

# **Wicked R&D Problems: Coastal Texas Protection and Restoration Feasibility Study**

## **CSRM and ER Proposed Measures**

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Natural and Nature-Based Features Workshop**

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# A Road Map for Today

*"A beginning is the time for taking the most delicate care that the balances are correct."*

—Frank Herbert  
*Dune* (1965)

1. Where we are in the study
2. Proposed Plans
3. Problems & Opportunities
  - **Sea Level Rise - Sustainability**
  - **Hybrid Solutions – Will they work?**
  - **Ecosystem Goods & Services – Metrics (Non-monetized & Monetized)**
  - **Resilience Indices – Metrics Again**
  - **BU Mapping & Regional Sediment Mgmt**



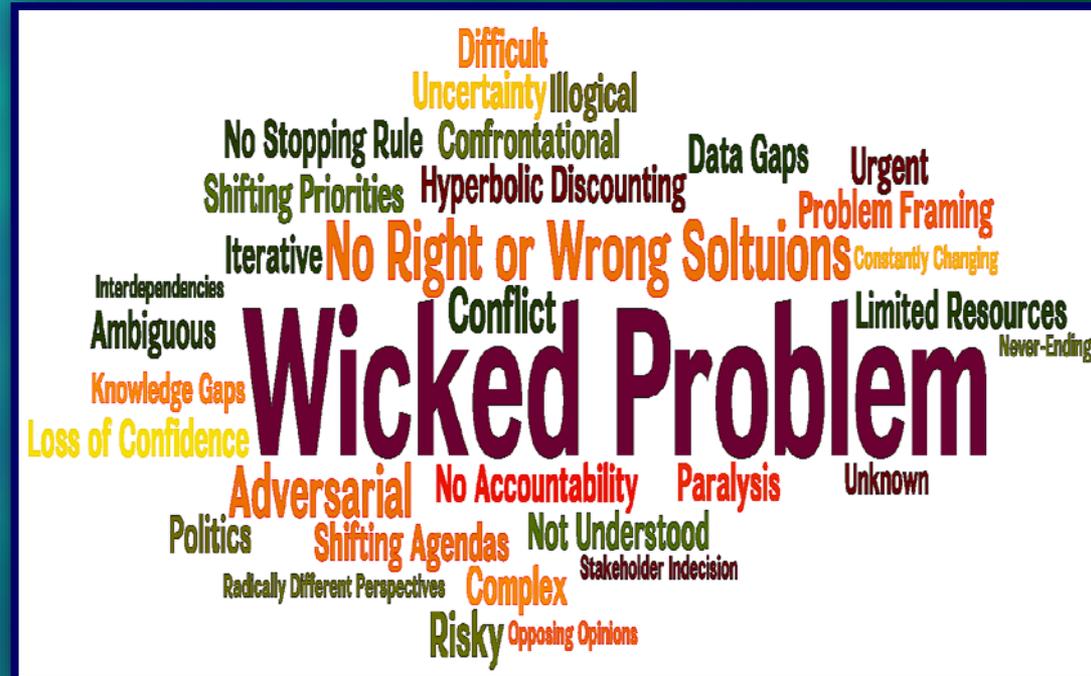
# Research Questions Behind the Study

- **How to plan** and implement effective protection and restoration plans for hundreds of miles of TX coastline over the long-term (50-100+ years) when shifting, oftentimes conflicting political, social, and ecological agendas influence the decision outcomes?
- **How to measure success** when ecosystem integrity or system wholeness cannot be assured and **SUSTAINABILITY** is questioned in the face of urbanization and climate change (specifically SLR)
- **How to efficiently integrate** data, models and expert knowledge in a transparent manner that is prescriptive (sufficient, relevant, and reliable), visually engaging (promoting rapid communication), and adaptive (proactively responsive to uncertainty) in dynamic decision making environment over the long-term?
- **How to effectively engage** stakeholders and scientists alike in formulating sustainable and resilient solutions?



# The Overarching Concern

- **Wicked problems** like this cannot be resolved in time solely with hard science or technical solutions – their complexity mandates rapid & prescriptive R&D to fill knowledge gaps and promote transparency and confidence in the proposed solutions.

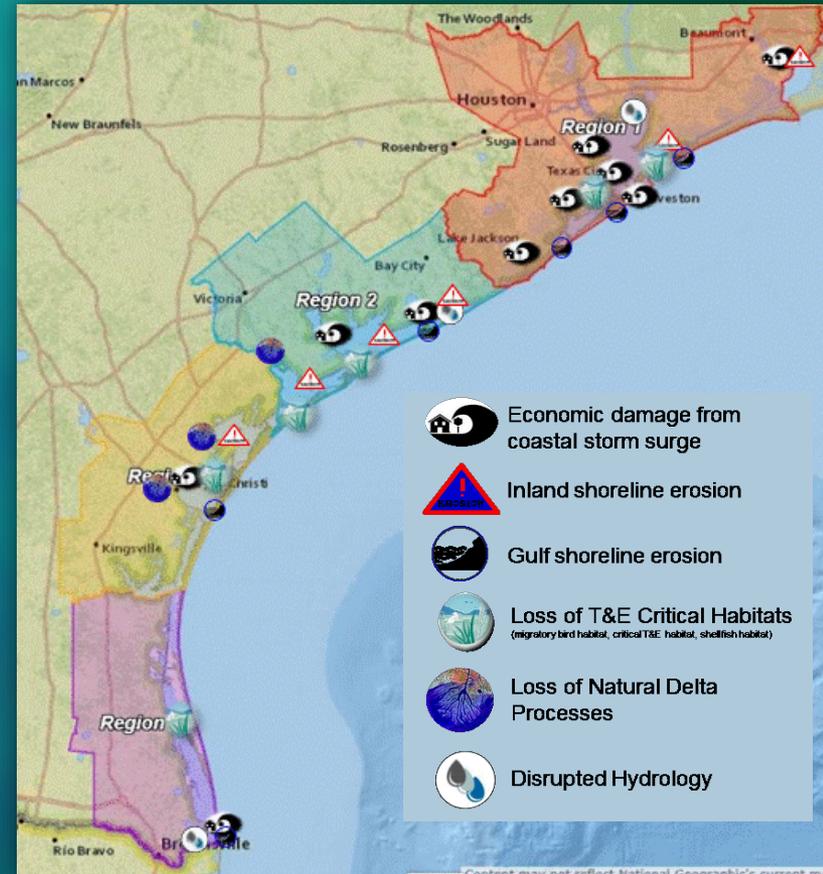


*“Wicked problems have numerous intervention points, have consequences difficult to envision, and are surrounded by a dynamic uncertainty wrapped in a moving frontier of knowledge.”*

