THE ROLE OF GEOSCIENCES IN COASTAL COMMUNITY RESILIENCE STRATEGIES: A CASE STUDY AT PORT FOURCHON IN THE MISSISSIPPI RIVER DELTA PLAIN, USA

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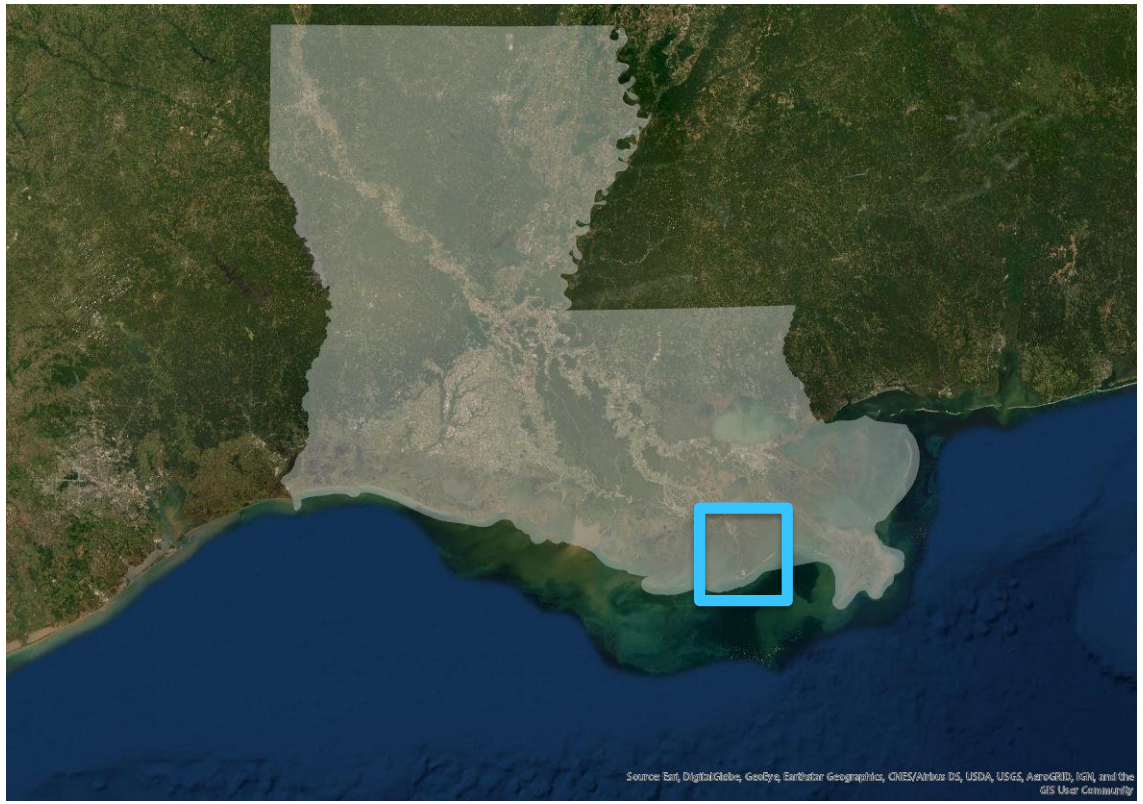
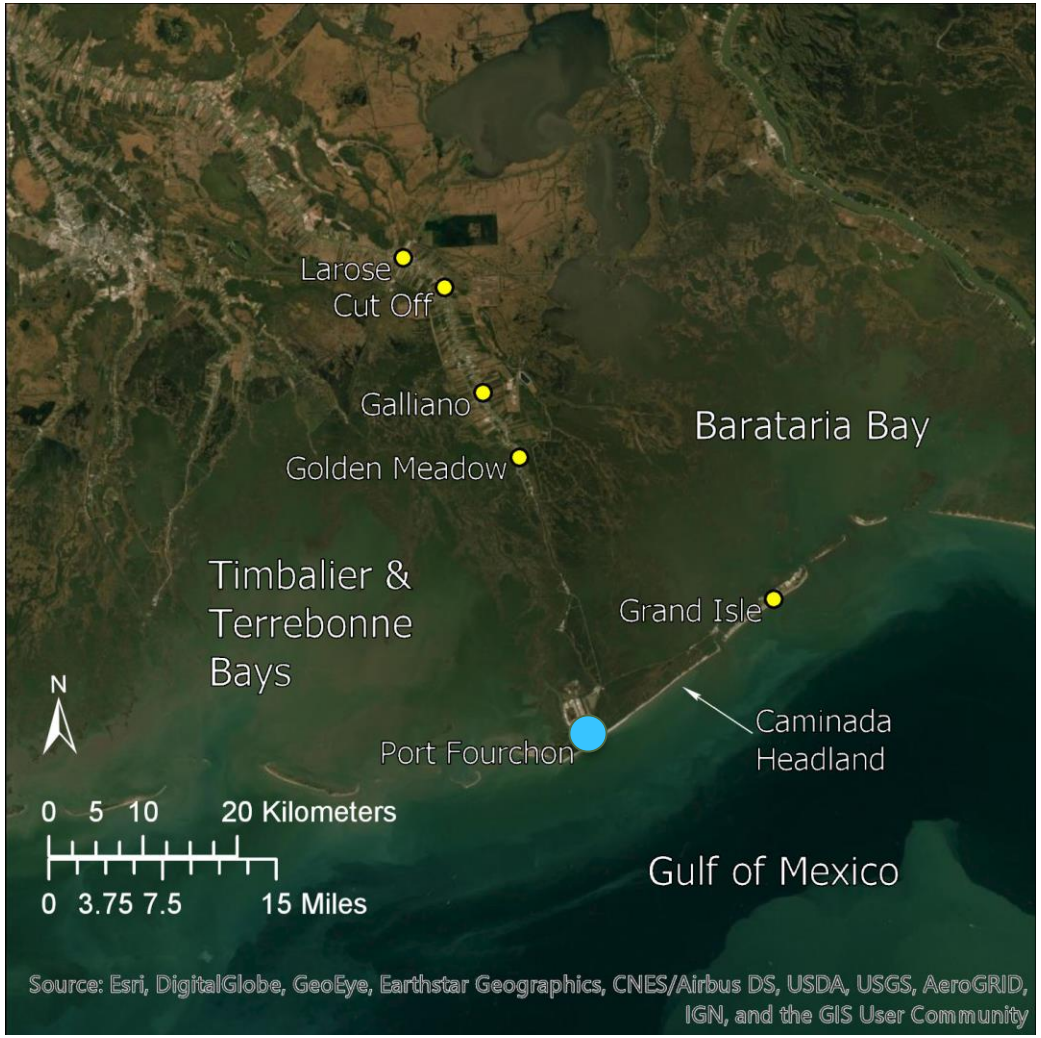
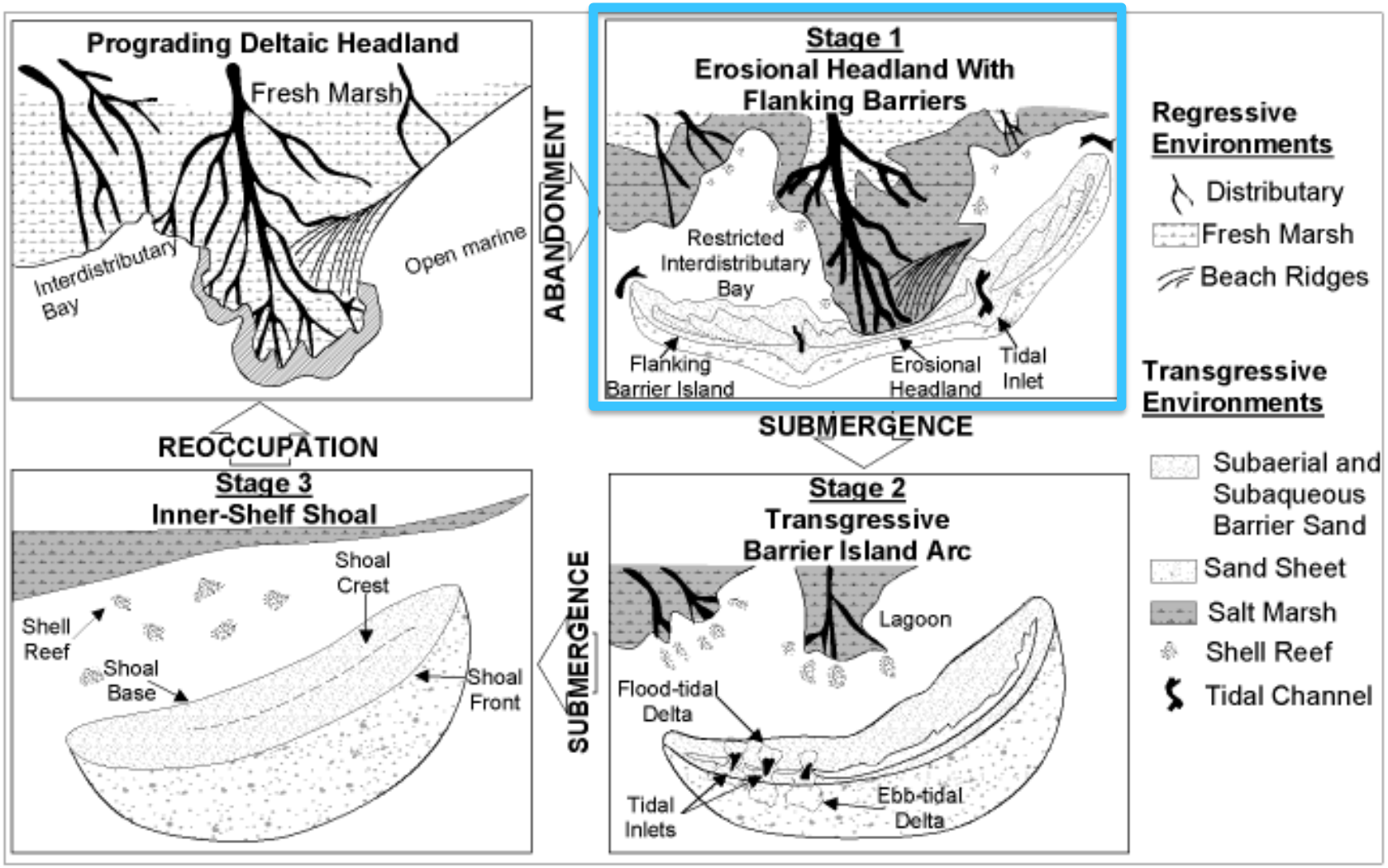
PROJECT AREA

