

Assessing the Vulnerability of Coastal Wetlands to Sea-Level Rise

Application of a Model



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Overview of Sea-Level Rise

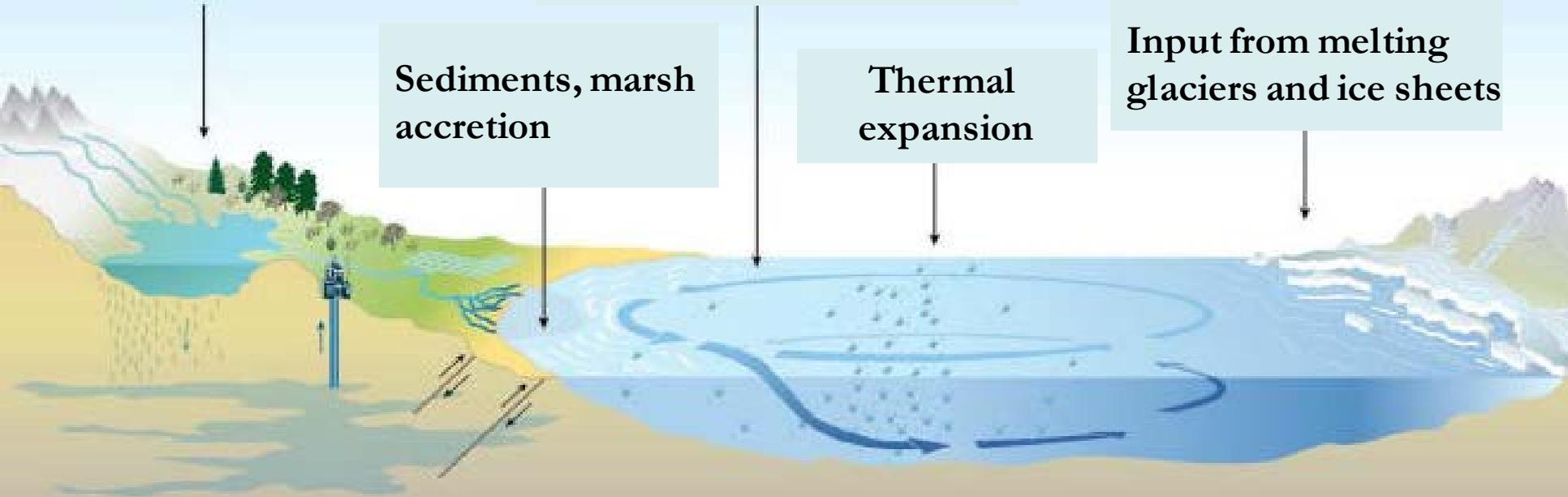
Subsidence, tectonic shifts, etc.

Ocean circulation patterns, Earth's rotation, etc.

Sediments, marsh accretion

Thermal expansion

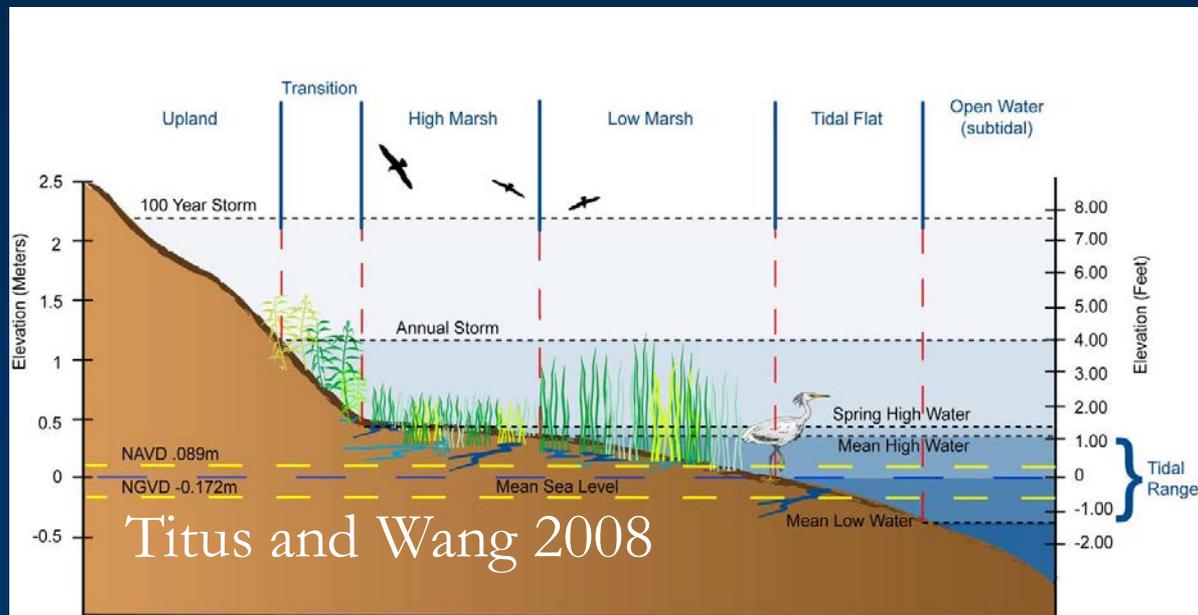
Input from melting glaciers and ice sheets



