

Physical & Program Options for Inland Migration of Louisiana's Coastal Wetlands

Melissa Kemm & Sam Pardo

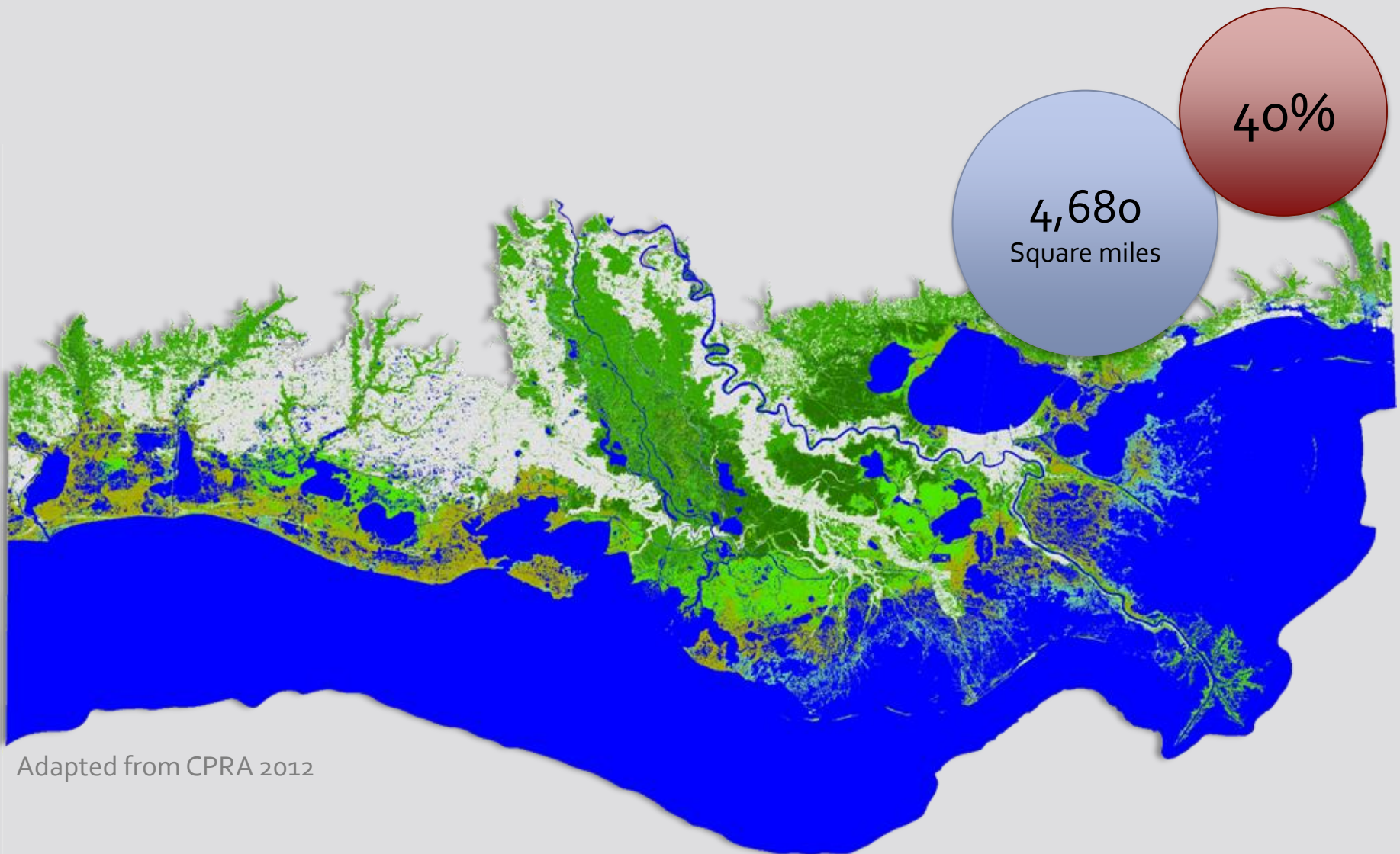
Duke University Nicholas School of the Environment

**Client: Louisiana Coastal Protection & Restoration Authority
(CPRA)**

Goals of the Master's Project

- What areas in coastal Louisiana can serve as future wetland sites?
 - What policy alternatives are available to facilitate the migration of wetlands?
1. Wetland loss in Louisiana
 2. Geospatial modeling of sea level rise (SLR) & wetland migration
 3. Policy analysis
 4. Bringing it all together – applying policy tool to geospatial results

