# Linked sea level rise, response, habitat and species models, an example from beaches and plovers





**Project Lead**

**Rob Thieler**
**U.S. Geological Survey**
**Woods Hole, MA**

# Project Team


App development: Luke Winslow, Megan Hines, Jordan Read, Rob Thieler

Science application: Nathaniel Plant, Ben Gutierrez, Sara Zeigler, Sawyer Stippa, Rob Thieler


Sarah Karpanty, Katy Gieder, Jim Fraser, Dan Catlin, Shannon Ritter

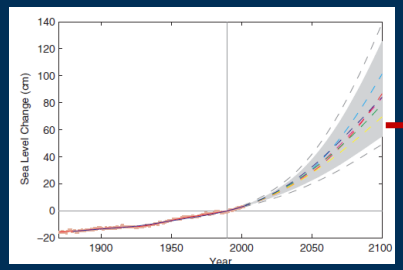

Anne Hecht, Andrew Milliken

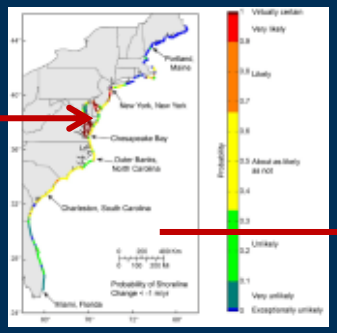
# Decision Support for DOI Agencies

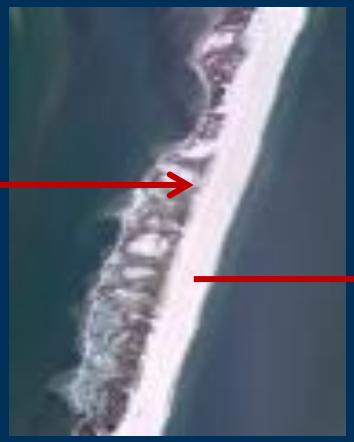
Piping plover, *C. melodus*


- Listed species
- DOI management responsibility
- Lifecycle includes substantial time on NPS lands for breeding, migrating, wintering
- Have interesting and specific habitat requirements that we can predict
  - Rangewide habitat availability
  - Attributes and distribution of breeding, foraging areas
  - Wave run-up and inundation sensitivity (morphologic and hydrodynamic detail)
- Can feed predictions into models used to make land and species management decisions

