



## Coastal Bend Vulnerability and Resiliency Workshop

### AGENDA

Time	Activity
8:30 – 8:45	Welcome and Introductions Overview of Workshop Goals and Agenda  Jorge Brenner, Associate Director of Marine Science, The Nature Conservancy Dana Sjostrom, Coastal Training Program Coordinator, Mission Aransas Reserve
8:45 – 9:15	Introduction to Coastal Resilience  Jorge Brenner
9:15 – 9:40	Introduction to High Resolution SLAMM-based Sea Level Rise Scenarios for Copano Bay and San Antonio Bay  Jorge Brenner Meagan Murdock, Marine GIS Manager, The Nature Conservancy
9:40 – 10:00	Update on Mission-Aransas Reserve's Vulnerability Assessment Project  Kiersten Stanzel, Research Associate, Mission-Aransas Reserve
10:00 – 10:15	Coffee Break
10:15 – 10:45	Introduction to Coastal Bend Vulnerability Assessment Meagan Murdock
10:45 – 11:45	Resiliency and Adaptation Discussion  Discussion Leads: Meagan and Jorge Notetaker: Dana
11:45 – 12:00	Next Steps  Jorge Brenner
12:00	Meeting Adjourn

*A project funded by the U.S. Environmental Protection Agency*



# Coastal Bend Vulnerability and Resiliency Workshop



**Jorge Brenner, *Ph.D.***  
**Associate Director of Marine Science**

**Meagan Murdock**  
**Marine GIS Manager**



## **Texas Coastal Bend Regional Climate Change Vulnerability Assessment**

**Management:** Coastal Bend Bays and Estuaries Program

**Execution:** The Nature Conservancy

**Funding:** EPA's Climate Ready Estuaries Program Initiative

### **EPA's Program goals:**

- Assess climate change vulnerabilities;
- Identify adaptation strategies; and
- Engage and educate stakeholders

### **Workshop goals:**

- Disseminate the coastal resilience approach and methods used in the coastal vulnerability assessment
- Gather the input of participants about strategies for adapting to climate related coastal hazards and building resilience

**Completion:** Spring 2016



## Texas Coastal Bend Regional Climate Change Vulnerability Assessment

Coastal Bend: 5 coastal counties

Needs & Scenario  
Identification

Geodatabase

Vulnerability  
Assessment

*Stakeholder workshop*

Adaptation  
Strategies

To inform

Citizens  
Communities  
Cities  
Agencies

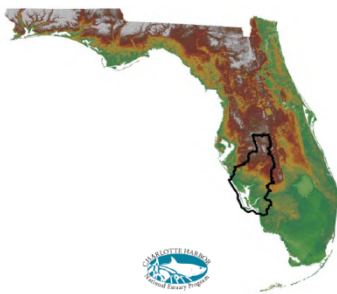
**CBBEP's  
Comprehensive  
Conservation &  
Management Plan**





# Texas Coastal Bend Regional Climate Change Vulnerability Assessment

Charlotte Harbor Regional  
Climate Change  
Vulnerability Assessment



The Charlotte Harbor National Estuary Program (CHNEP) is a partnership of citizens, scientists, elected users who are working to study and restore the area. A cooperative resource.

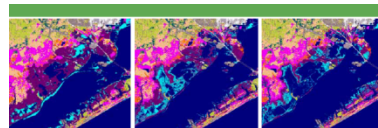
**Global Sea Level Rise Scenarios for the United States National Climate Assessment**

December 6, 2012

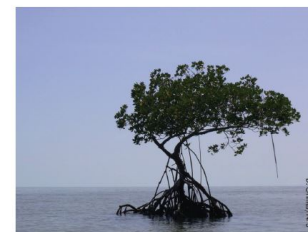


## Marshes on the Move

A Manager's Guide to Understanding and Using Model Results Depicting Potential Impacts of Sea Level Rise on Coastal Wetlands



## GULF COAST VULNERABILITY ASSESSMENT

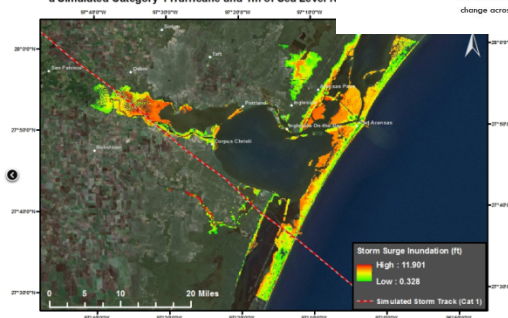


11/1/2015

Executive Summary

The Gulf Coast Vulnerability Assessment (GCVA) is a collaborative effort to evaluate the vulnerability of four key ecosystems and 11 associated species to the effects of climate change, sea level rise, and land use change across the U.S. portion of the Gulf of Mexico.

