

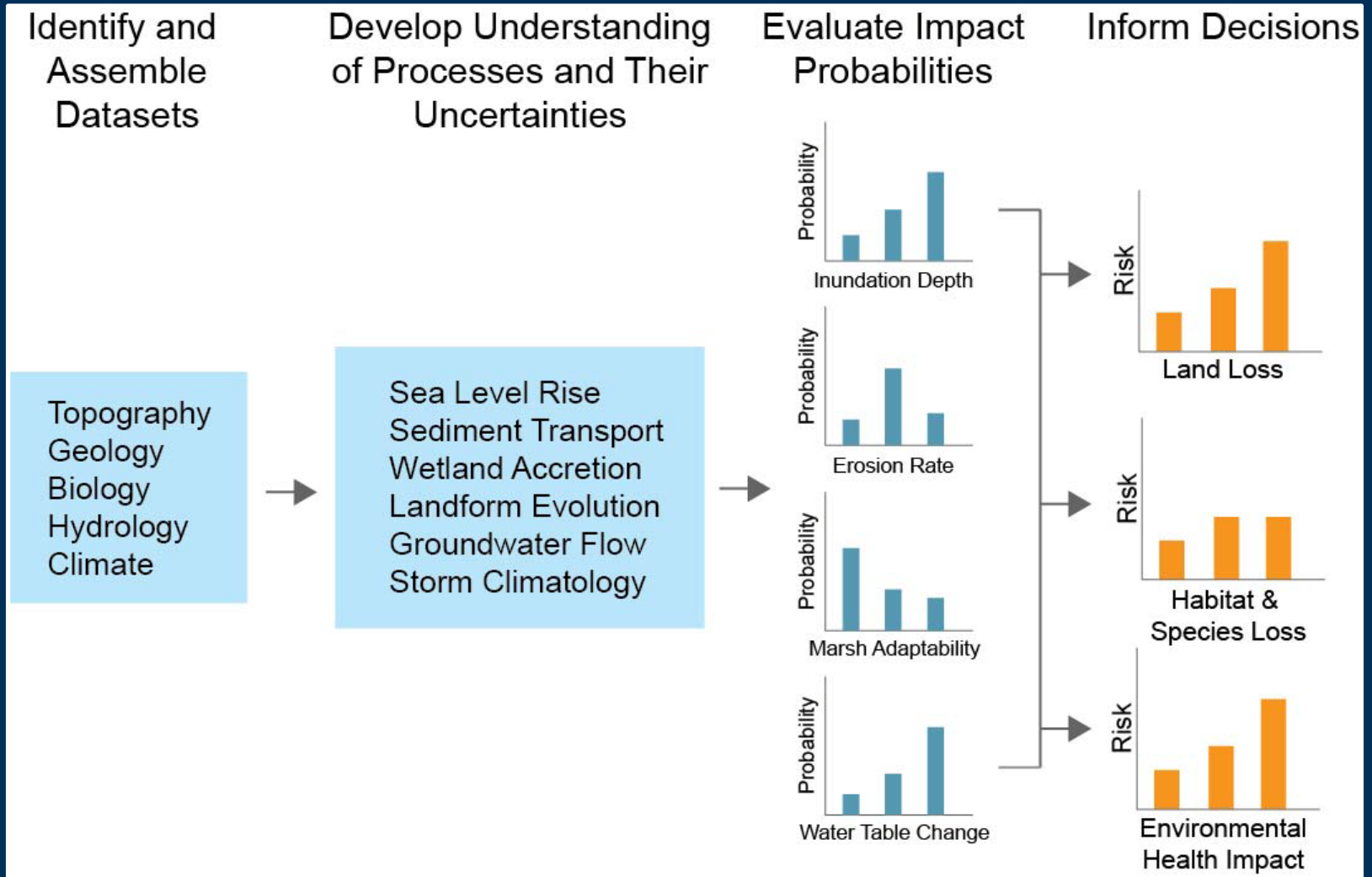
Forecast effects of accelerating sea-level rise (SLR) on the habitat of Atlantic Coast piping plovers and identify responsive conservation strategies

- Piping plover habitat virtually certain to be impacted by accelerating SLR
 - Potential impacts are rangewide
 - Natural and human responses to coastal change are poorly quantified
- Research group using common Bayesian approach to integrate geologic, biologic and other relevant data
 - Convey what we know and what we know we don't know
 - Synthesize data and models for habitat evolution and plover behavior
 - Provide basis to focus resources
- Develop science-based decision tools for managers to inform conservation recommendations to regulators

- Current partners



A conceptual approach to the multivariate, uncertainty problem for coastal change (and plovers)



Explicitly include uncertainties, as well as management application

Decision Support for DOI Agencies: Why are we starting with Piping Plovers?

