Development of an Operational Sediment Budget for Coastal Louisiana

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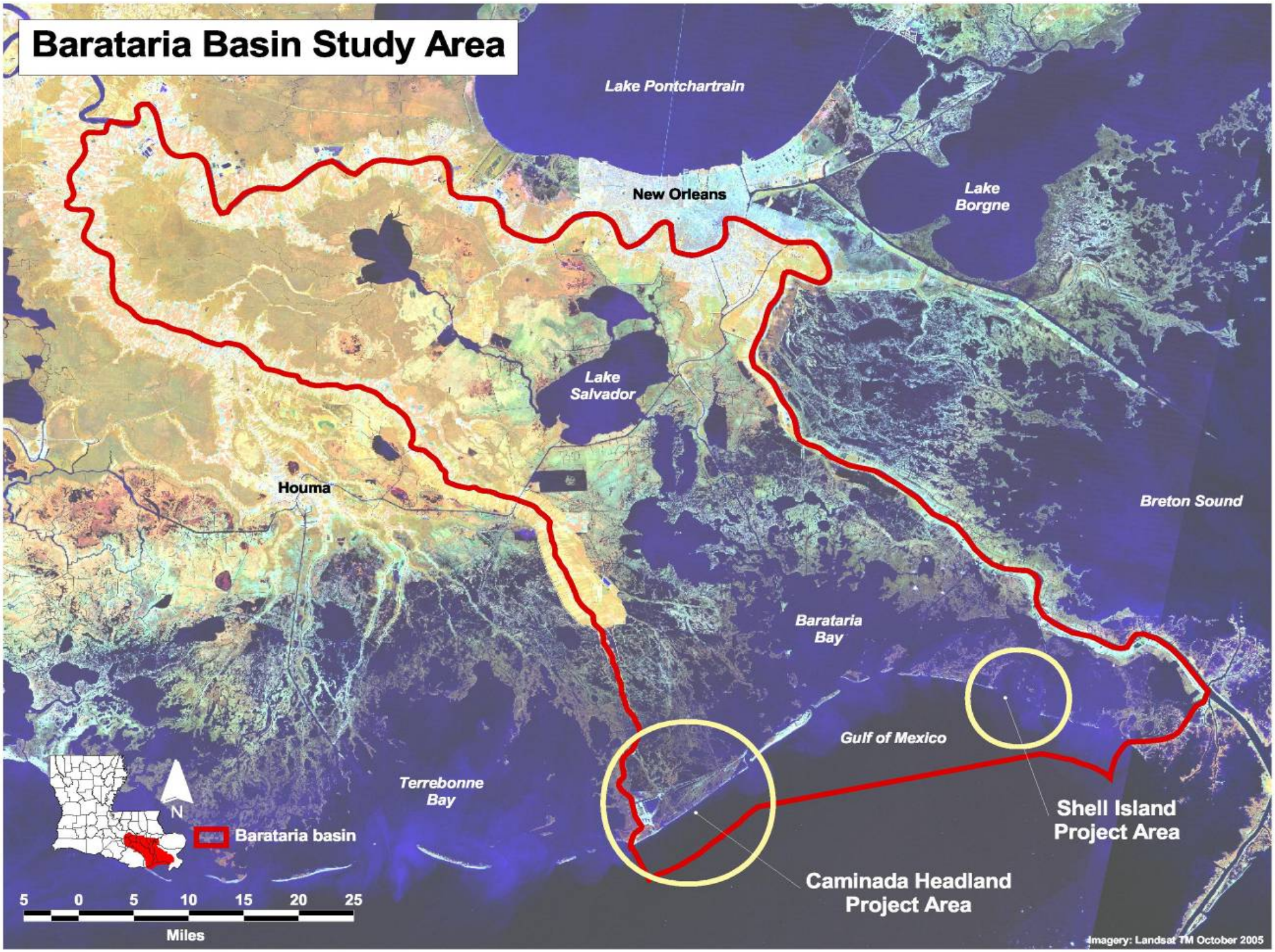
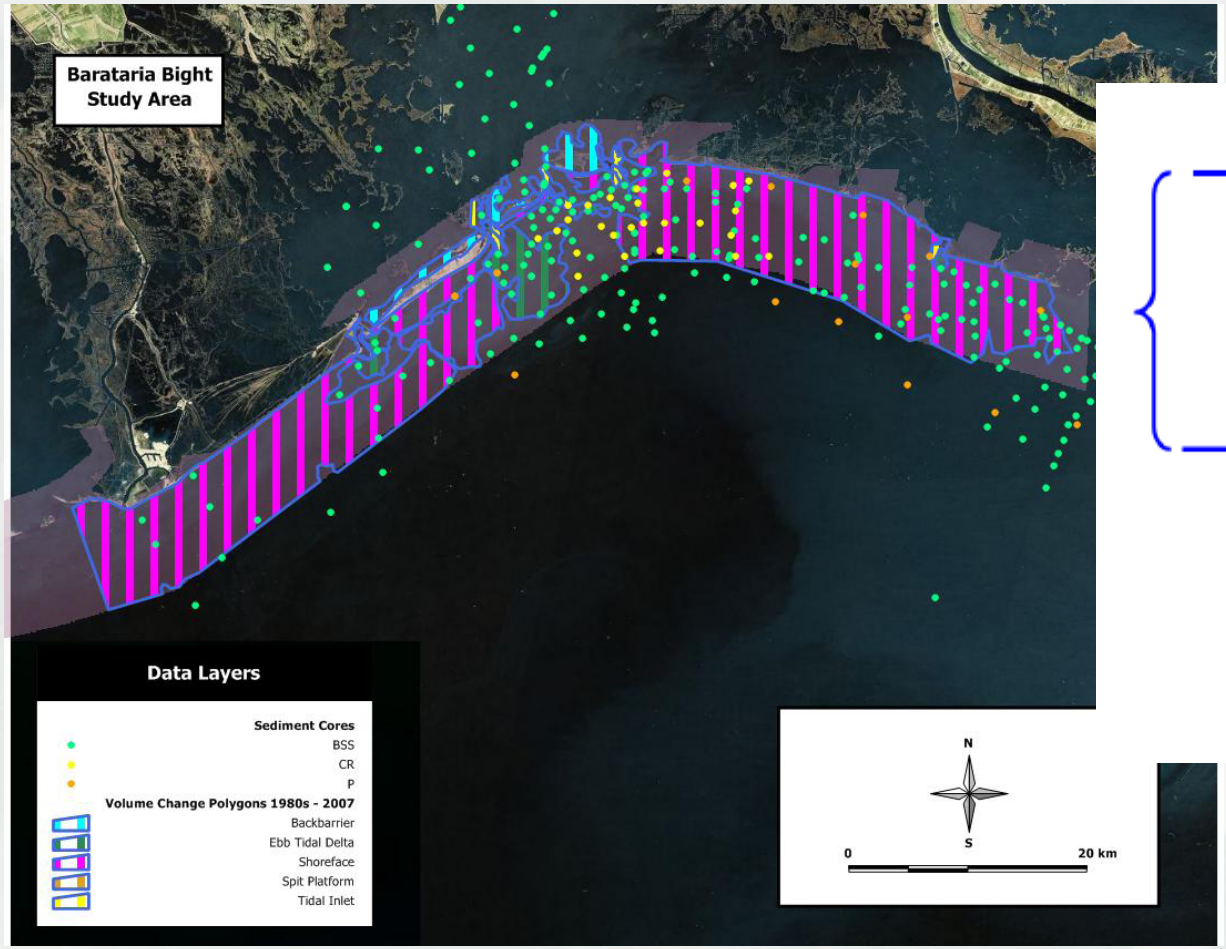
BUILDING STRONG®