What is SLAMM?

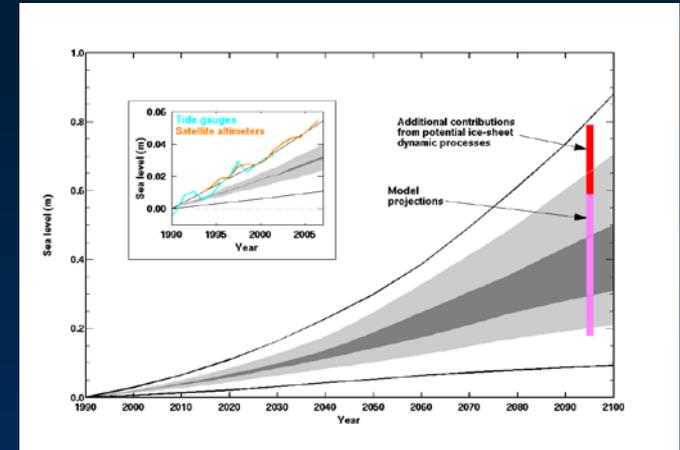
SLAMM Simulates the Dominant Processes Involved in Wetland Conversions and Shoreline Modifications During Long-Term Sea-Level Rise

(e.g., Elevation/tidal range and marsh type)

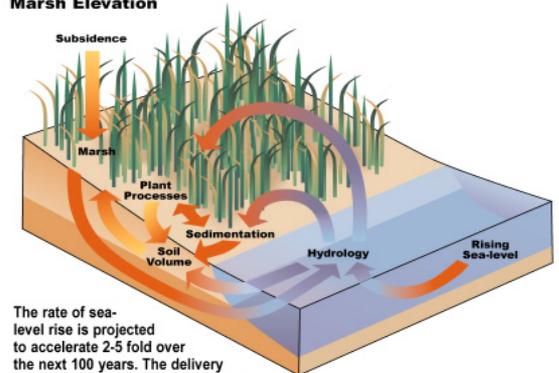


Multiple Scenarios, Localized Changes

- **Accelerating Sea-Level Rise, 25-year Time Steps**
 - Eustatic sea-level rise
- **Addresses Primary Processes**
 - Inundation, erosion, saturation, overwash, accretion, salinity
- **Site-Specific Accretion Rates and Geological Factors**
 - Relative sea-level rise



Processes Affecting Marsh Elevation



The rate of sea-level rise is projected to accelerate 2-5 fold over the next 100 years. The delivery of sediments to coastal wetlands is extremely important in determining the potential of these systems to maintain themselves in the face of current and future sea-level changes.

