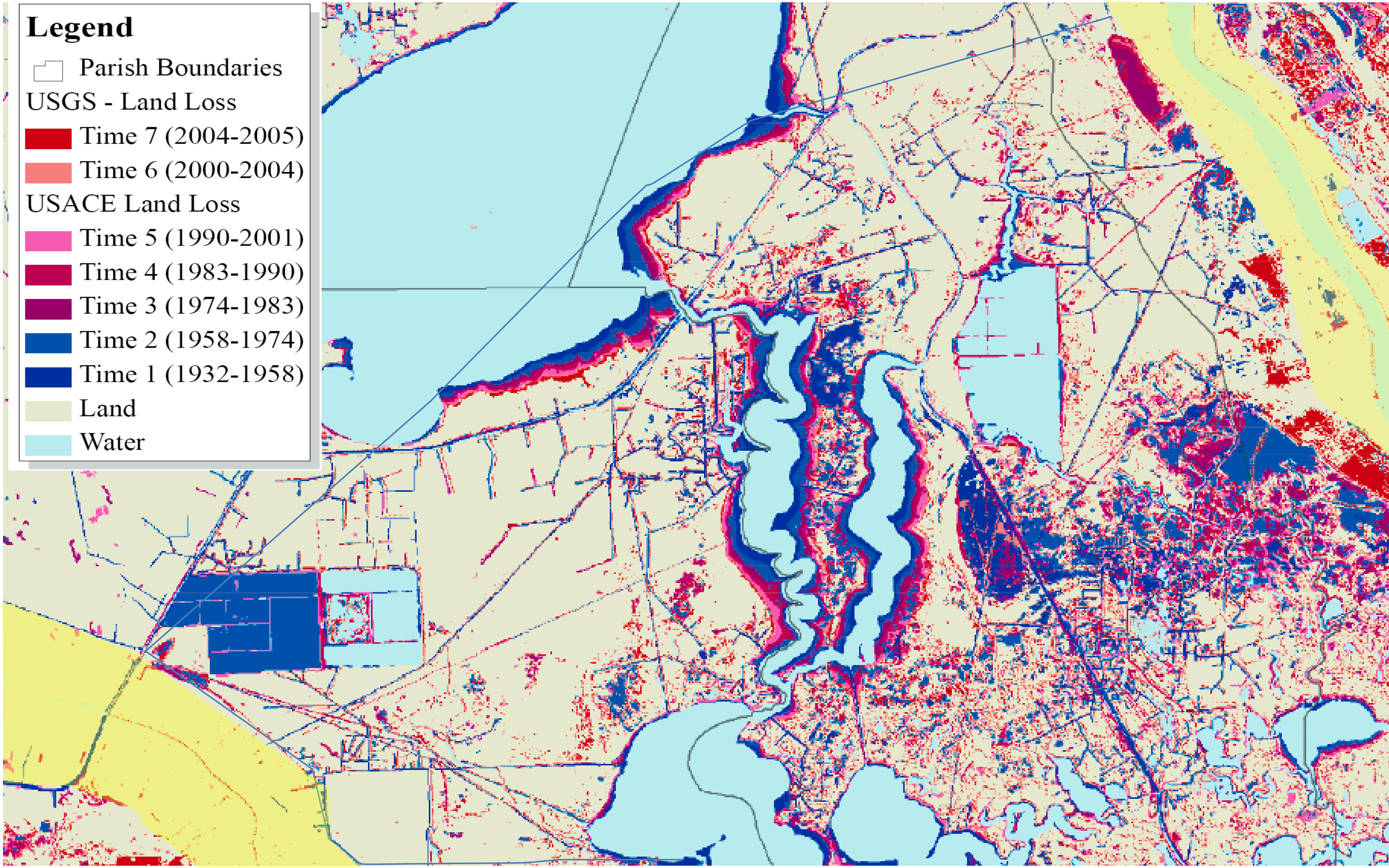
SAVE OUR COAST
LAKE PONTCHARTRAIN BASIN FOUNDATION



This map was generated by analysis and processing of land loss data provided by the USGS and the US Army Corps of Engineers. URS Corporation and FEMA provided GIS support. The Lake Pontchartrain Basin Foundation and the Coalition to Restore Coastal Louisiana directed the development of the map.

