Sea Level Affecting Marshes Model

SLAMM

Geoenabled by US

Chincoteague NWR, Virginia

What I am not going to talk about

- Sea-level Rise
- IPPC reports
- How active tectonics impact sea level rise
- Melting glaciers
- How eustatic sea levels are adjusted to Local rates
- The science behind tide data and datums
- and a lot of other things

I will tell you

- About the history of SLAMM (Sea level Affecting Marshes Model)
- How the agencies represented in this room geoenable SLAMM
- How to get you hands on the SLAMM model
- The basics of how it works
- How the SLAMM output is viewable over the Internet using SLAMM-View
- Live demo of SLAMM view

My Goal

- Peak your interest in SLAMM so you :
  - Download the technical documentation
  - Download the model and sample data
  - Kick the tires and look under the hood
  - Ask the hard questions
  - HELP us move SLAMM to the next level

Sea Level Affecting Marsh Model (SLAMM)

- Developed in mid-1980s by
  Dr. Dick Park, Eco Modeling
- Next generation developer
  Mr. Jonathon Clough, Warren Pinnacle
- Coastal Marsh Ecologist
  Dr. Chris Craft, Indiana University
- Developer of SLAMM-View
  Dr. Jeff Ehman, Image Matters

Model Development Overview

- SLAMM was developed with EPA funding by Dr. Richard A. Park (Park et al. 1986)
- SLAMM2 was used to simulate 20% of the coast of the contiguous US for the 1991 EPA Report to Congress
- SLAMM3 was developed in 1993, applied to Puget Sound and Florida
- SLAMM4 was produced in 1998, cell size resolution vastly improved, Windows GUI and mapping component added

SLAMM 5.1

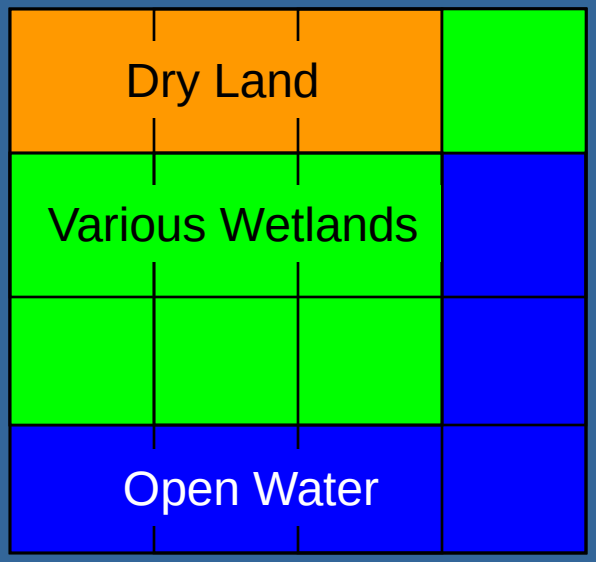
- EPA STAR grant has provided Funds for Significant model development.
  - Model allows the use of LIDAR data
  - Additional feedback from team of scientists incorporated
  - SLAMM 5 (beta) produced-- salt-wedge formulation for estuaries
  - Simulations of entire Georgia and South Carolina Coastline
- National Wildlife Federation Funded Simulations
  - Florida (ten large sites, complete)
  - Puget Sound (ten large sites and Columbia River, complete)
  - Chesapeake Bay (entire bay and Delaware Bay)

