



INCORPORATING SEA LEVEL RISE INTO LOCAL PLANNING

KIERSTEN STANZEL, PH.D.
MISSION-ARANSAS NATIONAL ESTUARINE RESEARCH RESERVE

Inundation

Erosion

Accretion

Soil Saturation

Barrier Island Overwash



SEA LEVEL AFFECTING MARSHES MODEL

Simulates the dominant processes involved in wetland conversions under different scenarios of sea level rise

sv3.slammview.org/slammview3/

SLAMMView Help

Home / Projects

Great White Heron NWR

Great White Heron NWR, FL (GCPLCC Revisions)

Guadalupe-Nipomo Dunes NWR

Guam NWR

Gulf Coast Prairie LCC SLAMM Gap Analysis Project

Gulf Coast Prairie LCC, Seamless Product

SLAMM Version 6.2
Cell Size 15
Elevation LiDAR & NED combination
Base Year 2008
Author Cynthia Kallio Edwards
Modeler Jonathan Clough
Funding Organization The Gulf Coast Prairie Landscape Conservation Cooperative
Report(s)
[Project Report](#)

Next, choose a region (optional) or skip ahead and choose one or more scenarios

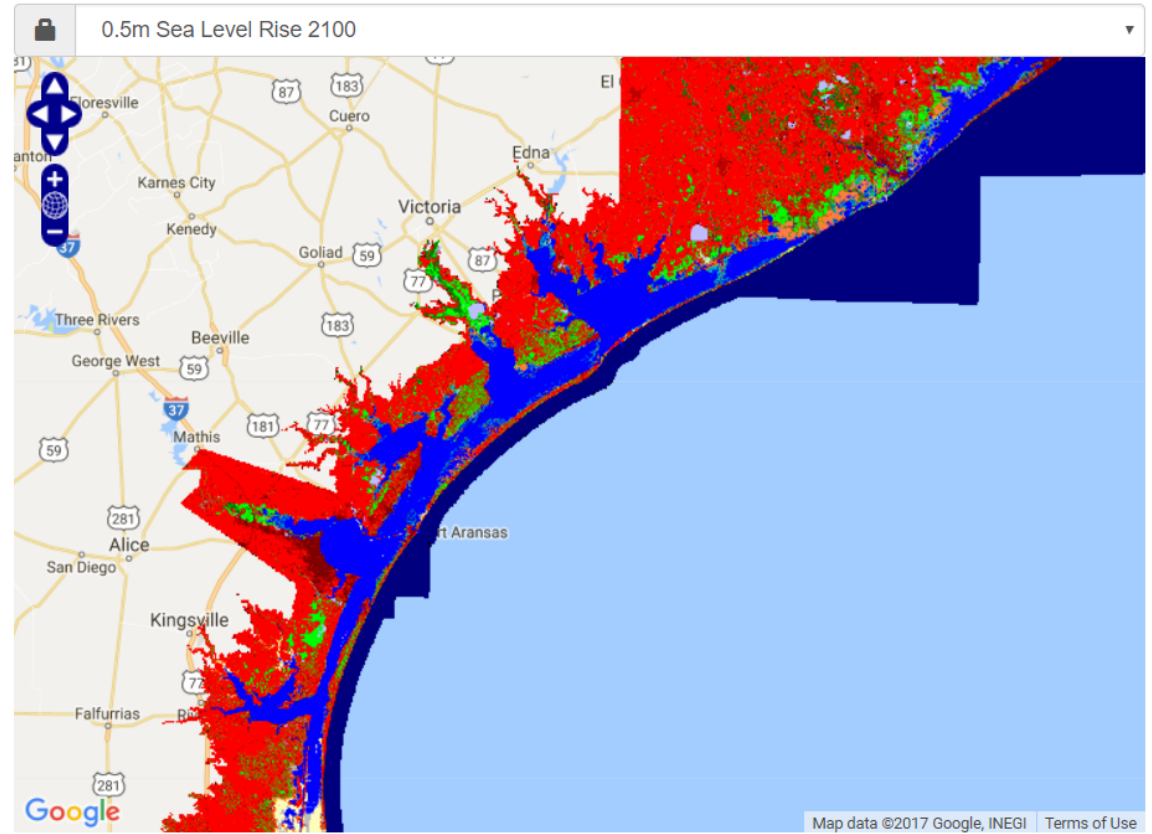
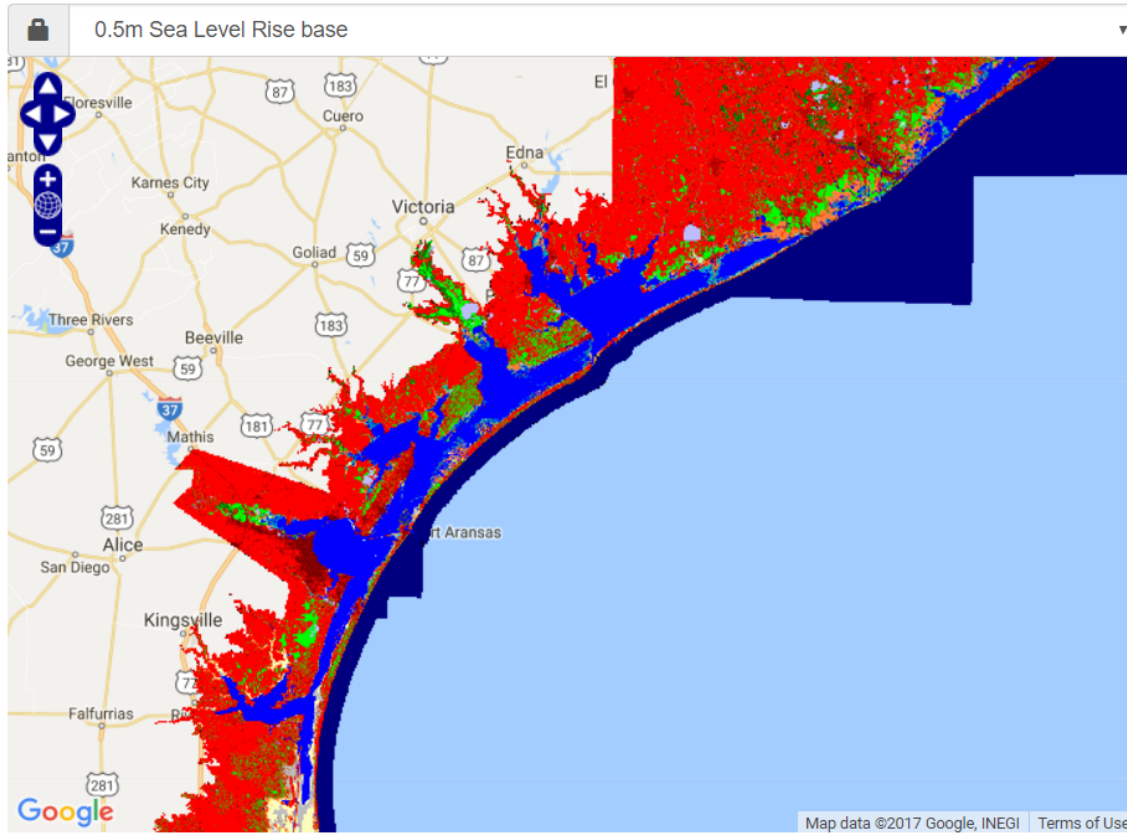
Zoom Regions Scenarios