# Objective: predict influence of
## sea-level rise ⇒ coastal morphology ⇒ plover*

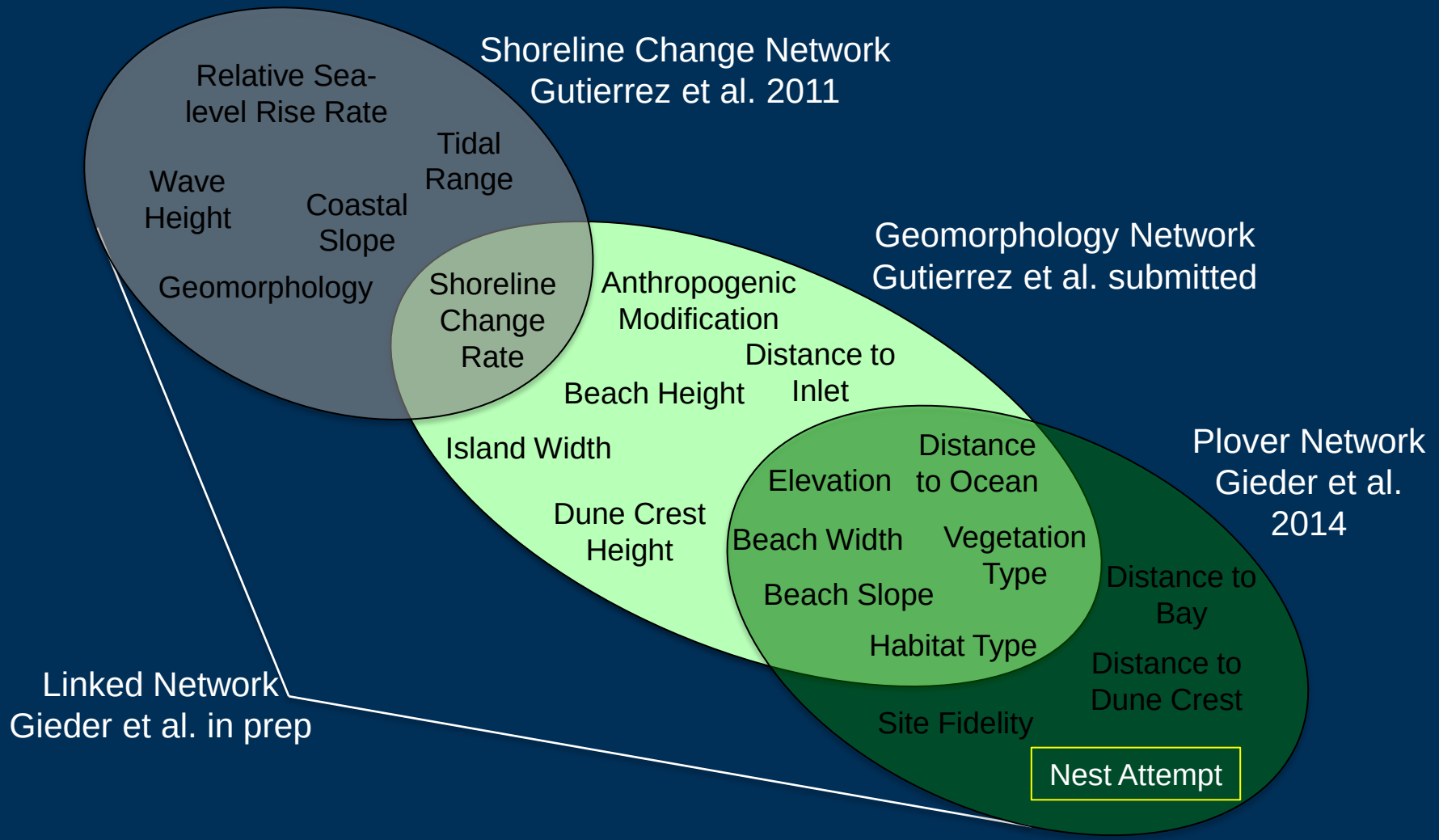


- Sea-level change (and other factors) drives coastal erosion
- Erosion and sedimentation modify morphology
- Large-scale and local morphology predicts plover success (and vegetation, groundwater resources, wetland behavior, etc.)
- *The people problem is the same, minus the feathers

# Forecasting the Effects of Sea-Level Rise on Piping Plovers



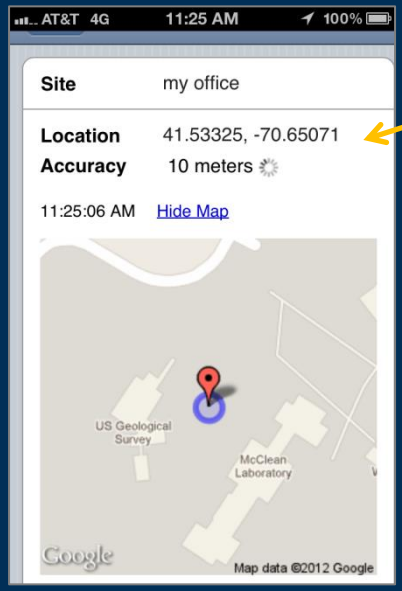
# iPlover: feeding SLR, plover (and other) models with standardized observations