From 1932 to 2006, 2,400 square miles of land lost to the sea

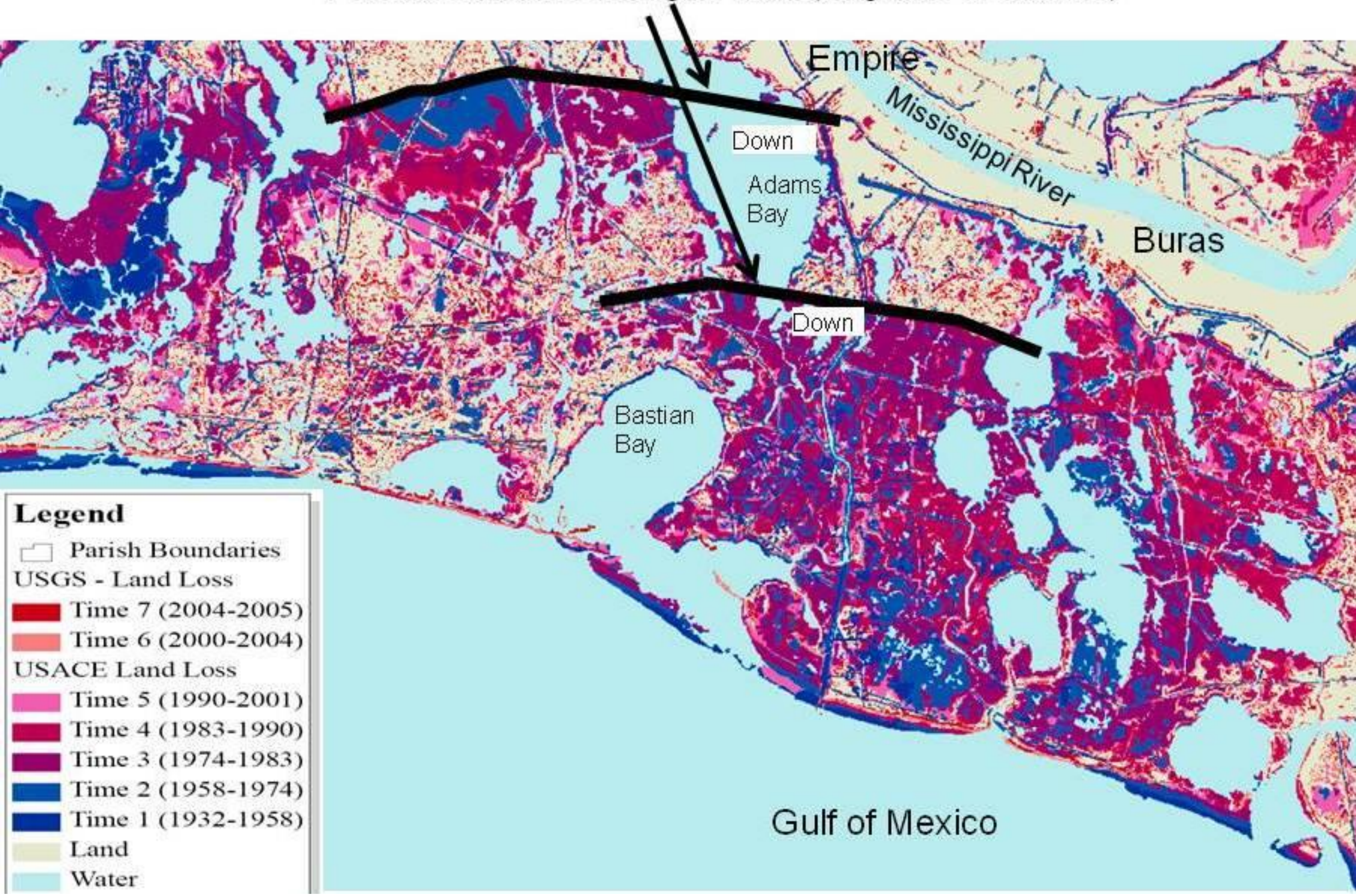
LPBF SAVE OUR LAKE SAVE OUR COAST LAKE PONTCHARTRAIN BASIN FOUNDATION



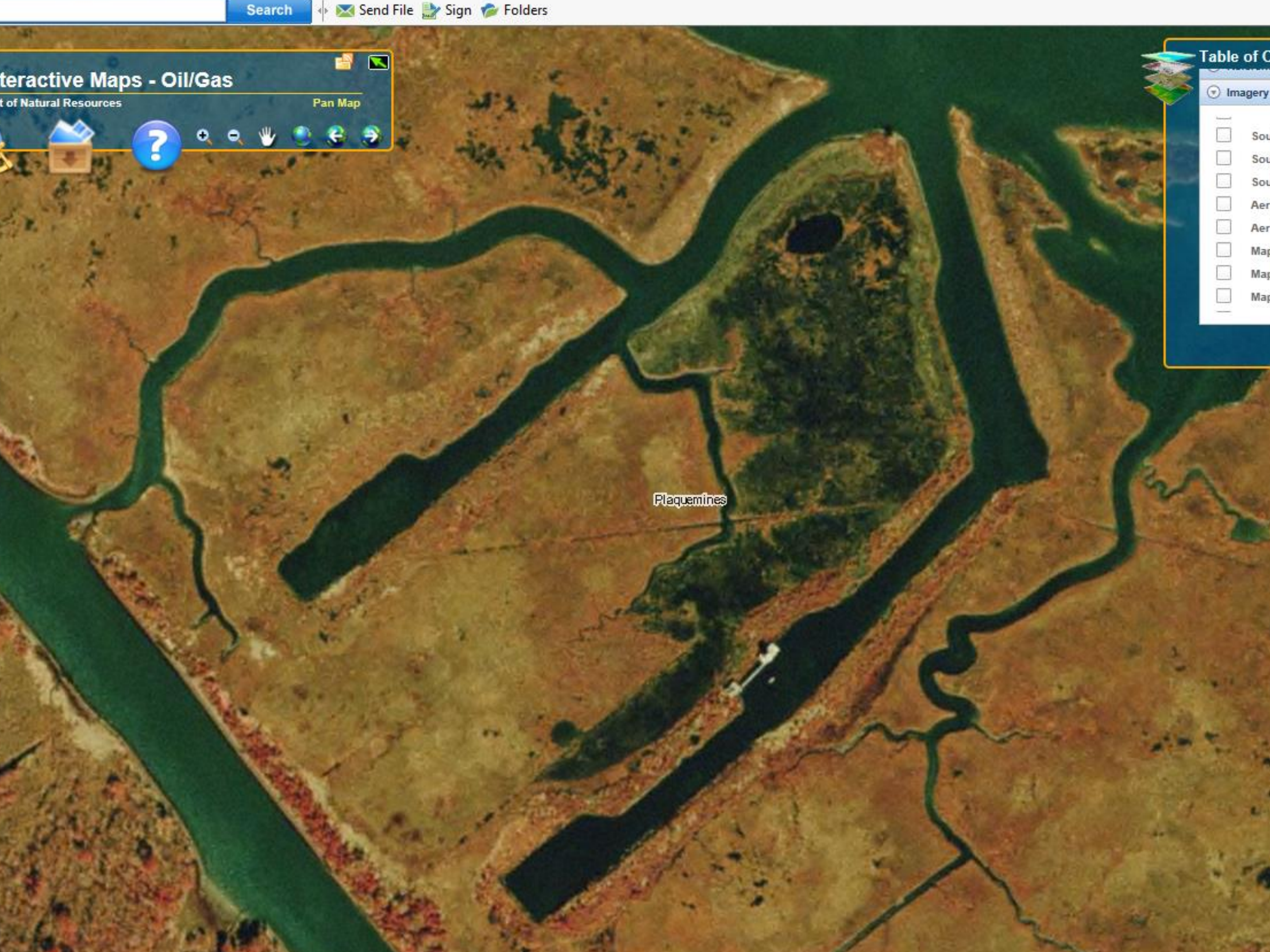
Barataria Basin Land Bridge Land Loss 1932 to 2005

LPBF SAVE OUR LAKE SAVE OUR COAST LAKE PONTCHARTRAIN BASIN FOUNDATION

Postulated Active Geologic Faults (Gagliano et al, 2003)



LPBF SAVE OUR LAKE SAVE OUR COAST LAKE PONTCHARTRAIN BASIN FOUNDATION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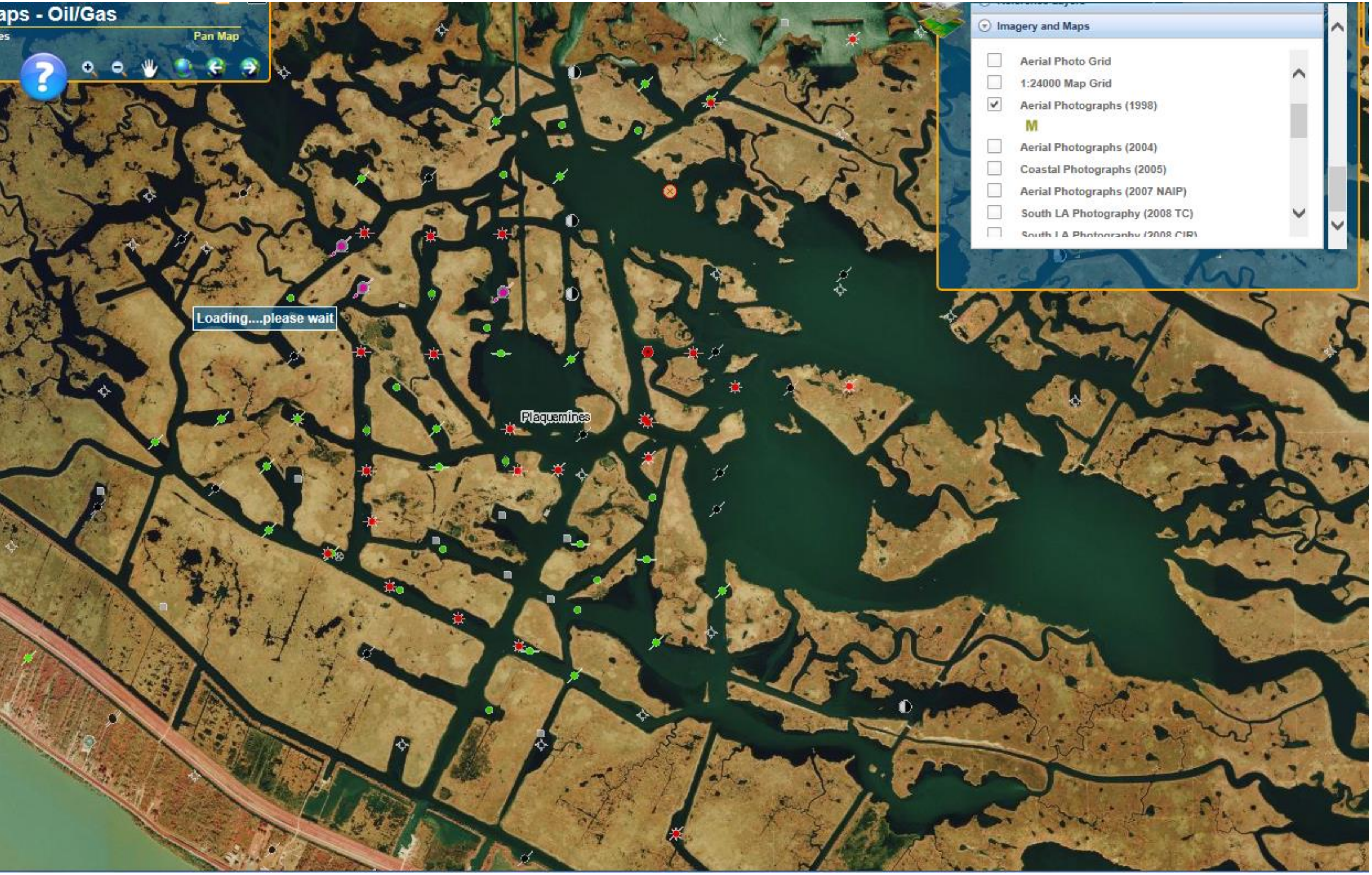
Send File
Sign
Folders
Maps - Oil/Gas
Natural Resources
Pan Map
Imagery
Plaquemines

1998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Aerial Photographs (1998)
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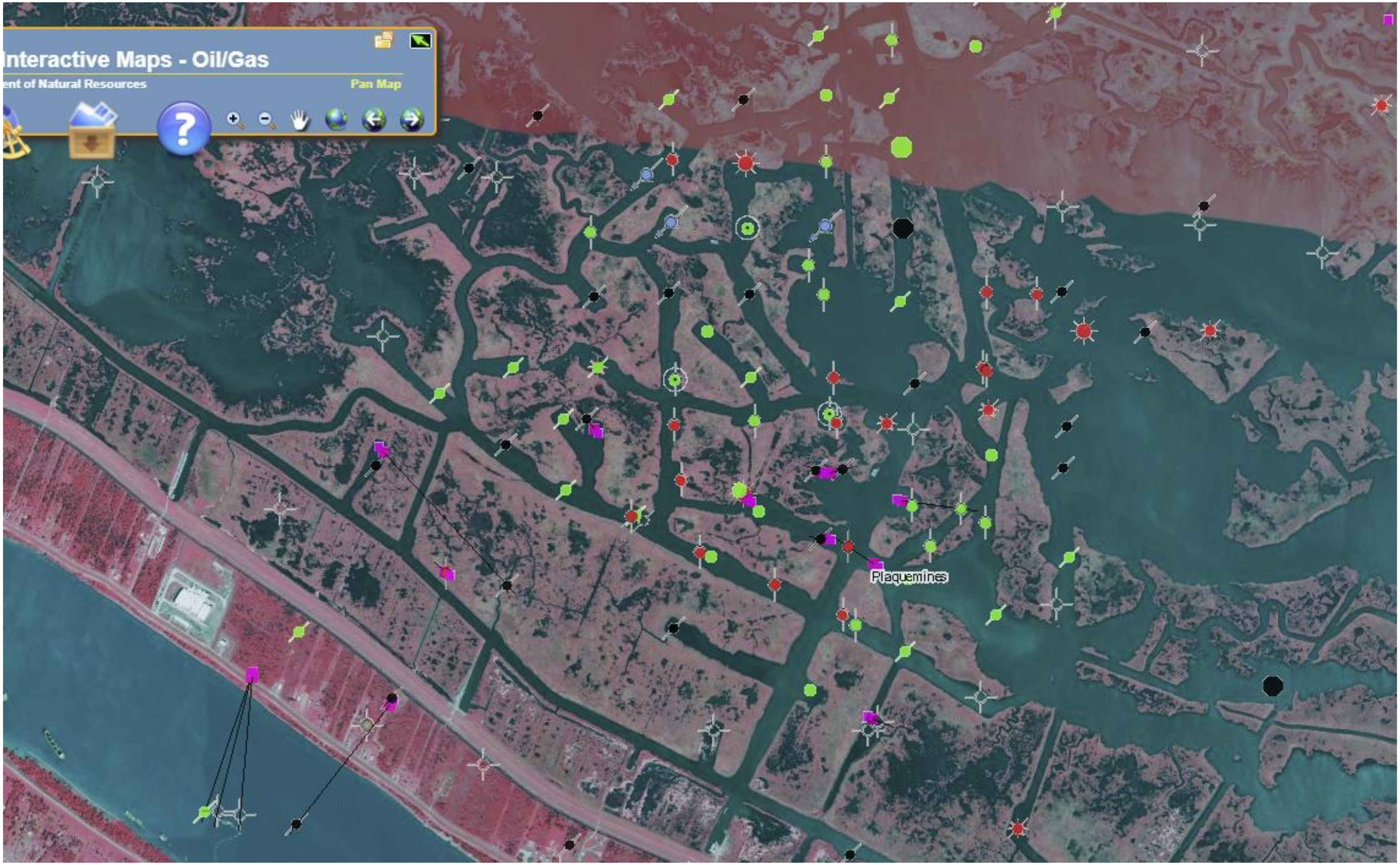
Aerial Photographs (2004)
Coastal Photographs (2005)
Aerial Photographs (2007 NAIP)
South LA Photography (2008 TC)