Louisiana's Coastal Wetlands

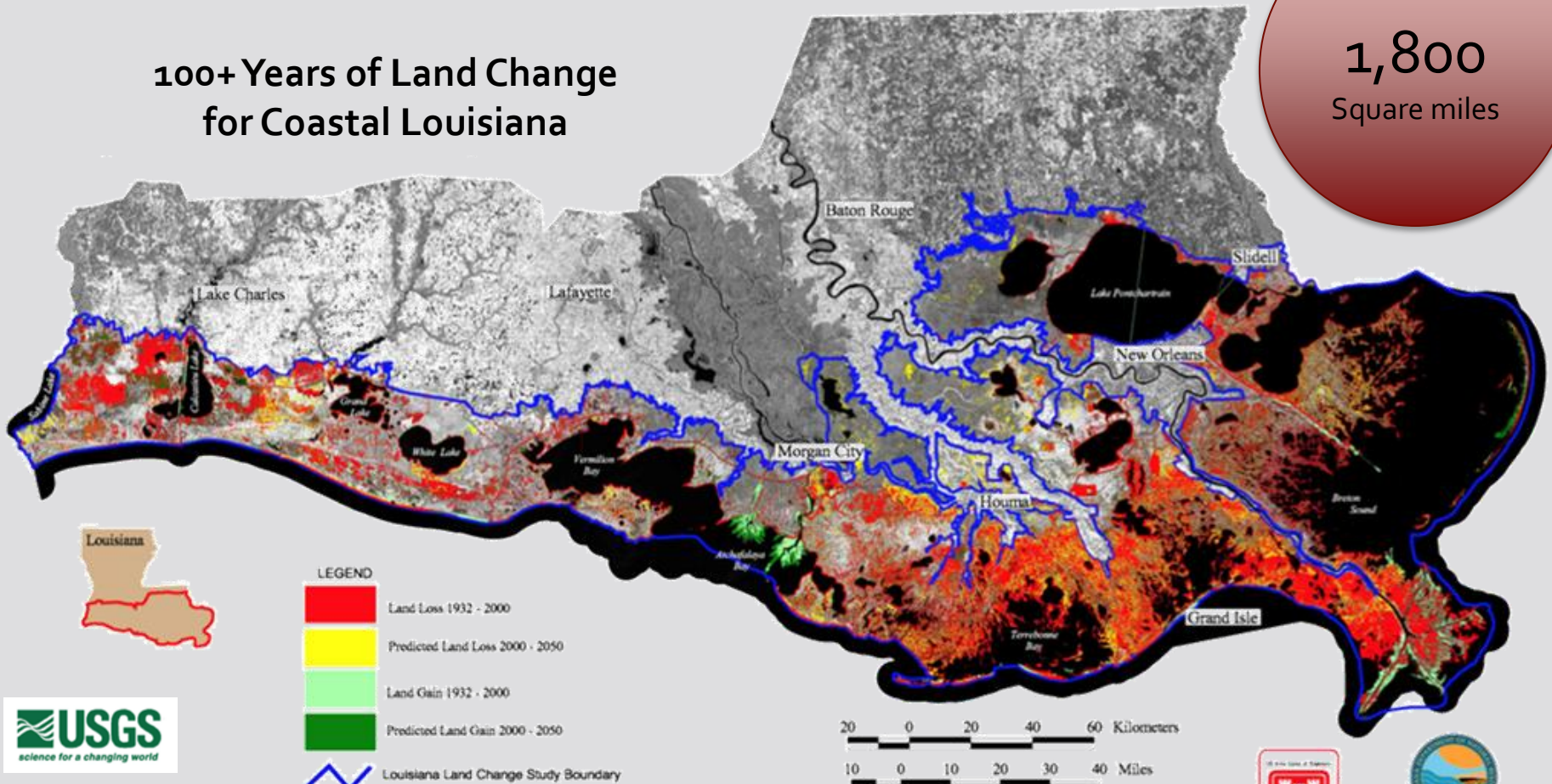


Adapted from CPRA 2012

History of Wetland Loss

100+ Years of Land Change
for Coastal Louisiana

1,800
Square miles



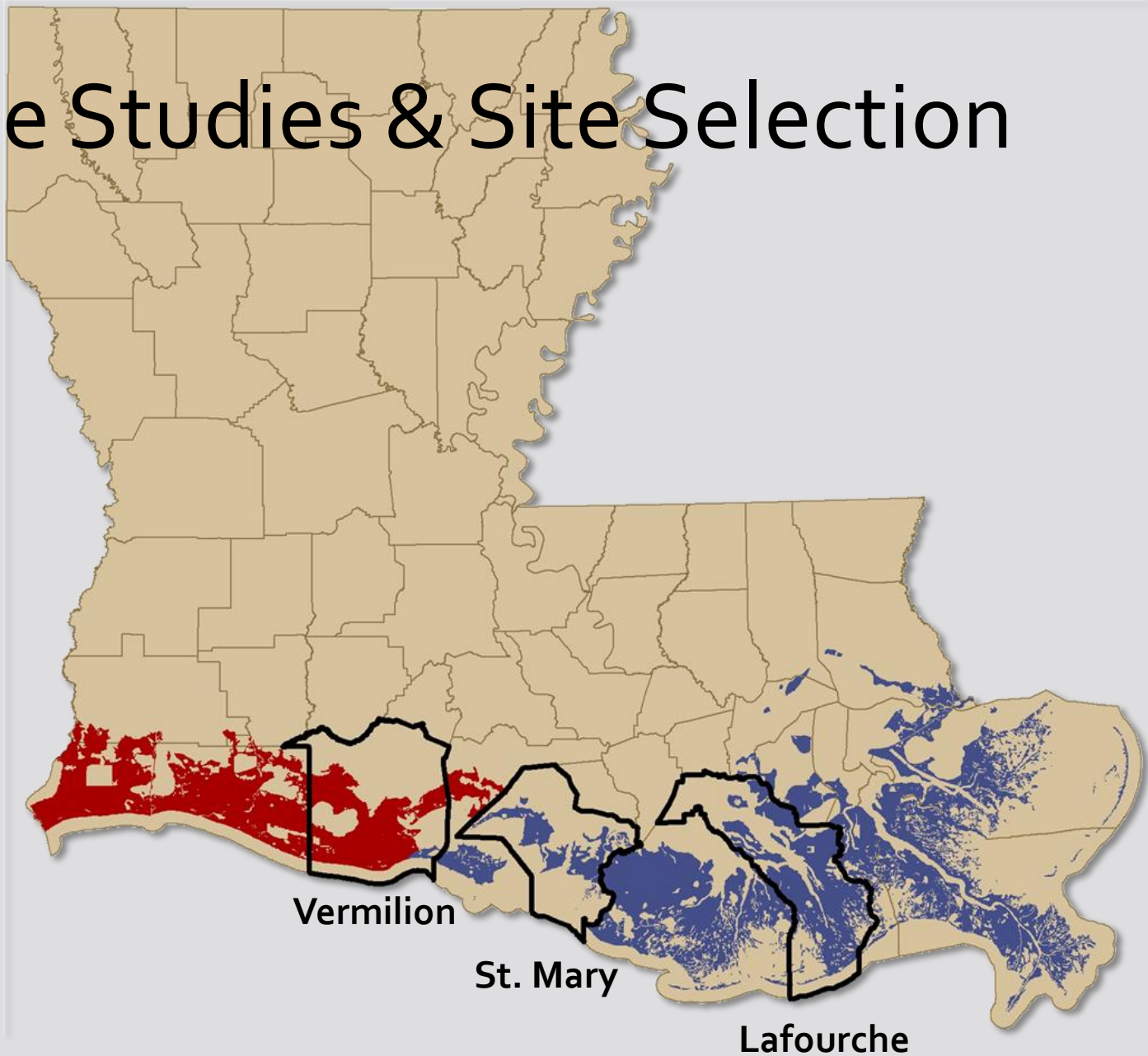
Prepared by:
U.S. Geological Survey
National Wetlands Research Center
Lafayette, LA

Background is 2000 Thematic Mapper panchromatic band.

