

# Coastal Resilience Forum

5/13/2020

Notes

## Frank Bernardino, Resiliency Florida

### Remembering Rep. Kristin Jacobs

- **Frank Bernardino** gave a remembrance of Representative Kristin Jacobs who passed away April 11, 2020. Rep. Jacobs was a driving force behind the creation and success of the Southeast Florida Regional Climate Change Compact and Resiliency Florida. There will be a memorial service for her in Tallahassee when lawmakers return, and next spring at the headwaters of the Everglades in Kissimmee.

## Sean Lahav, NEFRC and Angela Schedel, Taylor Engineering

### Northeast Florida Regional Resilience Exposure Tool

- **Sean Lahav and Angela Schedel** presented about the Northeast Regional Resilience Exposure Tool developed for the Northeast Florida Regional Council by Taylor Engineering. The tool allows residents, business owners and governmental actors to determine if resources will be exposed to coastal flooding. The tool includes coastal flood layers that can be overlaid with other data layers such as population density, critical infrastructure, and priority environmental habitats. <http://www.buildcommunityresilience.com/northeastflorida/> Examples of using the tool for the City of Atlantic Beach and others were provided. The sea level rise projections chosen for the tool came from the 2013 [Regional Action Plan](#).
- Follow up questions that were not answered during the webinar:
  1. There are lots of mapping tools! Are there any recent reviews of which are best, or pros & cons of different tools, etc... And I'm asking because my County is not in NE FL
    - a. FDEP published reviews of different sea level rise visualization tools in 2015. That report is available here: [https://floridadep.gov/sites/default/files/CRI\\_Inventory\\_SLR\\_Tools.pdf](https://floridadep.gov/sites/default/files/CRI_Inventory_SLR_Tools.pdf)
    - b. Climate Central also has a review of them here: <https://sealevel.climatecentral.org/matrix>
    - c. Here is another good website which helps you choose a tool: <http://gulftree.org/>
  2. Does the flood mask layer have detailed elevation data to perform Hazus runs?
    - a. We don't store any elevation data in our website flood layers. We pull the calculated sea level rise flooding depths directly from the NOAA Sea Level Rise Impacts Viewer. Depth of Flood is calculated as part of the Flood Insurance study.
  3. has this data been provided the FBC
    - a. I am not aware if FBC has this data, but I will bring it to their attention.

## Margaret Walton and Lawrence Frank, Atkins

### Mexico Beach Resilient Redevelopment Plan

- **Margaret Walton and Lawrence Frank** of Atkins gave a presentation on the FRCP Resilience Planning Grant-funded project in Mexico Beach. The project utilized the Florida Adaptation Planning Guidebook to take the City of Mexico Beach through an adaptation planning process. The project included a study of the vulnerability of several focus areas to sea level rise and other forms of coastal flooding, and resilience planning focused on building back safer and stronger in the wake of 2018's Hurricane Michael.

# Ashleigh Fountain, US Army Corps of Engineers

## Update on the South Atlantic Coastal Study

- **Ashleigh Fountain** gave an update on the progress of the Corps' South Atlantic Coastal Study, which is a multi-state watershed planning study. The effort is nearing the halfway point with some products wrapping up and coming online, such as the Institutional and Other Barriers report and the Measures and Costs Library. The Vision Statement for the project was recently updated to change "vulnerabilities" to "risks" in order to better consider the multiple dimensions of risk, which include vulnerability. Each state, including Florida, will have an appendix with their details and analysis. USACE has monthly newsletters and quarterly webinars to update stakeholders.
- Follow up questions that were not answered during the webinar:
  1. Is the USACE composite risk assessment database finished and available for either download or API?
    - a. Yes, the SACS Tier 1 Risk Assessment Viewer is complete and available at (best viewed in Chrome or Firefox)  
<https://clicktime.symantec.com/3FW2F6oViPwr4BQq2jAyVwV7Vc?u=https%3A%2F%2Fsacs.maps.arcgis.com%2Fapps%2FMapSeries%2Findex.html%3Fappid%3Dc54beb5072a04632958f2373eb1151cf>
  2. Is that database searchable by lat/long?
    - a. Yes
  3. In your sequence for adaptation, do you fast track mitigations that can be implemented more easily/more cheaply so that mitigation can start taking place while larger-more expensive mitigations are being worked on? Or is that left to the community level?
    - a. Generally, less expensive actions that can be easily implemented should be prioritized, and stakeholders will consider the need for sequencing and prioritization in Focus Area Action Strategies.
  4. Q: recently USACE has released reports for Miami and Charleston, and in both cases the preferred/recommended option is a big wall. I can't help but wonder if the cost benefit analysis process used adequately considers the multiple benefits from green infrastructure. Is this being discussed?
    - a. The majority of USACE studies consider structural and nonstructural alternatives. Recently, USACE has been directed to also consider natural and nature-based (NNBF) measures in its studies. The USACE Engineering With Nature (EWN) initiative is conducting ongoing research into NNBF. The EWN website (<https://clicktime.symantec.com/3LyyBNSTR9FoUTUC6DJQRnz7Vc?u=https%3A%2F%2Fewn.el.erdcdren.mil%2Fnnbf.html>) states, "Some of the priority areas of current R&D on NNBF include quantifying the engineering benefits associated with NNBF, interactions between NNBF and conventional measures, and knowledge and tools for projecting the long-term operation and maintenance of NNBF."
  5. For Ashleigh - do the Step 5 Dollar Damages address damages to the building infrastructure, bulkhead infrastructure? Are they probable annual damage costs? Has the Corps assessed potential impacts to the ad-valorem taxes, as collected by the impacted municipality?
    - a. Hazus damages do not include dollar damages to armor or bulkhead structures. The Measures and Costs Library has costs in FY20 dollars and annualized costs over a 50-year period. No, the Corps has not assessed potential impacts to the ad-valorem taxes, as collected by the impacted municipality.
  6. Why does the buyout program require paying current appraised value? If we wait the price will go down as SLR and/or storm damage occurs.
    - a. I believe this question may be geared more towards Corps' policies on buyout and acquisition beyond overall, than the most basic level being considered in SACS. However, the Measures and Costs Library will have a buyout/acquisition measure (NS-1) that's based on market value.

## Announcements

1. David Lafontant has joined the team, assisting both Angel and Whitney with various tasks. David is a recent FSU grad.

2. The FY 21-22 grant cycle is approaching. Applications will be submitted electronically this year starting August 1, 2020 via our new grant application website. There will be a webinar on July 15 from 10:00-10:30 to explain how to apply using the new system. Contact Angel to receive a registration link for the webinar.
3. FRCP's pre-proposal for a grant from the National Coastal Resilience Fund was approved to submit a full proposal. The project would develop best practices specifically for vulnerability assessments so that consistent types of data would result that could be better aggregated for the state. The project would pilot the method in 3 coastal communities.
4. Check out the Funded Projects page on the FRCP website as we make project work plans and major deliverables easily available.



**NORTHEAST FLORIDA  
REGIONAL COUNCIL**



**TAYLOR ENGINEERING, INC.**

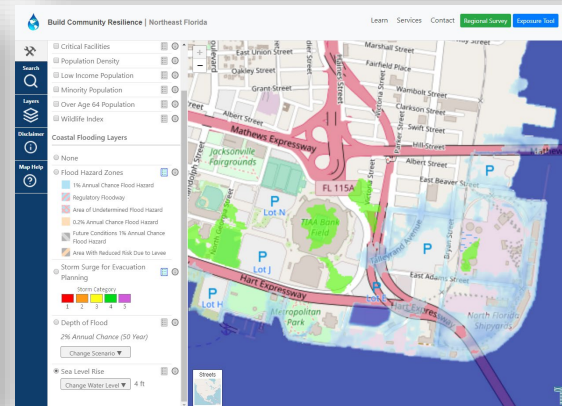
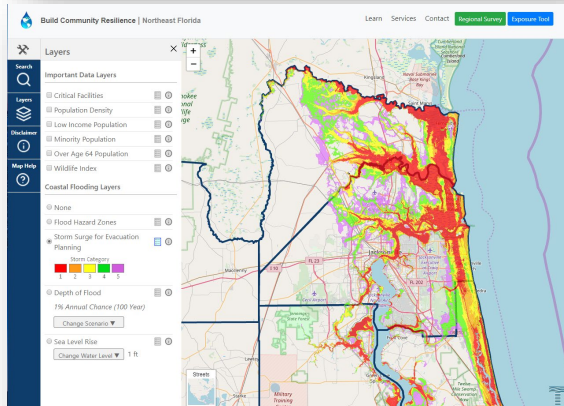
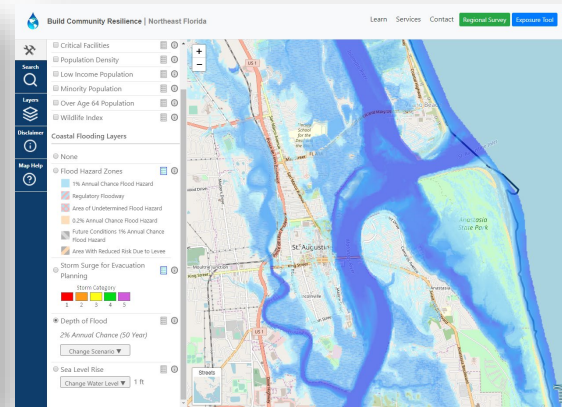
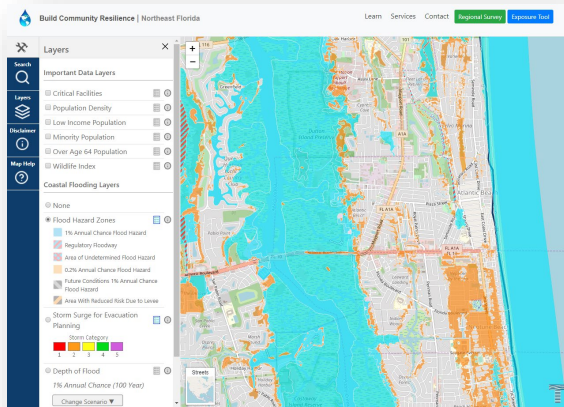


# Using Technology to Map Vulnerabilities and Educate Local Stakeholders

FDEP Quarterly Coastal Resilience Forum

Sean Lahav, MPA & Angela Schedel, Ph.D., P.E.

# REGIONAL RESILIENCE EXPOSURE TOOL



- Map tool that allows residents, business owners and governmental actors to determine if resources will be exposed to coastal flooding.
- Coastal flood layers can be overlaid with other data layers such as population density, critical infrastructure, and priority environmental habitats.



## Introduction:

Welcome to the Official Website for the Northeast Florida Regional Council's **Regional Resilience Exposure Tool (R2ET)**.

In the top right corner of this page, you will find an **"Exposure Tool"** button that will take you to the interactive R2ET platform - an innovative map tool that allows users to determine if a specific resource (or multiple resources) will be exposed to coastal flooding. In the top right corner of the page, you will also find a **"Regional Survey"** link that will take you to a survey that will help us gauge community support, concerns, and interest in programs related to resilience.

The types of flooding presented are FEMA flood hazard zones, storm surge for evacuation planning, depth of flood at defined storm occurrence intervals, and sea level rise at defined water levels. The flood layers can be overlaid on a variety of data to graphically analyze where specific vulnerabilities occur – from critical facilities and population density to low income/minority populations and wildlife.

**The Regional Resilience Exposure Tool (R2ET)** is intended to function as a base-line resource for citizens, businesses, and governmental actors to kickstart conversations about sea level rise and emergency preparedness. Utilizing this tool, as well as other community engagement resources offered by the Northeast Florida Regional Council, local communities will be able to have better-informed conversations about building a resilient future.