There's an app for that

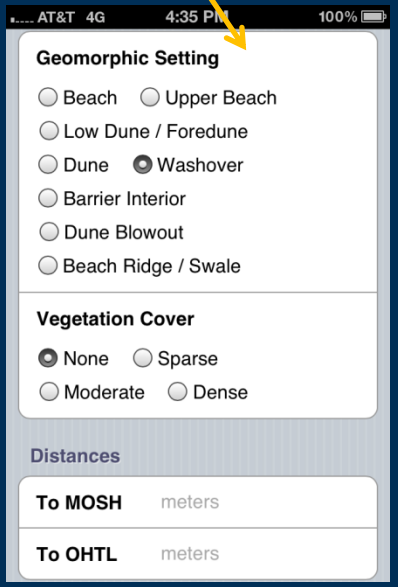

Unofficial splash screen


Unofficial icon

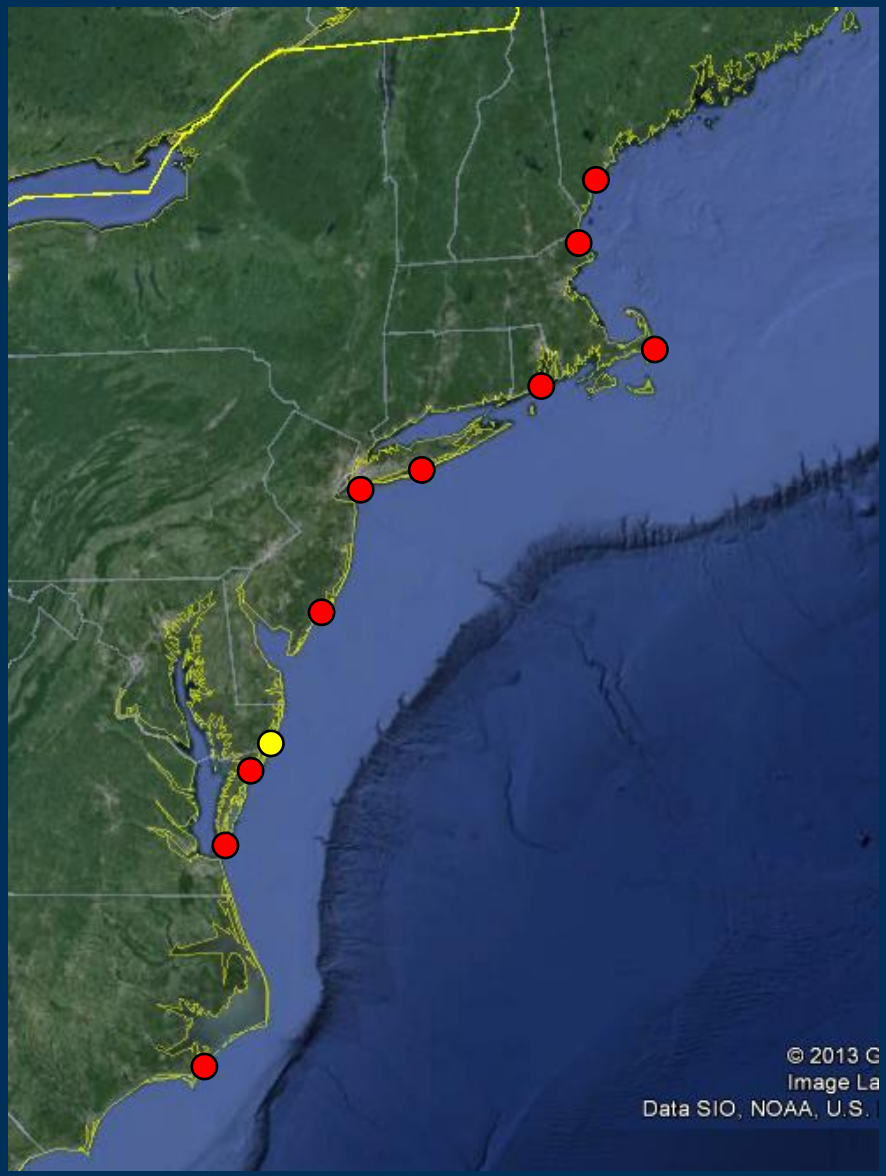
- Deploy to select DOI partners; provide protocols
- Vastly increase spatial domain
- Can deal with fuzzy observations
- Collection requirements based on what we've learned to date




DATA!

