RESULTS FROM THE TEXAS COASTAL SEDIMENT SOURCES: A GENERAL EVALUATION STUDY

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A desktop inventory of the Texas coastal soft sediments was developed through a compilation of engineering and geoscientific reports, peer reviewed publications, and sediment databases in state and federal programs.

The objective was to compile and interpret important datasets focused on the potential availability of sediments for coastal restoration and storm protection.

The analysis included the availability of sediments within dredging activities and the geological and geomorphological environments across Texas.

Limited information on several aspects of the sediment inventories within the coastal system left several gaps that will need to be covered with future investigations.

Acknowledgements: Special thanks to Dr. Tim Dellapenna and Dr. John Anderson for sharing important information on the geological deposits. USACE Galveston District staff provided their dredging records. USGS provided suspended sediment data.
Sediment Model

Reinson, 1992
CONCLUSIONS:

A.1. Coastal/marine depositional environments associated with past cycles of sea level rise that occurred from the Middle to Late Pleistocene;

A.2. Paleo-incise river channels and valley-filled fluvial deposits developed on the inner shelf;

A.3. Holocene deposits formed in the last 10,000 years on the Gulf shoreface;

B.1. Bay deposits as part of the new coastal/bay Holocene environments or on top of Pleistocene deposits;

B.2. Ebb Delta deposits located on the Texas Gulf Inlets;

B.3. Flood Delta deposits located on the Texas Bays;

C.1. Suspended and bedload fluvial sediments coming from rivers and watersheds;

C.2. Fluvial-Deltaic deposits;

D.1. Sediments generated by dredging and dredged material management of navigation channels; and

E.1. Sediments impounded by coastal engineering and navigation structures (e.g., jetties, breakwaters).
TEXAS RIVERS RESPONSE TO SEA LEVEL RISE

Blum et al., 2013
GEOLeGIC RECORDS VS. GEOMORPHOLOGIC RECORDS

Chowdhury and Turco, 2006

Anderson et al., 2016
Major Geologic Deposits

Anderson et al., 2016
GEOLOGICAL DEPOSITION ON INCISED FLUVIAL VALLEYS
SEDIMENT-ACCUMULATION PROCESSES

Anderson, 2007

Anderson et al., 2016
SEDIMENT IN BAYS

Anderson et al., 2016
### Estimated Sediment Volumes

<table>
<thead>
<tr>
<th>Geologic Unit: Offshore Trinity and Sabine Incised Valleys</th>
<th>Geologic Unit: Colorado River Delta Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location:</strong> From 10 to 50 km offshore</td>
<td><strong>Location:</strong> From 10 to 60 km from the beach (*)</td>
</tr>
<tr>
<td><strong>Areal Extent:</strong> In average &gt;150 km long, 10 km wide</td>
<td><strong>Areal Extent:</strong> See Figure 6-2</td>
</tr>
<tr>
<td><strong>Water Depth:</strong> From 10 to 50 meters water depth</td>
<td><strong>Water Depth:</strong> From -10 to -60 meters</td>
</tr>
<tr>
<td><strong>Layer Thickness:</strong> &gt;25 meters, variable depending of the paleo environment</td>
<td><strong>Layer Thickness:</strong> Variable depending of the paleo environment</td>
</tr>
<tr>
<td><strong>Sediment Characteristics:</strong> Episodic paleo river channel deposits (sand), bay head deltas (fines and sands), bays (fines), deltas (sand/mud)</td>
<td><strong>Sediment Characteristics:</strong> Episodic paleo river and delta deposits</td>
</tr>
<tr>
<td><strong>Potential Volumes/Quantities:</strong> 40,000,000,000 cubic meters</td>
<td><strong>Potential Volumes/Quantities:</strong> 21 km$^3$ (Anderson et al., 2016)</td>
</tr>
<tr>
<td><strong>Compatibility for Restoration of:</strong> Marshes and barrier islands</td>
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</tr>
<tr>
<td><strong>Gaps:</strong> Specific studies need to be conducted for specific targets in terms of composition due to the presence of mixed sediments (sand and fines) and compaction levels may be high for some bay and fluvial deposits. This will also require analysis of the consistency of the overburden.</td>
<td><strong>Gaps:</strong> This is the closest paleo delta to the beach. Specific studies need to be conducted for specific targets in terms of composition (abundant sand was reported). Compaction levels may be high for some deltaic deposits. This will also require analysis of the consistency of the overburden. Some deposits may have high percent of fines. (*) = High Uncertainty-requires more data)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geologic Unit: Colorado River Delta Stage 2 to 1</th>
<th>Geologic Unit: Sabine Bank Facies A1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location:</strong> From 5 to 150 km from the beach on paleo incised channels (*)</td>
<td><strong>Location:</strong> From 30 to 50 km from the beach (*)</td>
</tr>
<tr>
<td><strong>Areal Extent:</strong> In average &gt;70 km long, See Figure 6-2</td>
<td><strong>Areal Extent:</strong> See Figure 6-1</td>
</tr>
<tr>
<td><strong>Water Depth:</strong> From -10 to -120 meters</td>
<td><strong>Water Depth:</strong> &gt;-10 meters (*)</td>
</tr>
<tr>
<td><strong>Layer Thickness:</strong> Estimated volume 21 km$^3$ (Anderson et al., 2016)</td>
<td><strong>Layer Thickness:</strong> ~2 meters (Variable depending of the paleo environment)</td>
</tr>
<tr>
<td><strong>Sediment Characteristics:</strong> Episodic paleo river channel deposits</td>
<td><strong>Sediment Characteristics:</strong> Former Barrier Island</td>
</tr>
<tr>
<td><strong>Potential Volumes/Quantities:</strong> 77 km$^3$</td>
<td><strong>Potential Volumes/Quantities:</strong> 413,000,000 cubic meters (Dellapenna, 2009)</td>
</tr>
<tr>
<td><strong>Compatibility for Restoration of:</strong> Marshes and barrier islands</td>
<td><strong>Compatibility for Restoration of:</strong> Beaches and marshes</td>
</tr>
<tr>
<td><strong>Gaps:</strong> Specific studies need to be conducted for specific targets in terms of composition due to the presence of mixed sediments (gravels, sand, and fines) and compaction levels may be high for some fine fluvial deposits. This will also require analysis of the consistency of the overburden (**) = High Uncertainty-requires more data).</td>
<td><strong>Gaps:</strong> The deposits consist of sandy deposits. (** = High Uncertainty-requires more data)</td>
</tr>
</tbody>
</table>
Sediments on the Shoreface

Geologic Unit: Sand Bars on the Shoreface of Galveston Island
Location: From 2 to 12 km from the beach (*)
Areal Extent: See Figure 6-4
Water Depth: -2 to 15 meters (*)
Layer Thickness: Up to 1 meter
Sediment Characteristics: Sandy migrating bars
Potential Volumes/Quantities: 1,800,000 to 3,000,000 cubic meters (Dellapenna, 2009)
Compatibility for Restoration of: Beaches and marshes
Gaps: The deposits consist of sand migrating to deeper areas and it may content fine deposits. These deposits may be available after storms in other portions of the Texas coast. (* = High Uncertainty-requires more data)

Dellapenna, et al., 2013
Sediment Impoundments
ANALYSIS OF DREDGE MATERIAL RELATED SOURCES

• USACE Galveston District dredging volumes for navigation channels (mainly maintenance dredging)

• Location of past dredging events with associated volumes and potential locations of these sediments in nearby PAs

• Critical dredging “hot spots” along Texas Coast
Report to be cited as: