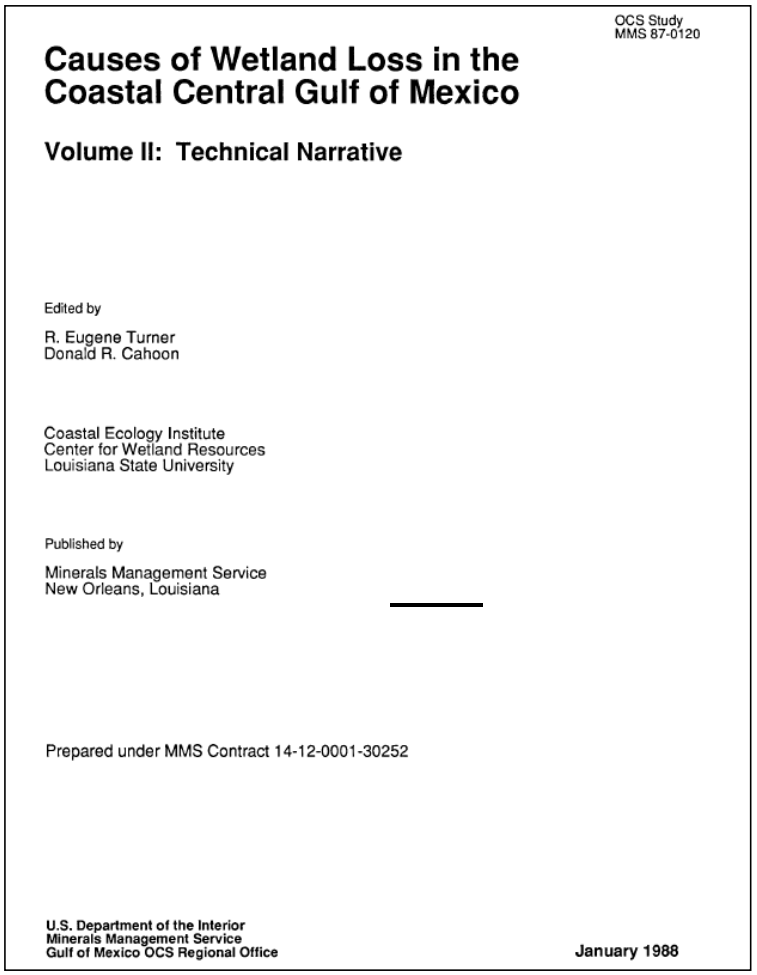
The Louisiana Coastal Lawsuits

Chris McLindon

April 17, 2019



OCS Study
MMS 87-0120

Causes of Wetland Loss in the Coastal Central Gulf of Mexico

Volume II: Technical Narrative

Edited by

R. Eugene Turner
Donald R. Cahoon

Coastal Ecology Institute
Center for Wetland Resources
Louisiana State University

Published by

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New Orleans, Louisiana

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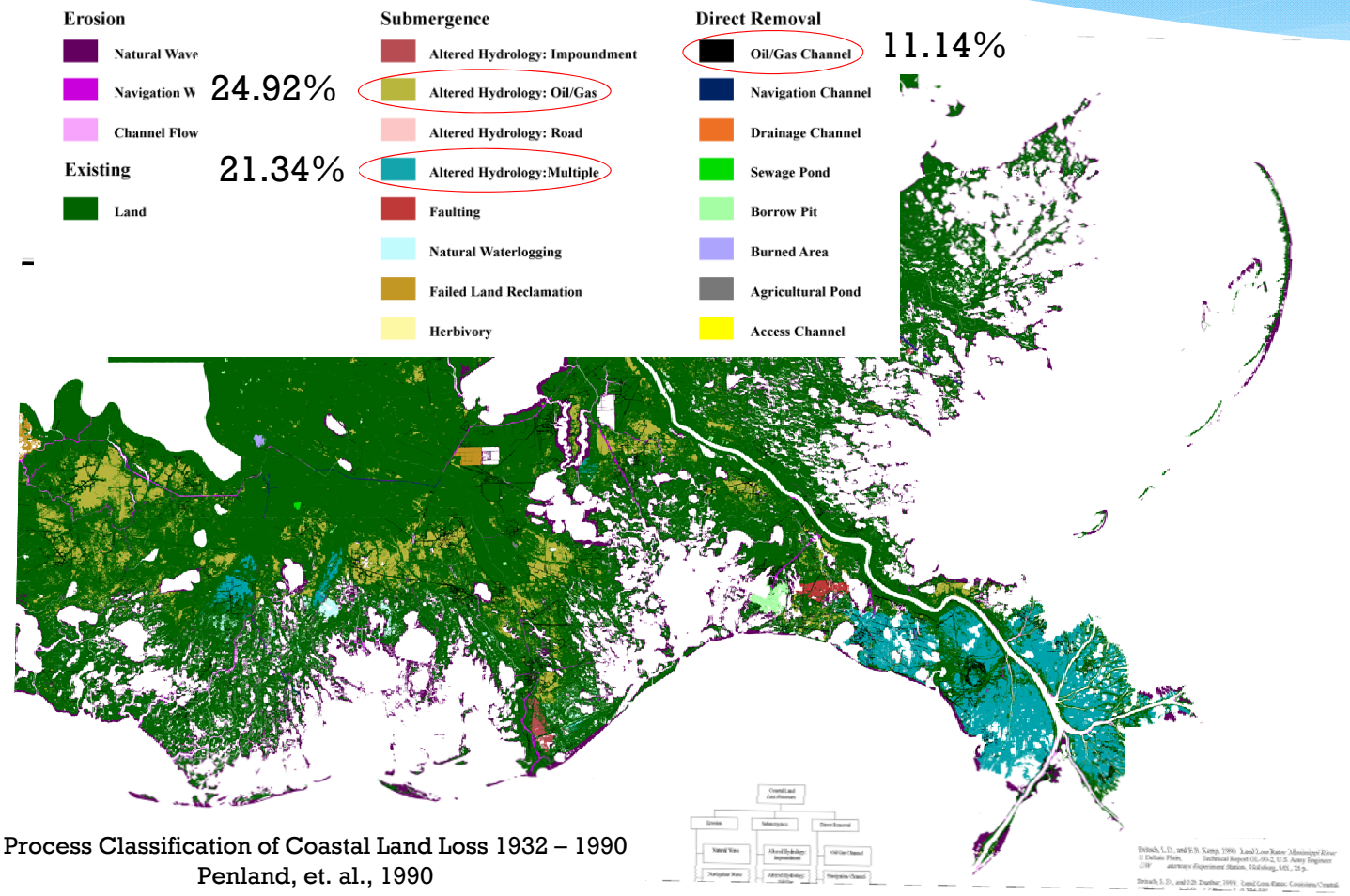
U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

January 1988

"Total canal area is estimated to be 10% of the Louisiana coastal region in 1978 and directly accounts for approximately 6.3% of the total wetlands loss from circa 1955 to 1978. However a strong statistical relationship exists between canal density and total wetlands loss indicates that the indirect impacts of canals account for a substantially larger percentage of total wetlands loss." Page 56



Process Classification of Coastal Land Loss 1932 – 1990
Penland, et. al., 1990

Table 2. Coastal Land Process- Delta Plain

CLASS NAME	ACREAGE	PERCENT
EROSION		
Natural Wave	181,090	26.21%
Navigation Wave	21,821	3.16%
Channel Flow	10,369	1.50%
Subtotal	213,280	30.87%
SUBMERGENCE		
Alt. Hydro Oil/Gas	172,174	24.92%
Alt. Hydro Multiple	148,666	21.52%
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Alt. Hydro Roads	4,825	0.70%
Faulting	3,921	0.57%
Herbivory	561	0.08%
Subtotal	375,612	54.36%
DIRECT REMOVAL		
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Navigation Channel	11,293	1.63%
Borrow Pit	11,130	1.61%
Access Channel	1,312	0.19%
Burned Area	729	0.11%
Sewage Pond	308	0.04%
Agricultural Pond	179	0.03%
Drainage Channel	109	0.02%
Subtotal	102,039	14.77%
TOTAL	**690,931**	**100.00%**

Table 3. Delta Plain Coastal Land Loss Ranking

CLASS NAME	ACREAGE	PERCENT
Oil and Gas	249,152	36.06%
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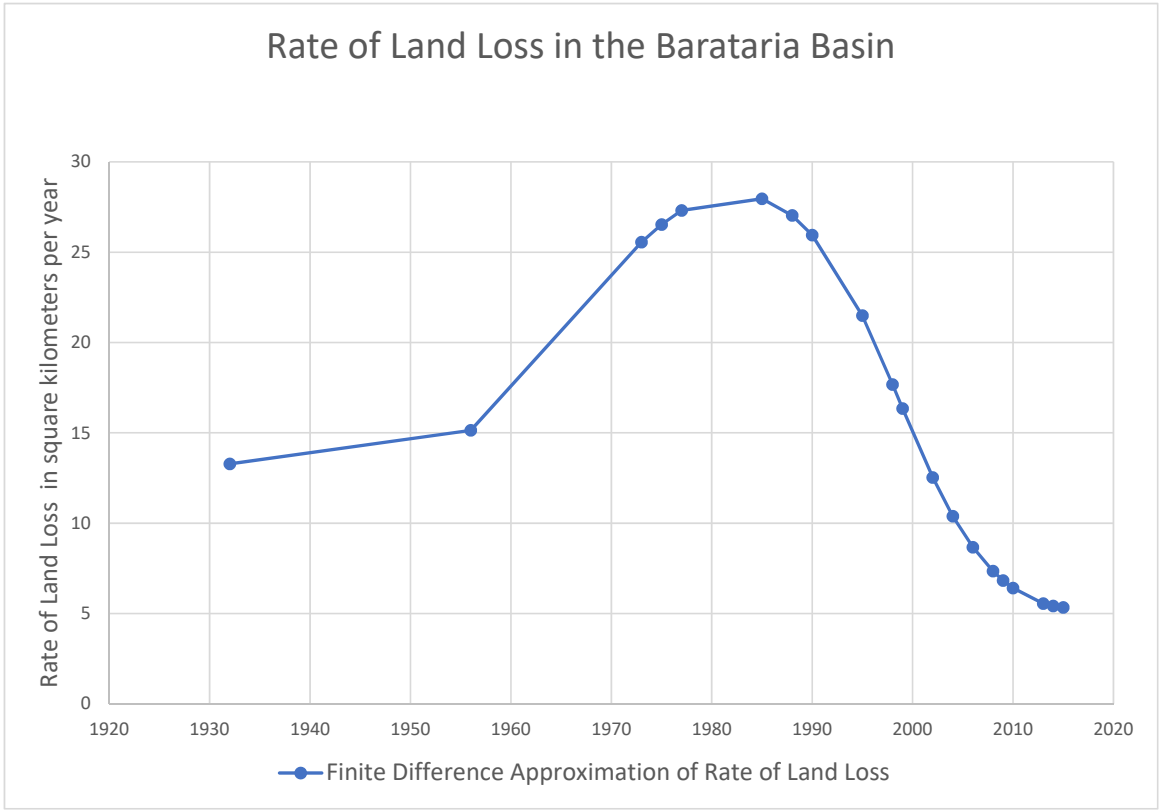
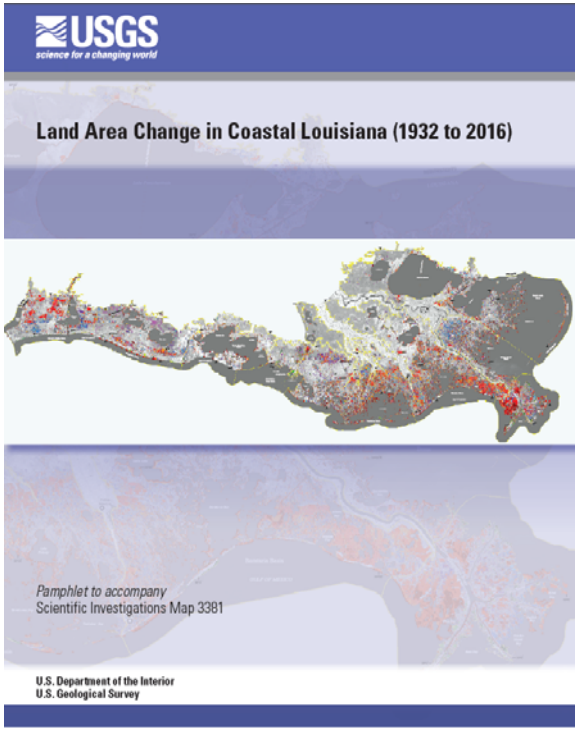
Crisis Narrative

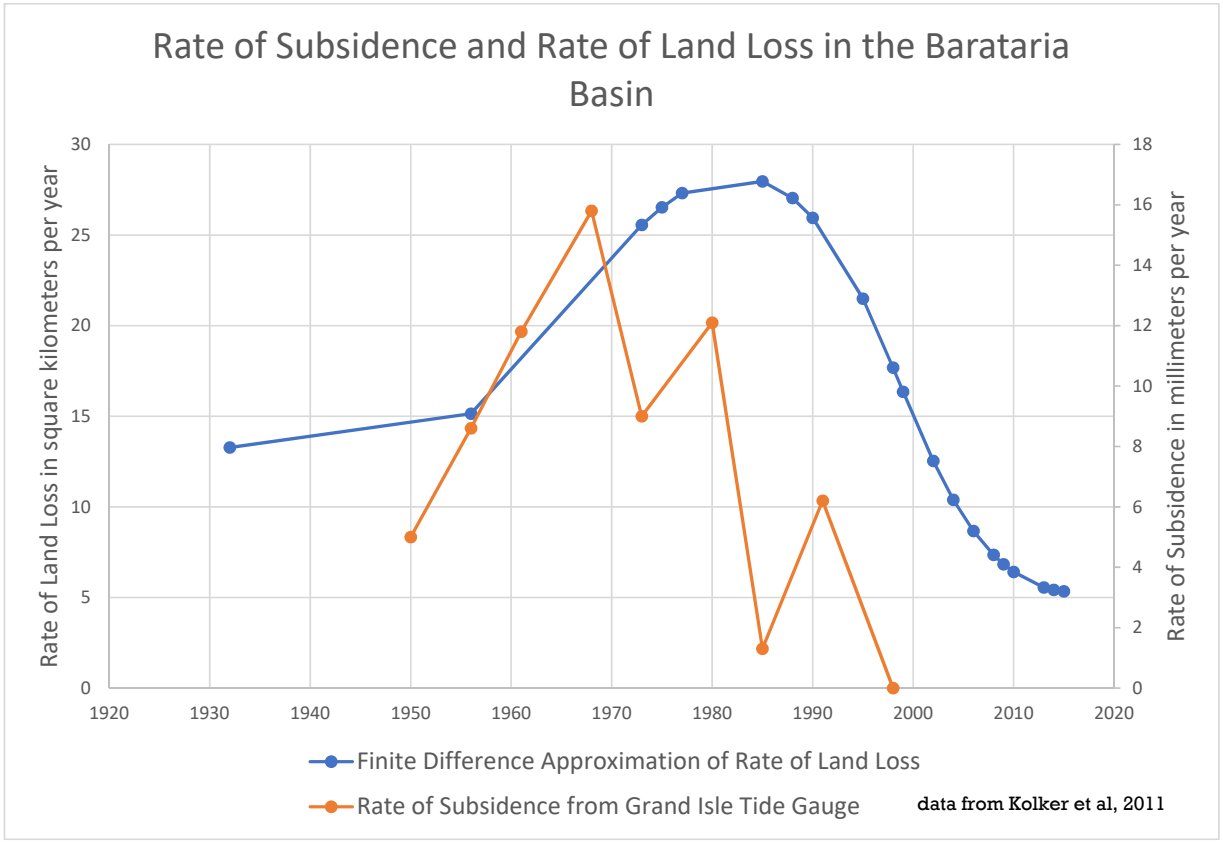
Crisis Narrative

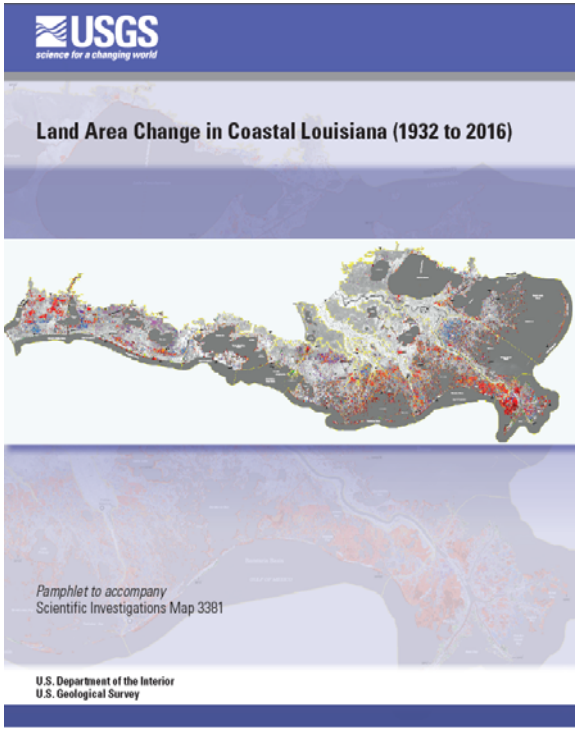
- State of Emergency
- Unprecedented Wetlands Loss
- Humans Caused Loss Through Erosion
- Humans Can Reverse It
- Success Will Be Proportional to Spending

Developments in Science


Rate of Land Loss in the Barataria Basin
Rate of Land Loss in square kilometers per year
30
25
20
15
10
5
0
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Finite Difference Approximation of Rate of Land Loss


USGS
science for a changing world
Land Area Change in Coastal Louisiana (1932 to 2016)
Pamphlet to accompany
Scientific Investigations Map 3381
U.S. Department of the Interior
U.S. Geological Survey


Rate of Subsidence and Rate of Land Loss in the Barataria Basin
Rate of Land Loss in square kilometers per year
Rate of Subsidence in millimeters per year
30
25
20
15
10
5
0
18
16
14
12
10
8
6
4
2
0
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Finite Difference Approximation of Rate of Land Loss
Rate of Subsidence from Grand Isle Tide Gauge
data from Kolker et al, 2011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S.L.C.R.M.A.

State and Local Coastal Resources Management Act of 1978

COASTAL ZONE MANAGEMENT PROGRAM UPDATE

TO THE

THE PLAQUEMINES PARISH COASTAL ZONE MANAGEMENT PROGRAM

PLAQUEMINES PARISH
DEPARTMENT OF COASTAL ZONE MANAGEMENT

U.S. FISH AND WILDLIFE SERVICE/ PLAQUEMINES PARISH
PROJECT NO. F12AF70162

EVANS-GRAVES ENGINEERS, INC. PROJECT NO. 2011-21-770

September 2013

Environmental Problems Leading to Resource Use Conflicts

The more serious environmental problems confronting the parish are subsidence of the upland/fastland areas, transition areas and wetlands; the shift in salinity zones in wetlands outside the flood protection levees; and loss of coastal wetlands and barrier shorelines. These problems could ultimately adversely impact the ability of the citizens of Plaquemines Parish to continue living and working in the area and are related to:

- regional subsidence and sea level rise,
- local subsidence related to compaction of fastland soils from forced drainage
- erosion of barrier islands and barrier shores
- construction of canals, slips, and pipelines, and other subtidal excavations (i.e., deepening of navigation channels and excavation of borrow areas),
- loss of fresh-to-intermediate salinity emergent marsh through saltwater intrusion, erosion, and/or submergence,
- widening of tidal passes and drainage routes due to current scour, boat wakes, and wind-induced waves, and increasing tidal envelope with corresponding decrease in retention of fresh water in upper Barataria and Breton hydrologic basins.

S.L.C.R.M.A.

State and Local Coastal Resources Management Act of 1978

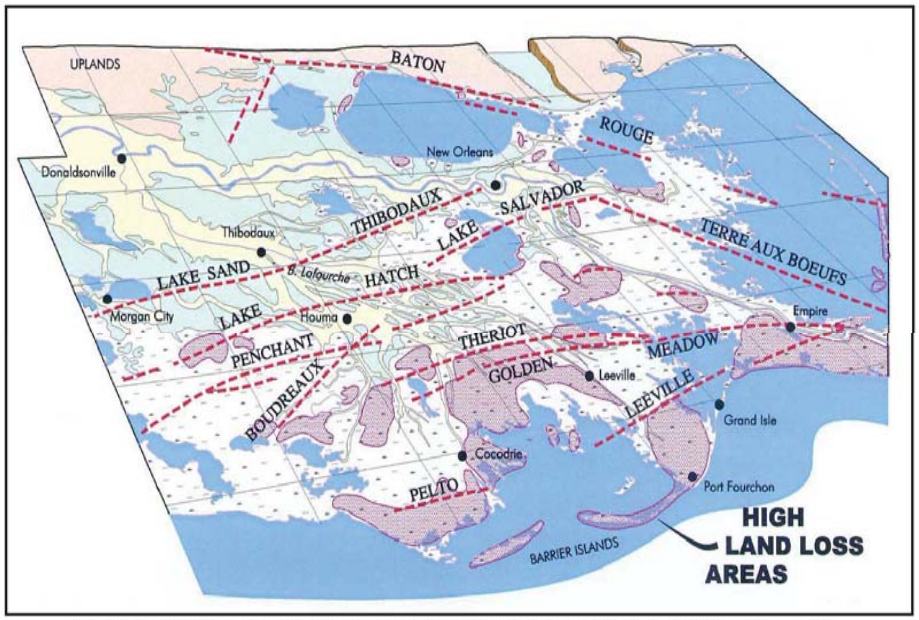
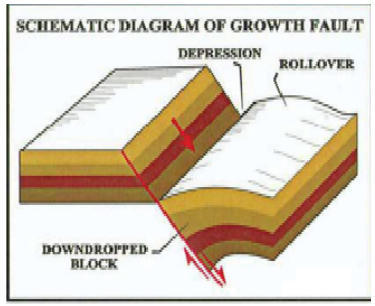


Fig. 2.4 Illustration between fault and high land loss in Southeastern Louisiana. Faults are the cause of land submergence and loss (Gagliano, 2005)

THE PLAQUEMINES PARISH COASTAL ZONE MANAGEMENT PROGRAM



Fault Movements and Subsidence

Current research indicates that the tectonic stability should be considered in conjunction with planning and design of coastal restoration. Results have shown that fault movement effects are underrated. A key discovery was made in recognizing and showing that there exists movement along ancient geological faults, as illustrated on Figure 2.4. The maps show a correlation between areas of faults and land loss. The coastal community is already aware that a large portion of land loss is due to submergence and erosion but not aware of moving faults. Fault-bound blocks beneath the coastal zone, as shown on Figure 2.5 are sinking and tilting. Because south Louisiana sits on top of a linked tectonic system that extends under the Gulf of Mexico, the area continues to sink. There is a trough that fills with sediment brought in by rivers and resulting in submerging the fault further. If the rate of subsidence is larger than the rate of sediment delivery the land loss continues. As a result, sediment loading could increase subsidence. Not surprising there is a divide between geologists and geophysicists and the community of scientists, engineers, and planners involved in coastal restoration. A goal should be to incorporate the fault information for better planning and design of coastal restoration projects.

Louisiana's Comprehensive
Master Plan for a Sustainable Coast

committed to our coast

Effective June 2, 2017

APPENDICES

2017 Coastal Master Plan

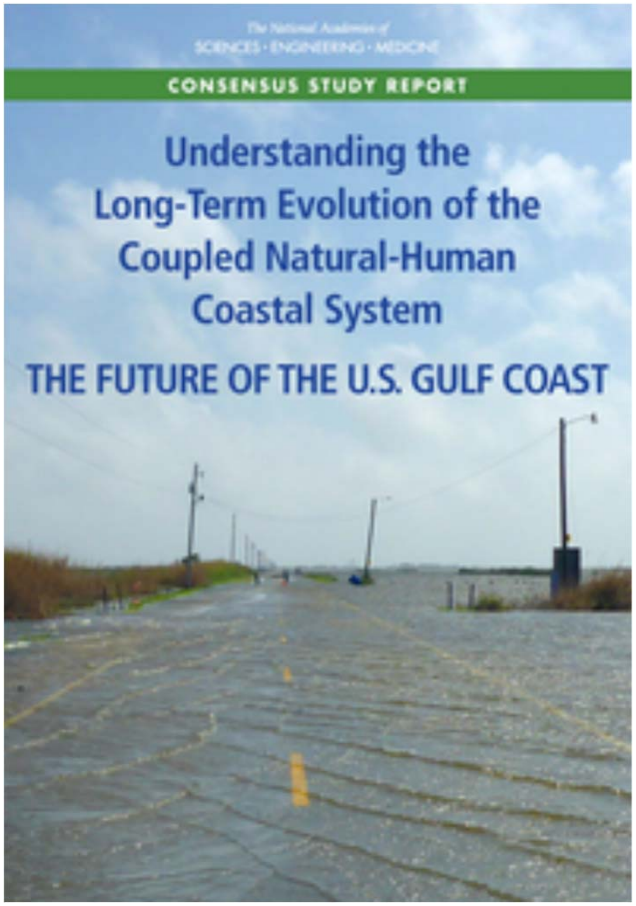
Appendix C – Modeling

Attachment C2-1

Eustatic Sea Level Rise

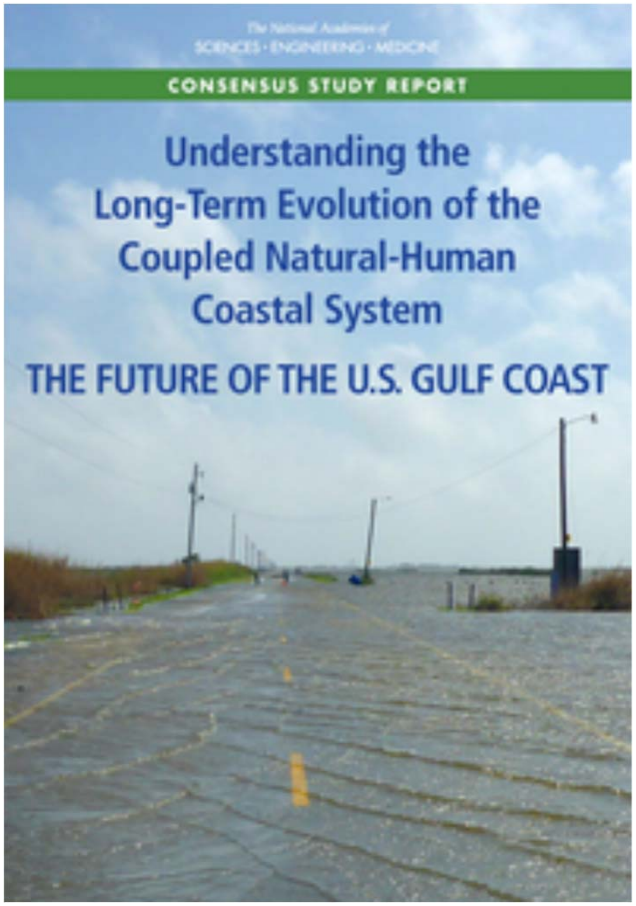
2017 Coastal Master Plan

Attachment C2-2: Subsidence



RESEARCH GAPS

Research Gap 2: The causes, rates, and patterns of subsidence along the Gulf Coast are not sufficiently well understood to allow for accurate prediction at the local to regional scale



BARRIERS AND OPPORTUNITIES FOR COMMUNICATION

Barrier 3. The size and complexity of the energy industry, as well as apparent limitations to information sharing, present a barrier to effective communication between the energy industry and other stakeholders.

Opportunity 3. Create an incentive structure that fosters information sharing between the energy industry and other stakeholders, as well as protocols for how to engage more effectively to facilitate information sharing. This process could be facilitated by a third party such as a boundary organization.

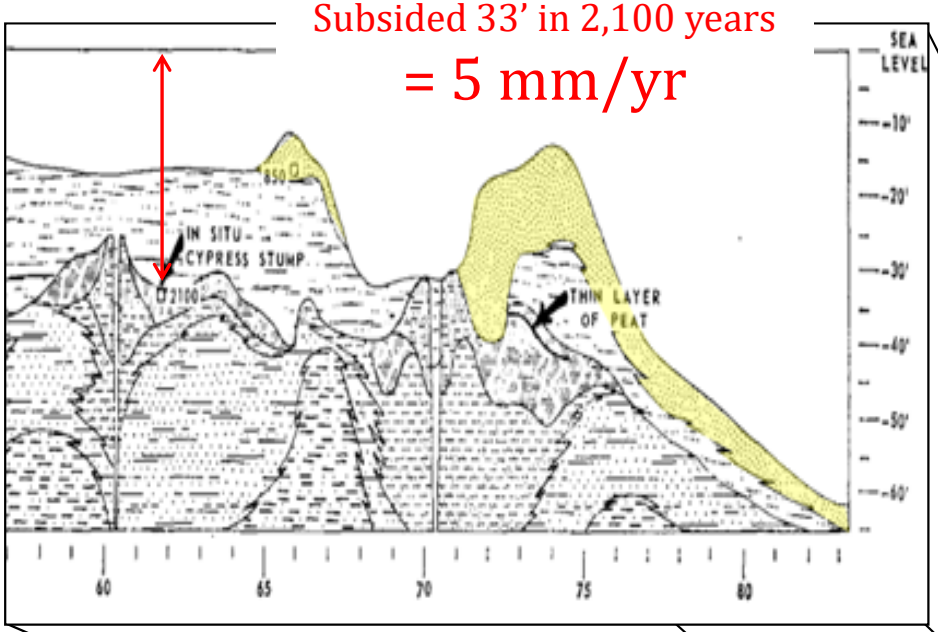
Litigation vs Science

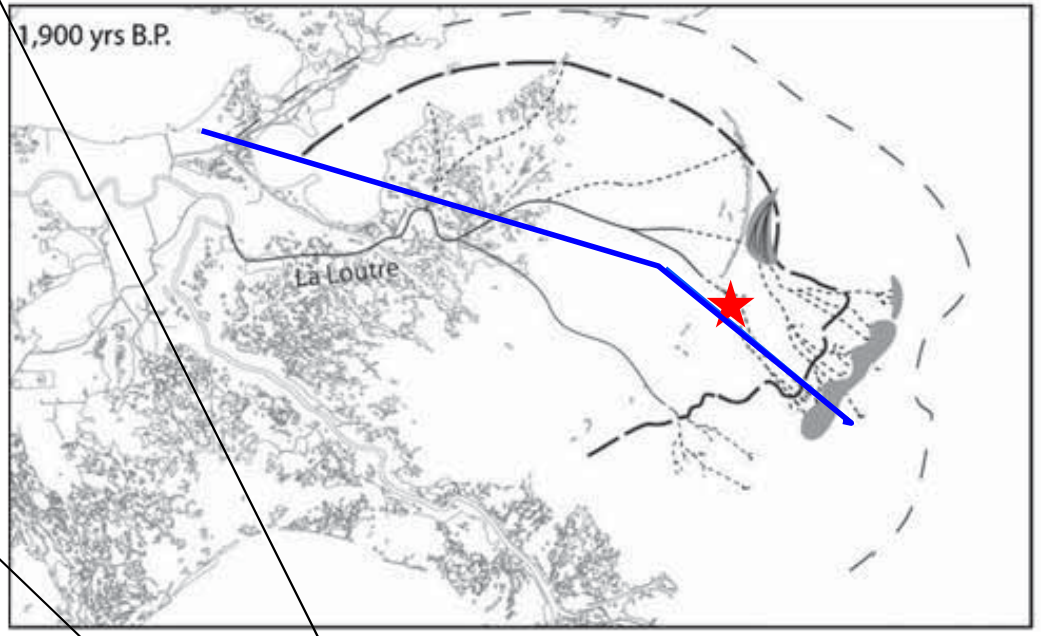
"This [coastal] lawsuit is based on the mythology that the Mississippi delta is in a steady state world and that, but for the actions of bad people – the oil industry, the Corps of Engineers – everything would be fine. The plaintiffs' claims deny climate change and the best coastal science. The defense of this case should be seen as an opportunity to bring the best science to bear on questions of the Louisiana coast and its future in a changing world."