*This tool was made possible by a grant provided by the Department of Commerce's Economic Development Administration (EDA). Other partners who were instrumental in making this tool possible were the National Fish and Wildlife Foundation (NFWF) and NatureServe who recently partnered to conduct a Coastal Resilience Assessment of the Jacksonville and Lower St. Johns River Watersheds. R2ET was designed by Taylor Engineering.*





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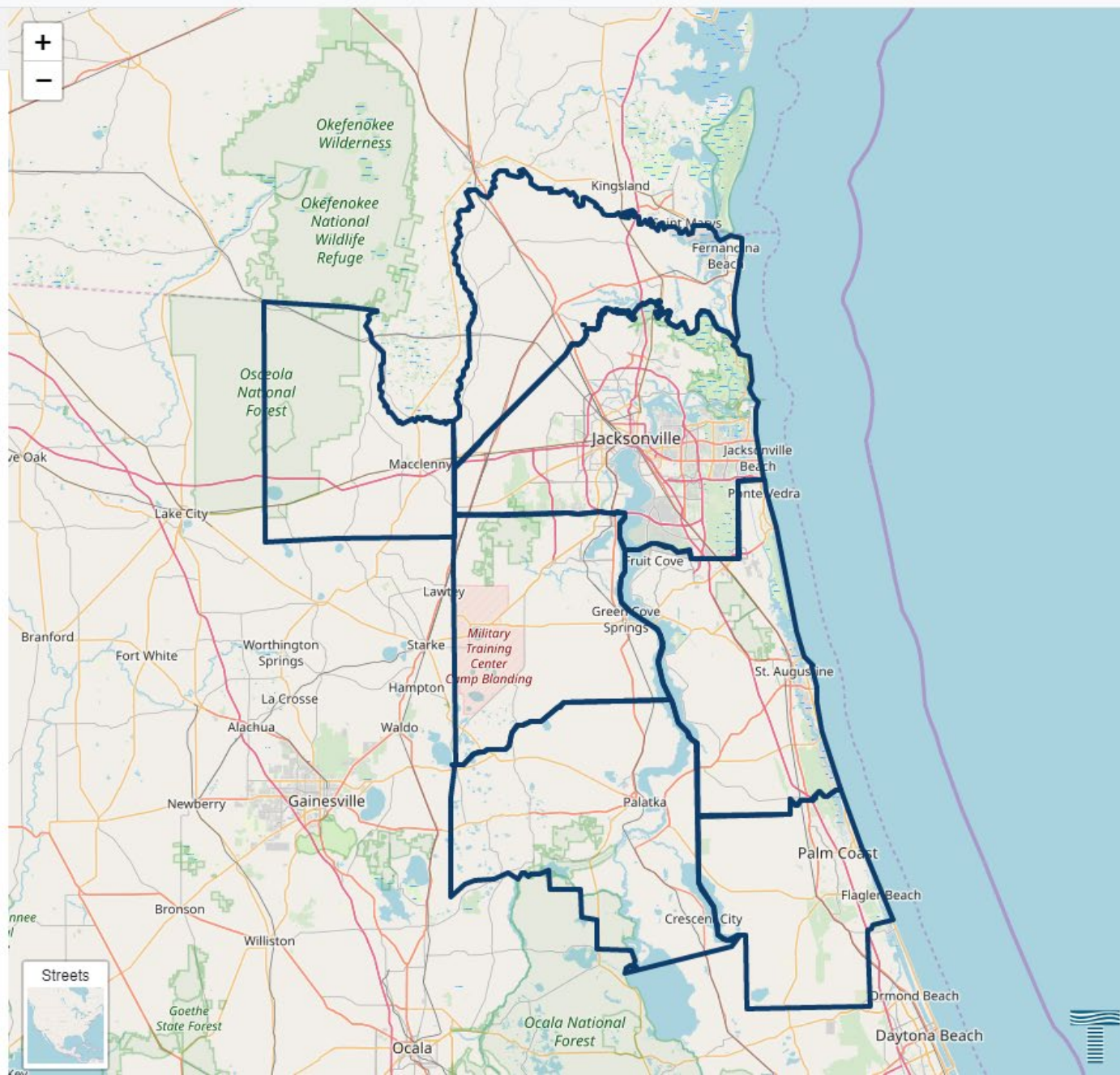


Important Data Layers

- Critical Facilities
- Population Density
- Low Income Population
- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

- None
- Flood Hazard Zones
- Storm Surge for Evacuation Planning
- Depth of Flood
- 1% Annual Chance (100 Year)*
- 
- Sea Level Rise
- 1 ft





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Important Data Layers

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- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

- None
- Flood Hazard Zones
  - 1% Annual Chance Flood Hazard
  - Regulatory Floodway
  - Area of Undetermined Flood Hazard
  - 0.2% Annual Chance Flood Hazard
  - Future Conditions 1% Annual Chance Flood Hazard
  - Area With Reduced Risk Due to Levee

Storm Surge for Evacuation Planning

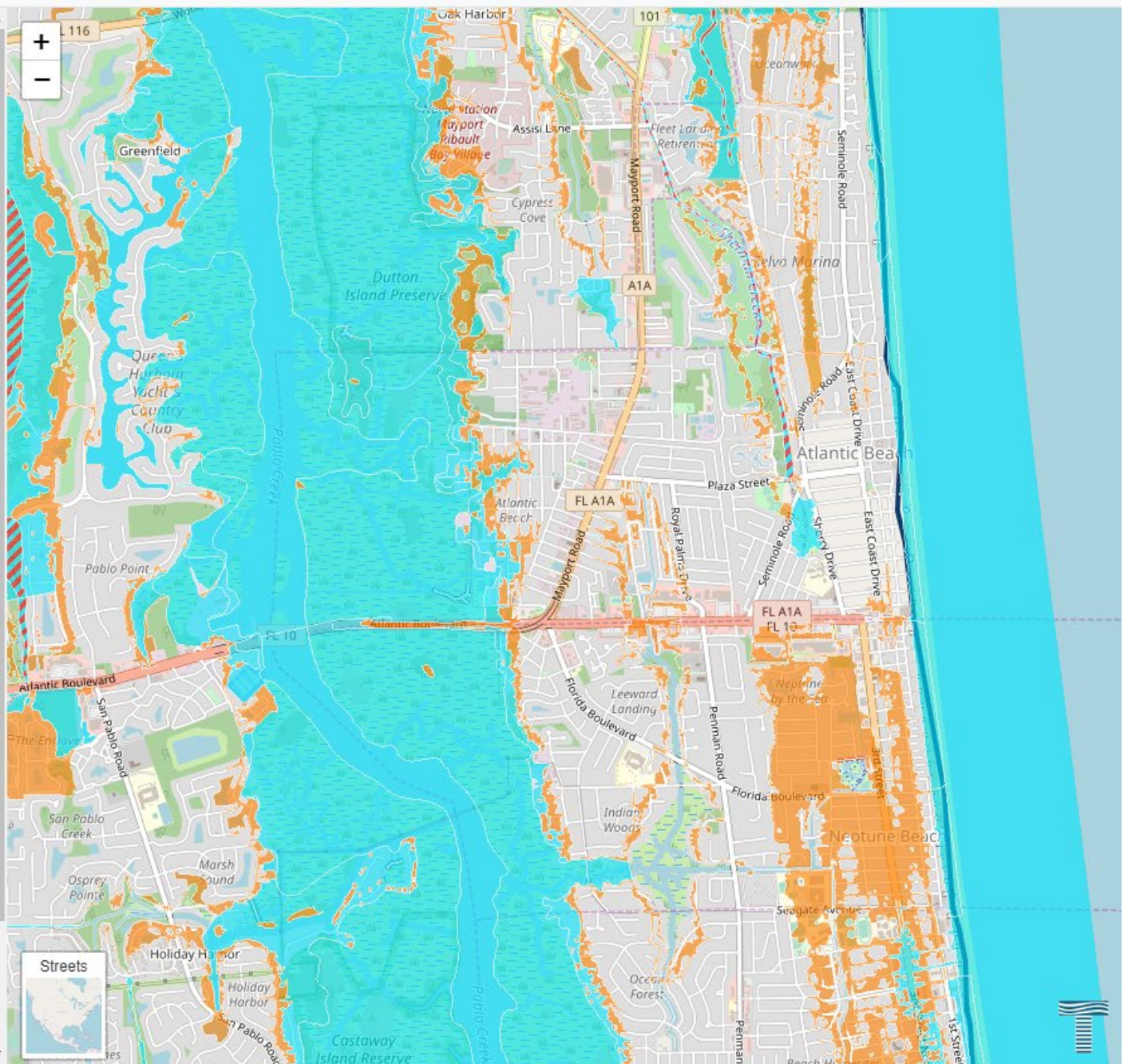
Storm Category

1	2	3	4	5

Depth of Flood

1% Annual Chance (100 Year)

Change Scenario ▼







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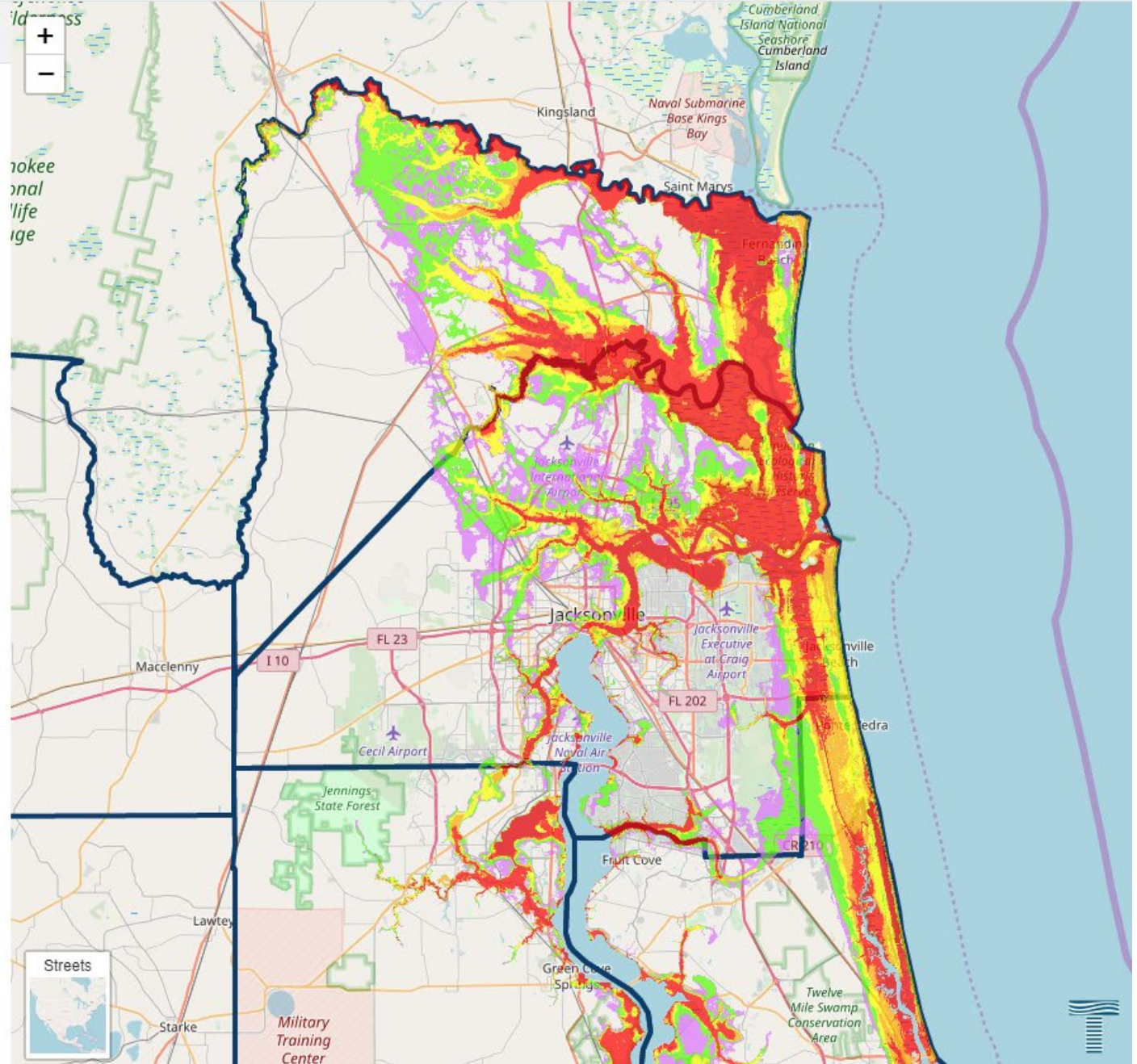


Important Data Layers

- Critical Facilities
- Population Density
- Low Income Population
- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

- None
- Flood Hazard Zones
- Storm Surge for Evacuation Planning
  - Storm Category
  - 1
  - 2
  - 3
  - 4
  - 5
- Depth of Flood
  - 1% Annual Chance (100 Year)
  - Change Scenario ▼
- Sea Level Rise
  - Change Water Level ▼ 1 ft





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Map Help



- Critical Facilities
- Population Density
- Low Income Population
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- Wildlife Index

Coastal Flooding Layers

- None
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  - 1% Annual Chance Flood Hazard
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  - Area of Undetermined Flood Hazard
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  - Future Conditions 1% Annual Chance Flood Hazard
  - Area With Reduced Risk Due to Levee

Storm Surge for Evacuation Planning

Storm Category

1	2	3	4	5

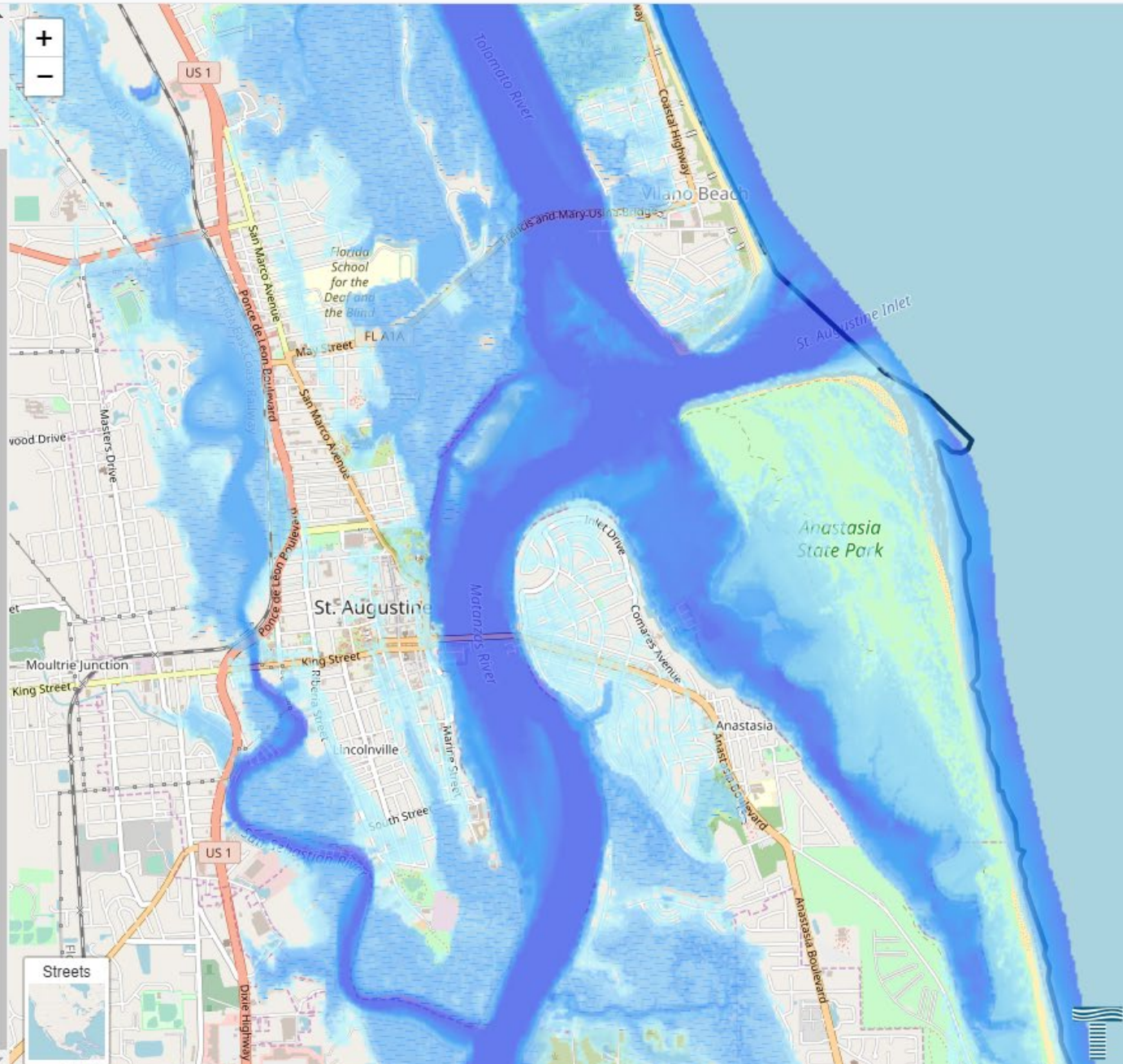
Depth of Flood

2% Annual Chance (50 Year)