**Maximum Predicted Storm Surge Inundation for Corpus a Simulated Category 1 Hurricane and 1m of Sea Level Rise**



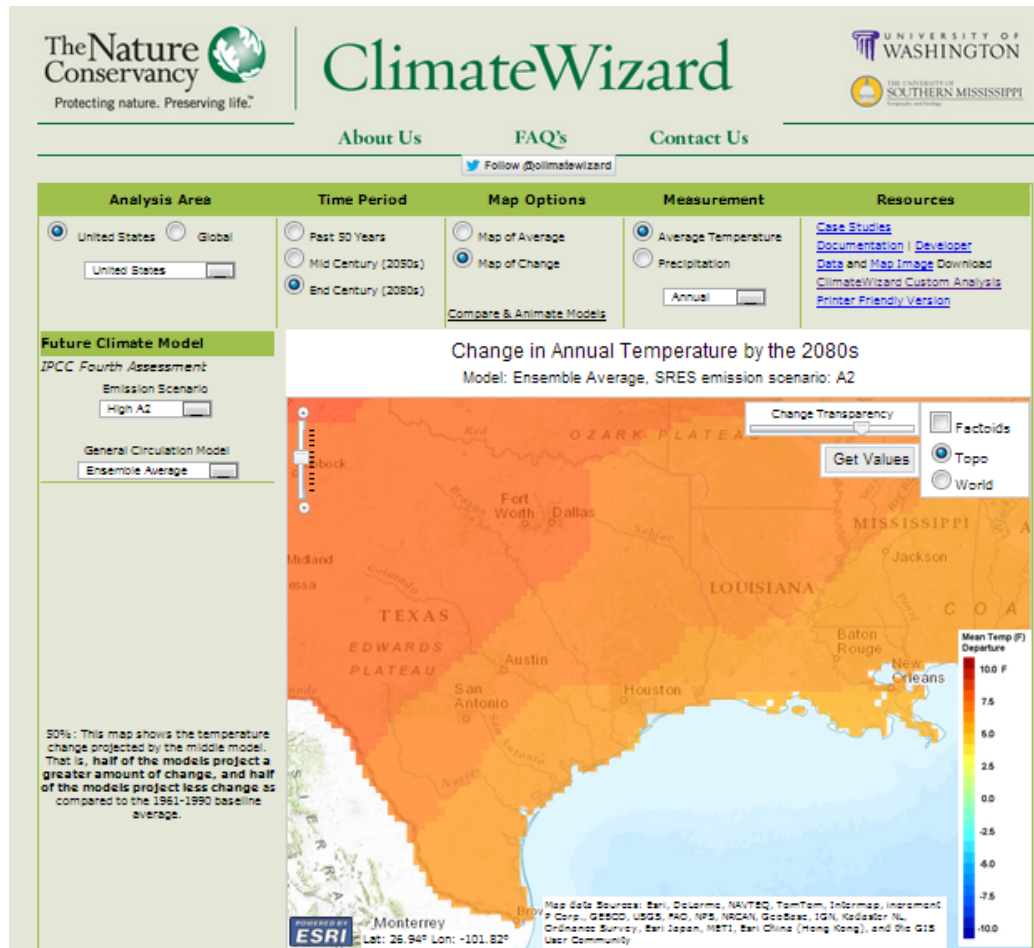
This map was created by the Marine Program of The Nature Conservancy's Texas Chapter. Funding for this Conservation and Resiliency Analysis was provided by a grant from the Coastal Bend Bays & Estuaries Program.

Date created: December 2013 Coordinate System: NAD83 UTM Zone 14N

Building  
From ...



# Global Climate Change



<http://www.climatewizard.org/>



# Climate Wizard 'Extremes'

WORLD BANK GROUP  
Climate Change Knowledge Portal  
Climate Analysis Tool - Powered by Climate Wizard

RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security  
CGIAR CCAFS

CIAT  
International Center for Tropical Agriculture  
CITA High Resolution Climate Change

To use this tool, draw polygons on the map below, or select a pre-defined area from the drop down boxes. Then select the input parameters you wish to use. When you submit this form, processing will take place on the server. You will receive an email with a link to the results.

Toggle Map Feature Count: 0

**Add Area to Map**  
☒ Pre-Defined Area  
☐ Upload Shapefile

**Add Pre-Defined Areas**  
 Search one or more region from any of the region types below and click "add" regions.  
 Your choices will then be added to the map display.

Region Types (Select One)	Countries
CRP Regions	Afghanistan
Africa Eastern - Major	Algeria
Benin	Angola
Burkina Faso	Argentina
Burundi	Armenia
Cameroon	

add selected regions

**Time Options**  
 Time Period: (Mid century (2046-2065))  
☒ Annual ☐ Monthly

**Temperature Variables**  
 (Never over variable for detail)  
☐ Average Low Temperature  
☐ Average High Temperature  
☐ Hottest Temperature  
☐ Coldest Temperature  
☐ Hot Days Temperature (Annual Only)  
☐ Number of Frost Days  
☐ Number of Warm Days  
☐ Number of Cold Days  
☐ Number of Warm Nights  
☐ Number of Cold Nights  
☐ Heat Wave Duration (Annual Only)  
☐ Growing Degree Days  
☐ Heating Degree Days  
☐ Cooling Degree Days

**Precipitation Variables**  
 (Never over variable for detail)  
☐ Total Rainfall  
☐ Consecutive Dry Days (Annual Only)  
☐ Number of Dry Periods (Annual Only)  
☐ Number of Wet Days  
☐ Wet Days  
☐ Wet Day Rainfall  
☐ 5 Day Rainfall (Annual Only)  
☐ Daily Rainfall  
☐ Erosivity (Annual Only)

**Aridity Variables**  
 (Never over variable for detail)  
☐ Aridity Index Plus  
☐ Aridity Index  
☐ Climate Moisture Deficit  
☐ Climate Moisture Surplus  
☐ Potential Evapotranspiration (Hargreaves)

**Climate Model Options**  
 General Circulation Model:  
 GISS-ER2011 (High-Res)  
 (Choose one or more)  
☐ CNRM-CM3  
☐ GISS-ER2011  
☐ GISS-ER2011  
☐ MIROC3.2 (medium)  
☐ BCCR-CM2.2

**Greenhouse Gas Concentration (CO<sub>2</sub>)**  
 GISS-ER2011 (High-Res)  
 (Choose one or more)  
☒ A2 (High) ☐ A1S (Med) ☐ B1 (Low)

**Results**  
 Analysis Output Name:  
 (optional, names will be truncated  
 to a maximum of 255 characters)  
  
 Email Address:  
 (Your results will be emailed to you)