—Ioannis Petrus, 2009

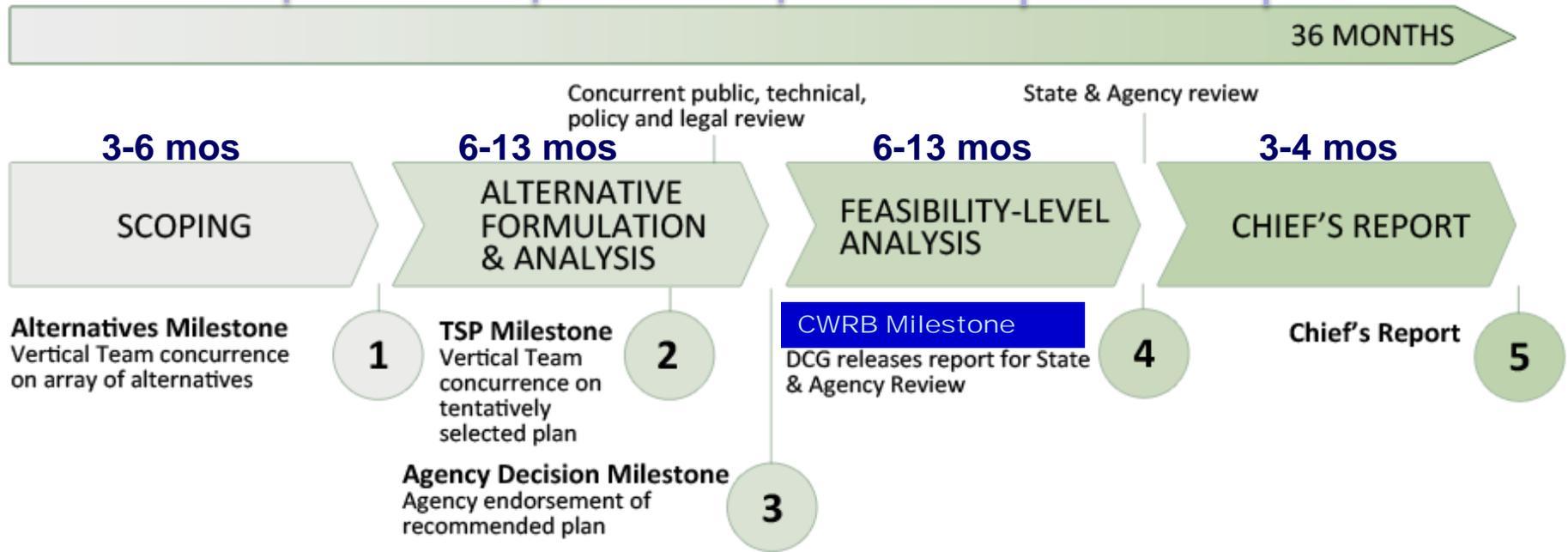
# Overarching Themes for the R&D Agenda

- **System-Based Approach** requires creative problem solving and critical thinking at both the strategic (future-oriented) and tactical (near-term) scales and encourages a systems-level characterization of ecosystem integrity based on scientifically-defensible performance metrics comparing/contrasting potential interventions and adaptively managing solutions
- **Spiraling framework** utilizes an interactive group approach that encourages stakeholders to identify problems, deliberate, propose solutions and respond to contextual changes in recursive reflection cycles (centered around information presented at each workshop/web meeting)
- **Transdisciplinary teams** draw knowledge not only from academic researchers coming from different unrelated disciplines, but also from experiential perspectives garnered from non-academics in applied disciplines (e.g., natural resource managers, end-user groups and the general public)



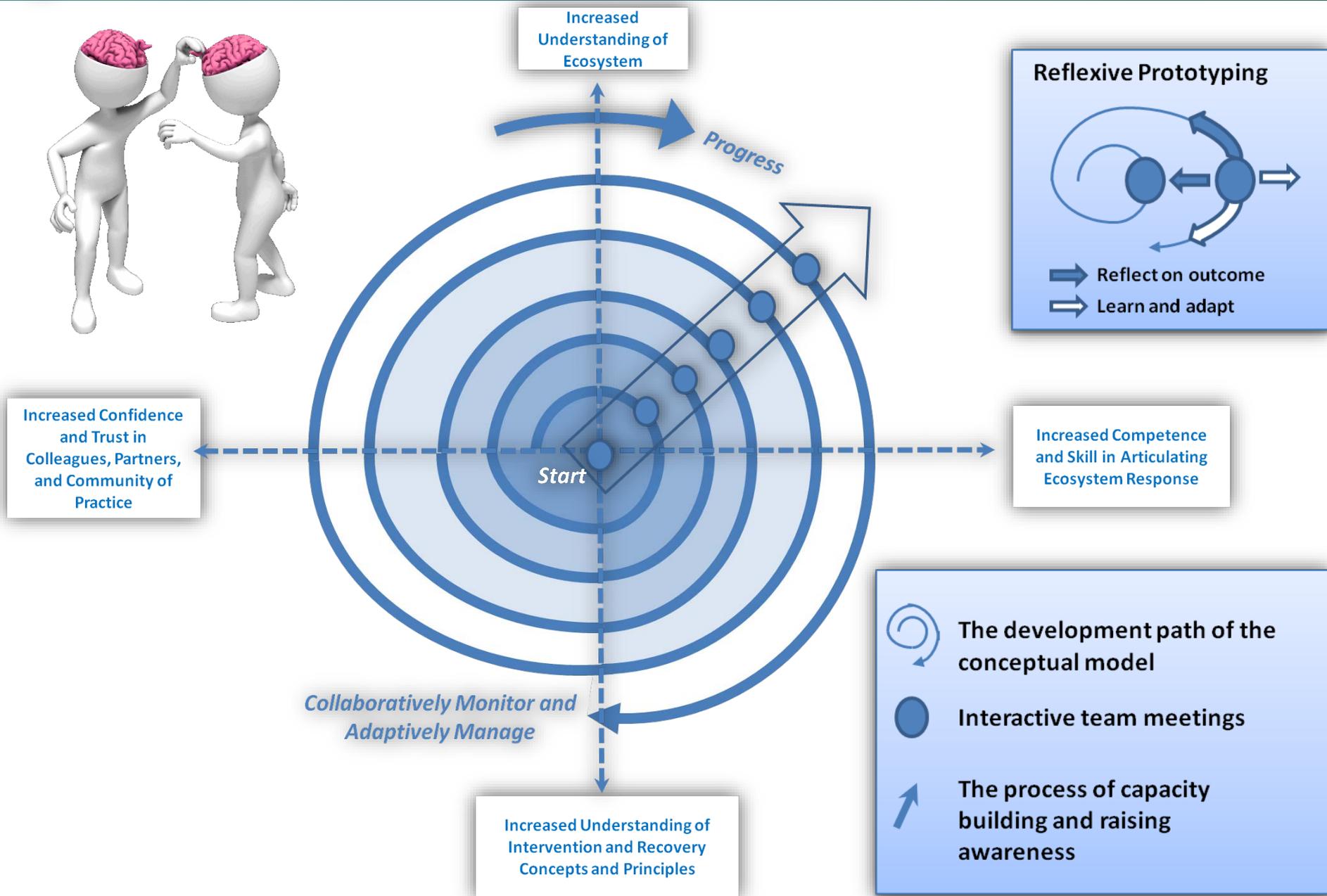
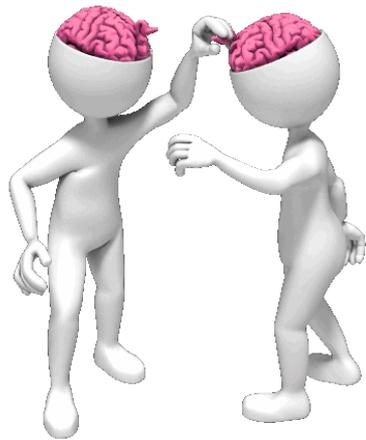
# SMART Feasibility Study Process