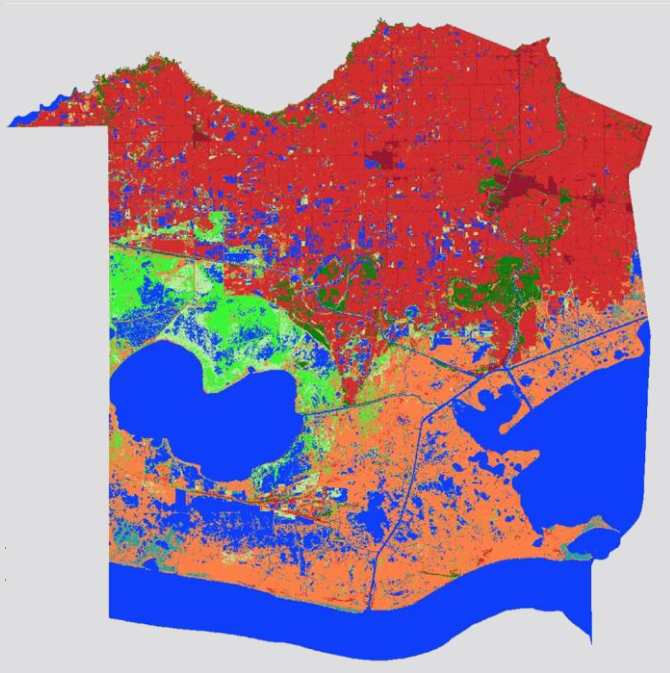


Map ID: USGS-NWRC 2003-03-01

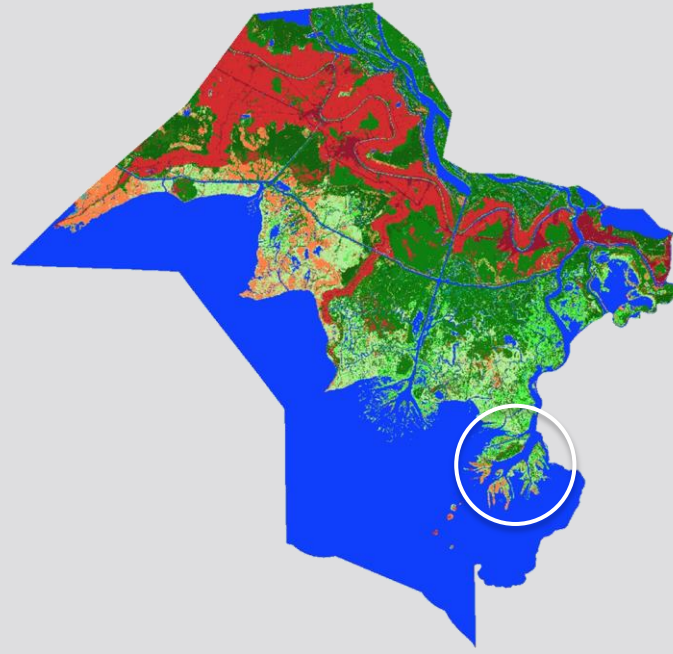
Case Studies & Site Selection



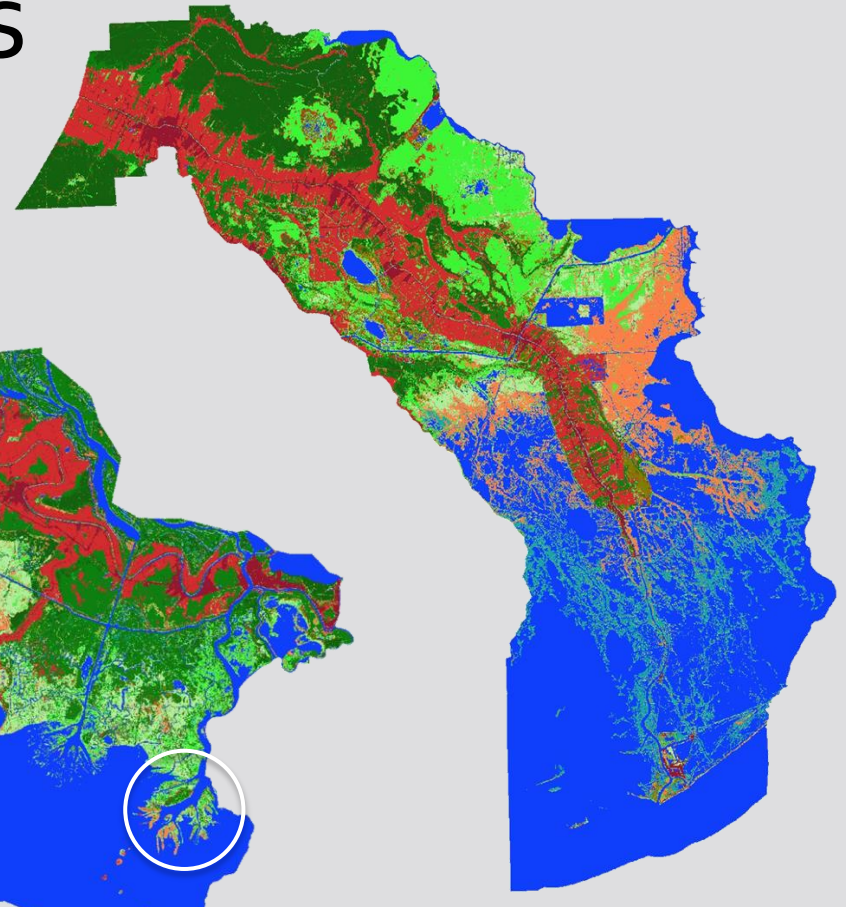
Parish Comparisons



Vermilion



St. Mary



Lafourche

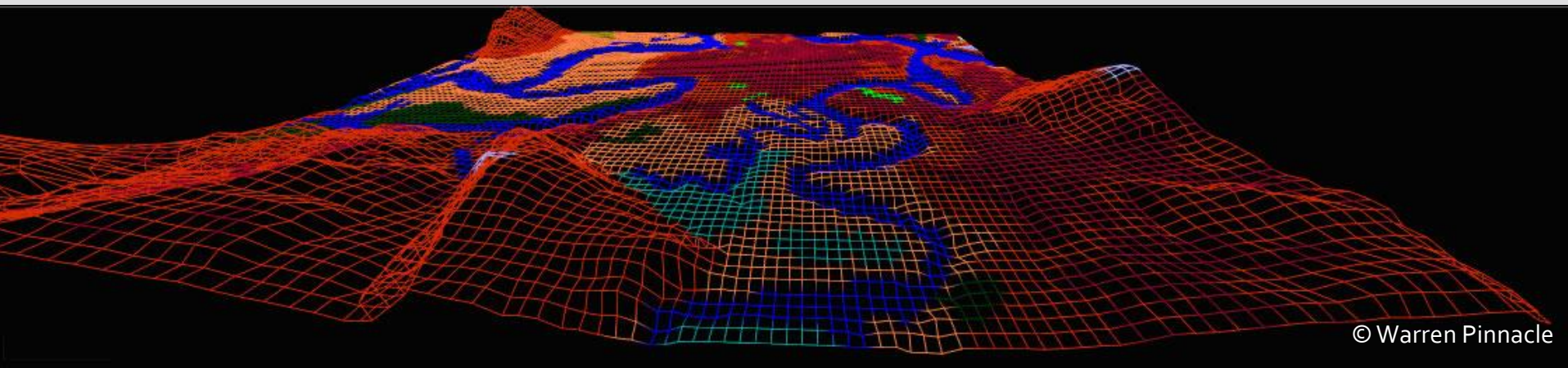
Sea Level Affecting Marshes Model (SLAMM)