Barataria-Terrebonne Basin Louisiana





GEOLOGIC SETTING

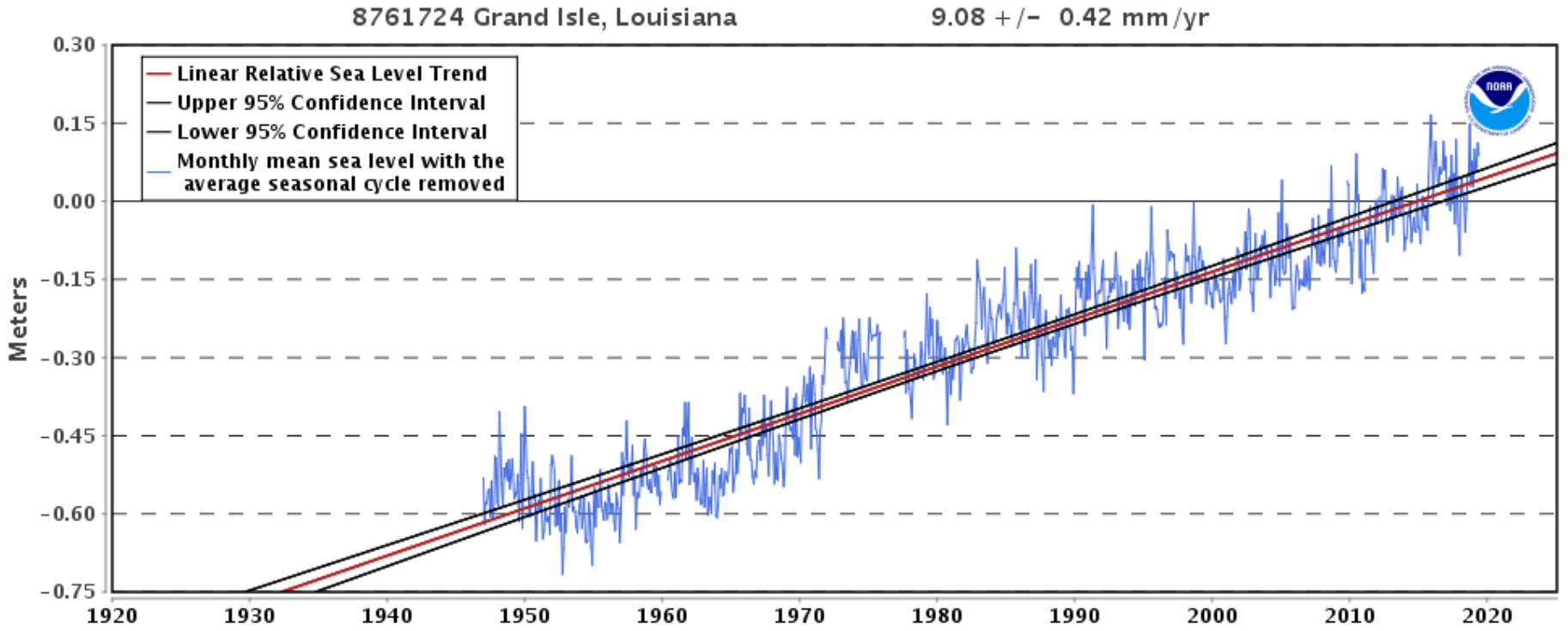


modified from Penland et al. (1988)

RAPID COASTAL EVOLUTION

Highest documented relative sea level rise rate in North America

~9 mm/yr (NOAA 2019)