In-Progress Reviews (IPRs) as needed

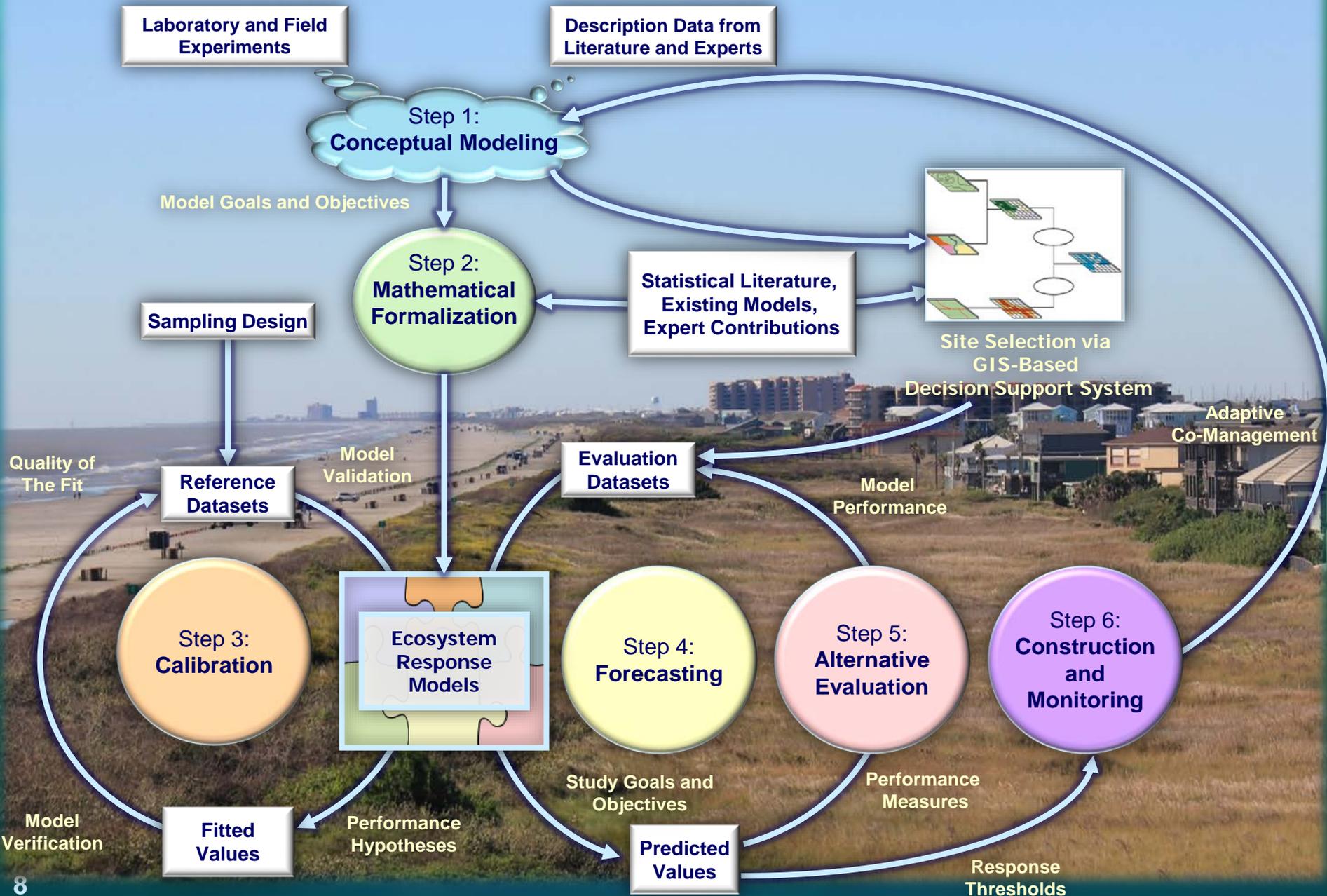


- Apply critical thinking throughout the study
- Develop the Feasibility Report as you go
- Target Completion: No more than 3 years for Chief's Report