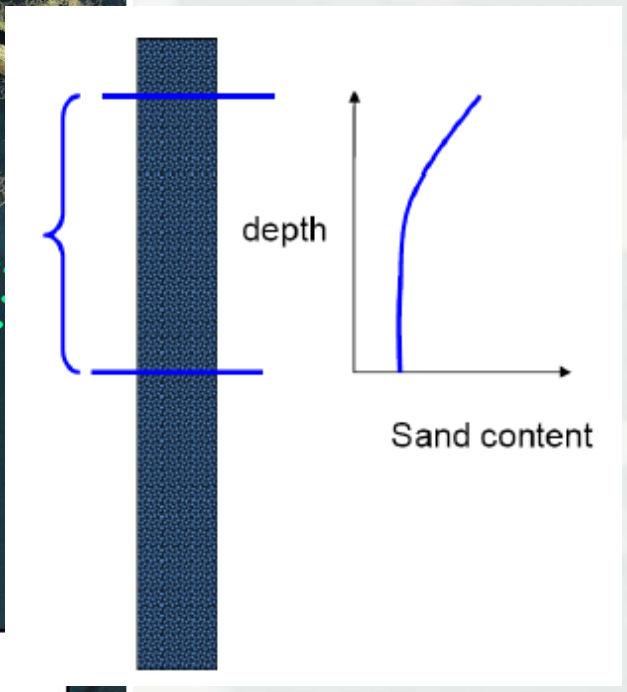
Louisiana's Need

- The Barataria Basin Barrier Shoreline Restoration project and the Terrebonne Basin Barrier Shoreline Restoration project were contingently authorized by Title VII of the Water Resources Act of 2007.
- Louisiana shoreline sediment movement is NOT dominated by wave induced transport but is associated with the abandonment phase of the delta cycle.
- Barrier shorelines in Louisiana separate the Gulf of Mexico from the interior estuaries and consist of three landforms: beaches, dunes, and marsh.


Barataria Basin Study Area
Lake Pontchartrain
New Orleans
Lake Borgne
Lake Salvador
Houma
Breton Sound
Barataria Bay
Gulf of Mexico
Terrebonne Bay
N
Barataria basin
5 0 5 10 15 20 25
Miles
Shell Island Project Area
Caminada Headland Project Area
Imagery: Landsat TM October 2005