Harris Neck NWR

Huleia NWR

Humboldt Bay NWR

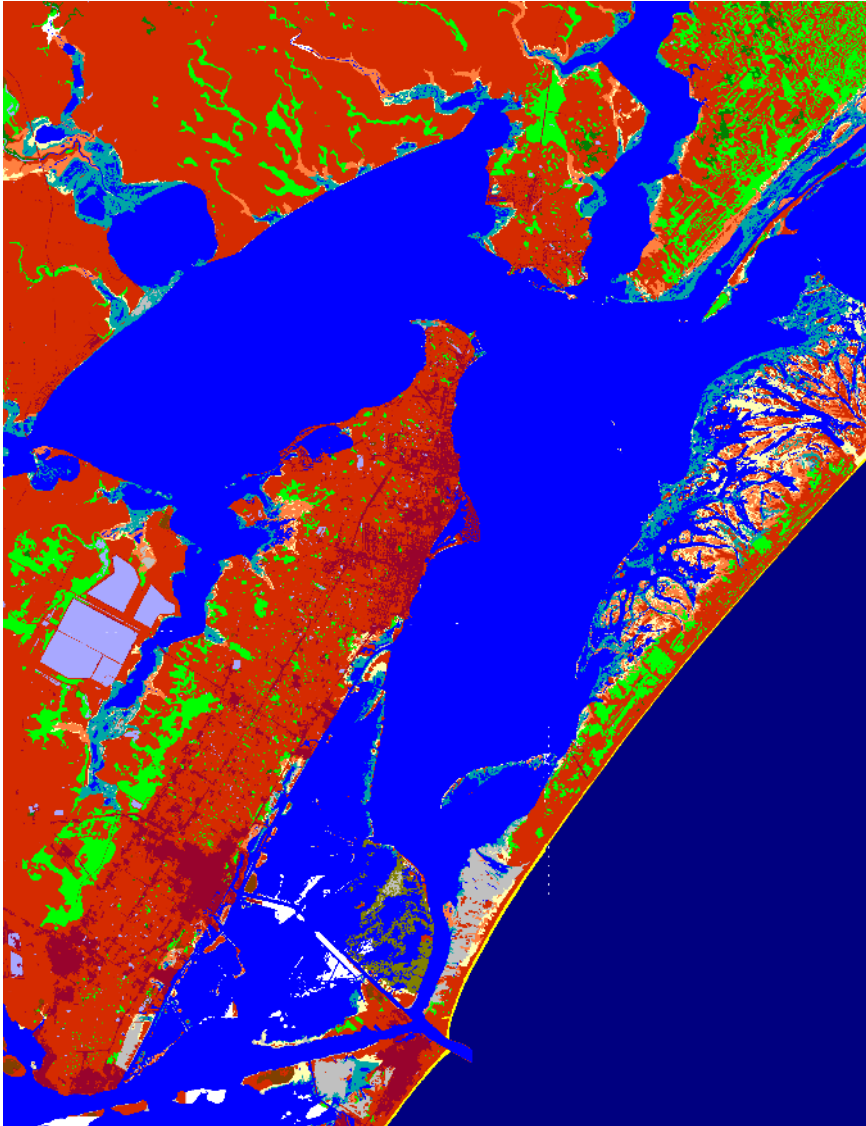
<http://sv3.slammview.org/slammview3/>



Legend

<http://sv3.slammview.org/slammview3/>

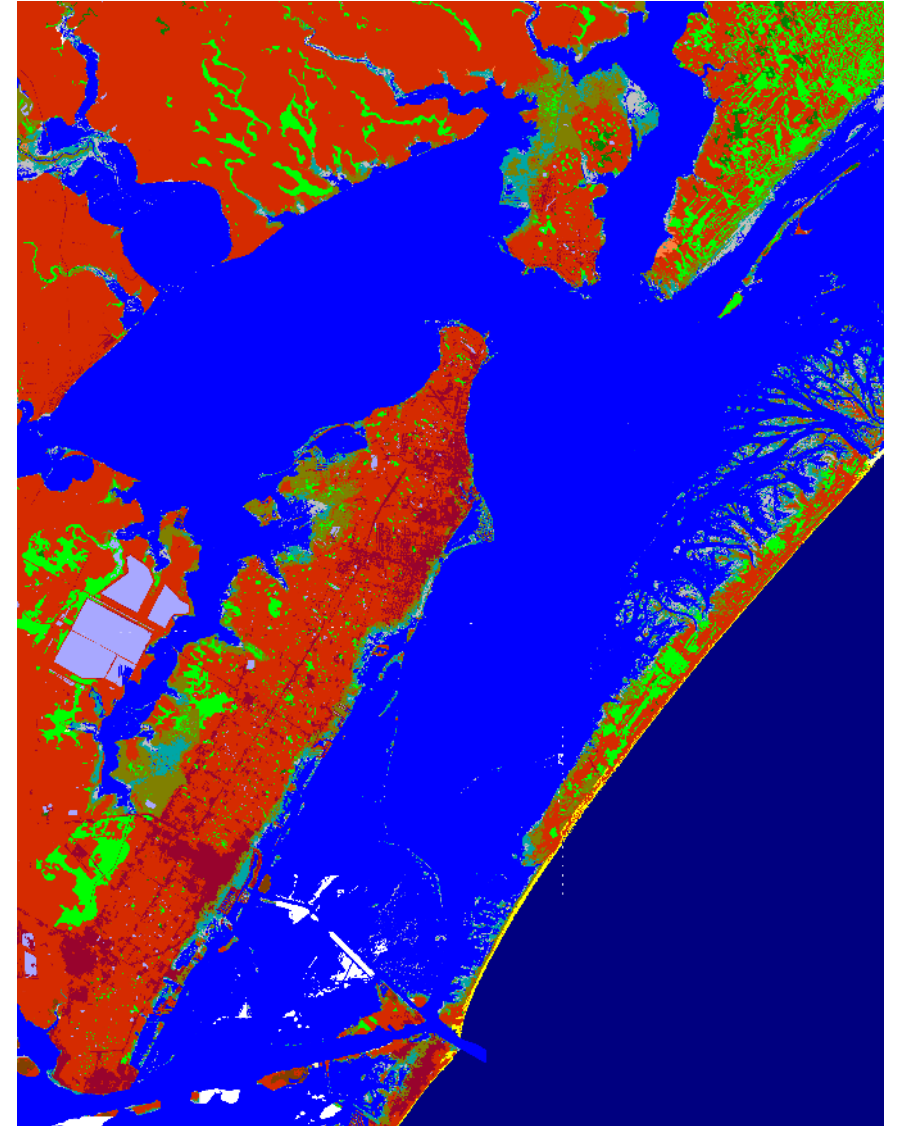
Initial Condition



LEGEND

- Developed Dry Land
- Undeveloped Dry Land
- Swamp
- Inland Fresh Marsh
- Transitional Fresh Marsh
- Regularly-flooded Marsh
- Estuarine Beach
- Tidal Flat
- Ocean Beach
- Ocean Flat
- Inland Open Water
- Riverine Tidal
- Estuarine Open Water
- Open Ocean
- Irregularly-flooded Marsh
- Inland Shore

1.5 m SLR, 2100



TEXAS COASTAL BEND REGIONAL CLIMATE CHANGE VULNERABILITY ASSESSMENT



CRITICAL INFRASTRUCTURE

Approximately 28% of fire stations lie within 1,000 meters of the shoreline in the 1.2 m sea level rise scenario. The Corpus Christi Fire Department Station 15 (North Padre Island) and Nueces County Rural Fire Protection District 2 (mainland side of JFK causeway).