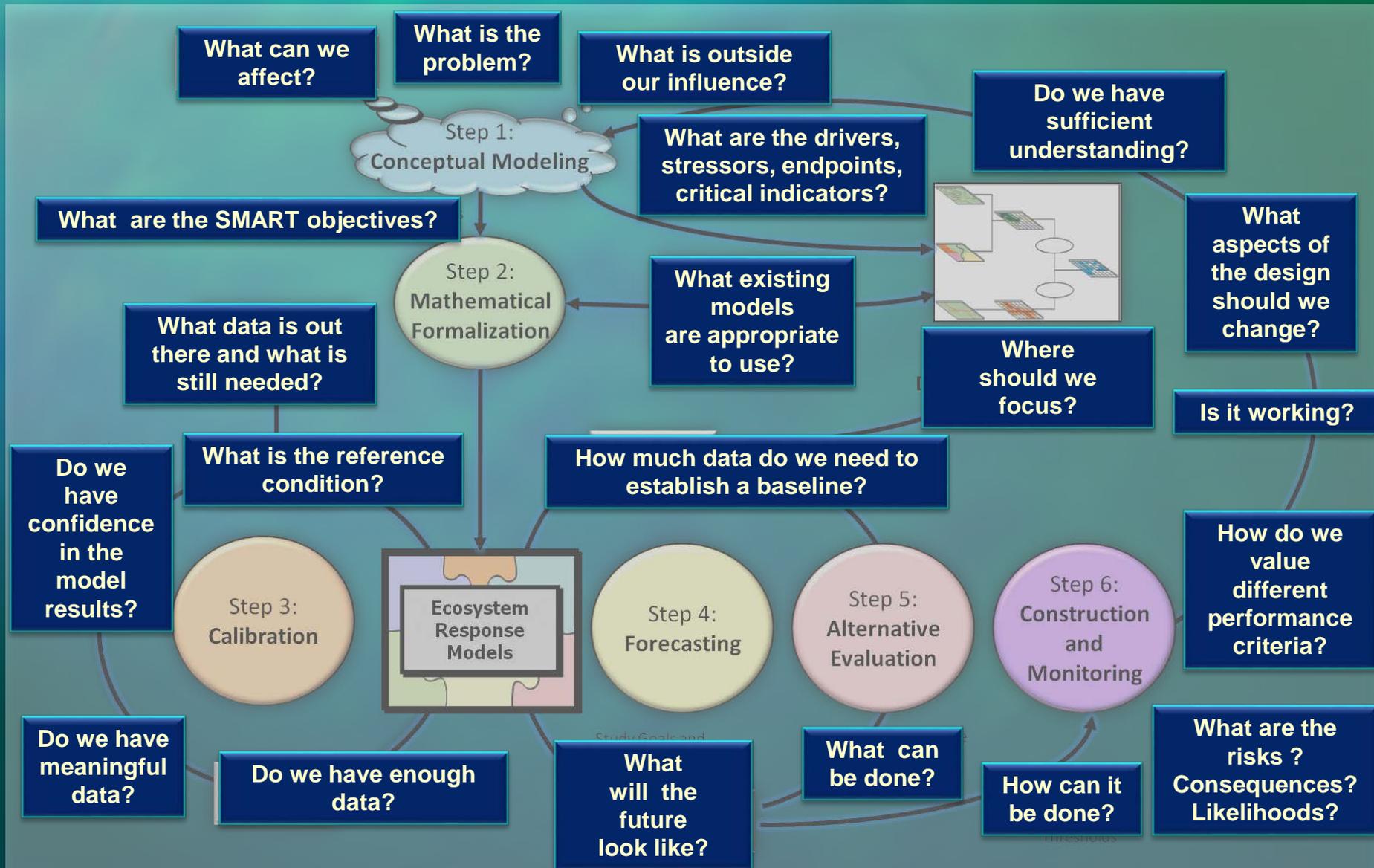
# Spiral Framework in Action



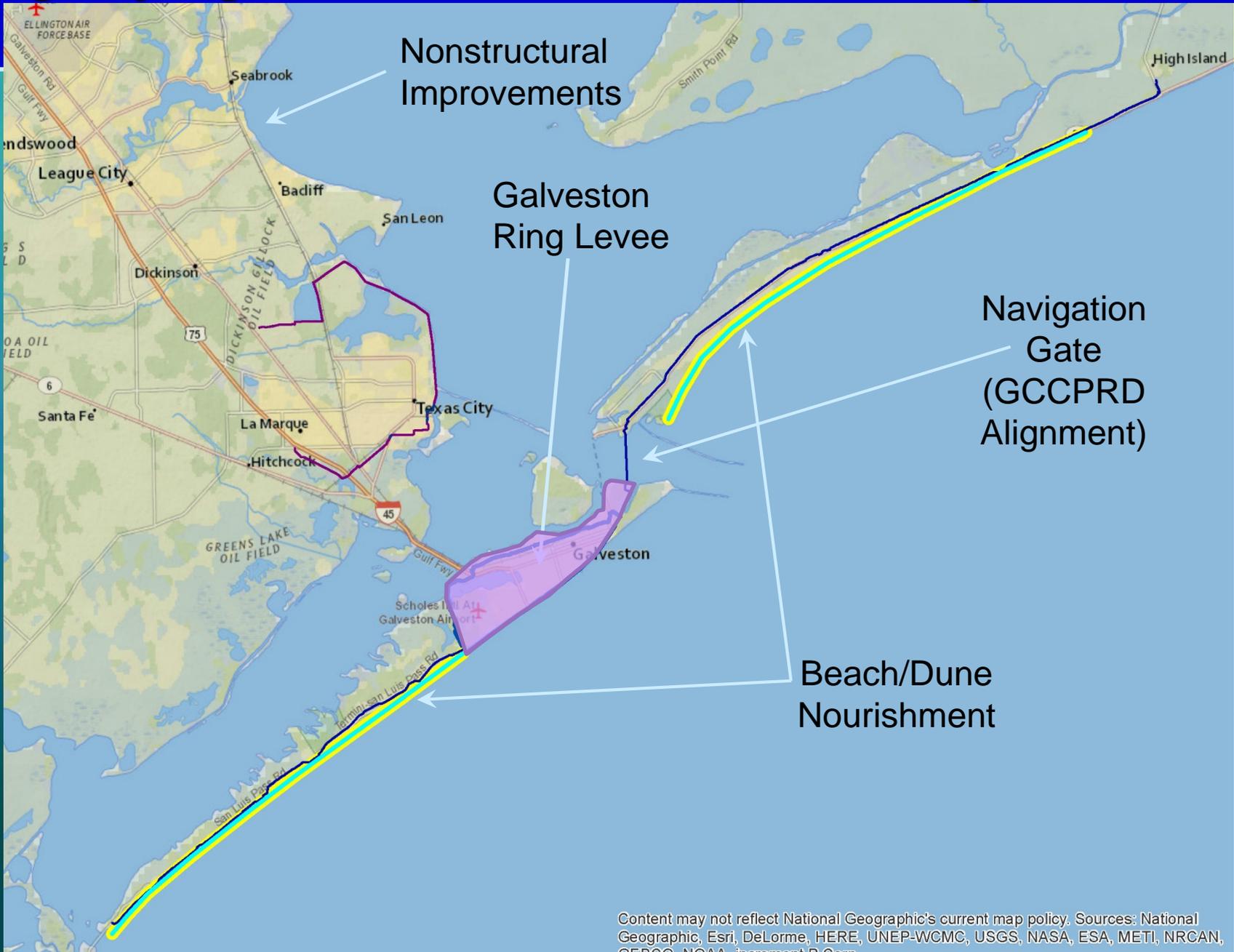
# Ecosystem Assessment Framework



# All the BIG questions

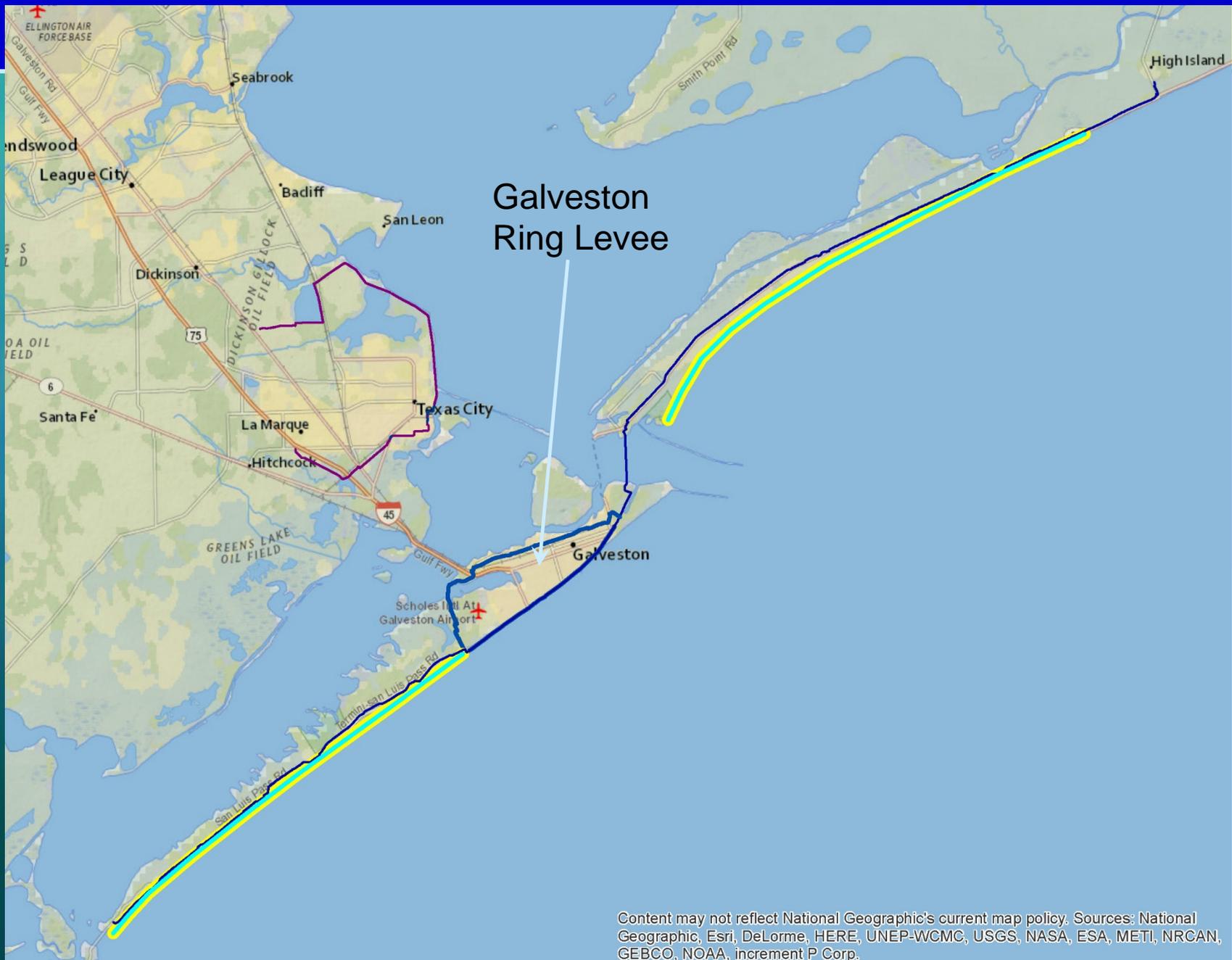


# Planning Example Region 1: Alternative A - Coastal Barrier/Nonstructural System



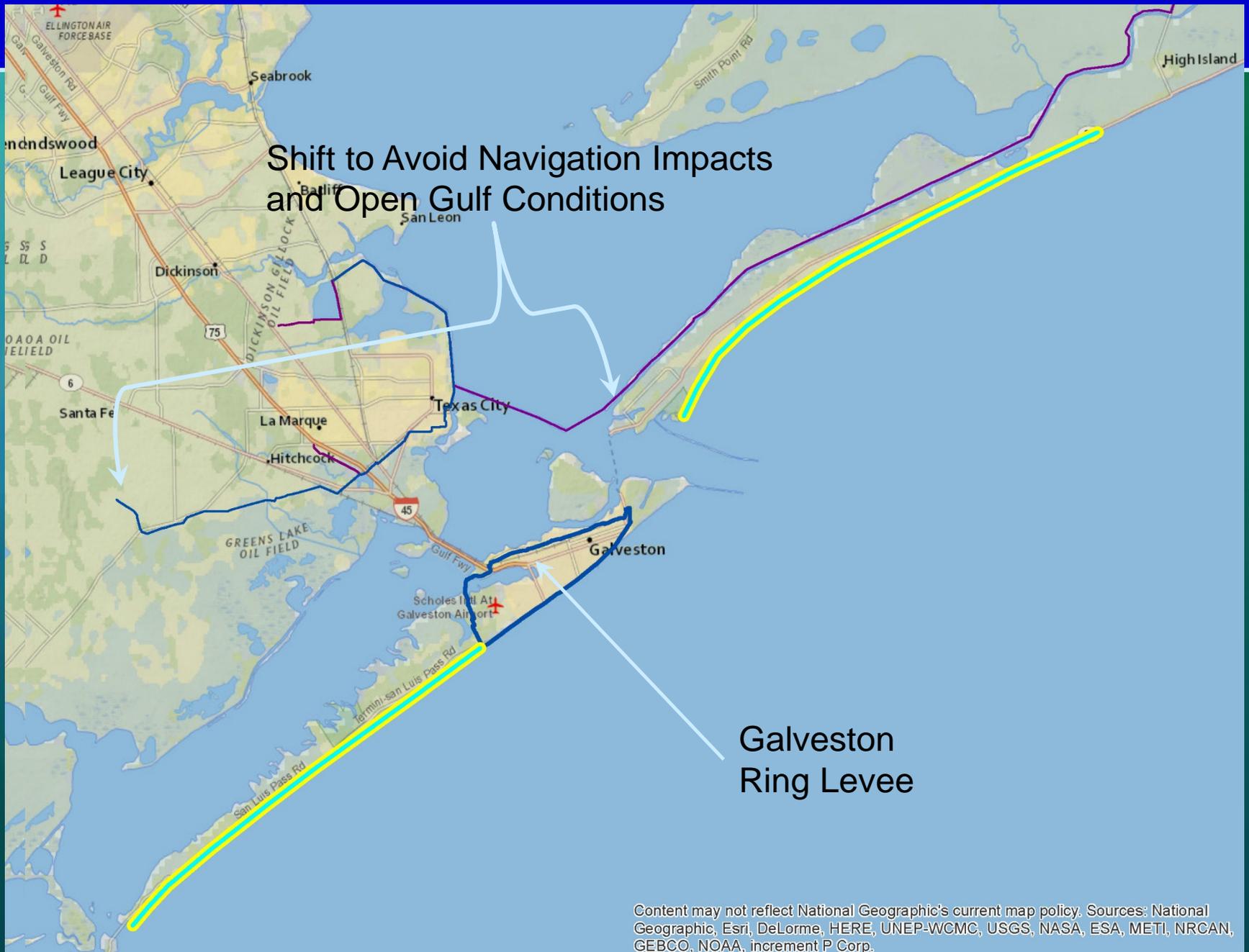
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# Planning Example Region 1: Alternative B - Coastal Barrier



