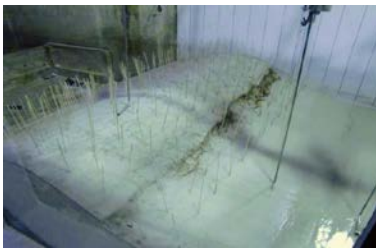
Engineering With Nature Project Fact Sheet

Title

Parametric Study of Belowground Biomass on Short-term Dune Evolution

Background

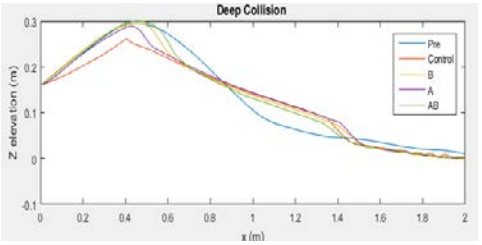
Dunes have, and continue to be, natural or engineered features which prevent or delay flooding of inland areas by waves and storm surge. Currently, morphological models do not consider the effect of vegetation when estimating short-term dune response to erosional events. A previous study showed that aboveground and belowground plant structure significantly reduced the erosion of coastal dunes under both collision (scarping) and overtopping regimes.



Model eroded dune showing below and aboveground biomass

Objectives

Although the previous study has shown vegetation to reduce dune erosion, it considered only one above and belowground biomass condition. This complimentary study will help fill the data gaps with respect to unknowns regarding the effect of the amount of biomass on dune erosion, which is required for improved simulation of short-term dune morphological response



Different dune erosion rates with and without biomass inclusion

Approach

Isolating the effect of vegetation on dune morphology is problematic in the field as hydrodynamic conditions, vegetation species and growth habits, and dune morphology cannot be controlled and replicated. A laboratory setting offers a controlled environment to isolate the response of dune morphology to vegetation by allowing for comparisons to a control case under known, repeatable conditions. The dune morphological change will be quantified by a 1:15 scale model with varying amounts of belowground biomass encompassing the range of dune ecology from non-planted to bare/newly planted to mature vegetation.

Outcomes

Detailed measurements of water surface elevation, overtopping (both water and sediment), and dune morphology will be collected with high-precision instrumentation. Products include laboratory measurements of dune profiles with varying degrees of biomass to serve as comprehensive model validation datasets for dune morphological models. This research tasks will provide USACE engineers with quantitative benefits of dune vegetation during erosive events for improved coastal planning.

Point of Contact: Duncan Bryant, PhD, PE
Duncan.Bryant@usace.army.mil; 601-634-3898