Piping plover, *C. melodus*



Bill Byrne, MA F&W

- Atlantic coast breeding population is listed as a threatened species; wintering populations are a mixture birds with threatened and endangered status
- DOI management responsibility
- Lifecycle includes substantial time on federal lands for breeding, migrating, wintering
- Have interesting and specific habitat requirements that we can predict from measurable physical variables
- Can feed predictions back into population dynamics models

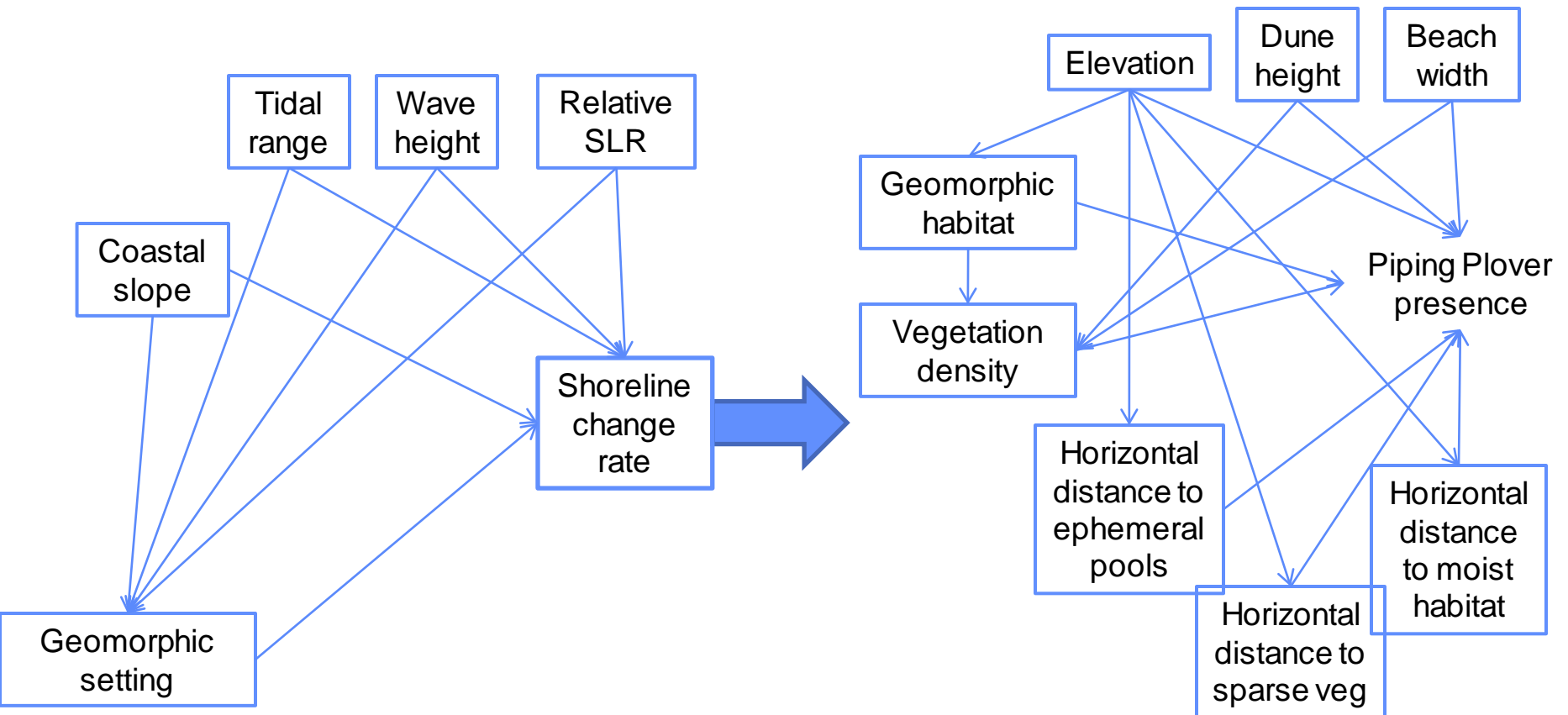
Piping plover habitat and SLR

- Breed in dry open areas, sparsely vegetated adjacent to moist substrate habitats
- Stopover on migration, and winter in similar habitats



An Example Bayesian Network for Piping Plover Habitat and SLR effects

We are developing a coupled model predicting climate change effects on piping plover behavior.