Inputs

- Landcover
- Elevation
- Slope
- Dikes/Levees

Parameters

- Subsidence
- Tide Range & Frequency of Inundation
- Erosion & Accretion Rates



© Warren Pinnacle

SLAMM Scenarios

Inputs & Parameters

- Low Subsidence
- High Subsidence
- Dikes
- No Dikes

SLR by 2100

- 0.5 meters
- 1.0 meters
- 1.5 meters
- 2.0 meters

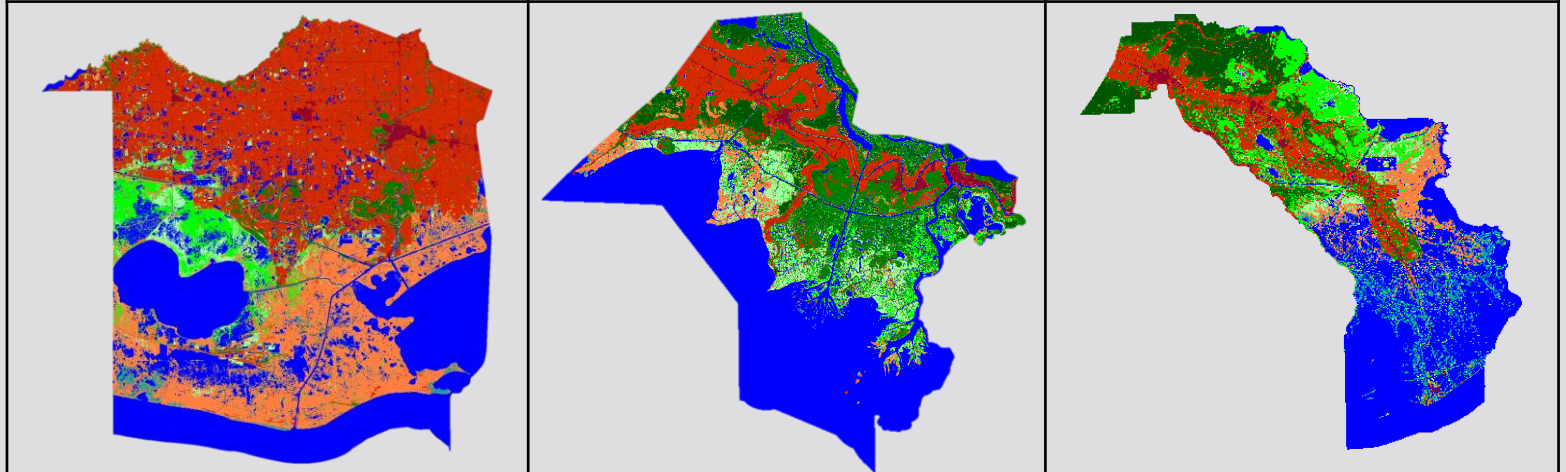
SLAMM Results

Vermilion

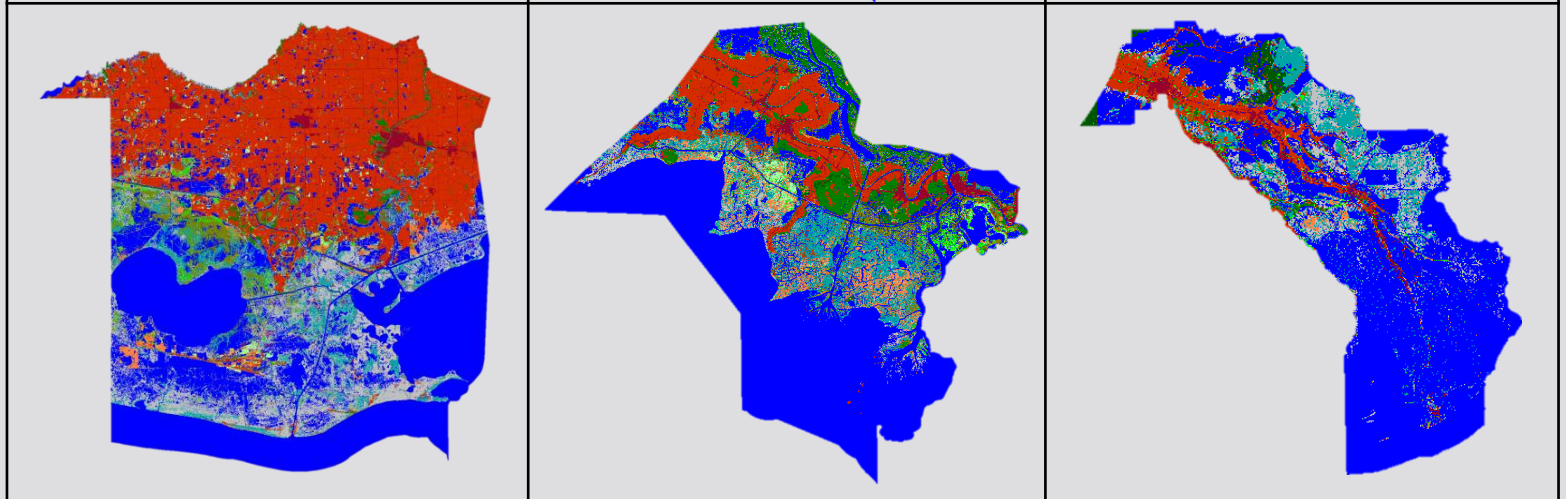
St. Mary

Lafourche

2007