2013



Interactive Maps - Oil/Gas
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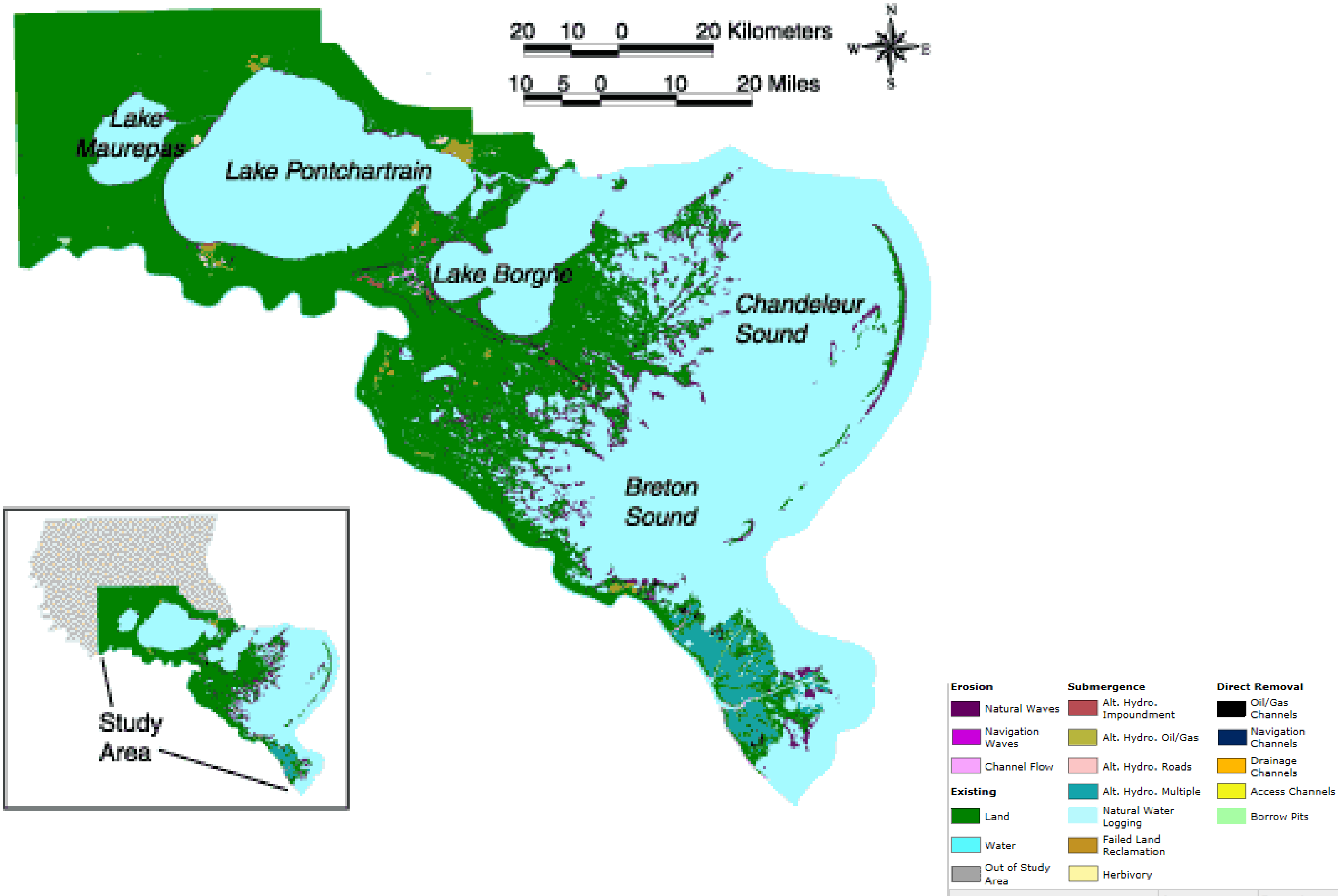
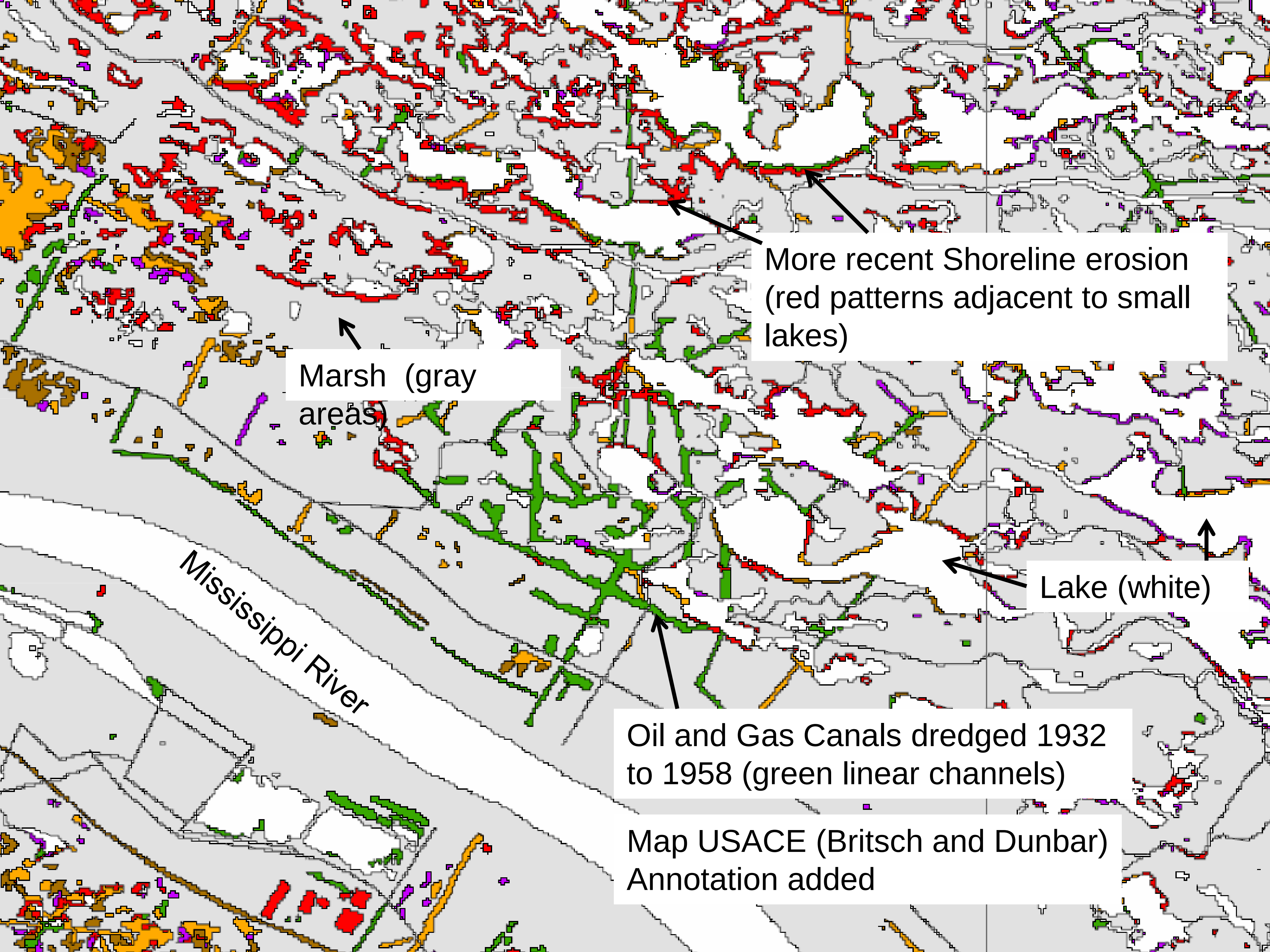
Pan Map
Plaquemines

Pontchartrain Basin Land Loss - Process Classification
USACE data 1932 to 1990




More recent Shoreline erosion (red patterns adjacent to small lakes)
Marsh (gray areas)
Lake (white)
Mississippi River
Oil and Gas Canals dredged 1932 to 1958 (green linear channels)
Map USACE (Britsch and Dunbar) Annotation added

Out of Study Area | Herbivory

Class Wetland > Open water	Area Acres	Percent Loss
Erosion		
Natural Waves	55,603.34	29.52%
★ Navigation Waves	3,138.79	1.67%
Channel Flow	6,333.97	3.36%
Subtotal	65,076.10	34.55%
Submergence		
Alt. Hydro. Impoundment	4,480.04	2.38%
Alt. Hydro. Oil/Gas	16,714.63	8.87%
Alt. Hydro. Roads	4,766.56	2.53%
★ Alt. Hydro. Multiple	54,513.86	28.94%
Natural Water Logging	11,188.25	5.94%
Failed Land Reclamation	7,091.13	3.76%
Herbivory	560.55	0.30%
Subtotal	99,315.02	52.73%
Direct Removal		
Oil/Gas Channels	12,780.72	6.79%
★ Navigation Channels	6,787.35	3.60%
Drainage Channels	0.13	<0.01%
Borrow Pits	3,116.54	1.65%
★ Access Channels	1,279.79	0.68%
Subtotal	23,964.52	12.72%
Total	188,355.65	100.00%

Figure 3: Process Classification of Coastal Land Loss Between 1932 and 1990 in the Mississippi River Delta Plain, SE Louisiana.