Two hospitals and 32 health clinics are located less than 1,000 meters from the projected 1.2 meter sea level rise shoreline.

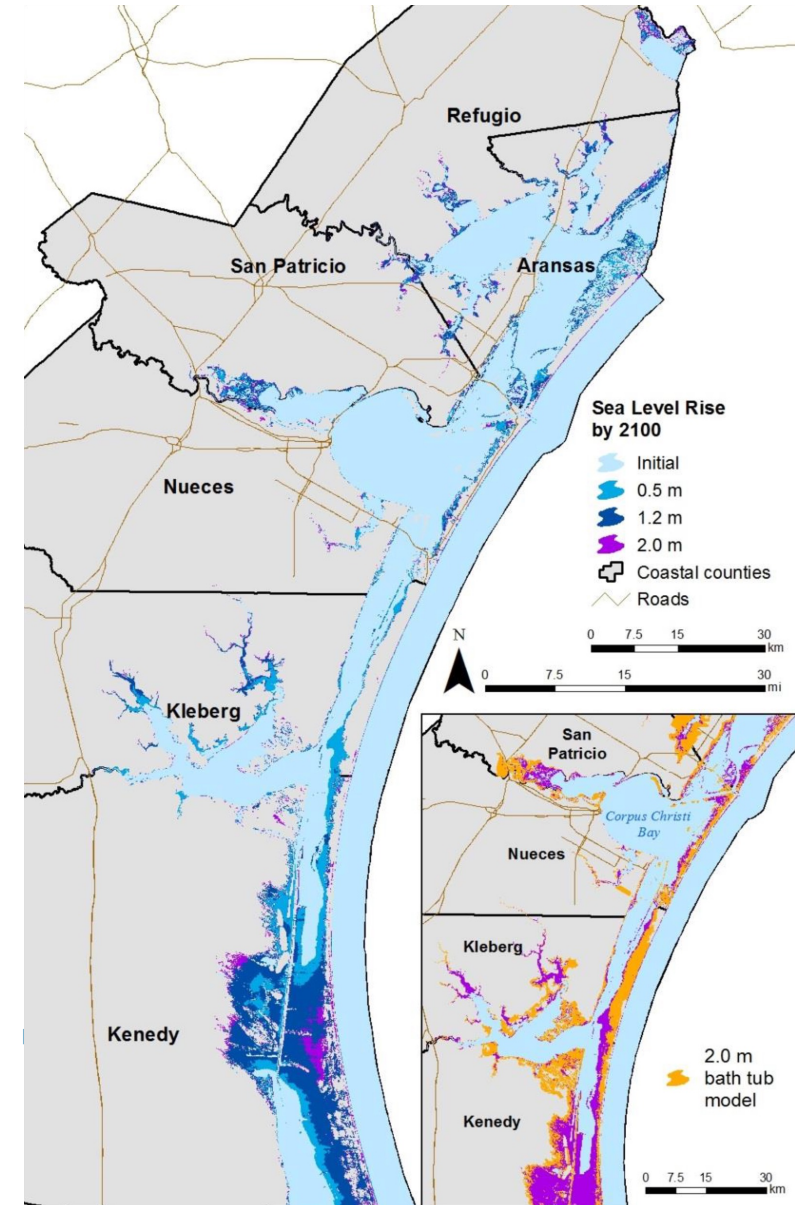
Two water treatments in the Coastal Bend are both safe from sea level rise, but may suffer from decreased water supply due to drought and increased temperatures (i.e., increased temperature reduce machine efficiency and increase evaporation rates).

The Port Aransas Wastewater Treatment Plant is at risk from the 1.2 meter sea level rise scenario.

One airport (Mustang Beach Airport in Port Aransas) and 3 heliports (San Patricio County: Arco Ingleside Shorebase Heliport and JBH Aerospace Heliport; Nueces County: Mustang Island Heliport) are within the mid-level sea level rise scenario.

Sea level rise will increase the likelihood of flood risks to those areas not directly affected by sea level rise - storm surges will extend further inland and even high tides may interrupt normal traffic conditions.

Wind turbines located at the Gulf Wind farm in Kenedy County (Iberdrola Renewables) and the Harbor Wind farm at the Port of Corpus Christi are at risk to 1.2 meters of sea level rise by 2100.



Murdock and Brenner, 2016

TEXAS COASTAL BEND REGIONAL CLIMATE CHANGE VULNERABILITY ASSESSMENT



HUMAN HEALTH

As sea level rises, saltwater invades freshwater areas in the Coastal Bend, threatening surface and groundwater supplies.

If storm surge is able to reach waste facilities or floods sewage systems, surface waters could be contaminated with untreated human, industrial, and commercial waste.