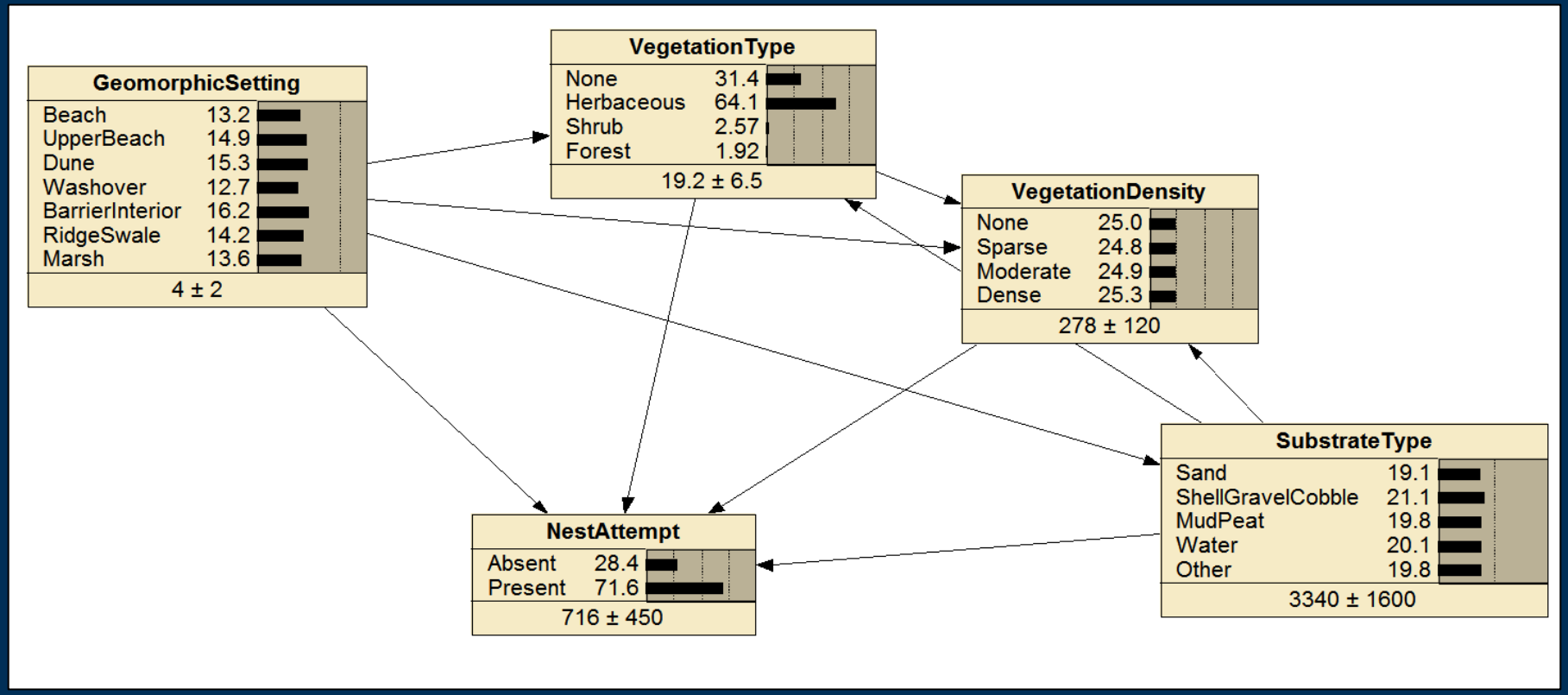


# Sea-level rise: broadening scope and diving deep

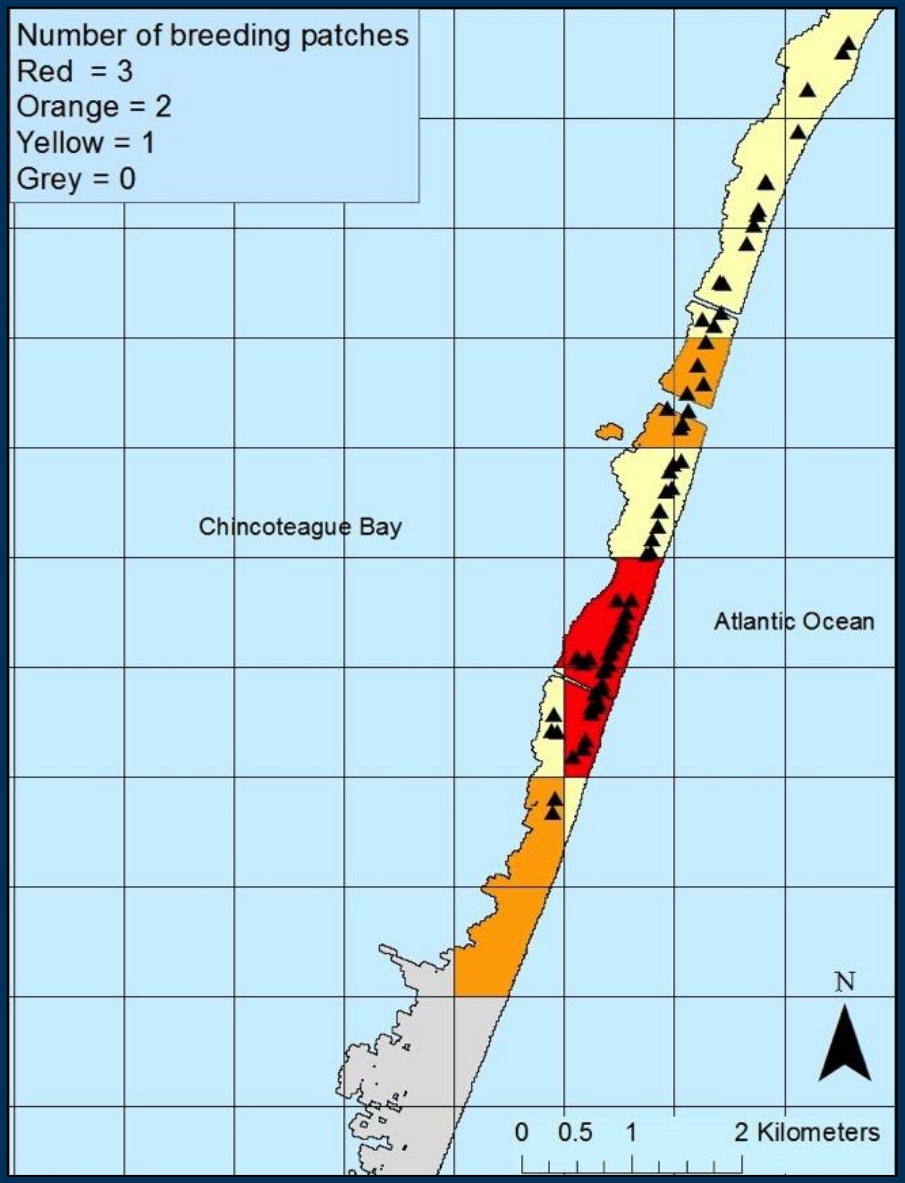



- Continued research
  - Assateague
  - Chincoteague
- Expansion to new locales
  - Cape Lookout
  - Eastern Shore of VA
  - Forsythe
  - Gateway (JBU)
  - Fire Island
  - Rhode Island
  - Monomoy
  - Parker River
