Stakeholder driven science is providing important near term solutions, but is it addressing long-term risk to ecosystems and communities?

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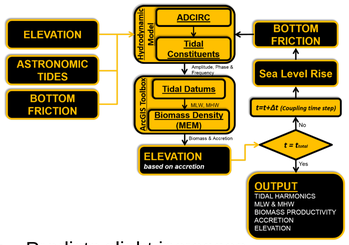
Ecological Effects of Sea Level Rise Program Overview

The Ecological Effects of Sea Level Rise (EESLR) is a multidisciplinary research program focused on the advancement of integrated models and tools capable of evaluating coastal vulnerability and resilience under a suite of sea level rise (SLR), inundation and mitigation scenarios. Specific EESLR research priorities are user driven and include:

- Advancement of existing SLR and inundation predictive capabilities through targeted field-based studies and the dynamic coupling of physical and biological models;
- Evaluations of coastal community and ecosystem vulnerability to SLR and inundation under scenarios of shoreline condition and/or natural and nature-based feature (NNBF) use;
- Quantification of ecosystem services provided by NNBF approaches at enhancing community and ecosystem resilience to SLR, nuisance flooding and acute inundation.

Marsh Modeling, Hydro-MEM



- Dynamic coupling of hydrodynamic model (ADCIRC) and marsh model (Marsh Equilibrium Model; MEM) based on field- and remotely-derived inputs and conditions.
- Produces outputs of marsh productivity migration under SLR scenarios allowing examination of vulnerability, thresholds and landward migration potential.
- Input parameters can be manipulated to examine mitigation options.

- Predicts slight increases in marsh productivity that peaks around 2030;
- Productivity slowly declines until around 2060, when low productivity marshes begin to rapidly turn into open water;
- Landward migration of the marsh is predicted, but extent is not sufficient to compensate for area lost.
- By 2075, the Pascagoula/Escatawpa River complex is projected to reconnect with Grand Bay.

Grand Bay NERR marsh with 2 m SLR by 2100

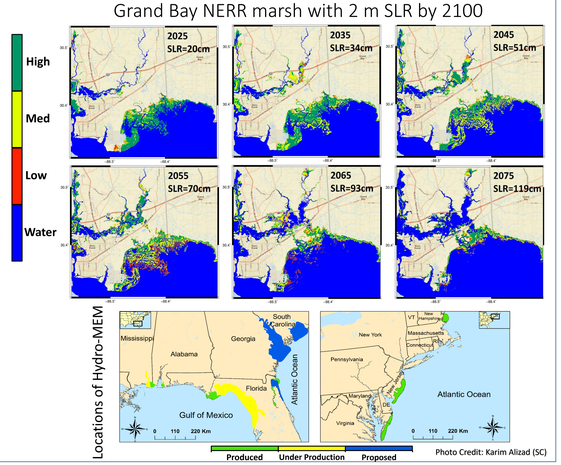
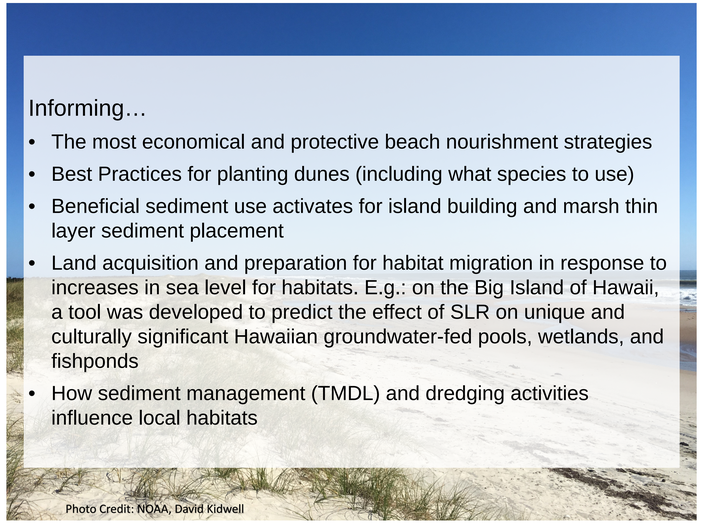