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# Alternative B - Coastal Barrier (Eng. Workshop Discussions)



Shift to Avoid Navigation Impacts  
and Open Gulf Conditions

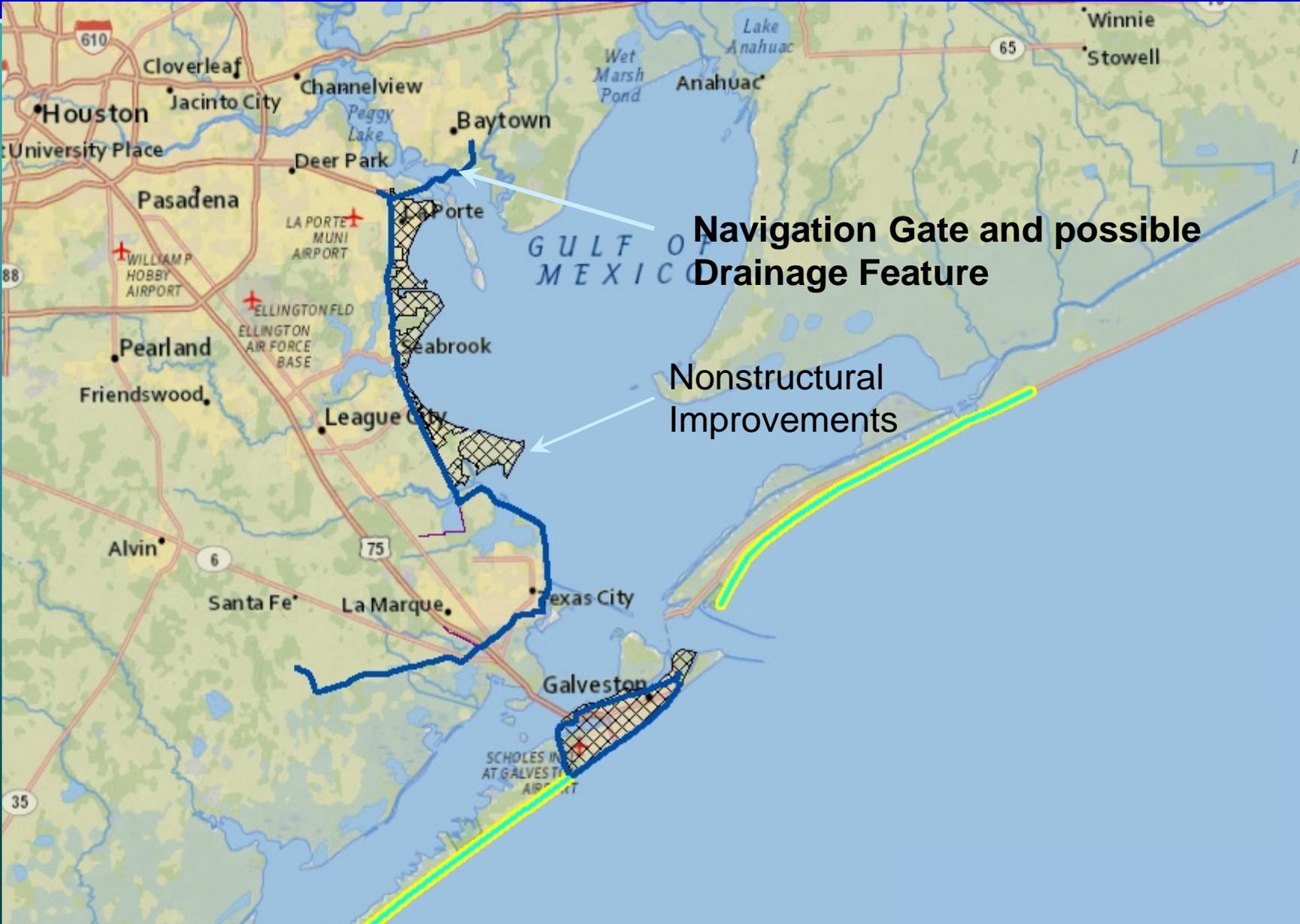
Galveston  
Ring Levee

# Planning Example Region 1: Alternative C – Mid Bay



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# Planning Example Region 1: Alternative D Upper Bay Barrier/ Nonstructural System