  - Rachel Carson
- Diving Deep
  - Forsythe
  - Gateway (JBU)
  - Fire Island

# iPlover Network



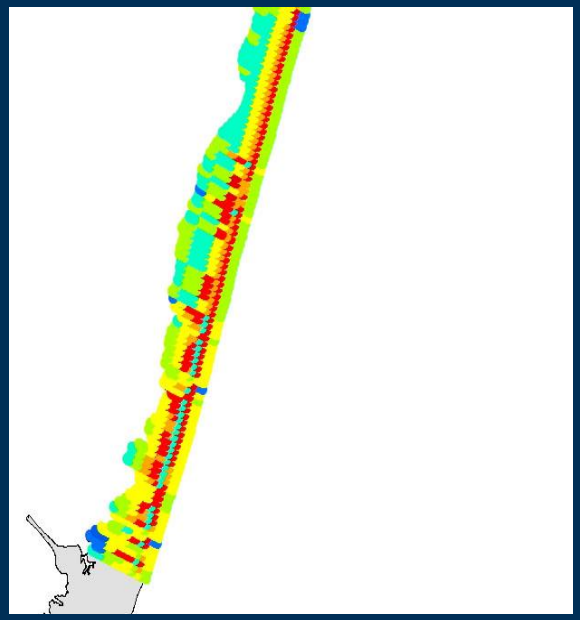
# Forecasting the Effects of Sea-Level Rise on Piping Plovers




Gieder et al. in prep

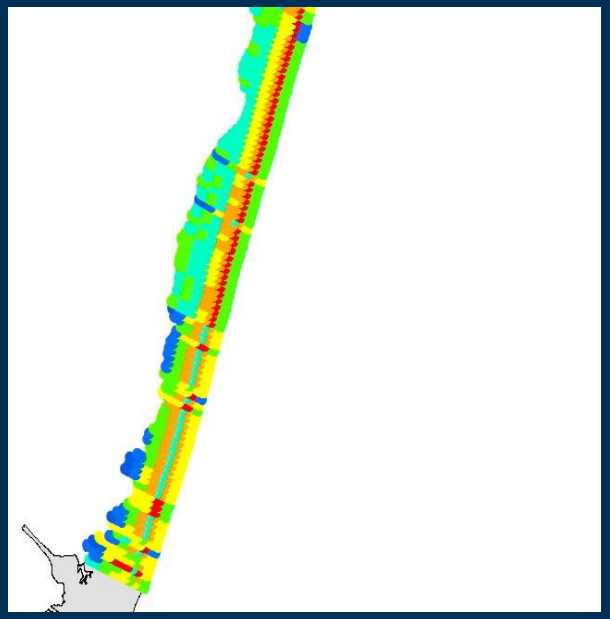
# Forecasting hypothetical future management scenarios and plover nesting probability