**Submit**

<http://climatemwizard.ciat.cgiar.org/index1.html>



# Coastal Resilience Framework

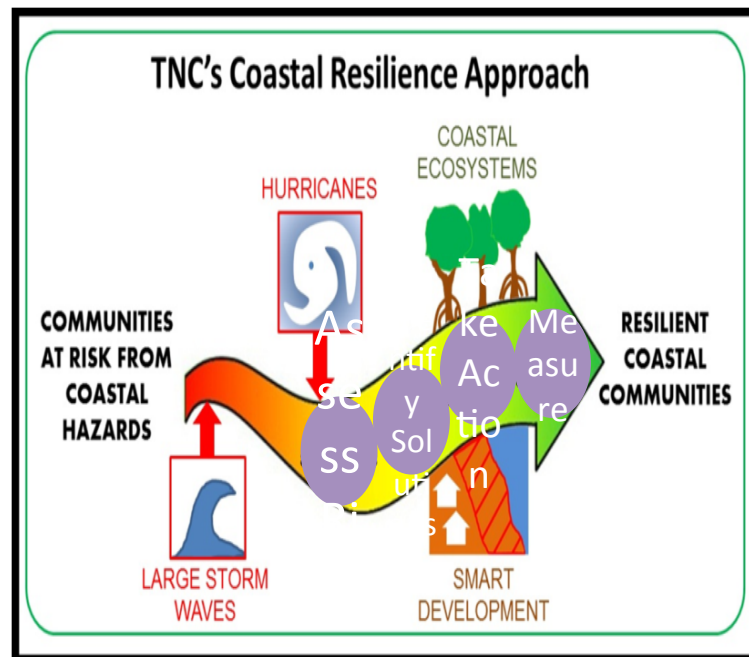
Coastal Resilience is an approach which includes planning frameworks and tools that support decisions to reduce the ecological and socio-economic risks of coastal hazards.

**Assess Risk**

**Identify Solutions**

**Take Action**

**Measure Effectiveness**







## Green infrastructure

*Temperate*

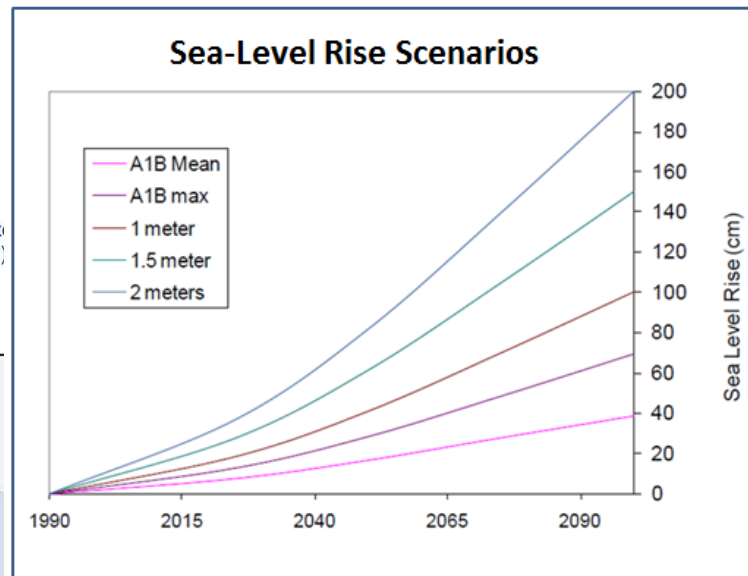
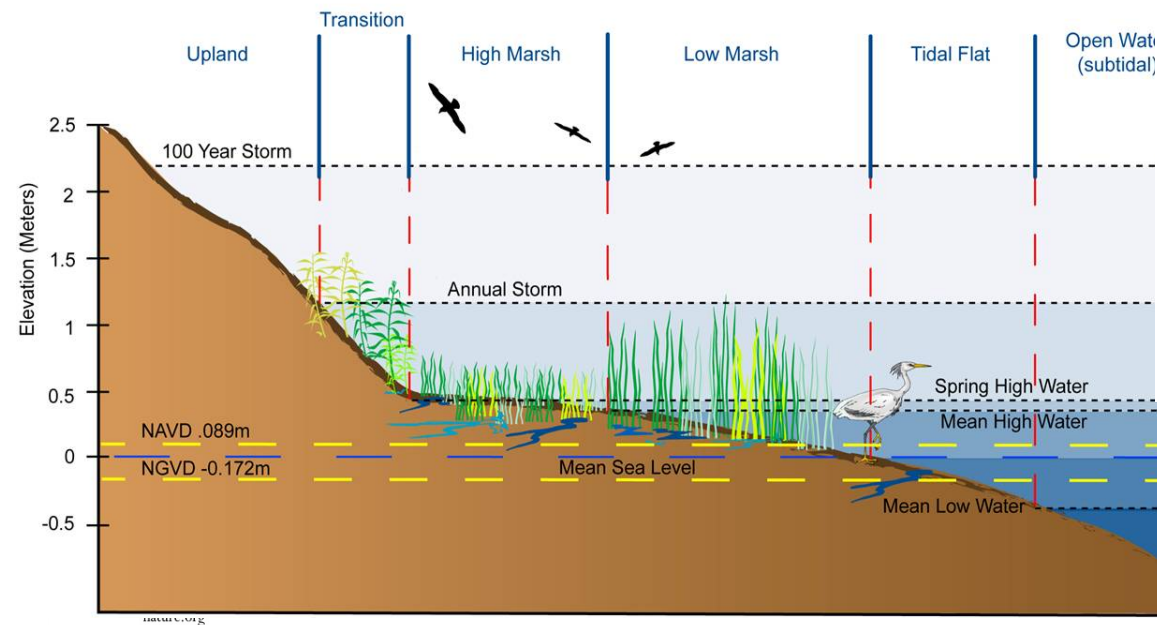
*Tropical*





# Sea Level Affecting Marshes Model (SLAMM)

(Inundation, Erosion, Saturation, Overwash, Accretion, Salinity)