« Previous | Next »

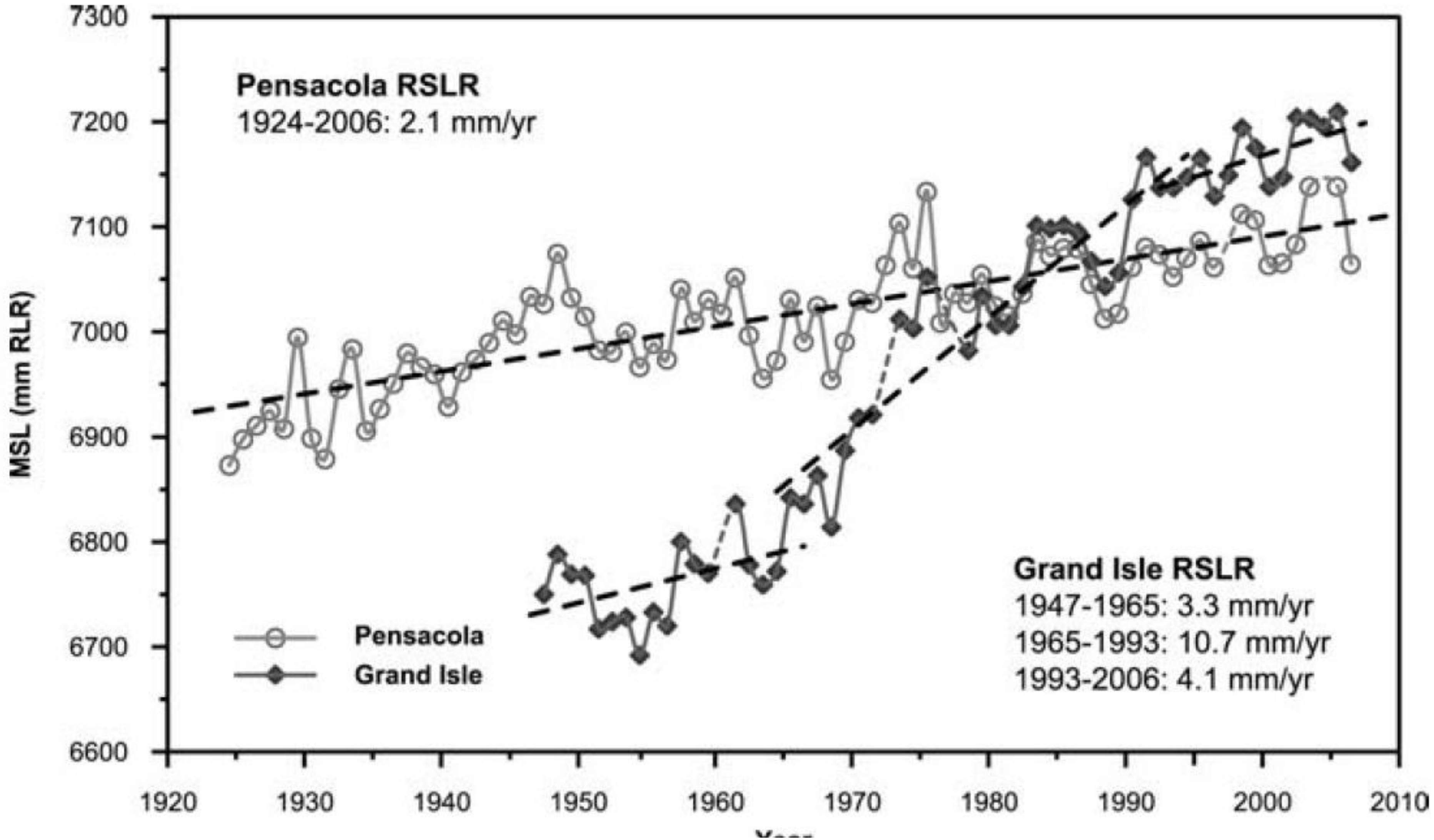
1932 To 1990
Penland, Beall, Britsch, Williams

15.6%

Oil and Gas

Indirect	16,714 acres
Direct canals	12,780 acres
Direct spoil banks	12,780 acres
Total	42,274 acres

★ Possible Land loss contribution by Oil and Gas activities



Morton and Bernier, 2010

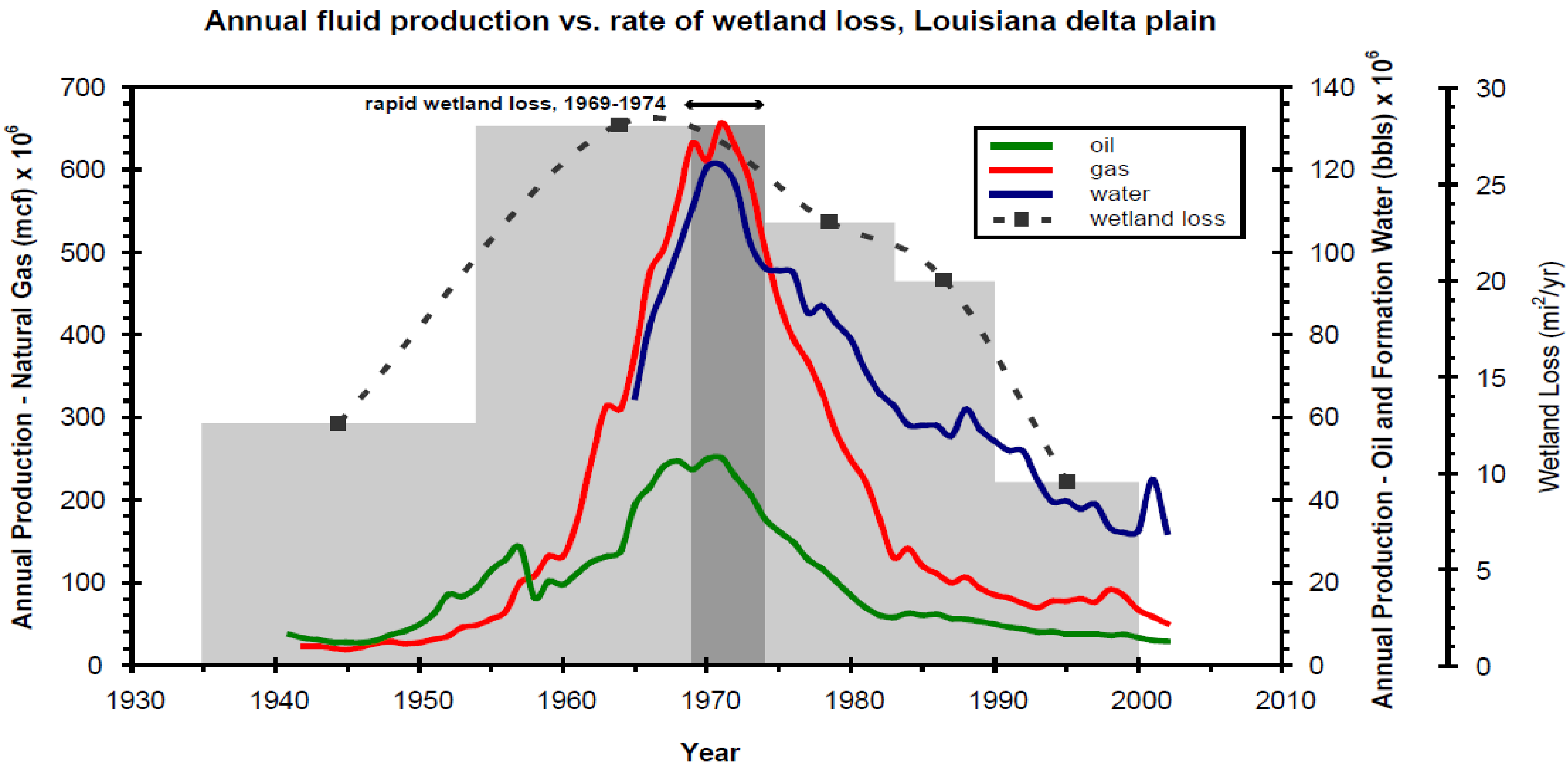


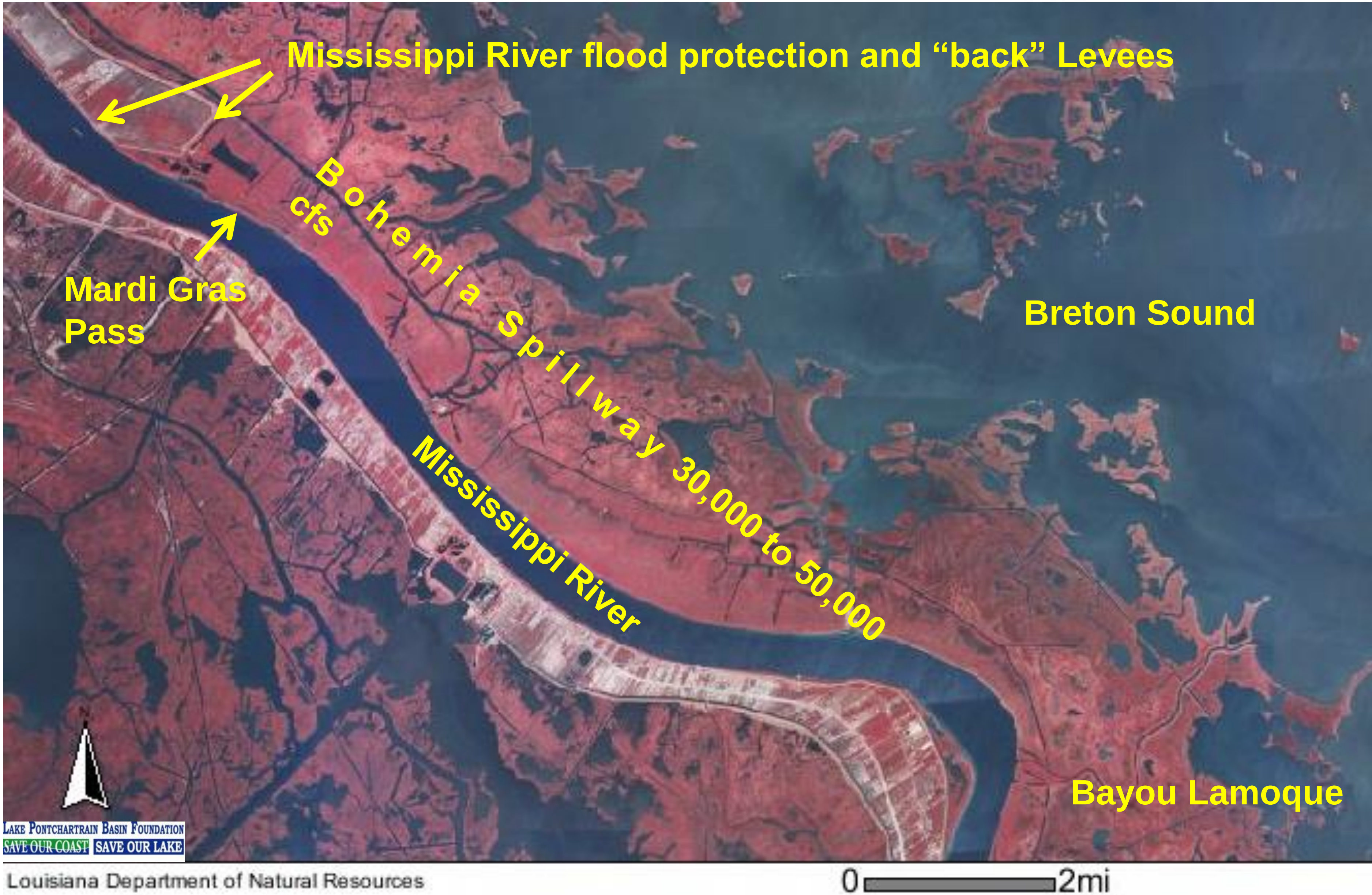
Figure 25. Composite histories of fluid production from oil-and-gas fields and wetland loss in south Louisiana. Production data from the Louisiana Department of Natural Resources and the PI/Dwights PLUS database (IHS Energy, 2003). Wetland loss values were determined by Britsch and Dunbar (1993) and John Barras (personal communication, 2005). These historical data, integrated across the delta plain, show close temporal and spatial correlations between rates of wetland