~2050, 4.1 mm/yr SLR



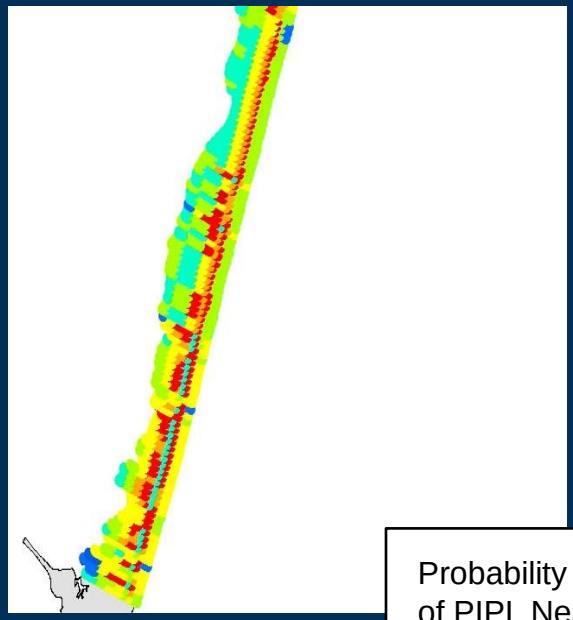
Good

~2050, 4.1 mm/yr SLR, with frequent sand placement

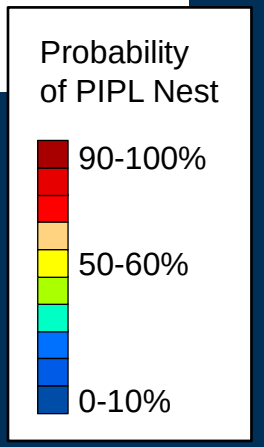


Not-as-good

~2050, 4.1 mm/yr SLR, with increased berm height



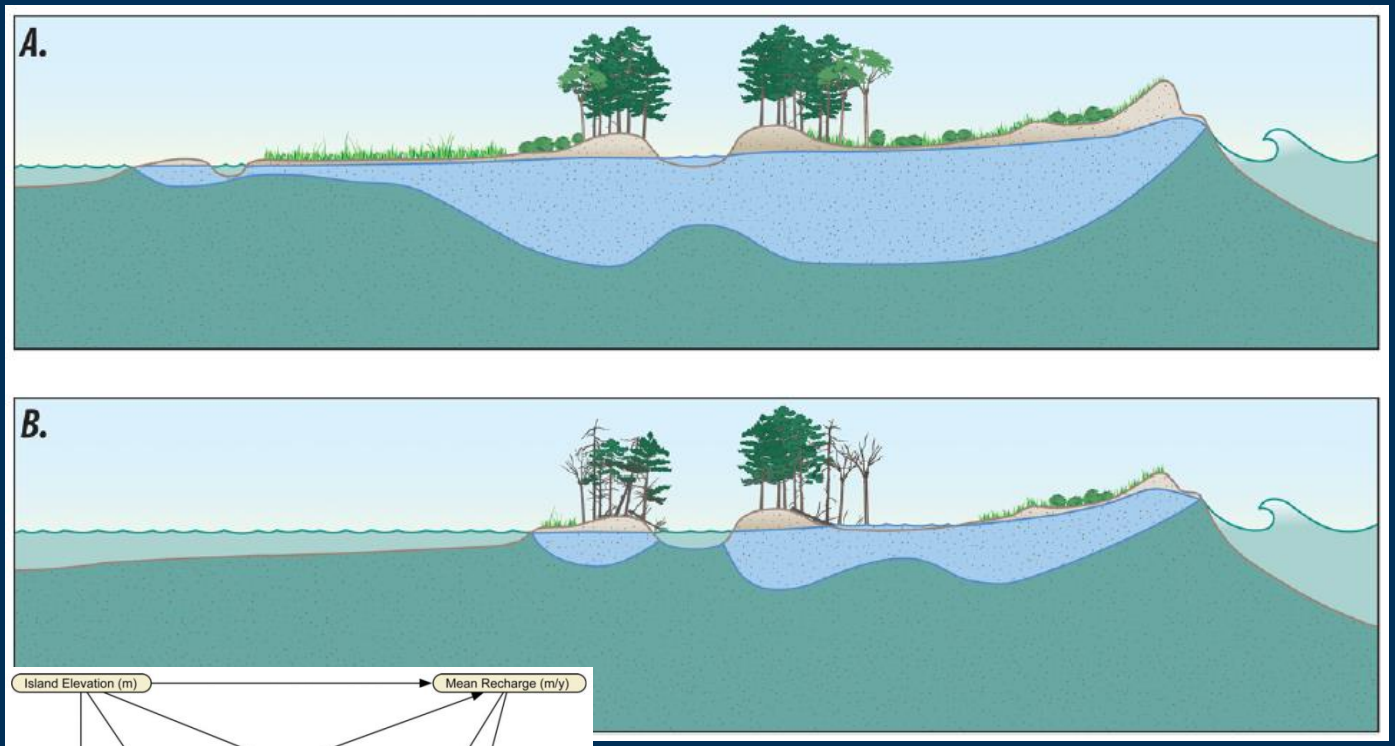
Good



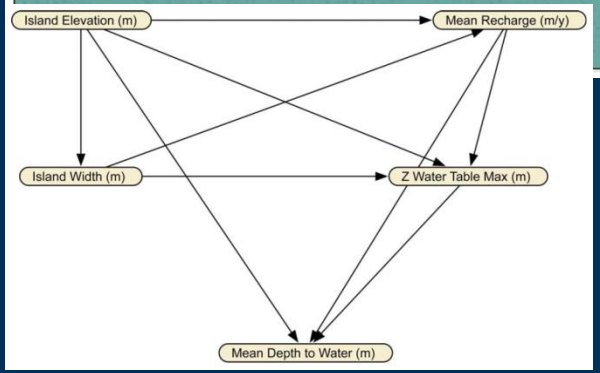

(Gutierrez, Gieder et al., in prep)