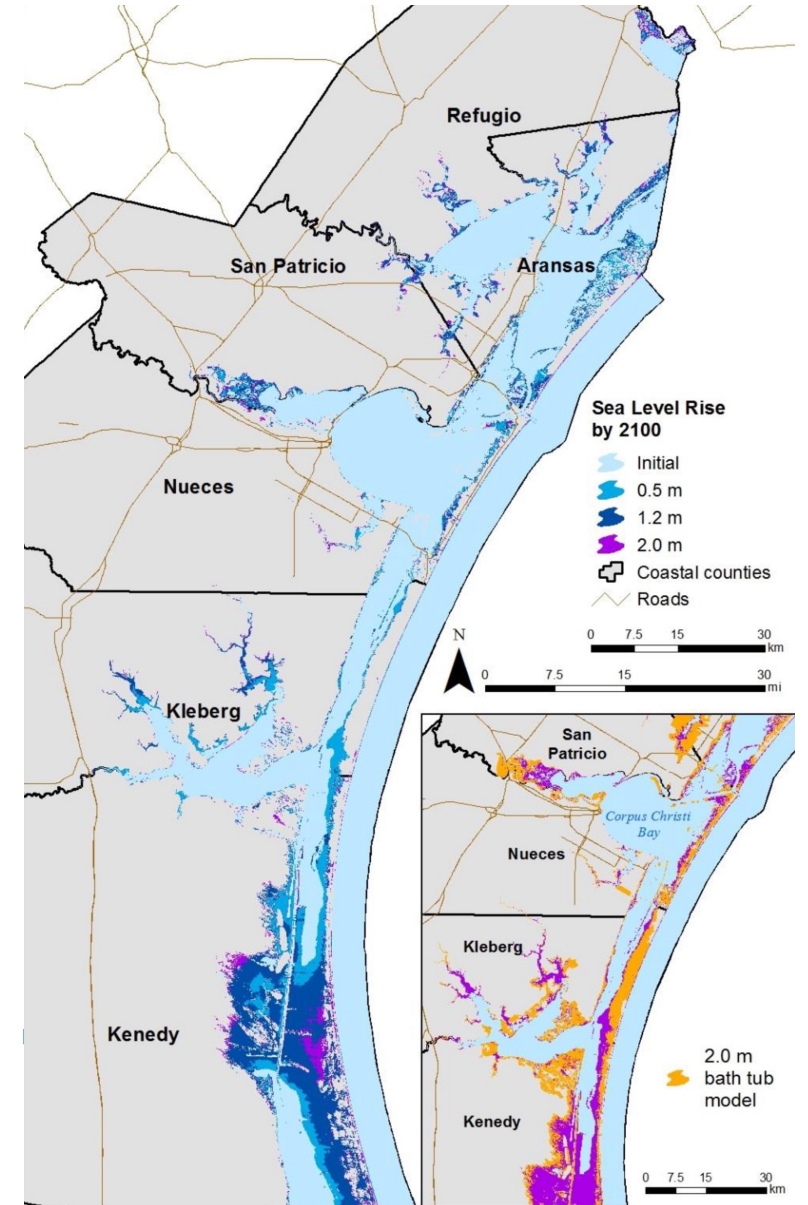
WATER RESOURCES

Due to the threat of saltwater intrusion, many smaller communities and user groups in the Coastal Bend that are largely dependent upon groundwater from the Gulf Coast Aquifer (Kenedy County, Refugio County; mining, livestock, and irrigation user groups), should consider alternative water supplies.

ECONOMY

Resorts, hotels, and other vacation properties located along the coastline will either have to armor their shoreline to protect against sea level rise and wave exposure or resort to moving landward.

Beaches may have to be managed through costly means of beach replenishment as sea level rise and erosion damage the shorelines.



Murdock and Brenner, 2016

TEXAS COASTAL BEND REGIONAL CLIMATE CHANGE VULNERABILITY ASSESSMENT



WILDLIFE AND ECOSYSTEMS

Projections of marsh movement and viability under a 2.0 meter (6.6 feet) SLR scenario show that Aransas and Refugio counties have the lowest marsh viability in the Coastal Bend area with an overall net loss of marsh, while Kenedy County has the highest marsh viability.

Sea level rise threatens current seagrass extent as light attenuates with depth and seagrasses require light to survive.

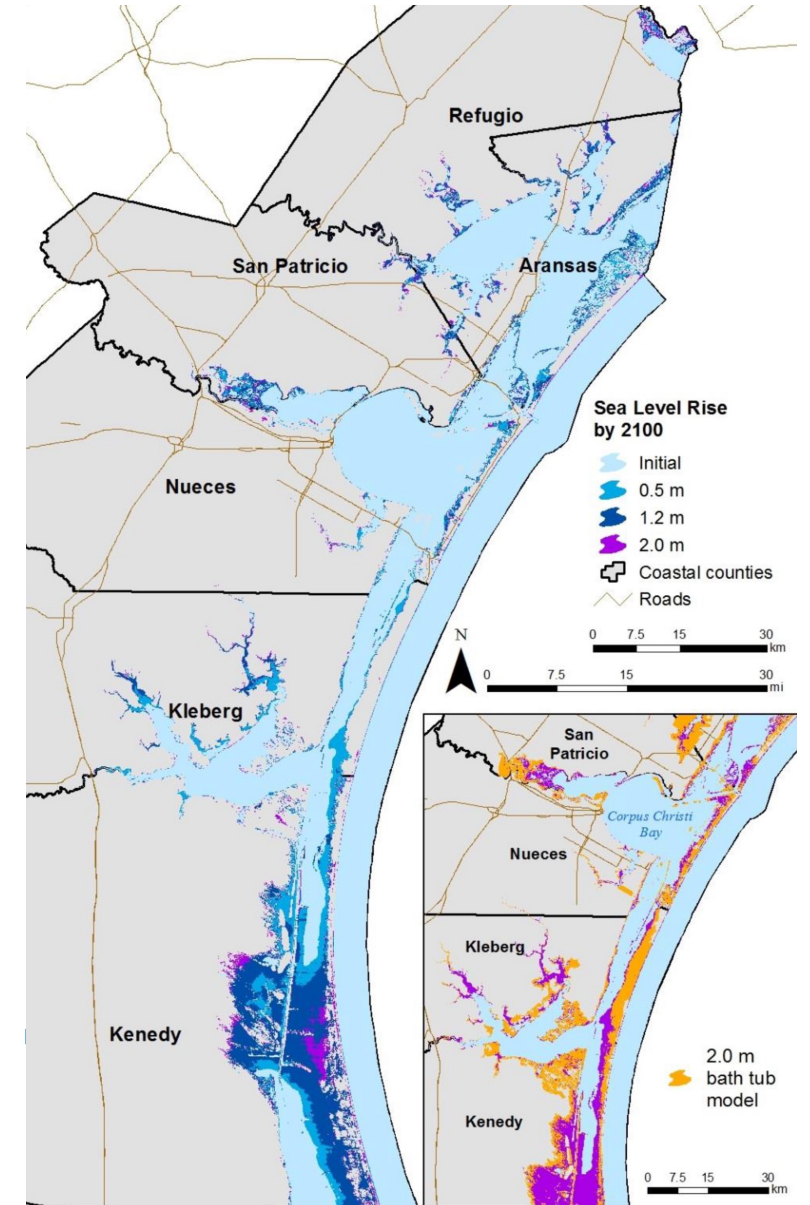
Based on the intermediate sea level rise scenario, 135 colonial waterbird rookery islands will be submerged by 2100 or almost half (47%) of the rookery islands currently present in the area - erosional forces from increased wave action and storm severity will further decrease the area of habitat available if no action is taken to protect these islands.

COASTAL RESOURCES

Communities at high risk to erosional forces are North Padre Island and Flour Bluff - sea level rise is partially responsible for the erosion suffered, but shoreline armoring is also a relevant factor as bulk heads, jetties, and other structures have replaced natural habitats that used to border and protect the shoreline.