USGS
science for a changing world

Rapid Subsidence and Historical Wetland Loss in the Mississippi Delta Plain: Likely Causes and Future Implications

By Robert A. Morton, Julie C. Bernier, John A. Barras, and Nicholas F. Ferina


MONICA ANN


Mississippi River flood protection and "back" Levees
Bohemia Spillway 30,000 to 50,000 cfs
Mardi Gras Pass
Breton Sound
Mississippi River
Bayou Lamoque
Lake Pontchartrain Basin Foundation
SAVE OUR COAST SAVE OUR LAKE
Louisiana Department of Natural Resources
0
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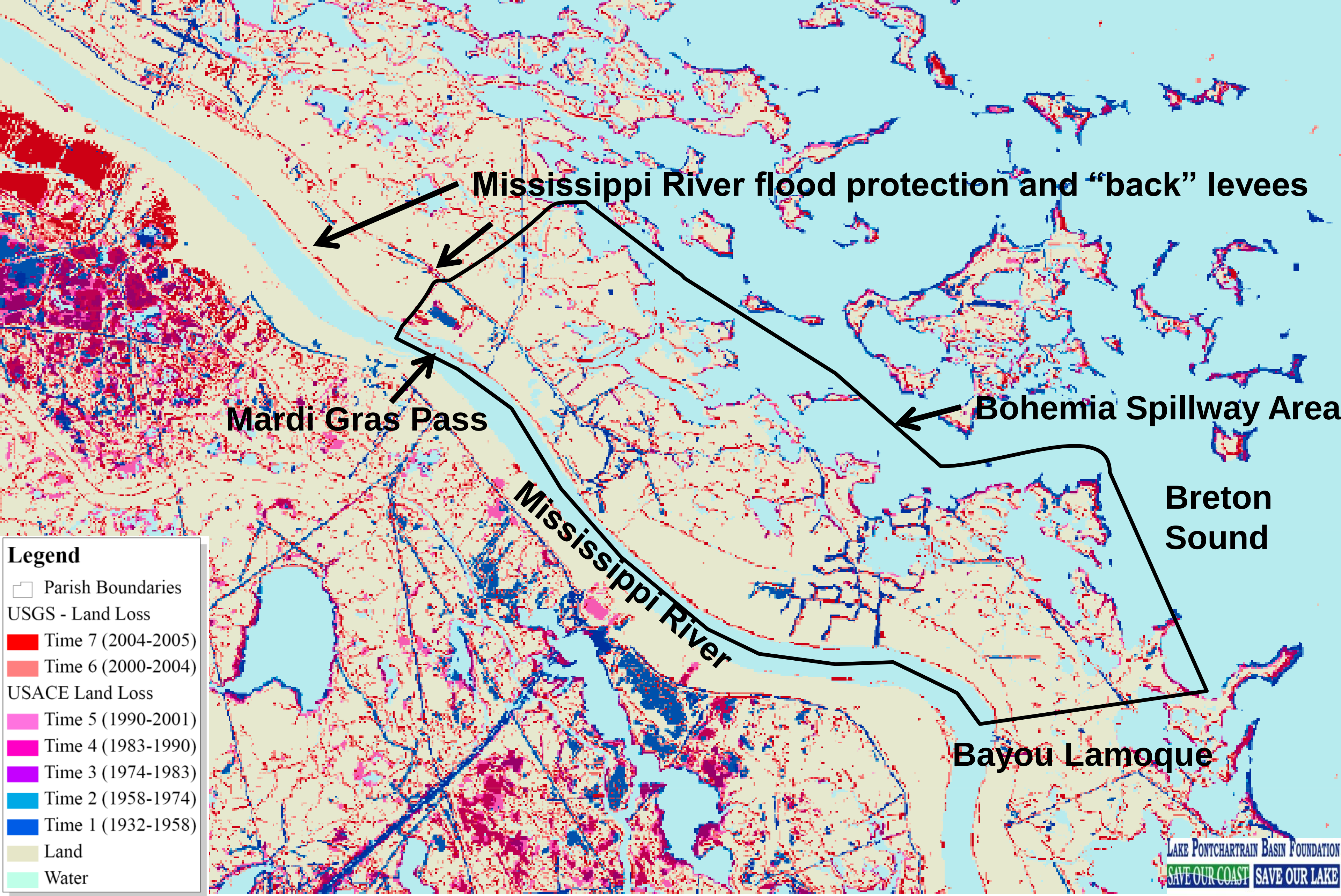
Mississippi River flood protection and "back" levees
Mardi Gras Pass
Bohemia Spillway Area
Breton Sound
Mississippi River
Bayou Lamoque
Legend
Parish Boundaries
USGS - Land Loss
Time 7 (2004-2005)
Time 6 (2000-2004)
USACE Land Loss
Time 5 (1990-2001)
Time 4 (1983-1990)
Time 3 (1974-1983)
Time 2 (1958-1974)
Time 1 (1932-1958)
Land
Water
Lake Pontchartrain Basin Foundation
Save Our Coast
Save Our Lake

A naturally recovered or re-claimed canal: Back Levee Canal (old route) in the Bohemia Spillway near Nester Canal (view looking north). Oak trees are on the original spoil bank of the canal. The Back levee Canal was probably in-filled by sediment deposited by early discharges (1926 to 1940) through the Bohemia Spillway. Photograph taken February 14, 2013.

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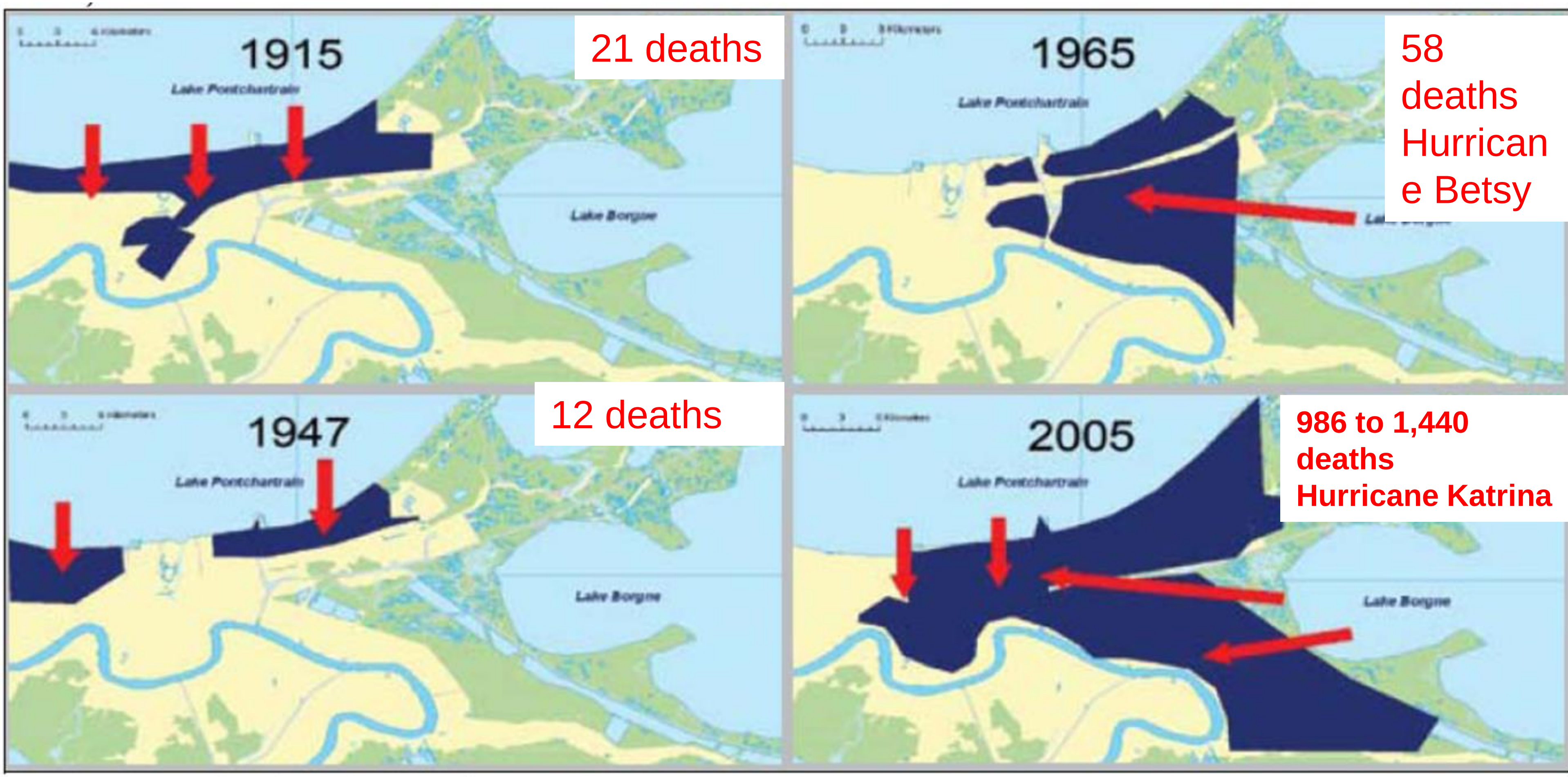
The future of the region and New Orleans hinges on Coastal restoration.