Barataria Sediment Cores



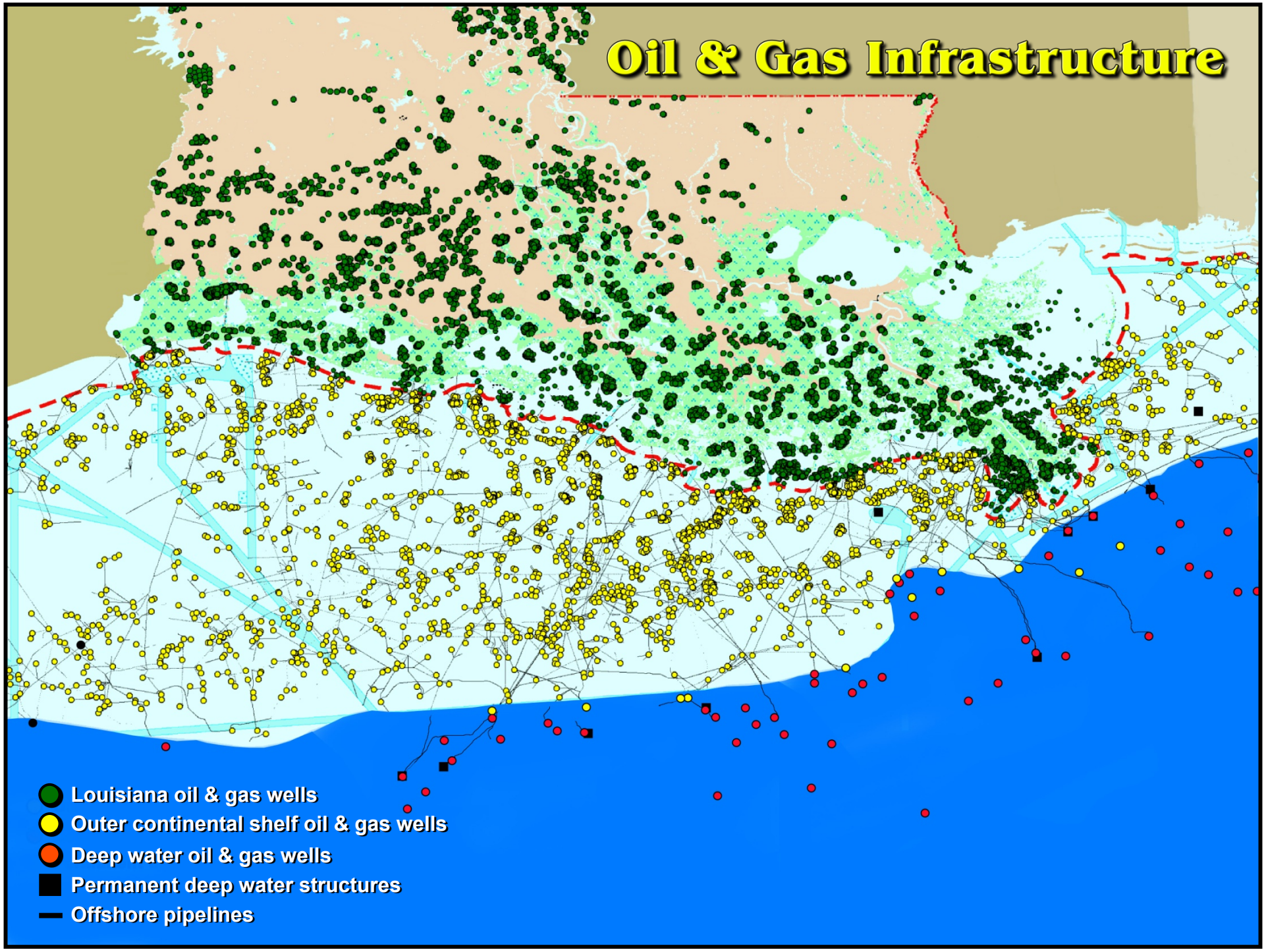


Louisiana's Need

- Sediment budgets can (and should) greatly influence the overall strategy of restoration projects
- Where should the sediment come from?
- Where should the sediment go?
  - ► What will happen to the sediment?

Louisiana's Need

- Ship Shoal, the nearest accessible sand source for much of the Barataria and Terrebonne basins, is 40 miles from the Caminada Headland.
- Thousands of Oil and Gas Wells and Pipelines Prevent Access to Other Shoals.
- An estimated 100 million cubic yards of material is required to construct and maintain these barrier shoreline projects over the 50 year period of analysis.


Oil & Gas Infrastructure
Louisiana oil & gas wells
Outer continental shelf oil & gas wells
Deep water oil & gas wells
Permanent deep water structures
Offshore pipelines