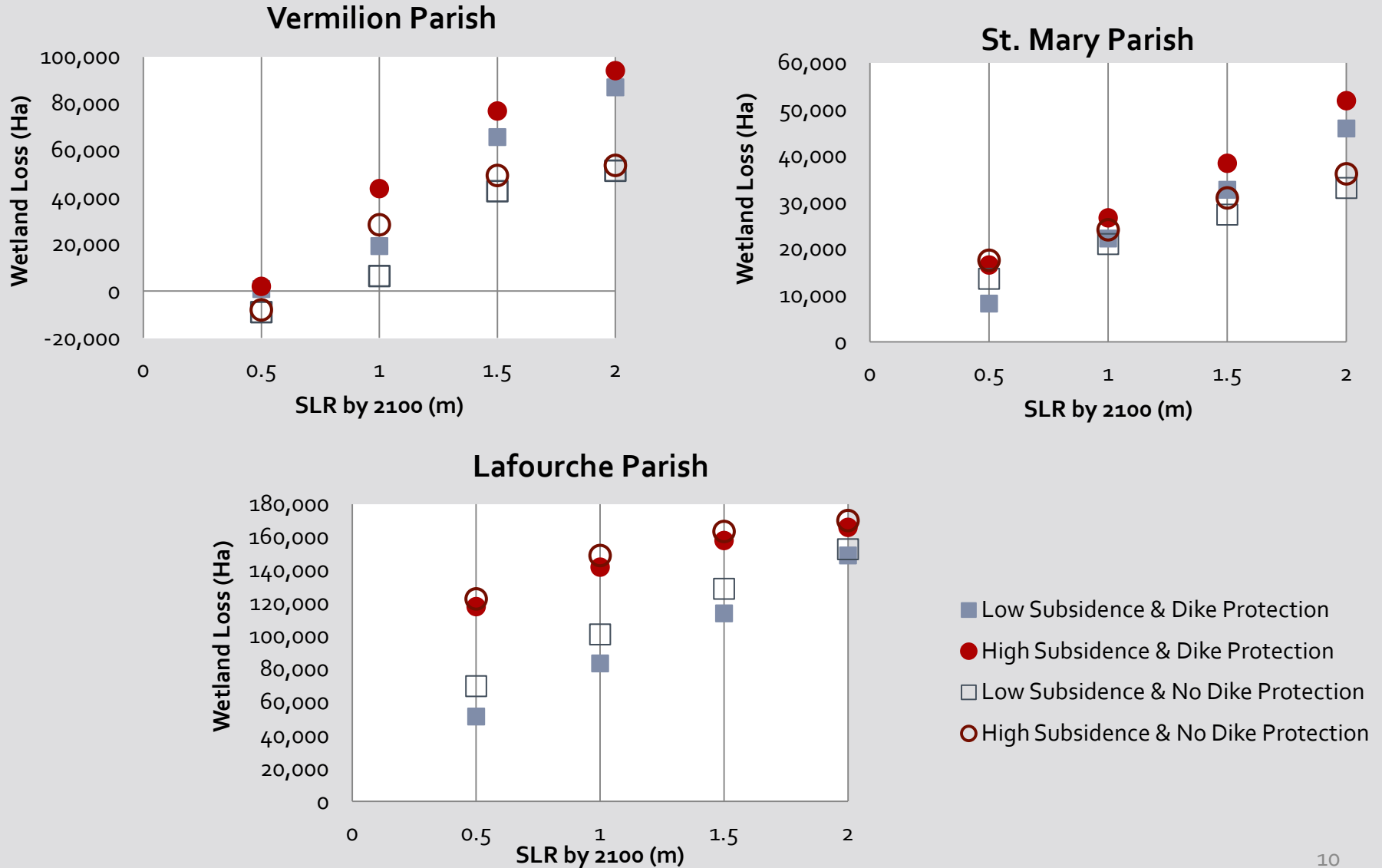


2100



1.5 meter SLR by 2100, Dike Protection, Low Subsidence

Model Sensitivity to Subsidence & Protection Conditions



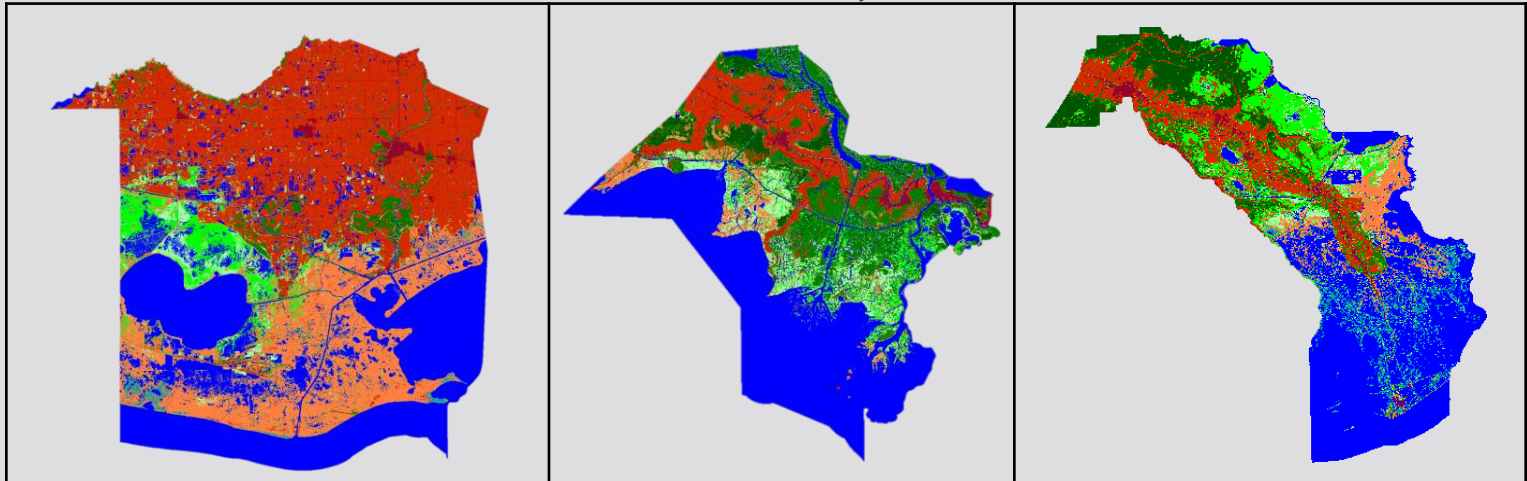
Upland Migration of Wetlands

Vermilion

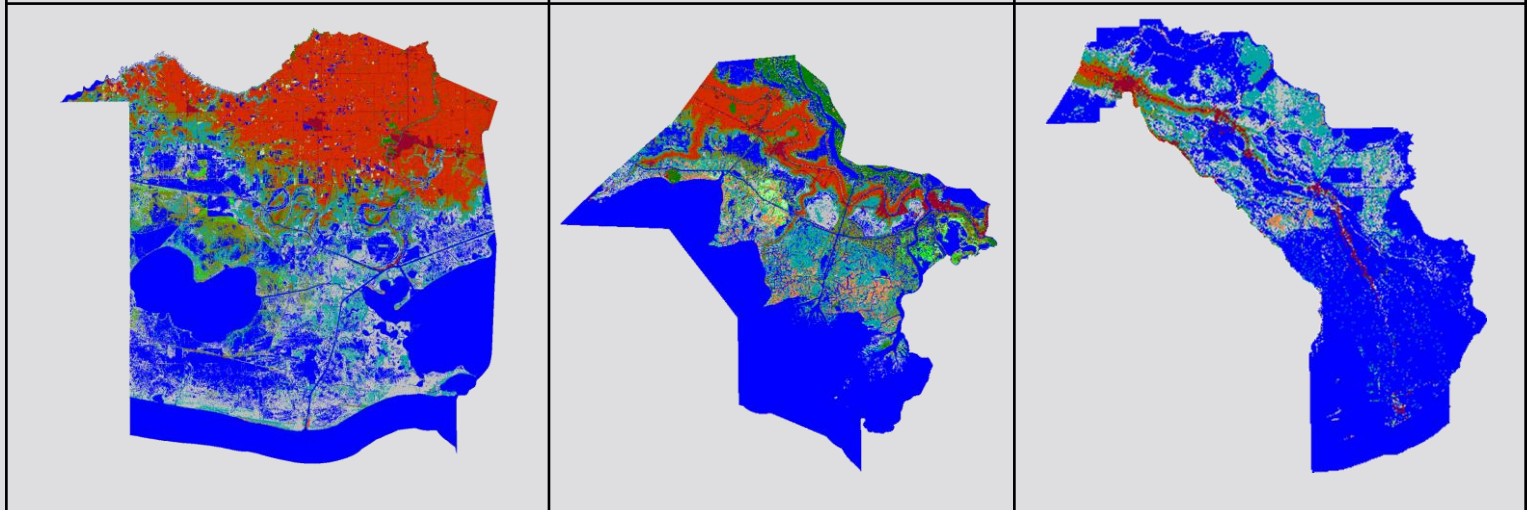
St. Mary

Lafourche

2007

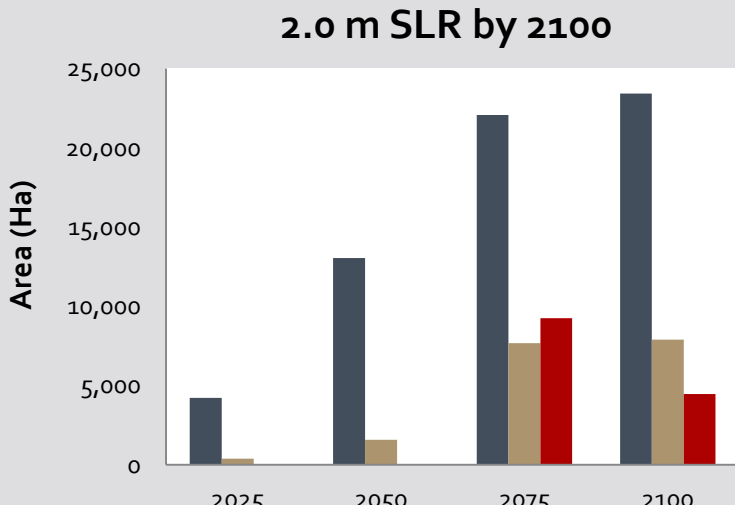
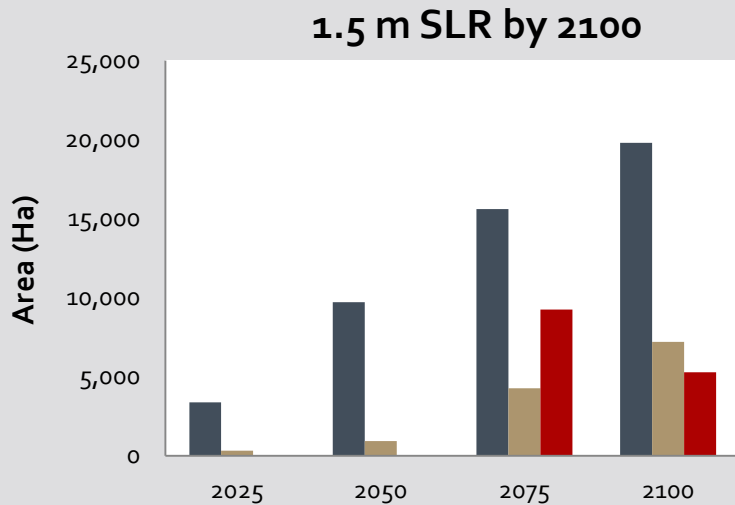
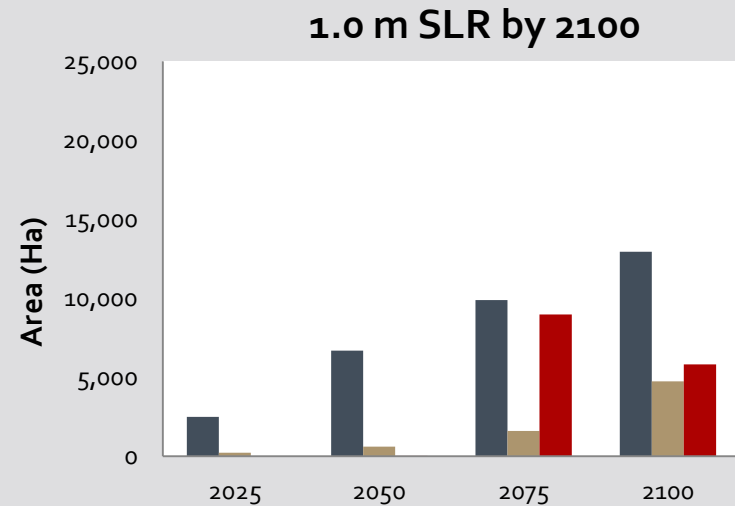
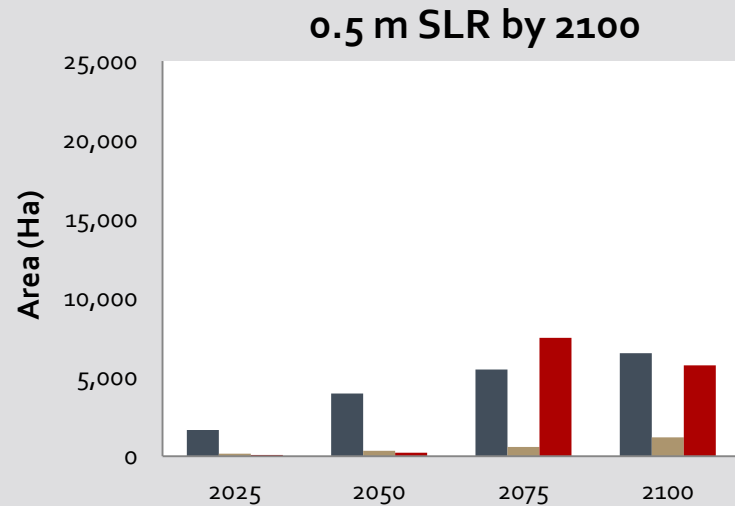