Emergence of Coastal Louisiana's Vulnerability to Hurricane Surges



Pontchartrain & Vic. Decision Chronology (Woolly and Shabman, 2008) Mortality added by LPBF

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Empirically Observed Surge “falloff”

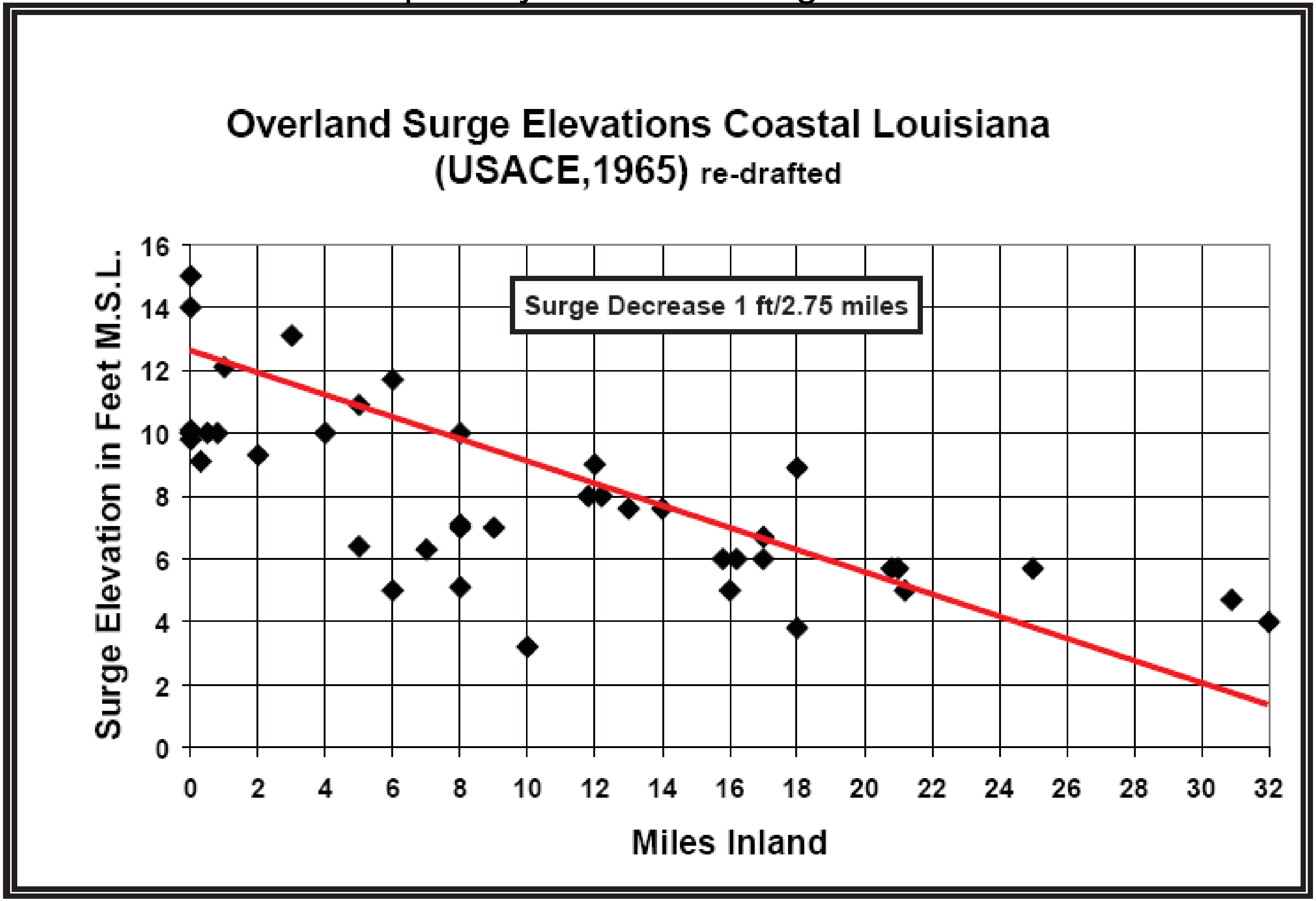


Figure 5. Observed storm surge elevation relative to the position inland for seven hurricanes impacting south Louisiana from 1909 to 1957 (re-drafted). Relationship implies coastal habitats can generally reduce surge by one foot for every 2.75 miles of coastal habitat (USACE, 1965).

Hurricane Katrina surge, Note: 5-foot reduction across 14 miles = 1’/2.8 miles

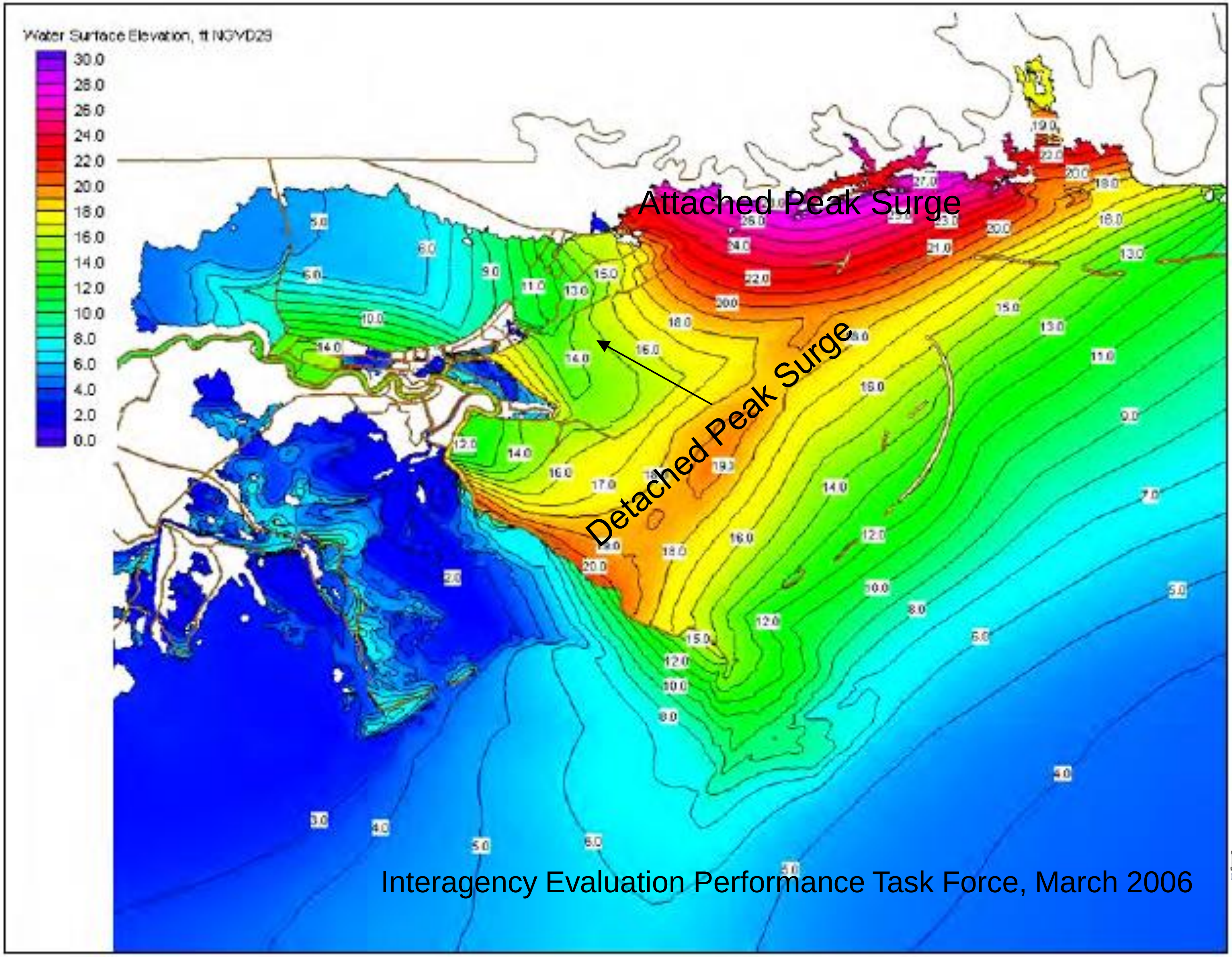
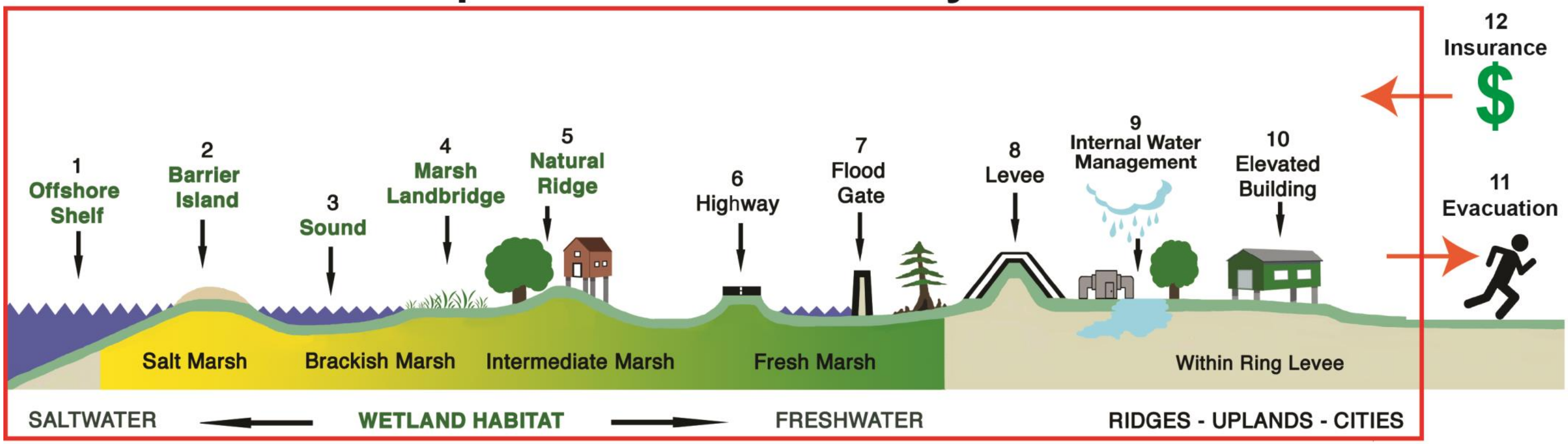
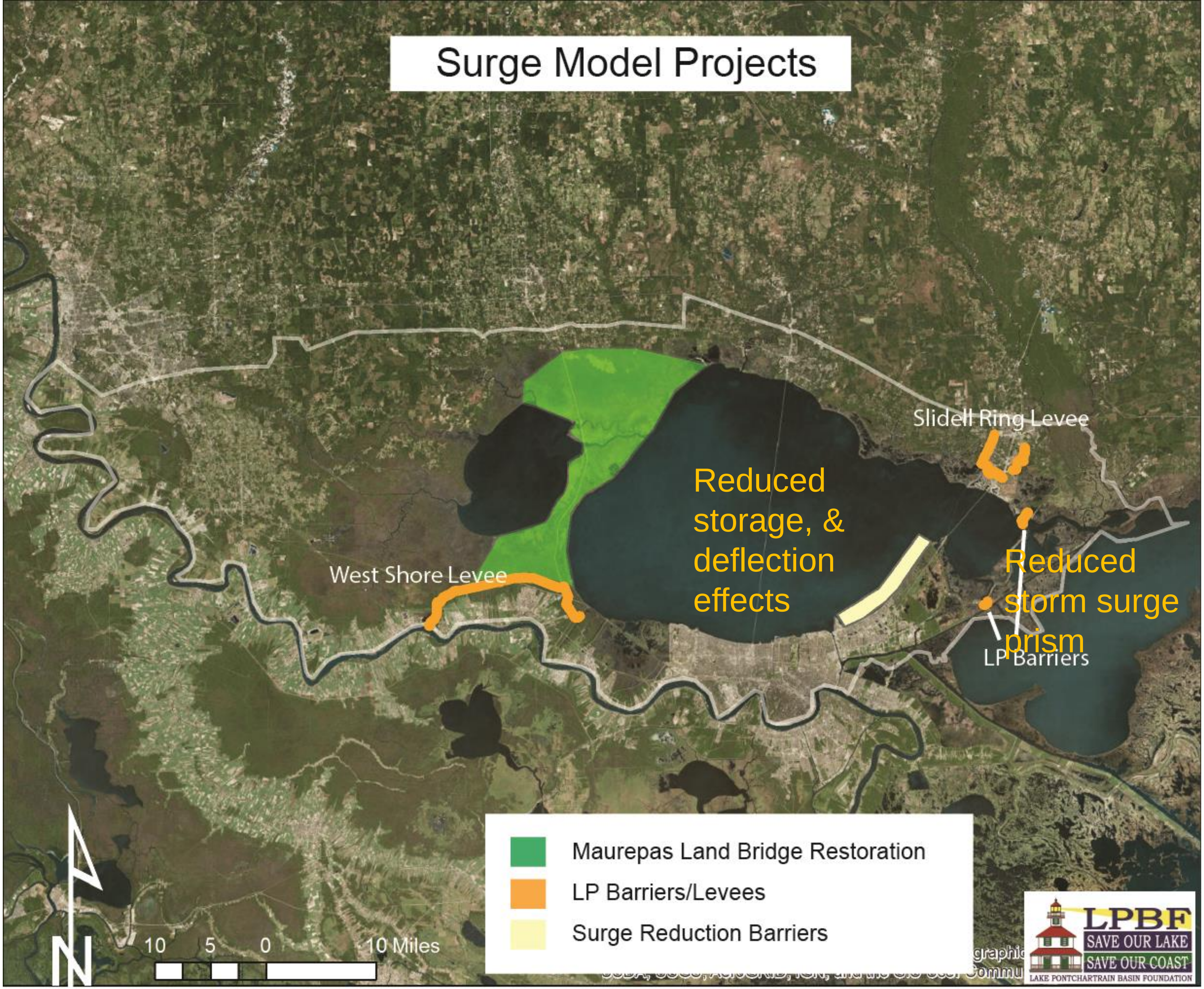