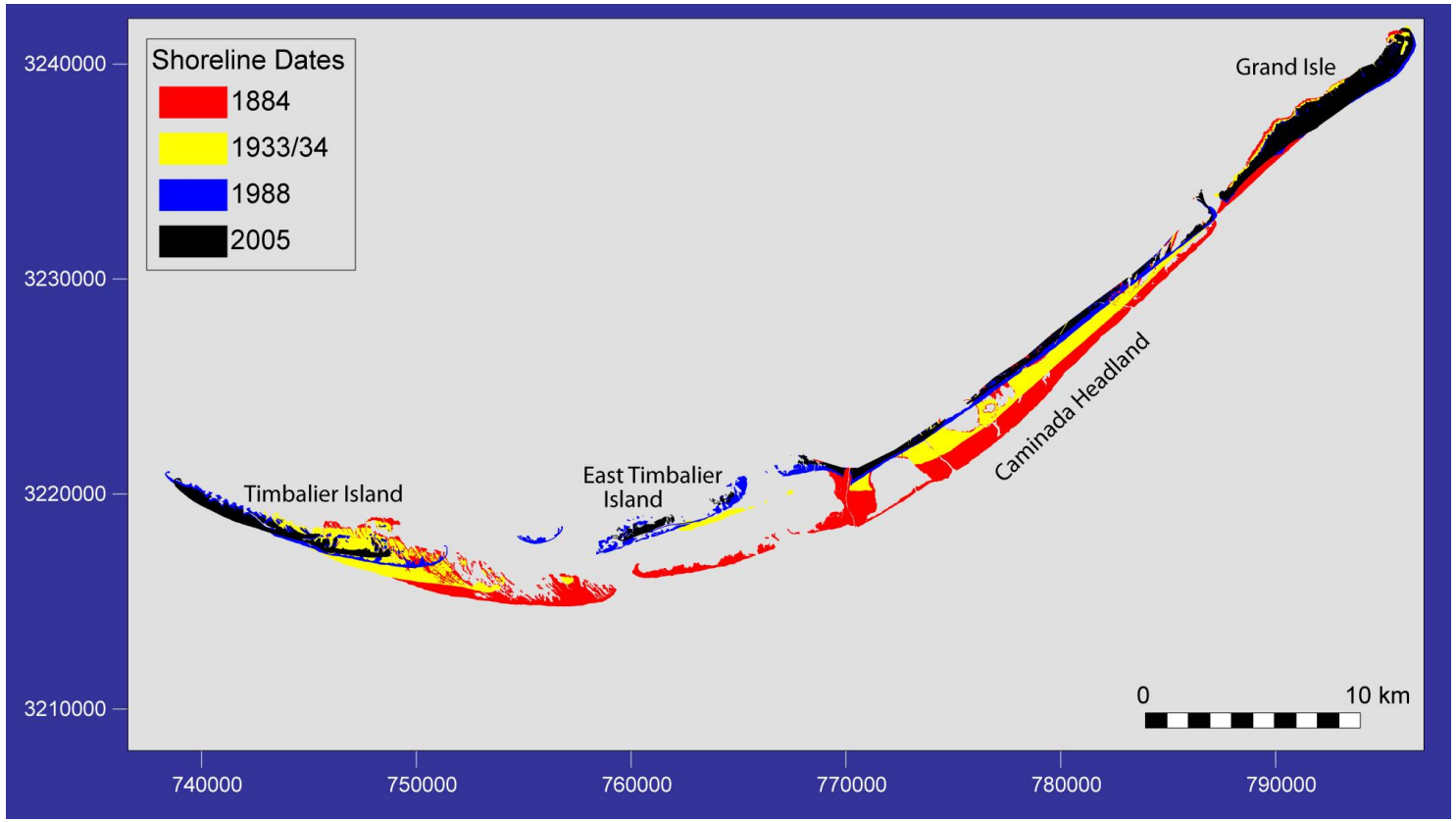


NOAA 2019

RAPID COASTAL EVOLUTION

Highest documented shoreline retreat rate in North America

~3 km/century (Miner et al. 2009)