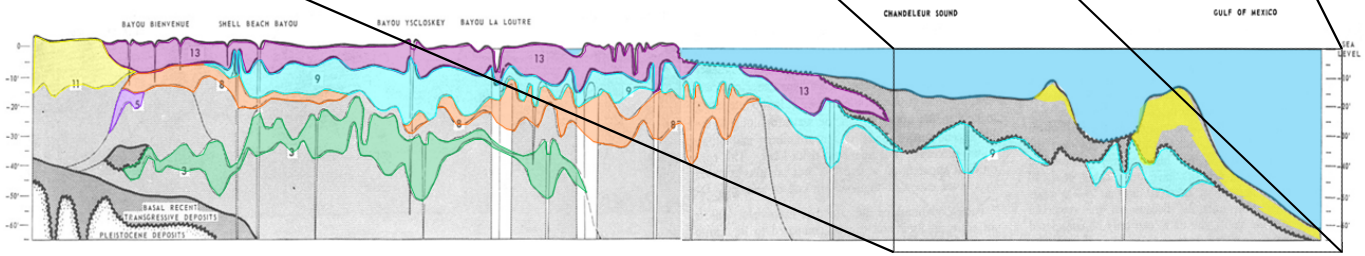
Ed Richards - Director of the LSU Law School Climate Change Law and Policy Project

Subsided 33’ in 2,100 years

= 5 mm/yr

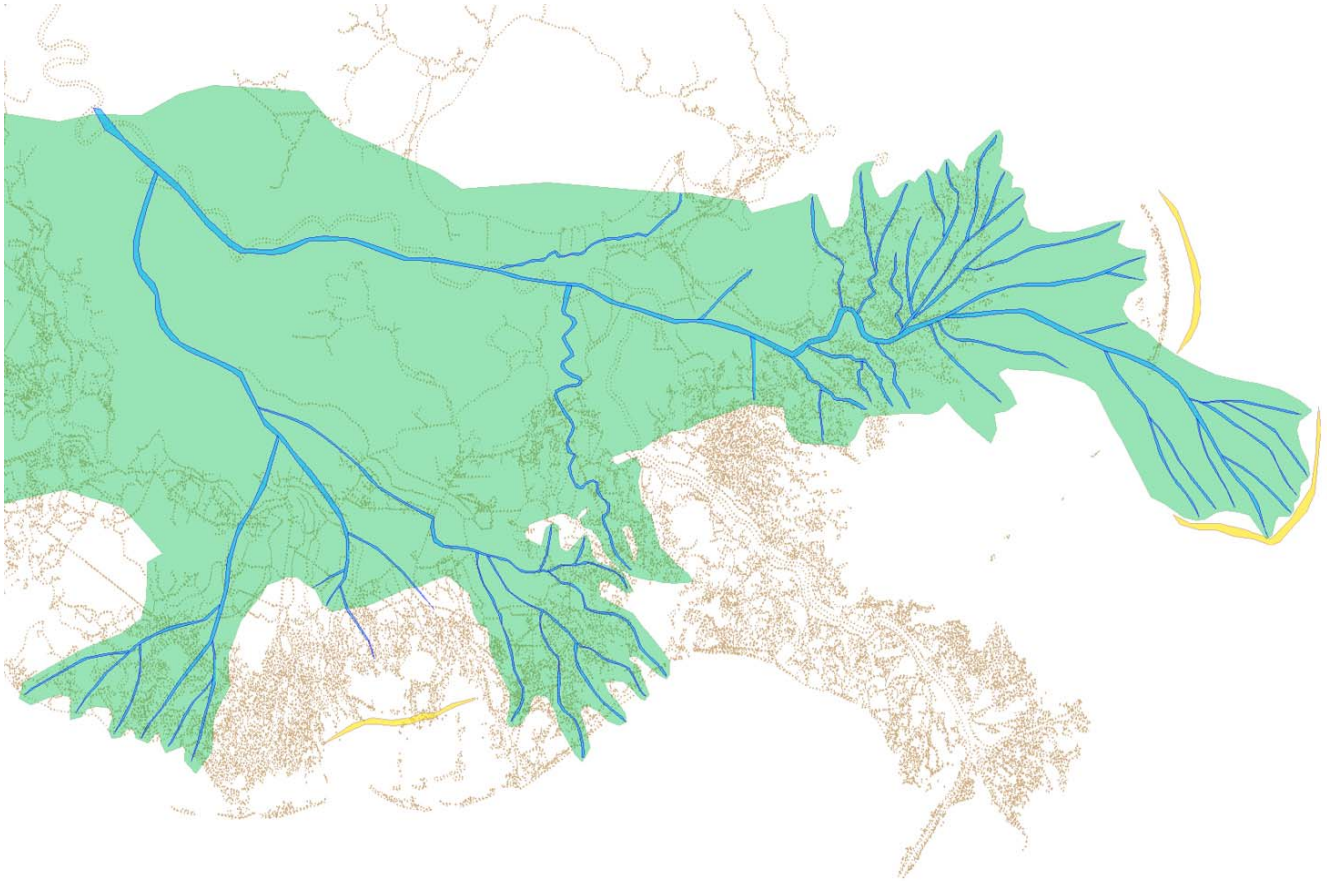




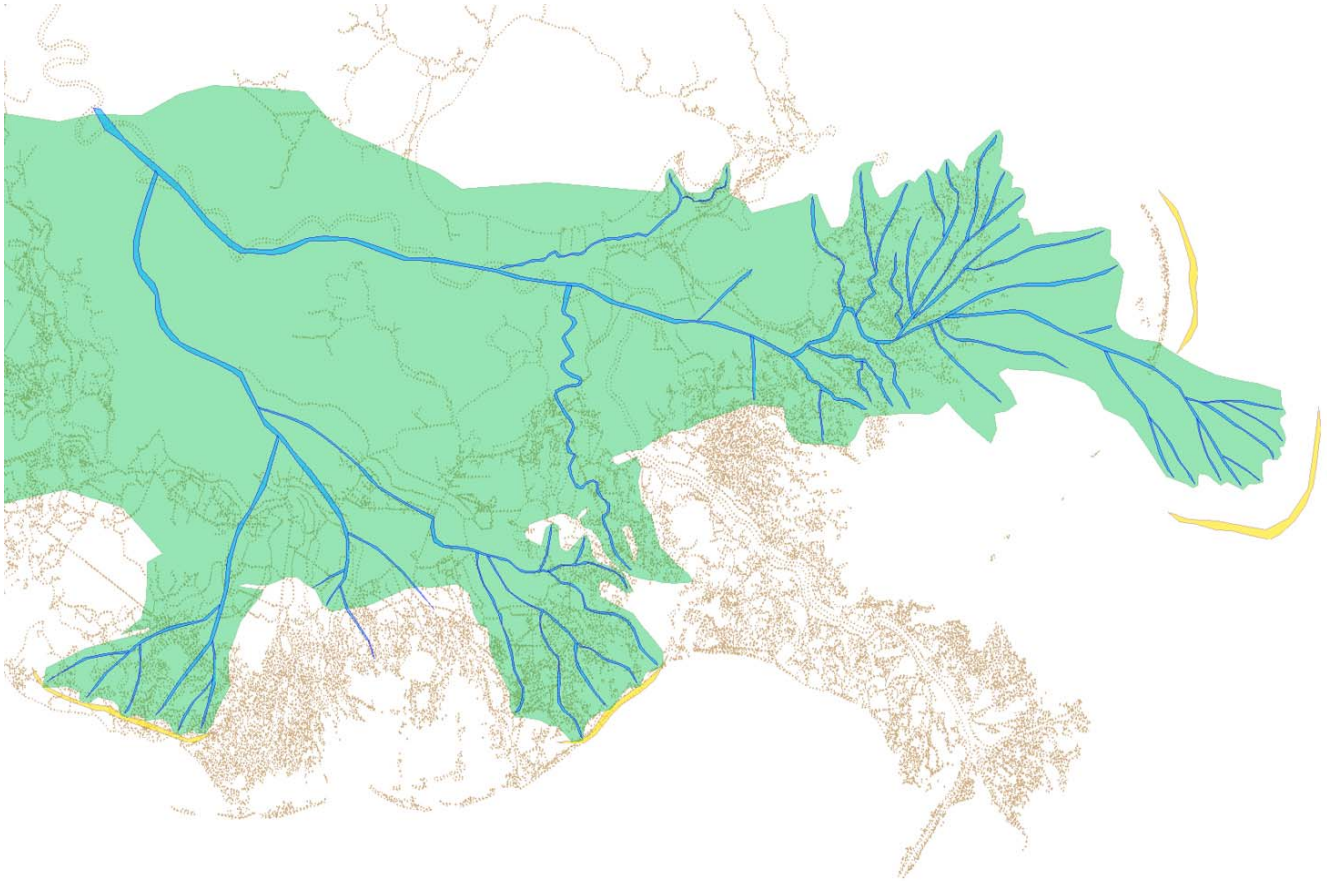


Rogers, B.E. et.al., 2009

1800 years ago



1700 years ago



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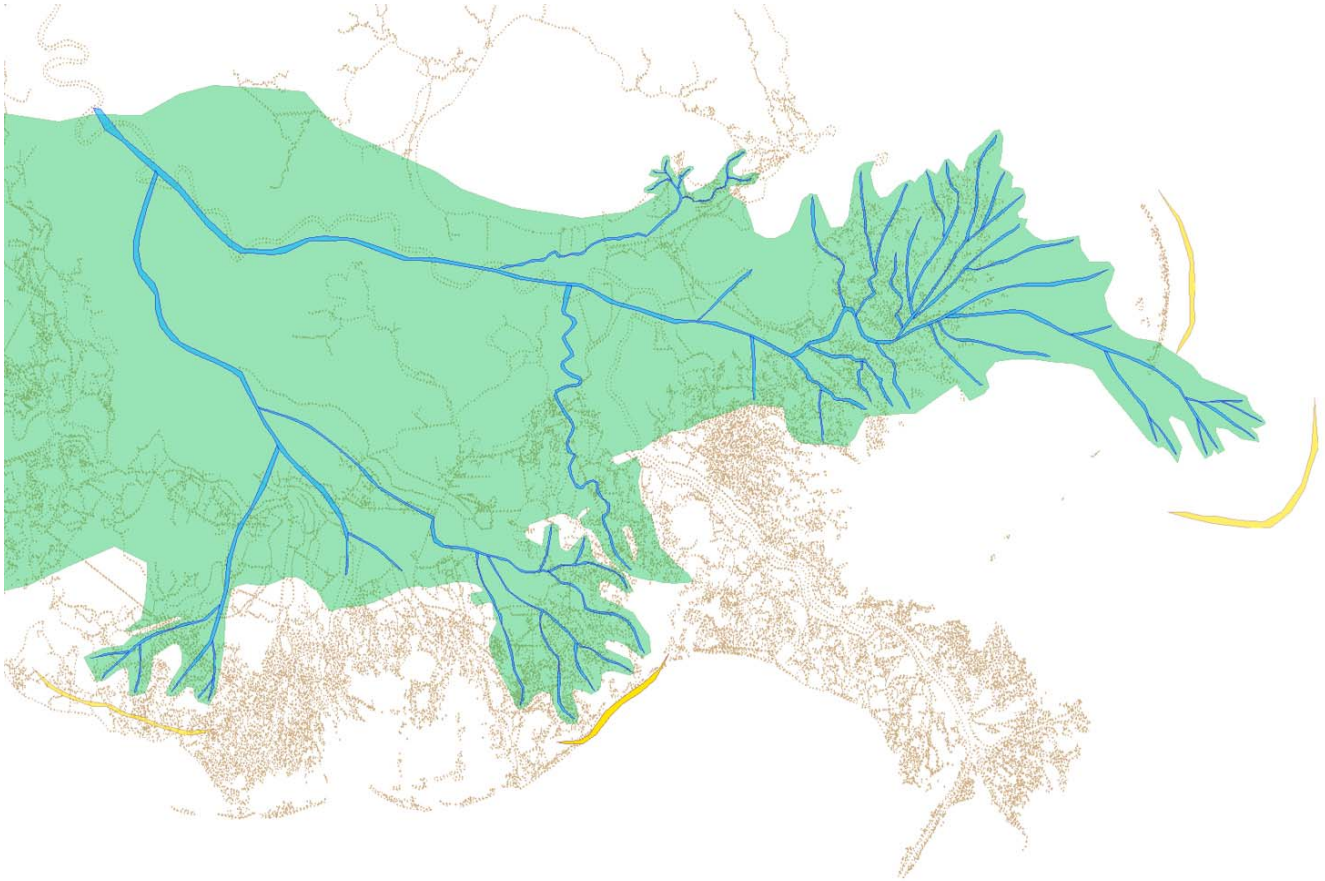

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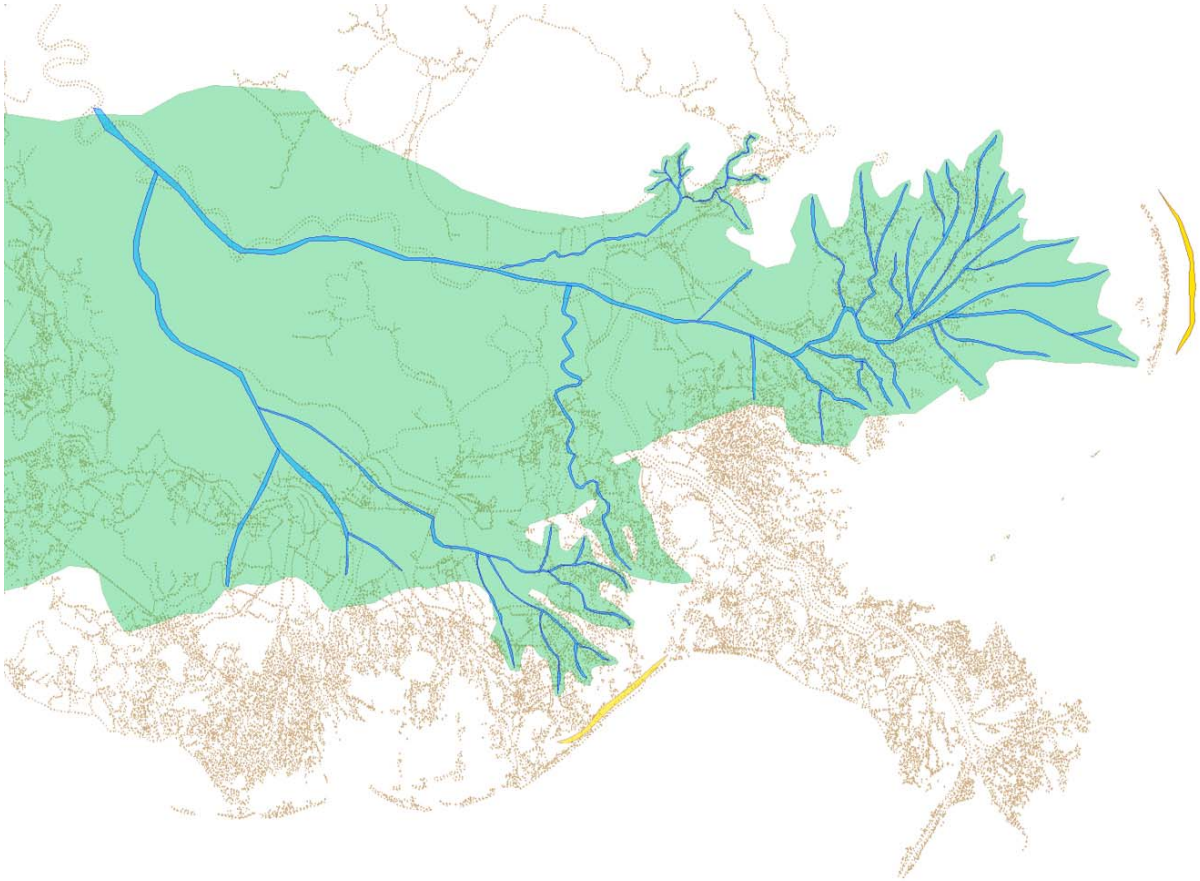
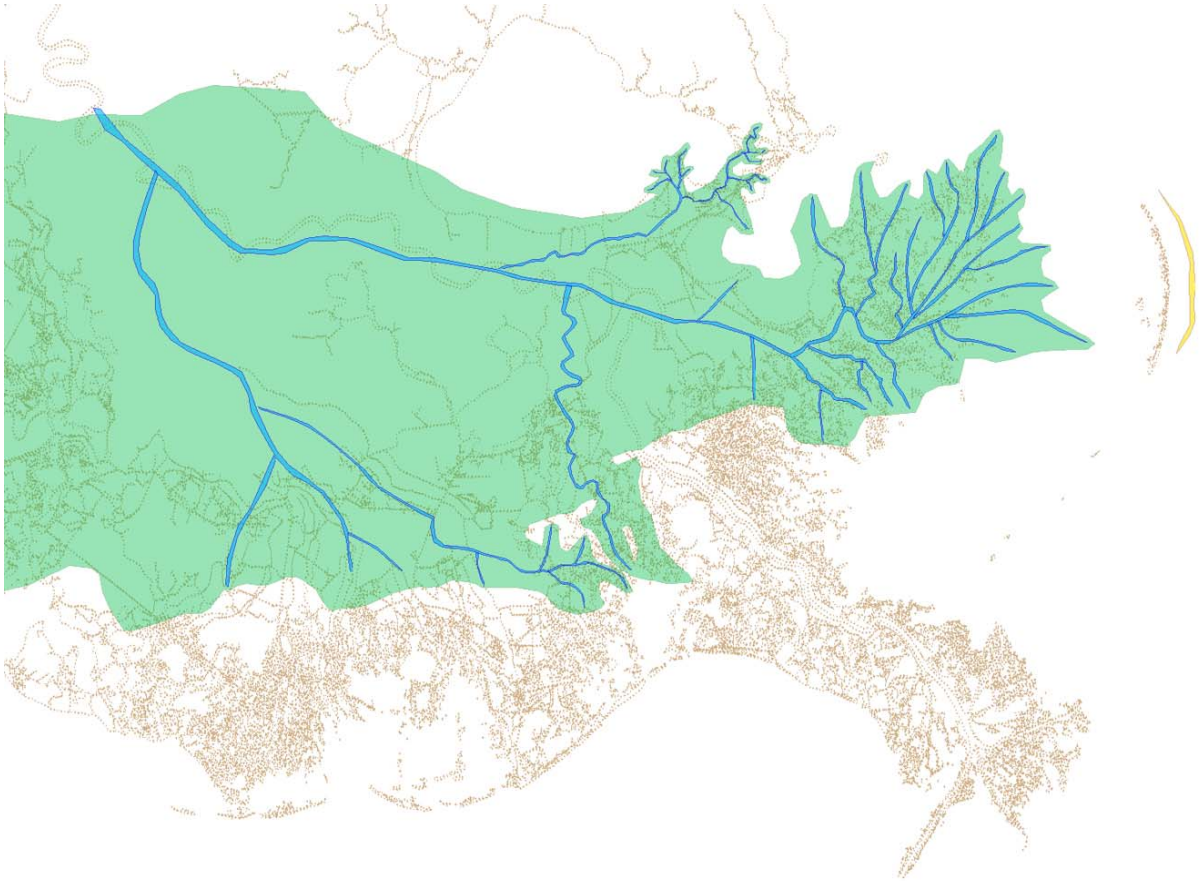


1400 years ago



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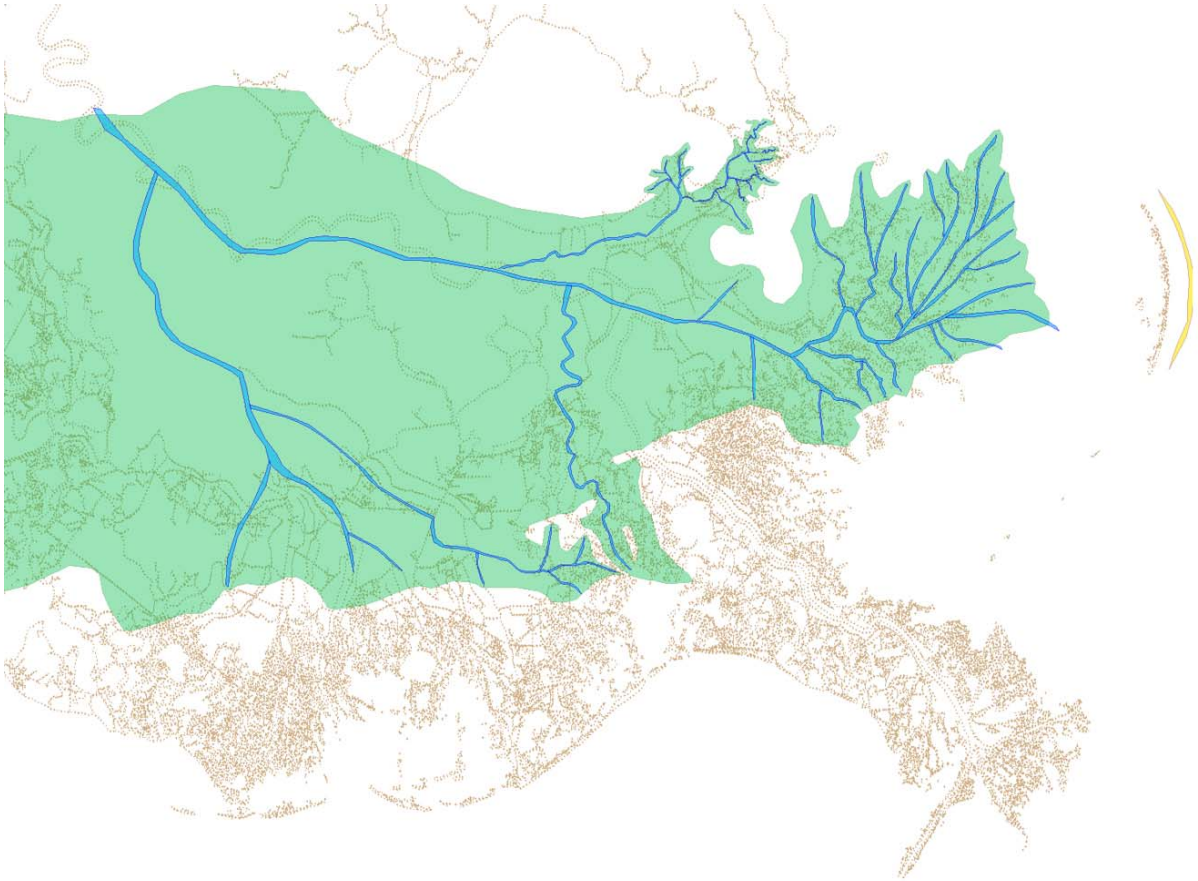

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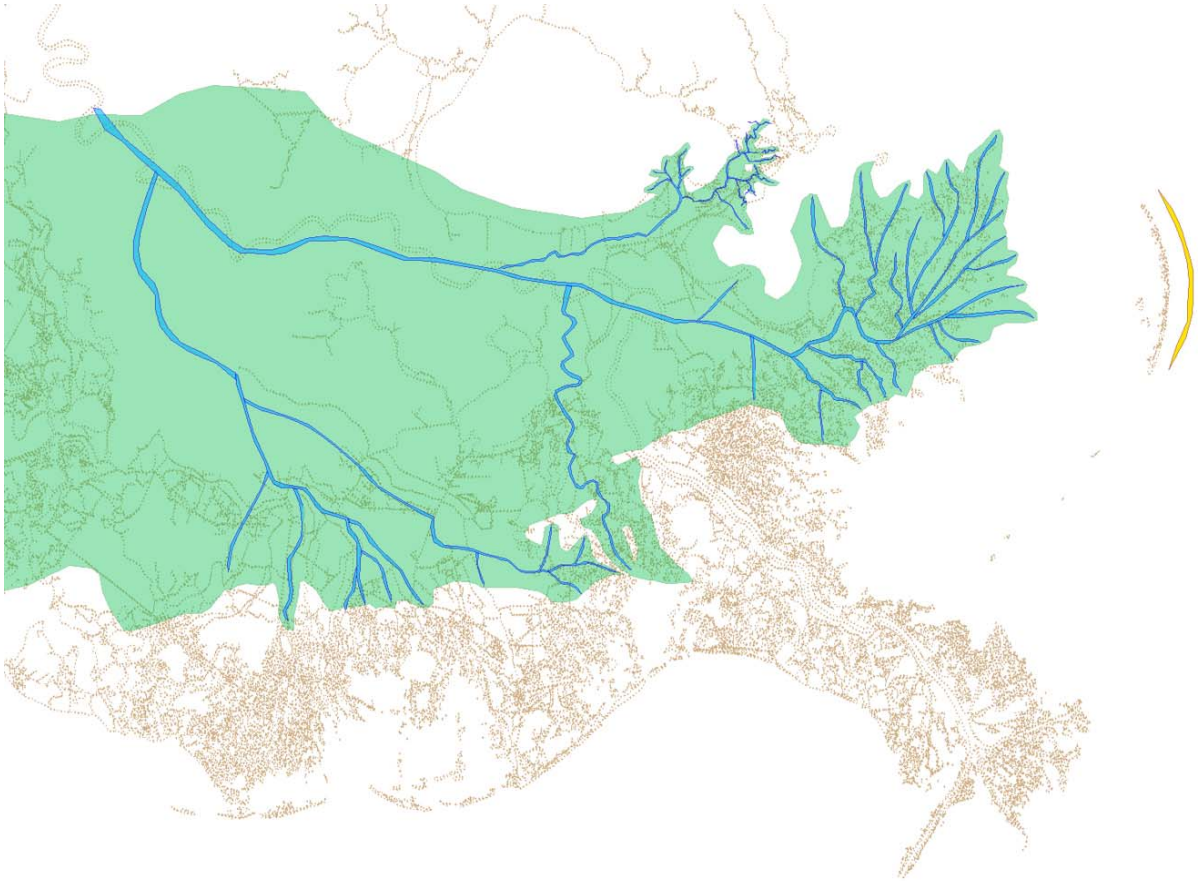

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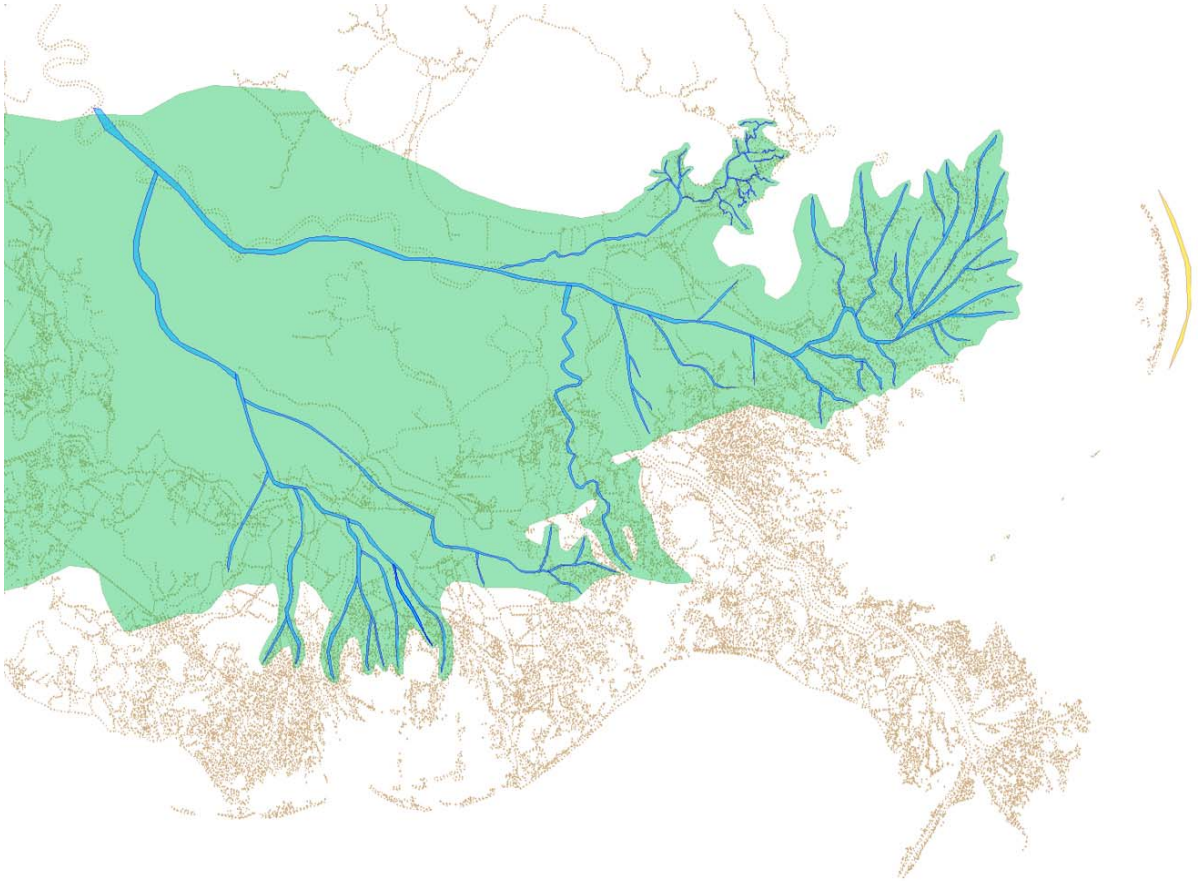

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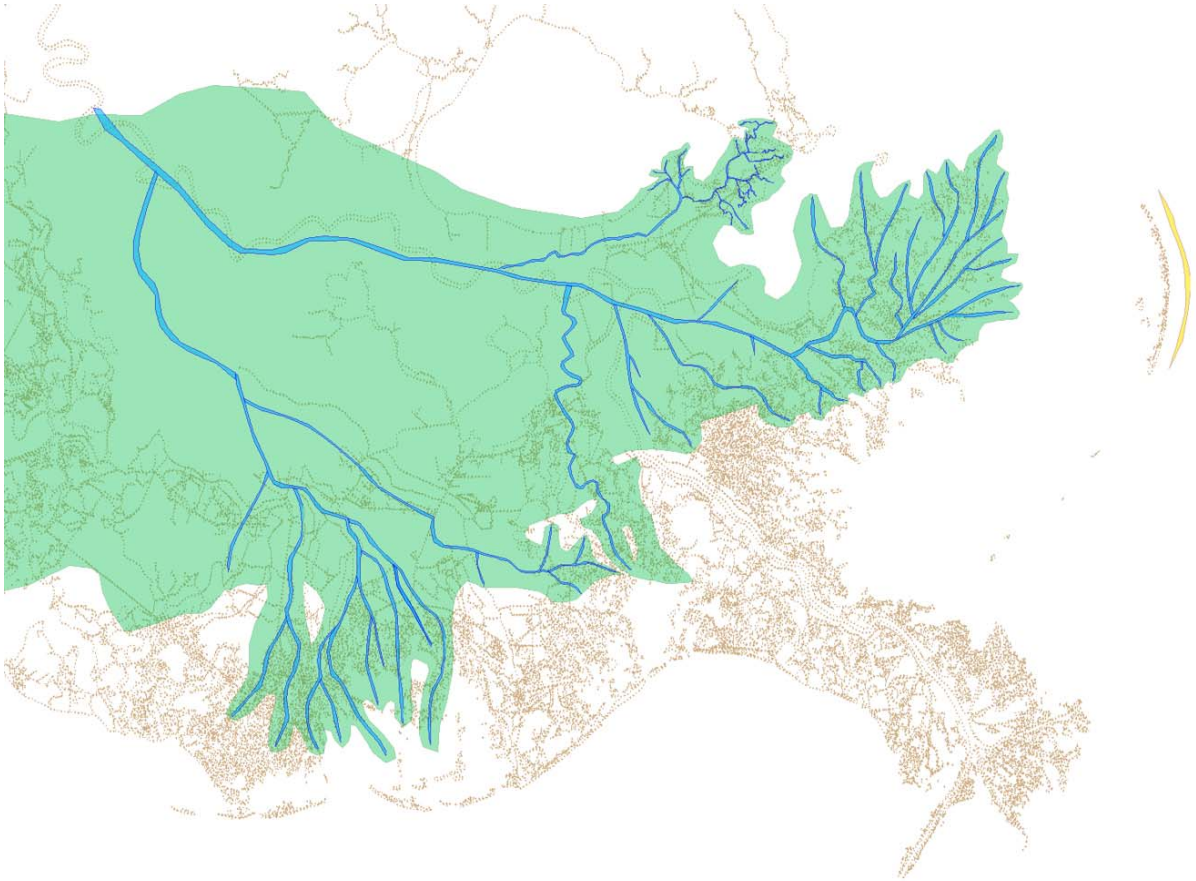