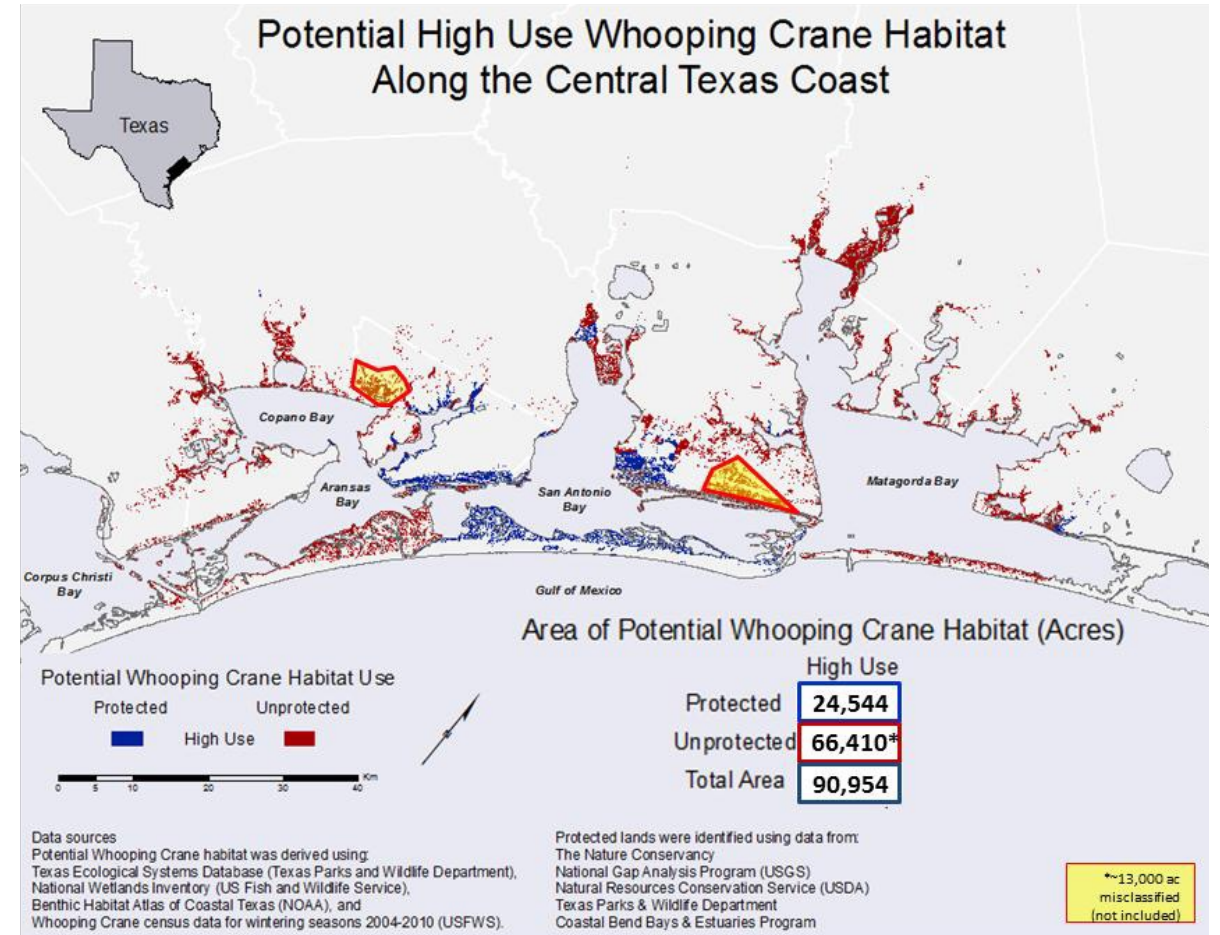
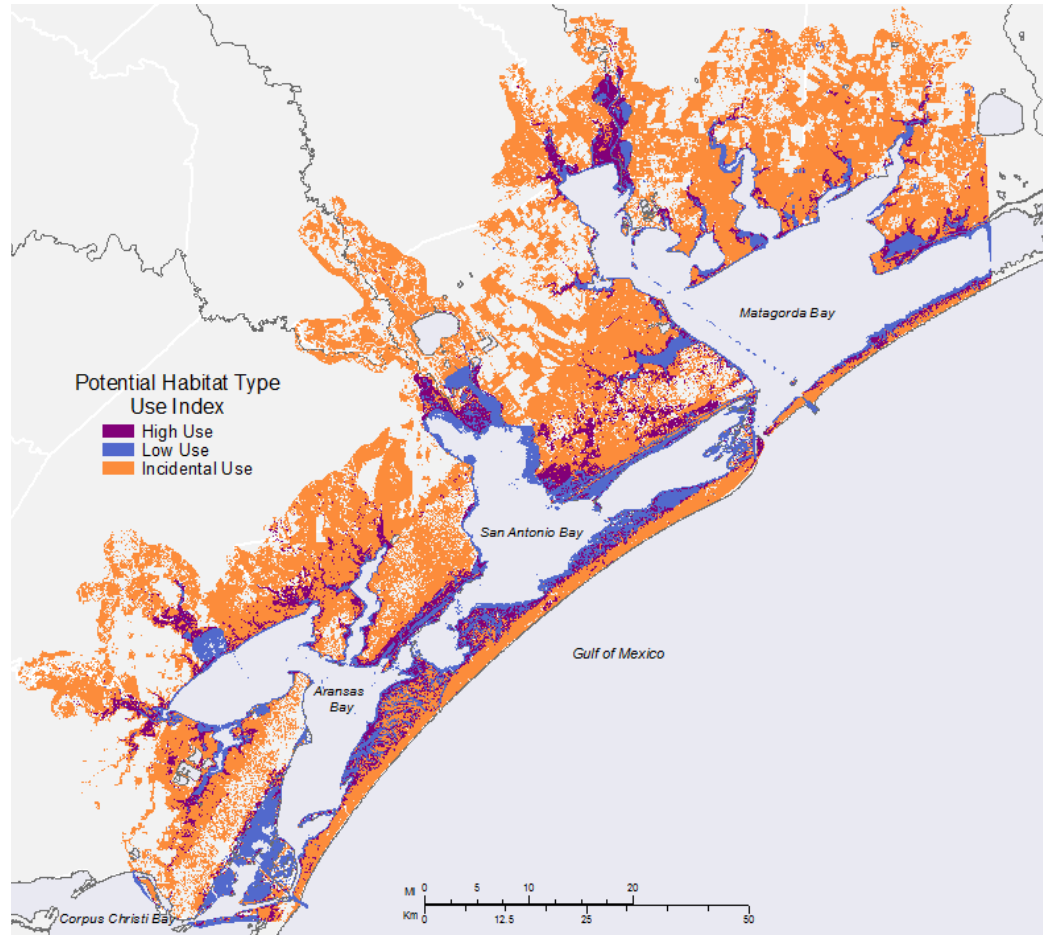
Under the low-end sea level rise scenario, there is a 10% increase in area affected by a Category 3 hurricane. This storm would submerge all barrier islands, and the majority of Aransas County including the Rockport/Fulton area.

Under the intermediate sea level rise scenario, a 100-year flood will become 20% more likely to happen by 2030 in Rockport and by 2080, the likelihood increases to 100%.