2100



1.5 meter SLR by 2100, No Dike Protection, Low Subsidence

Undeveloped Dry Land Converting to Wetlands



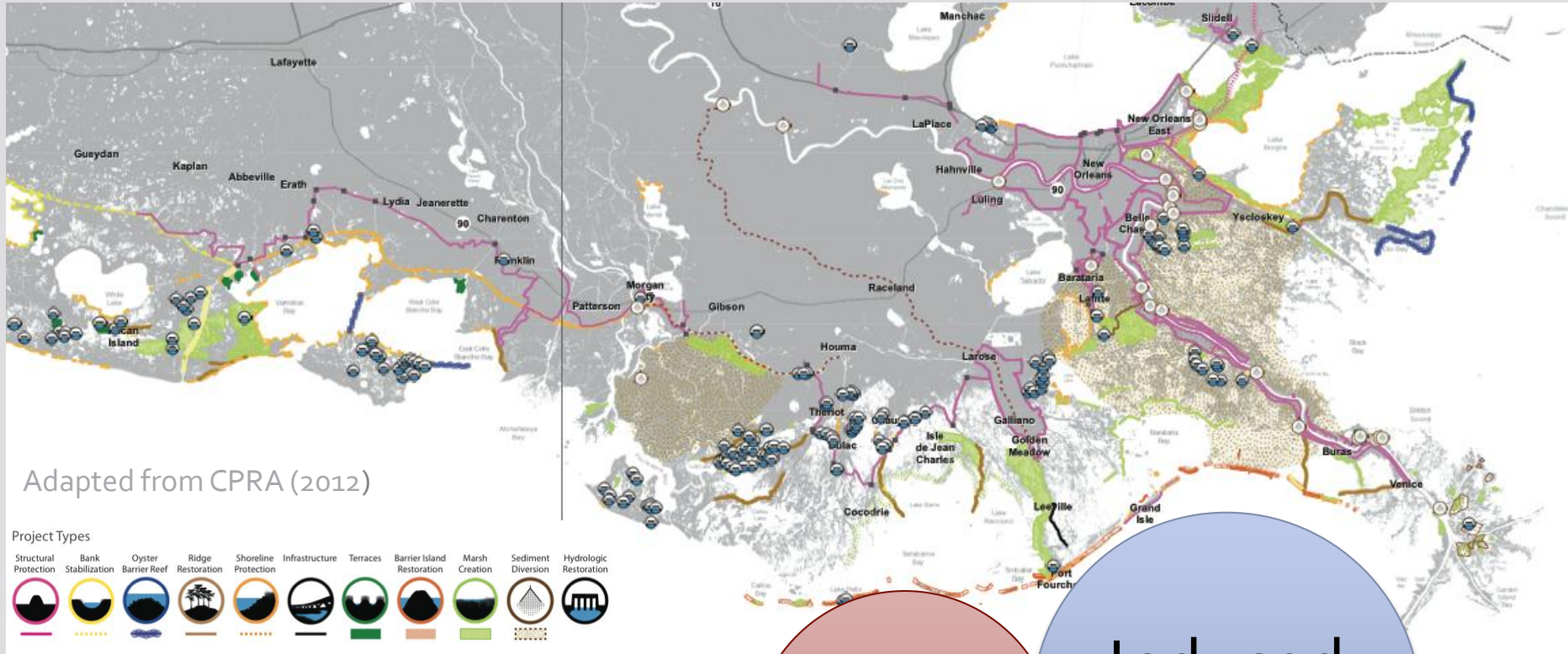
■ Vermilion ■ St. Mary ■ Lafourche

1.5 meter SLR by 2100, No Dike Protection, Low Subsidence

Modeling Results Summary

- Protection of dry land \neq Wetland migration
- Allowing migration may not result in equal benefits across the study sites
- Management decisions must consider variability along the coast