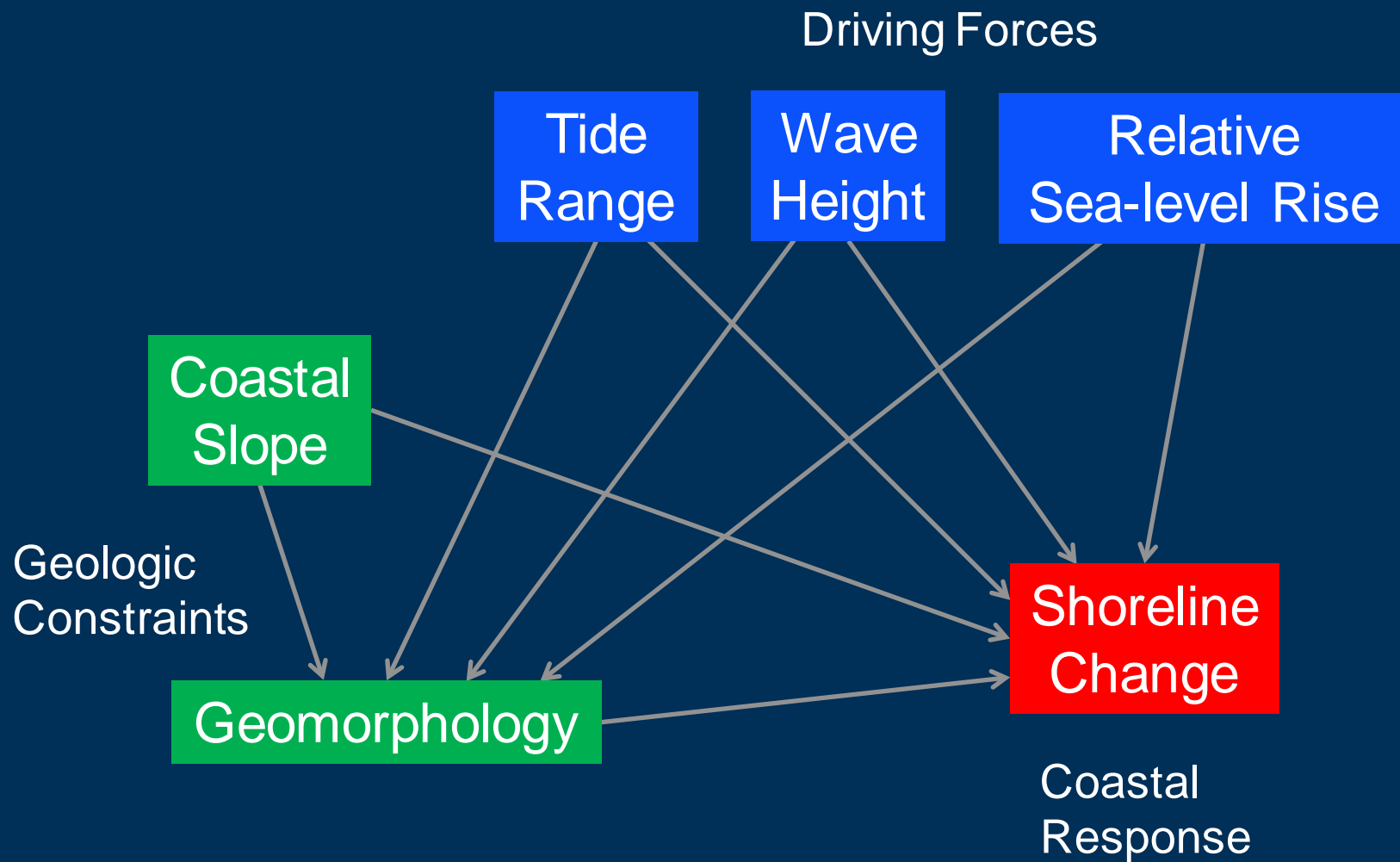
In the end...