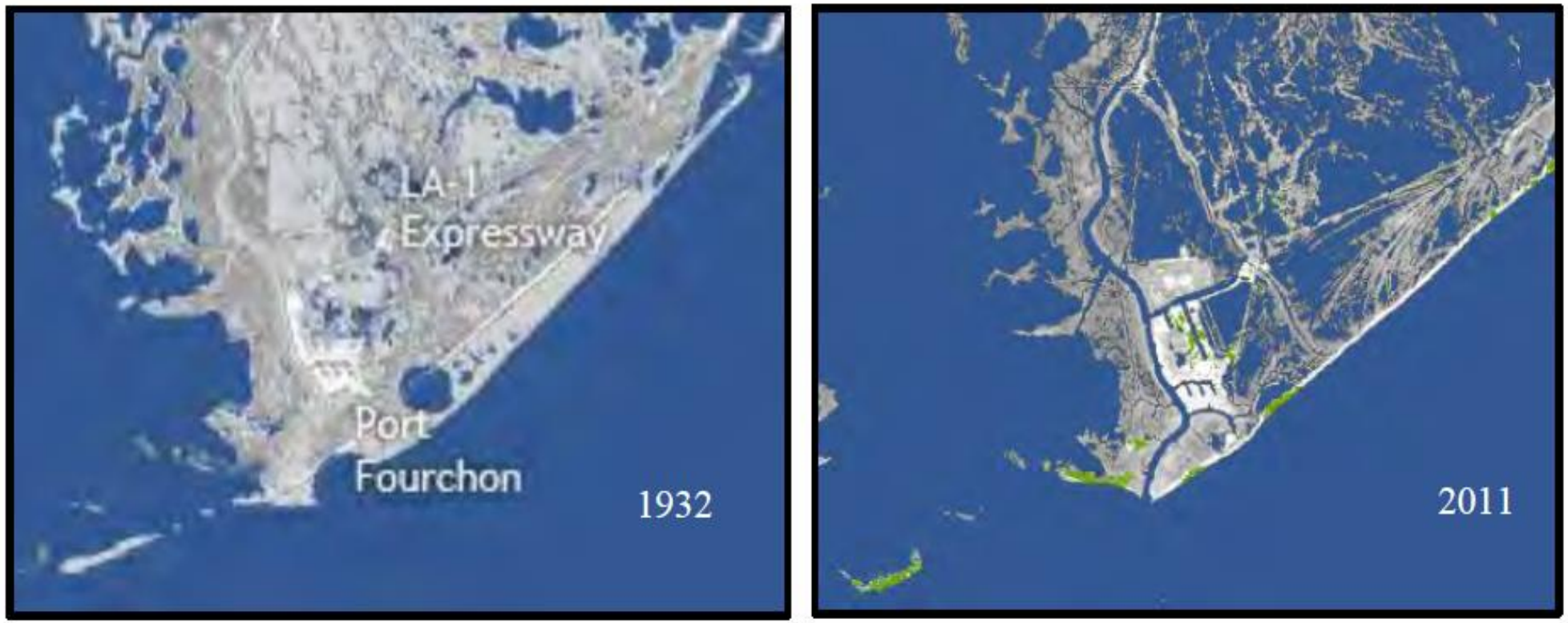


Miner et al. 2009

RAPID COASTAL EVOLUTION

Highest documented land loss rate in North America

~28 km^2/year for 1932 – 2016 (Couvillion et al. 2017)



Belle Pass draft EIS

ECOLOGICAL SETTING

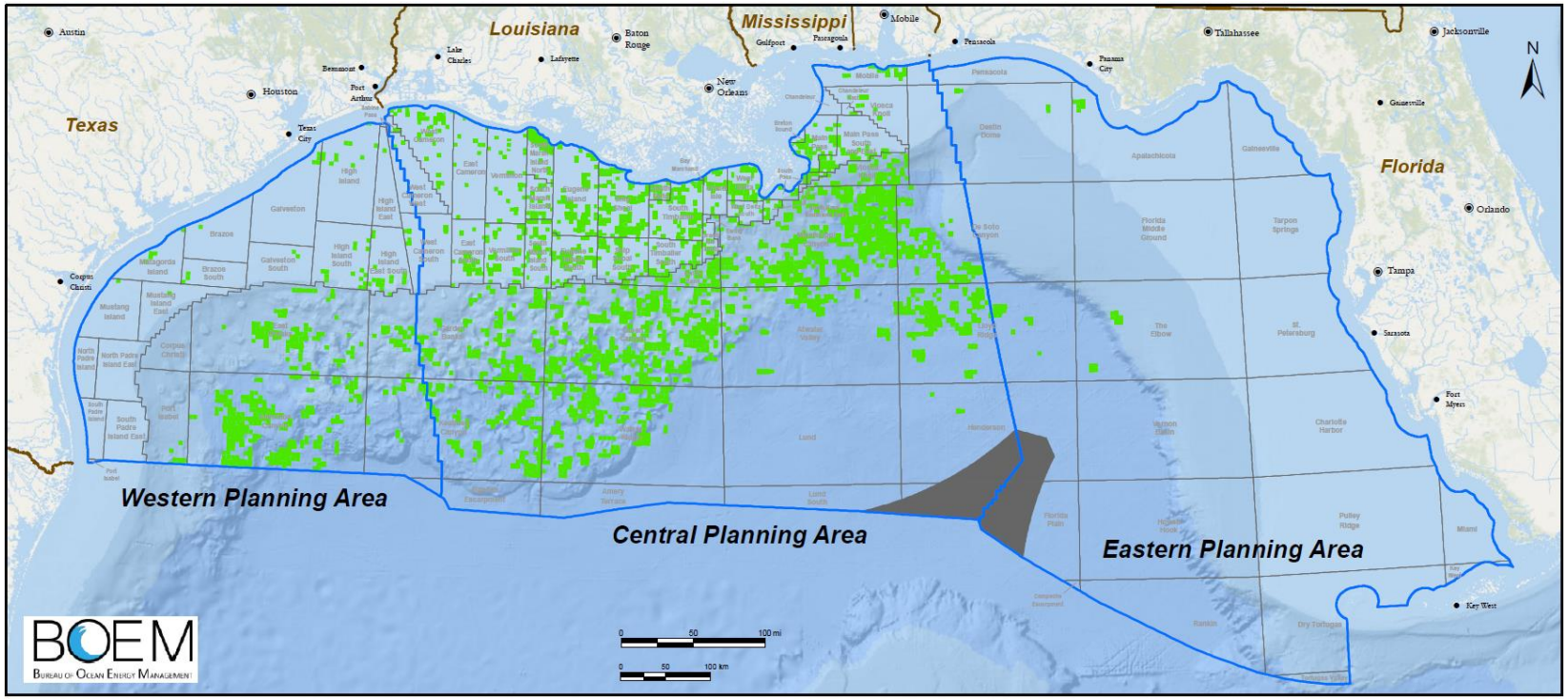
High ecological value

- Marsh and beach habitat
- Fisheries
  - eg: shrimp and oysters
- Migratory bird stop over