Coastal Protection and Restoration Authority (CPRA)



5-year
Cycle

Induced
Risk

Policy Alternatives

Regulatory Programs

Rolling Easements

Density
Restrictions

Transferable
Development Rights

Voluntary Options

Conservation
Easements

Defeasible Estates

Voluntary
Acquisition

Policy Criteria

Primary

Wetland
Migration

Flood
Risk

Practical

Equity

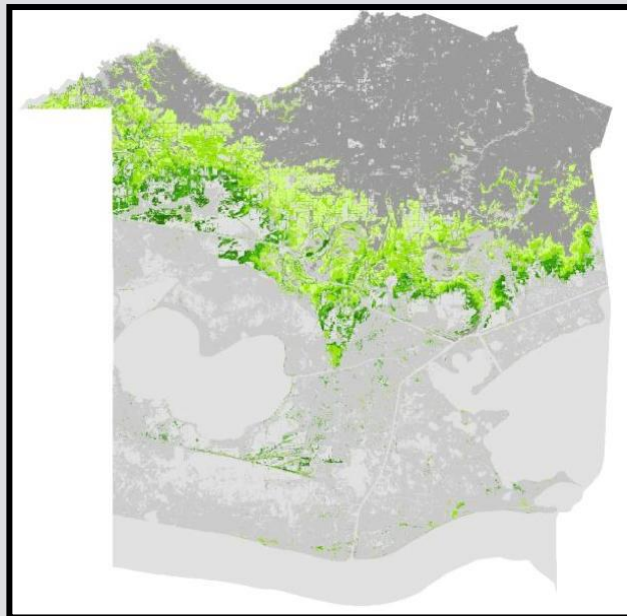
Adaptability

Political
Feasibility

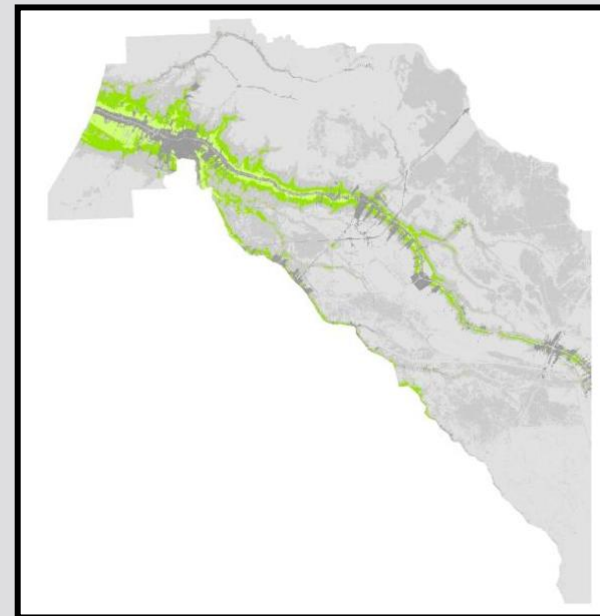
Potential Wetland Migration

	Wetland Gain (sq. mi.)	Wetland Loss (sq. mi.)	% Loss Offset by Gain
Vermilion	76	165	46%
St. Mary	28	106	26%
Lafourche	20	497	4%

Vermilion
Migration



Lafourche
Migration



Using Matrix as Decision Support Tool

Criteria	Sub-Criteria	Regulatory Programs			Voluntary Options		
		Rolling Easements	Zoning Restrictions	Transferable Development Rights	Conservation Easements	Defeasible Estates	Voluntary Acquisitions
Wetland Migration	Prevent Property Armoring	Green	Red	Grey	Green	Grey	Green
	Minimize Development	Grey	Green	Green	Green	Grey	Green
Flood Risk Reduction	Minimize Assets at Risk	Grey	Green	Green	Green	Grey	Green
Equity	Social Equity	Green	Red	Grey	Green	Green	Green
	Protection of Property Rights	Red	Red	Grey	Green	Green	Green
Adaptability	Maximize Flexibility of Outcomes	Green	Green	Green	Red	Grey	Red
Political Feasibility	Regulatory Precedent	Grey	Green	Green	Green	Green	Green
	Popular Sentiment	Red	Grey	Grey	Green	Green	Green

Expect the Unexpected

Public suggestions included in coastal restoration plan

BY AMY WOLD

0 COMMENTS

Tweet 7

March 16, 2012

Recommend

+1 0

The state's draft plan on how coastal restoration and protection will proceed in the next 50 years is going through some changes based on

6

Changes include rethinking levees that have been proposed for Lake Charles in favor of other protection measures, as well as moving some

Louisiana coast, authorities said.

to voice your opinion.

The draft plan v approval from t Louisiana on M approval later t protection proj 50 years.

During the pub coast, state coas some of which administrator o Protection and

As an example, Coastal Protect and residents a levees the plan



Adapted from CPRA (2012)

Advocate Photography

“They don’t particularly want a levee system,” he said.

restoration and protecting the shoreline along the Gulf of Mexico with rocks or other hard materials, he said.

