So Close Yet So Different: Construction and Design Lessons from Adjacent Barrier Islands

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November 5, 2014
Louisiana Gulf Shorelines: Project Setting

- Formed through geologic process of marine re-working of historic deltas and “at the edge” of geomorphologic modeling and engineering understanding
- Multi-layered **working coast** with active user groups and associated support infrastructure – rapid change fostering new partnerships and tradeoffs
- Challenging and often **untested** institutional setting (regulatory compliance and agreements)
Project Goals and Design Premises

- Continuous sandy shore-face without formation of tidal inlets
- Restore coastal habitat function

Goal-driven design:
- Shoreface/beach: design driven by sediment budget and classic coastal engineering
- Flanking marsh: design driven by habitat objectives and structural support
Shoreface - Coastal Processes

Sediment budget → 20 (or 50) year deposit to maintain continuous shoreline

- **RSLR (Subsidence and Eustatic)**: 11,400 cy/yr
- **Overwash**: 13,500 cy/yr
- **Offshore**: 89,000 cy/yr
- **Long-shore in**: 3,300 cy/yr
- **Long-shore out**: 3,900 cy/yr
Comparison of Projects

Pelican Island
- 20 Year Life (CWPPRA)
- Offshore borrow for dune and marsh
- 45 on 1 dune slope; 7.5 ft NAVD
- 2.2 miles long; contained marsh

Shell Island (East)
- 50 Year Life (CPRA from berm funds)
- Riverine borrow for dune and marsh
- 30 on 1 dune slope (steeper); 8 ft NAVD
- 1.3 miles long; contained marsh
Pelican Island
Pelican Island – Design Information

- 2.2 miles long
- 240 acres beach and dune restoration (2.27 MCY)
- 300 acres saline marsh (1.43 MCY)
- Sand fencing and vegetative plantings
- 392 active construction days – 10/2011 - 12/2012
Pelican Island Borrow Locations
Courtesy of Great Lakes Dredge and Dock, LLC and Aerophoto
Dune Height Change due to Hurricane Isaac

Pre-Construction – January 7, 2012

Post-Construction – August 14, 2012

Post-Isaac – September 8, 2012

Post-Isaac – September 1, 2012
Lessons Learned – Pelican Island

- Project delays can have a domino-effect.
- If possible, develop your construction contract with options.
- When reacting to an unforeseen condition during construction, it is best to develop at least three potential alternatives for resolution.
- Full dune/beach and full marsh is the best solution.
- Construct marsh first where possible.
Shell Island (East) – Design Information

- 1.6 miles long; 8 ft NAVD dune height
- 188 acres beach and dune restoration (2.26 MCY)
- 83 acres saline marsh (0.27 MCY)
- Sand fencing and plantings
- 123 active construction days (May through August 2013)
Shell Island Borrow Locations
Shell Island Borrow Locations
Lessons Learned – Shell Island East

• Capitalize on existing conditions – pipeline corridor being in use reduced mobilization costs allowing additional volumes of material to be dredged and greater dune elevation for available funds.

• Quality of sand from Mississippi River was able to hold steeper slopes on the dune and thus allow a steeper dune and wider crest.
Key Observations from Multiple BI Projects

- Back-barrier marsh is a critical structural component.
- Marsh elevations settling to intertidal range generally as predicted.
Key Observations from Multiple BI Projects cont

- Sand fencing and intensive dune plantings play an important role in maintaining and even increasing dune height (critical to prevent breaches/inlet formation).
Acknowledgements
Coastal Wetlands Planning and Protection and Restoration Act (CWPPRA)

Coastal Protection and Restoration Authority
Plaquemines and Lafourche Parish Coastal Zone Management

Coastal Planning and Engineering, a CBI company

Great Lakes Dredge and Dock