MOTIVATION

High economic value

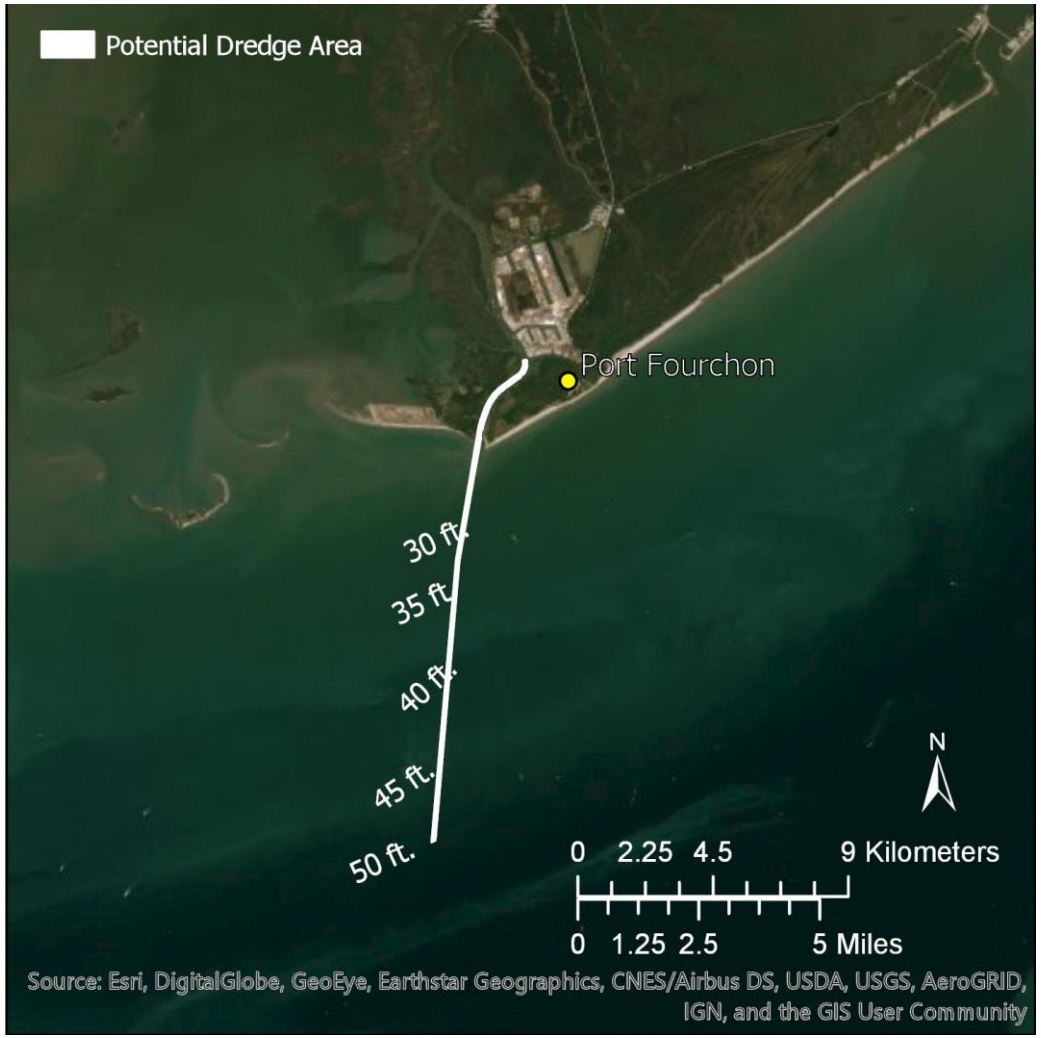
- Strategically located to support offshore oil and gas industry
- Over 90% of U.S. Gulf of Mexico offshore oil and gas activities are serviced in Port Fourchon
- There is a need to develop an adaptation plan for the next 3 decades.



MOTIVATION

Channel Dredging

- Increase depth of the Belle Pass channel to allow larger ships to access the Port
- Create a rig repair facility to service deep water vessels
- Generate 20 million cubic yards of sediment suitable for marsh creation
- Sediment starved system
  - Need ecosystem-based approach to sediment management

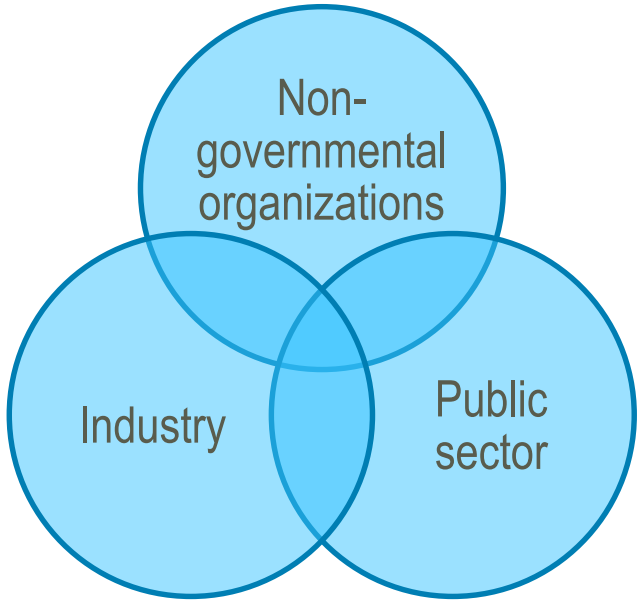


PUBLIC PRIVATE PARTNERSHIP

Partnership for Our Working Coast

- Combine the resources and expertise of public, private, and non-governmental organizations to enhance coastal habitat and provide protection to critical infrastructure and communities.