NEWSLETTERS

Breaking News Alerts

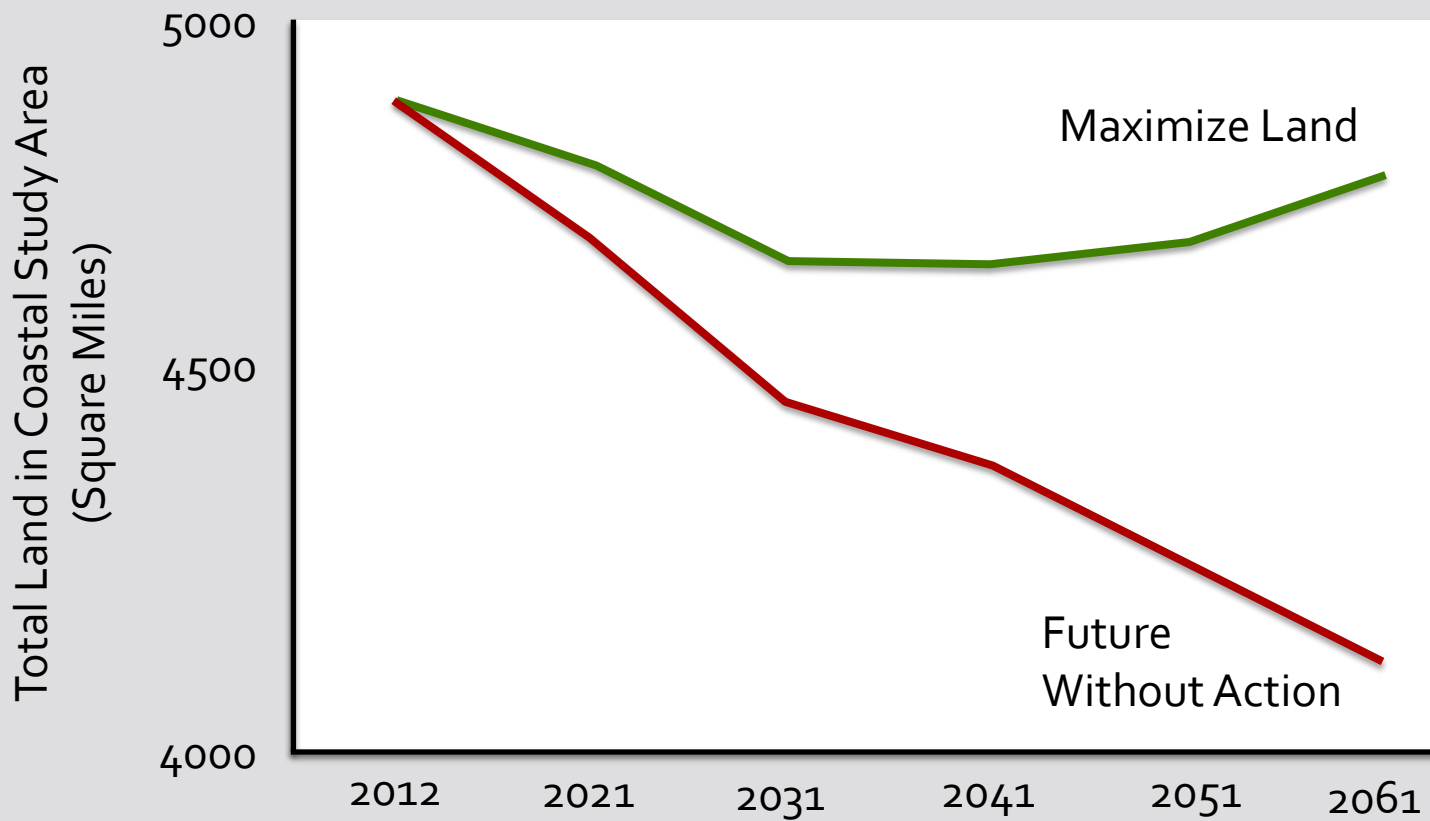
Conclusions

- Wetland migration can reduce, but not fully offset wetland loss by 2100
- Levee protection of undeveloped dry land is the greatest impediment to migration
- HOWEVER removing levees does not help facilitate wetland migration in every case
- A wetland migration policy can help mitigate wetland loss AND address “induced risk”
- Social, political, and environmental factors need to be considered at the finest grain possible

**Thank you for your attention.
Questions?**

Future of Wetland Loss

Optimistic Scenario

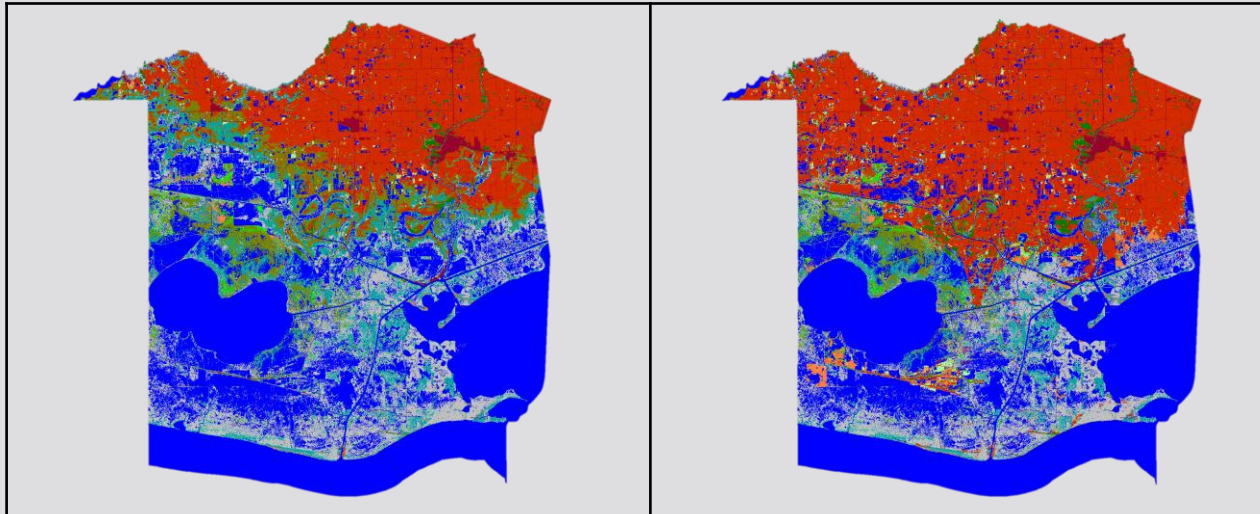


Vermilion Parish in 2100

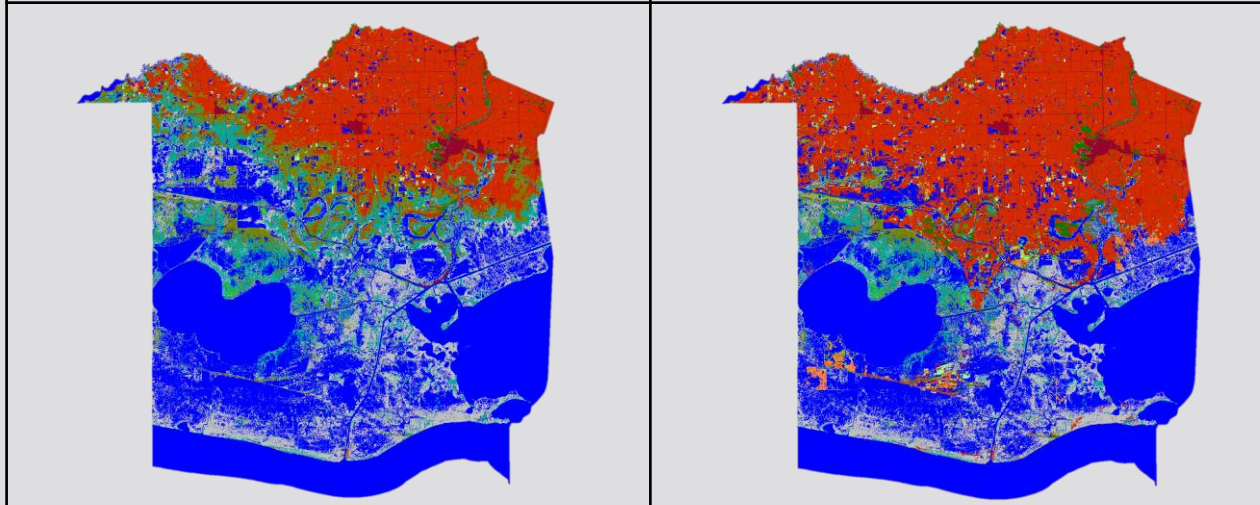
No Dike Protection

Dike Protection

Low Subsidence
(4 mm/yr)



High Subsidence
(6 mm/yr)



1.5 meter SLR by 2100, Low Subsidence

Project Types

Total:
\$50
Billion

\$12.9
Billion

Restoration

Barrier Islands

Sediment
Diversions

Hydrologic
Restoration

Marsh Creation

Structural Protection

Levees

Floodwalls

Nonstructural Protection

Flood Proofing

Elevating
Structures

Voluntary
Acquisition

Wetland
Migration

Policy Approach

Prescriptive



vs.

Exploratory