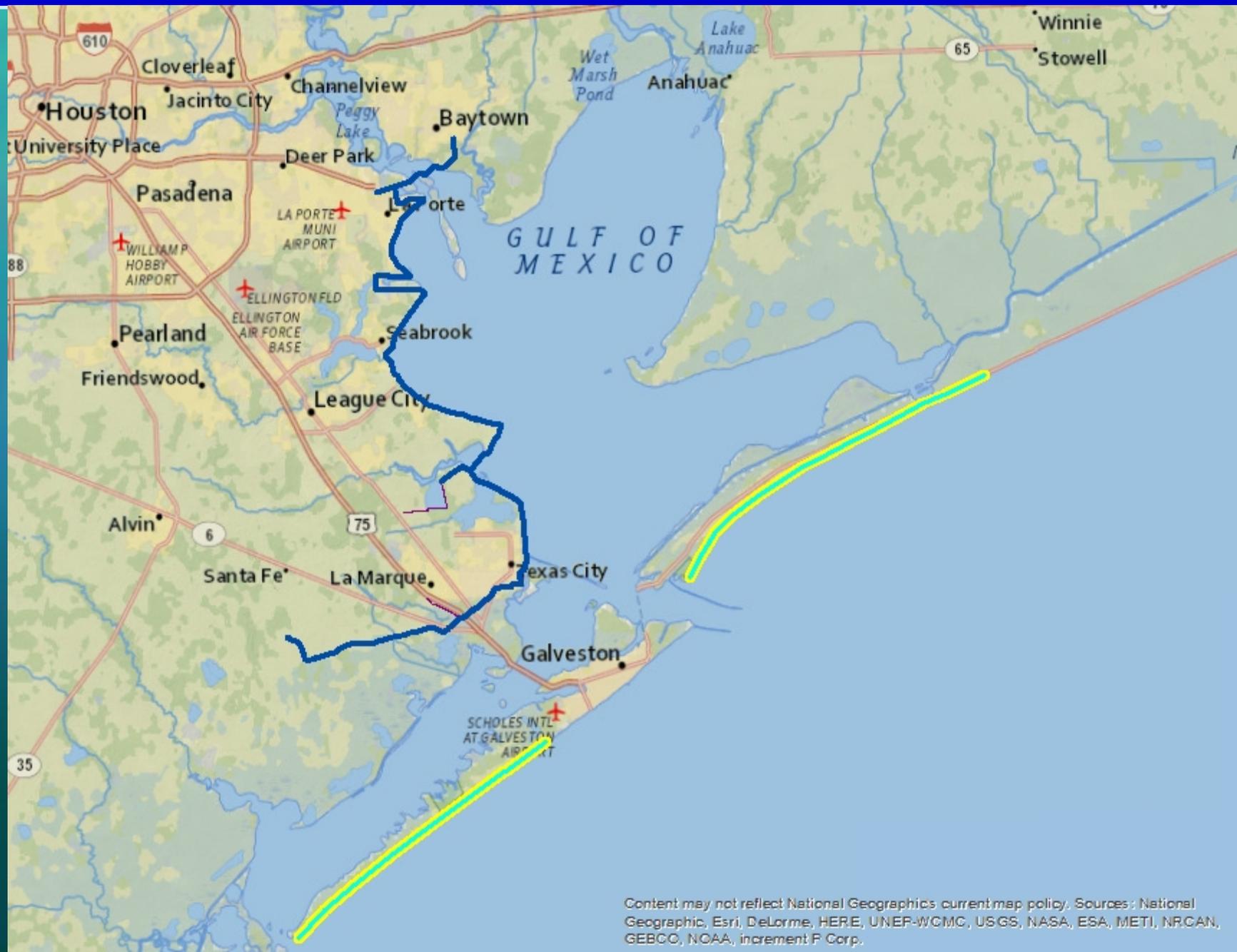


**Navigation Gate and possible Drainage Feature**

**Nonstructural Improvements**

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# Planning Example Region 1: Alternative D - Options Reviewed based on GCCPRD Comments



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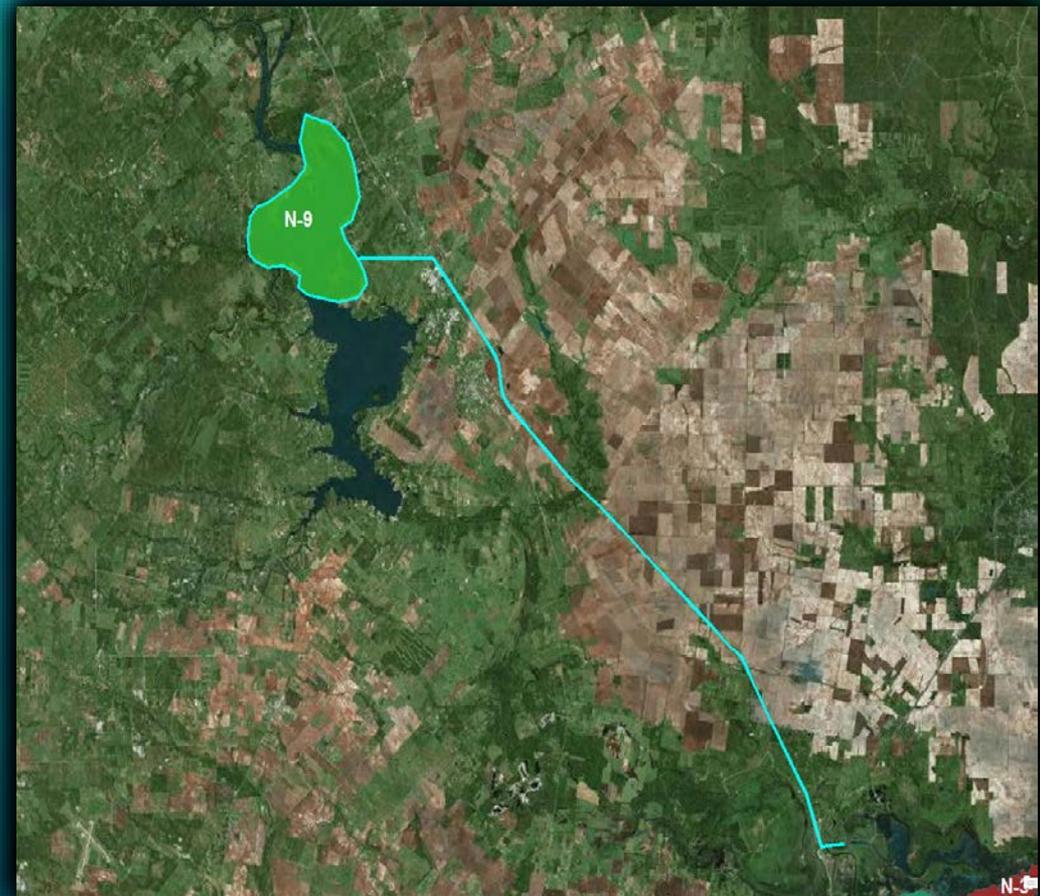
# Conceptual Ecological Model