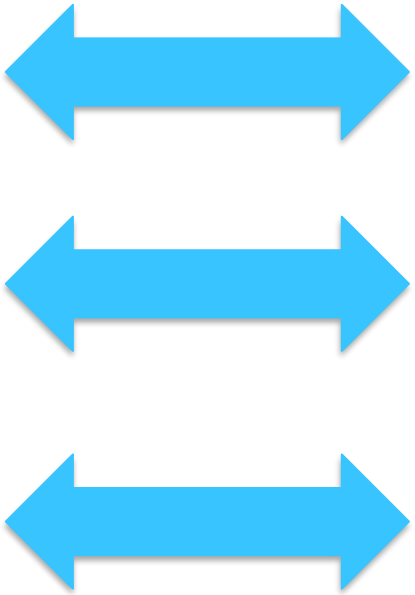
PARTNERSHIP FOR OUR WORKING COAST



TRANSDISCIPLINARY

Water Institute Interdisciplinary Team

- Geologists
- Ecologists
- Modelers
- Geographers
- Anthropologists
- Urban Planners



Stakeholders

- Port representatives
- Workers at Port Fourchon
- Port tenants
- Local teachers
- Area residents
- Local non-profits

(*sensu* Rice 2013)

METHODOLOGY

Goals

- Protect infrastructure
- Promote ecosystem services
- Enhance community risk and resilience
- Promote carbon sequestration

Nature Based Approach

- Build wetlands, not seawalls
- Use scientific method to:
  - Prioritize and optimize the type, size, location, configuration, and character of wetlands constructed
  - Maximize project benefits, life-span, and ecosystem function

METHODOLOGY

Activity 1: Develop Risk and Resilience Framework

- Identify stakeholder group: snowball sampling approach
- Create community risk and resilience framework
- Workshop #1 with stakeholder group

METHODOLOGY

Activity 2: Data Collection and Initial Model Development

- Data collection
- Initial model development
  - 30-year Landscape Evolution Simulations
  - Delft3D with Integrated Biophysical Model
    - Hydrodynamics, nutrient and vegetation dynamics, morphodynamics
  - Empirical morphodynamic model
    - Barrier headland and island evolution
- Simulations will include:
  - Future with no action
  - Wetland creation (3-4 alternative scenarios)
  - Sea-level rise
  - Storms (ADCIRC and SWAN)

2050?

METHODOLOGY

Activity 3: Participatory Modeling and Future Scenario Development

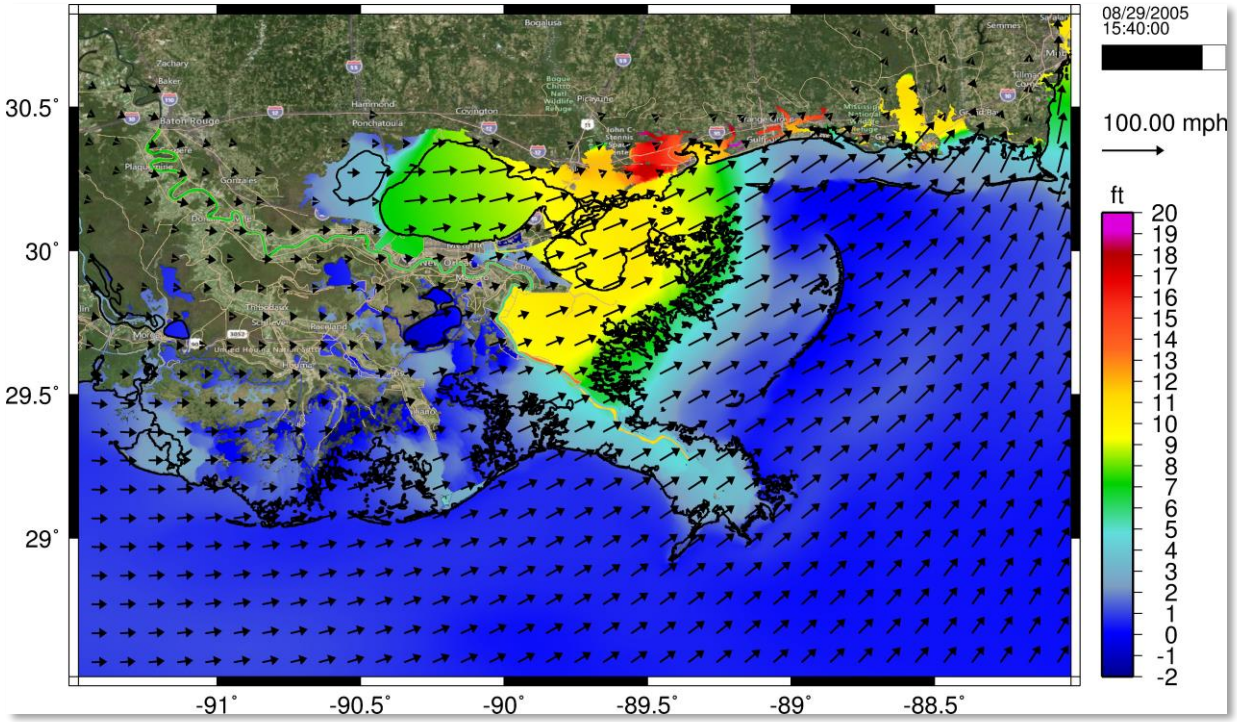
- Workshop #2 with stakeholder group
- Model refinement based on stakeholder input and other field data
- Workshop #3 with stakeholder group
- Finalize future scenarios and project alternatives for further evaluation