Change Scenario ▼

Sea Level Rise

Change Water Level ▼ 1 ft





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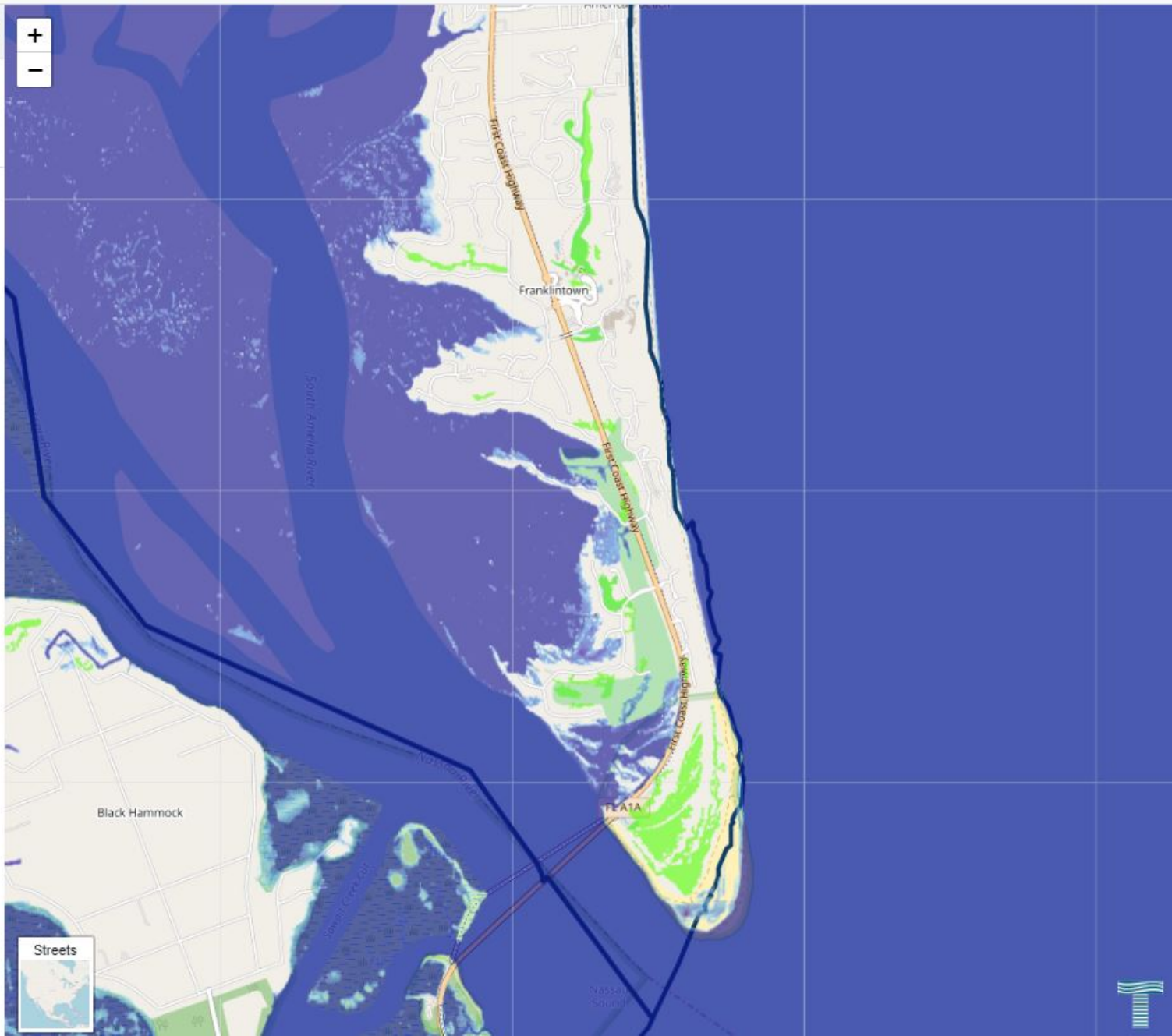
Map Help [Map Help Icon]

Important Data Layers

- Critical Facilities
- Historical Resources
- Population Density
- Low Income Population
- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

- None
- Flood Hazard Zones
- Storm Surge for Evacuation Planning
  - Storm Category
  - 1
  - 2
  - 3
  - 4
  - 5
- Depth of Flood
  - 1% Annual Chance (100 Year)
  - Change Scenario ▼
- Sea Level Rise
  - Change Water Level ▼ 2 ft



# BUILDING BLOCKS for a RESILIENT CITY



**RESILIENCE** is the ability of communities to withstand and recover from disasters as well as to learn from past disasters to strengthen future response and recovery efforts.

## A RESILIENT COMMUNITY CAN

- 1 determine what it needs to reduce damage and to use its assets or resources wisely. The community is resourceful with what it has, no matter its condition or whether it has a lot of resources.
- 2 not only bounce back quickly, but take the opportunity to strengthen health, environmental, social and economic systems.
- 3 learn from past emergencies so that it can be better prepared for the next response.



The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest. [www.rand.org](http://www.rand.org)

For more information, please visit [www.rand.org/resilience-in-action.html](http://www.rand.org/resilience-in-action.html)

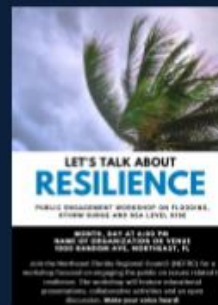
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REGIONAL COUNCIL (NEFRC)

# COMMUNITY RESILIENCE SERVICES

The Council is offering **FREE** resilience services to groups in Baker, Nassau, Duval, St. Johns, Putnam and Flagler Counties.

For more information, contact:

**Sean D. Labav, MPA**  
Resiliency Coordinator  
Email: [slahav@nefrc.org](mailto:slahav@nefrc.org)  
Phone: (904) 279-0880 ext. 111



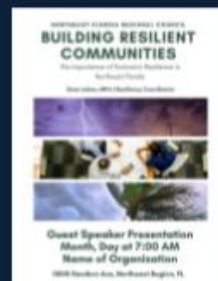
## Public Workshop on Flooding, Storm Surge & Sea Level Rise

This public workshop offers community members the opportunity to identify community assets, develop resilient strategies to protect those assets and voice concerns! Workshop includes local background presentation, group activities and open-discussion.



## Adaptation Planning for Sea Level Rise: Guest Speaker Presentation

This presentation overviews key concepts related to adaptation planning. From protection and accommodation, to strategic relocation and avoidance, audience members will learn about available solutions for addressing sea level rise.



## Building Community Resilience: Guest Speaker Presentation

This presentation overviews key concepts related to understanding community resilience. From shocks and stresses, to exposure and sensitivity, audience members will learn about the steps that can be taken to better protect communities.



## Building Economic Resilience: Guest Speaker Presentation

Want to protect your business assets but have no idea where to start? This presentation provides small business owners with vital information related to the steps that can be taken to protect a business before, during and after any emergency.

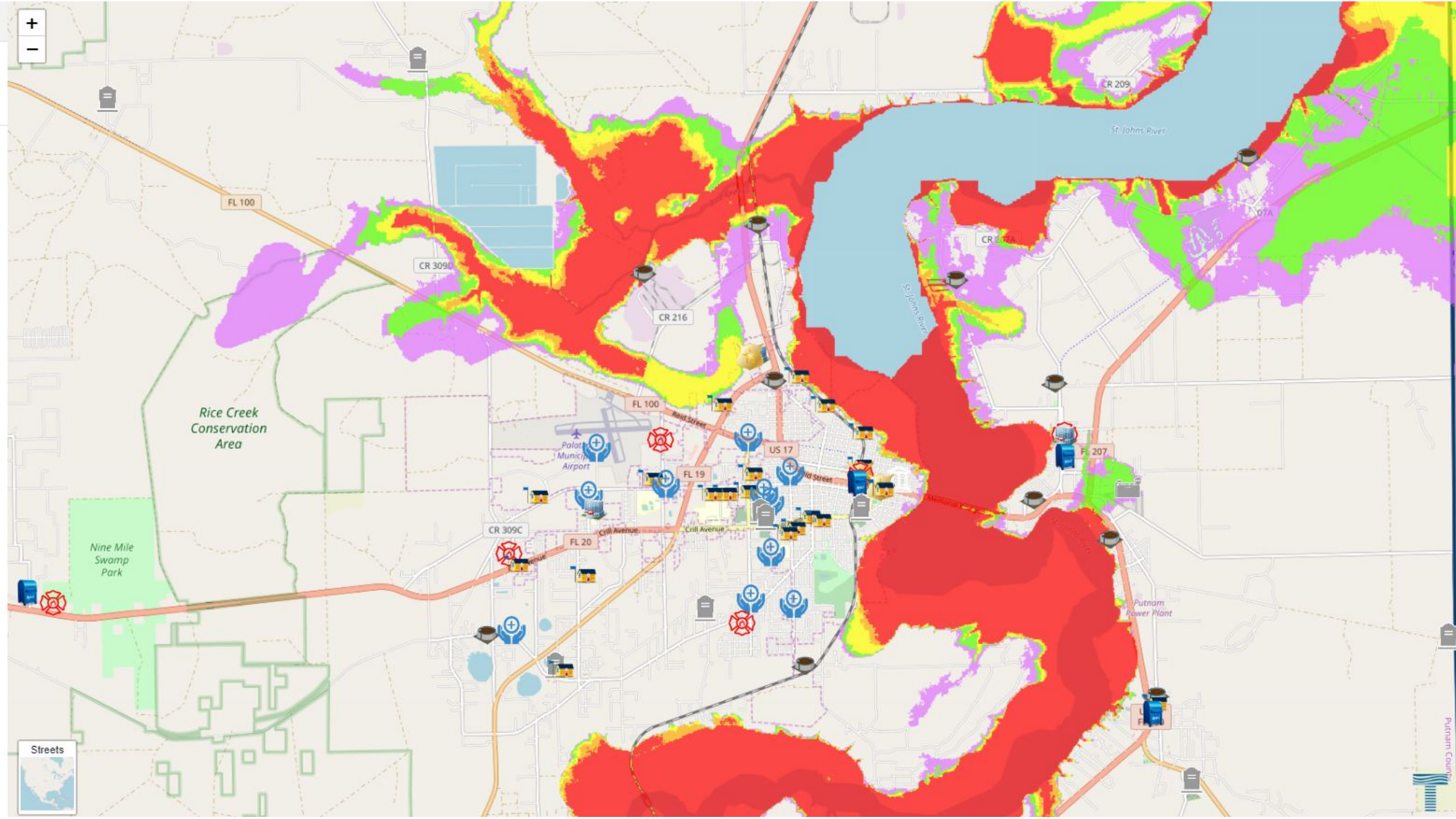
Layers

Important Data Layers

- Critical Facilities
- Historical Resources
- Population Density
- Low Income Population
- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

- None
- Flood Hazard Zones
- Storm Surge for Evacuation Planning
  - Storm Category
    - 1
    - 2
    - 3
    - 4
    - 5
- Depth of Flood
  - 1% Annual Chance (100 Year)  
Change Scenario
- Sea Level Rise
  - Change Water Level 1 ft