Figure V-36. Maximum computed storm surge using the ADCIRC model, Mississippi to Louisiana region (water levels in feet, NGVD 29)

Multiple Lines of Defense System




Surge Model Projects
Slidell Ring Levee
Reduced storage, & deflection effects
Reduced storm surge prism
West Shore Levee
LP Barriers
Maurepas Land Bridge Restoration
LP Barriers/Levees
Surge Reduction Barriers
N
10 5 0 10 Miles
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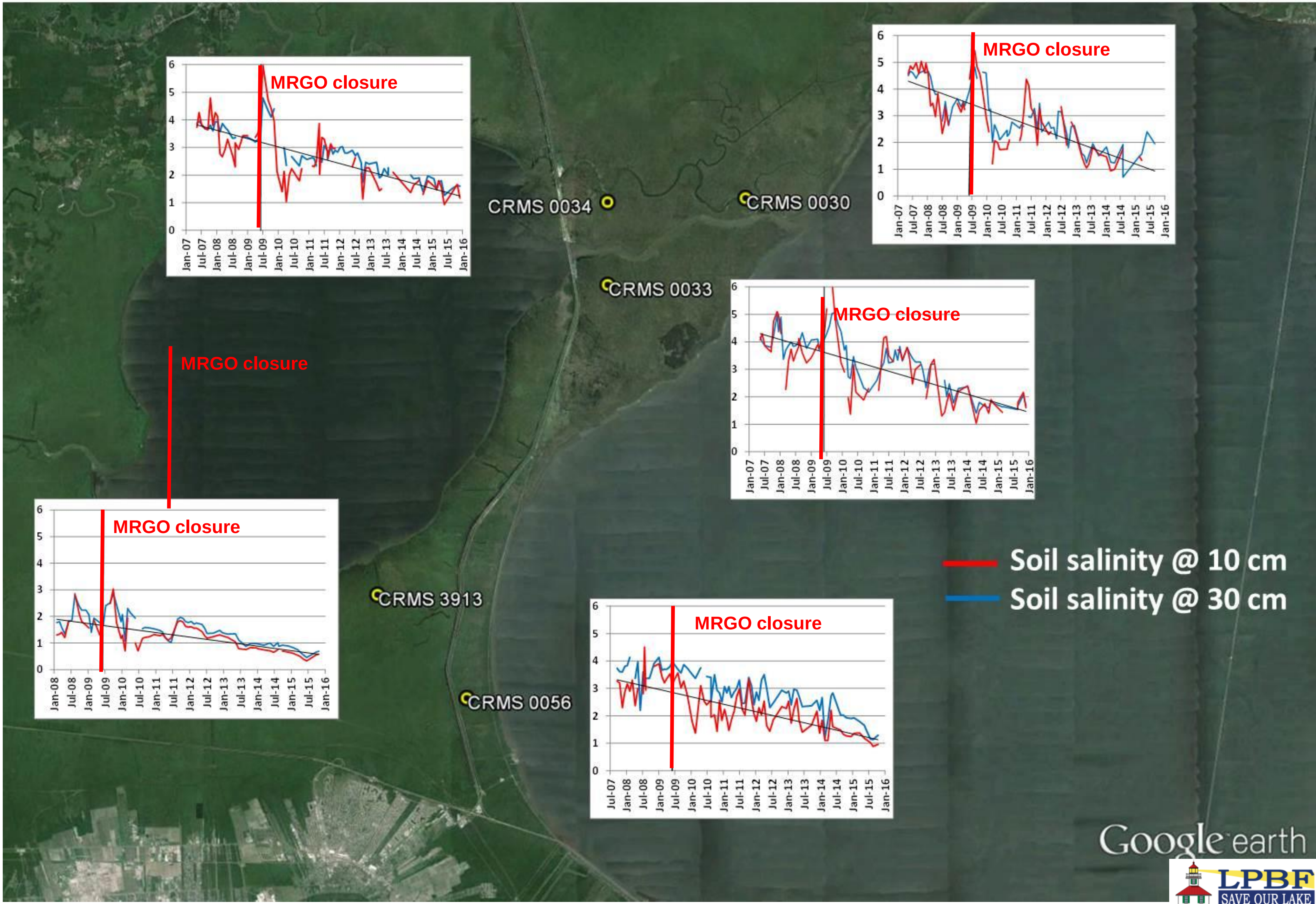
Soil Salinity (ppt) Over Time at CRMS Stations on the Maurepas Land Bridge