(Hemmerling et al. in press)

METHODOLOGY

Activity 4: Project Evaluation and Prioritization

- Model simulations for alternatives and future scenarios
- Social Return on Investment Analysis
- Final project evaluation and prioritization



(Meselhe et a. in press)

METHODOLOGY

Activity 5: Risk and Resilience Assessment Tool and Preliminary Project Design

- Workshop #4 to share results
- Create preliminary project design
- Risk and Resilience Assessment Report

CONCLUSIONS

- Plan for interdisciplinary and transdisciplinary work from the beginning.
- Involve all team members in key decisions.
- Stakeholder engagement is central to project organization and occurs at multiple points during the process.
- Incorporate stakeholder engagement in meaningful ways.

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THANK YOU

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REFERENCES

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PORT FOURCHON


OCEAN EVOLUTION

PROJECT MOTIVATION

- Historical and projected land loss demonstrates importance of optimizing beneficial use of limited sediment resources.

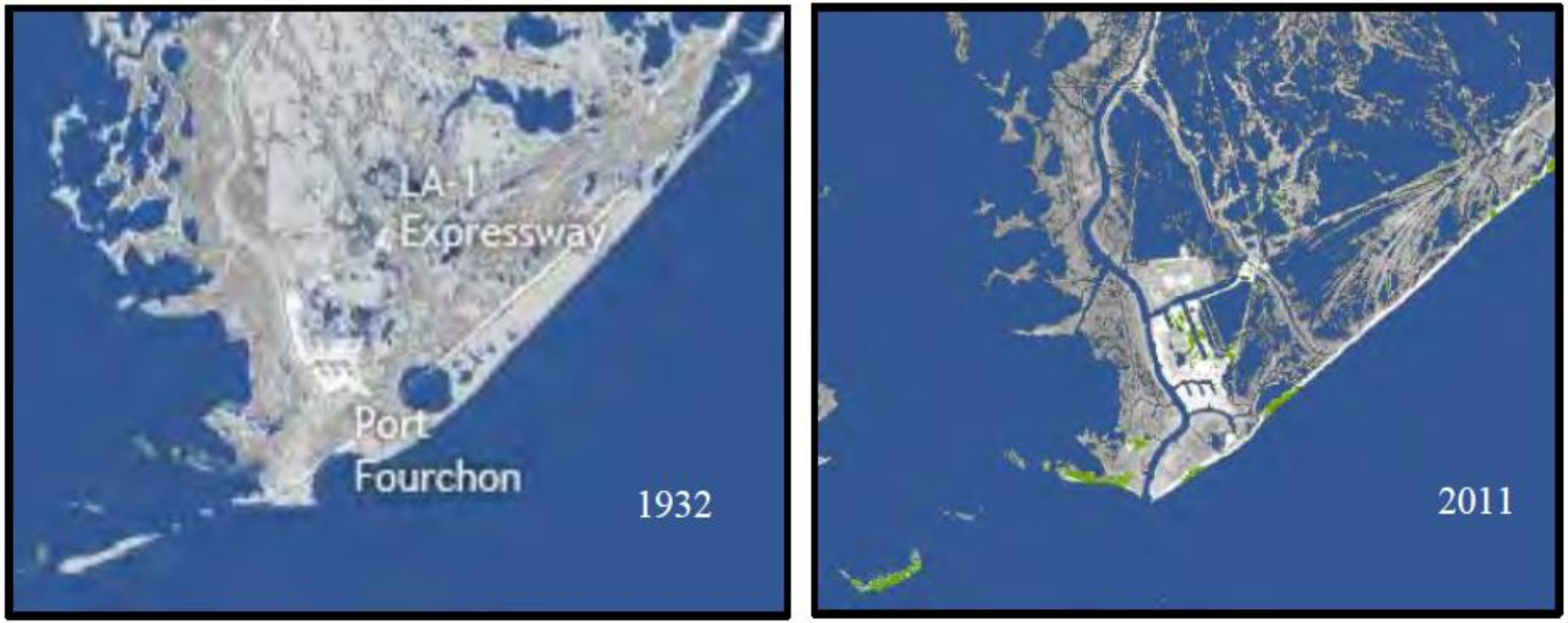

Figure from Belle Pass draft EIS