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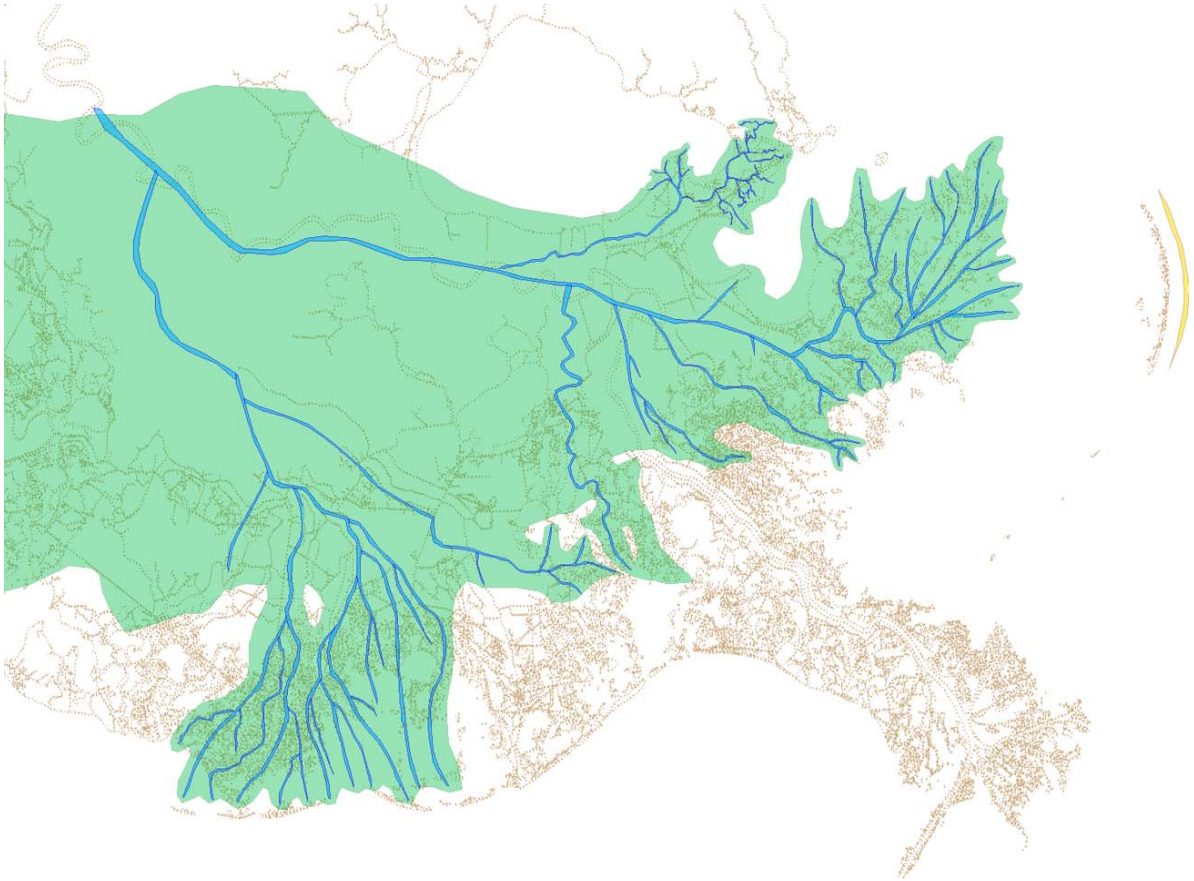

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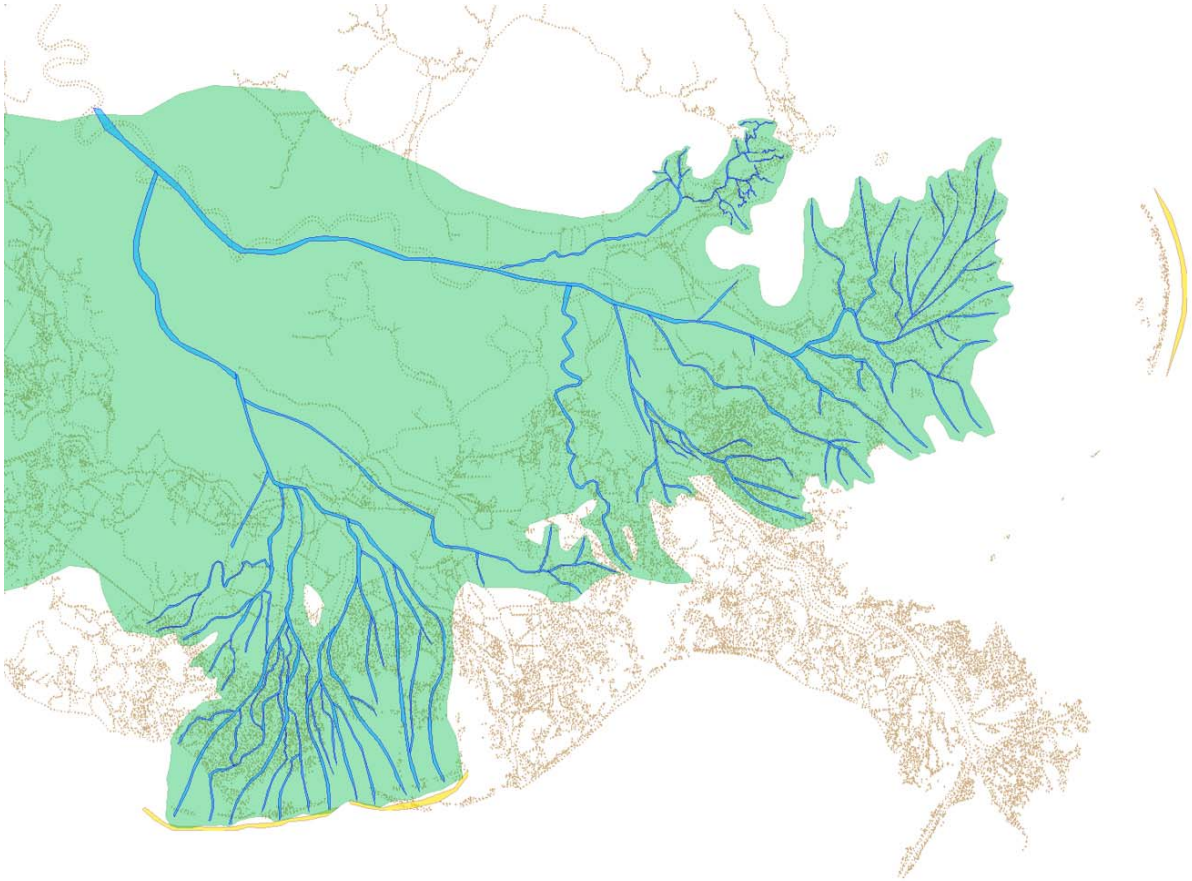

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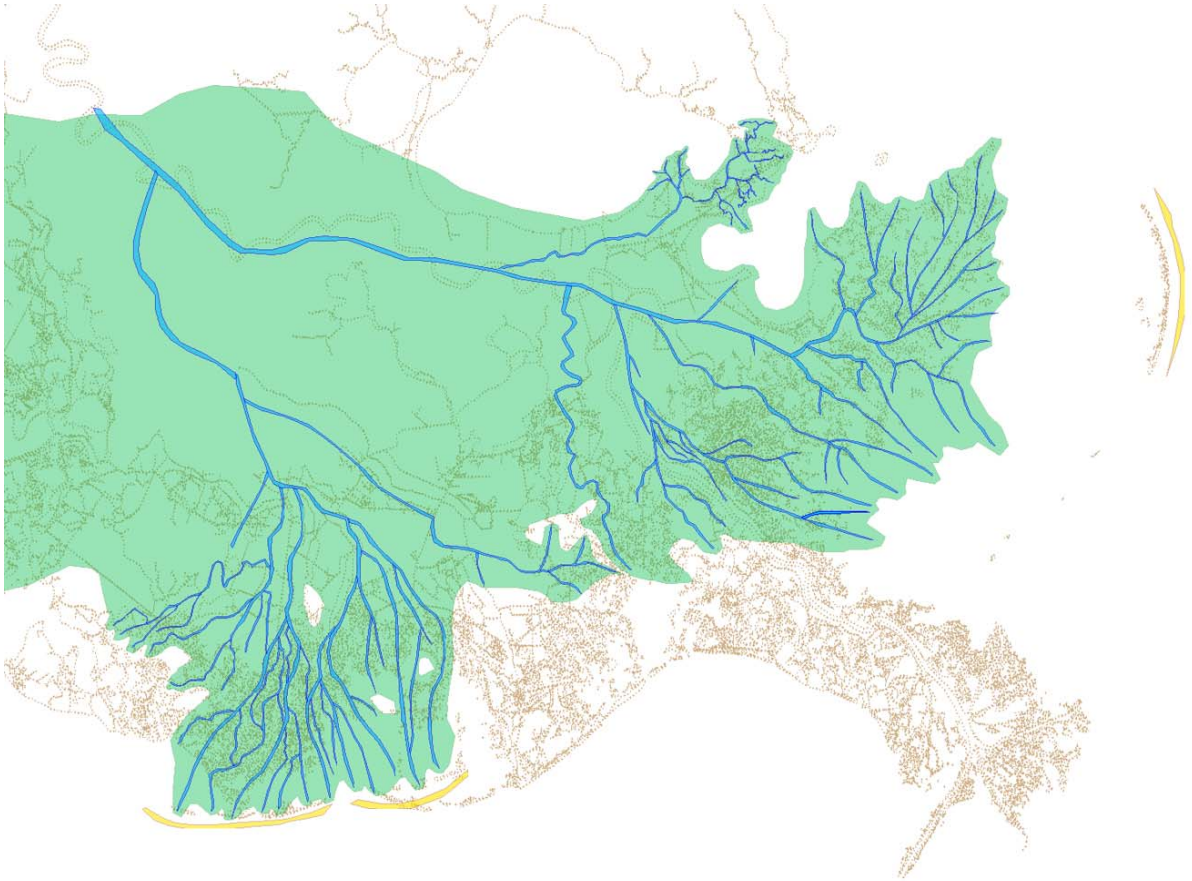

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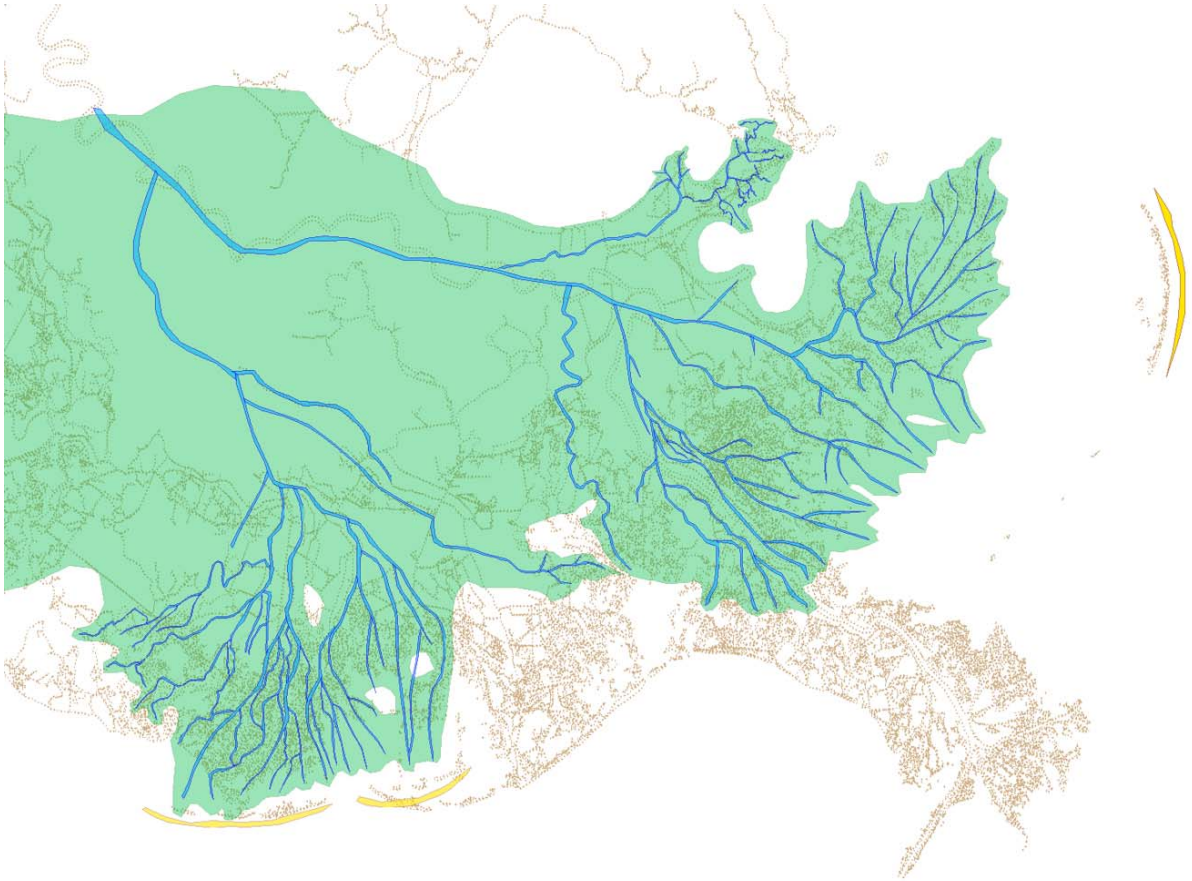

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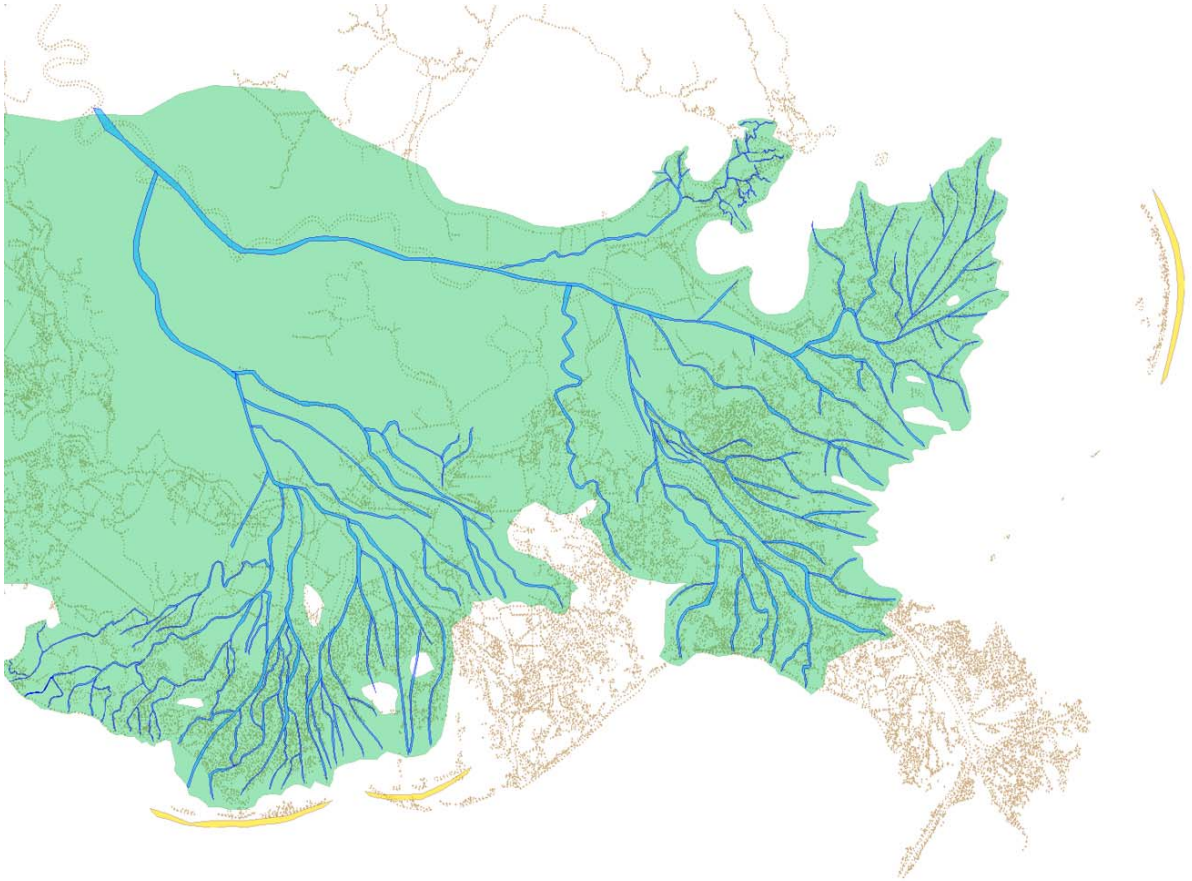

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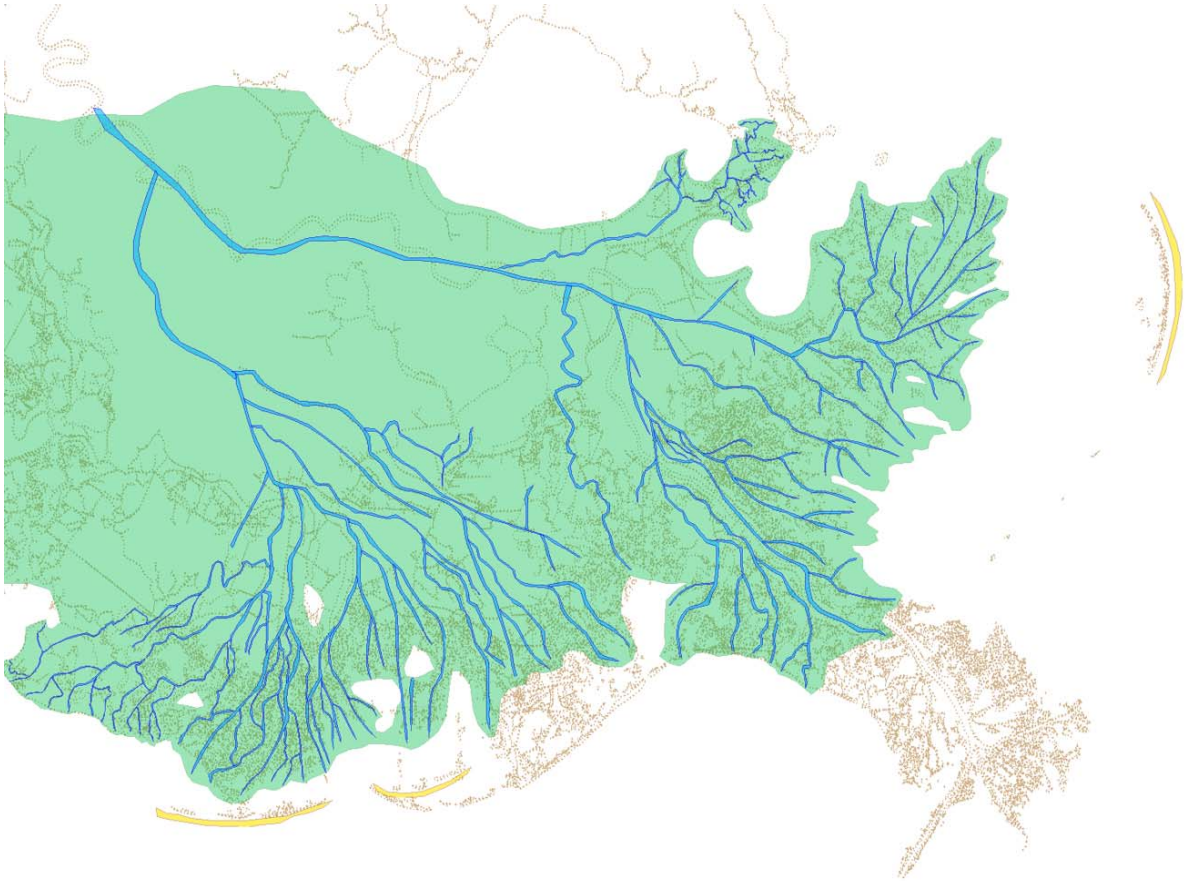

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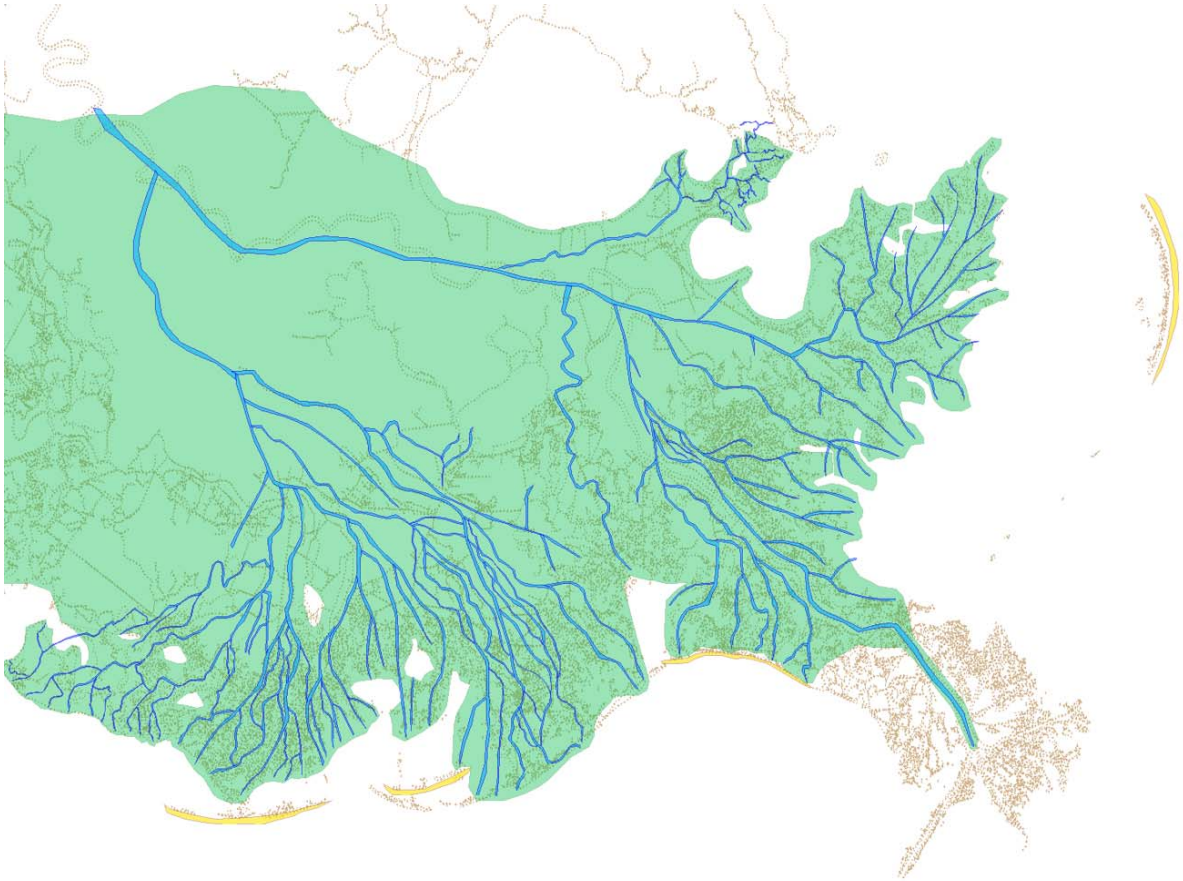

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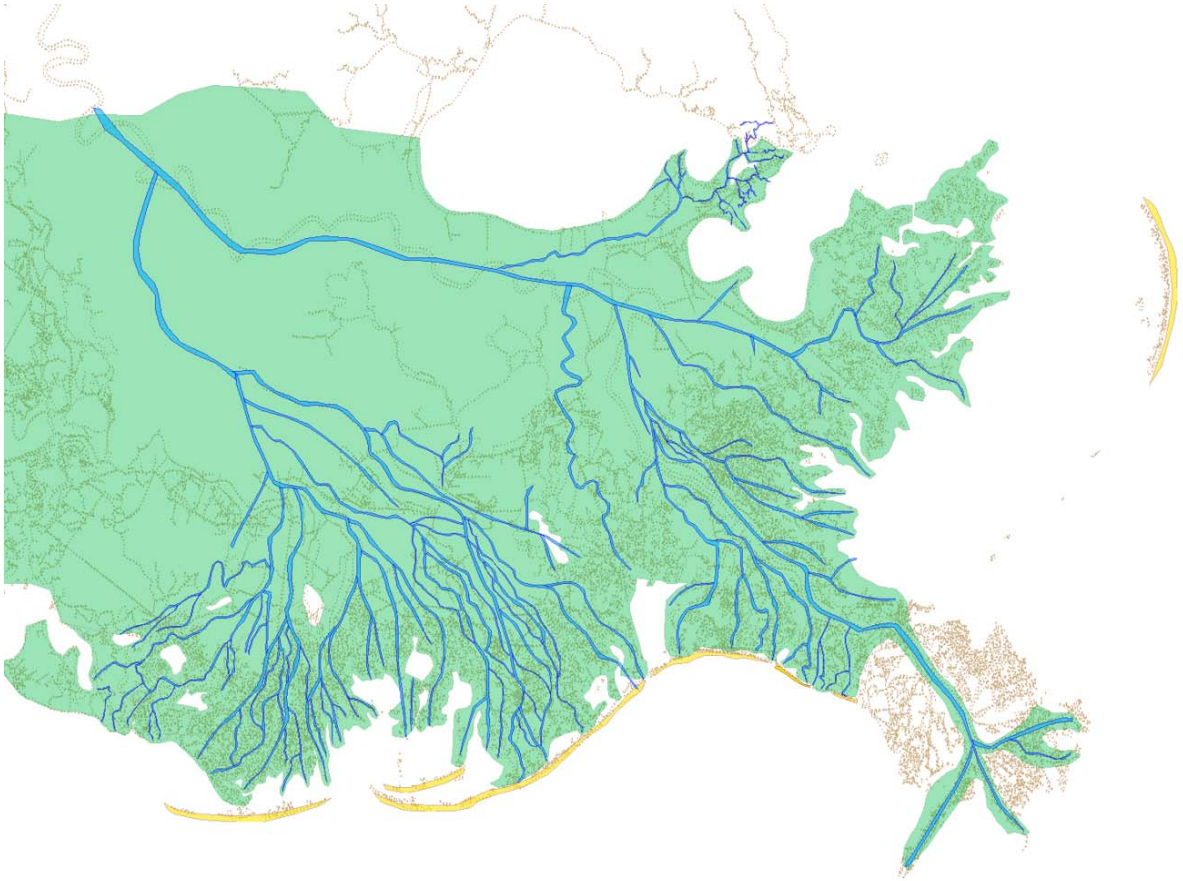

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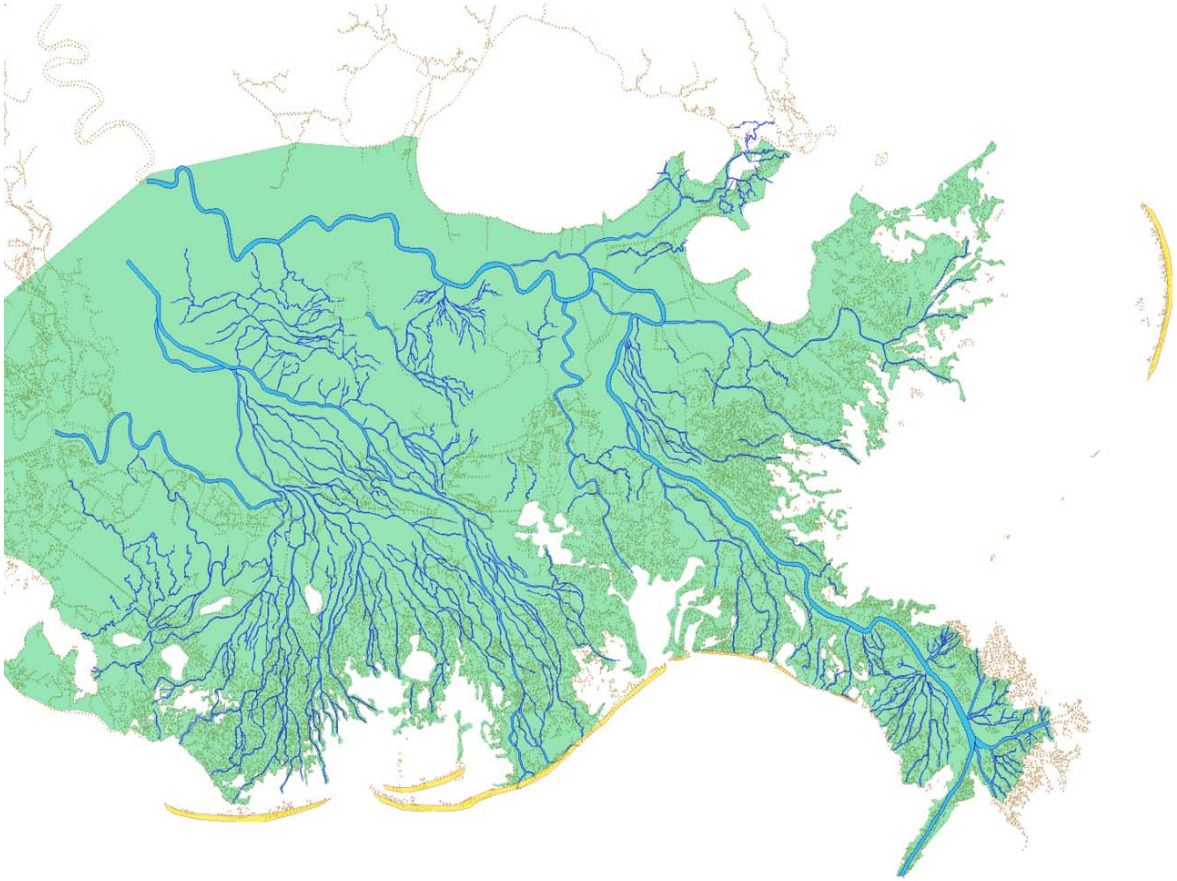
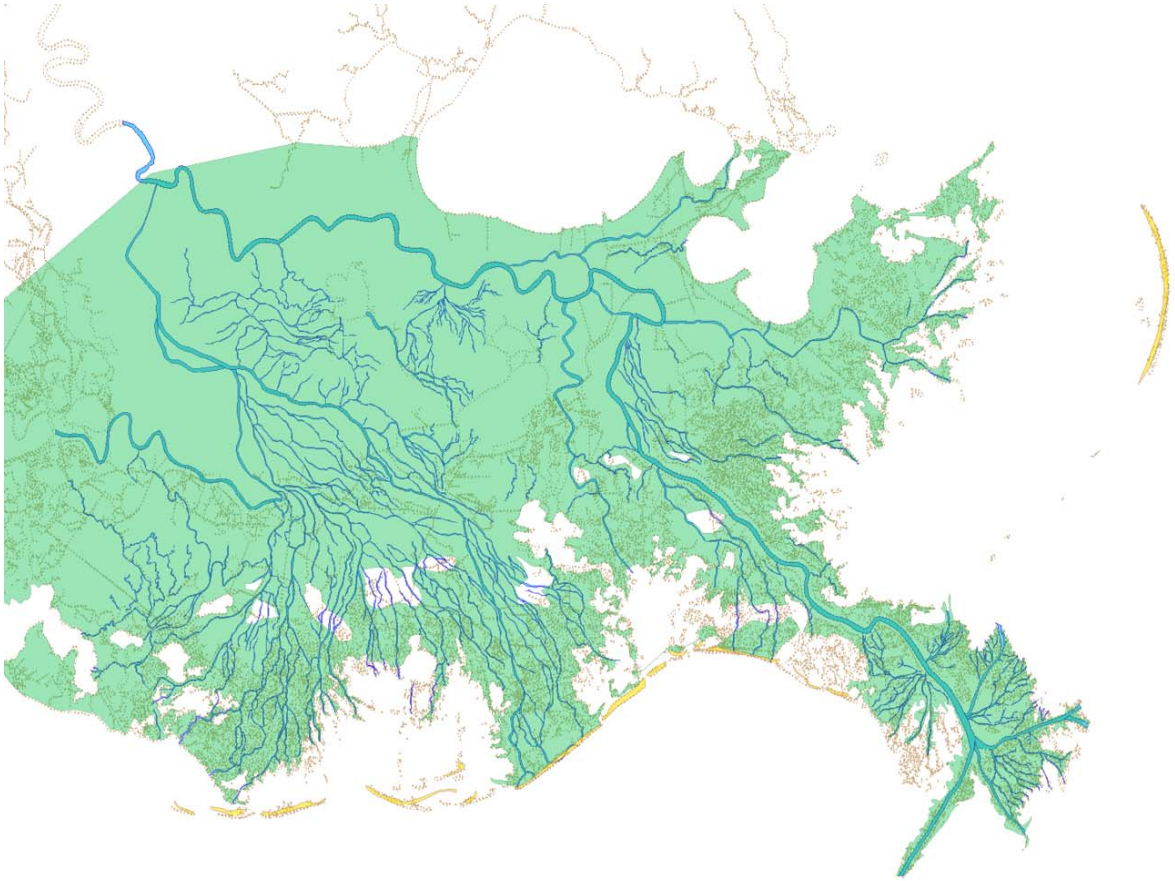