Critical Facilities

Search



Population Density

Layers



Low Income Population

Minority Population

Over Age 64 Population

Wildlife Index

Disclaimer



Coastal Flooding Layers

None

Flood Hazard Zones

1% Annual Chance Flood Hazard

Regulatory Floodway

Area of Undetermined Flood Hazard

0.2% Annual Chance Flood Hazard

Future Conditions 1% Annual Chance Flood Hazard

Area With Reduced Risk Due to Levee

Map Help



Storm Surge for Evacuation Planning

Storm Category



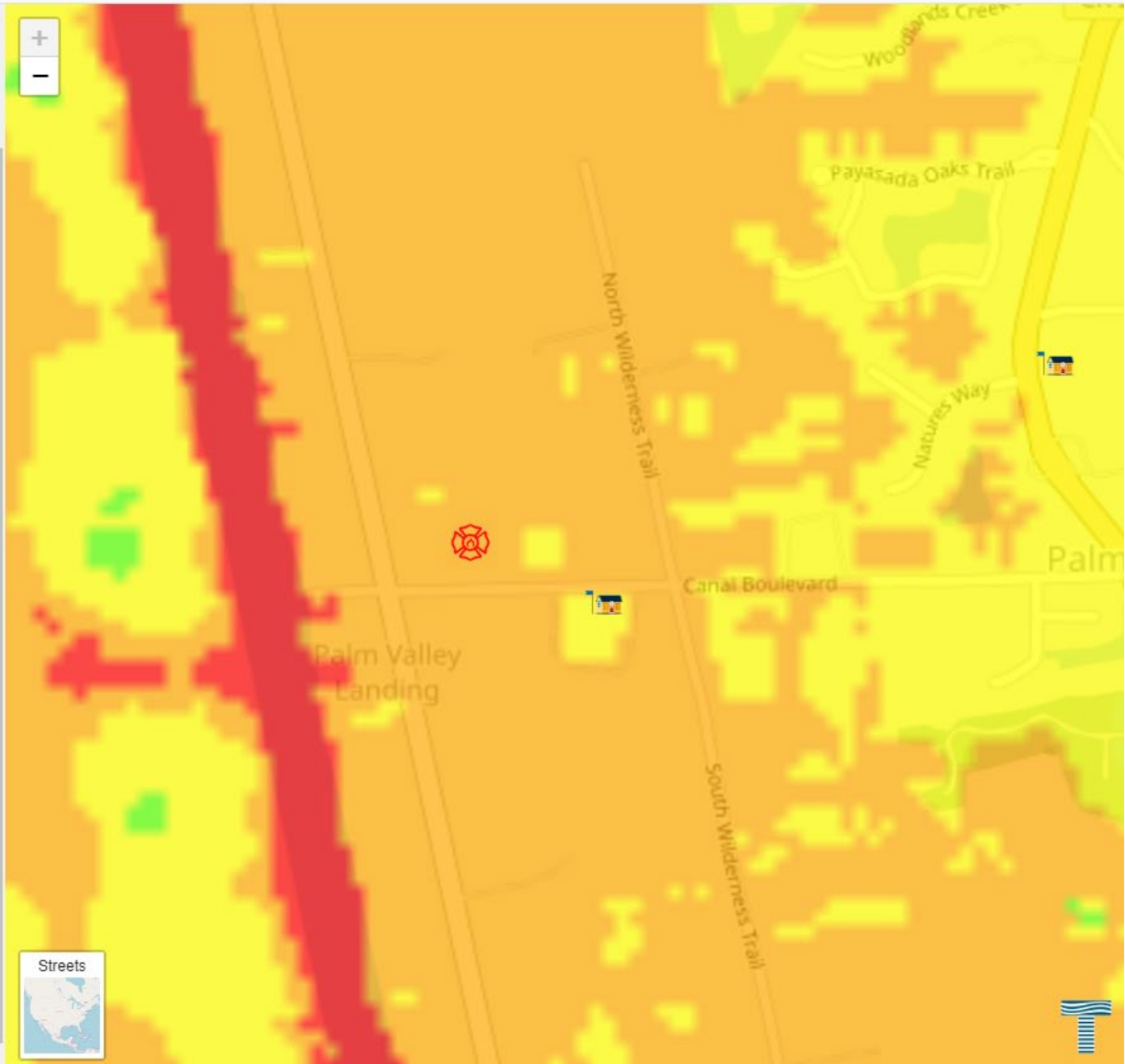
Depth of Flood

2% Annual Chance (50 Year)

Change Scenario ▼

Sea Level Rise

Change Water Level ▼ 3 ft





Critical Facilities

Population Density

Low Income Population

Minority Population

Over Age 64 Population

Wildlife Index

Search



Layers



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Map Help



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None

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Area With Reduced Risk Due to Levee

Storm Surge for Evacuation Planning

Storm Category



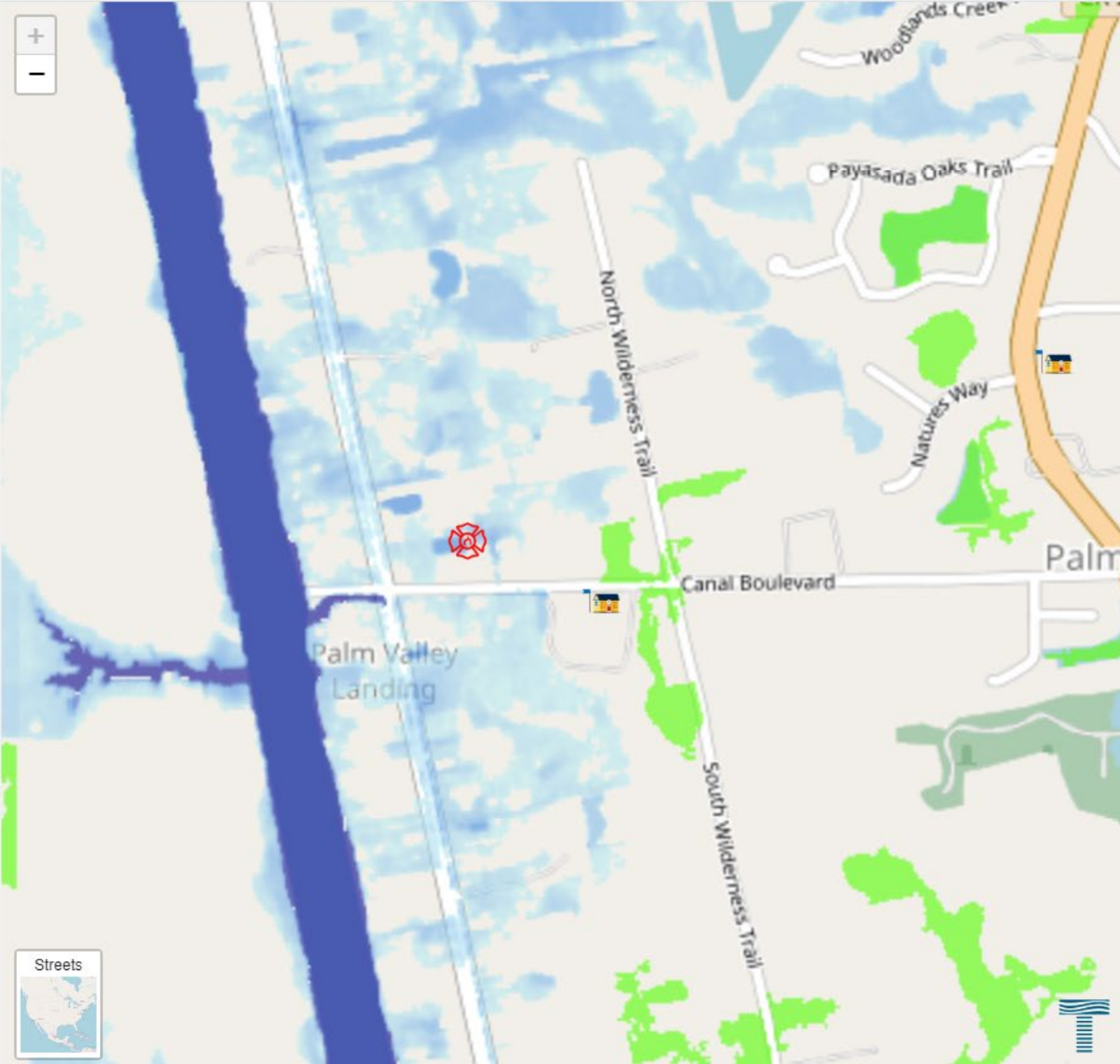
Depth of Flood

2% Annual Chance (50 Year)

Change Scenario

Sea Level Rise

Change Water Level 3 ft







Important Data Layers

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Layers




















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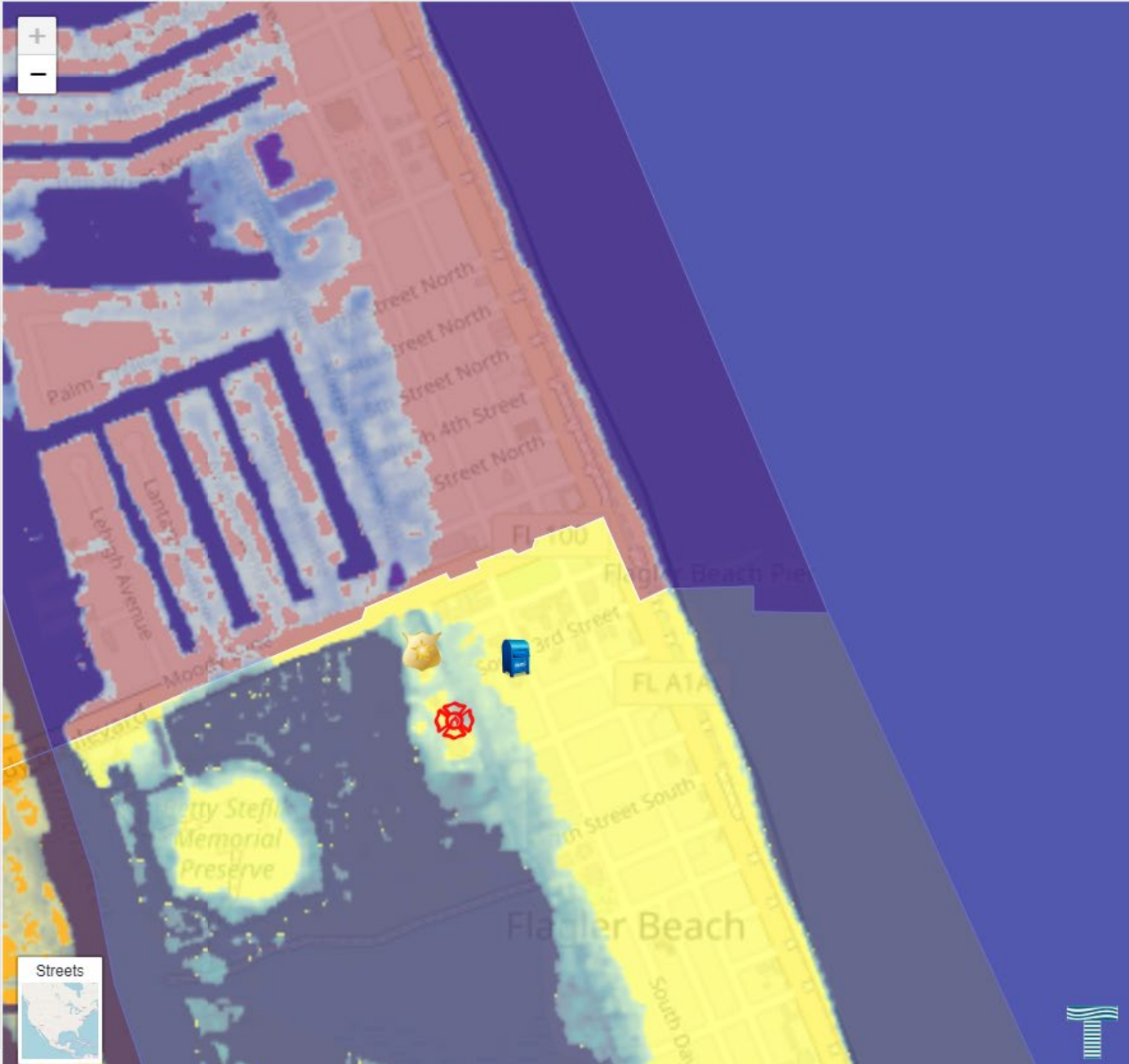


- Critical Facilities  
  - Population Density  
  - Low Income Population  
  - Minority Population  
  - Over Age 64 Population  
- Percentage of each census block comprised of population over age 64
-  < 50
  -  50 - 60
  -  60 - 70
  -  70 - 80
  -  80 - 90
  -  90 - 95
  -  95 - 100

- Wildlife Index  

Coastal Flooding Layers

- None
  - Flood Hazard Zones  
  - Storm Surge for Evacuation Planning  
  - Depth of Flood  
- 1% Annual Chance (100 Year)
- Change Scenario ▼
- Sea Level Rise  
- Change Water Level ▼ 3 ft





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Layers



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Map Help



Population Density

Low Income Population  
Percentage of each census block comprised of low income population

- < 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 95
- 95 - 100

Minority Population

Over Age 64 Population

Wildlife Index

Coastal Flooding Layers

None

Flood Hazard Zones

Storm Surge for Evacuation Planning

Storm Category

1

2

3

4

5

Depth of Flood

1% Annual Chance (100 Year)