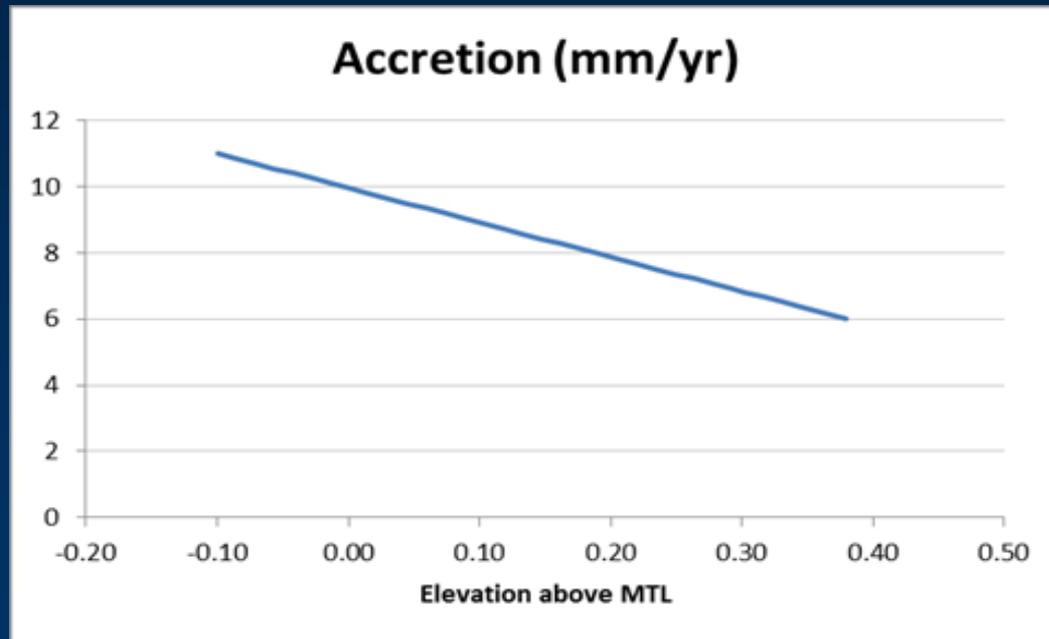
Key Data Inputs

- Land Elevation
 - (e.g., LiDAR)
- Tidal Data
 - (e.g., NOAA tide gauges)
- Habitat Coverage
 - (e.g., FWS NWI, ifSAR, C-CAP)
- Other Land Use
- Data for Relative Sea-Level Rise



Accretion Data

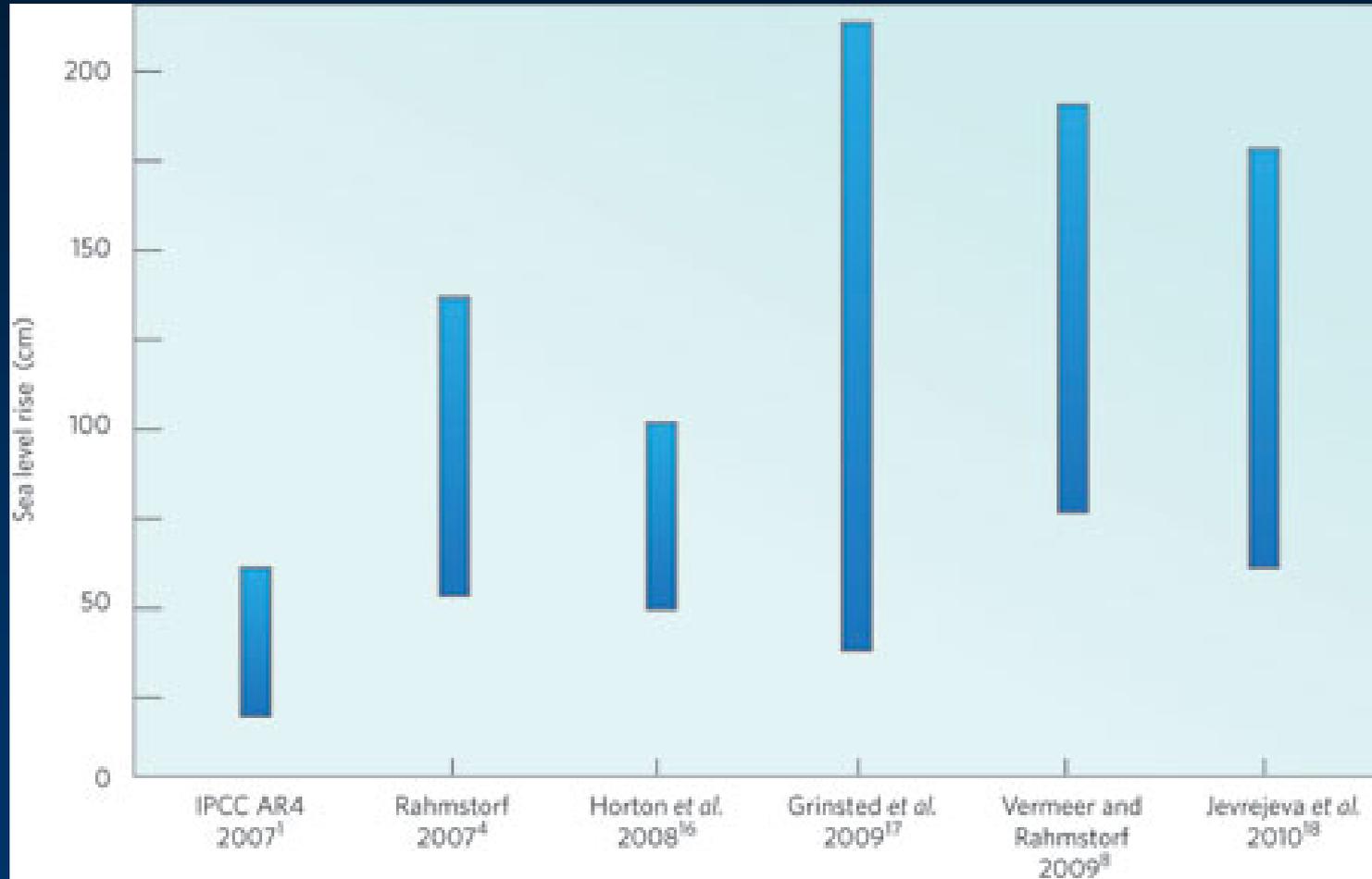
- **SLAMM 6 Allows Accretion Feedback**
 - Accretion rates higher in areas of lower elevation
 - Feedback not used for floating marshes