Present



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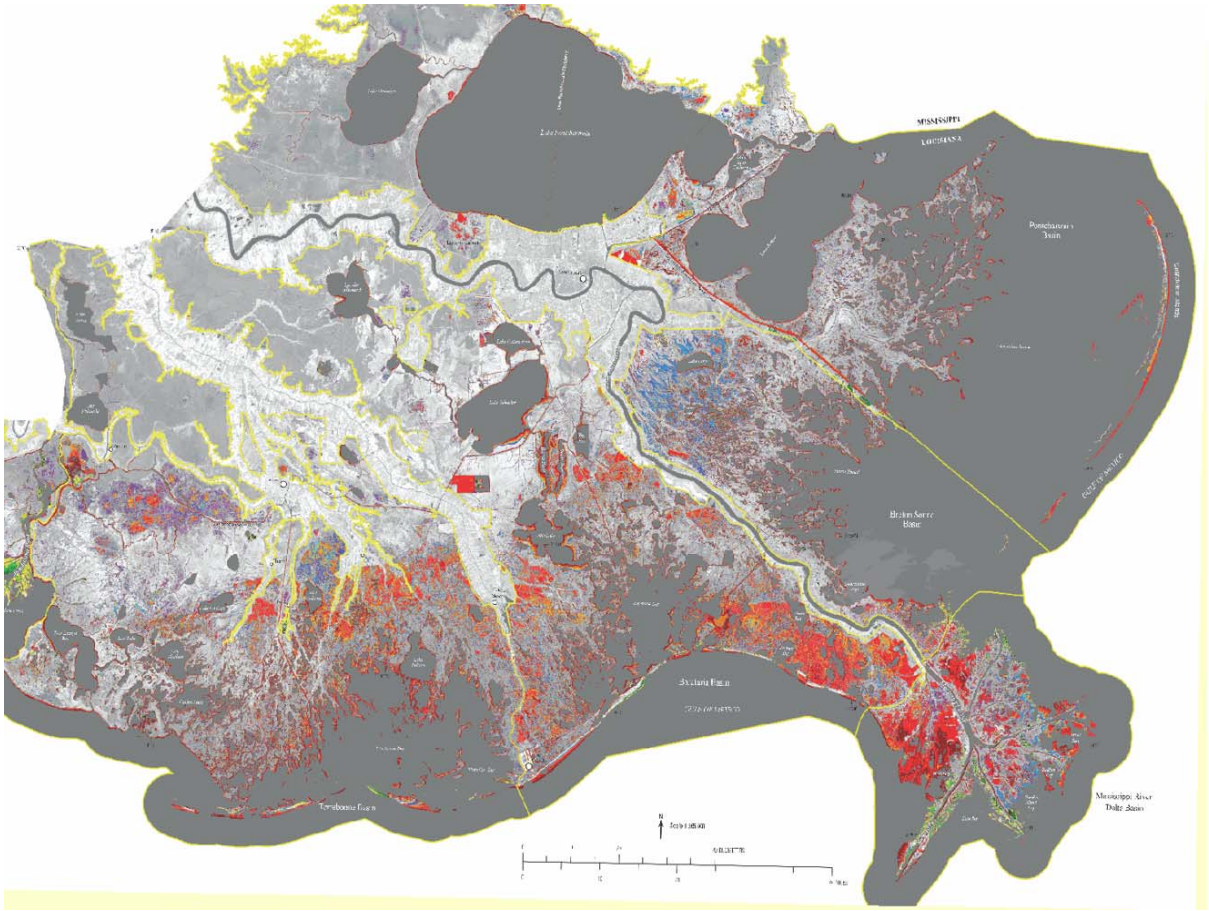
EXPLANATION
1932–56 Persistent land loss[2]
1956–73 Persistent land loss[2,4]
1973–75 Persistent land loss[2,4]
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2010–14 Persistent land loss[2]
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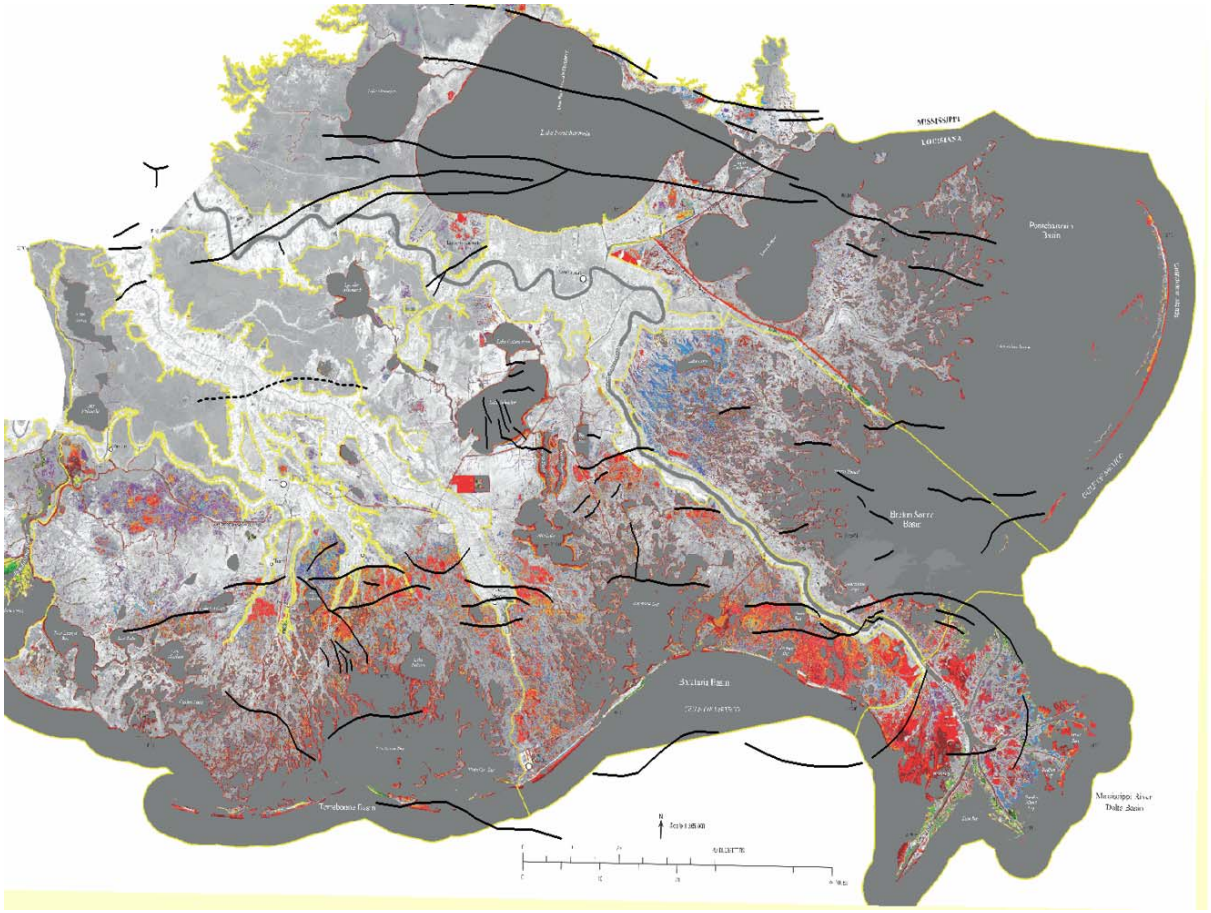
SIM 3381 w/ faults



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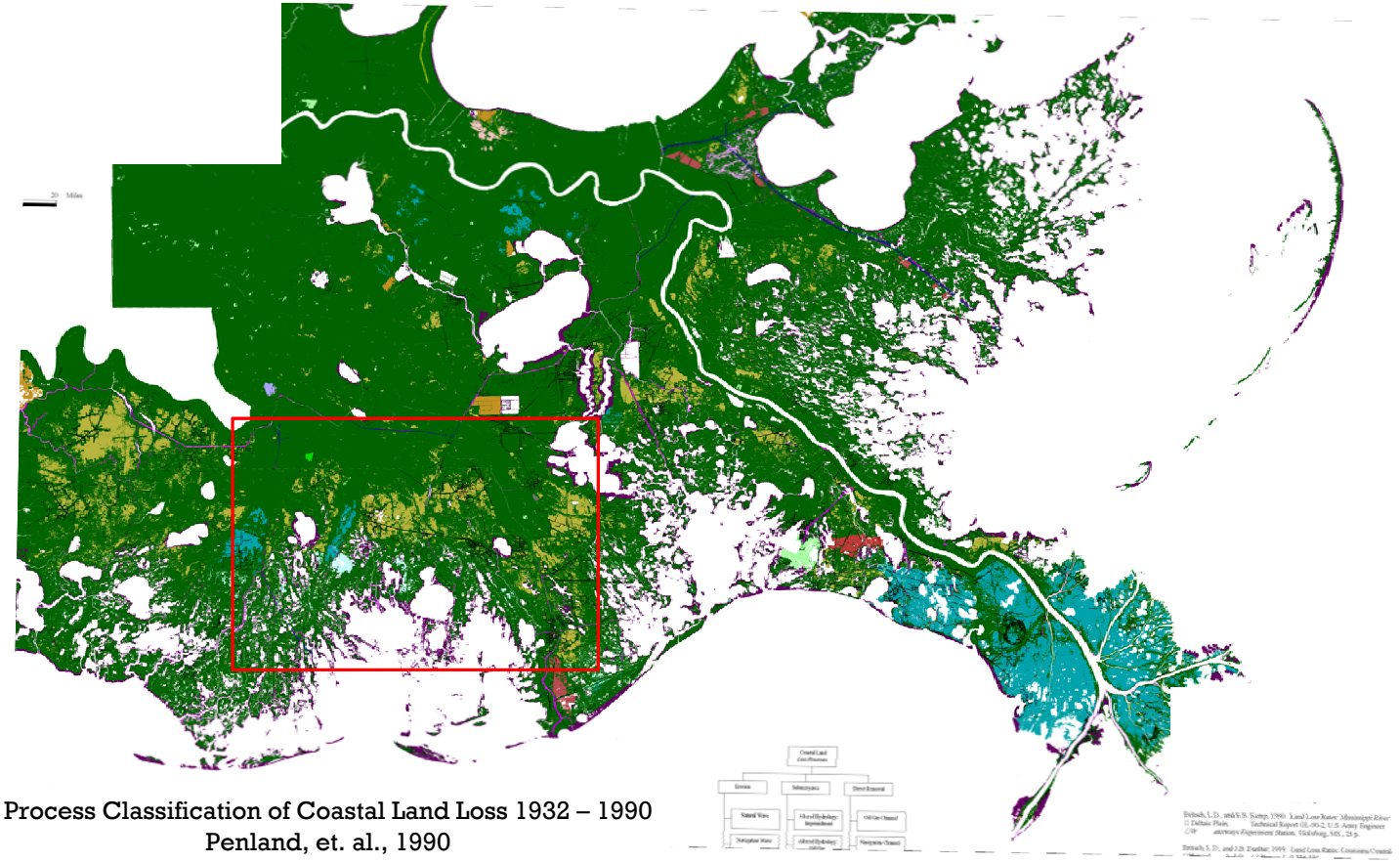
OFR 00418



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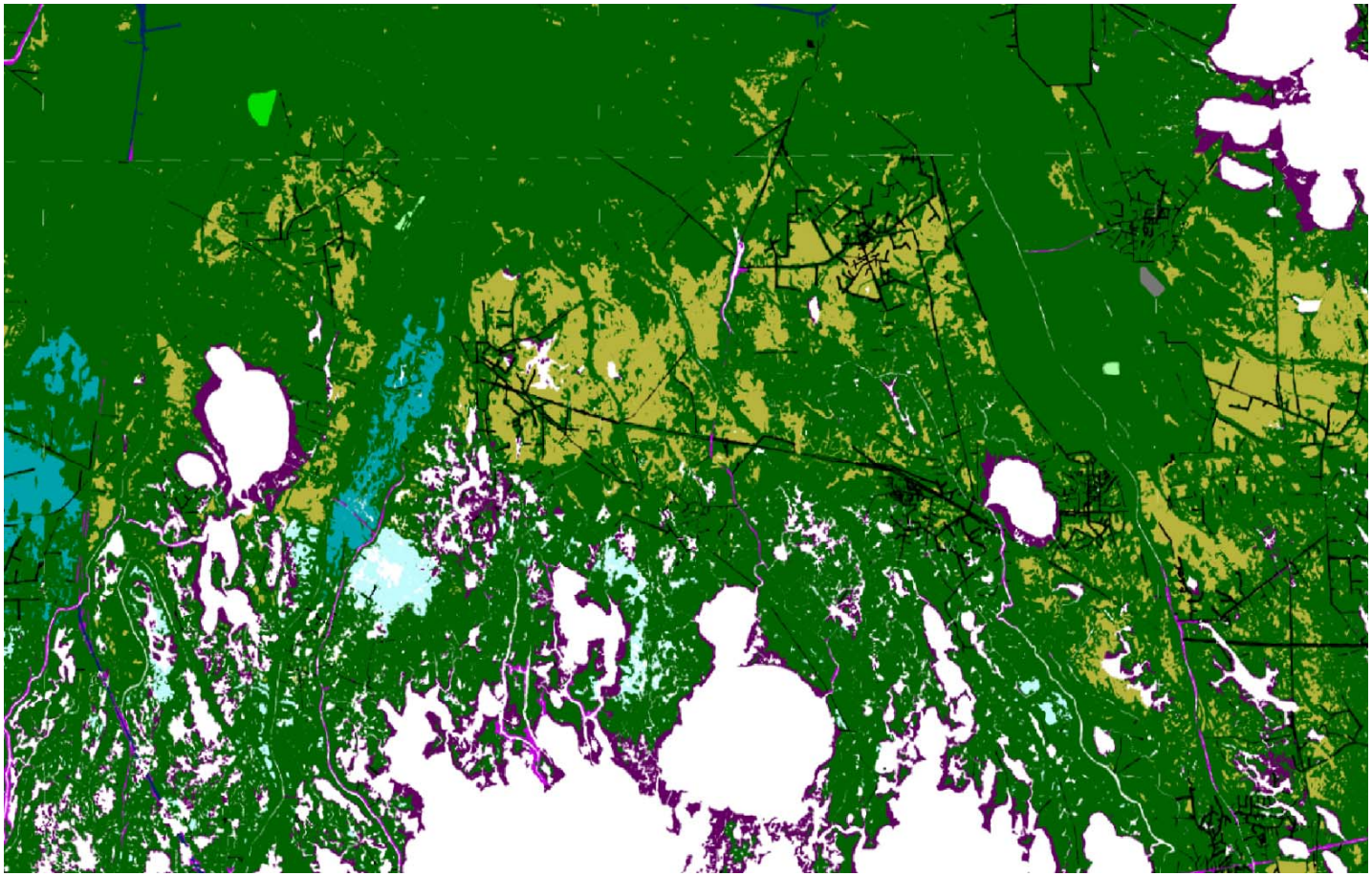
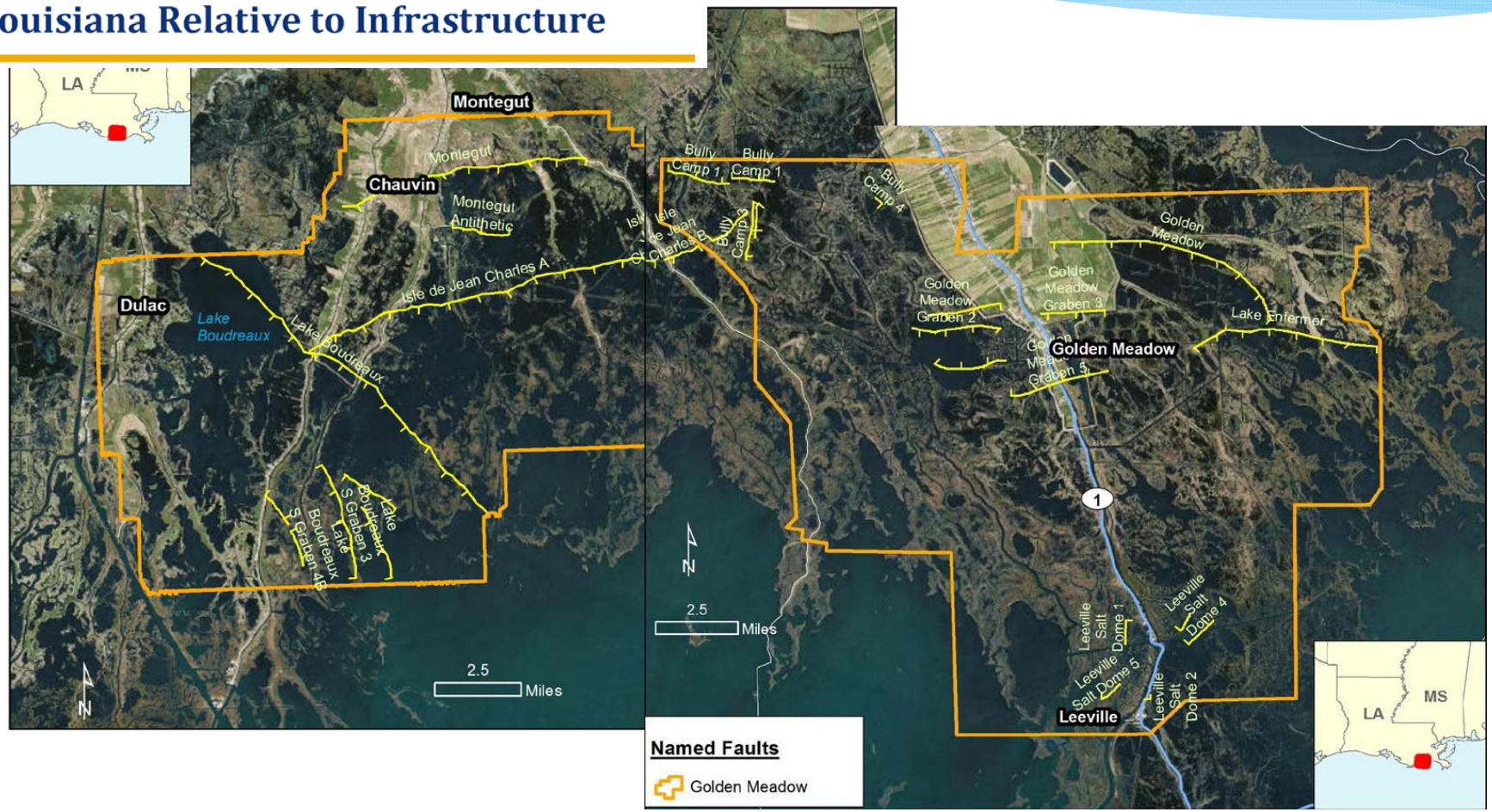
Channel Flow	15,668	2.27%
Borrow Pits	11,130	1.61%
Alt. Hydro Impoundment	7,992	1.16%
Alt. Hydro Road	4,825	0.70%
Faulting	3,921	0.57%
Access Channel	1,312	0.19%
Burned Area	729	0.11%
Herbivory	561	0.08%
Sewage Pond	308	0.04%
Agricultural Pond	179	0.03%
Drainage Channel	109	0.02%
TOTAL	**690,931**	**100.00%**

OFR 00418



Synthesis of Fault Traces in SE Louisiana Relative to Infrastructure



Tran-SET

Transportation Consortium of South Central States

Solving Emerging Transportation Resiliency, Sustainability, and Economic Challenges through the Use of Innovative Materials and Construction Methods: From Research to Implementation

Synthesis of Fault Traces in SE Louisiana Relative to Infrastructure

Project No. 17GTLSU12

Lead University: Tulane University

Collaborative Universities: University of New Orleans, University of Louisiana at Lafayette

David Culpepper

Elizabeth Chinn McDade

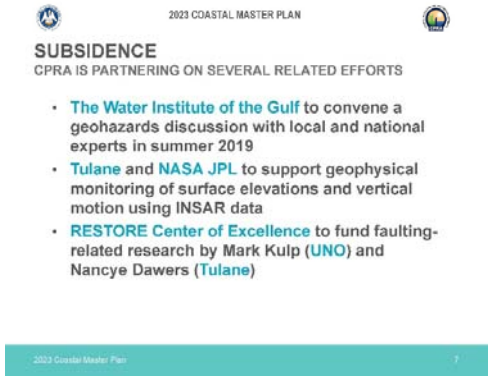
Nancye Dawers

Mark Kulp

Rui Zhang

Final Report

January 2019



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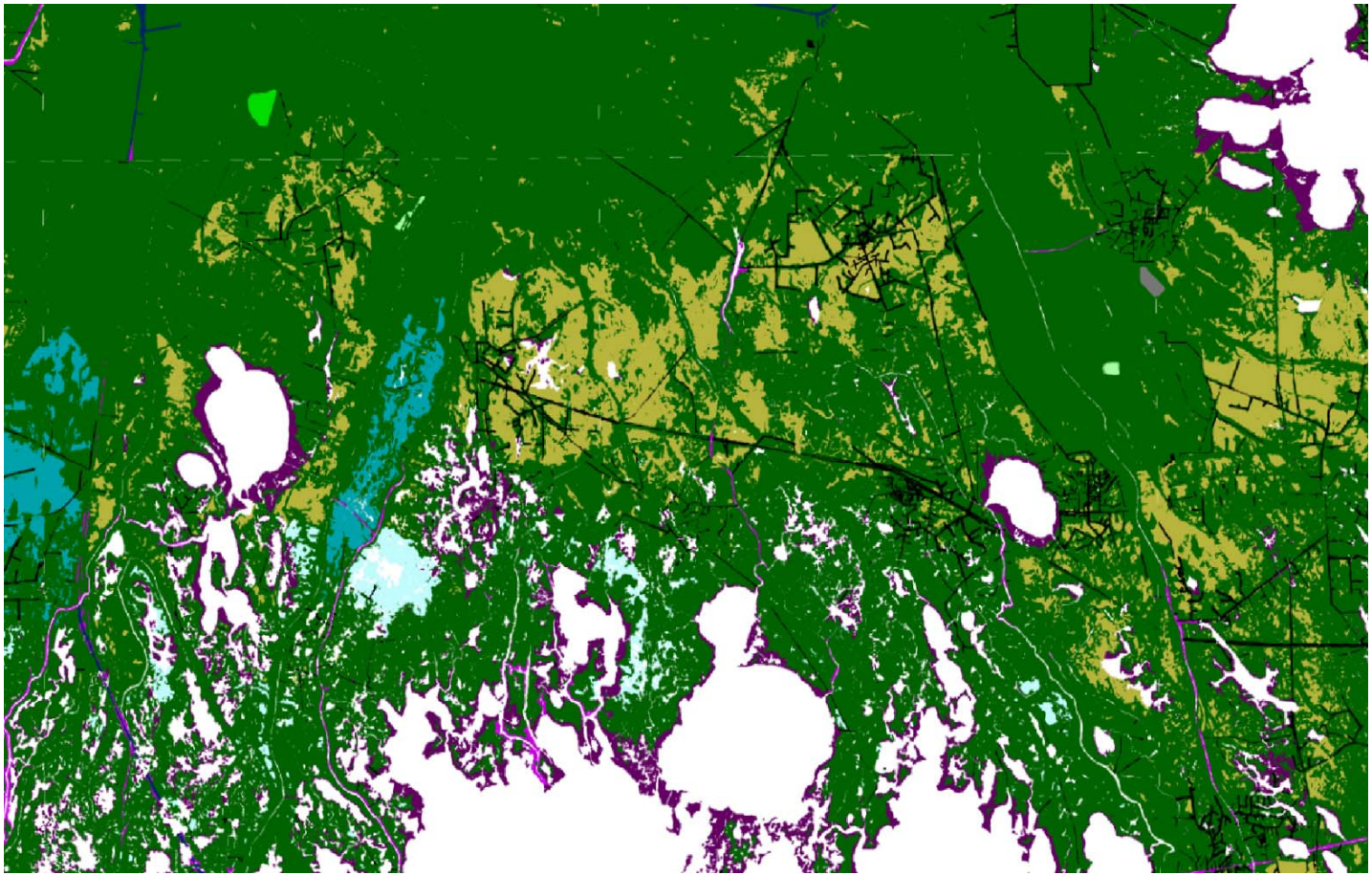
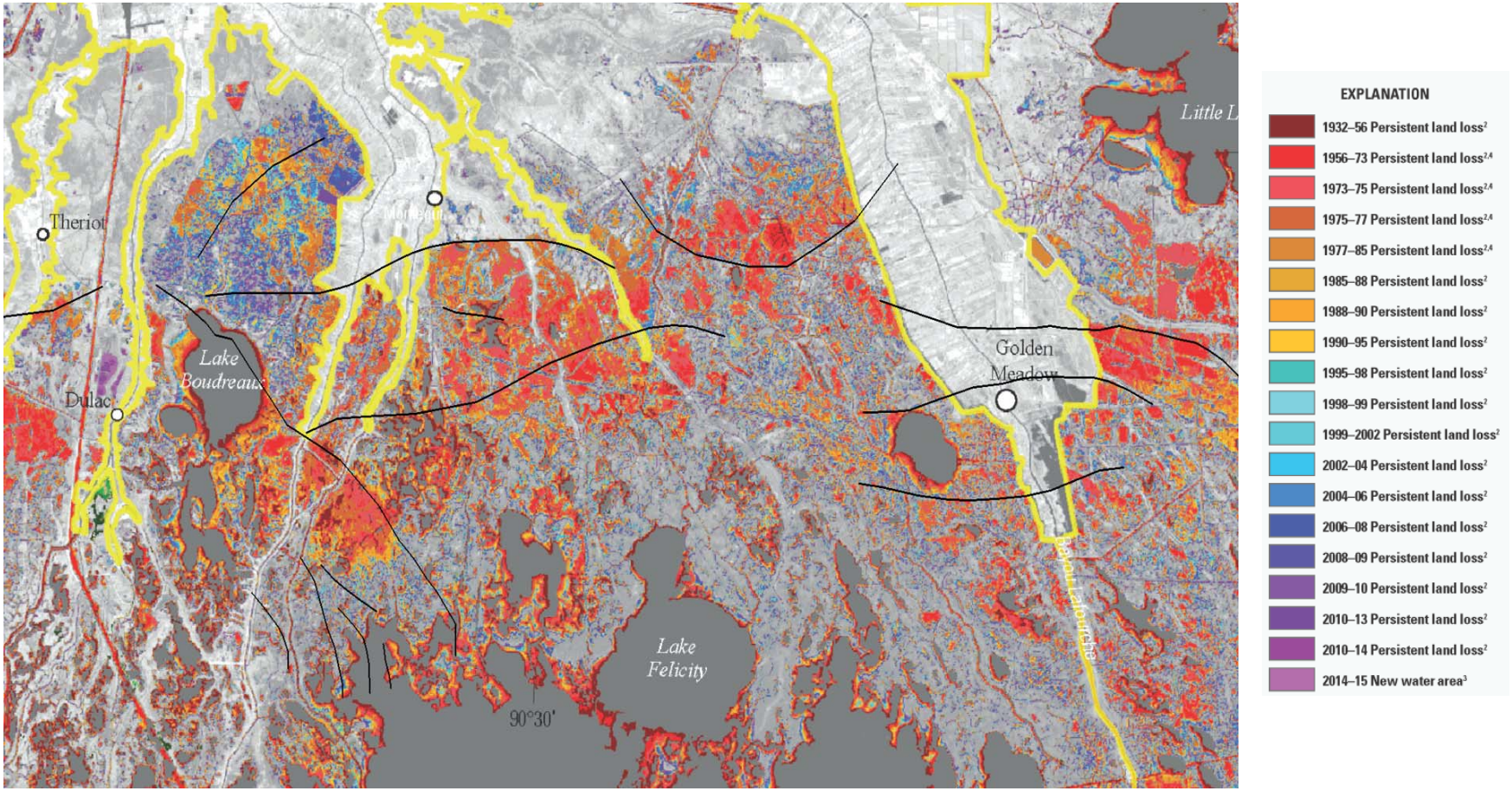
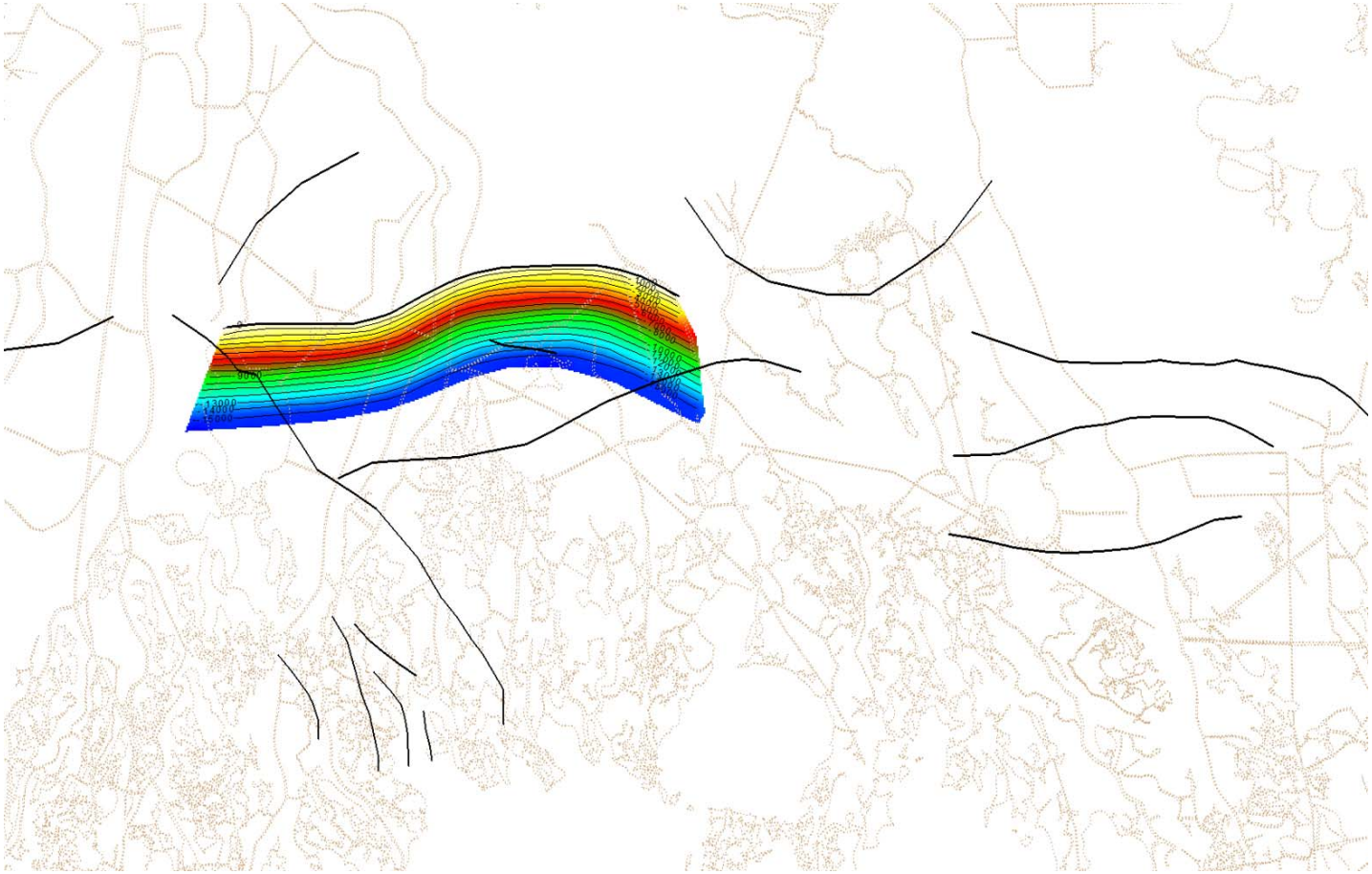