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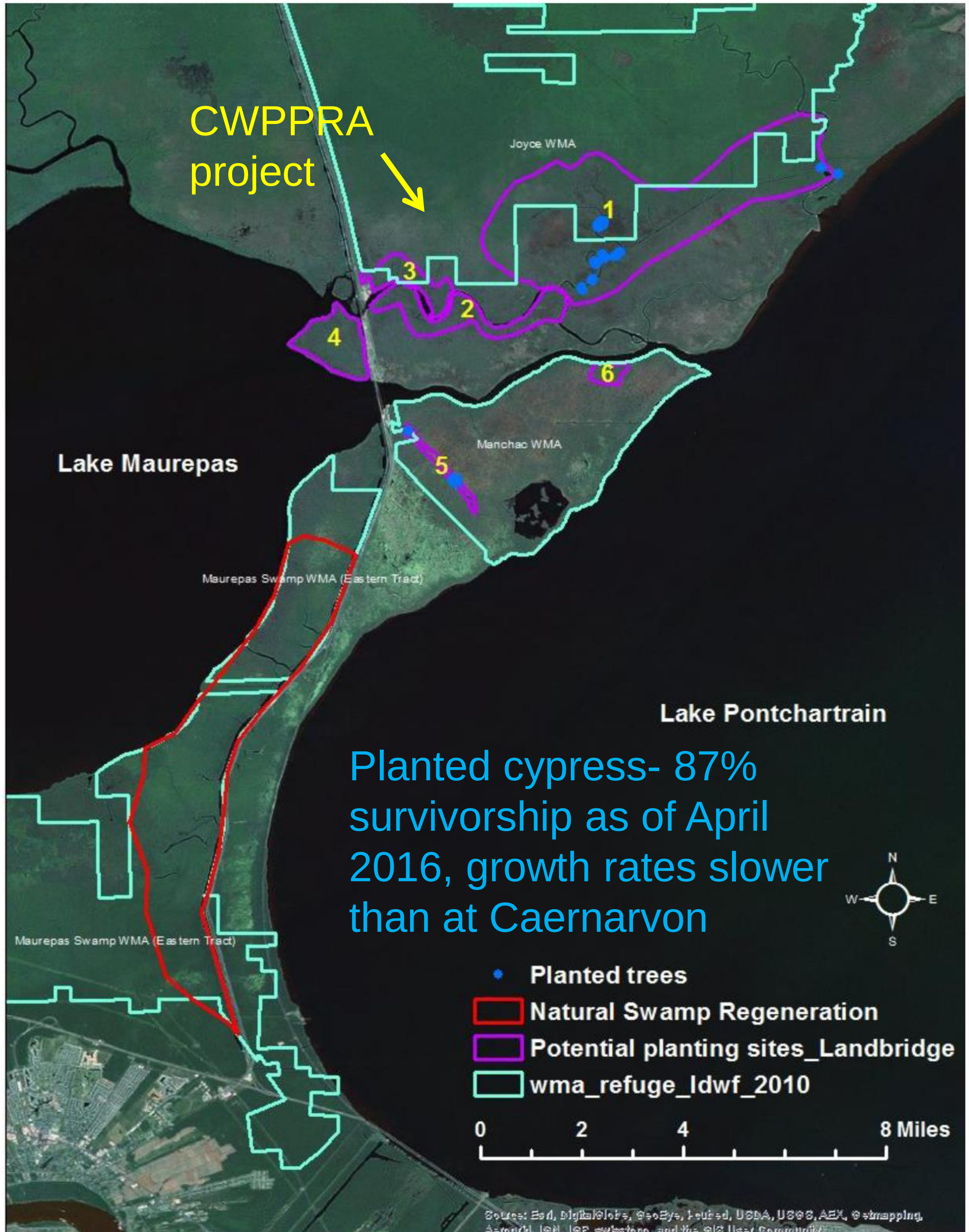

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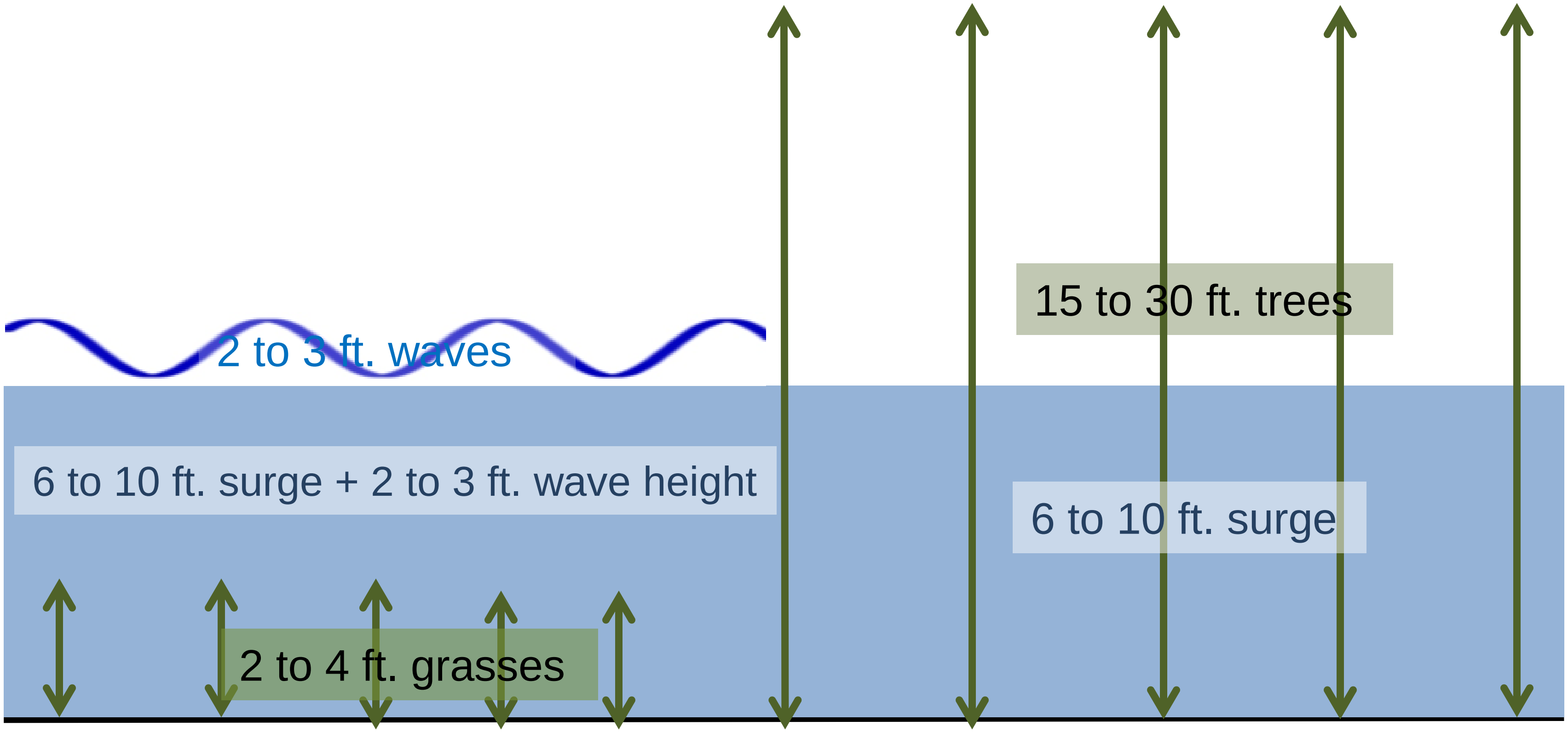

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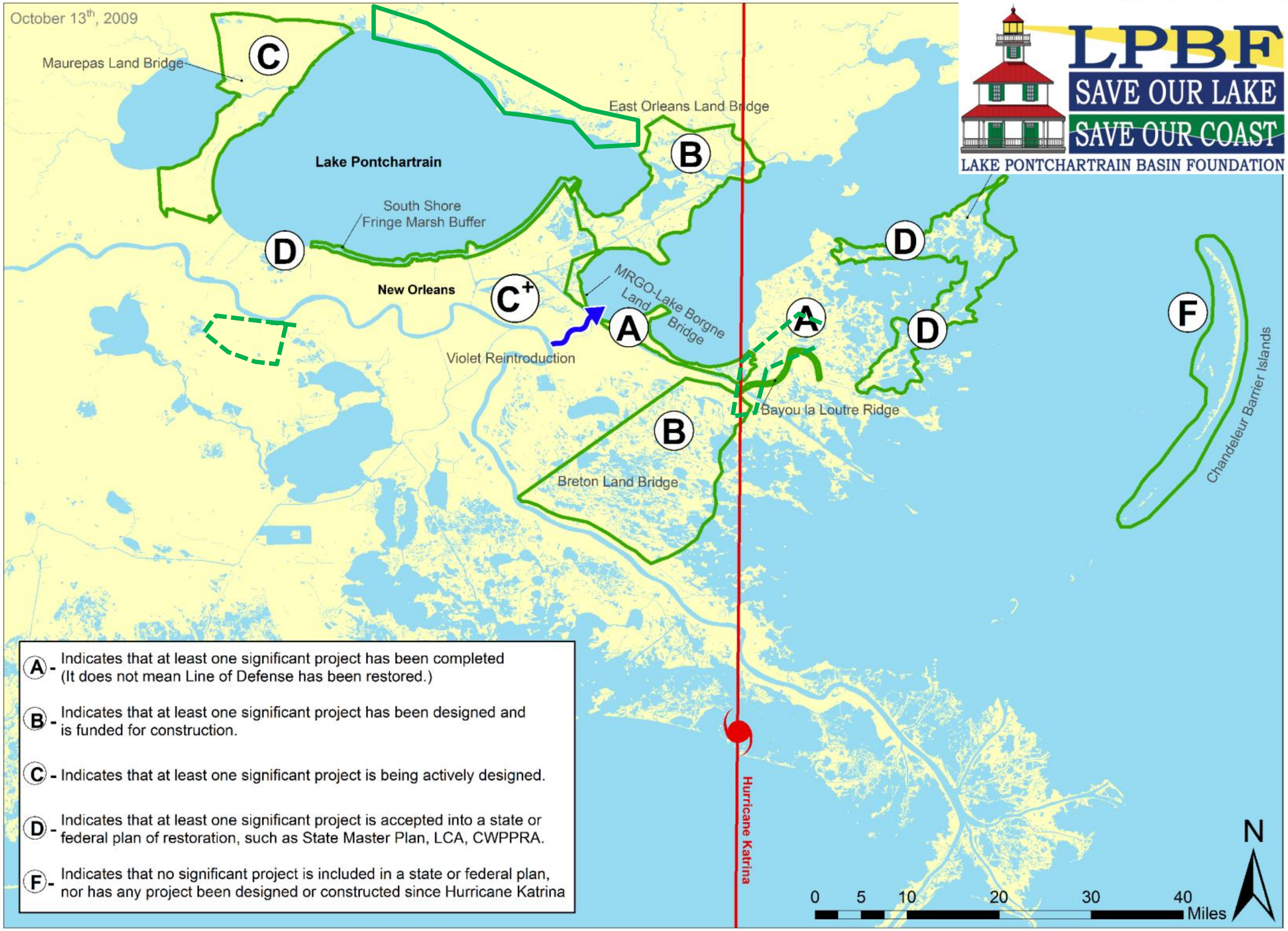
Pontchartrain Coastal Lines of Defense: Report Card



We're always looks for new partners and collaboration!

John Lopez 504 421 7348 jlopez@saveourleake.org