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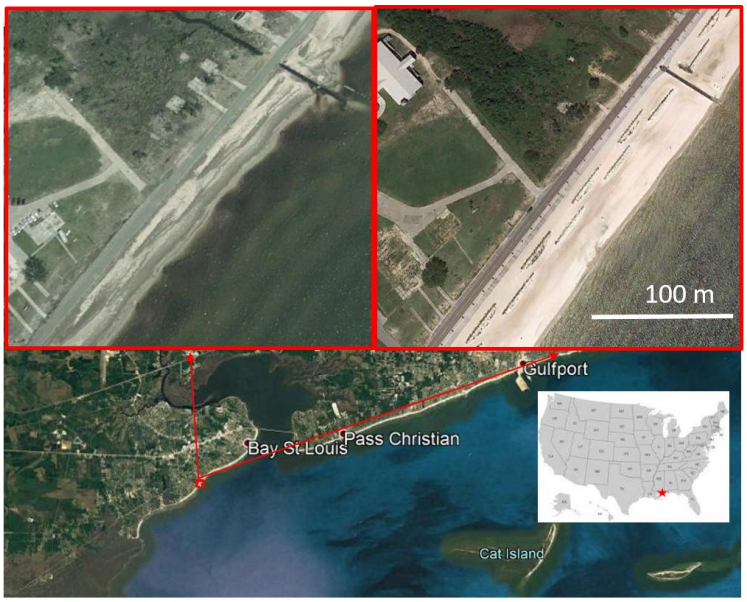
Engineer Research and Development Center

National Regional Sediment Management Program
CEERD-HNC:

Field Implementation of Belowground Biomass for Increased Dune Stability and Resiliency

Description

The aim of this proposed project is to observe and document the response of a man-made dune to incrementally added belowground biomass. Recent research at ERDC shows the value of belowground biomass in dunes, and it is hypothesized that including biomass during the construction project, or adding biomass incrementally as the dunes naturally accrete, will greatly increase the stability of the dune, especially while vegetation is establishing.



The proposed location for this RSM initiative is along the Mainland MS Coast. After the passage of Ike in 2008 (~500 km south), wrack material was left on the beach (top left). This material is typically disposed of, and the beach is regularly groomed by dragging around each dune segment (2015 image, top right)

Issue/Challenge To Address

Dunes as part of construction and rehabilitation beach-nourishment projects are typically built to a desired elevation with clean sand and then planted with appropriate dune-building grasses such as sea oats, bitter panicgrass, and American beachgrass. Beaches used recreationally are then typically groomed by raking and removal of beach wrack material, costing municipalities for labor and disposal. Both this dune building process and maintenance removal of wrack can leave the dune system without the biomass needed for natural stable dune growth, reducing the dunes' effectiveness at preventing sand loss from the beach and protecting the coast from storm impacts. Thus, innovative methods that mimic natural building process are needed to efficiently maximize dune construction efforts and sediment requirements.

Successes Lessons Learned

Lessons learned specific to this project will be compiled during the duration of this project.

Recent ERDC research led by members of the PDT tested the below ground biomass hypothesis in a laboratory setting. The addition of biomass, particularly belowground to simulate organic material, was effective at reducing erosion during both collision and overtopping regimes for a model dune.

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Projected Benefits
Cost Savings
Value Added

- The use of naturally-deposited wrack material for dune improvement will reduce costs to the local stakeholders associated with beach grooming and disposal of large volumes of the wrack material.
- As wrack material is slowly added to the foredune, the dune will become more effective at aeolian sand trapment, reducing sand loss on to the road.
- It has been suggested that the use of sargassum beach wrack in Texas may be able to provide nutrients for and enhance the growth of dune vegetation.
- The dunes will become more resistant to erosion through the increase in belowground biomass and resulting dune vegetation growth stimulated by the increased nutrient and organic matter content in the dune.

Expected Products

- Technical note summarizing Innovative Dune Construction, Maintenance, and Restoration Methods currently in the literature
- Technical note outlining the methods used in this study, including beach/dune management changes and data collection.
- Conference/workshop presentations throughout FY20
- Presentation at the FY20 RSM IPR
- *Journal Article reporting findings from the study when completed (FY21 target)*

Stakeholders/Users

Proponents at Mobile District (SAM) have voiced their support for this project as we began developing the idea in 2017. We plan to include two representatives from the Mobile District on the PDT, Elizabeth Godsey, and Richard Allen.

Most managed beaches under the jurisdiction of both the USACE or local municipalities will benefit from this study as it will potentially reduce costs and increase dune stability.

Leveraging Opportunities

- The Mississippi Coastal Improvements Program (MsCIP) is a comprehensive, long-term plan for the MS coast, initiated by congress after the impact of Hurricane Katrina. The MS mainland dunes were constructed early in the initiative, and this effort to add value to these features is supported by MsCIP leadership at Mobile District (SAM).
- Past ERDC laboratory efforts investigating the addition of belowground biomass to dunes led by Duncan Bryant will be leveraged. Additionally, there is potential for collaboration with FRF-based research modeling aeolian transport and deposition on dunes.
- The team hopes to leverage equipment and manpower already employed by the local municipalities in the chosen pilot study area for beach grooming (Harrison County, MS).
- The team will pursue collaboration with other programs, including Coastal Inlets Research Program, Flood and Coastal Systems, and the Engineering with Nature Initiative

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Points of Contact

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