# Contribution to the Goal: SLAMM & ADCIRC

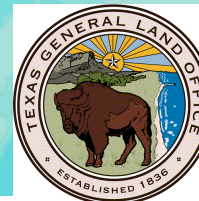
**San Antonio & Copano Bays**

Summer 2015

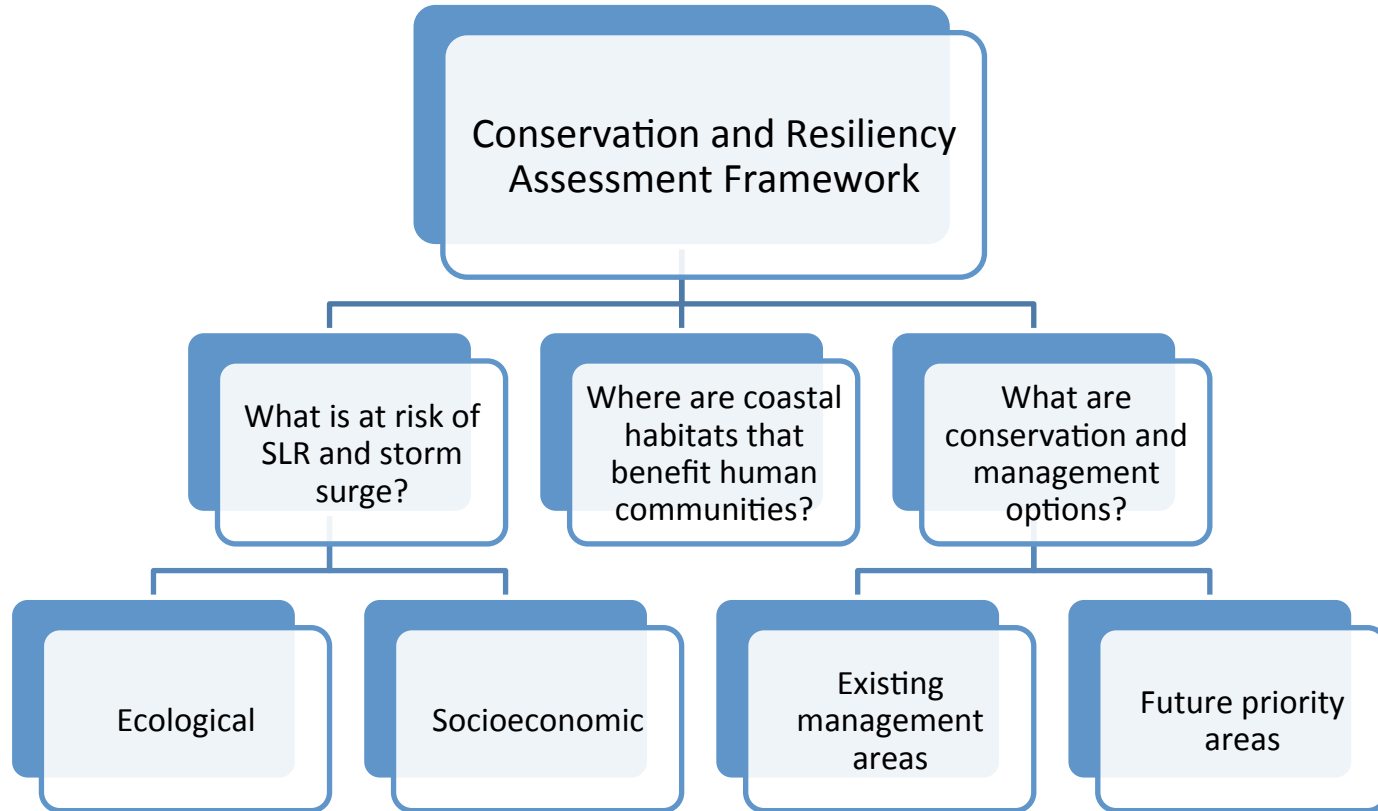
SLAMM Gap Analysis

**Legend**

- NWR Complete
- USFWS Contract
- NWR Not Being Run
- National Wildlife Federation
- TNC Florida
- TNC Texas



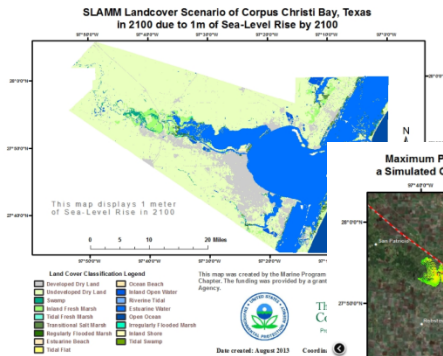
# Coastal Resilience Framework



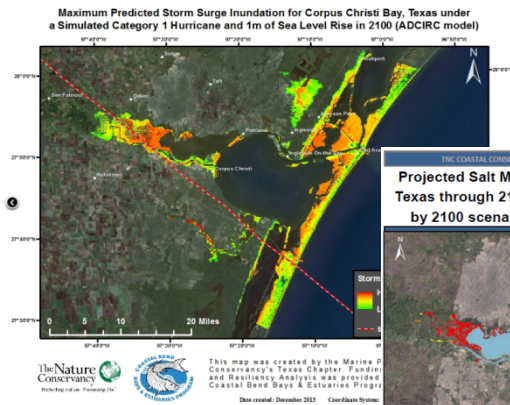
- ❖ What are the potential impacts of a 1 meter sea level rise to marshes?
- ❖ Which communities are most at risk to hurricane storm surge, and how might SLR increase present-day risk to storm surge?
- ❖ Which communities might be most or least resilient to future changes based on socioeconomic indicators, inundation exposure, and marsh viability?
- ❖ How might SLR impacts and future marsh habitat distribution inform land acquisition and management planning?



# The Coastal Resilience Approach: Put to work



**SLAMM**



**ADCIRC**

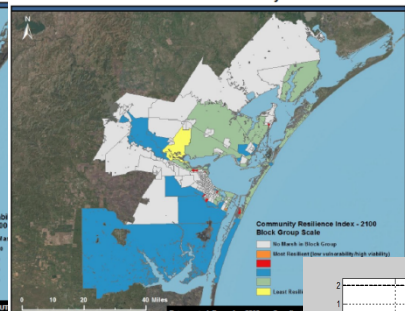
## Coastal Resilience

Projected Salt Marsh Viability for Corpus Christi Texas through 2100 under a 1 meter of Sea-Level by 2100 scenario using SLAMM Modeling results



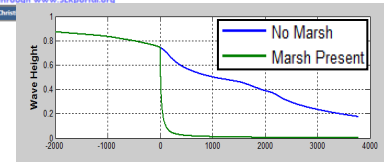
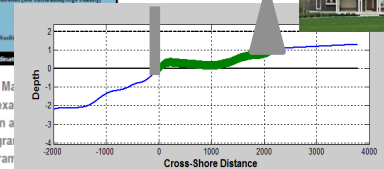
This map was created by the Marine Program Chapter. The funding was provided by a grant from The Nature Conservancy.