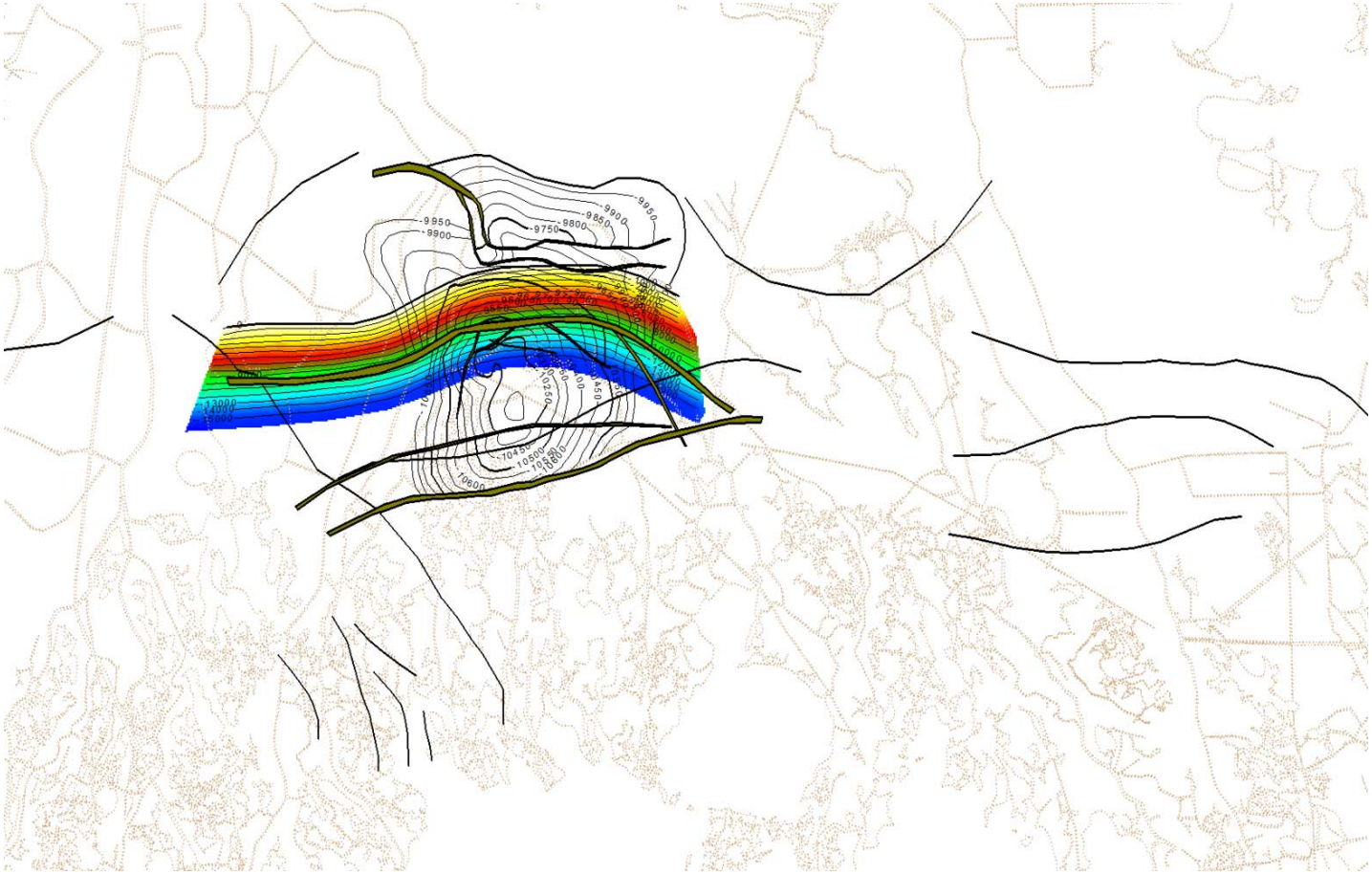
SIM 3381 w/ faults



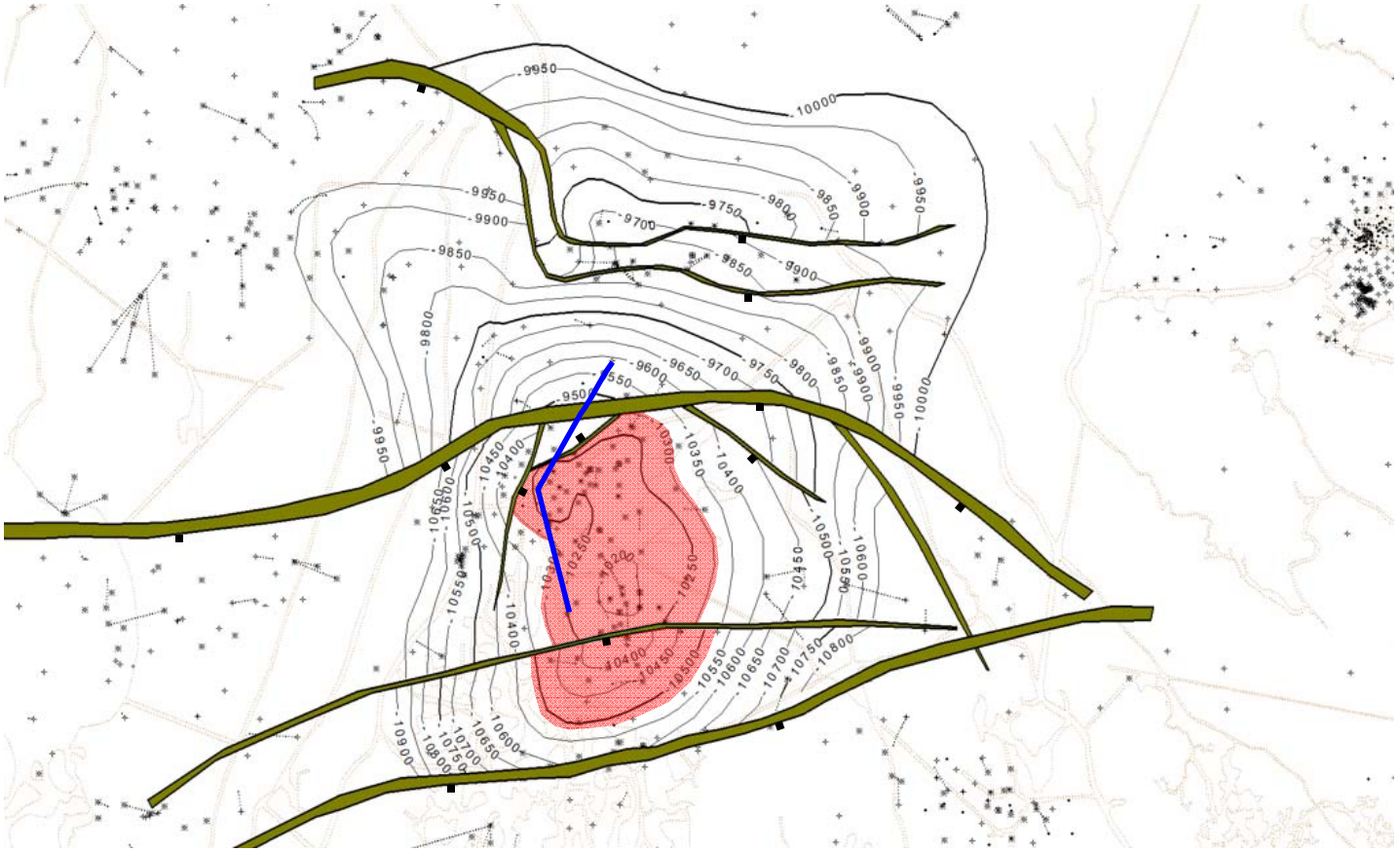
Montegut fault – Lirette Field



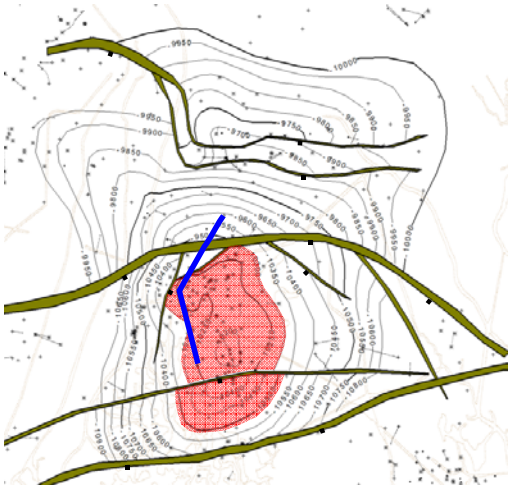
Montegut fault – Lirette Field

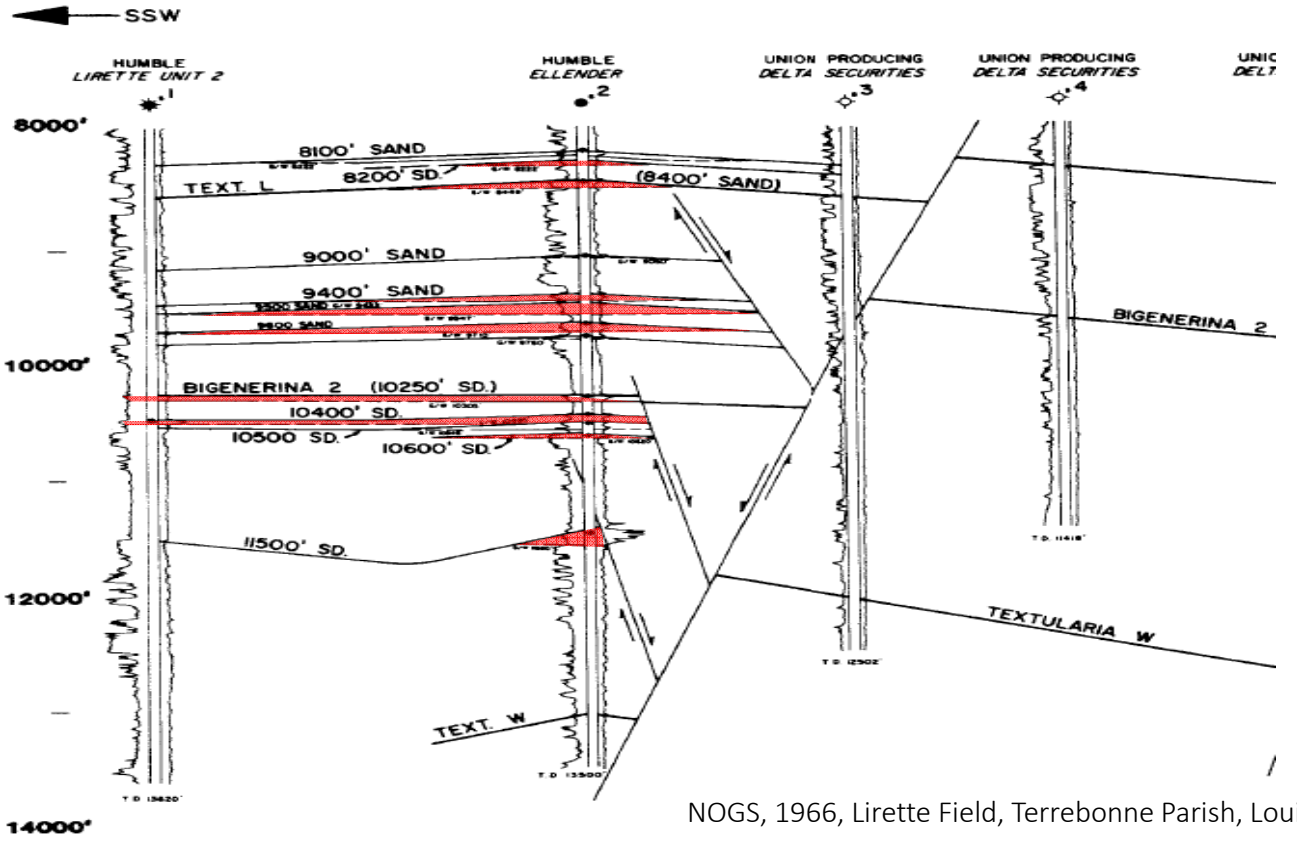


Lirette Field

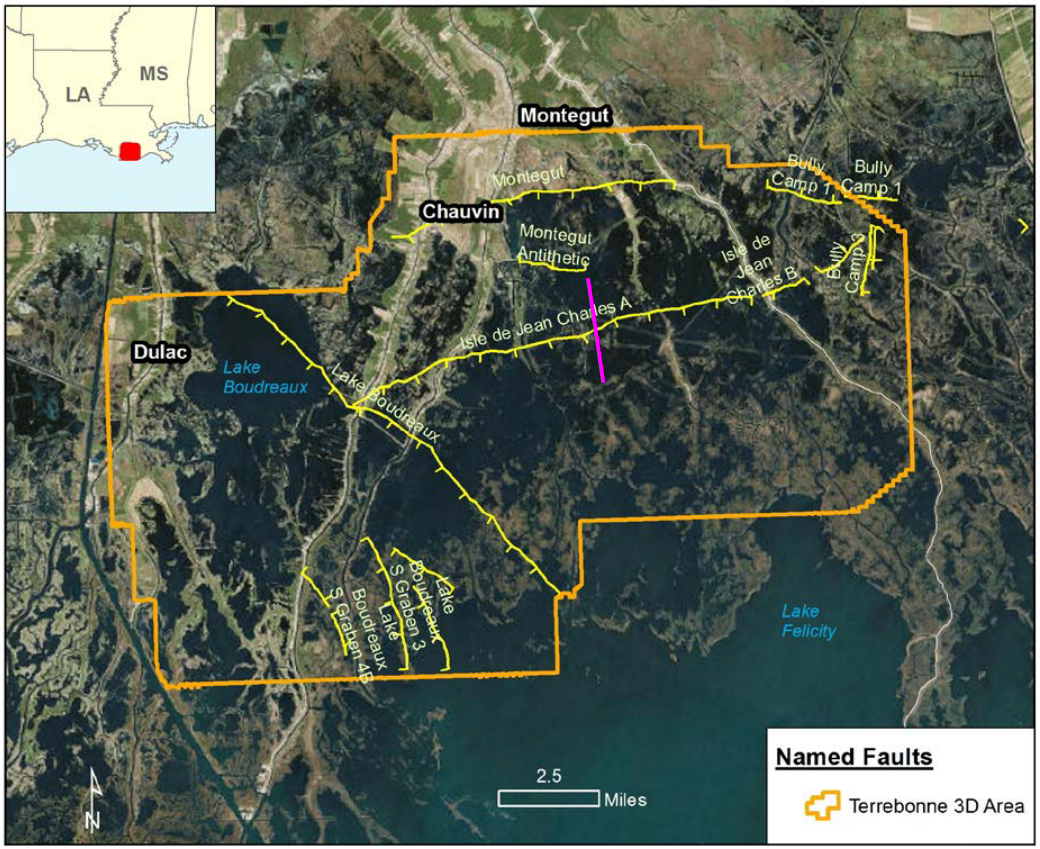


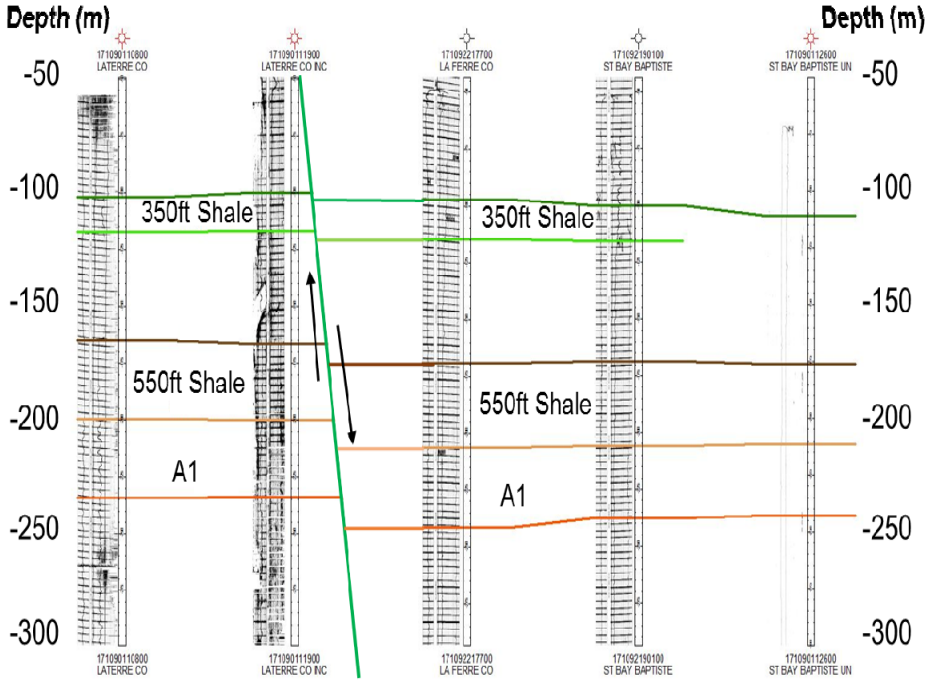
Lirette Field



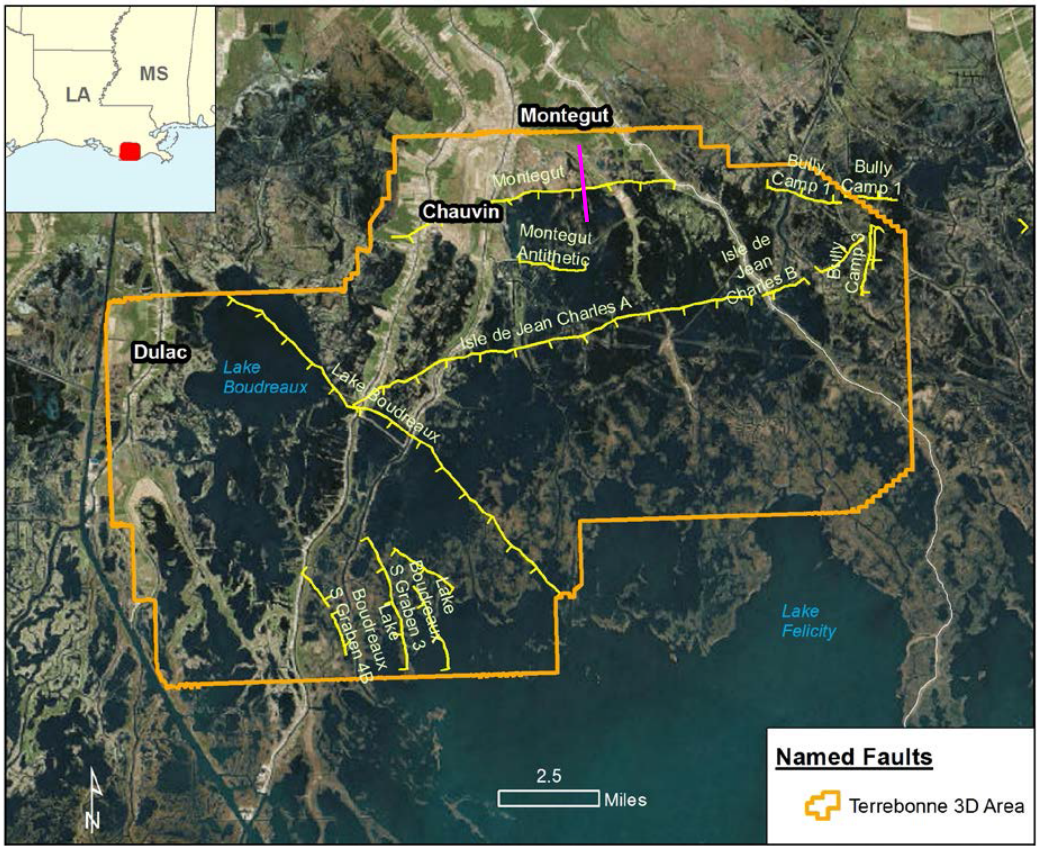


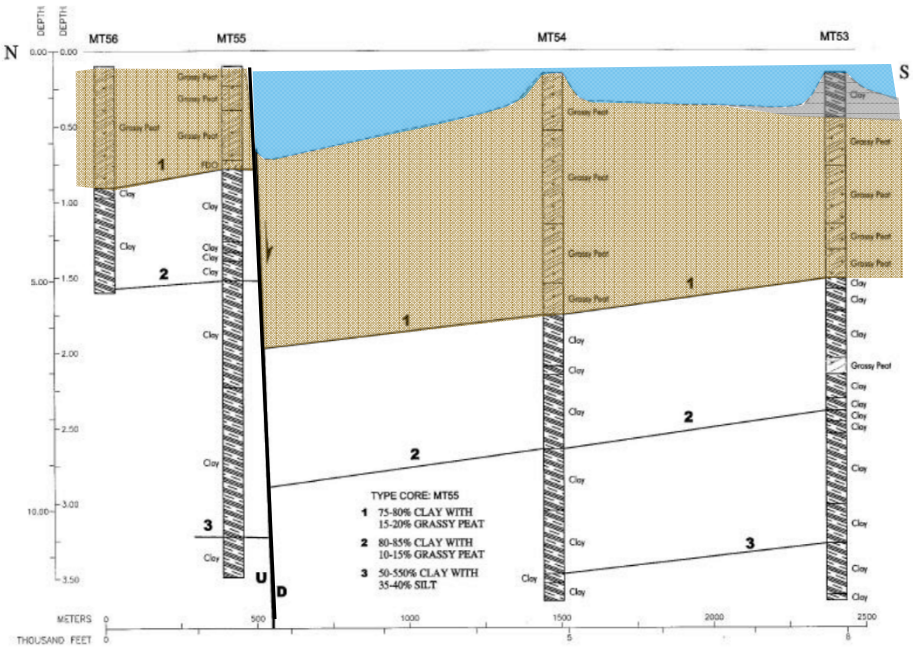
NOGS, 1966, Lirette Field, Terrebonne Parish, Louisiana





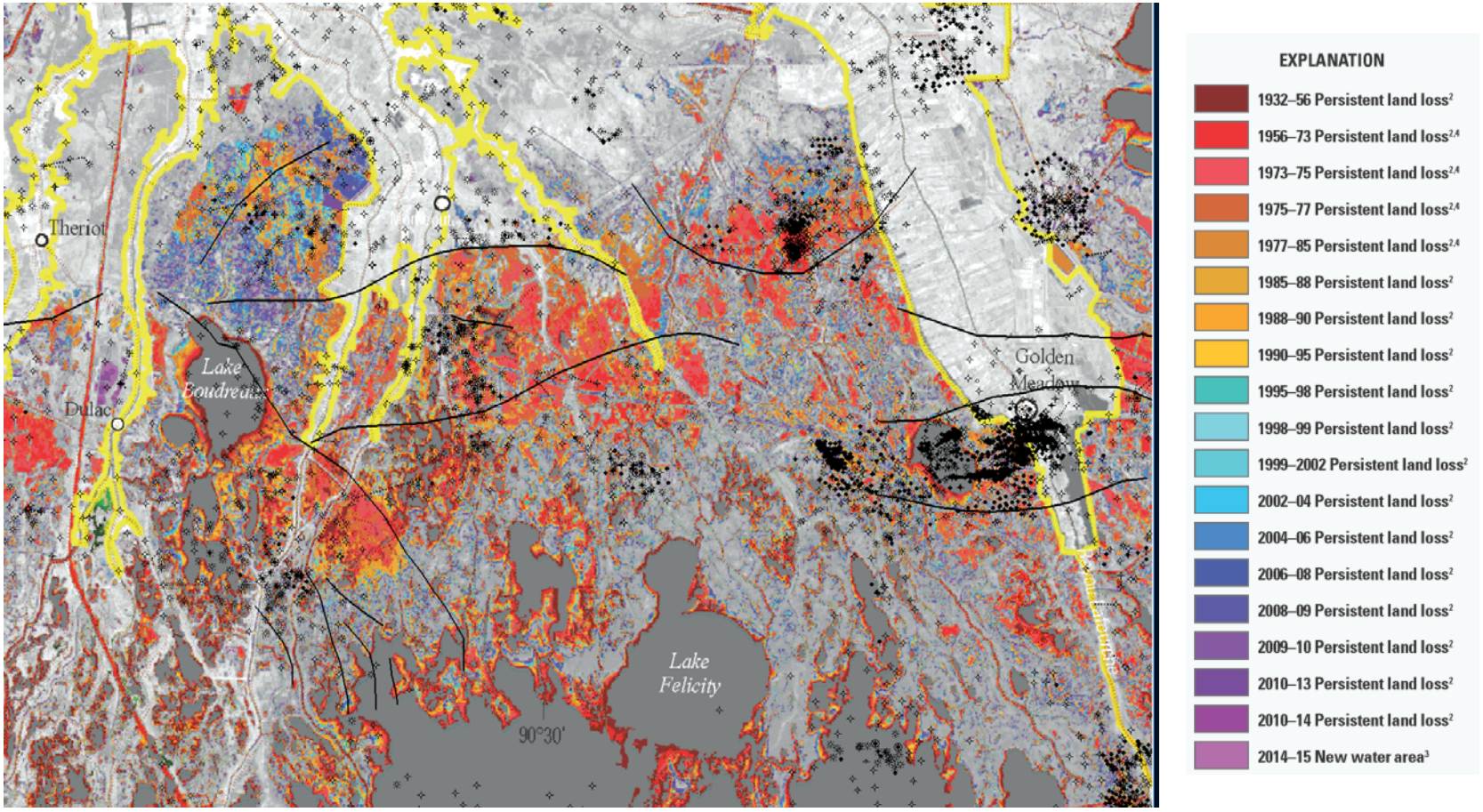
AKINTOMIDE, A. & DAWERS, N., 2018. Fault activity in the Terrebonne Trough, southeastern Louisiana: Implication for subsidence hot-spots



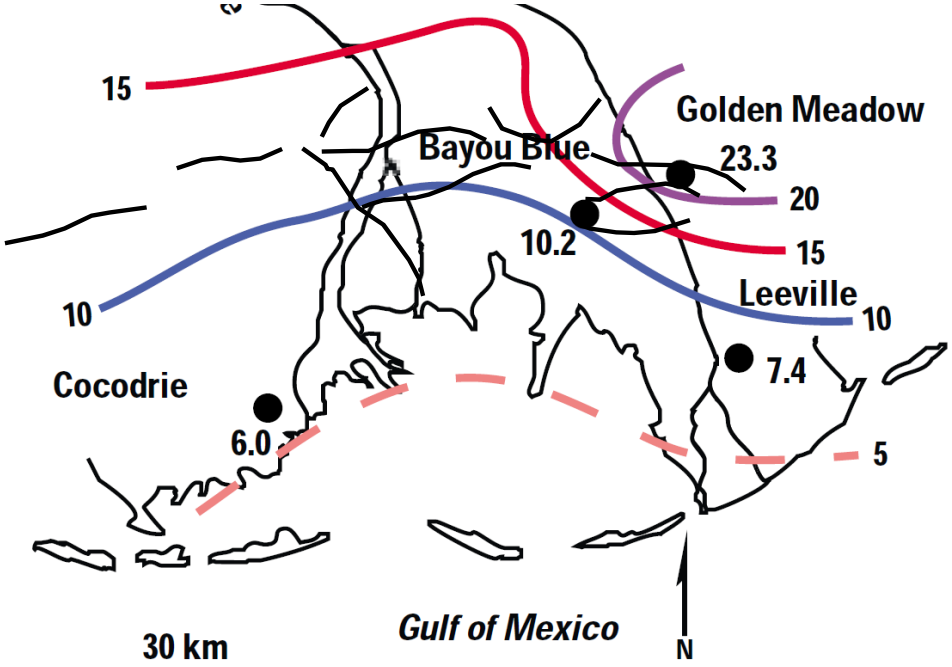


GAGLIANO, S.A., et al, 2003. Active Geological Faults and Land Change in Southeastern Louisiana

SIM 3381 w/ faults



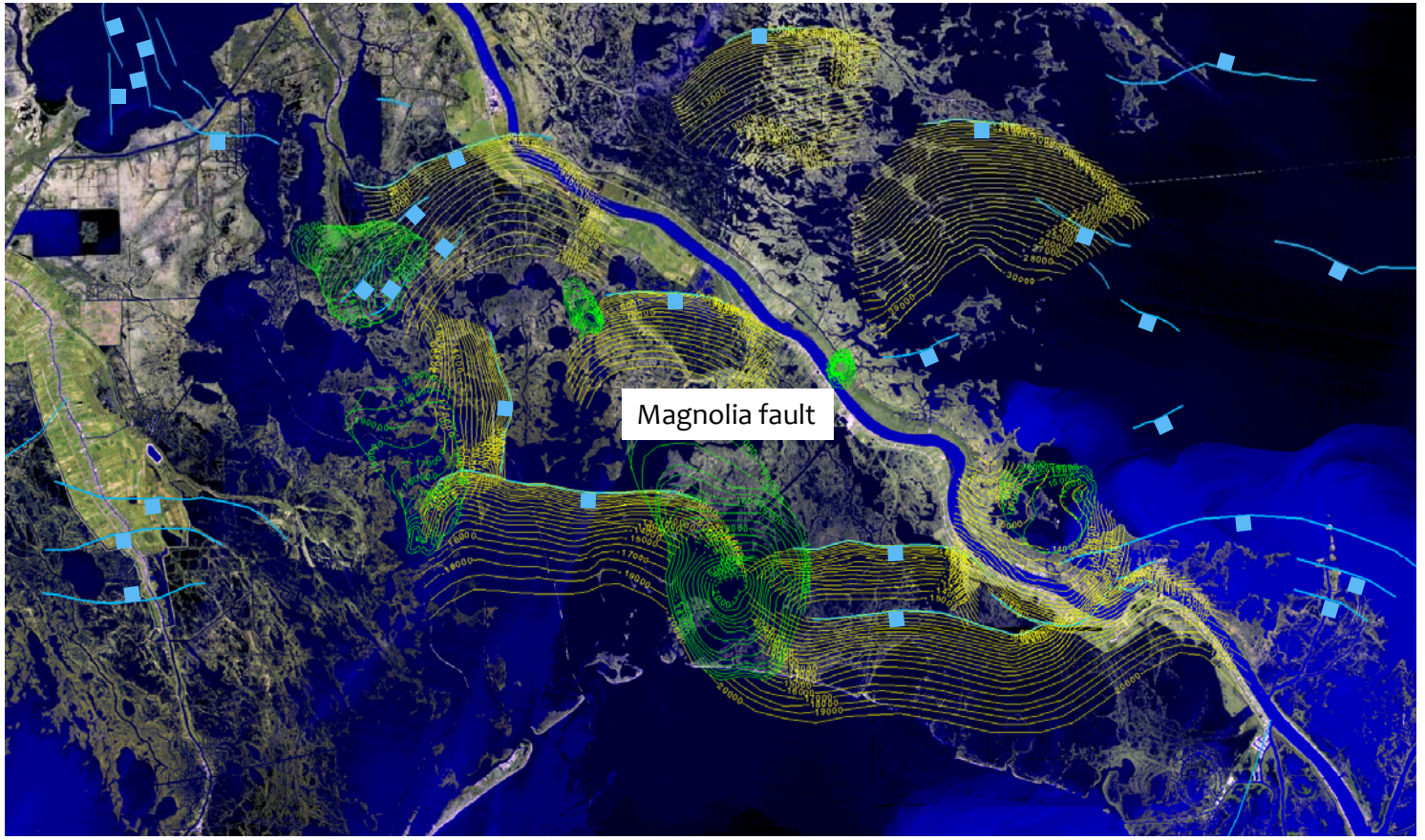
Relative Sea Level Rise from Tide Gauge Data



MORTON, R.A., et al, 2002, Subsurface Controls on Historical Subsidence Rates and Associated Wetlands Loss in Southeastern Louisiana

Faults in Plaquemines

Barataria Basin

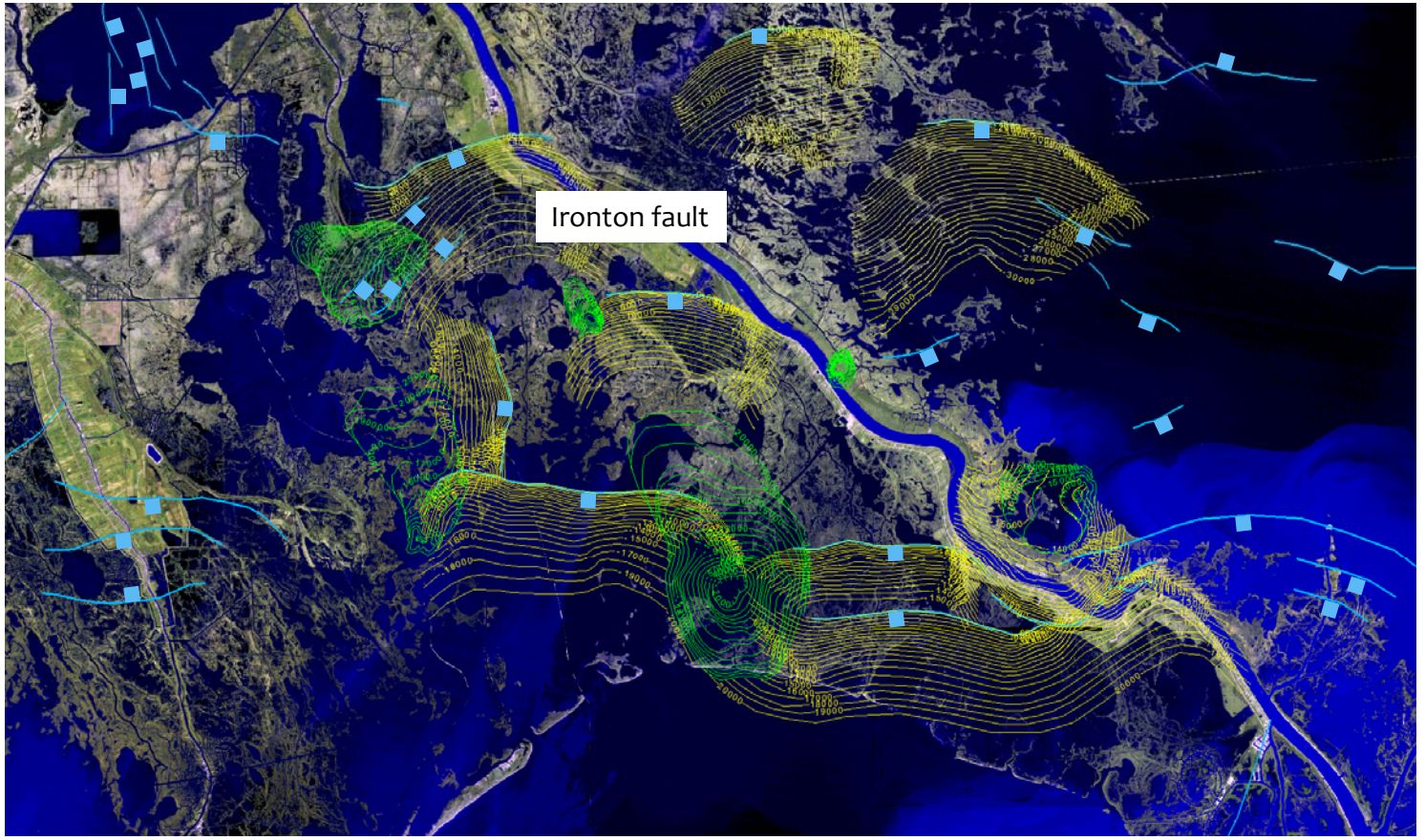


Lake Hermitage Marsh Creation Project

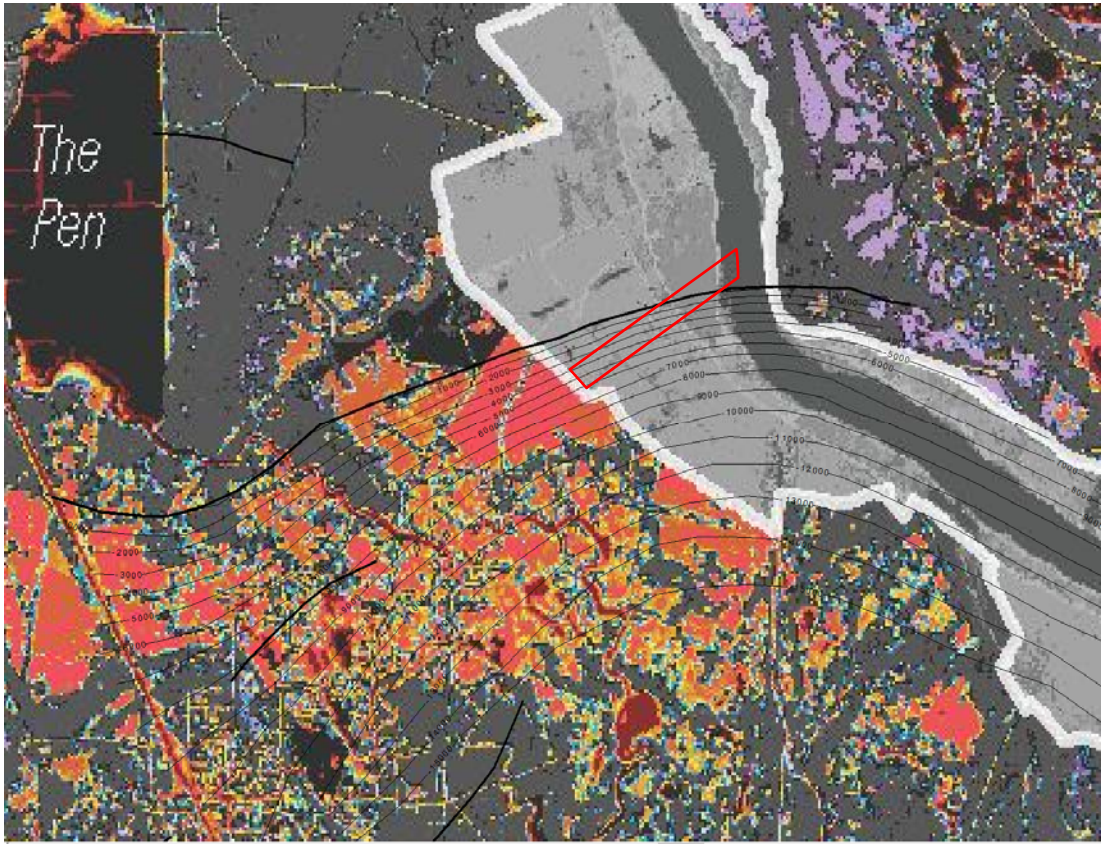
This presentation will provide a 'lessons learned' perspective on the multiple aspects and phases of the project from planning and design, through permitting, to construction. The Lake Hermitage project is composed of two primary fill sites. Both sites are underlined with soft, organic in-situ soils. This was first observed during design once the geotechnical investigation and analysis was complete. However, the magnitude of lateral displacement of these soft organic soils after fill material placement (aka 'mudwaving') was grossly underestimated. These displacements may be cause for rethinking how we approach the settlement and consolidation estimates for these projects.