Change Scenario ▼

Sea Level Rise

Change Water Level ▼ 2 ft





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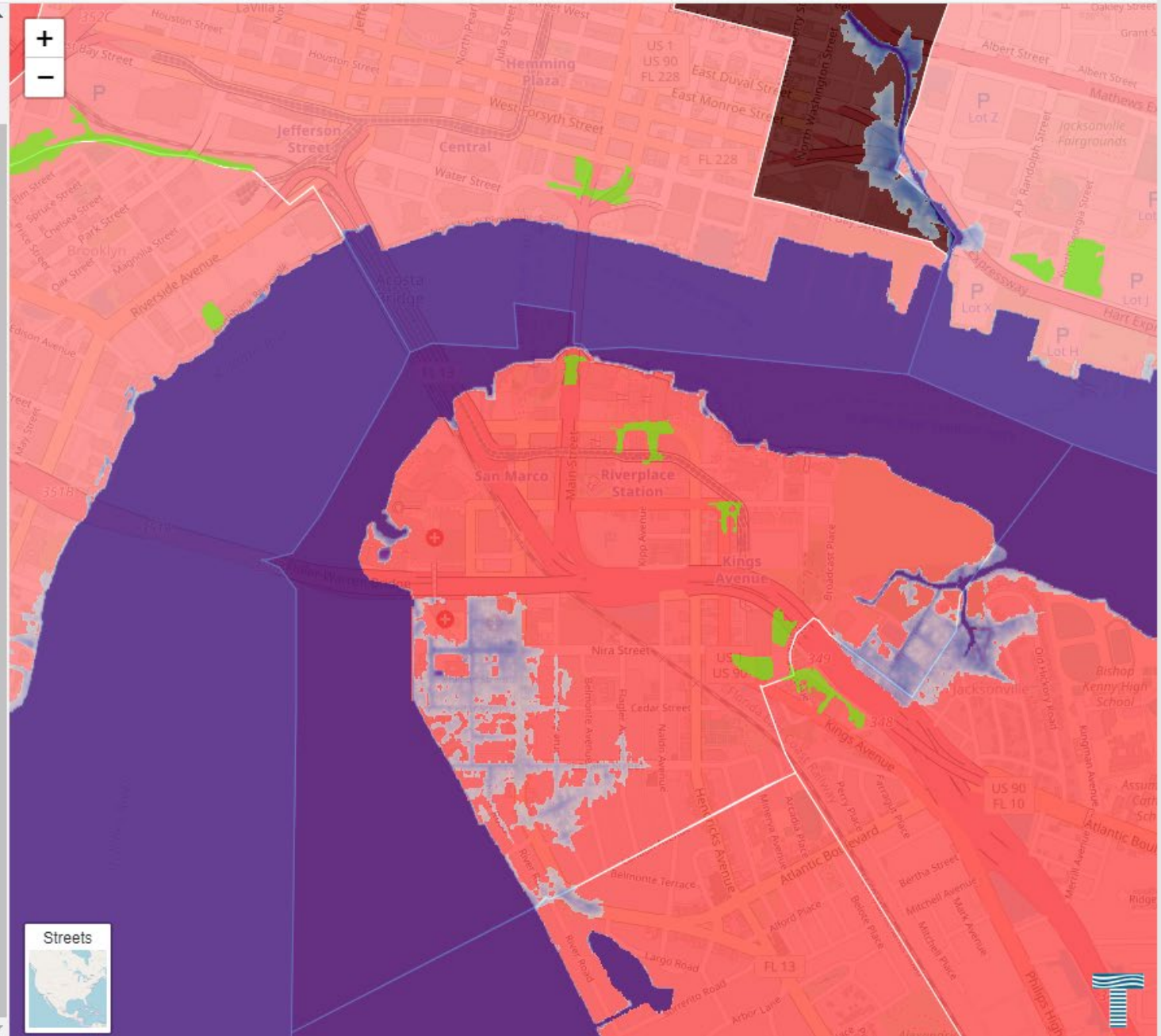


- Critical Facilities
- Population Density
  - People per square mile
  - < 500
  - 500 - 1,000
  - 1,000 - 2,000
  - 2,000 - 3,000
  - 3,000 - 4,000
  - 4,000 - 5,000
  - > 5,000

- Low Income Population
- Minority Population
- Over Age 64 Population
- Wildlife Index

Coastal Flooding Layers

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Storm Surge for Evacuation Planning

Storm Category

1	2	3	4	5

Depth of Flood

2% Annual Chance (50 Year)

Change Scenario ▼

Sea Level Rise

Change Water Level ▼ 4 ft





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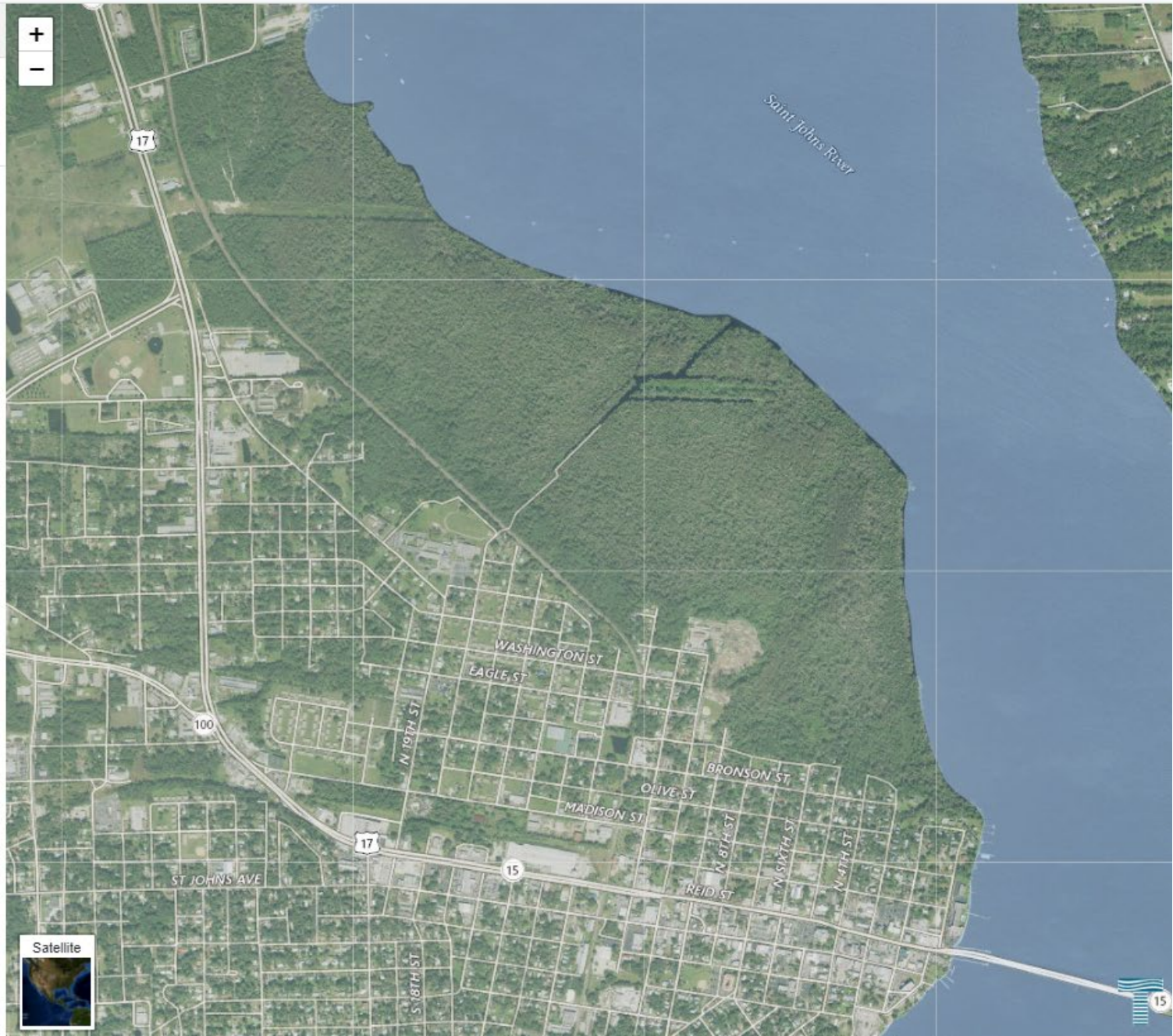


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- Depth of Flood  
- 1% Annual Chance (100 Year)*
- 
- Sea Level Rise  
- 1 ft





Layers

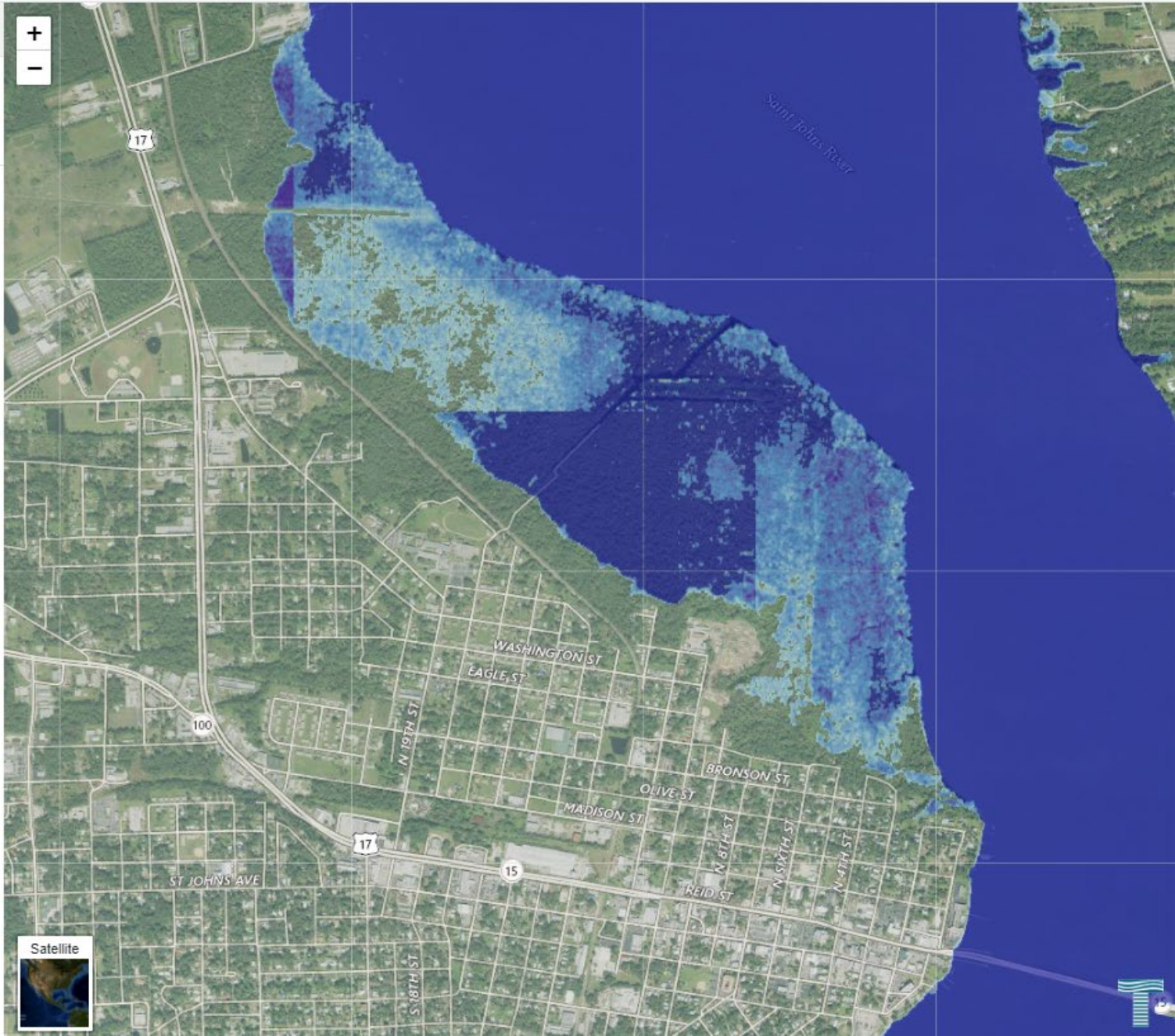
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- Layers
- Disclaimer
- Map Help

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Layers



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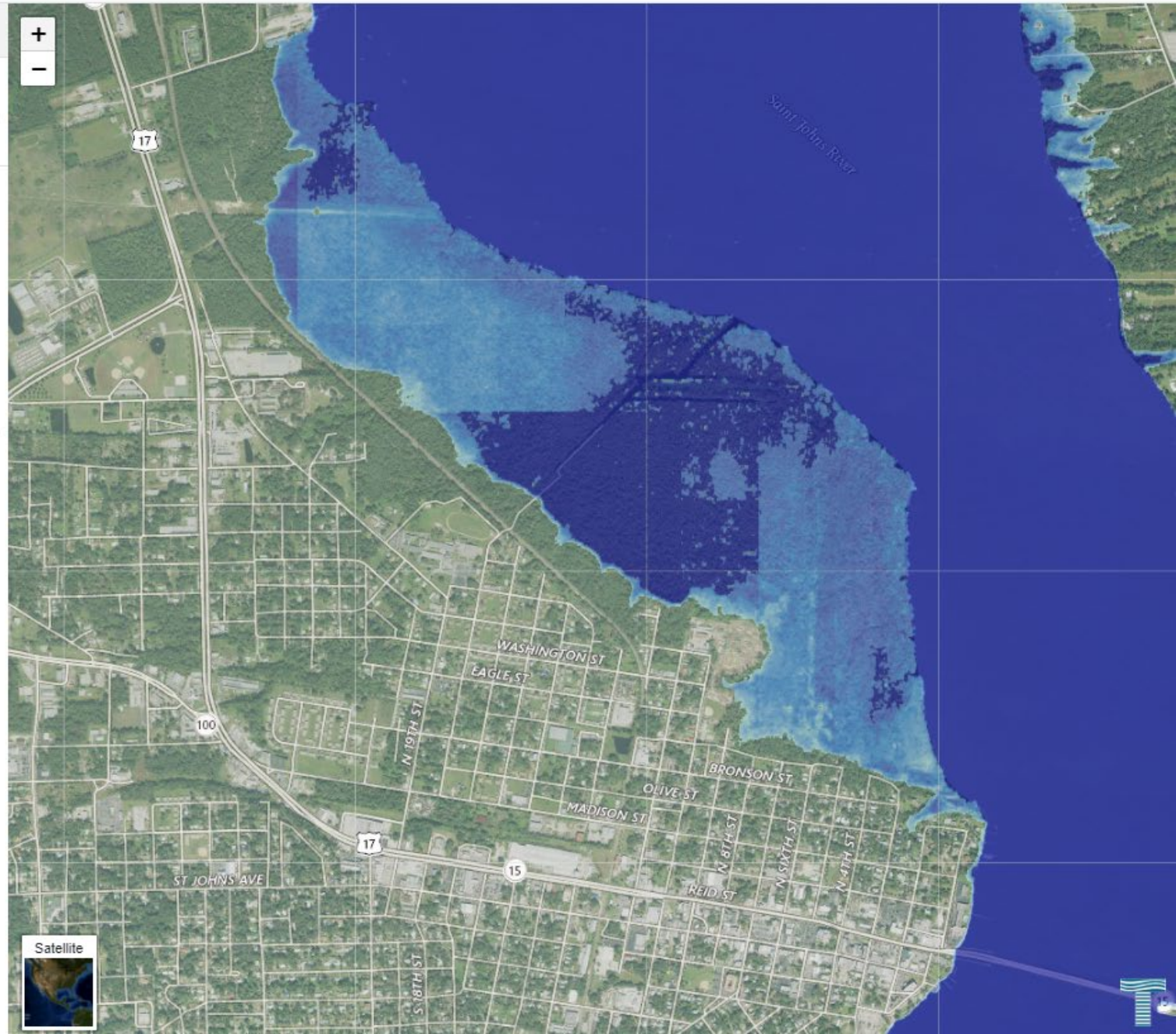