Web Links

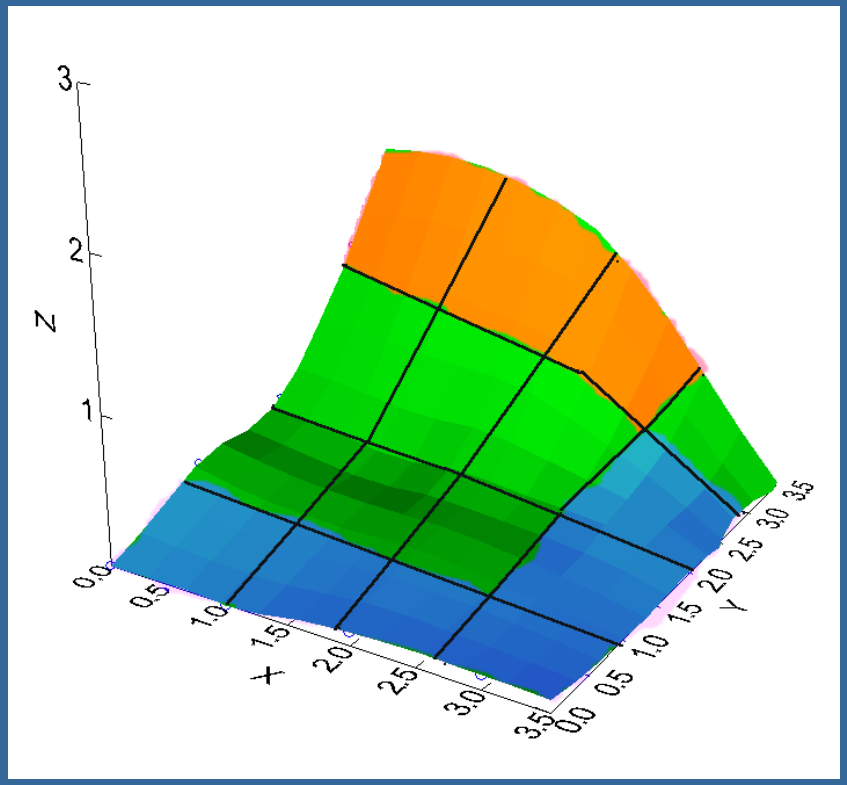
- SLAMM documentation, model, and sample data
- Google : SLAMM
- To view SLAMM simulations on the web
- Google: SLAMM-view

Conceptual Model

- 30m x 30m cells with elevation, slope, aspect, wetland type
- Cell size can be variable but many DEMs have 30 m resolution
  - Cells will track movement of multiple land-type categories



2D Representation



3D Representation

Five Primary Processes Modeled

- Inundation
- Accretion
- Erosion
- Overwash
- Saturation

Data Download from Internet

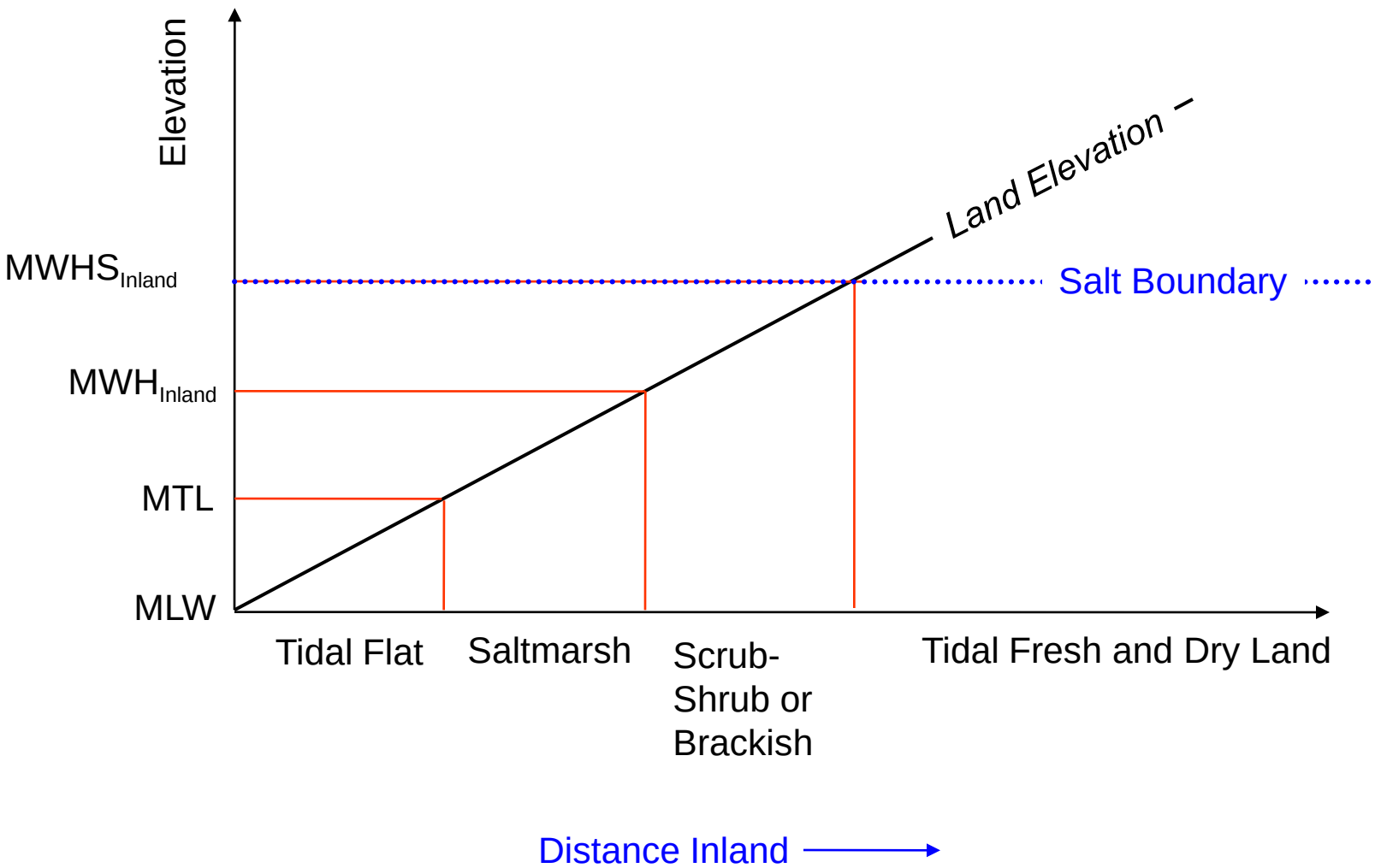
- National Wetland Inventory Wetlands Data - FWS
- Tide ranges - NOAA
- Historic relative sea level rise -NOAA
- Projected eustatic sea-level rise – IPCC
- Digital elevation models produced from maps or LiDAR - USGS
- LiDAR – Digital Coast and Misc. Sources
- Landuse, Landcover and impervious surface -MRLC and NOAA C-Cap