Simoneaux et al, 2016

Barataria Basin



Proposed Mid-Barataria
Sediment Diversion



Comments to the U.S. Army Corps of Engineers, New Orleans Division
in reference to
The Environmental Impact Statement for
The Mid-Barataria Sediment Diversion

Chris McLindon
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New Orleans, Louisiana

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New Orleans, Louisiana

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Registered Professional Geoscientist # 465, Louisiana
The Culpepper Group, LLC

Dr. Elizabeth McDade, Ph.D., P.G.
Chinn-McDade Associates, LLC

2004–06 Persistent land loss[2]
2006–08 Persistent land loss[2]
2008–09 Persistent land loss[2]
2009–10 Persistent land loss[2]
2010–13 Persistent land loss[2]
2010–14 Persistent land loss[2]
2014–15 New water area[3]

Mid-Barataria Sediment Diversion

It is recommended that a subsurface geological evaluation should include the following elements:

1. An attempt to review the interpretation of subsurface geology using oil and gas industry 3-D seismic data. This may be accomplished through a collaborative engagement with owners, licensees and interpreters of the 3-D seismic surveys in the area. Such a collaborative engagement may be facilitated with the assistance of the New Orleans Geological Society, the Louisiana Mid-Continent Oil and Gas Association, or the Louisiana Oil and Gas Association.

2. The acquisition of high resolution seismic data in the immediate vicinity of the diversion structure. This should necessarily include land-based acquisition along both banks of the river and marine acquisition in the river channel, as indicated in Figure 6.

3. The acquisition of sediment core profiles across potential faults. The arrangement of these core profiles should be of adequate density to allow for the interpretation of faults by the vertical offset and variations in thickness of the sedimentary layers. The evaluation of core profiles should include detailed stratigraphic analysis and age-dating of the sedimentary layers to allow for estimates of historical subsidence rates and rates of fault movement.

4. The addition of subsidence measurement capabilities similar to those of the Myrtle Grove Superstation at several additional locations in the vicinity of the diversion. These stations should be positioned with advance knowledge of the location of faults in the area to allow for the direct measurement of variations in subsidence velocities across the faults.

5. The integration of subsurface geological models including detailed variations in subsidence rate and estimates of fault slip rate into predictive models for the response to sediment loading associated with diversion operations.

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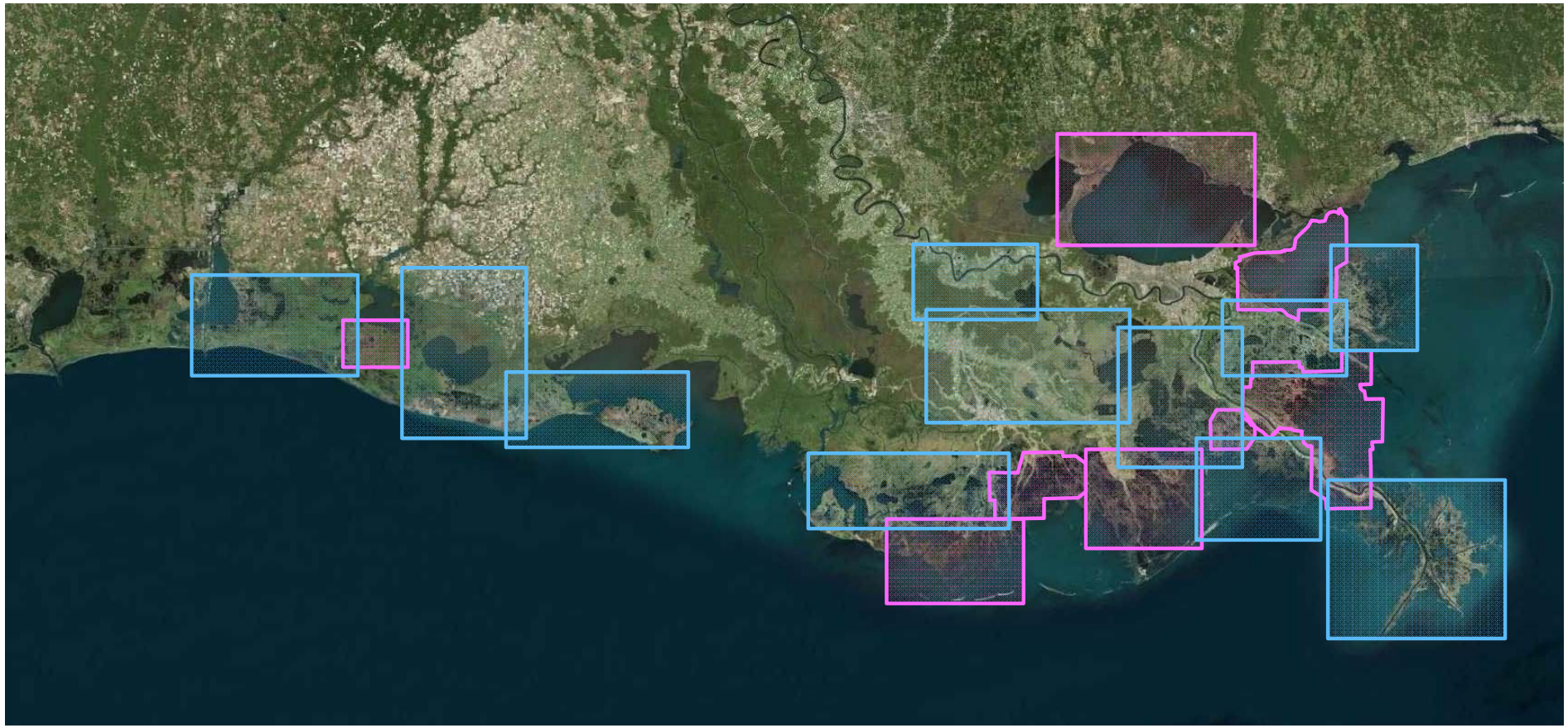
Coastal Geohazards Atlas



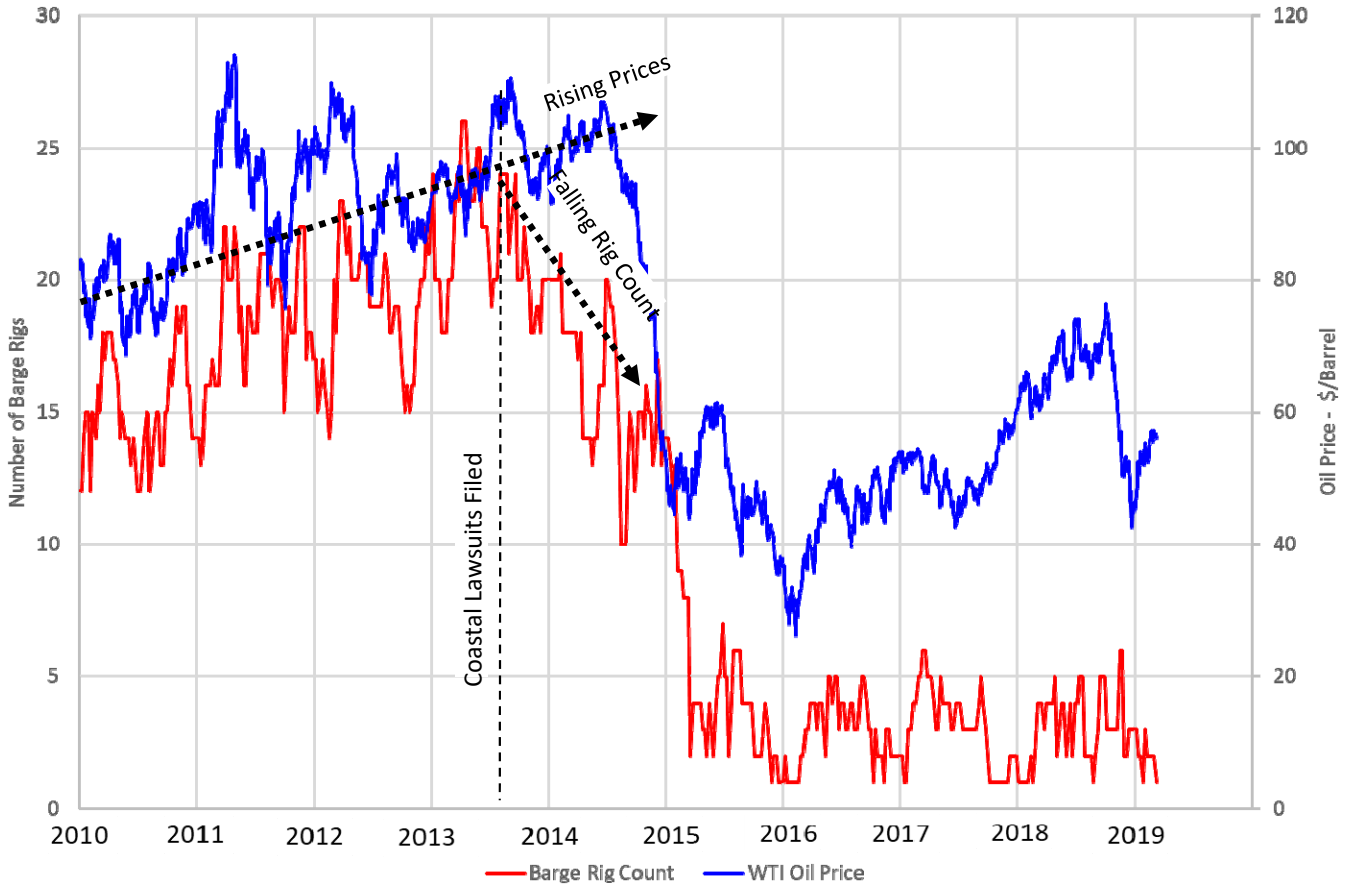
Support Cooperative Engagement

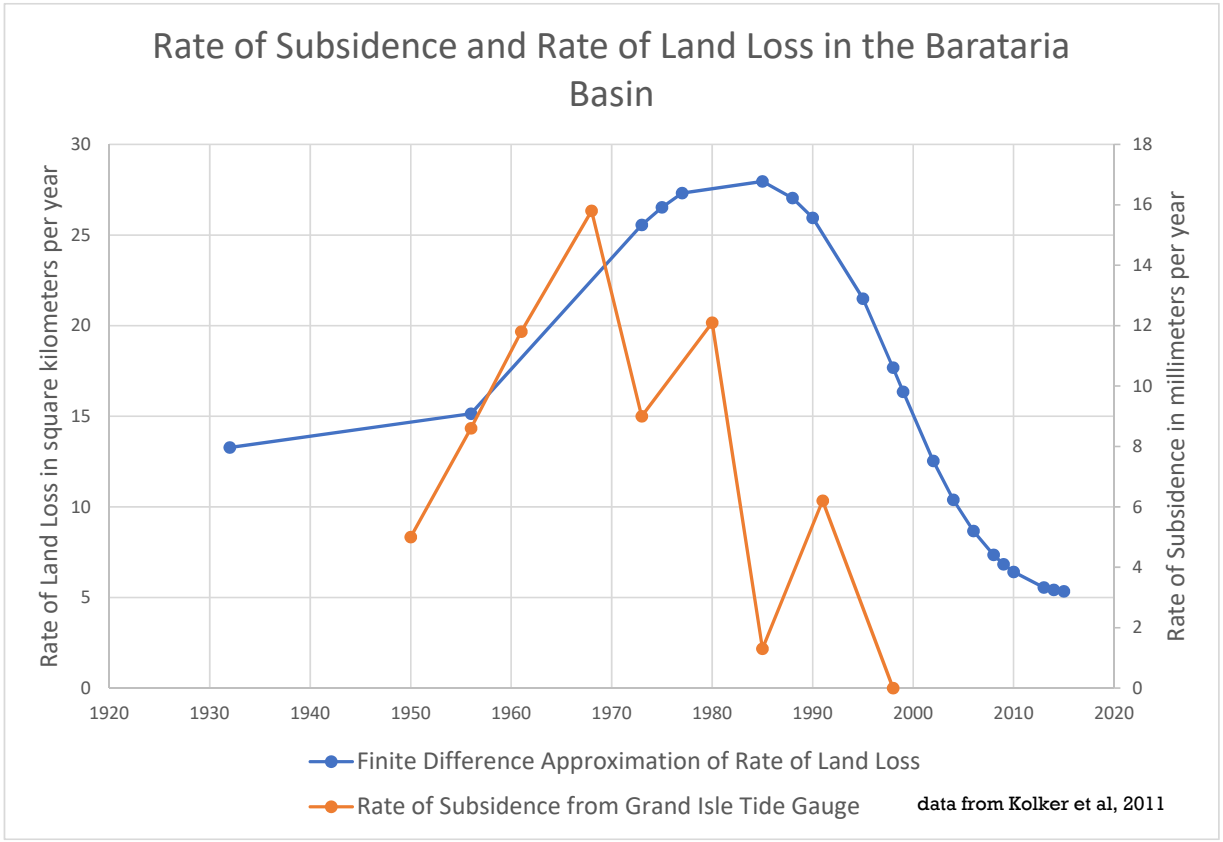
Thank-you

chris_mclindon@att.net

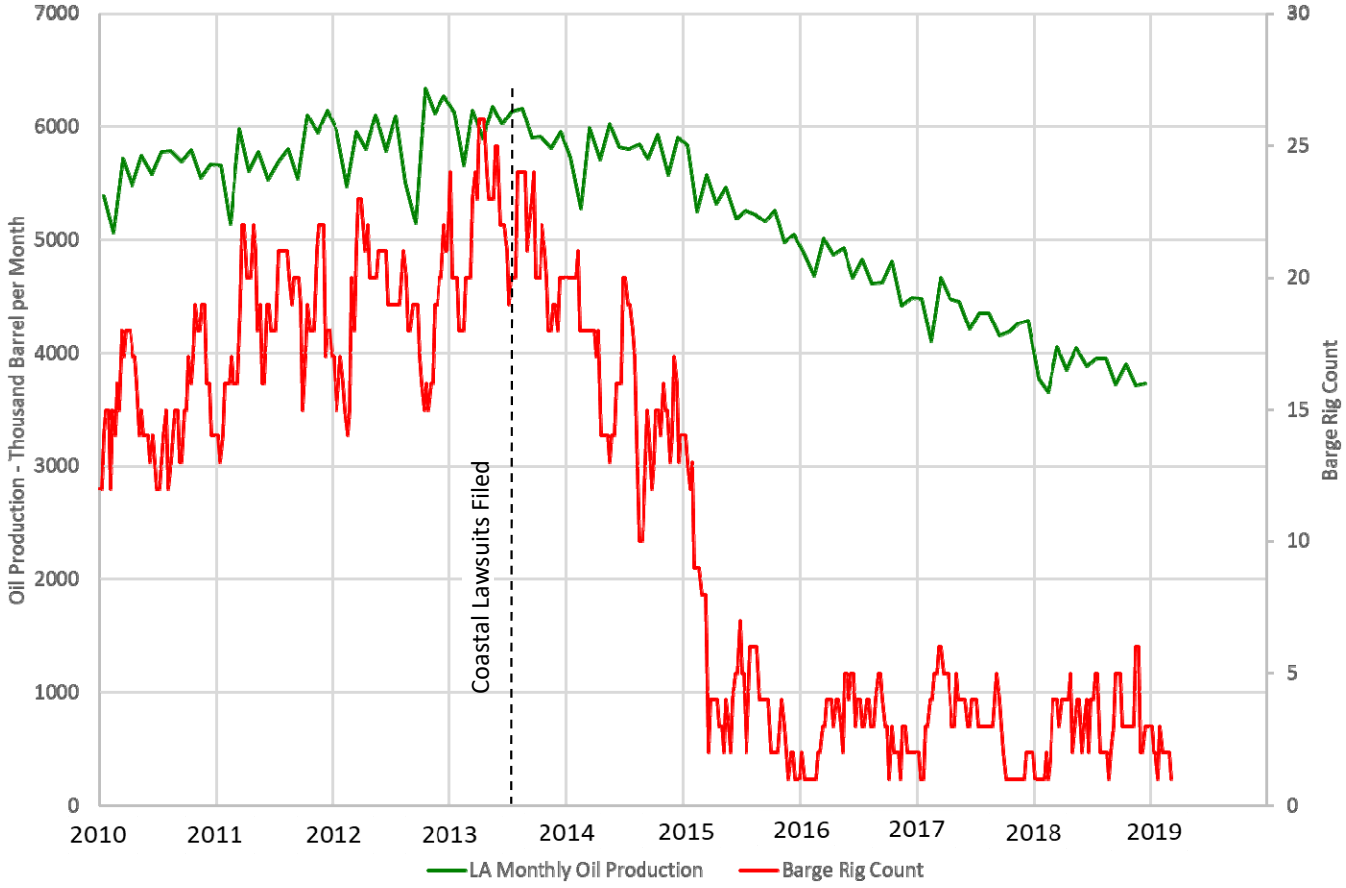
504-756-2003

LA Barge Rig Count and Oil Price

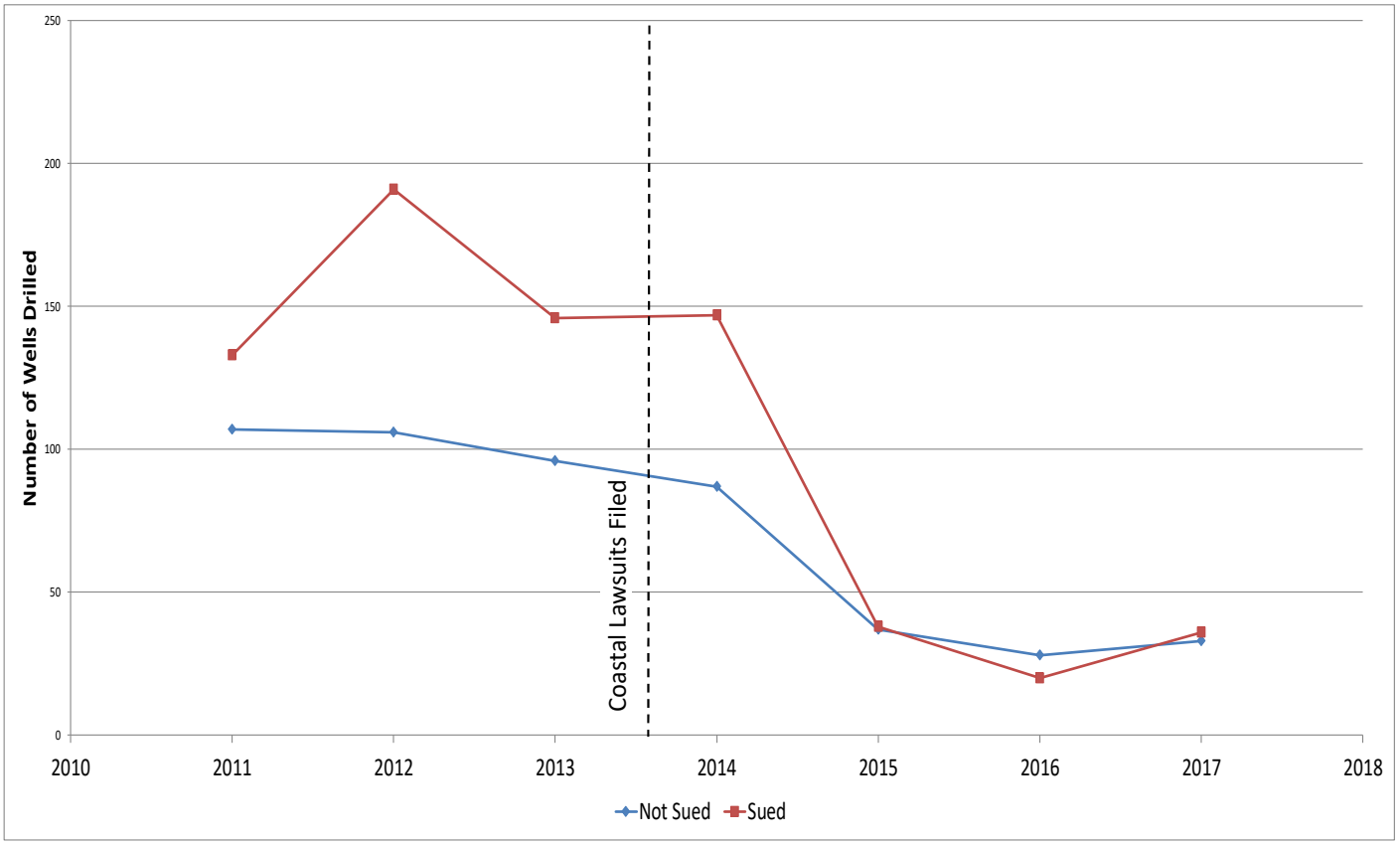



Rate of Subsidence and Rate of Land Loss in the Barataria Basin
Rate of Land Loss in square kilometers per year
Rate of Subsidence in millimeters per year
30
25
20
15
10
5
0
18
16
14
12
10
8
6
4
2
0
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Finite Difference Approximation of Rate of Land Loss
Rate of Subsidence from Grand Isle Tide Gauge
data from Kolker et al, 2011

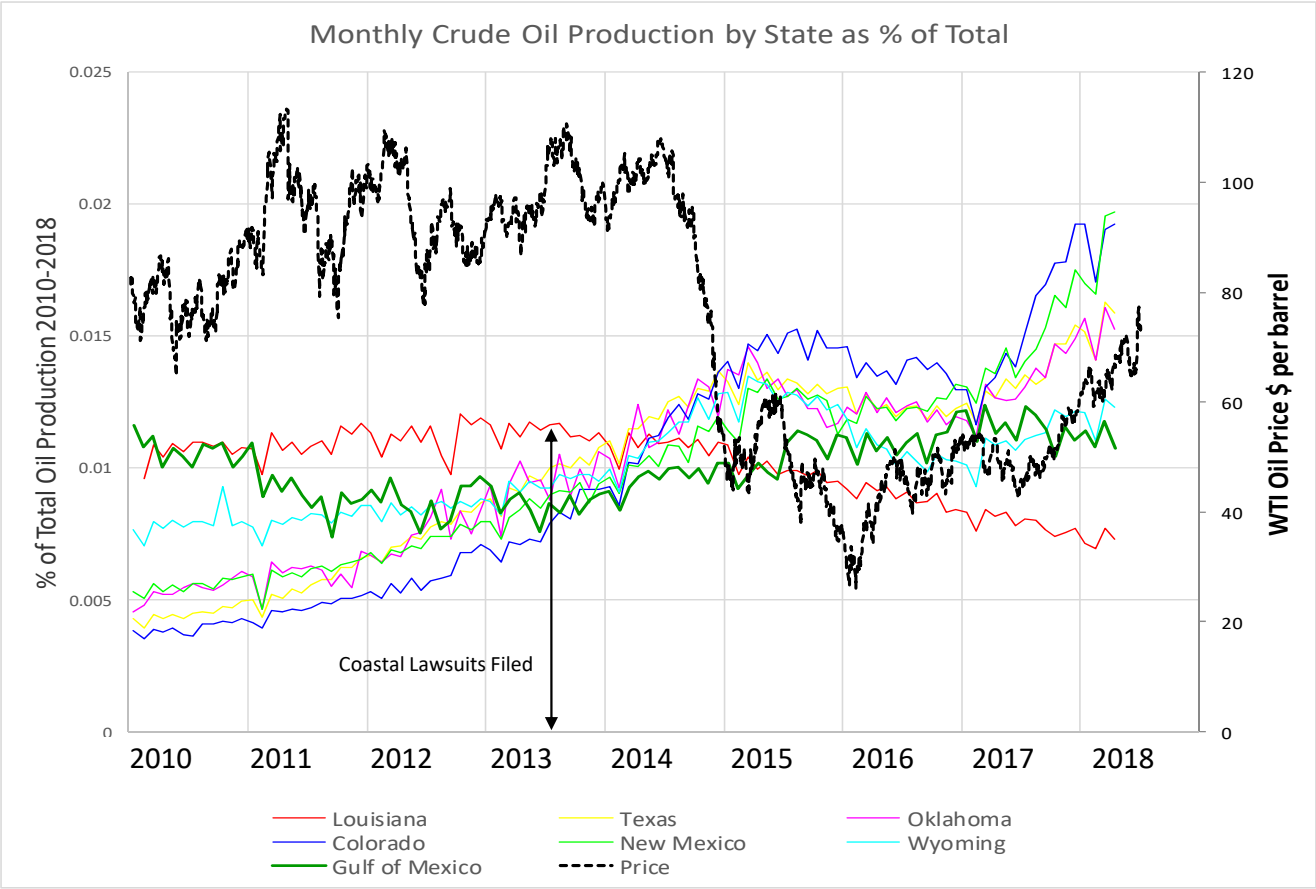
LA Barge Rig Count and Oil Production



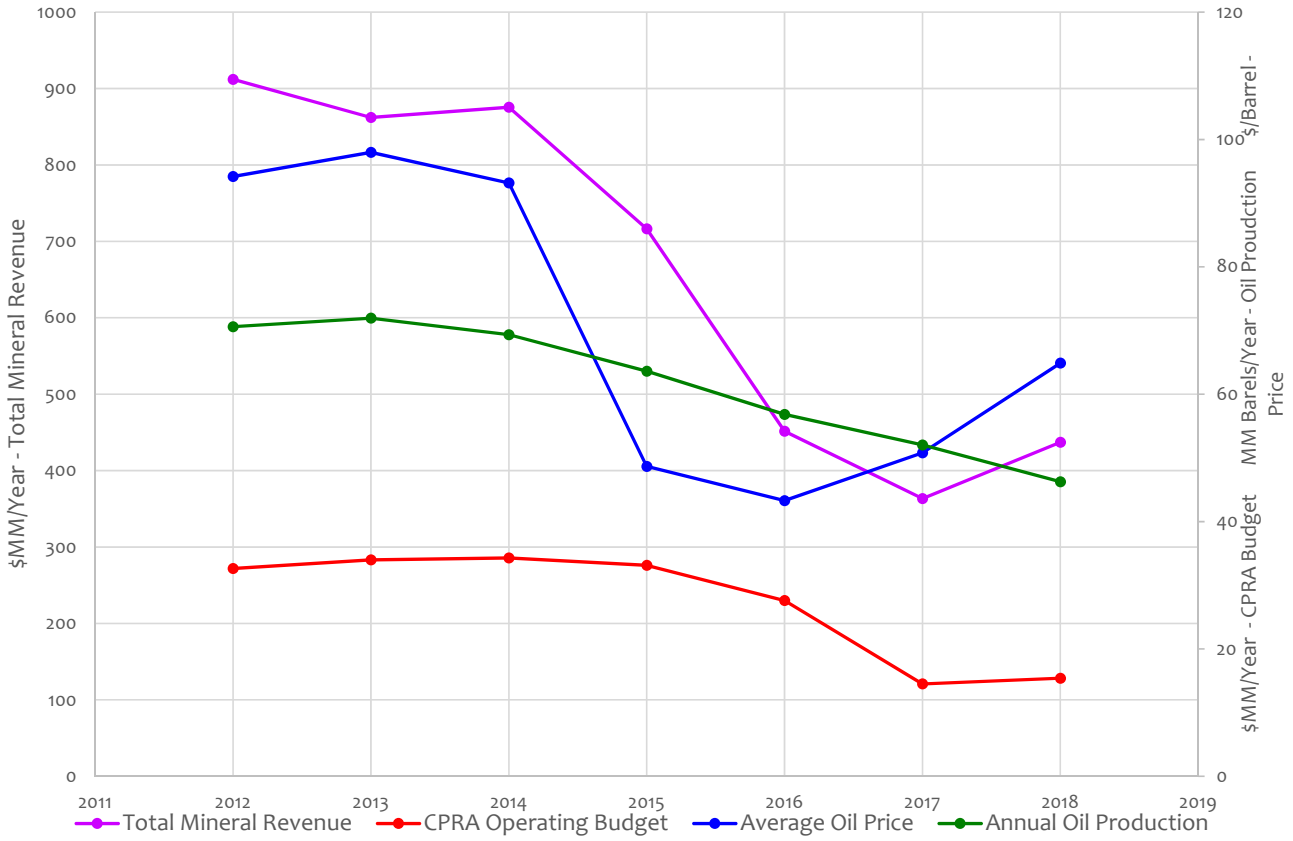
Sued vs Not Sued Operators in Coastal Parishes



LA Oil Production vs other regions



CPRA Operating Budget and LA Mineral Revenue



Coastal Geohazards Atlas

"Using litigation or the injuries [involved] to fund coastal restoration is no way to go about things. It is definitely not a reliable source [of funding]. Even though at this moment it seems like the closest thing to a plan that we have when it comes to a lot of our funding questions, it is certainly no way to continue."