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  - Change Water Level ▼ 3 ft





Search



Layers



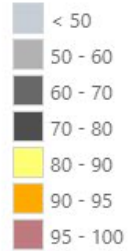
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Map Help



Percentage of each census block comprised of low income population



Minority Population

Over Age 64 Population

Wildlife Index

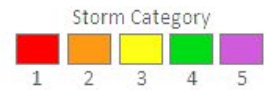


Coastal Flooding Layers

None

Flood Hazard Zones

Storm Surge for Evacuation Planning



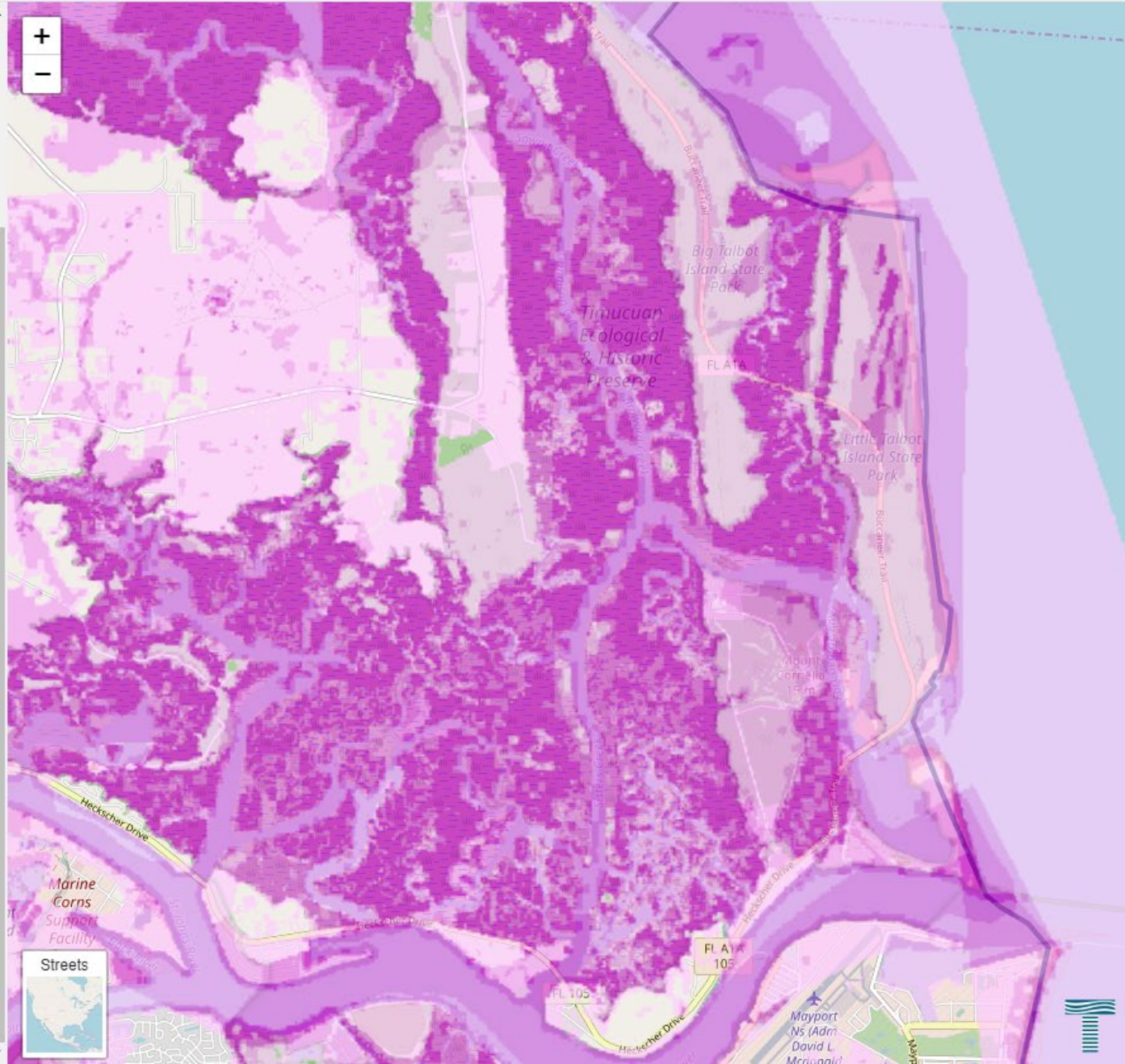
Depth of Flood

1% Annual Chance (100 Year)

Change Scenario

Sea Level Rise

Change Water Level 6 ft







Search



Layers



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Map Help



Percentage of each census block comprised of low income population

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Minority Population

Over Age 64 Population

Wildlife Index

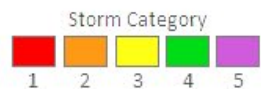


Coastal Flooding Layers

None

Flood Hazard Zones

Storm Surge for Evacuation Planning



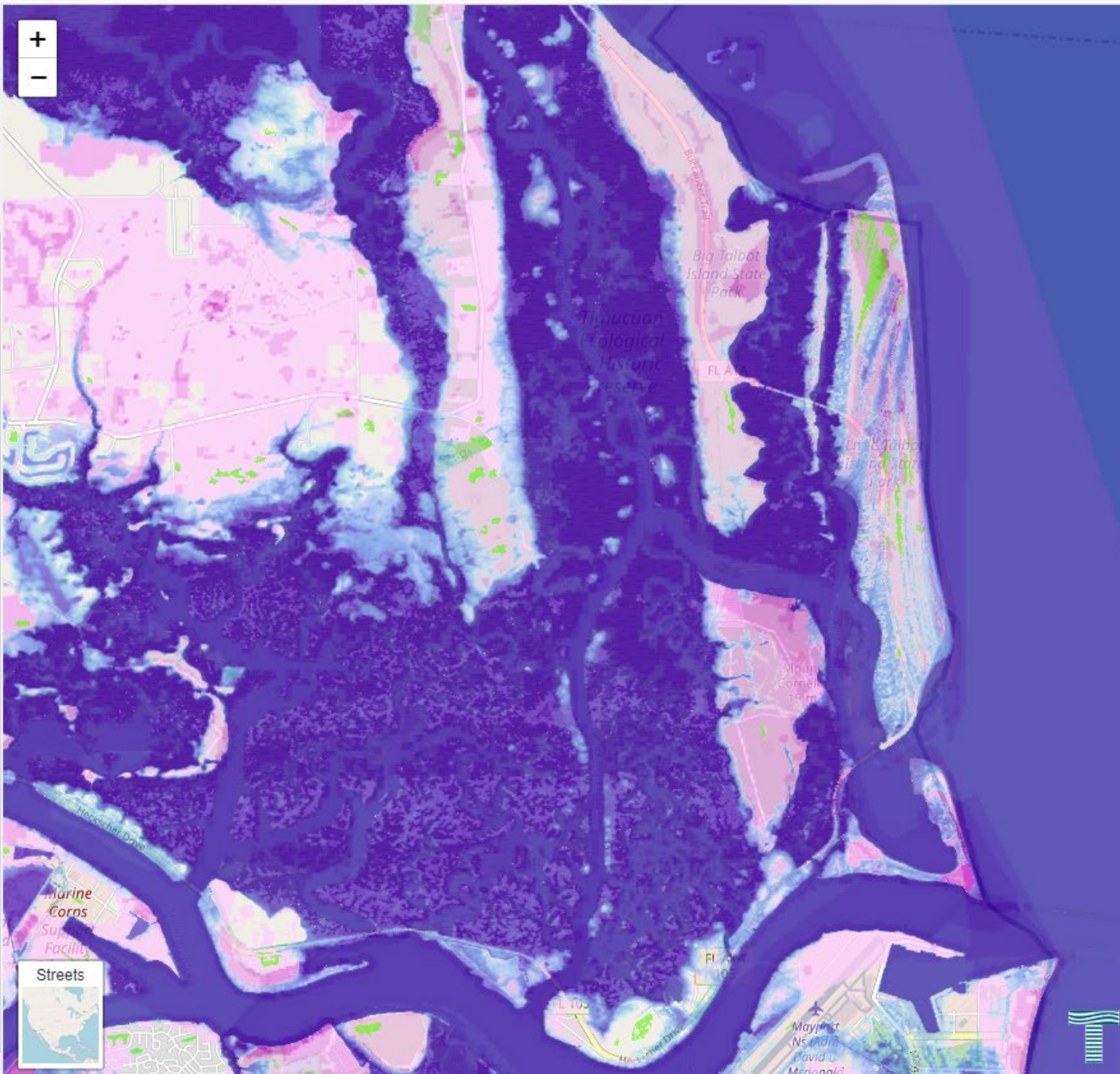
Depth of Flood

1% Annual Chance (100 Year)

Change Scenario

Sea Level Rise

Change Water Level 6 ft



# MOVING FORWARD

- Updating data layers
- Using the tool for local government comprehensive planning
- Private sector educational outreach
- Local government public outreach
- FEMA/NFIP Community Rating System (CRS)



# Resilient Recovery Planning for the City of Mexico Beach

## Vulnerability Assessment, Community Engagement, and Resilience Action



The Florida Department of Environmental Protection (DEP), through the Florida Resilient Coastlines Program (FRCP) provided financial assistance aimed at preparing coastal Florida communities for current and future effects of rising sea levels, including coastal flooding, erosion, and ecosystem changes. The purpose of the FRCP Resilience Planning Grants (RPG) is to promote community resilience planning, vulnerability assessments, address adaptation plans, and comprehensive plan goals, objectives, policies, regional coordination, along with environmental justice.

# Vulnerability and Resilience



## Key Activities

**2019**

*September*

### **Kickoff**

*Stakeholder engagement and goal setting*

**2019**

*Oct-Dec*

### **Vulnerability Assessment**

*Conduct vulnerability assessment, develop draft report*

**2020**

*February*

### **Community Engagement**

*Present vulnerability assessment report, and perform community engagement*

**2020**

*Mar-May*

### **Resilience Planning**

*Add resilience planning elements to the vulnerability report. Draft overall document*


**2020**

*June*

### **Finalize and Present Plan**

*Collect feedback from stakeholders, finalize plan, and present results*

# MEXICO BEACH, FL

 ADD COMPARISON

POPULATION

1,473

9.84% GROWTH

POVERTY RATE

10.7%

MEDIAN AGE

59.2

MEDIAN HOUSEHOLD INCOME

\$57,917

6.16% GROWTH

NUMBER OF EMPLOYEES

501

8.44% GROWTH

MEDIAN PROPERTY VALUE

\$214,200

10.6% GROWTH



ABOUT



COVID-19



ECONOMY



HEALTH



DIVERSITY



HOUSING &  
LIVING

# Vulnerability Assessment

The 2015 Bay County Local Mitigation Strategy (currently going through a 5-year update) was utilized to start the assessment. The plan showed that...

**39%** of the City's 1,773 structures with some **exposure to the FEMA 100-year** storm event and **100%** exposed to some level of **storm surge**

## Flood Zones

Occupancy	Number of Parcels	Number of Structures	Value of Structures	Value of Contents
Residential	692	700	\$ 129,679,492	64,839,746
Commercial	16	24	\$ 12,033,035	\$ 12,033,035
Industrial	6	9	\$ 1,629,544	2,444,316
Institutional	8	9	\$ 920,148	\$ 920,148
Government	3	3	\$ 3,108,093	\$ 3,108,093
<b>TOTAL</b>	<b>725</b>	<b>745</b>	<b>\$ 147,370,312</b>	<b>83,345,338</b>

## Storm Surge

Occupancy	Number of Parcels	Number of Structures	Value of Structures	Value of Contents
Residential	1,655	1,674	\$266,760,842	\$133,380,421
Commercial	57	66	\$20,900,287	\$20,900,287
Industrial	7	10	\$1,766,539	\$2,649,809
Institutional	14	15	\$1,397,701	\$1,397,701
Government	8	8	\$4,051,378	\$4,051,378
<b>TOTAL</b>	<b>1,741</b>	<b>1,773</b>	<b>\$294,876,747</b>	<b>\$162,379,596</b>

# About Hurricane Michael

October 10, 2018 - Cat 5 Landfall  
Near Tyndall Air Force Base

Strongest hurricane on record to make landfall in the Florida Panhandle



Maximum Sustained Winds: 140 KTS  
161 MPH



Minimum Pressure: 919 mb



Peak Storm Surge Inundation:  
9-14 feet Mexico Beach to Indian Pass



NWS Tallahassee  
weather.gov/tallahassee

## Mexico Beach Impacts



1.2 Million cubic yards of debris removed accounting for approximately 25% of all costs



Estimated damage cost of **\$200** million



More than \$1.2 million in donations of supplies, material, and money

# Vulnerability Assessment – Sea Level Rise

To facilitate analysis and discussions, a series of map overlays was created to compare damages from Hurricane Michael to hazards included in the vulnerability assessment. Due to Privacy Act concerns, the maps were used for planning purposes only and not included in the report.