# Sea-level rise impacts on groundwater resources

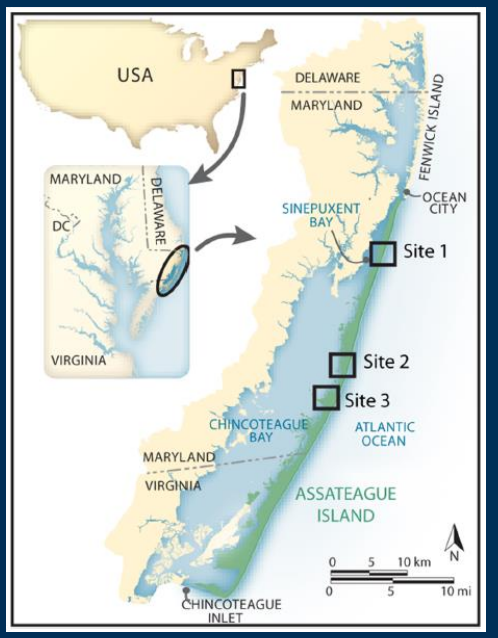
- Long-term coastal processes (i.e., cumulative storm effects, sea-level rise)
- Uses models and data (boreholes, geophysics, water wells, topography, biology)




(Masterson et al., 2013)




(Fienen et al., 2013)



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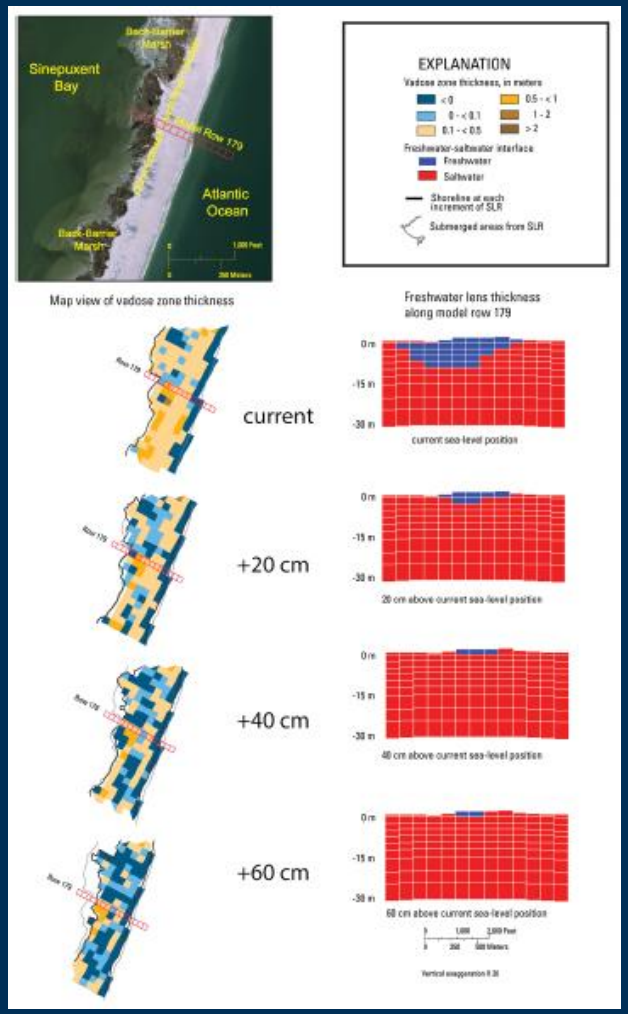