Chris Dalbom, Program Manager of Tulane's Institute on Water Resources Law and Policy

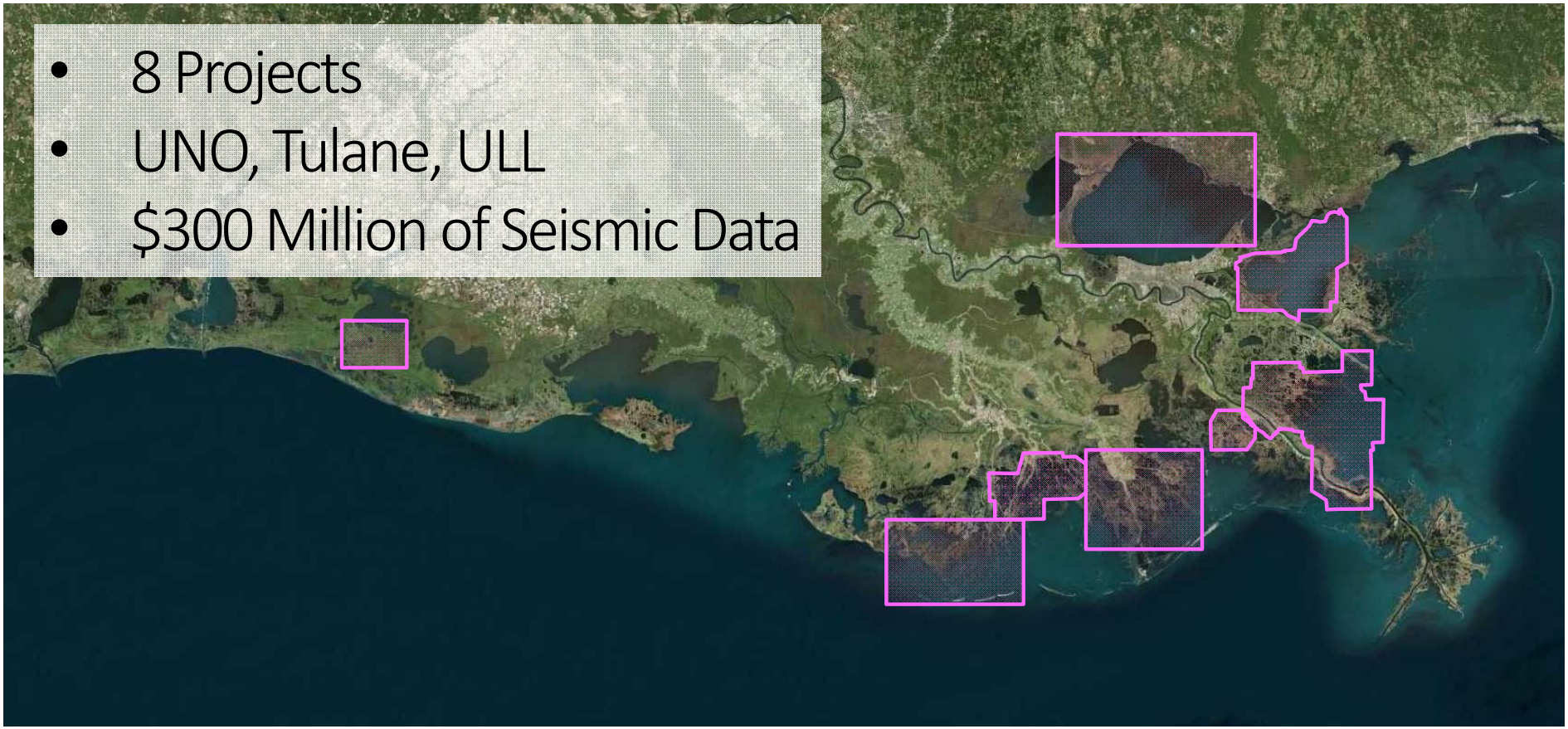
Ineffectiveness of Litigation

360 Legacy Lawsuits filed

137 State-Verified Contamination

12 Sites Cleaned up

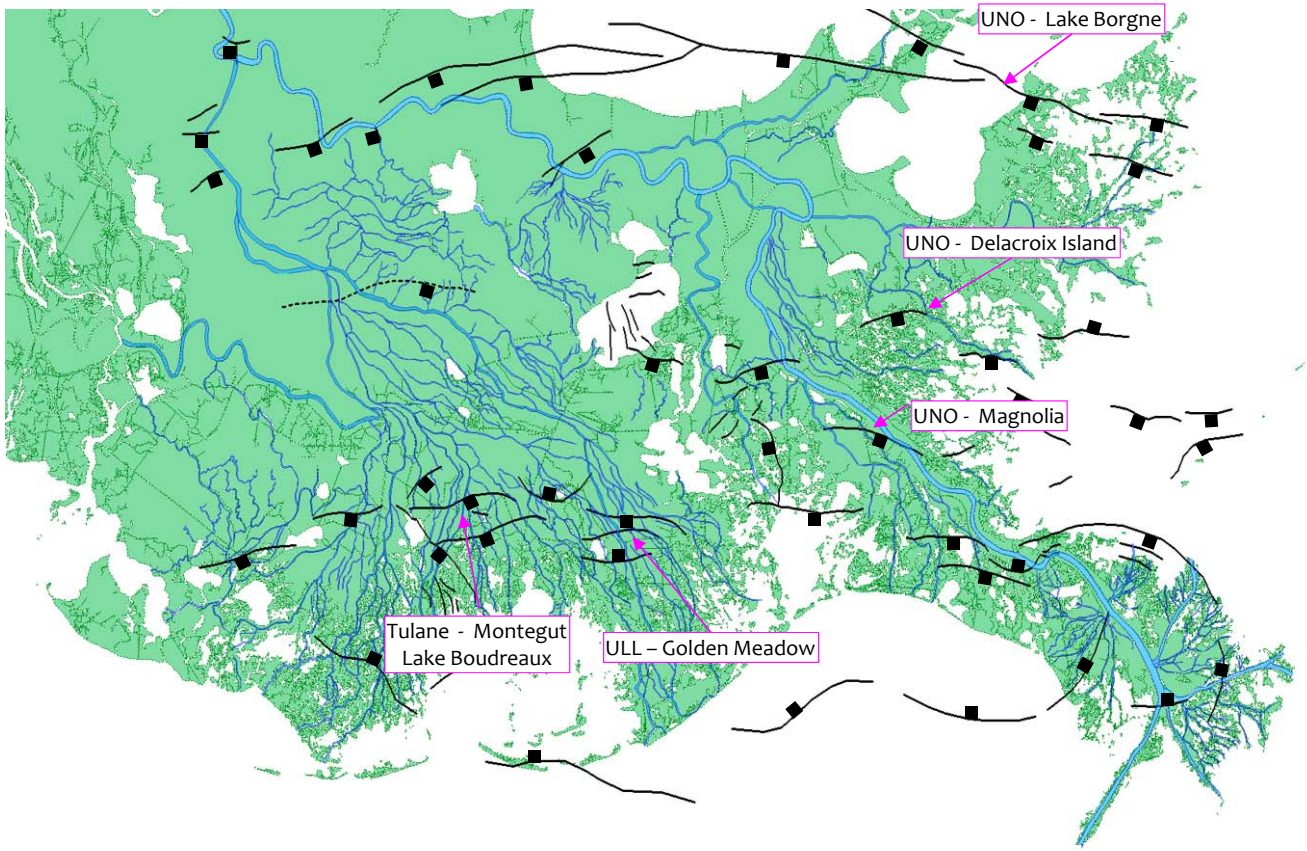
Coastal Research Projects



Coastal Geohazards Atlas

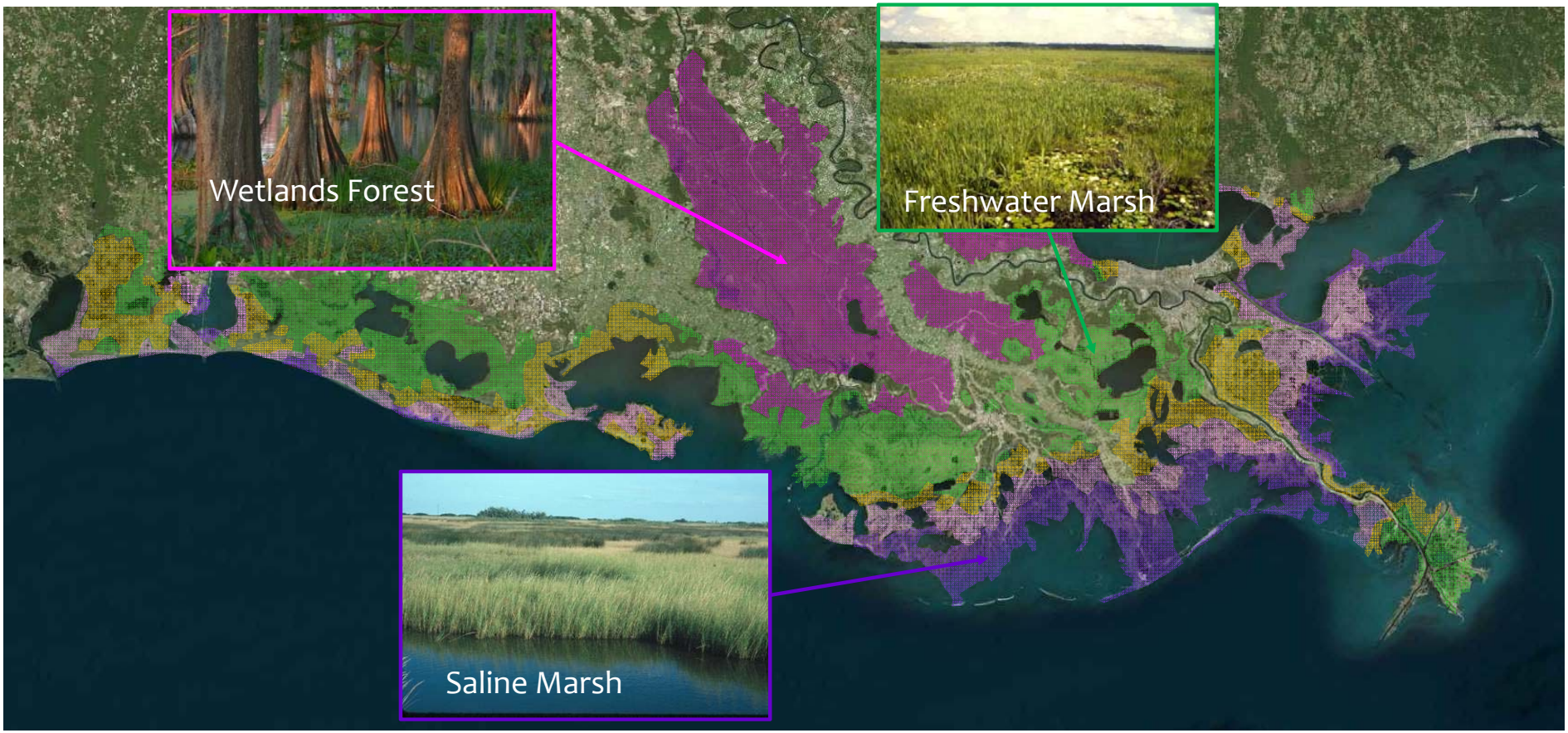
Dr. Charles Groat - Acting Director of LGS, former CEO of TWIG, former director USGS
Dr. Jeff Hanor - Professor Emeritus, LSU Dept of Geology & Geophysics
Dr. Woody Gagliano - CEO, Coastal Environments, Inc.
Dr. Gary Kinsland - Professor, ULL School of Geosciences
Dr. Mark Kulp - Director of the Coastal Research Laboratory, UNO
Dr. Nancye Dawers – Chair, Tulane School of Earth and Environmental Sciences
Dr. Raphael Gottardi – Assistant Professor, ULL School of Geosciences
Dr. Karen Wicker – Senior VP, Coastal Environments, Inc.
Dr. Elizabeth McDade - Geological Consultant, 30 years oil and gas industry experience
Mr. Michael Merritt – retired S.L.F.P.A.-W.
Mr. Chris McLindon – Vice-President, New Orleans Geological Society
Mr. John Johnston - Geological Review, Louisiana Geological Survey
Mr. Rick McCulloh - Research Associate, Louisiana Geological Survey
Mr. Paul Heinrich - Research Associate, Louisiana Geological Survey

Coastal Research Projects



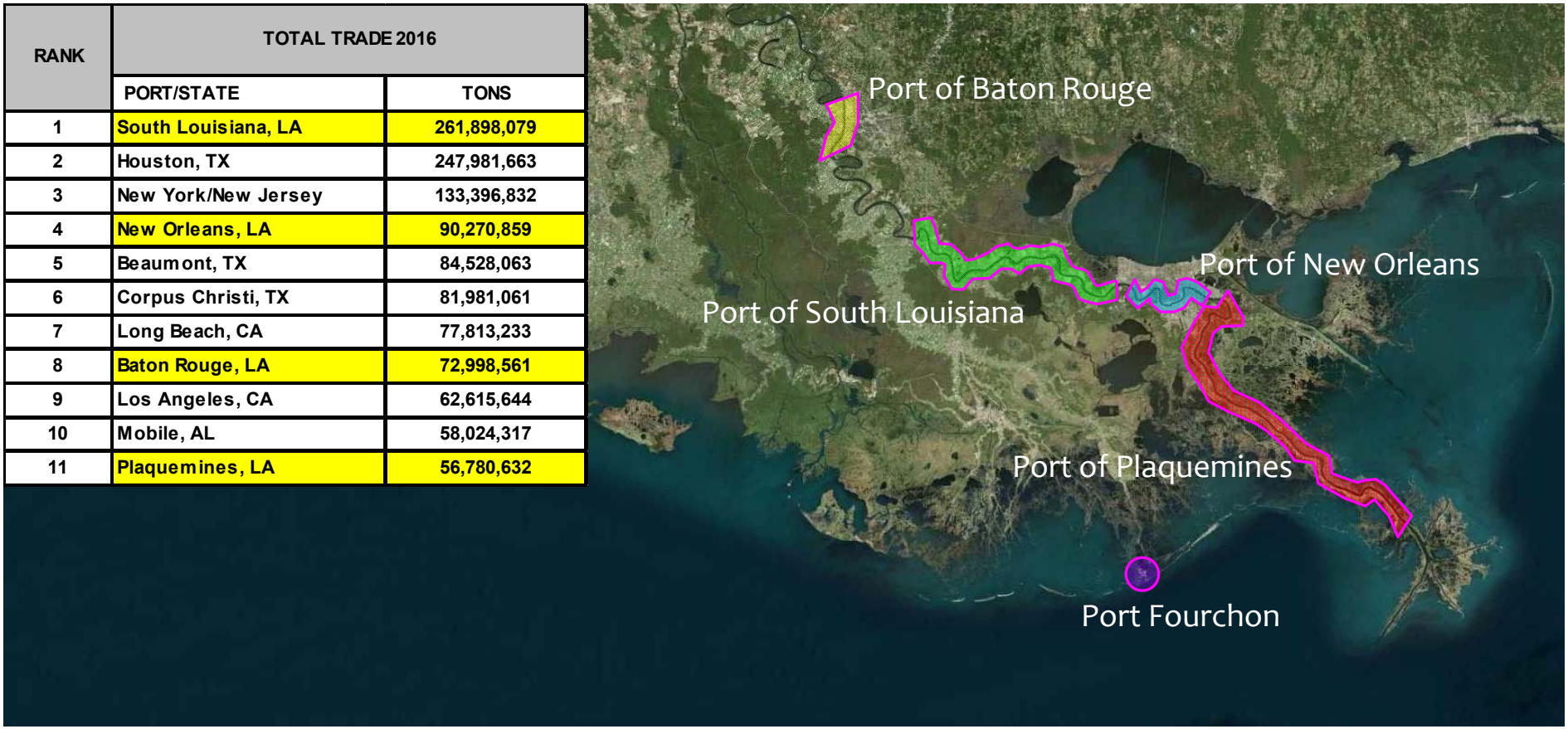
Ecosystems

Fisheries and natural infrastructure

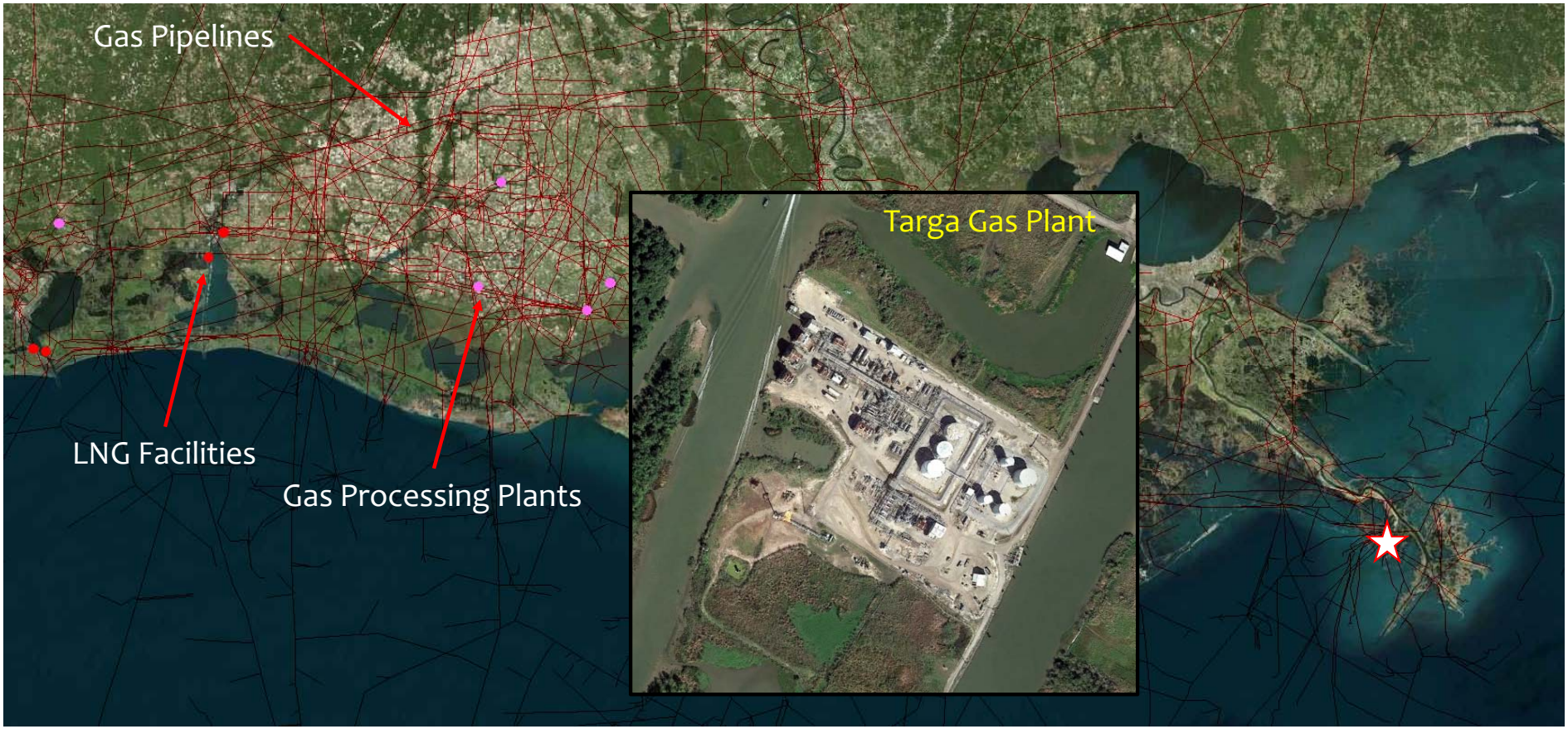


Ports and Navigation

RANK	TOTAL TRADE 2016	
	PORT/STATE	TONS
1	South Louisiana, LA	261,898,079
2	Houston, TX	247,981,663
3	New York/New Jersey	133,396,832
4	New Orleans, LA	90,270,859
5	Beaumont, TX	84,528,063
6	Corpus Christi, TX	81,981,061
7	Long Beach, CA	77,813,233
8	Baton Rouge, LA	72,998,561
9	Los Angeles, CA	62,615,644
10	Mobile, AL	58,024,317
11	Plaquemines, LA	56,780,632