## Flood Zones

## Wind vs Water

To facilitate analysis and discussions, a series of map overlays was created to compare damages from Hurricane Michael to hazards included in the vulnerability assessment. Due to Privacy Act concerns, the maps were used for planning purposes only and not included in the report.

## Sea Level Rise

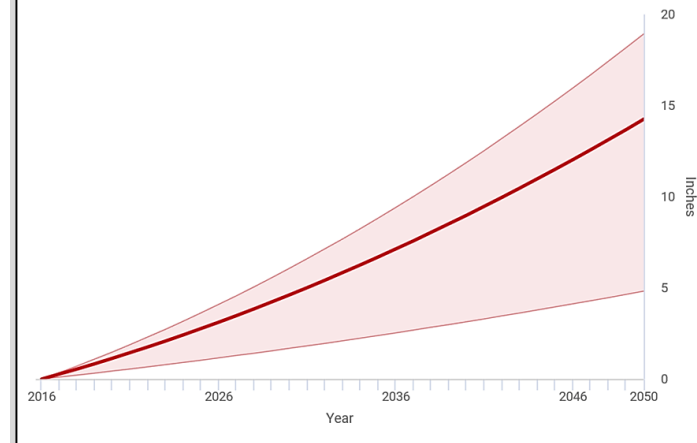
## Storm Surge

# Sea Level Rise Highlight

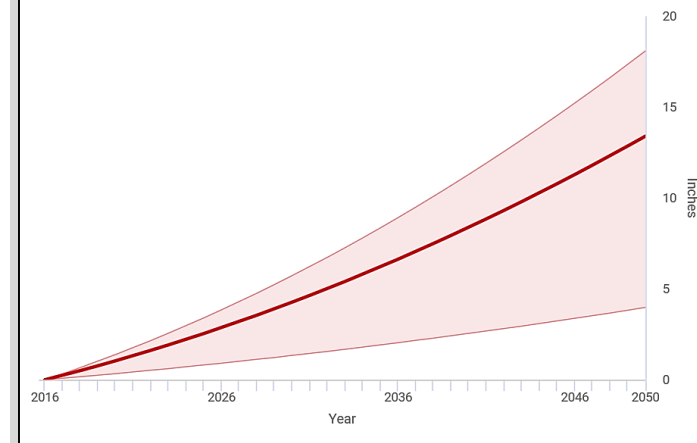
Two potential SLR scenarios selected for this Plan:

- The projected rise of 1-2 feet by 2050
  - A less optimistic projection of 3-5 feet of rise by 2050
- The two canals within the City will feel the effects of SLR as if it were actually on the coast.

Apalachicola Sea Level Rise Forecasts



Panama City Sea Level Rise Forecasts





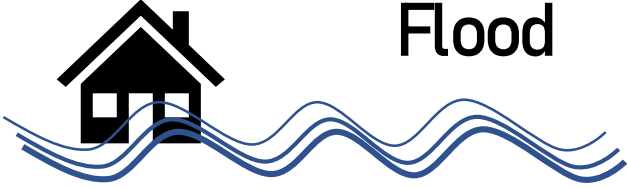



# Priority Risk Index

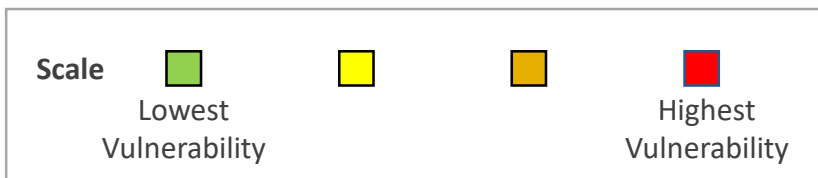
The prioritization and categorization of the flood, high winds, storm surge and sea level rise for Mexico Beach is based principally on the Priority Risk Index (PRI), a tool used to measure the degree of risk for identified hazards in a particular planning area.

The PRI is not scientifically based but is rather meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks in the City based on standardized criteria.

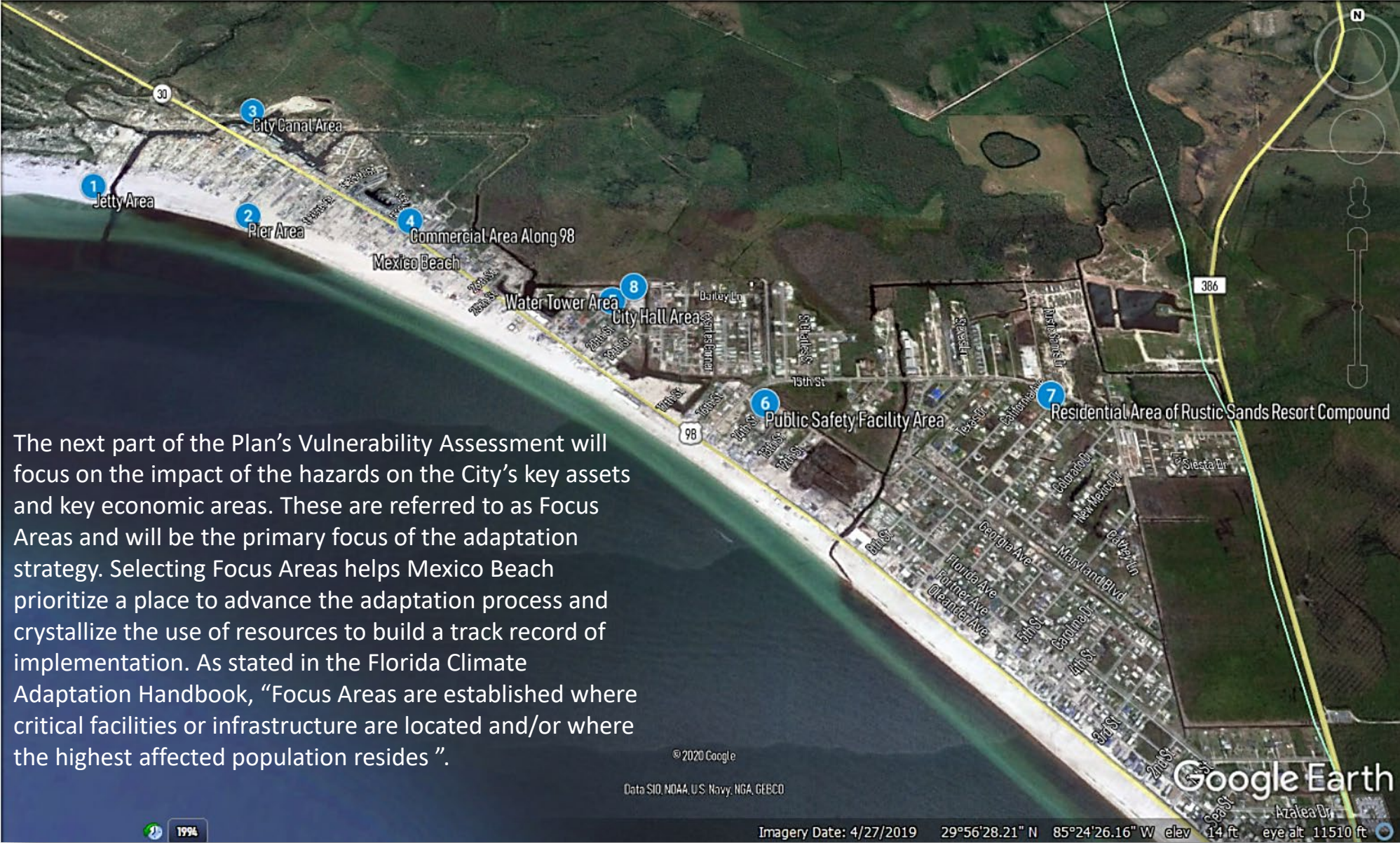
PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

# Priority Risk Index Results

	<i>Factor Weight</i>	<i>30%</i>	<i>30%</i>	<i>20%</i>	<i>10%</i>	<i>10%</i>	
		Probability	Impact	Spatial Extent	Warning Time	Duration	
 <b>Flood</b>		Highly Likely	Critical	Moderate	12-24 Hours	More Than a Week	3.3
 <b>Storm Surge</b>		Likely	Catastrophic	Moderate	More Than 24 Hours	6 – 12 Hours	3.1
 <b>High Wind</b>		Highly Likely	Critical	Moderate	More Than 24 Hours	Less Than 6 Hours	2.9
 <b>Sea Level Rise</b>		Highly Likely	Minor	Small	More Than 24 Hours	More Than a Week	2.4



# Focus Areas (Geographically Specific or Sector Specific)



- 1) Jetty/Canal Opening Area
- 2) Pier Area
- 3) City Canal Area
- 4) Commercial Area Along U.S. 98
- 5) City Hall Area
- 6) Area for Police/Fire/Community Facility
- 7) Water Tower Area
- 8) Water/Wastewater Infrastructure System

The next part of the Plan’s Vulnerability Assessment will focus on the impact of the hazards on the City’s key assets and key economic areas. These are referred to as Focus Areas and will be the primary focus of the adaptation strategy. Selecting Focus Areas helps Mexico Beach prioritize a place to advance the adaptation process and crystallize the use of resources to build a track record of implementation. As stated in the Florida Climate Adaptation Handbook, “Focus Areas are established where critical facilities or infrastructure are located and/or where the highest affected population resides”.

# Focus Area 1

## Jetty/Canal Opening Area

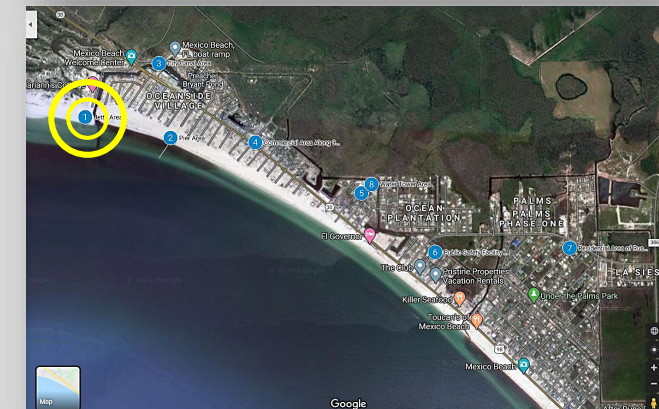
### Sensitivity Analysis

Asset Components	Sensitivity to Wind	Sensitivity to Flood	Sensitivity to Surge	Sensitivity to Sea Level Rise
1) Ingress/Egress Channel	Potential blockage of vessel passage	Potential blockage of vessel passage	Potential blockage of vessel passage	Limited
2) Riprap Structures	Potential destruction	Potential destruction	Potential destruction	Loss of functionality

### Adaptive Capacity

Asset Components	Wind Protection Needs	Flood Protection Needs	Surge Protection Needs	Sea Level Rise Protection Needs
1) Ingress/Egress Channel	Deeper dredging	Deeper dredging	Deeper dredging	Deeper dredging
2) Riprap Structures	Reinforcement with strong materials	Reinforcement with strong materials	Reinforcement with strong materials	5-year analysis for reinforcement

On the west side of the canal opening, the majority of the riprap running along the edge was pulled away and moved into the center of the canal opening becoming a blockage. The east side of the canal's riprap was pulled from the side and was completely lost or buried within the sand in the canal. A lot of sand that was deposited in the opening made an actual bridge across the canal and ultimately will require dredging.



# Focus Area 3

## City Canal

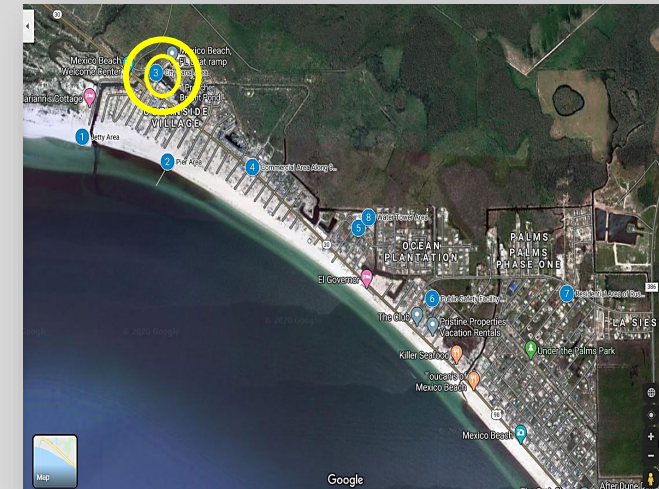
### Sensitivity Analysis

Asset Components	Sensitivity to Wind	Sensitivity to Flood	Sensitivity to Surge	Sensitivity to Sea Level Rise
1) Channel Armoring	Severe damage may occur	Overtopping will occur	Overtopping will occur	Overtopping may eventually occur

### Adaptive Capacity

Asset Components	Sensitivity to Wind	Sensitivity to Flood	Sensitivity to Surge	Sensitivity to Sea Level Rise
1) Channel Armoring	Stronger materials or reinforcement	Extend the height of it	Stronger materials or reinforcement	Extend the height of it

The City canal is on the back side of Highway 98 along a residential area. During Hurricane Michael, water topped the canal and flowed over the Highway 98 bridge. Part of the pier traveled from the coast and landed on a private dock in this area. The canal was inundated with a vast amount of debris to include pieces of boats and homes. To make the canal operational, it had to be completely cleaned out and dredged.