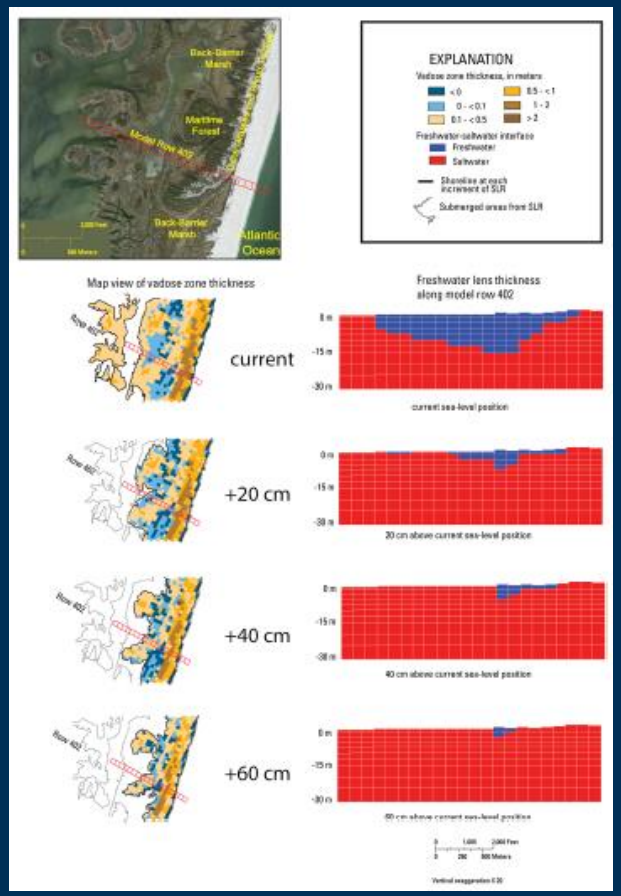


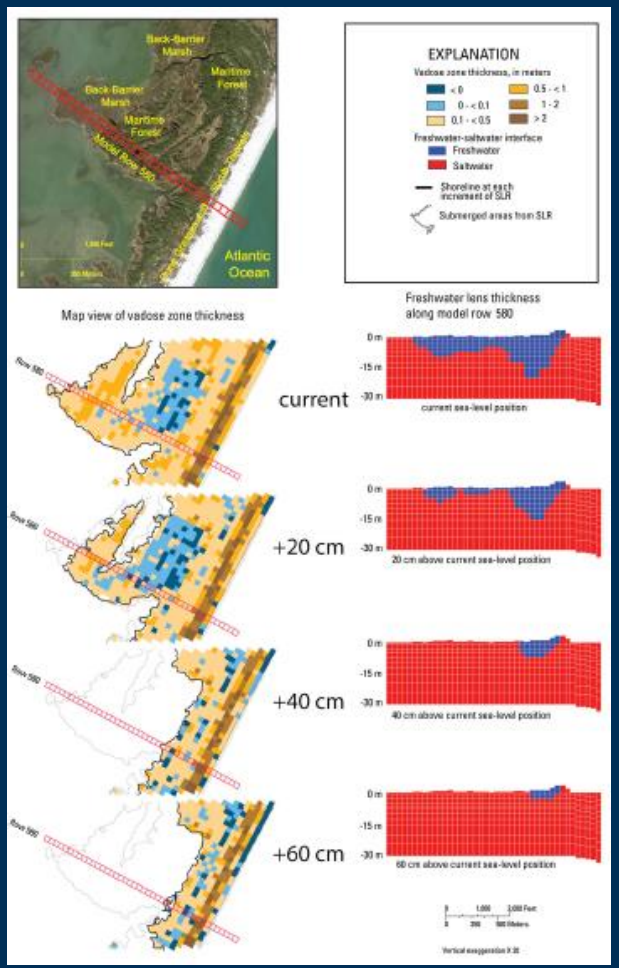


(Masterson et al., 2013)