- We will test multiple possible scenarios of the future of our coasts
- We will incorporate practical application guidelines and case studies to inform current and near-term decisions regarding coastal stabilization
- Please come see our poster



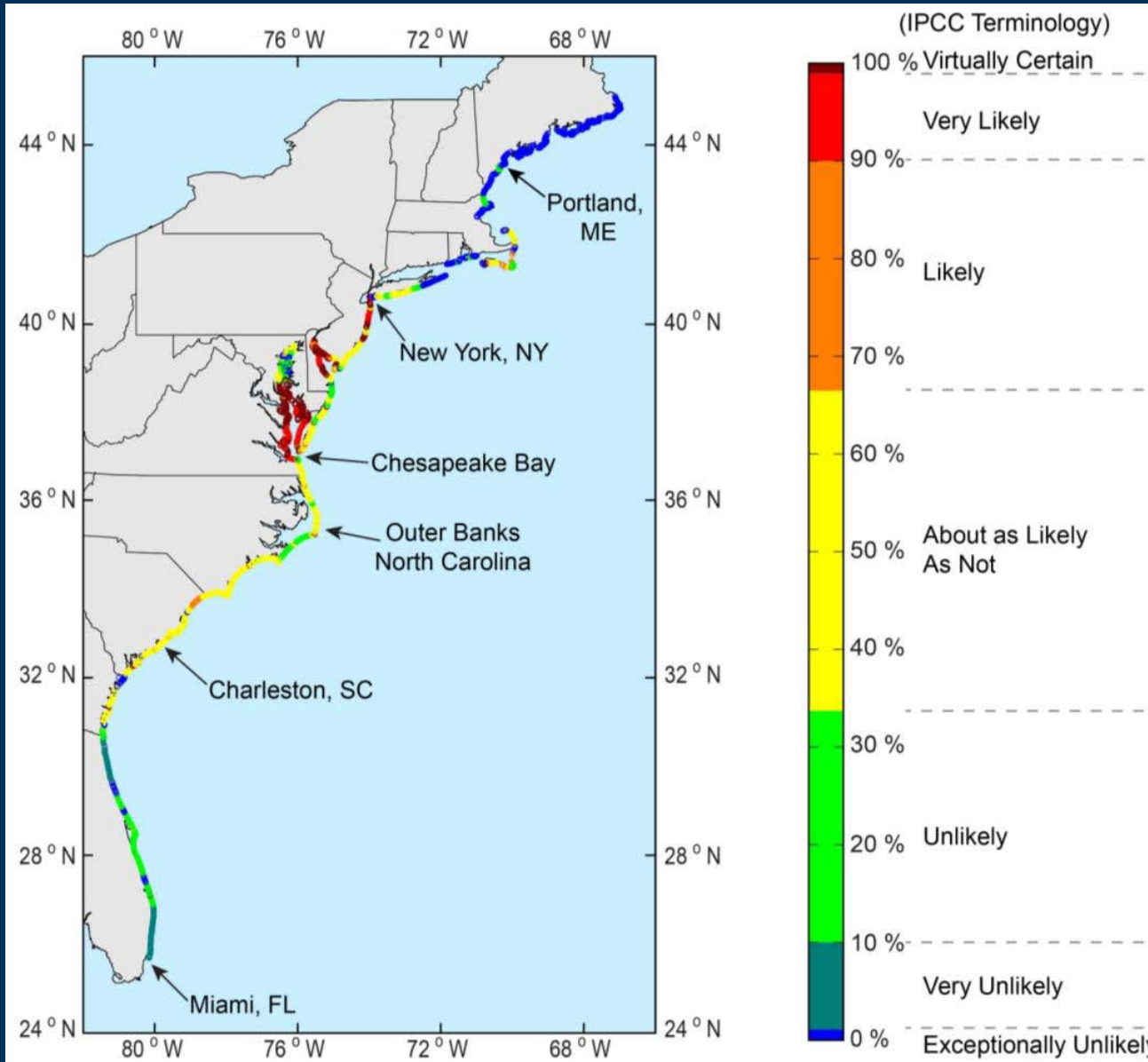
Simple Bayesian Network for Coastal Vulnerability

(uses existing USGS data from Thieler and Hammar-Klose, 1999)