National Elevation Data

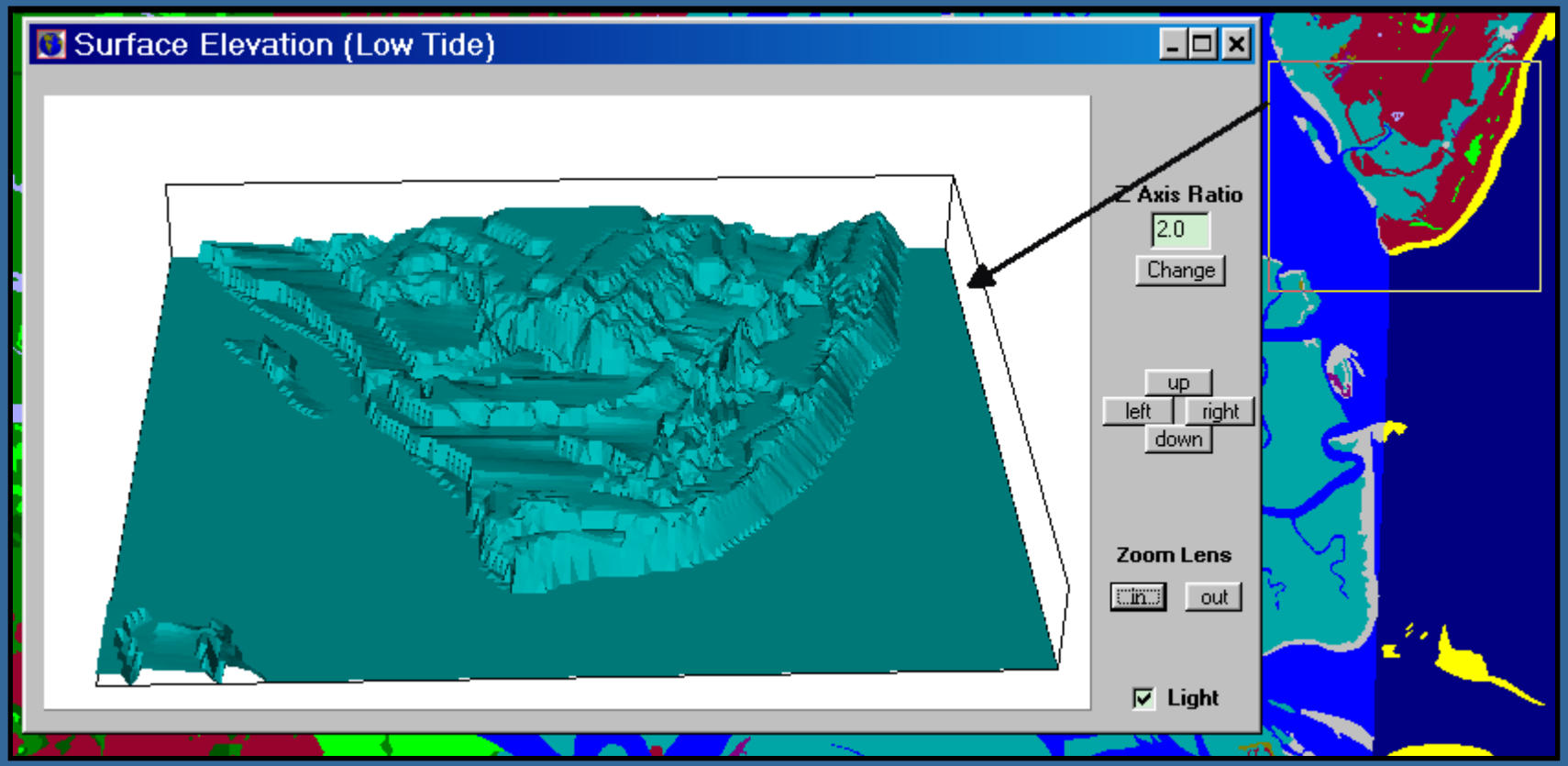
- NED data with a vertical datum of NAVD88.
- Data must be corrected so that mean tide level is set to zero (which is the internal SLAMM datum).
- If LiDAR data are available, they are used (“bare earth”
- DEM data do not have the vertical resolution required for accurate predictions of marsh elevations.
- Reason for NWI Preprocessor

