Reference SON: *Strategic Research Initiative, FY13 RFP: Assessing Barrier Island Vulnerability to Future Conditions and Sea Level change*

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Wiki

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Assessing Barrier Island Ecosystem Vulnerability to Future Conditions and Sea Level Change[1]

Research Need

Planning, managing, and engineering natural or nature-based systems such as barrier islands requires integrated solutions that consider the complex interactions between physical and ecological processes controlling island development, evolution, and stability. Modeling is often required to study and evaluate such systems. Simulating the dynamic feedbacks between collision, overwash, inundation, and vegetation necessitates the integration of multiple data sources, tools, and physically based models.

Project Objectives & Plan

The purpose of this project is to develop an assessment framework that can model the response of barrier island systems to disturbances, including storms and changing environmental conditions such as sea level change and weather-related hazards. The modeling framework developed is tiered to best suit USACE District and Division needs. In its simplest form (Tier 1), it can be used as a screening tool for SMART Planning. Higher levels of complexity (Tier 2) can be implemented for quantitative scenario comparison. To support the modeling framework, specific products include technical notes describing the overall framework and each Tier, a Tier 1 executable including a user's guide, a technical report describing the application of the framework to a field site, and webinar and web content describing the modeling framework were developed.

Payoff

The multi-tiered approach is an advancement over current approaches as it integrates existing tools and data in such a way that considers the complex ecogeomorphic feedbacks controlling barrier island morphological and ecological function. Results provide a quantifiable way to target and prioritize areas that will require and benefit from restoration interventions, in addition to providing multiple benefits beyond those conveyed by the initial ecosystem restoration efforts. This approach will lead to better allocation of project

resources by enabling focus on areas with the greatest uncertainty and risk, and is compatible with USACE SMART Planning.

Products

Journal Articles (JAs)

Charbonneau, B., Duarte, A., Swannack, T., Johnson, B., and Piercy , C. 2022. DOONIES: A process-based ecogeomorphological functional community model for coastal dune vegetation and landscape dynamics. Geomorphology, 398, https://doi.org/10.1016/j.geomorph.2021.108037

Conference Presentations/Webinars/Workshops

(2018). ASBPA beaches and dunes workshop presentation, Workshop. USGS collaboration workshop, NOAA-USACE Natural and Nature Based Features (NNBF) workshop (Assessing Barrier Island Ecosystem Vulnerability to Climate Change and Sea Level Rise Work Unit)

(2018). CSHORE-veg: Development of an Integrated Morphology and Vegetation Growth and Distribution Model for Coastal Dunes, Presentation. Eighth International Symposium on Environmental Hydraulics, Notre Dame, Fort Wayne, Indiana.

Johnson et al. (2016). CSHORE use in modeling long term dynamics of barrier islands - Deltares/Rijkswaterstaadt - USACE modeling meeting, Vicksburg, Mississippi.

Models and Applications

CSHORE-veg: Objectives to enable prediction of dune restoration impact on storm response and ecosystem recovery, and subsequent changes over multi-decadal timescales – informing and prioritizing remedial measures to maintain and increase coastal resilience. Now integrated with DOONIE (above).

Dune resilience tool (final name not determined) – Excel-ArcGIS tool to rank sites based on potential for long term resilience

[1]Project Alias – Work Unit Documentation Title: *Assessing Barrier Island Ecosystem Vulnerability to Future Conditions and Sea Level Change*