Community Resilience by Census Block Group for Corpus Christi Bay, Texas in 2100 under a Simulated Category 1 Hurricane and 1 meter of Sea-Level Rise by 2100 scenario.



This map was created by the Marine Program Chapter. The funding was provided by a grant from The Nature Conservancy.

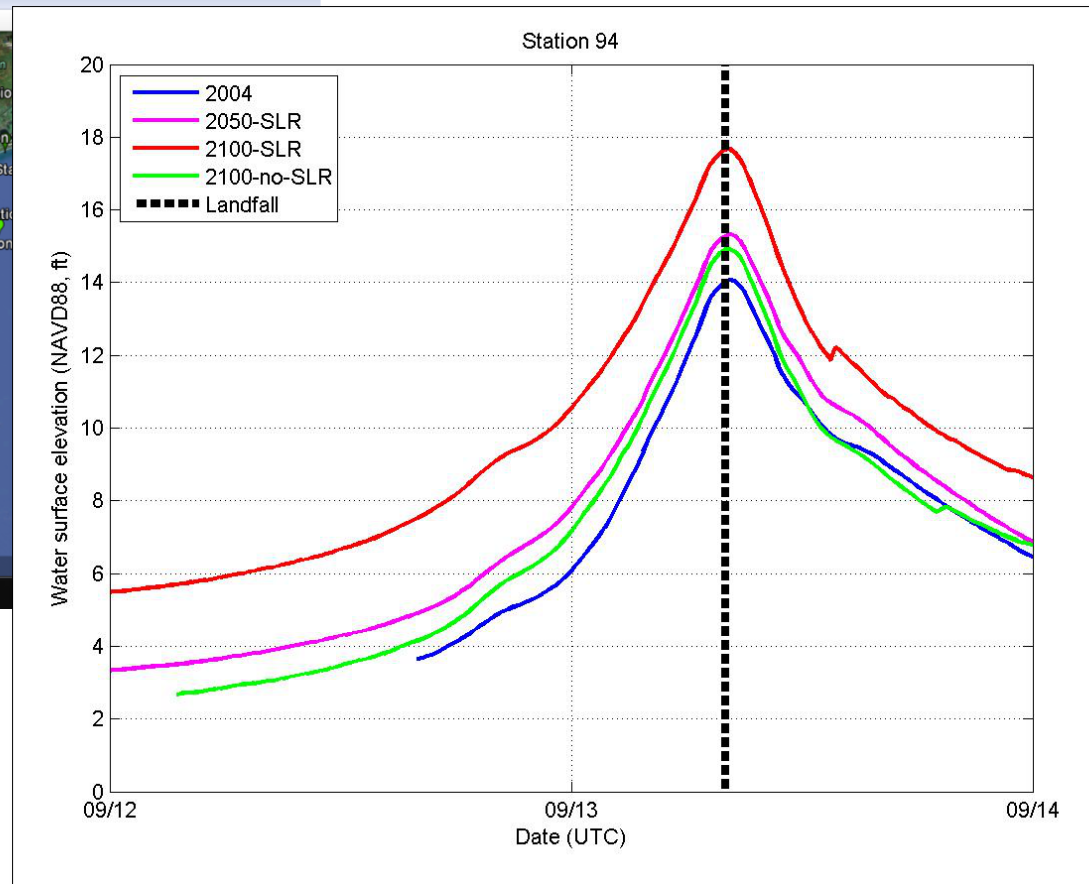
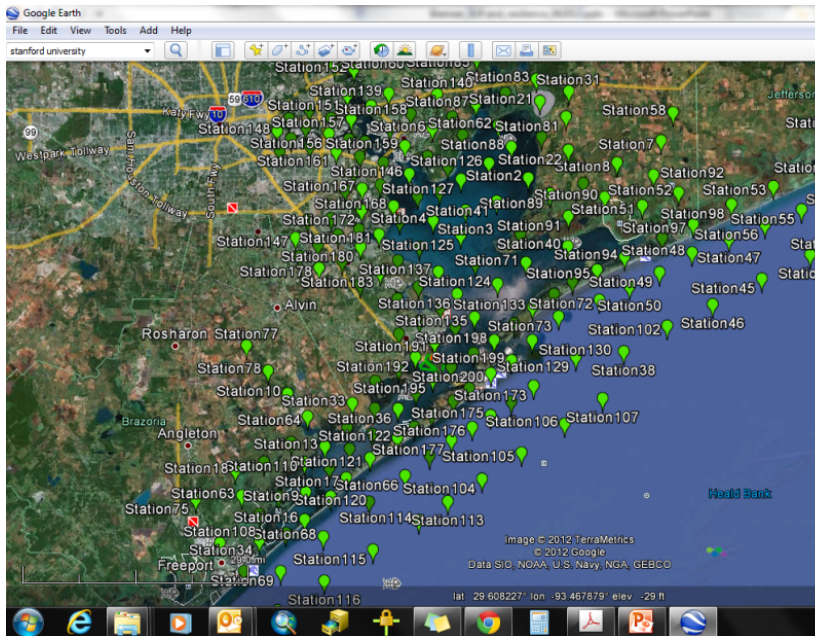
## Ecosystem Services