Mapping Erosion Risk Using Bayesian Networks

Probability of shoreline erosion >2 m/yr

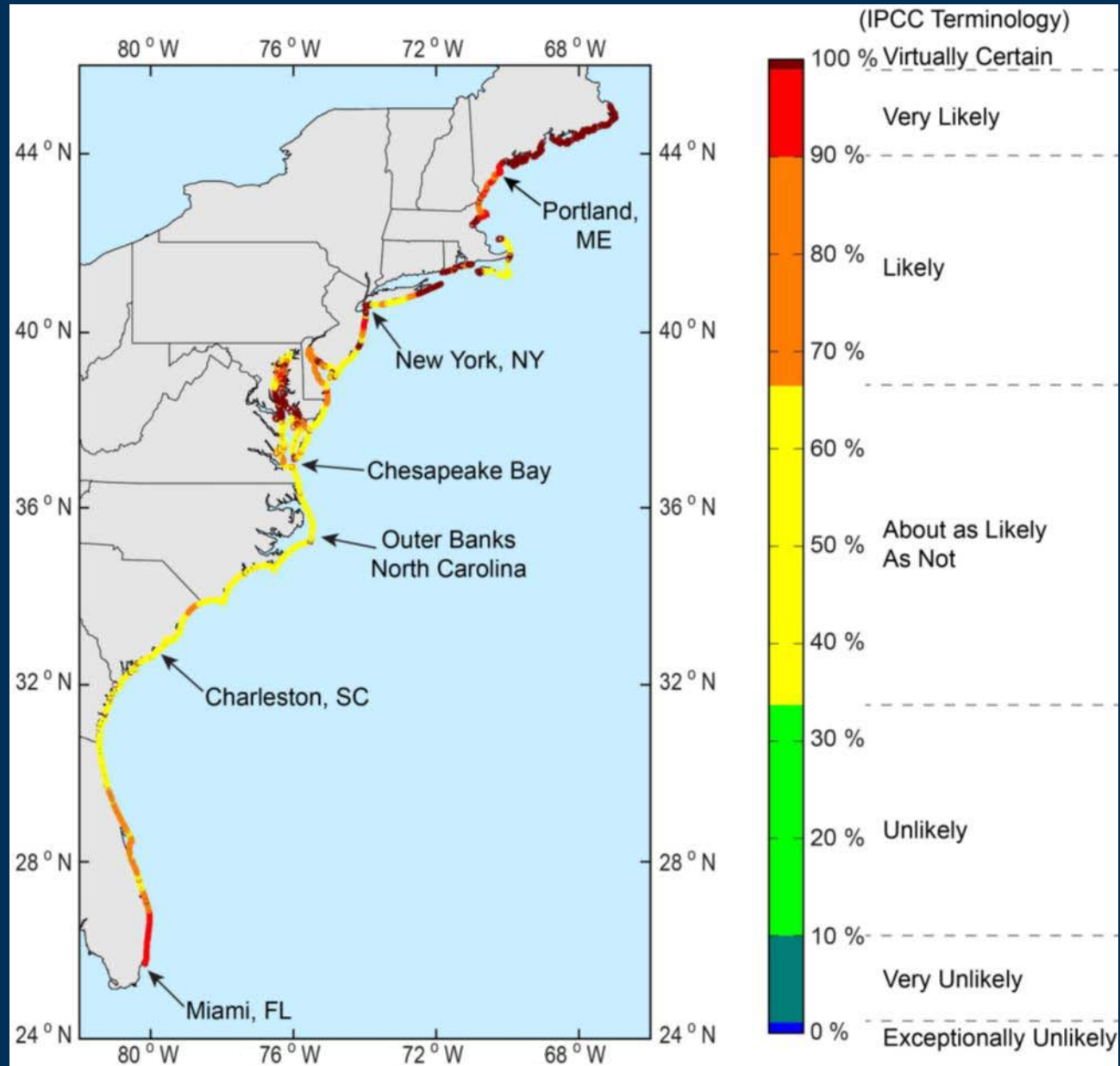


(Gutierrez et al., 2011)