Murdock and Brenner, 2016

Whooping Crane



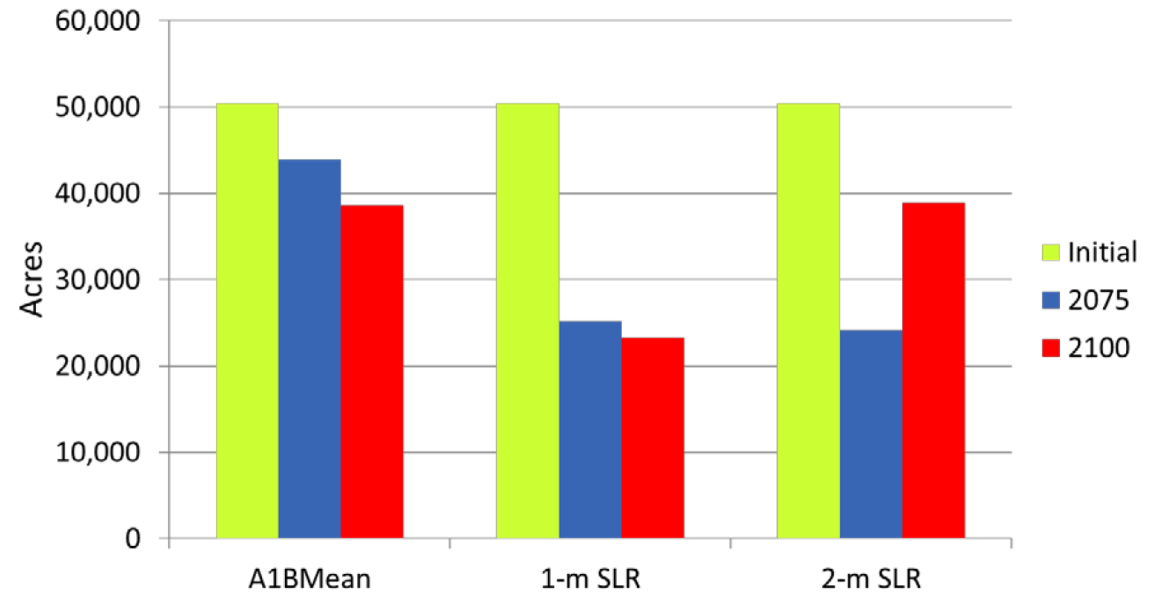
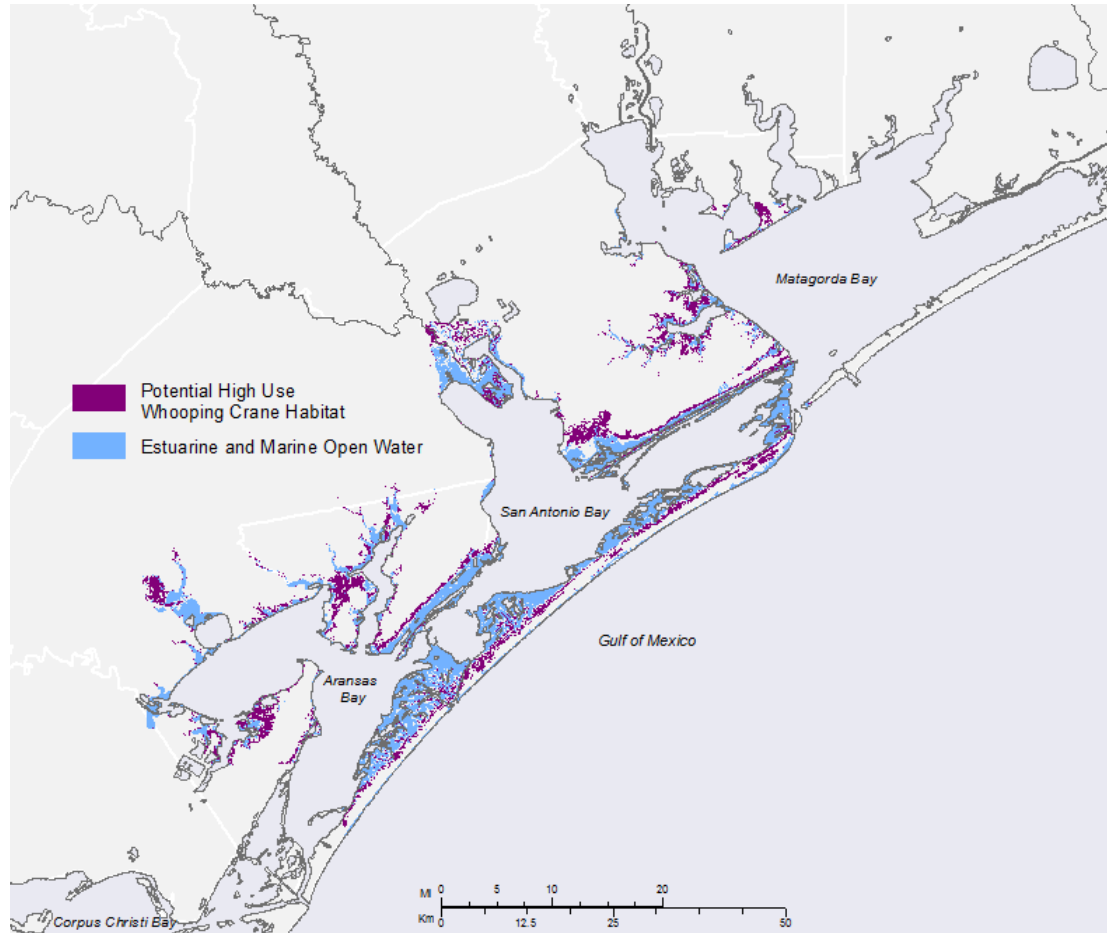
EMPLOYING THE CONSERVATION DESIGN APPROACH ON SEA-LEVEL RISE IMPACTS ON COASTAL AVIAN HABITATS ALONG THE CENTRAL TEXAS COAST

