Blue Carbon Project Design:
Early Lessons Learned from the U.S. Gulf and East Coasts

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Blue Carbon Feasibility Studies

Port Fourchon, LA

Herring River, MA

Goodland, FL

Delaware Bay

Eastern Shore, VA
Blue Carbon Project Design: Key Insights

1. Data needs and gaps
2. Land tenure and carbon ownership issues
3. Project scale considerations
Blue Carbon Data Needs and Gaps

- Soil organic carbon
  - soil carbon stocks
  - accretion/subsidence

- Biomass
  - above- and belowground carbon stocks

- Sea Level Rise

- CH$_4$ / N$_2$O emissions
  - pre-restoration flux
  - salinity
Measuring methane

Important where hydrology (salinity) has changed

Low CH$_4$ emissions in high salinity (>18ppt)
→ measure salinity and use default values

High CH$_4$ emissions in low salinity (<18ppt)
→ variable, no default
→ degraded, little research, hard to apply
→ measure or model CH$_4$

Poffenbarger et al. 2011
Land Tenure and Blue Carbon Ownership

Public lands:

→ Research to support GHG accounting
→ Restoration is mission aligned
→ But...often unclear if state and federal land management agencies can enter into carbon transactions

Subtidal zones may present unique challenges

Herring River, MA

Eastern Shore, VA
Importance of Scale - Illustrative Example

5 generic project types
➔ Marsh restoration (revegetation), marsh restoration (tidal restoration, low and high $CH_4$), mangrove restoration, seagrass restoration

Soil carbon
➔ 1.46 tons of C/ha/yr for marshes and mangroves (default), 0.43 tons of C/ha/yr for seagrass (IPCC), 0.00 tons C/ha/yr for unvegetated

Soil methane
➔ 0.75 tons of $CH_4$/ha/yr (High) and 0.16 tons of $CH_4$/ha/yr (Low) based on literature synthesis, medians for oligohaline (0.5-5 ppt) and mesohaline (5-18 ppt)

Biomass carbon
➔ 3.5 tons $CO_2$/ac/yr for mangroves (FL), 0.0 tons $CO_2$/ac/yr for vegetated or unvegetated
Importance of Scale - Illustrative Example

Non-permanence buffer - 15%

Carbon prices - $5.00 and $10.00/ton

Carbon costs - $150k upfront, $50k every 5 years
Illustrative Example: Offsets/acre/year
Scale to break even @ $5.00/ton

Scale to Break Even Cash Flows over 20 years
@ $5.00/ton carbon price

<table>
<thead>
<tr>
<th>Restoration Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh Restoration (revegetation)</td>
<td>1,900</td>
</tr>
<tr>
<td>Marsh Restoration (tidal CH4)</td>
<td>2,543</td>
</tr>
<tr>
<td>Marsh Restoration (high CH4)</td>
<td>542</td>
</tr>
<tr>
<td>Mangrove Restoration</td>
<td>727</td>
</tr>
<tr>
<td>Seagrass Restoration</td>
<td>6,451</td>
</tr>
</tbody>
</table>
Scale to break even @ $10.00/ton

Scale to Break Even Cash Flows over 20 years
@ $10.00/ton carbon price

- Marsh Restoration ( revegetation): 950 acres
- Marsh Restoration (tidal restoration-low CH4): 1,271 acres
- Marsh Restoration (tidal restoration-high CH4): 271 acres
- Mangrove Restoration: 363 acres
- Seagrass Restoration: 3,225 acres
Summary: Lessons Learned

1) Data rich sites can be good blue C incubators
2) Public lands and subtidal zones have unique advantages/disadvantages
3) Bigger (may) be better