

RESILIENCE OF NATURAL AND NATURE-BASED FEATURES FOR FLOOD RISK MANAGEMENT

Need

Coastal wetlands, as a type of NNBF, can attenuate waves and stabilize sediments, thereby providing coastal storm protection. Dense vegetation and the shallow water within wetlands can slow storm surge advance and can reduce wave runup and surge landward. However, a systematic methodology to determine the capacity and damage threshold of vegetation and marshes for wave, current, and erosion protection is lacking. The existing USACE numerical model has a limited capabilities to quantify impact of vegetated shorelines under waves and storm surges. Thus this research aims to develop the CSHORE model for assessing vegetation effects and apply the validated model to evaluate practical coastal engineering analyses, specifically assessing:

- Capacity of living shorelines to reduce low-intensity storm damages;
- Threshold storm parameters for which vegetation becomes ineffective;
- Threshold at which vegetated shores are unable to naturally recover;
- Difference in risk reduction between vegetated shore and revetments, and
- Applying this knowledge to develop fragility, damage, and recovery profiles for vegetated shorelines.

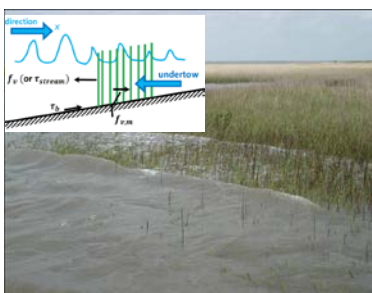
Approach

To establish a methodology to evaluate the benefit of vegetated shorelines using numerical modeling and field studies, major tasks as follows are conducted:

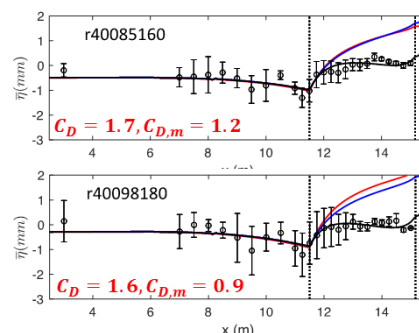
- CSHORE is validated for wave attenuation and wave setup/runup reduction using laboratory and field data.
- New formulations for calculating drag forcing due to stiff and flexible vegetation are developed based on nonlinear wave theory.
- Field observation at Terrebonne Bay near Cocodrie, LA is conducted to measure marsh edge erosion and change of wetland.
- Observation data is used for validating CSHORE and developing threshold parameters for determining capacities of vegetated shoreline.

Outcomes

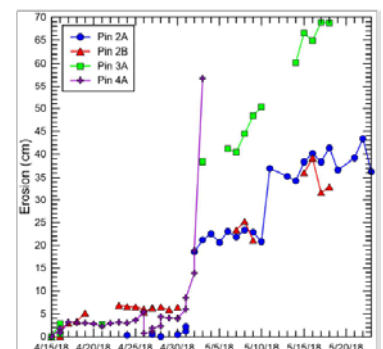
This research provides a verified and validated CSHORE model with new capabilities for assessing vegetation effects in shorelines. Datasets of waves, currents, water levels, and marsh edge erosion rate will be developed based on the observation data and other data from public domains. Technical reports will documented development, validation, and applications of the model.



Development of numerical model for predicting wave attenuation and setup due to vegetation resistance



Validation of CSHORE with three vegetation drag forcing formulations.



Measured marsh edge erosion in Terrebonne Bay from 4/15-5/20/2018

More Information

POCs, wiki page links, links to other sources of information

For more information on FRM R&D, see the ERDC FRM wiki:
https://wiki.erdc.dren.mil/Flood_and_Coastal_Storm_Damage_Reduction_Research_Program