NWI Preprocessor

- Data derived from the DEM tend to have elevational plateaus, making model predictions subject to a threshold after which all wetlands are lost .
- Often this threshold is arbitrary, based on the vertical resolution of the DEM that underlies the NED data.
- To correct for these problems, SLAMM calculates wetland elevations based on National Wetlands Inventory (NWI) Categories.


Elevation
Land Elevation
MWHS Inland
Salt Boundary
MWH Inland
MTL
MLW
Tidal Flat
Saltmarsh
Scrub-Shrub or Brackish
Tidal Fresh and Dry Land
Distance Inland

SLAMM 3-D Graphing Tool



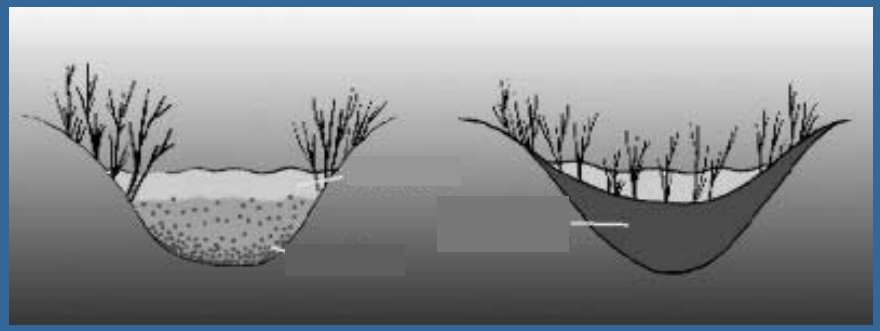
Wetlands Integrate

- Tidal Regime
- Degree and or duration of flooding
- Water salinity
- Freshwater inflow (accretion)

Critical Local Influences

- Accretion is the buildup of organic and inorganic matter on the marsh surface

Sediment and
Organic Deposition



Substrate Buildup

- Response of vegetation to sea level rise
- Freshwater inflow
- Movement of the Salt wedge