Hindcast and Forecast

- **Model Validation (Hindcast)**
 - Purpose of this exercise is to run the model, starting at a time in the past (depending on data availability), and examine results against “current” data
- **Model Calibration (Hindcast)**
 - Start with model validation, examine model parameters and modify them (within feasible range) to gather best possible simulation
- **Calibrated Model Serves as Basis for Forecasting**

Forecast: SLR scenarios



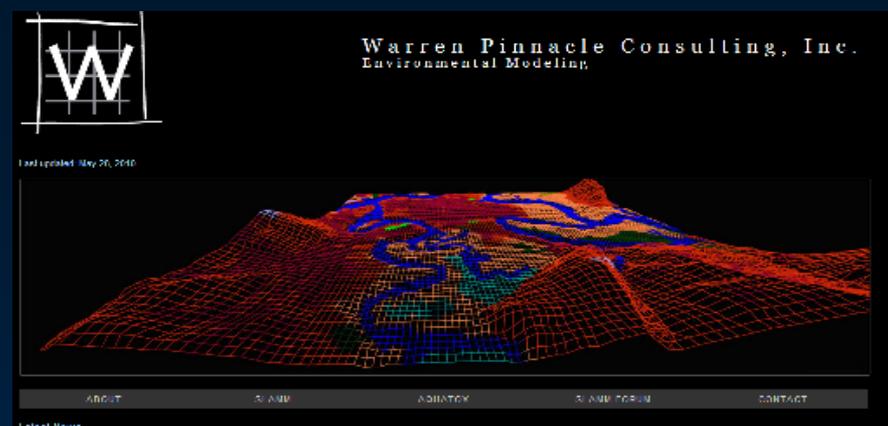
For more information about SLAMM

- **SLAMM Webpage**

<http://warrenpinnacle.com/prof/SLAMM> or Google “SLAMM”

- Includes Brief Model Overview, Bibliography
- Updated with Latest Projects and Results
- Technical Documentation with Full Model Specs
- Model Executable/Source Code Available through the Forum

- **Email:** jclough@warrenpinnacle.com



Using SLAMM Results

Help prioritize species and systems

- Identify sites based on ecological/economic importance and vulnerability to sea-level rise