## Coastal Resilience Decision Support Tool



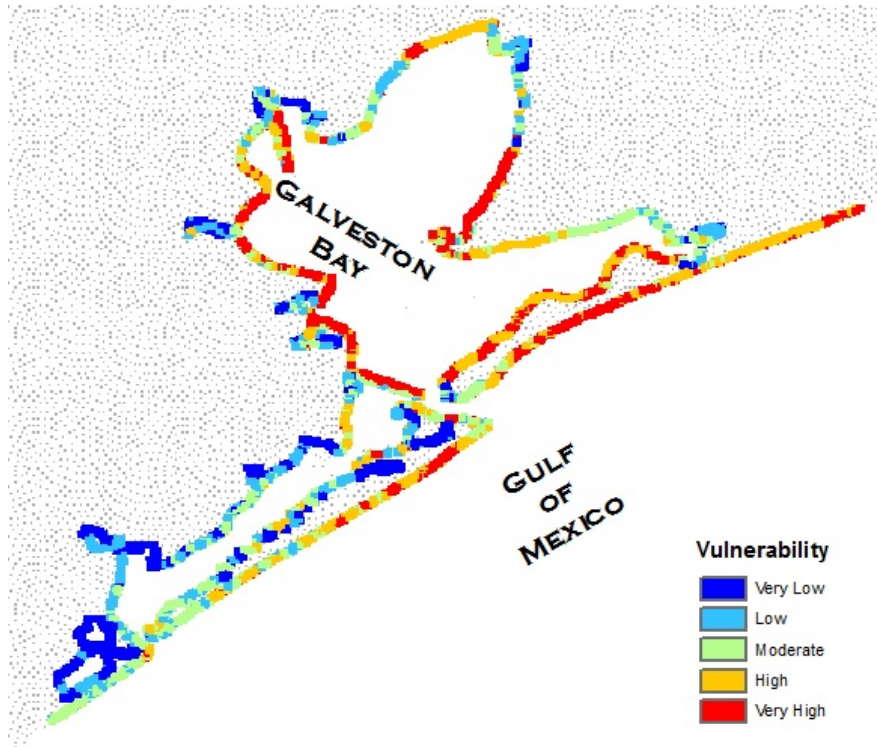
# ADCIRC - Storm Surge Hydrographs



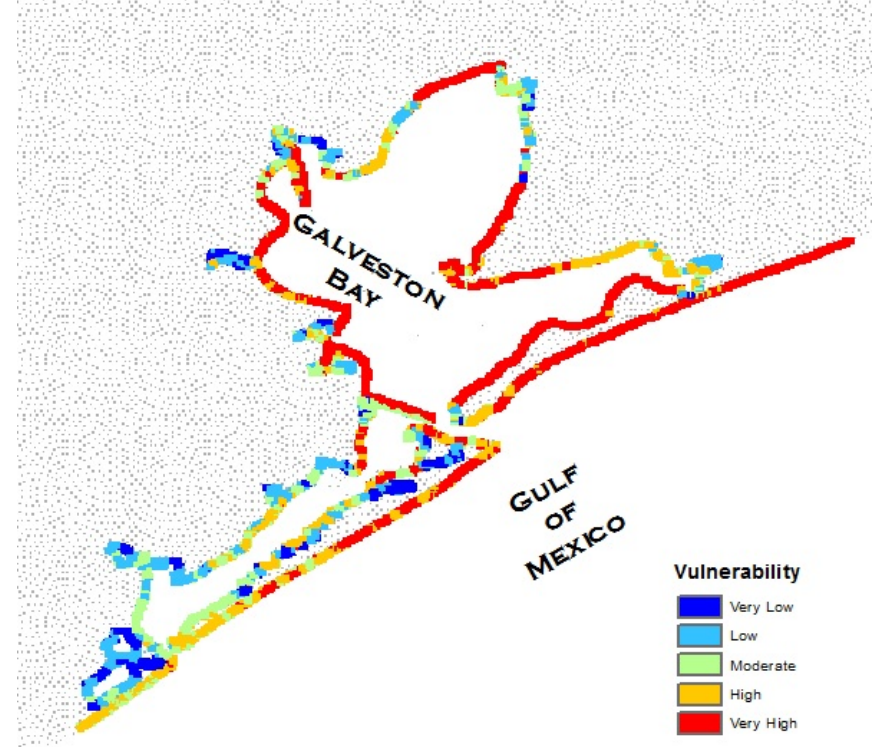




# Coastal Vulnerability Assessment



*With oyster reefs and marshes*



*Without oyster reefs and marshes*



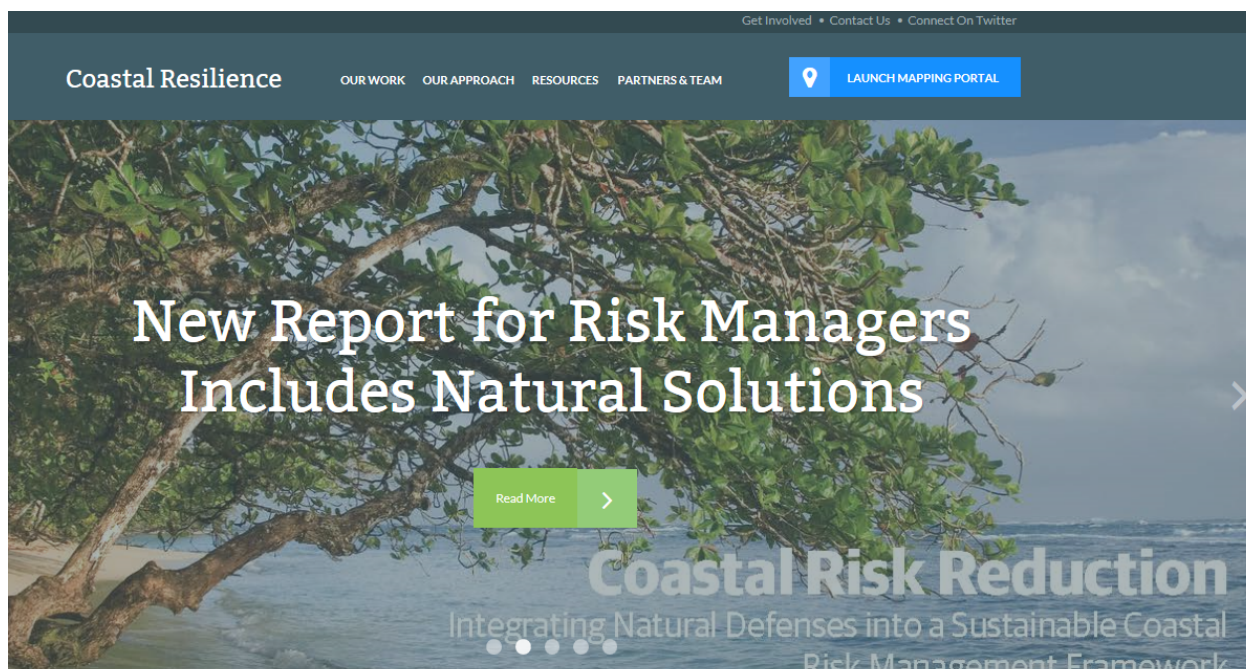
The Nature  
Conservancy



Protecting nature. Preserving life.®



## Coastal Resilience 2.0



RESILIENCE MAPPING

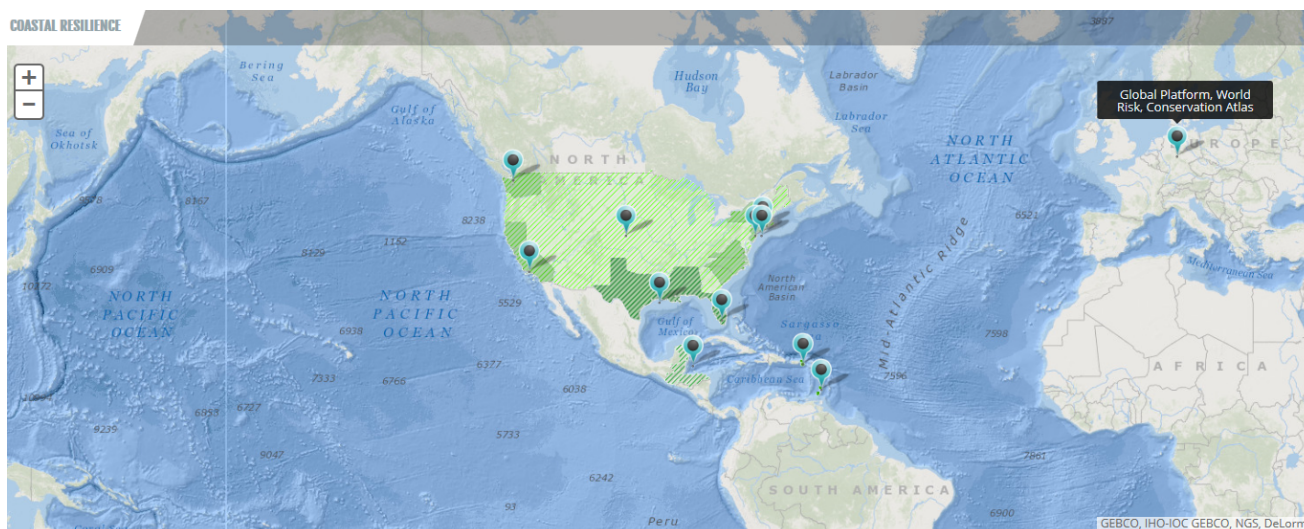
The coastal resilience approach and mapping are informing restoration, adaptation and conservation decisions around the world.

<http://coastalresilience.org/>





# Coastal Resilience 2.0 - Network



## Coastal Resilience mapping portal

Click on the blue point markers on the map to navigate to specific geographies, or scroll down to see a list of places where we work. The green hatching on the map represents our Coastal Resilience coverage across countries, regions and states.

Coastal Resilience supports a community of practitioners around the world who are applying spatial planning innovations to coastal hazard risk, resilience and adaptation issues. This is a global network providing access to peer practitioners, tools, information and training focused on nature-based solutions. For more information see our [Coastal Resilience website](http://coastalresilience.org/)