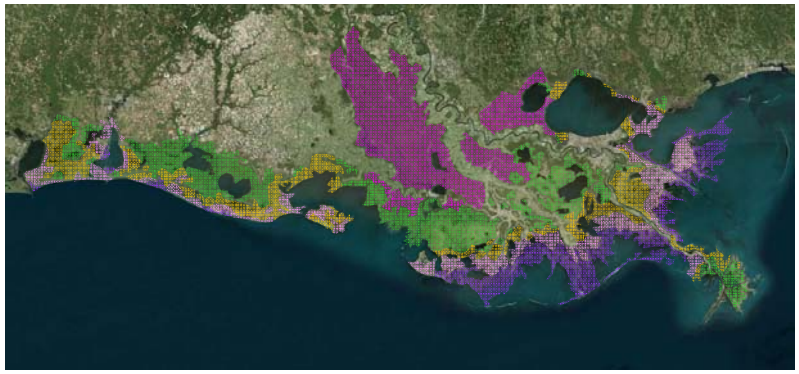


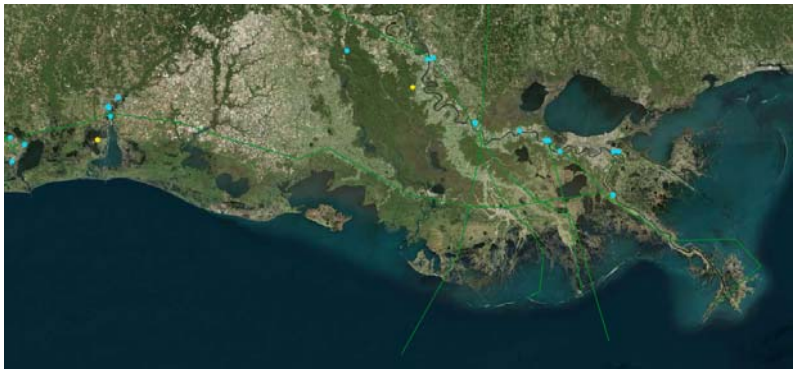
Oil and Gas Infrastructure



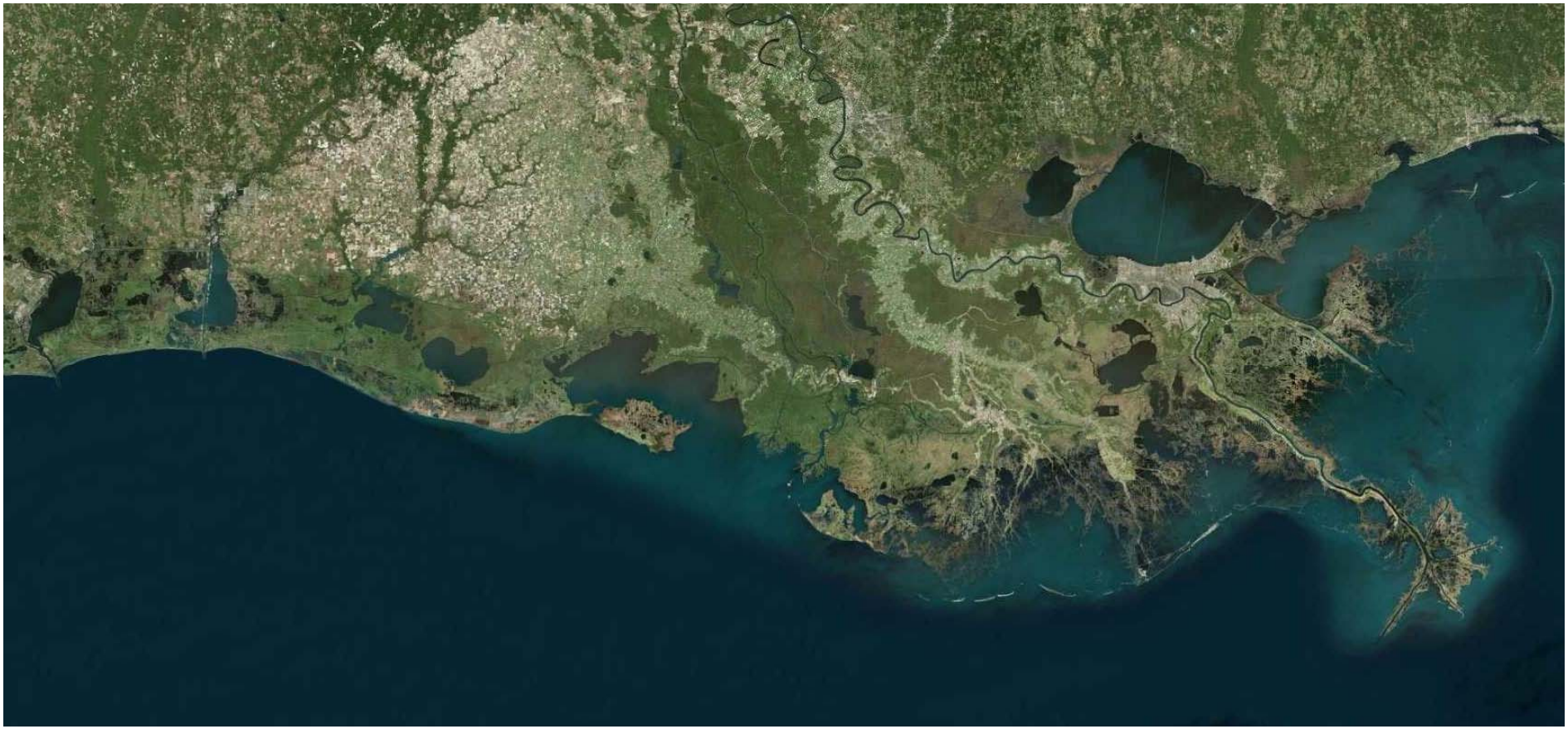
Oil and Gas Infrastructure

Sustainability

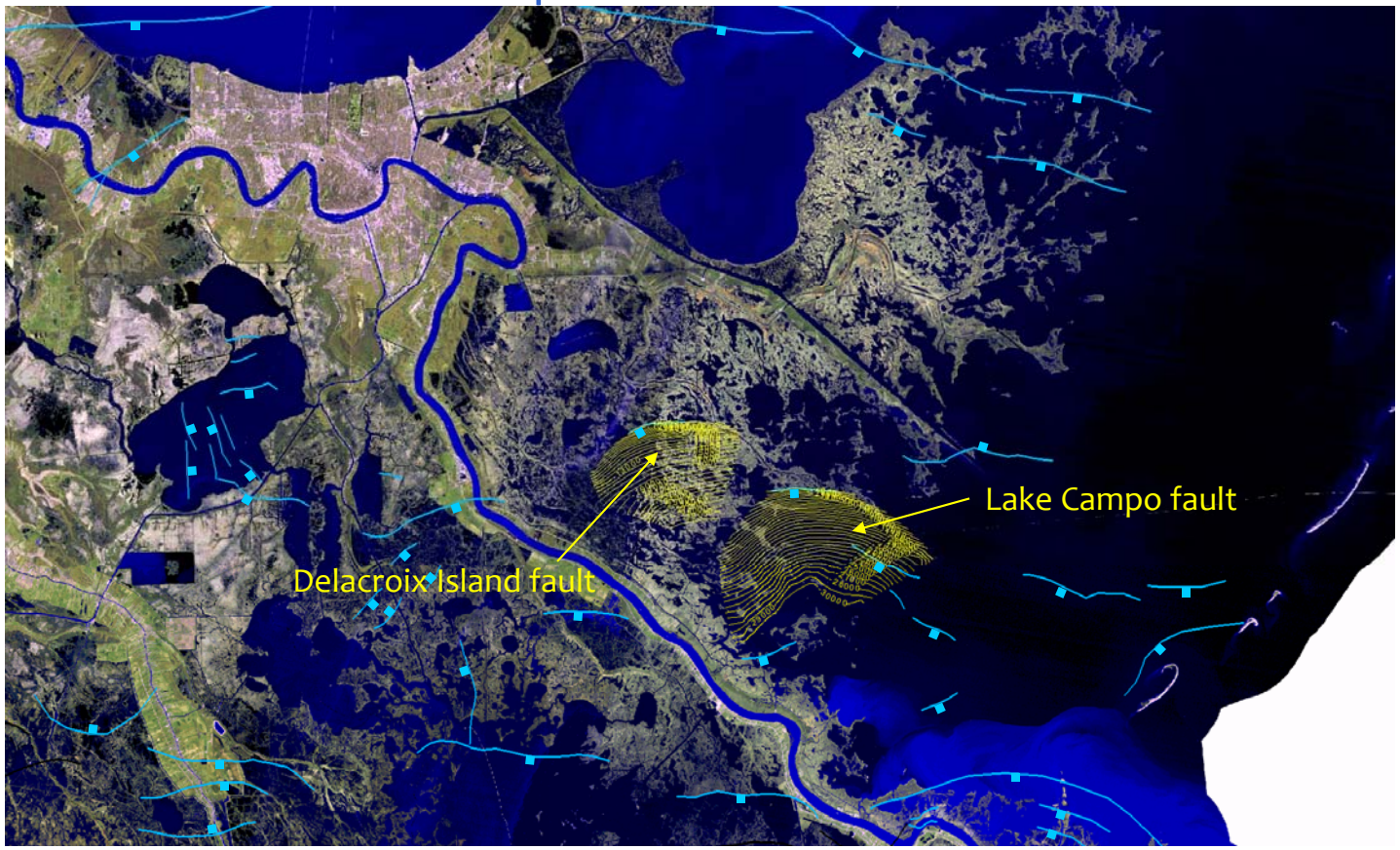




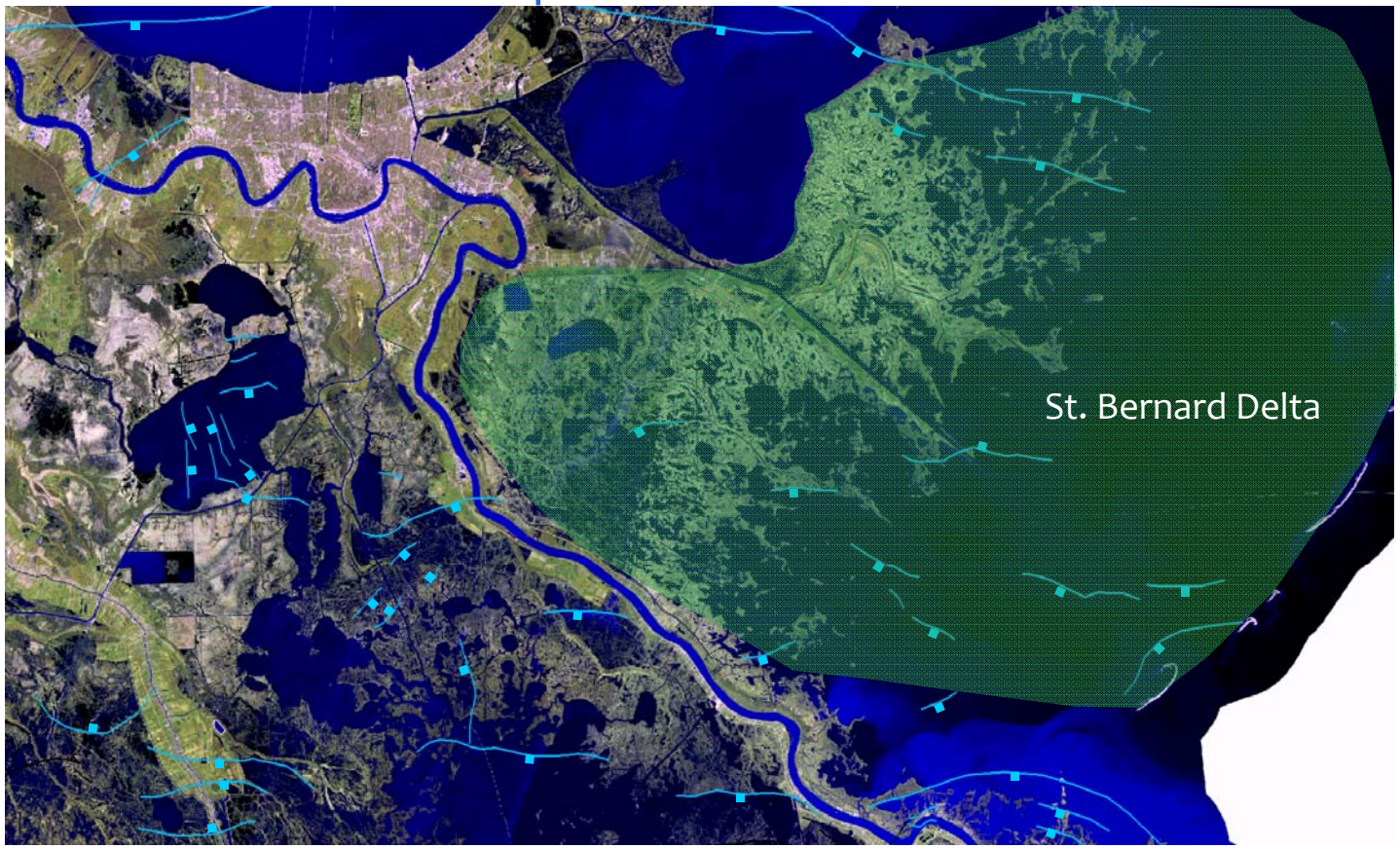
Eco-Eco System



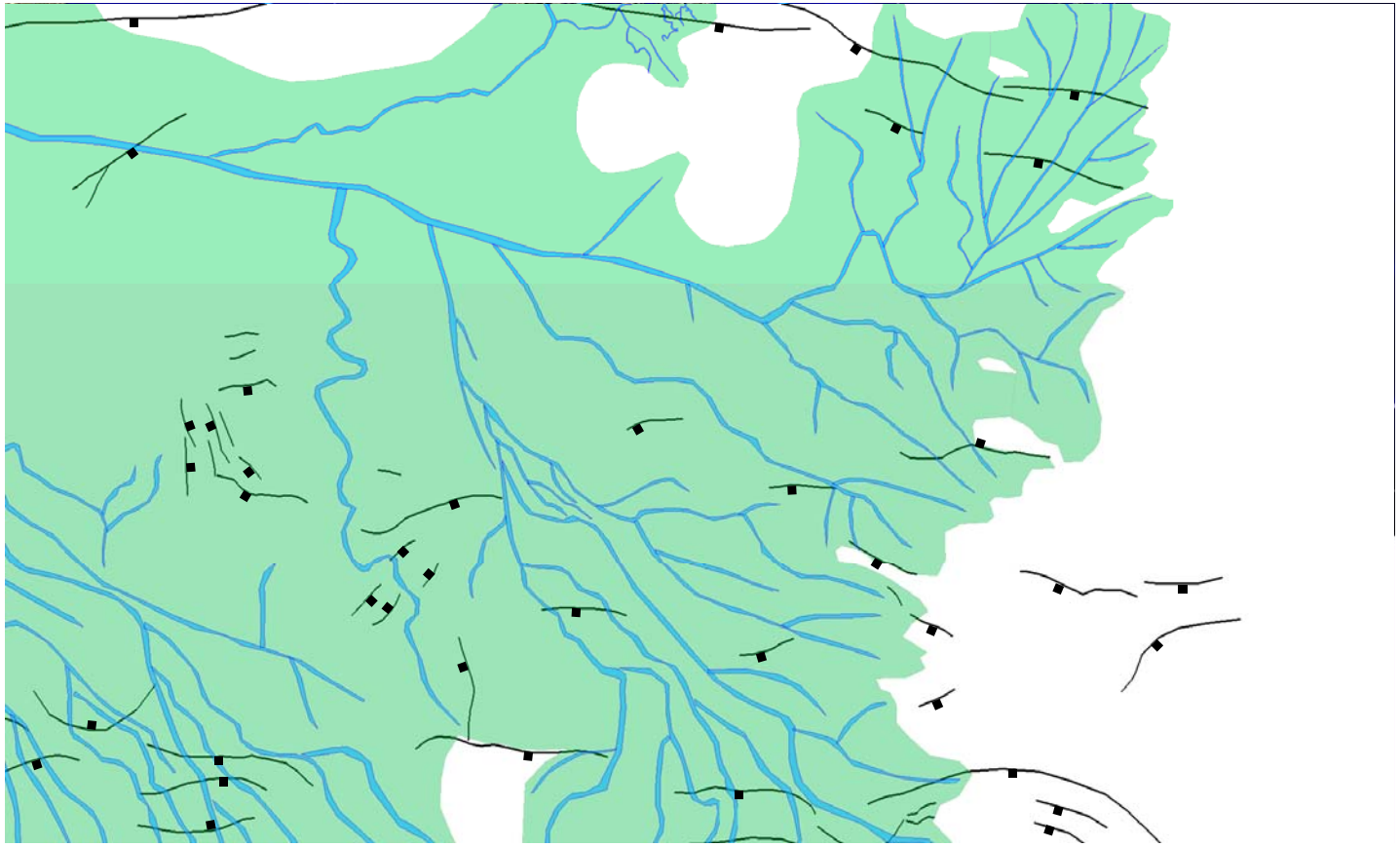
Delacroix Island and Lake Campo faults



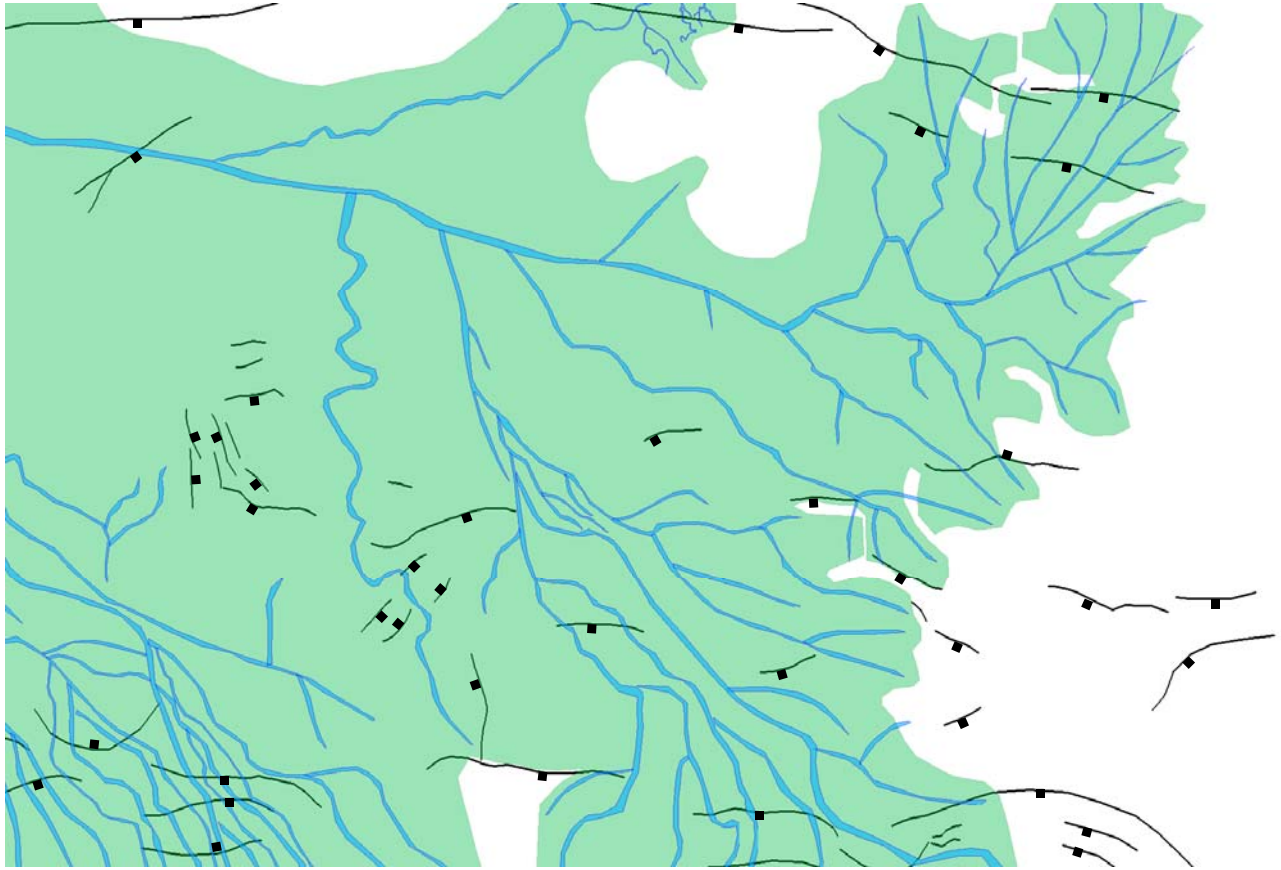
Delacroix Island and Lake Campo faults



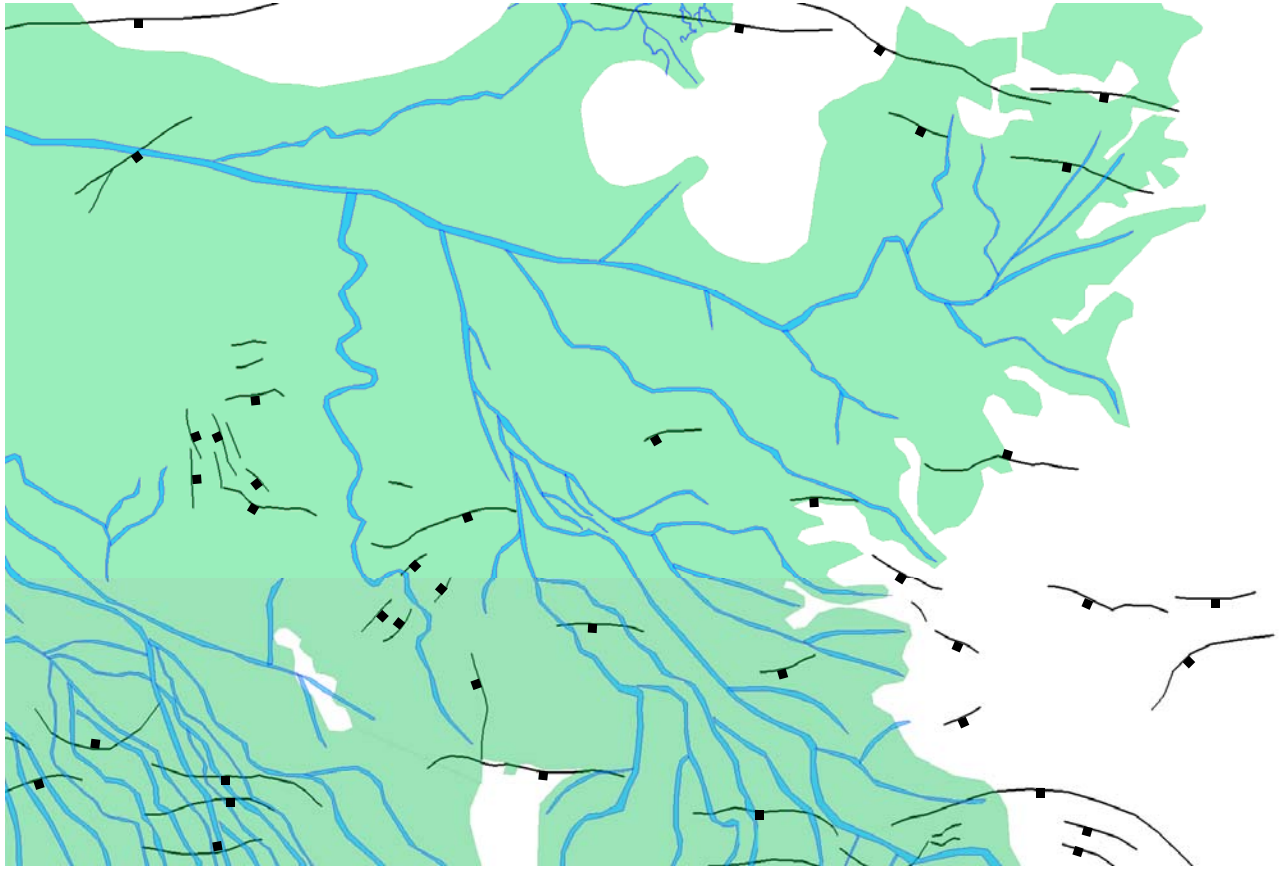
1600 AD



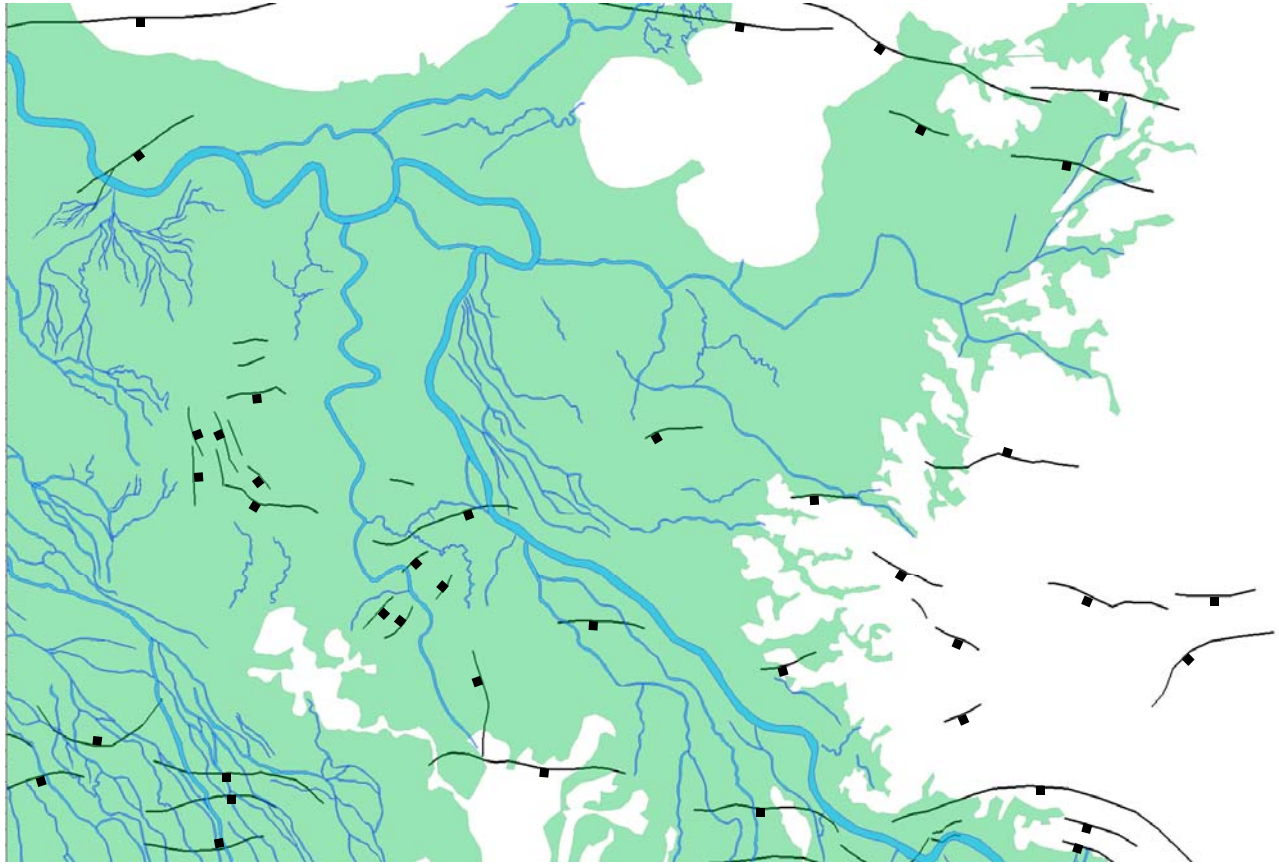
1700 AD



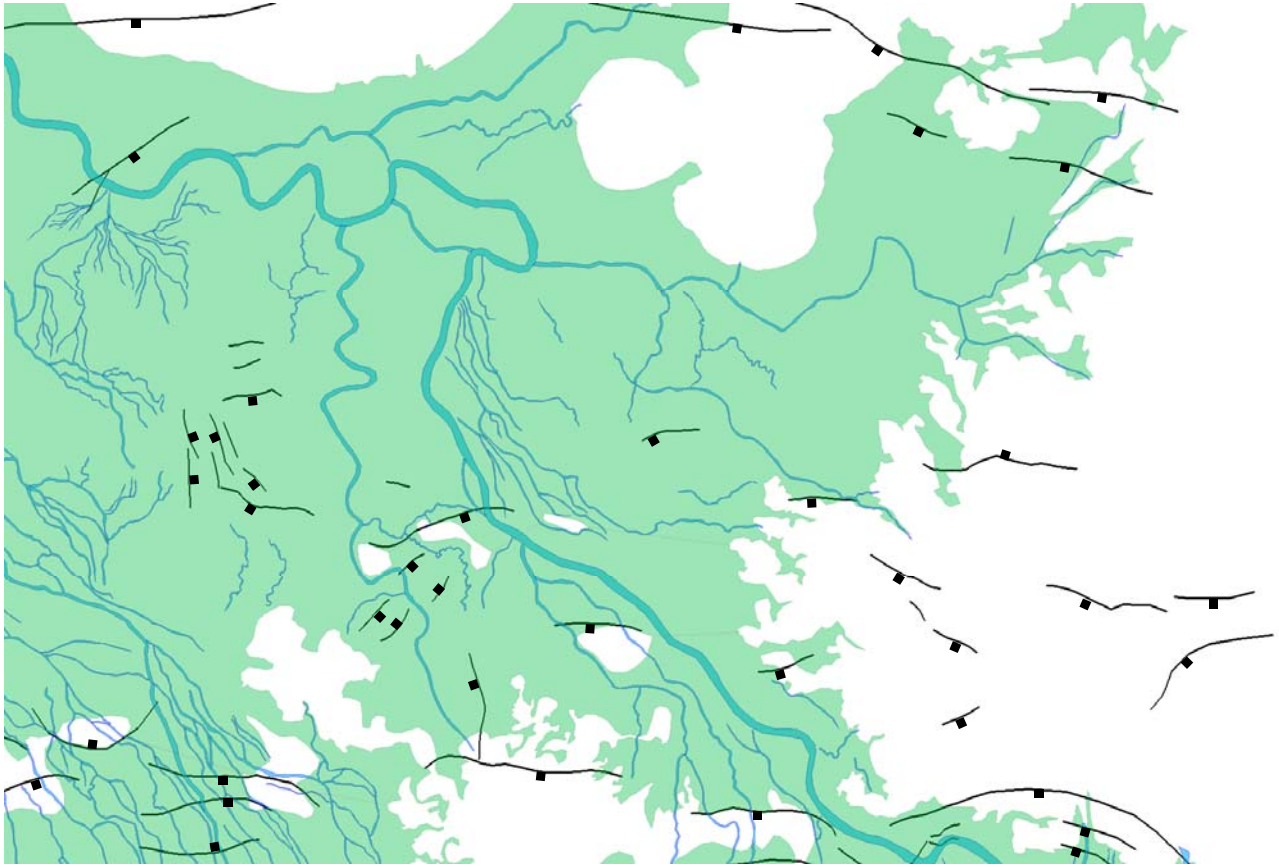
1800 AD



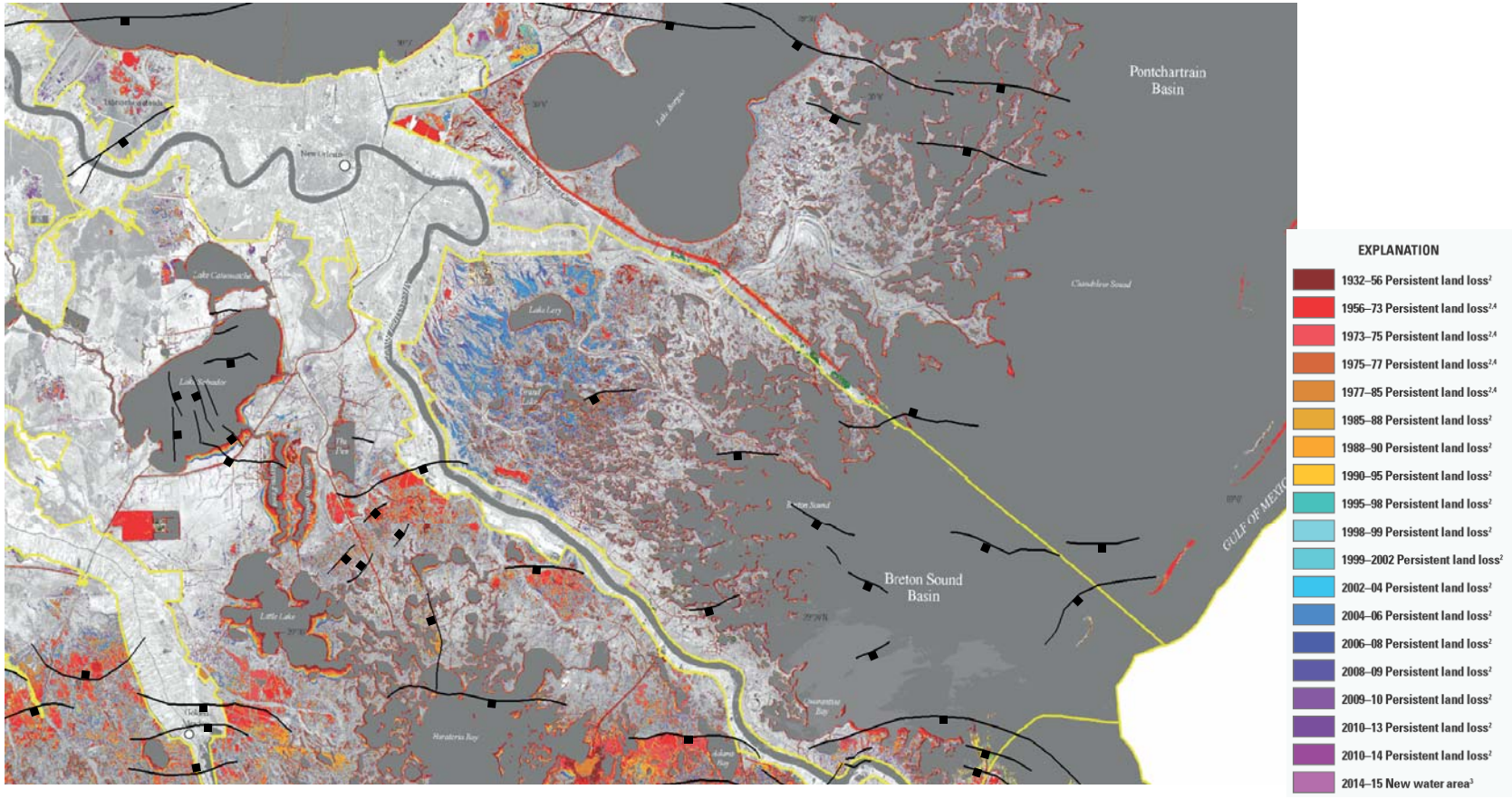
1900 AD



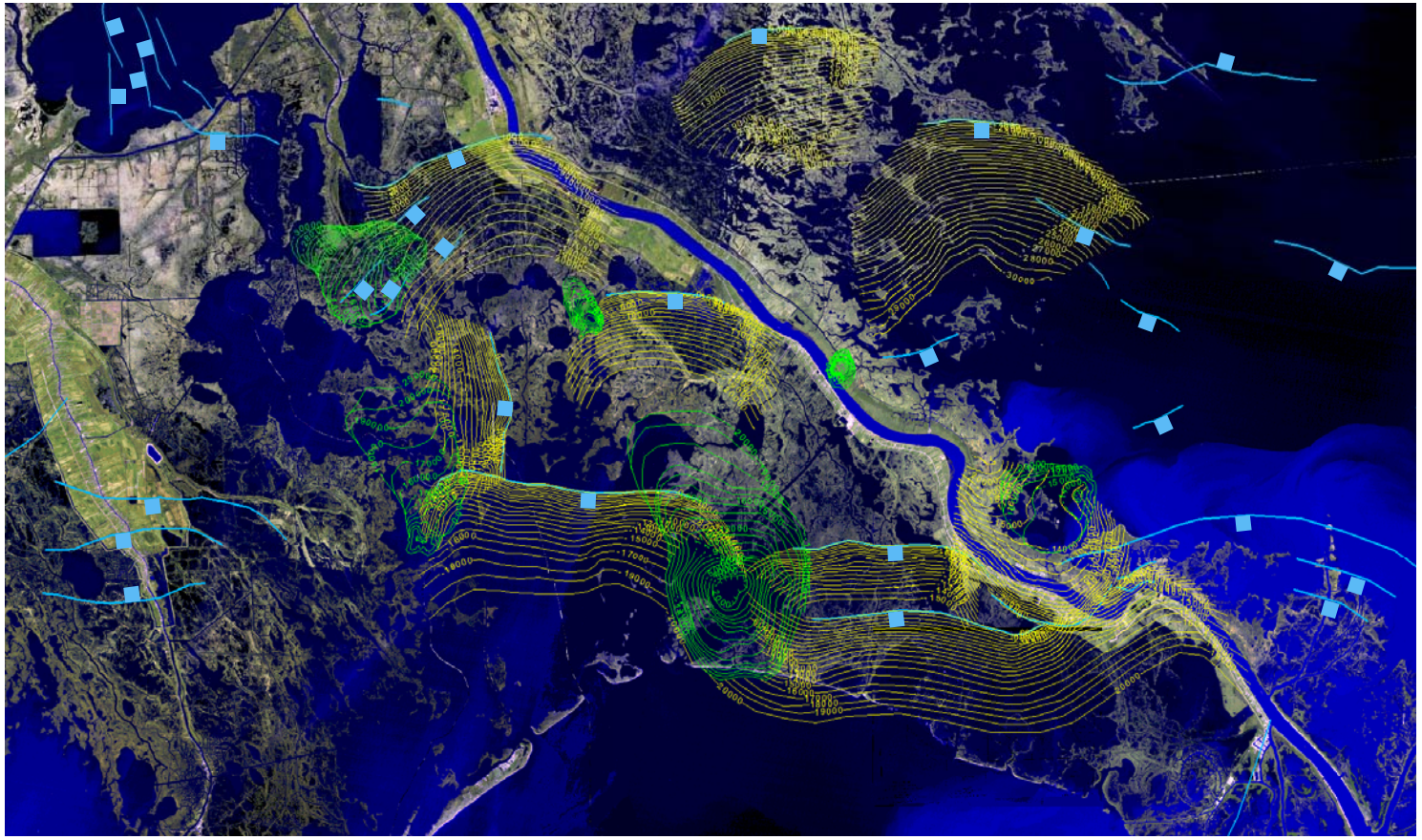
Present



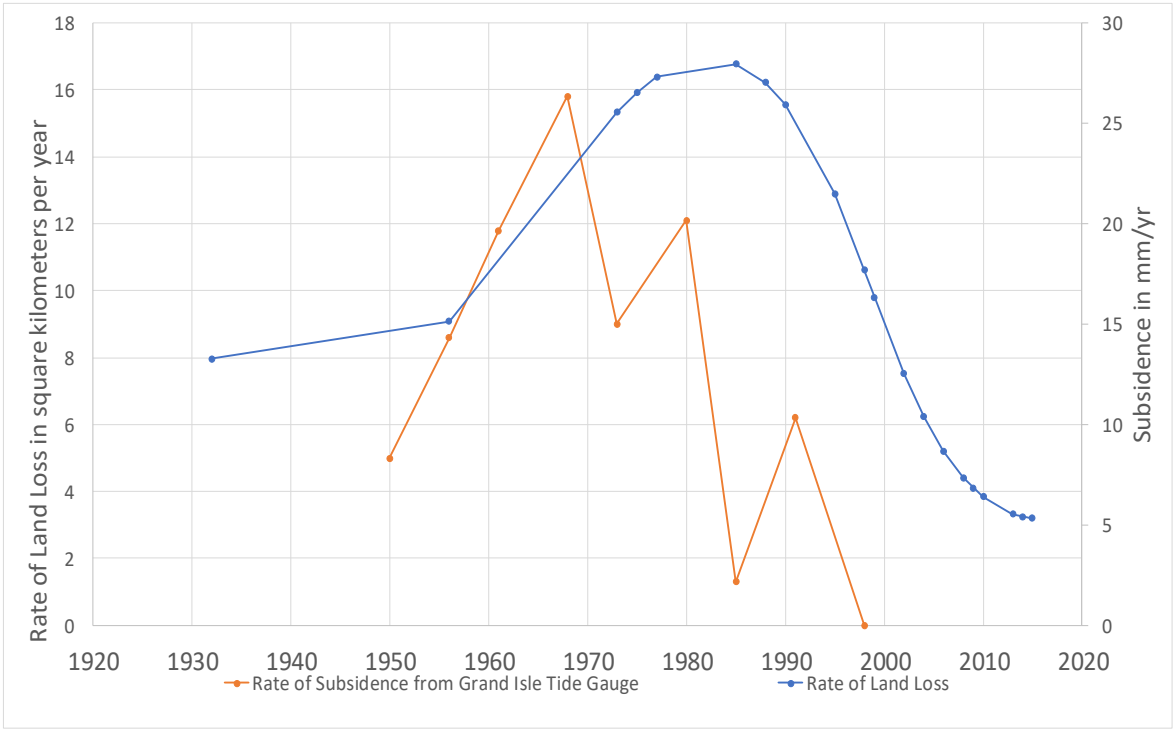
USGS Land Loss Map



Barataria Basin

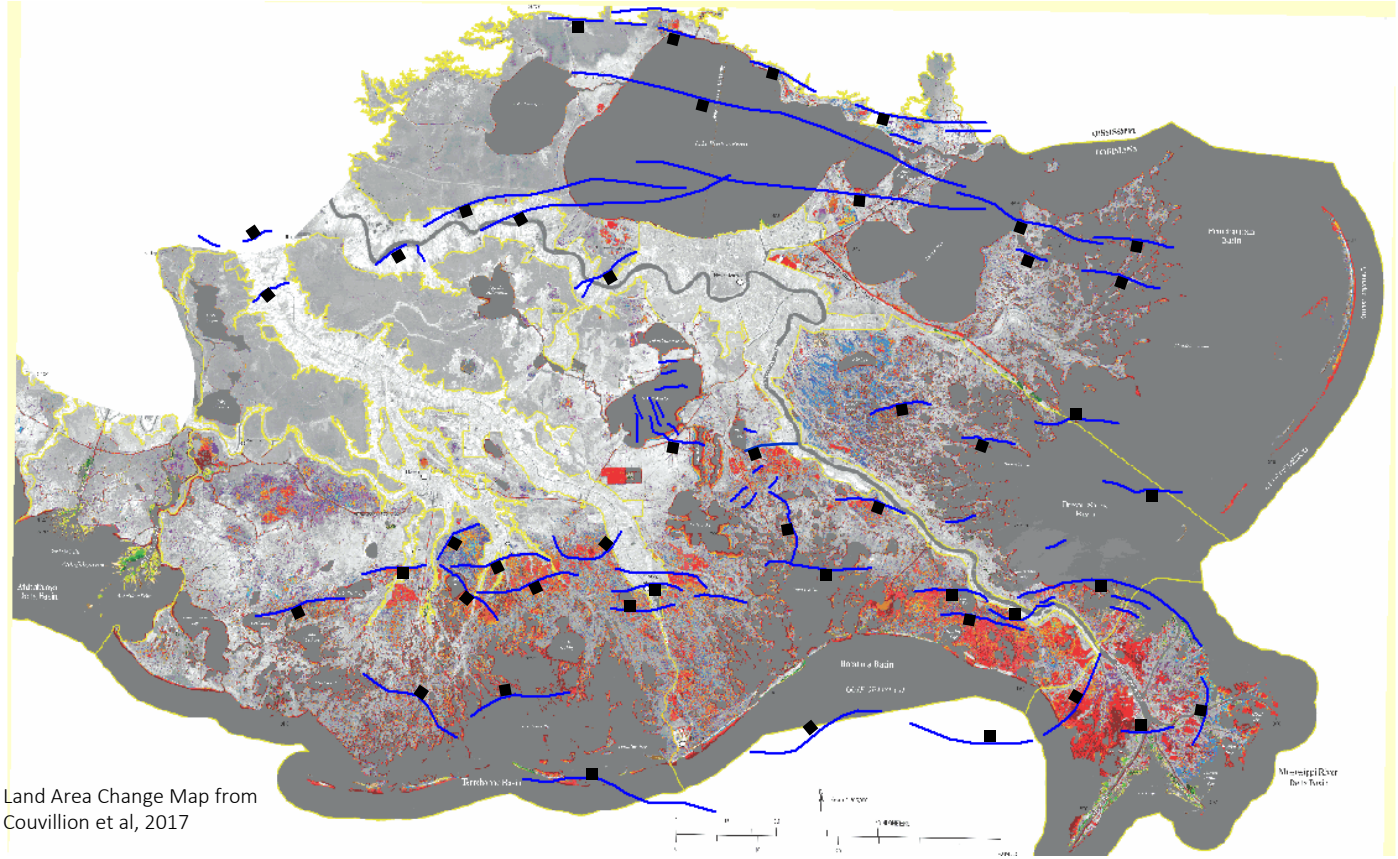


Land Loss & Subsidence Rates



Surface Faults

Land Area Change



Land Area Change Map from Couvillion et al, 2017