# Coastal TX Plans to Date

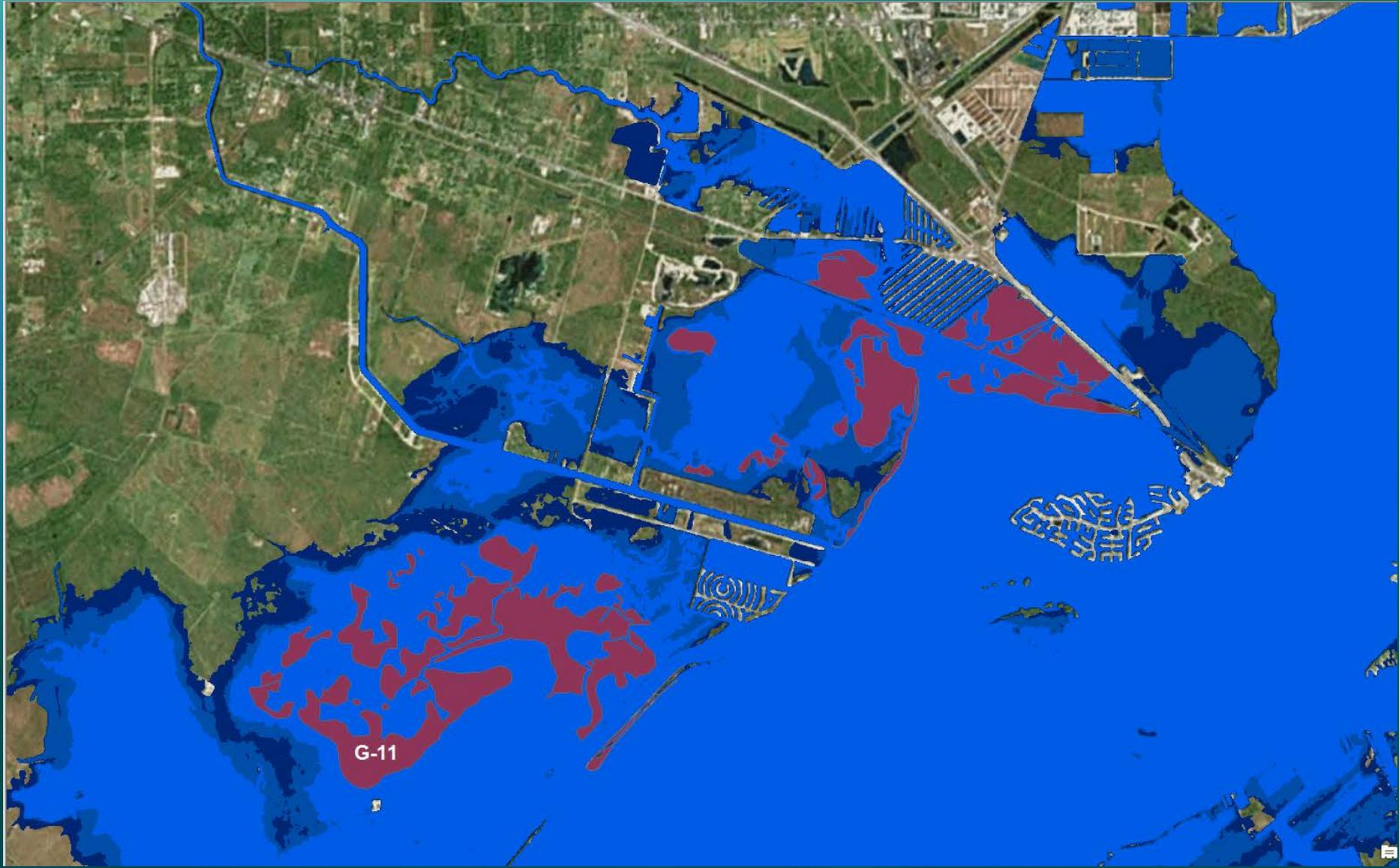
## Ecosystem Restoration Plans

### Multiple Lines of Defense:

- Wetland Restoration
- Dunes and Beaches
- Hydrologic Restoration
- Island Restoration
- Revetment/Breakwaters
- Sediment Bypass & Sediment Management



# Sustainability in the face of threats?



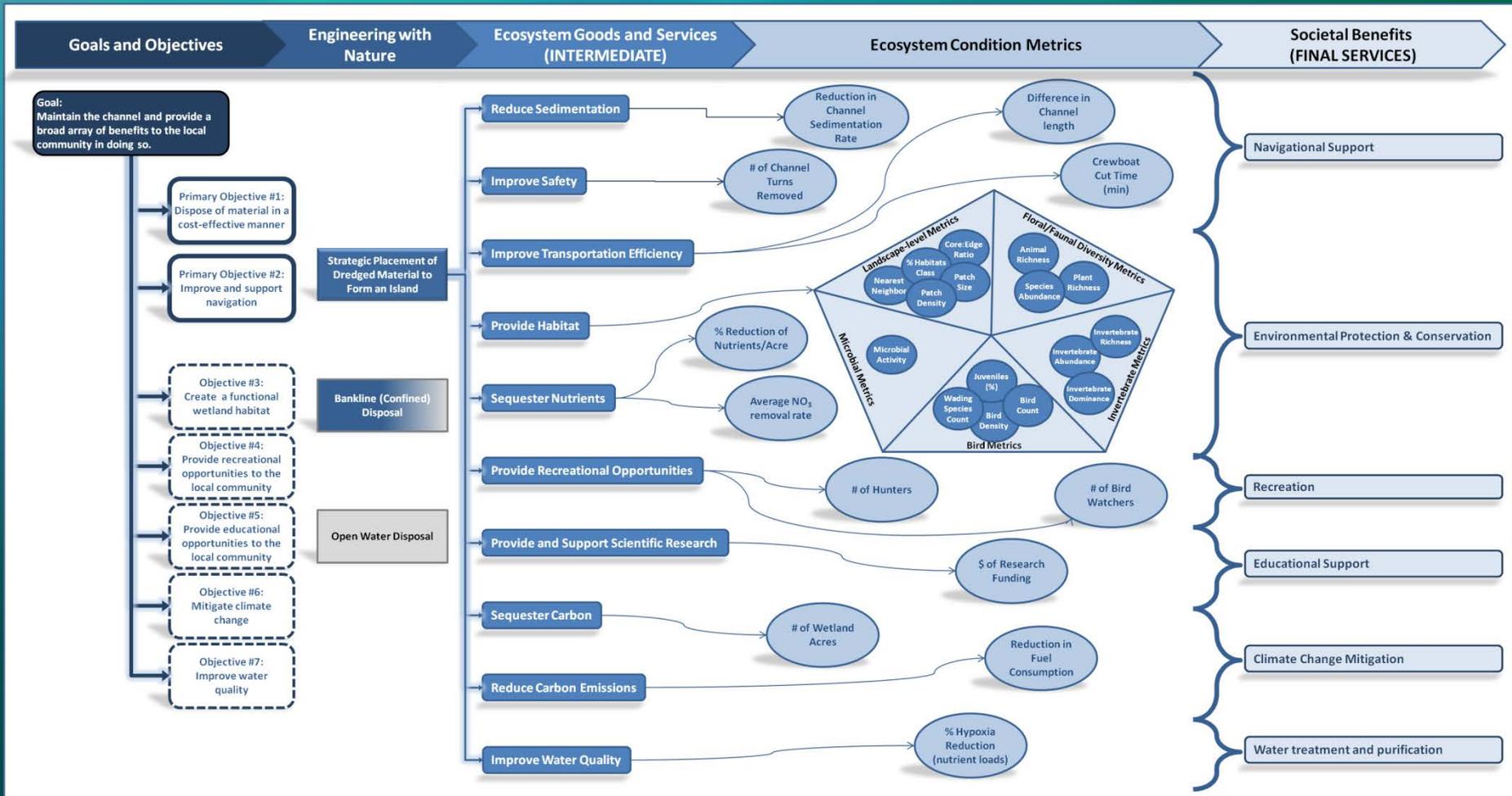
# Multiple Lines of Defense – Hybrid Success?