GLOBAL PLATFORM, WORLD RISK, CONSERVATION ATLAS

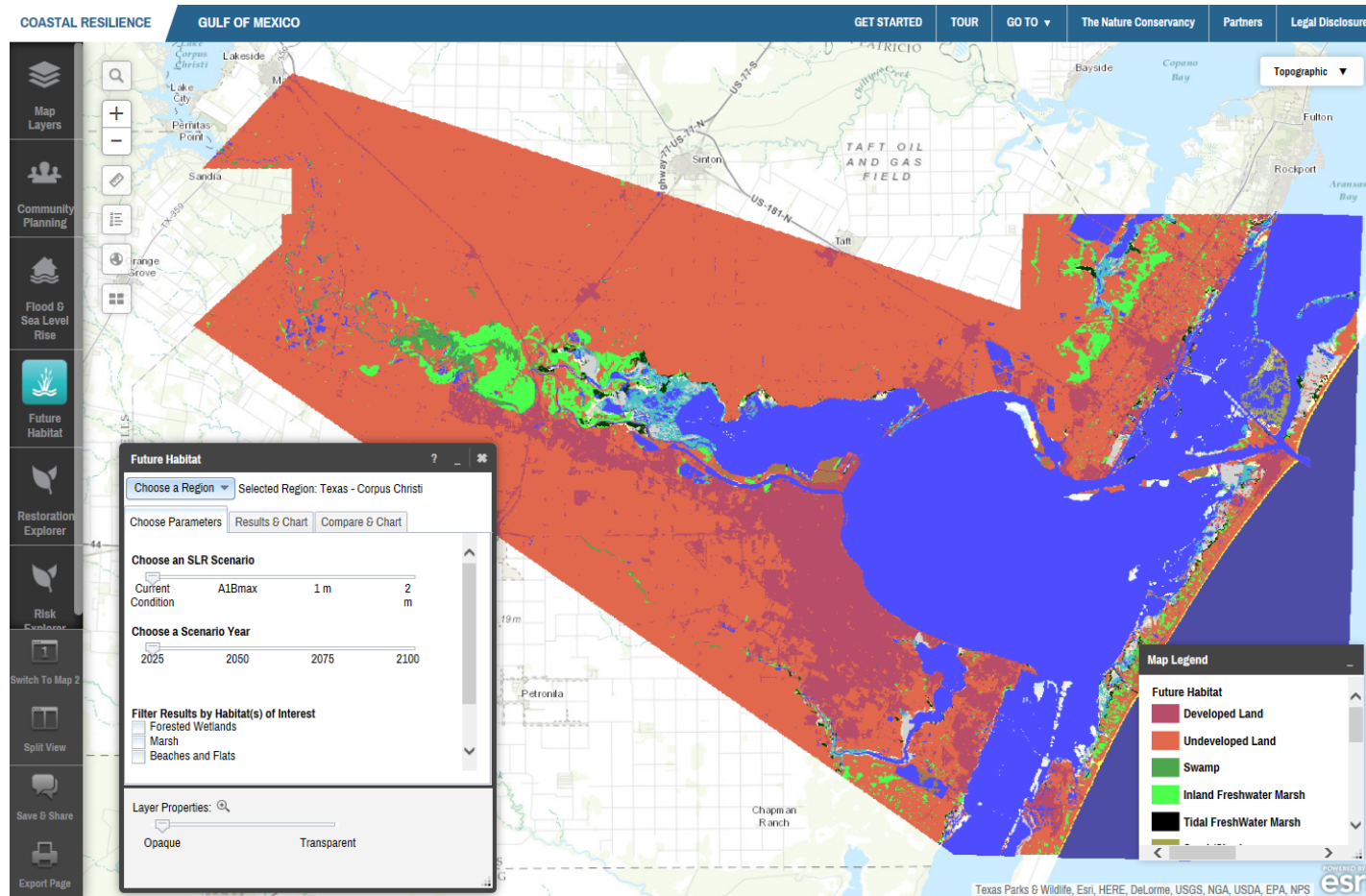
CARIBBEAN

MEXICO AND CENTRAL AMERICA

<http://coastalresilience.org/>



# Coastal Resilience 2.0 – Mapping Portal



<http://maps.coastalresilience.org/gulfmex/>



# Sea Level Rise Data Platform

Log Out of StormSmart

Search SLR Portal

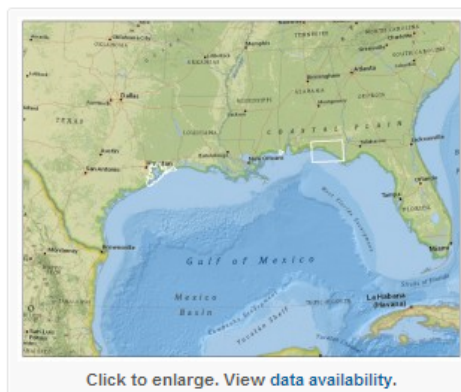
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## Home

Rising sea levels, caused by global change, have become a major concern in countries around the world that occupy low lying coastal areas. Scientific research indicates that the Global Mean Sea Level has been increasing since the 1990's and as sea levels continue to rise through the 21st century many island and coastal communities will need to adapt to the changing landscape by instituting new public policies in order to become more resilient and adjust to the cumulative loss of coastal habitats and shifting shorelines. As SLR progresses around the globe even a slight increase can have devastating effects on coastal low lying habitats and communities. Some of the possible environmental impacts of SLR include erosion, submerging of wetlands, contamination of agricultural lands and fresh water aquifers, and the loss of vital and valuable habitat for plants and animals. Rising sea levels may also result in tidal marsh submergence and habitat "migration" as salt marshes transgress landward and replace tidal freshwater and irregularly-flooded marsh land.

Concerns about the effects of sea level rise (SLR), not only from governments but also their populace, are



Click to enlarge. View [data availability](#).

## Gulf Resilience DS Tool



Experience interactive spatial data visualization with the [Resilience DS tool](#).


## Project Regions

[Florida](#)

[Mississippi](#)



# Sea Level Rise: SLAMM-based Scenarios



RESEARCH & SCENARIOS FOR A CHANGING COAST

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### GIS Data Platform

GIS files are in ESRI vector (shapefile and geodatabase) and raster (grid, geoTIFF) formats; storm surge hydrographs are in Google Earth format (KMZ); reports are in PDF format. View the [readme document](#) and the [data completion matrix](#).

#### Select Location & Data Type

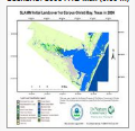
Region	Data Type	Site
Florida	AOI Boundaries	Corpus Christi Bay
Gulf of Mexico	Conservation Analysis	Galveston Bay
Mississippi	<b>SLAMM</b>	Jefferson County
<b>Texas</b>	Storm Surge	

#### Browse Files

Sort By: ☐ Year ☒ Scenario

**Scenario: A1B Max (0.69 m)**

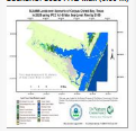
Scenario: 2008 A1B Max (0.69 m)



Click to enlarge

[GIS File](#) [PDF](#)

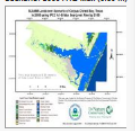
Scenario: 2025 A1B Max (0.69 m)



Click to enlarge

[GIS File](#) [PDF](#)

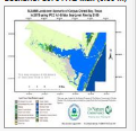
Scenario: 2050 A1B Max (0.69 m)



Click to enlarge

[GIS File](#) [PDF](#)

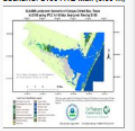
Scenario: 2075 A1B Max (0.69 m)



Click to enlarge

[GIS File](#) [PDF](#)

Scenario: 2100 A1B Max (0.69 m)

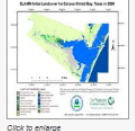


Click to enlarge

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**Scenario: 1m**

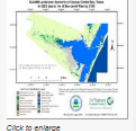
Scenario: 2008 1m



Click to enlarge

[GIS File](#) [PDF](#)

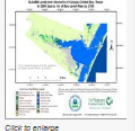
Scenario: 2025 1m



Click to enlarge

[GIS File](#) [PDF](#)

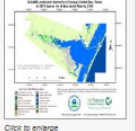
Scenario: 2050 1m



Click to enlarge

[GIS File](#) [PDF](#)

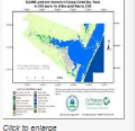
Scenario: 2075 1m



Click to enlarge

[GIS File](#) [PDF](#)

Scenario: 2100 1m



Click to enlarge

[GIS File](#) [PDF](#)

[www.SLRPortal.org](http://www.SLRPortal.org)



# *THANK YOU*

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The Nature  
Conservancy



Protecting nature. Preserving life.™