Using SLAMM Results

Virginia's Eastern Shore



Using SLAMM Results

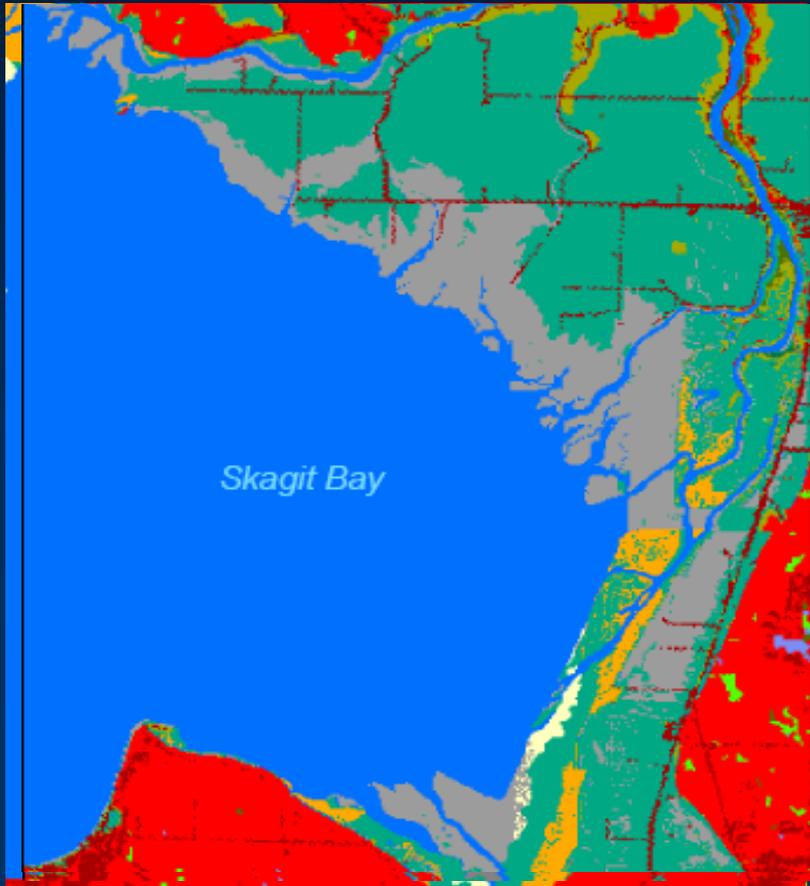
Help prioritize species and systems

- Identify areas with potential for upland protection (e.g., marginal agricultural land)