Smith et al., 2014



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 RESEARCH INSTITUTE FOR GULF OF MEXICO STUDIES

Whooping Crane



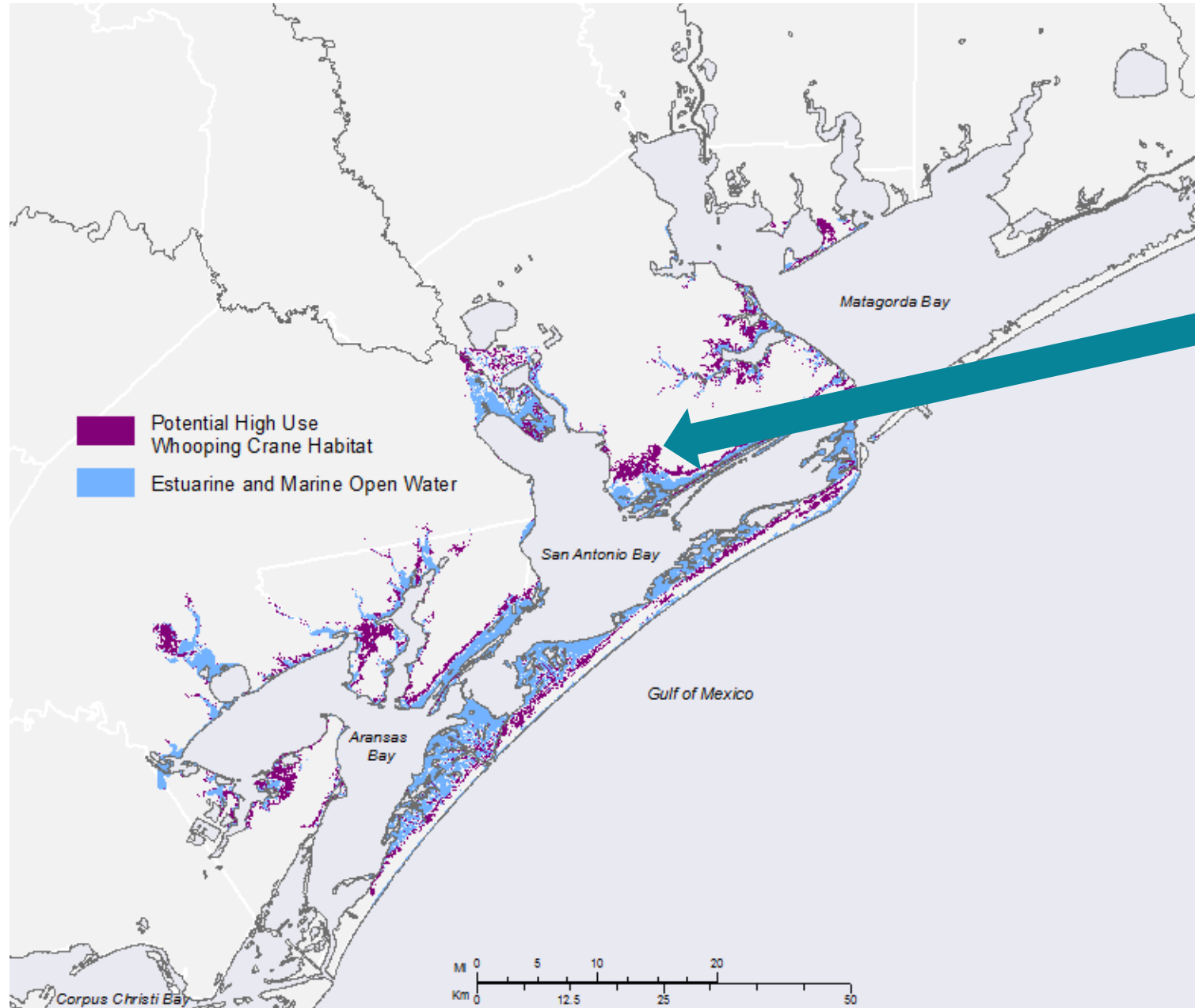
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2 meters SLR by 2100



IDENTIFY ACQUISITION TARGETS

2010 Census

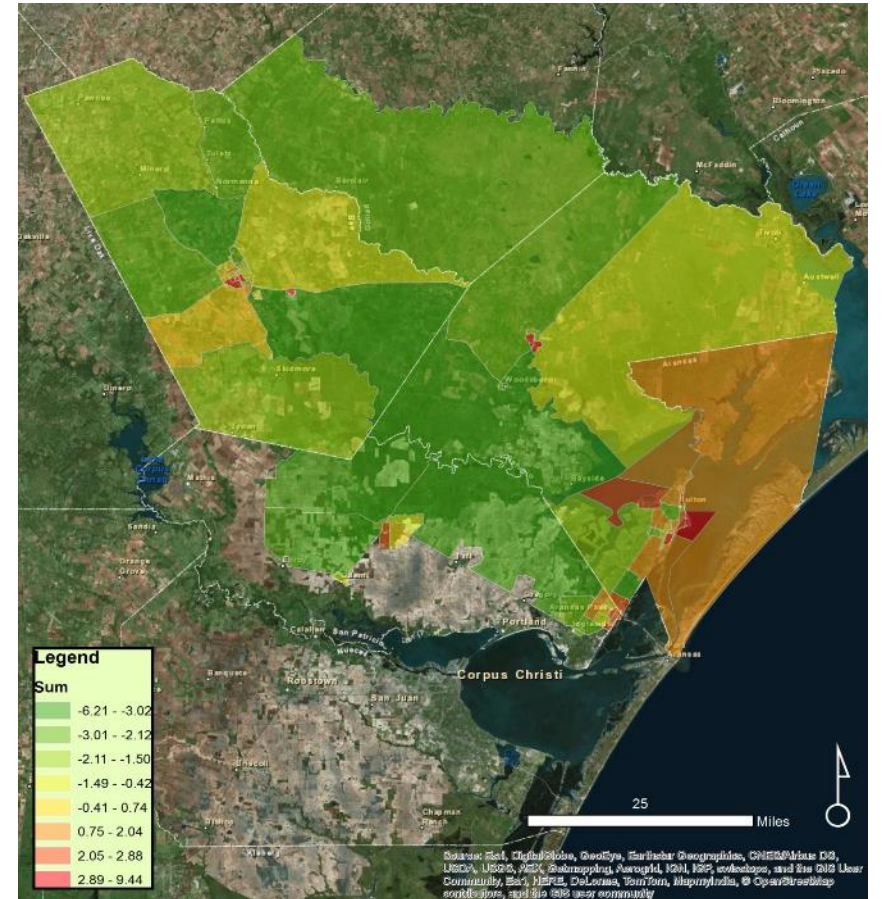
American Communities Survey

Infrastructure (Shepherd et al., 2012)



Principal Component	Name	Cardinality	Percent Variation Explained	Dominant Variables (Component Loading)
1	Age and Housing	+	22	Median age (0.905) Persons per occupied housing unit (-0.877) Age 65 and over (0.857) Seasonal housing units (0.842) Percent Hispanic (-0.839) Percent non-Hispanic white (0.828) Age 5 and under (-0.74)
2	Demographic	+	16	Housing unit year built (-0.969) Percent female (-0.947) Senior group quarters (0.883) Percent black (0.78) Married couple families with children (0.771)
3	Density	+	6	Housing density (0.876) Population density (0.622)
4	Cultural Barriers	+	5	Percent mobile homes (-0.597) Non-English speaking (0.519)
5	Wealth	-	9	Median income (-0.774) Per capita income (-0.714) Rich households (-0.682) Median house value (-0.673) Below poverty (0.577)
6	Natural Resource Dependent	+	5	Employment in extractive industry (-0.815) Employment in service industry (0.648)
7	Asian	+	4	Percent Asian (-0.803) Median gross rent (-0.639)
8	Tenancy	+	8	Renter occupied housing (0.775) Renters (0.769) Single parent (0.56) Length of residency (0.527)
9	Socially Dependent	+	5	Public assistance (0.844) Limited English proficiency (0.498)