Why is FWS involved

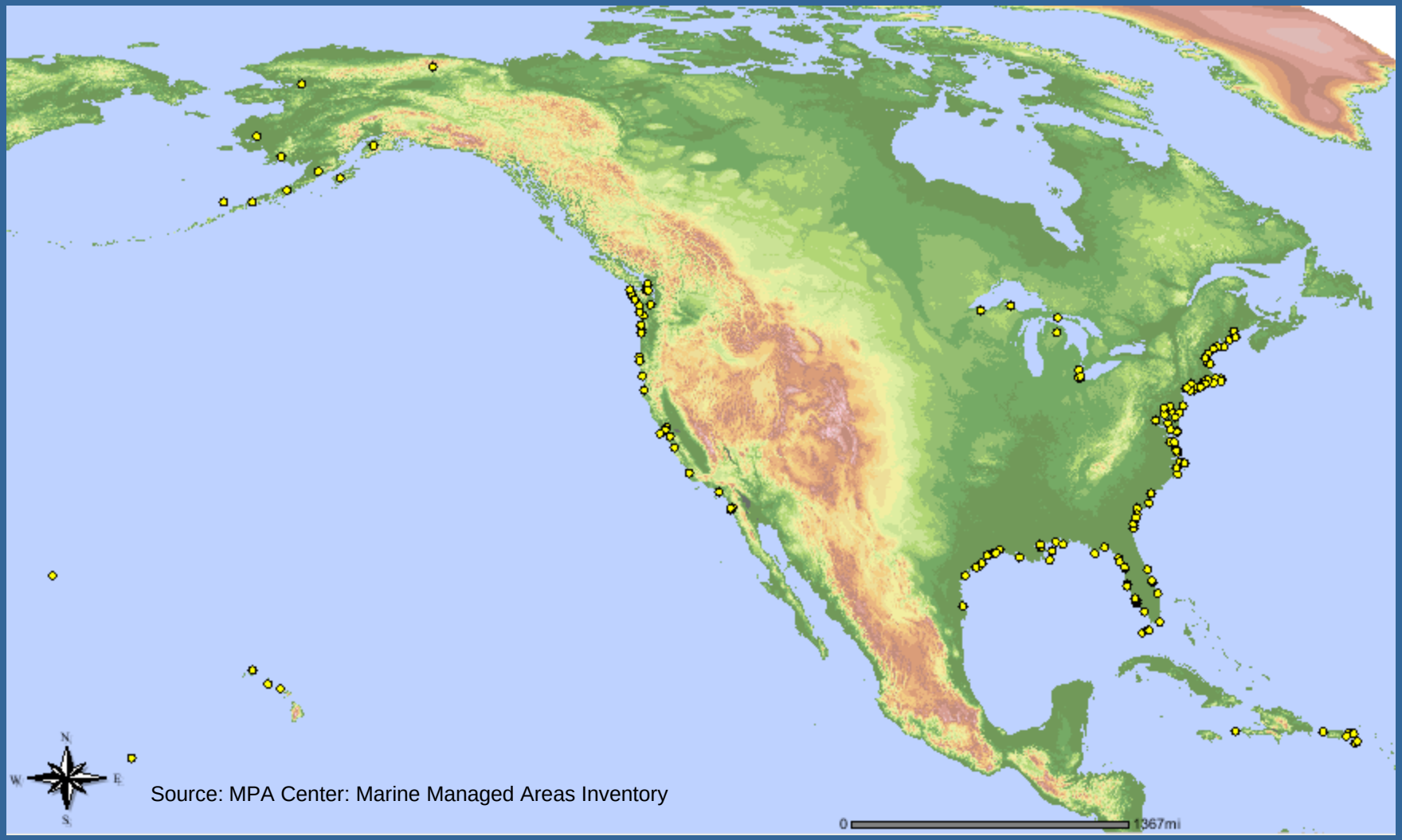
- It allows us to be in compliance with DOI Secretarial Order 3226: *"consider and analyze potential climate change impacts… when developing multi-year management plans."*
- The results of SLAMM simulations are being included in Refuge (CCPs) Comprehensive Conservation Plans

Relative Vulnerability

SLAMM provides policymakers with valuable information as to which sites are **more vulnerable** than others to sea level rise. and is a useful tool in **assessing priorities when finances are limited.**

- For land Acquisition
- For restoration projects

159 Coastal Refuges



Source: MPA Center: Marine Managed Areas Inventory

Why SLAMM

- **Because** SLAMM mostly runs on **existing data** available over the **INTERNET and** because the model is relatively simple.
- **It is possible to produce comparative analysis over large areas relatively inexpensively.**
- Areas like Chesapeake Bay, Puget Sound, the combined coasts of South Carolina and Georgia cost **tens of thousands** not **hundreds of thousand of dollars.**

SLAMM is relatively simple

- SLAMM continues to be tested and refined.
- Accretion assumptions (including a feedback to the response of vegetation to SLR) need to be refined.
- The salinity portion of the model needs to be upgraded.
- It can be run by mere mortals with data that can be downloaded for the Internet.

How can you help

- Get your data posted on the Internet.
- Help build the scientific foundation upon which SLAMM 6 or 7 or 8 will be built.
- Download the executable model
- Change the inputs and see what happens
- After you have reduced your carbon footprint
- Apply your talents to move SLAMM down the road

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Questions