Photo Credit: Karim Alizad (SC)

Solutions for healthy natural habitats

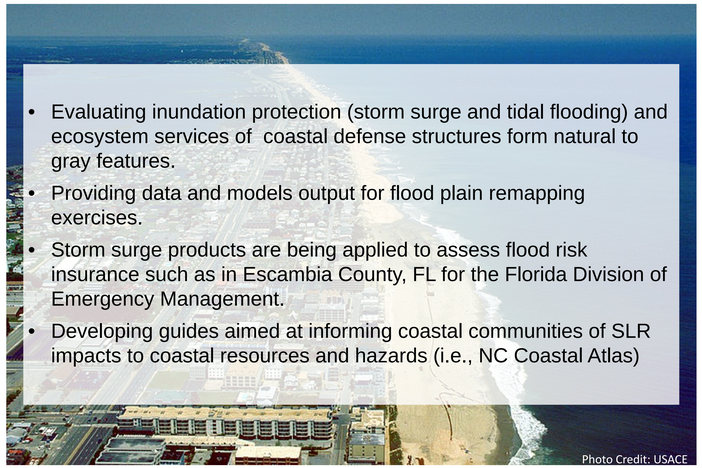


Informing…

- The most economical and protective beach nourishment strategies
- Best Practices for planting dunes (including what species to use)
- Beneficial sediment use activates for island building and marsh thin layer sediment placement
- Land acquisition and preparation for habitat migration in response to increases in sea level for habitats. E.g.: on the Big Island of Hawaii, a tool was developed to predict the effect of SLR on unique and culturally significant Hawaiian groundwater-fed pools, wetlands, and fishponds
- How sediment management (TMDL) and dredging activities influence local habitats

Photo Credit: NOAA, David Kidwell

Solutions for protecting communities with natural habitats and through policy changes



- Evaluating inundation protection (storm surge and tidal flooding) and ecosystem services of coastal defense structures form natural to gray features.
- Providing data and models output for flood plain remapping exercises.
- Storm surge products are being applied to assess flood risk insurance such as in Escambia County, FL for the Florida Division of Emergency Management.
- Developing guides aimed at informing coastal communities of SLR impacts to coastal resources and hazards (i.e., NC Coastal Atlas)

Photo Credit: USACE

Are these the solutions we need?

Is Stakeholder driven science addressing long-term risk to ecosystems and communities?

- Coastal managers are pressured to identify the cheapest approach to resilience for a relatively short term planning period (≤ 30 year planning cycle).
- Our scientists target their needs, which can result in reducing short term risks while inadvertently increasing our long term coastal vulnerability.
- Averting this costly oversight will require reliable data and collaboration between coastal communities, costal decision makers, private industry, scientists, and funders, with a collective goal of longer term solutions.

How do we get there – our next funding opportunity

- **Predictive Tools** - Assess coastal ecosystem and community risk/ vulnerability to SLR and inundation through the advancement of existing tools, field-based studies or models;
- **Socioeconomic evaluation** - Regional strategies to mitigate SLR and inundation that offer additional non-protective benefits, under scenarios of varying precipitation, wind, and the presence of NNBFs.
- **Require Longer Term Considerations** - Incorporate natural resource planning and short and long-term (>30 years) coastal vulnerability perspectives into regional coastal plans that are associated with **transportation planning, community planning, coastal engineering, coastal permitting, coastal resilience project finance, or flood insurance.**
- **Require Management Advisory Groups** - The management and planning scenarios selected should lead to regional application and be developed in a collaborative approach with a management transition advisory group (MTAG) to ensure the science is useful to the decision making by **natural resource managers, city officials, community resilience planners, coastal communities; and others that are integral to managing natural lands, transportation planning, community planning, coastal engineering, coastal permitting, project financing, or flood insurance;**
- **Require application, provide support** - Assess projects that are actively planning to install NNBF or incorporating natural landscapes into resilience planning in the designated region by the final year of funding.

Who and **what** are needed to make real progress in reducing long term vulnerability to inundation?

EESLR Study Locations

*6 new projects in 2019, not shown

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