# Benefit Quantification?

- Community-based index modeling
- Ecosystem goods & services
- Multiple account tradeoffs

**Model Certification is Key**



# Resilience Indices?



## COASTAL RESILIENCE

Bouncing back & *building beyond*.

### PLAN & BUILD RESILIENCE

Develop and implement plan to become more resilient.



improving forecasts, observation models, computer systems



getting information to decision makers faster



incorporating green infrastructure



### DISASTER STRIKES

Disasters can be imminent or strike unexpectedly.



sea level rise



tsunamis



coastal storms and hurricanes



### RESPOND

Immediately take action following a disaster.



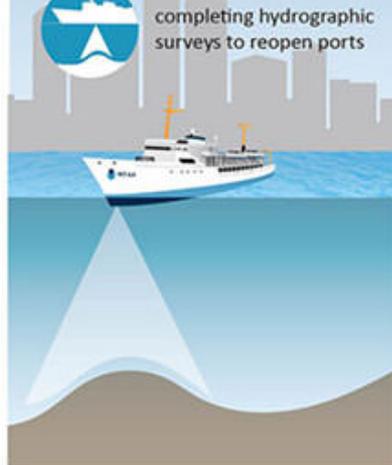
pollution response



damage assessment imagery



completing hydrographic surveys to reopen ports



### RECOVER

Assess resilience and manage adaptively.



assessing damage to communities, economy, and environment



issuing grants to rebuild and restore habitat



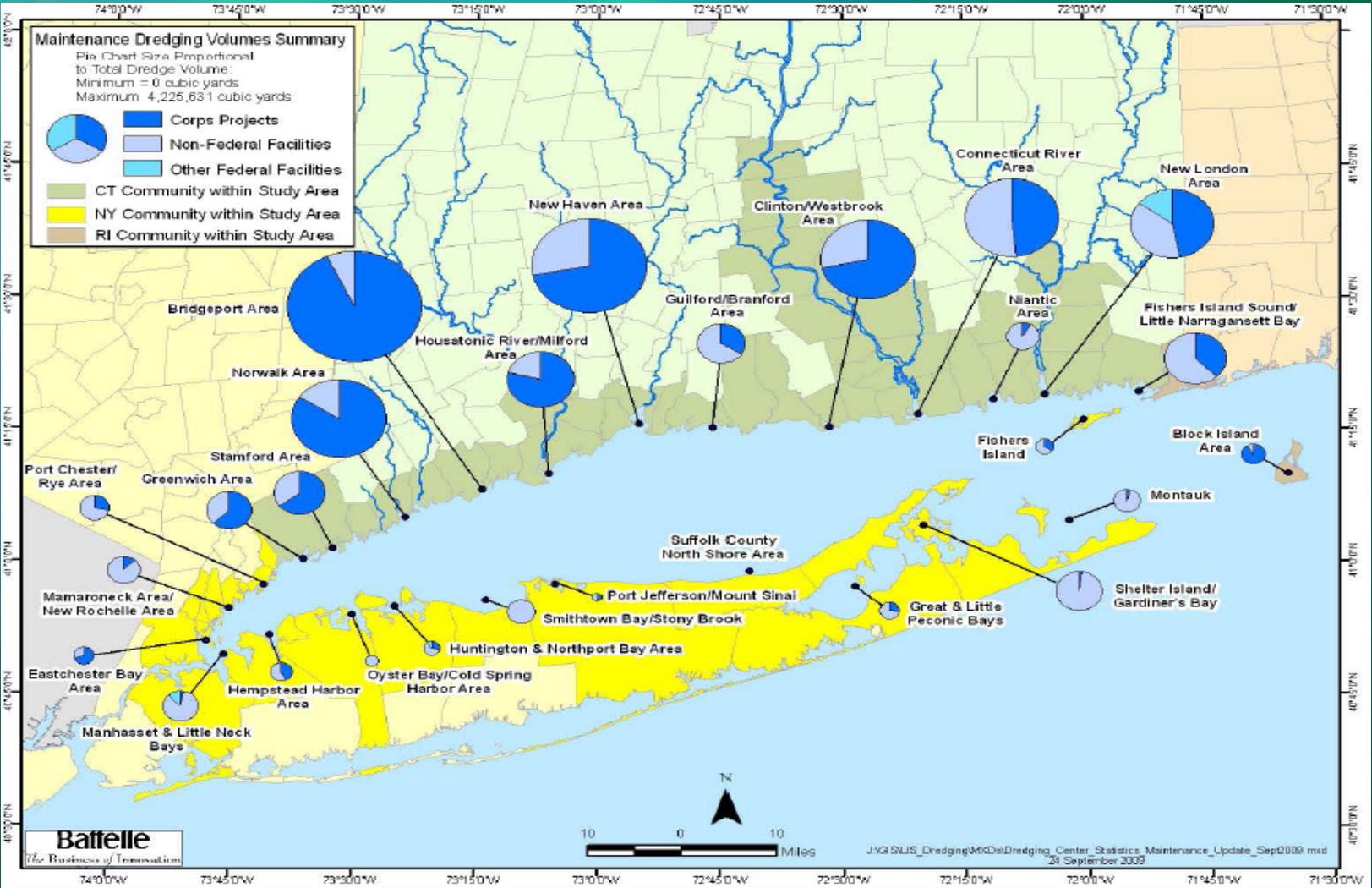
providing data and tools for analysis



Assess resilience and begin planning for the next disaster.

*Building resilience is an iterative process.*

# Regional Sediment Management



# Research Agenda

- **Metrics for Ecosystem Response:**
  - Community-based Models
  - Resilience
  - Goods & Services
- **Regional Sediment Management**
  - BU Maps
  - Particle Tracking
  - Stockpiling
- **Sustainability**
  - SLR & Urbanization
  - Hybrid Solutions Proving Grounds

	Milestone	Date
Scoping	Exemption Approval by Senior Leaders	Sep 2015
	Exemption Approval by ASA(CW)/OMB	Nov 2015
	Execute FCSA with GLO	Nov 2015
Alternative Evaluation and Analysis	Alternatives Milestone	June 2016
	Tentatively Selected Plan (TSP) Milestone	May 2018
Feasibility Level Analysis	Agency Decision Milestone (ADM)	Oct 2018
	Feasibility Report Complete	Oct 2020
	Civil Works Review Board (CWRB)	Jan 2021
	S&A Review	Feb 2021
	Chief's Report	Apr 2021

# Questions?