Using SLAMM Results

Skagit Bay, Washington



Using SLAMM Results

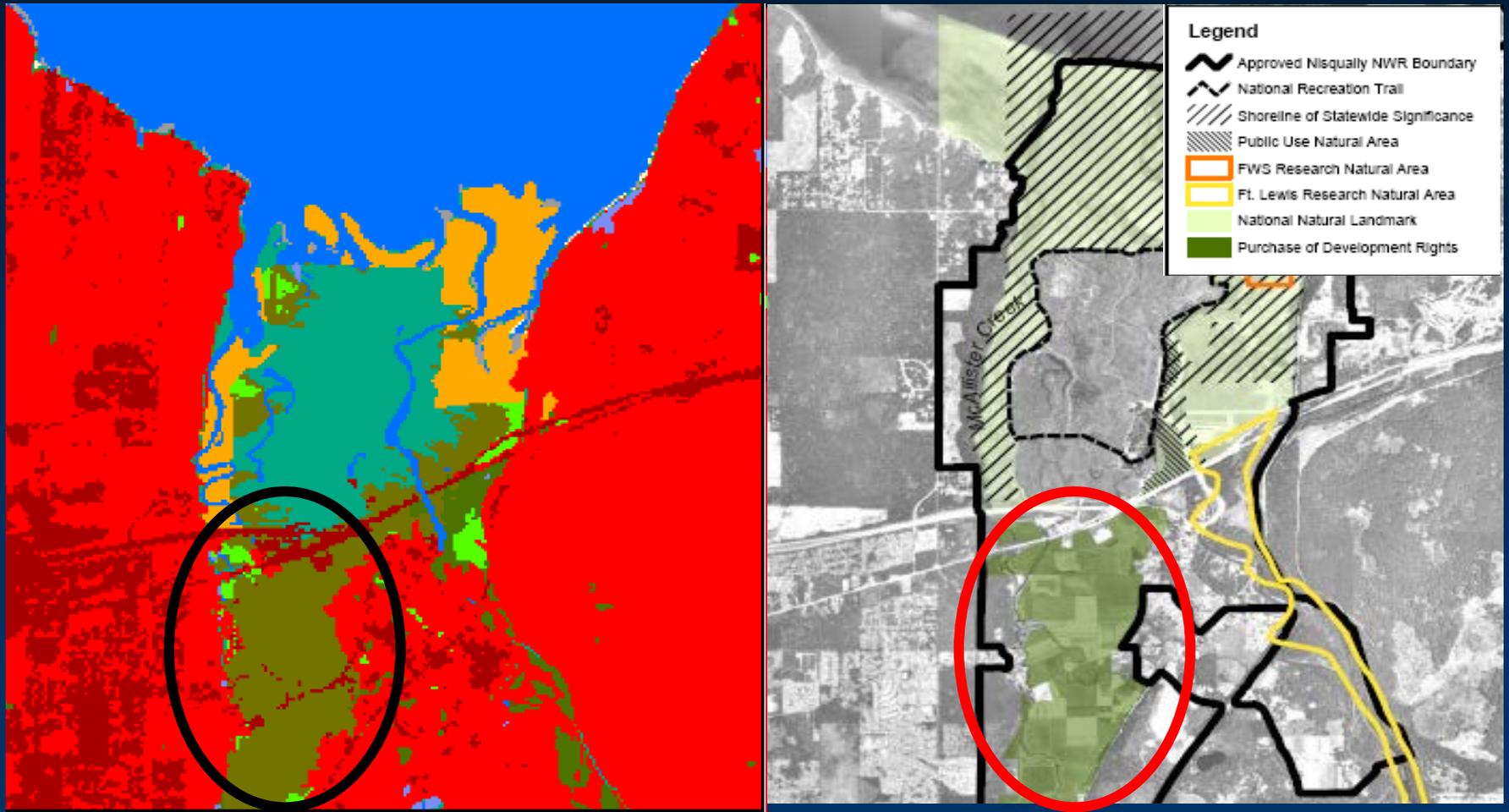
Help develop management strategies

- Removal of coastal armoring
- Purchase of development rights/easements



Using SLAMM Results

Nisqually NWR, Washington



Using SLAMM Results

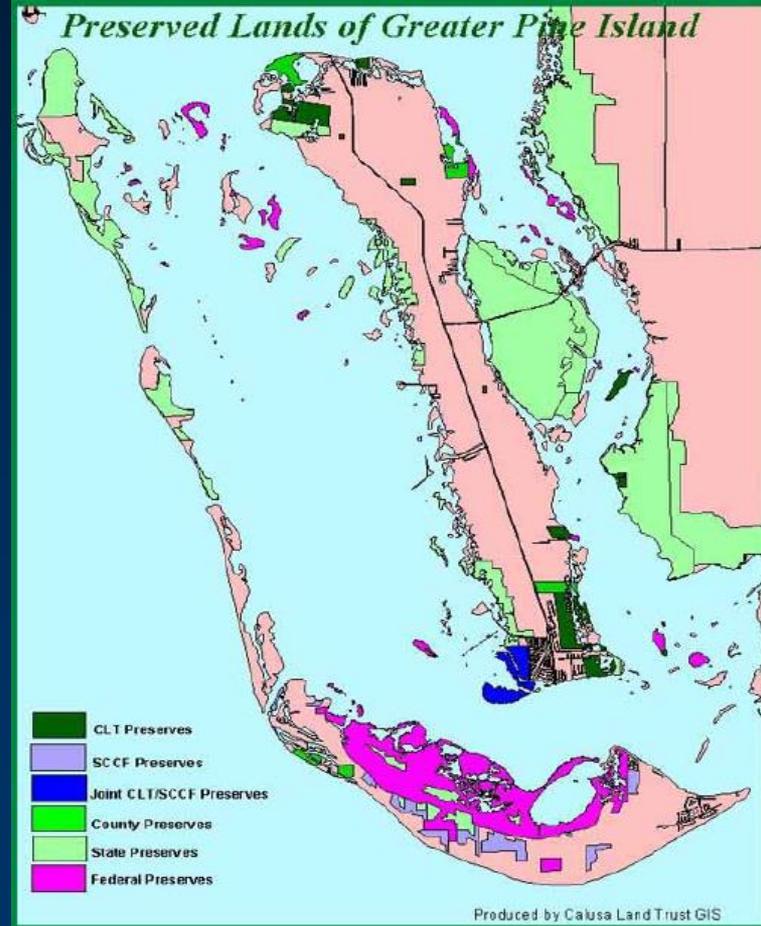
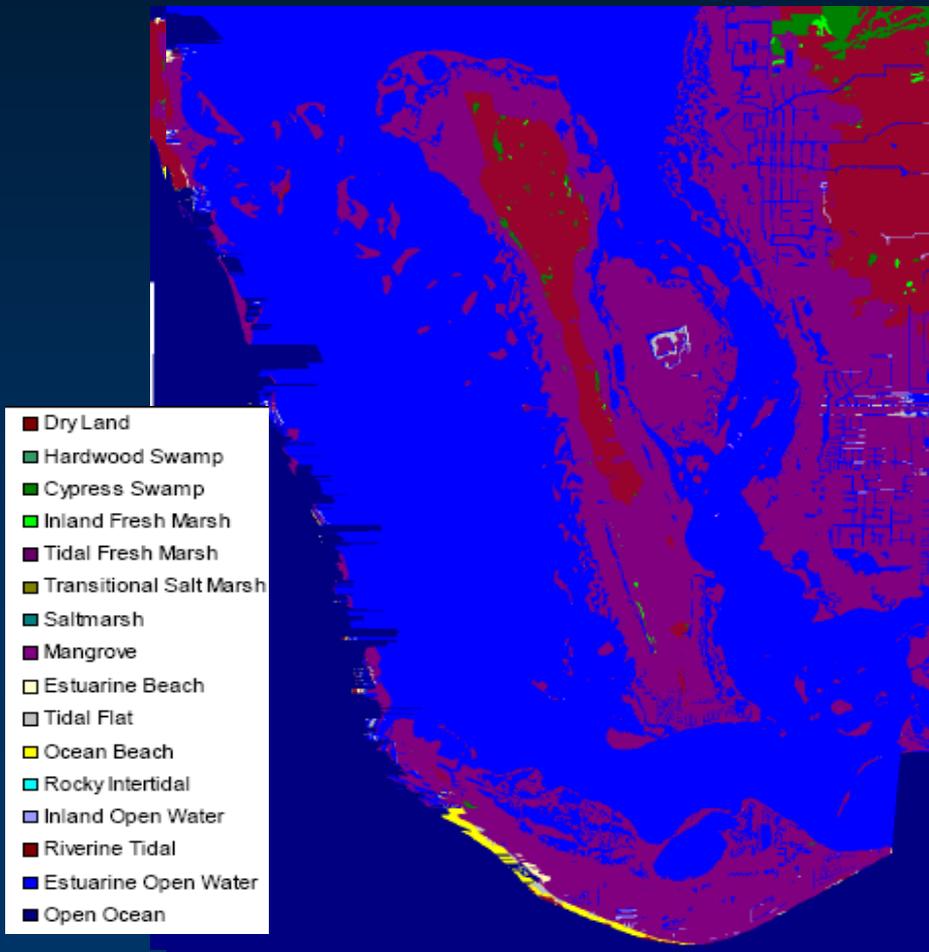
Help develop management strategies

