The Placement and Fate of Subaqueous Berms for Marsh Edge Protection and Intertidal Flats Enhancement

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US Army Corps of Engineers (USCAE) Sediment Mission Areas

Navigation

Flood Risk Management

Dredging

Environmental
2030: Beneficially Use 70%

- >50% dredging involves fine-grained sediment.
- Common perception of wide dispersal during & after placement.

Encompassing 24 mi², and 15,000 acres of Back Bay Tidal Marshes, Shallow Bays, and Inlets.

Goal: To advance and improve dredging, beneficial use, and marsh restoration techniques.
Loss of critical bird habitats in the marshes and tidal flats of Gull Island.
Placement in September 2020

~40,000 yd$^3$ of fine sand and mud

~32,000 yd$^3$

~8,000 yd$^3$
Features Along Southern Edge of Gull Island-1 Month Post-Placement

Direct Placement

Indirect Placement
Approximately 6 Months After Placement
Approximately 6 months after placement
Approximately 6 months after placement

~1-2.5 ft gain in elevation
Bathymetry Change Aug 2020 to Mar 2021

Approximately 6 Months After Placement

Mar2021 to Aug2020 Change (ft)

Value
-2.628 - -2
-1.999 - -1
-0.999 - 0
0.001 - 1
1.001 - 2
2.001 - 3
3.001 - 4
4.001 - 5
5.001 - 6

~9000 cy
~8700 cy

VOLUME
Net Gain
Unchanged
Net Loss
Approximately 16 Months After Placement

-1.744 to -1
-0.999 to 0
0.001 to 1
1.001 to 2
2.001 to 3
3.001 to 4
4.001 to 5

Direct Placement
Indirect Placement

~1-1.5 ft gain in elevation
Features still present but show
~50% reduction in volume from March 2021 to Feb 2022
Berm Impacts on Wave Energy

Preliminary analysis of May 2022 Event:
• Sustained, Strong Winds from the NE pushing water up onto marsh.
• Marsh inundated for days.
Preliminary analysis suggests berms slightly reduce wave height and energy at marsh edge, particularly during tail end of event.
Initial Findings

• Dredge material placement of muddy sediment at Gull Island successfully created two depositional features along the marsh edge.

• Placed material showed evidence of cohesion and stability 16 months after placement without any containment/confineement.

• Reduction in feature volume due to a combination of erosion, consolidation, and compaction.

• Initial analysis indicates that the berm features can reduce wave energy at the marsh edge.
Future Work

- Berm cores

Feb 2022 to Aug 2020 Change (ft)

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<th>Value</th>
<th>Description</th>
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<tr>
<td>-1.744</td>
<td>-1</td>
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<tr>
<td>-0.999</td>
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<td>3.001</td>
<td>3</td>
</tr>
<tr>
<td>4.001</td>
<td>5</td>
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Sediment Cores

Legend:
- Gray: -1.744 to -1
- Light blue: -0.999 to 0
- White: 0.001 to 1
- Light blue: 1.001 to 2
- Dark blue: 2.001 to 3
- Dark blue: 3.001 to 4
- Dark blue: 4.001 to 5