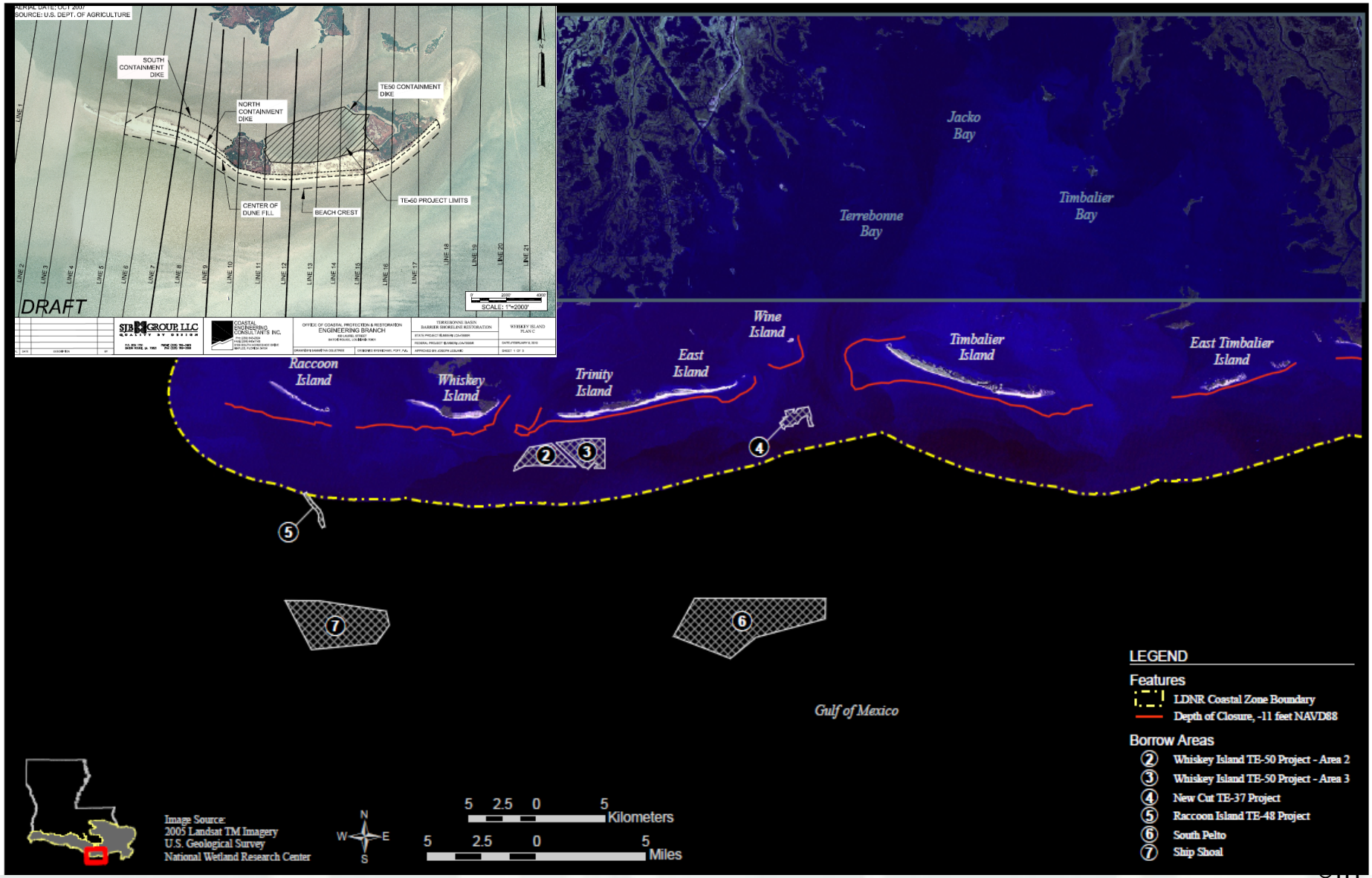
Louisiana's Need

- Lack of Accessible, Suitable Sediment as well as the High Cost of Transporting Sediments Make Shoreline Restoration a Major Challenge.
- Sediment Budgets Combined with Numerical Modeling Can Provide Critical Understanding of the Estimated Volume of Sediment that will Remain in a System over a Period of Analysis for Different Alternatives, under Various Sea Level, Wave and Storm Conditions.

Louisiana's Need

- This Understanding is Required to Evaluate the Sustainability of Federal Ecosystem Benefits into the Future.
- Can Assist in Determining When or if Maintenance (Renourishment) is Required, along with an Estimated Quantity.
- Can Aid in Project Design by Showing if Containment or other Features to Retain Sediment are Required.

Louisiana's Need



Phases of 2010/2011 Sediment Budget Work

- Phase 1 – Develop Conceptual Sediment Budget
- Phase 2 – Develop Coastal Change Database
  - Import Coastal Sediment Data Into GIS and ID Data Gaps
  - Convert all Elevation Data to a Common Datum
  - Develop Geomorphic Units
  - Interpolate Data
  - Perform Sensitivity Analysis
  - Determine grain size, volume eroded and accreted
- Phase 3 – Apply Numerical Models to quantitatively investigate the relative impact of long-shore and cross-shore transport to barrier island evolution.
- Phase 4 – Refine Sediment Budget with Results from Phase 2-3. Conduct Future With and Without Project Analysis.