- Restore/build “protective” habitats such as mangroves and dunes



Using SLAMM Results

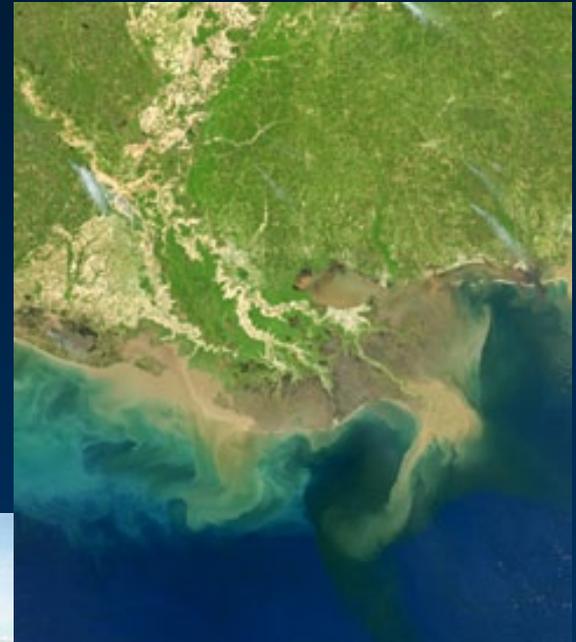
Charlotte Harbor/Pine Island, Florida



Using SLAMM Results

Develop management strategies

- Assess potential for “assisted accretion” (e.g., reconnecting to sources of sediment, using dredged materials, etc.)



Using SLAMM Results

Help allocate resources
efficiently

- Identify/support additional research
 - Localized geomorphology
 - Species-specific impacts
 - Interaction with additional stressors