Mapping Prediction Uncertainty

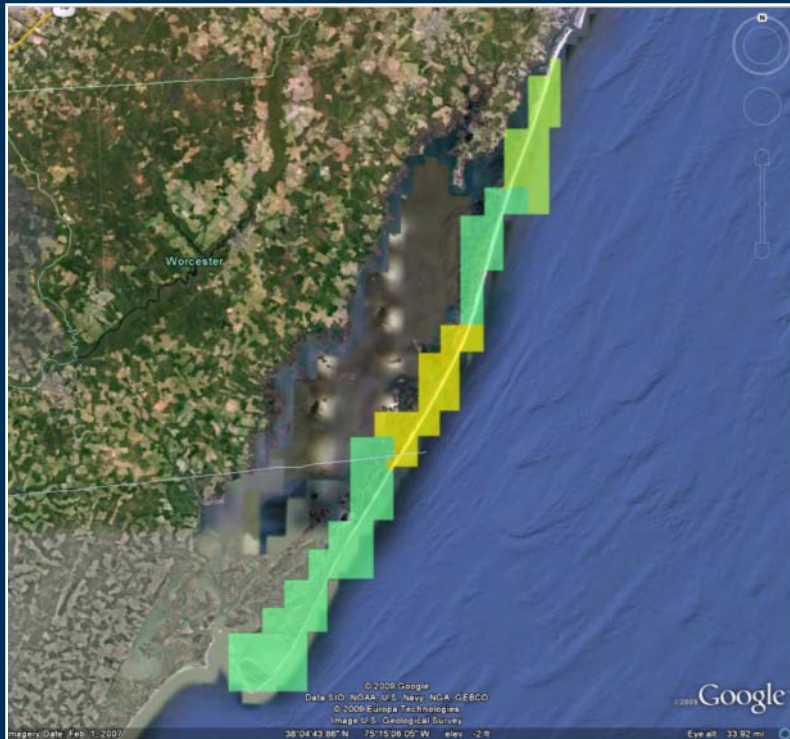
Higher probability = higher certainty of outcome

- Uncertainty map can be used to identify where better information is needed
- Areas of low confidence require
 - better input data
 - better understanding of processes
- Can use this map to focus research resources

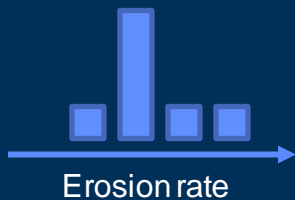
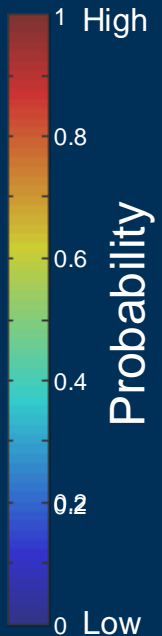
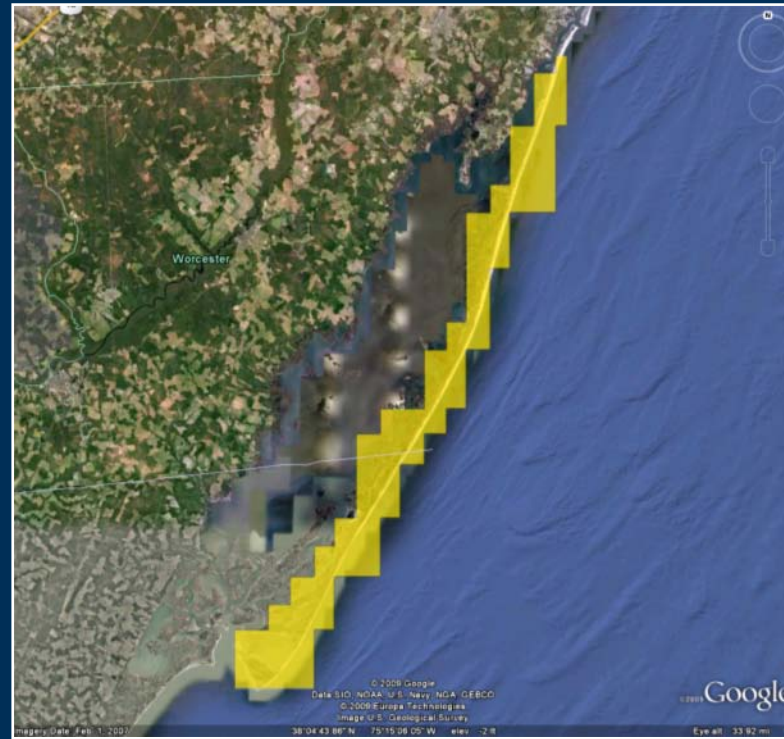


Application of a Bayesian network to an uncertain future: Probability of shoreline erosion >1 m/yr at Assateague Island National Seashore

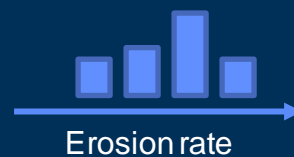
Current conditions



SLR +1 mm/yr, Wave ht. +10%



Narrow probability
distributions
Relatively low uncertainty



Higher likelihood of
erosion
Broader distributions
Increased uncertainty

Plovers in a Bayesian Network