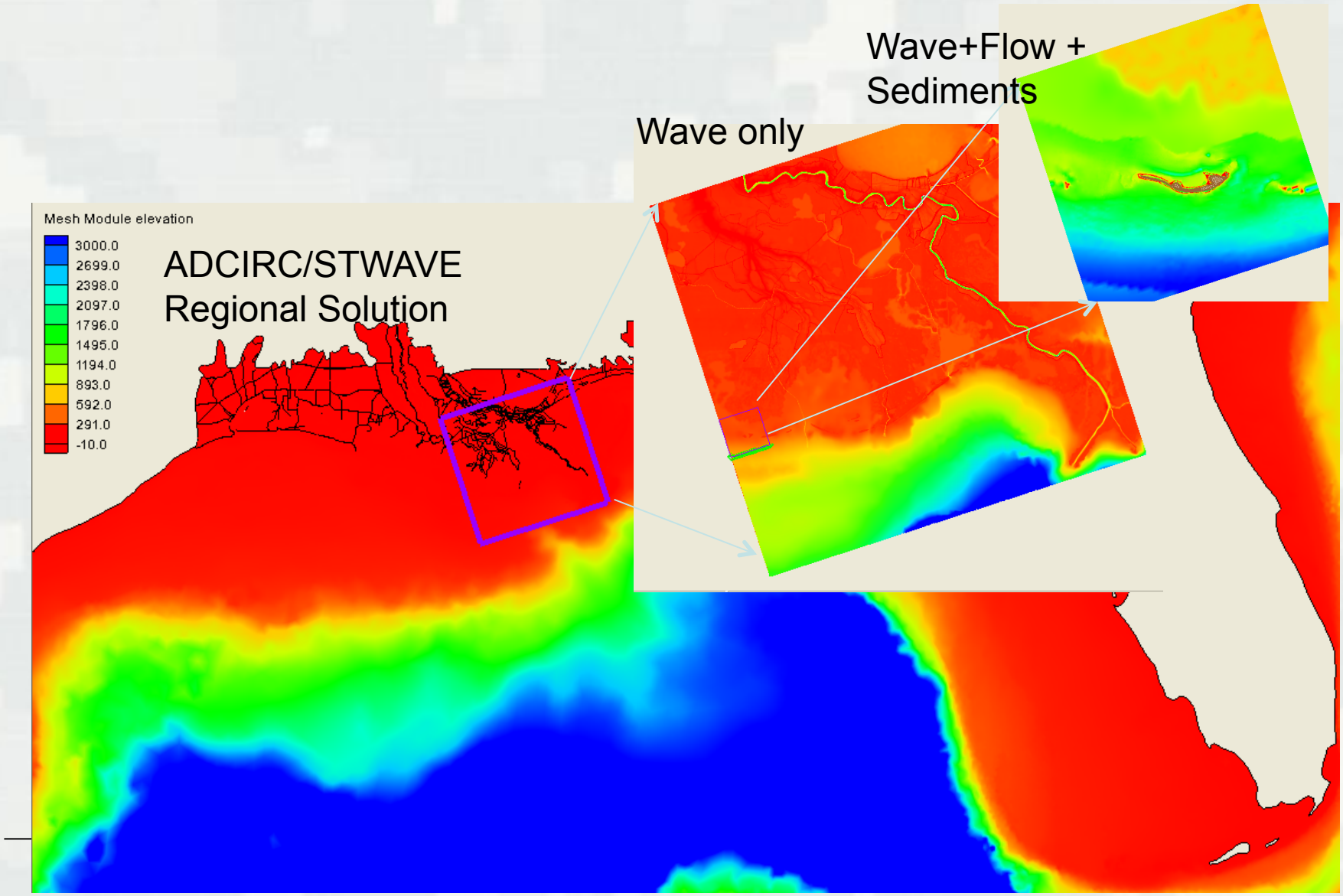
Modeling Application

- Engineering – Detailed Design examples
  - Wave overtopping of structures
  - Influence of borrow areas on adjacent shorelines
  - Predicted shoreline change
- Sediment Budget
  - Compare predicted morphological change with historical data. - Pathways

Modeling Challenges

- Predicting water levels and currents under varying conditions
  - ► Use available regional model solutions for boundary conditions
  - ► Create tools to handle large datasets and extract needed subsets
- Mixed sediments, varying in composition with depth.
  - ► Research by Sanchez A., and Beck, T. – mixed sands
  - ► Work by Hayter, E. – fine cohesive sediment

Modeling Approach



Work Completed and in Progress

- Conceptual Sediment Budget Developed for Coastal Louisiana (ERDC)
- Coastal Change Database Developed for Barataria Shoreline (University of New Orleans)
- Numerical Models (Coastal Modeling System) Under Development for Barataria Shoreline (ERDC and New Orleans District (MVN))
- Coastal Change Database Under Development for Terrebonne Shoreline (ERDC and MVN)

Gulf Coast Ecosystem Restoration Task Force

- Presidential Executive Order after the Deepwater Horizon Oil Spill – Task Force chaired by EPA
- Restore and conserve Gulf ecosystems
- Develop Restoration Strategy by October 5, 2011
- 4 Goals
  - ► Conserve and Restore Habitat
    - Wise Use of Sediments in Conservation and Restoration
    - More Beneficial Use
    - Effective Mississippi River Strategies to Obtain Sediments
  - ► Restore Water Quality
  - ► Protect and Replenish living coastal and marine resources
  - ► Enhance Community Resilience

Outline

- **Louisiana's Need for Coastal Sediment Budgets - Barataria and Terrebonne Shorelines**
- **Phases of 2010/2011 Sediment Budget Work**
- **Work Completed and in Progress**
- **Gulf Coast Ecosystem Restoration Task Force**