Most Sensitive
↓
Least Sensitive



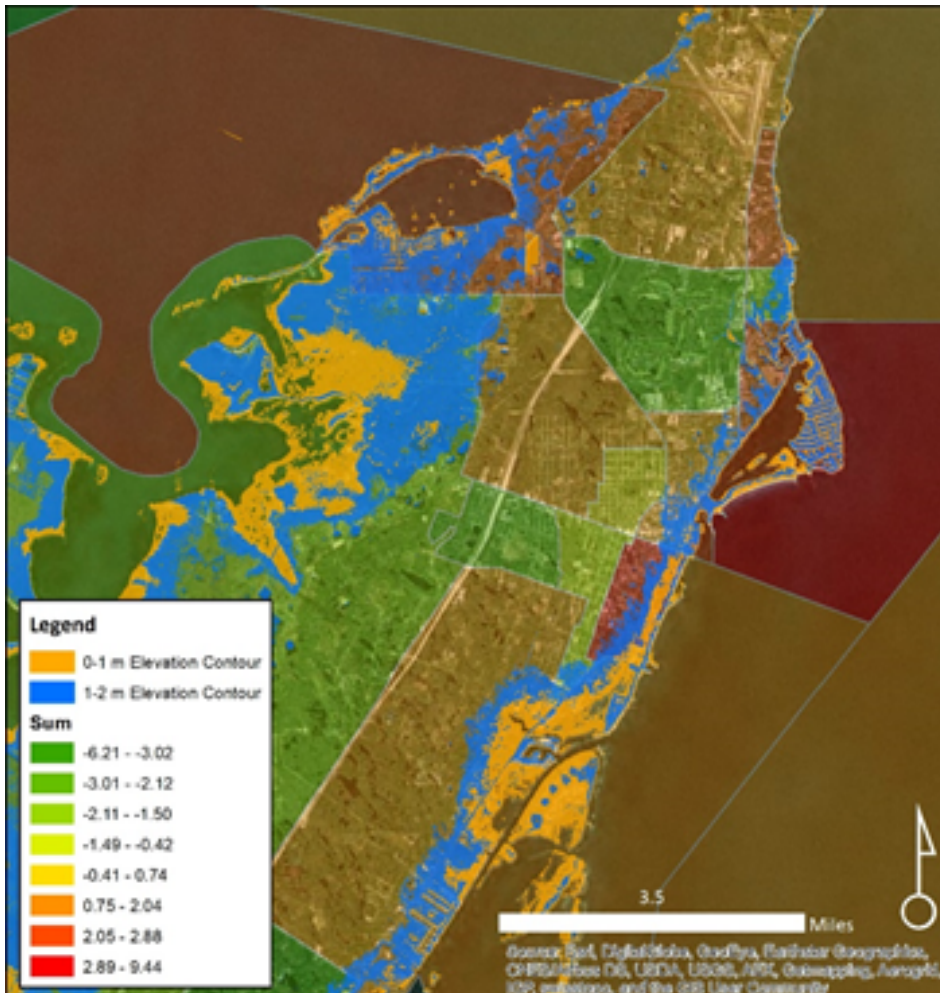
MISSION-ARANSAS NERR CLIMATE CHANGE VULNERABILITY ASSESSMENT

Wade and Stanzel, 2015



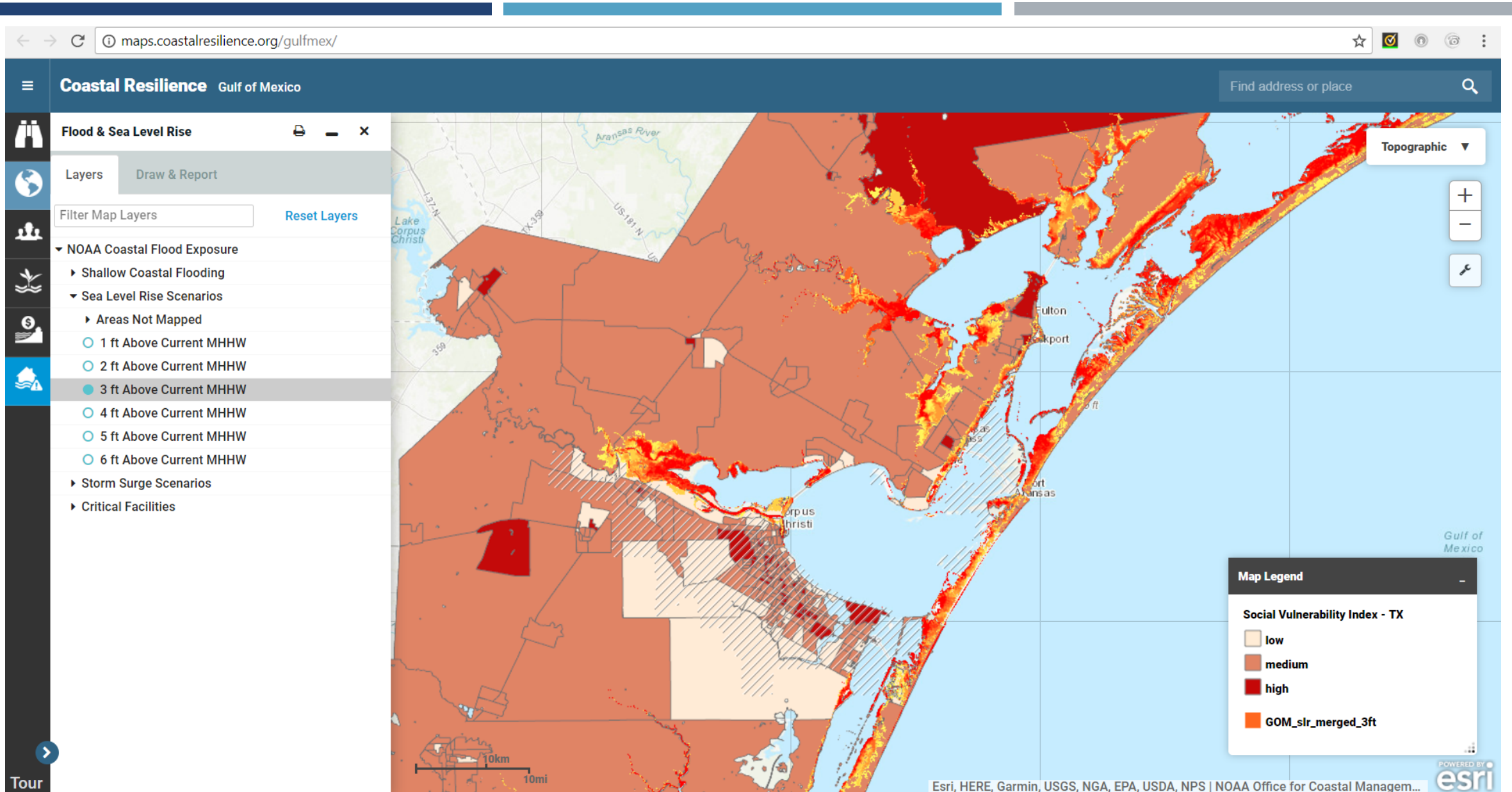
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Wade and Stanzel, 2015



Geoid	County	Principal Components with High Loadings	Major Vulnerability	Index Score
480259502011	Bee	2, 8	Ethnicity, Families with Children, Renters	9.44
480079504001	Aransas	8,9	Public Assistance, Renters	8.63
483919502003	Refugio	4,8	Non-English Speaking, Renters	7.13
483919502004	Refugio	4,8,9	Non-English Speaking, Poverty, Renters	7.06
480259505005	Bee	4,6	Non-English Speaking, Employment in Service Industry	6.6
480079502001	Aransas	1,3	Age, Percent over 64, Housing Density	5.49
480259505002	Bee	4,9	Non-English Speaking	3.19
480259505003	Bee	3,5	Income and Poverty	2.91





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



QUESTIONS?

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