# Comprehensive Plan Coastal Management Element

- *First comprehensive plan developed in 1991*
- *Peril of Flood Statute mandated in 2015*
- *Mexico Beach received technical assistance grant from DEO for coastal management element development*
- *Conducted vulnerability assessment for data and policy support in 2017*
- *2018 Coastal Management Element reviewed and approved by DEO*
- *2018 Updated Comprehensive Plan adopted*
- *2019 Comprehensive Plan updated following Hurricane Michael*

## Peril of Flood Requirements

1. Include development and redevelopment principles, strategies, and engineering solutions that reduce the flood risk in coastal areas which results from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise.
2. Encourage the use of best practices development and redevelopment principles, strategies, and engineering solutions that will result in the removal of coastal real property from flood zone designations established by the Federal Emergency Management Agency.
3. Identify site development techniques and best practices that may reduce losses due to flooding and claims made under flood insurance policies issued in this state.
4. Be consistent with, or more stringent than, the flood-resistant construction requirements in the Florida Building Code and applicable flood plain management regulations set forth in 44 C.F.R. part 60.
5. Require that any construction activities seaward of the coastal construction control lines established pursuant to s. 161.053 be consistent with chapter 161.
6. Encourage local governments to participate in the National Flood Insurance Program Community Rating System administered by the Federal Emergency Management Agency to achieve flood insurance premium discounts for their residents.



**Vulnerability  
Assessment**



**Resilience  
Planning**

# Resilience Themes/Priorities

- Rebuild Safer and Stronger
- Maintain the Community's Unique Character
- Protect Critical Infrastructure
- Enhance Community Appeal
- Provide a Long-Term Vision While Being Opportunistic for Shorter-Term Projects and Policies





## Potential Projects



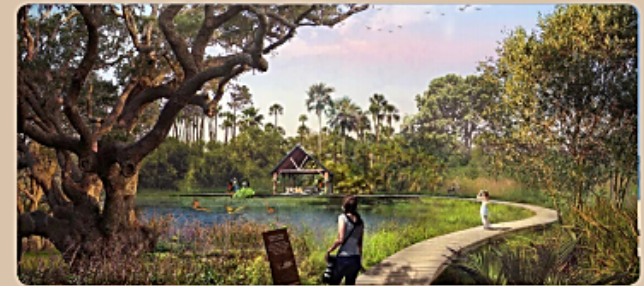
### Structure Elevation

- Physically raising an existing structure to base flood elevation or higher.
- Elevation on an open foundation such as piles, piers, posts, or columns.
- In coastal flood zones, elevated foundation needs cross-bracing.
- Protects structure from most flood events but not designed for habitation during event.



### Mitigation Reconstruction

- Construction of an improved, code-compliant elevated building on the same site where an existing building and/or foundation has been partially or completely demolished or destroyed.
- Only permitted for structures outside of the regulatory floodway or coastal high hazard area (Zone V) as identified by available flood hazard data.
- New structure must be within 10 percent of the square footage of existing one.



### Stormwater Infrastructure Improvement

- Retrofits to collect, filter, infiltrate and convey stormwater runoff.
- Captures excess stormwater runoff and safely contains it.
- Usually also provides water quality benefits and reduces runoff of contaminants into water bodies.
- Low-impact designs to streetscapes.
- Green infrastructure.



### Community Infrastructure and Lifelines

- Structural measures to protect systems like first responders network and power, that allow critical government and essential business operations to continue.
- Lifelines include police and fire departments, hospitals, power plants, arterial roads, grocery stores, and the cellular towers that connect everything.



### Road Elevation / Protection

- Building up or elevating the height of a roadway or corridor to prevent flooding.
- Provide accessibility for emergency and response services.
- Reduces exposure of road bed to destructive flooding.
- Other protection options include flood barrier and armoring to protect from flood source. (e.g., articulated block as part of the barrier)



### Utility Mitigation/Wastewater System Protection (Pumps)

- Providing protection to critical utilities such as elevation of electrical panels at lift stations or pumps.
- Could also include bypass pumps to keep the system operational after a major flood event.
- Options also include generators to provide backup power.

## Potential Projects (2)



### Dune Restoration

- Restoring dunes by planting sand trapping vegetation.
- Planting native plants.
- Dunes serve as a natural storm surge barrier absorbing the ocean's energy to protect structures and infrastructure behind it.



### Surge Gate

- Installing a preventative barrier or structure to eliminate or lessen flooding and storm surge in a protected area.
- May be part of a larger system and may work in conjunction with natural features.
- Different options available to impede storm surge from entering canals and back bay areas.
- Gates can be designed to allow passage of boats and only activated when surge is forecast.



### Jetty Improvement

- Installing structures or perimeter barriers to prevent deterioration of the land along a body of water.
- Coastal structures also block or impede storm surge from entering back bays or canals.
- Could also help provide beneficial sand accretion to build up beach areas.



### Wind Retrofit-Property Protection

- Enhancement made to strengthen roofs, walls, doors, and windows.
- Minimizes damage from wind, wind-driven missiles, and wind-driven rain caused by hurricanes and other high-wind events.
- In coastal areas, often combined with flood mitigation like elevation.



### Power System Support

- Purchase or rent a backup permanently installed power generator.
- Maintain fuel on-site or fuel access.
- Need for generator hook-up to power supply.
- Protect generators against wind and water impacts.
- Allows for continuity of operations and reduces secondary impacts post-disaster if operating properly.



### Planning/Regulations

- Develop specific regulations on development to help avoid impacts from natural hazards.
- Develop specific hazard plans
- Create new regulations to manage land use to avoid incompatible development in high hazard areas.



# Community Engagement

Non-traditional location for gathering public feedback on proposed plan and projects to fund



9:45

5G

 **City of Mexico Beach Government**  
Thursday at 12:34 PM · 

**MEXICO BEACH RESILIENCE PLAN**

Please look for our tent at the 21st Annual Gumbo Cook-off.  
Saturday, February 22, 2020 at 12:00 pm

Public Engagement Opportunity - Please let us know what types of projects you want to see in Mexico Beach to make it more resilient.



## Mexico Beach Resilience Plan Public Engagement Opportunity



After the devastating effects of Hurricane Michael, Mexico Beach is rebuilding in a resilient fashion to avoid damage and disruption from future storms, and we need YOU! Please come and provide your feedback and input on the current stage of your community's NEW resilience plan at the 21st Annual Gumbo Cook-off. We will be located at the Boat Ramp Park located just off Highway 98, starting at 12:00 pm. Please look for our tent we will have interesting information for review and fun items for participation.



Saturday, February 22, 2020  
12:00pm

We want to know what types of projects you want to see in Mexico Beach to make it more resilient. Come to get engaged in this planning process and discover how your community is building back better and stronger.



Write a comment...  

# Community Engagement (2)

Each participant was provided with 3 stickers/dots and allowed to place them on any of the 12 options



## The Information Used to Prepare the Plan

- Flood and Wind Risk**
- Best available FEMA flood data
  - Storm surge information
  - NOAA sea level rise projections
  - Local damage assessments post-Michael
  - Wind data

## What to Review in this Session

- Learn about resilience project types
  - Part of recovery process
  - Mitigation Grants
- Choose projects that you think would work best in Mexico Beach. These projects will fall into two general categories:
  - Property Protection - Residential Structures and City Facilities
  - City Infrastructure and Lifelines Protection

Both types of projects will be pursued.

## Comment on the Final Plan!

We will post a draft Final Resilience Plan on the City of Mexico Beach's official website at <http://mexicobeachgov.com/>. The draft should be posted around mid-April. Watch the website for more details.

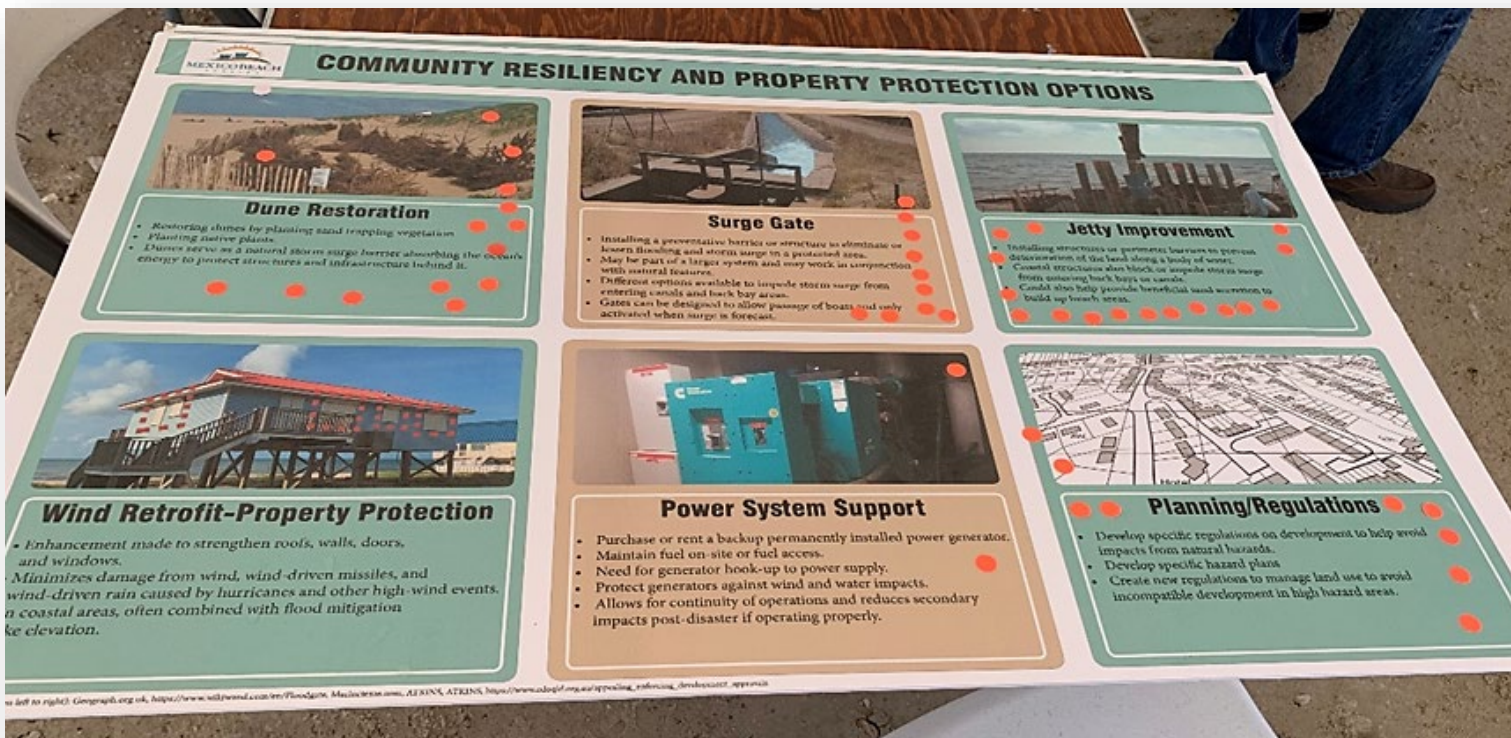


## Representative Resilience Actions Undertaken by the City

- Updated Comprehensive Plan
- Higher floodplain standards - adopted the draft updated FEMA Flood Insurance Rate Map as best available data and extended the Special Flood Hazard Area requirements to the Shaded X zone
- Modifications to the Stormwater Management Ordinance
- Dune replanting

## What Other Florida Cities Are Doing

- Navarre used FEMA grants to expand the outflow pipes in a detention pond to move stormwater more rapidly into nearby wetlands
- Cedar Key Living Shoreline
- Hallandale Beach is using a NOAA Decision Support Tool to assess to pinpoint the timing and location of stormwater system failures to prioritize resources
- St. Augustine home elevation and roof protection completed before Hurricane Irma and home survived
- Clearwater completed an adaptation plan



## Results (Sorted by Most Votes)

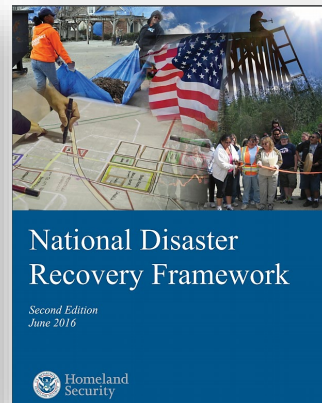
Results (Sorted by Most Votes)	Count
Community Infrastructure and Lifelines	16
Jetty Improvement	16
Stormwater Infrastructure Improvement	15
Dune Restoration	14
Surge Gate	10
Utility Mitigation/Wastewater System Protection (Pumps)	9
Planning/Regulations	9
Road Elevation/Protection	5
Power System Support	2
Mitigation Reconstruction	1

Property protection measures of structural elevation and wind retrofit were options, but received 0 votes

# Opportunities, Strategies, & Funding

The planning process utilizes the Recovery Core Capabilities as identified within the National Disaster Recovery Framework as guidance.

Visioning process will consider opportunities to enhance these elements of the community.



A broad array of publications was reviewed to capture lessons learned and opportunities to develop a more resilient Mexico Beach

Reviewed Plan/Study	Date of Publication
FEMA Hurricane Michael in Florida Mitigation Assessment Team Report	Feb-20
State of Florida Action Plan for Disaster Recovery	Feb-20
Recovery and Resilient Partnership (RRP) Mexico Beach	Dec-19
Mexico Beach Post-Michael Substantial Damage Estimate Report	Nov-19
City of Mexico Beach Land Development Code	Aug-19
Post-Michael Sewer Lift Station Site Inspection Report	Feb-19
City of Mexico Beach Land Development Regulations	Feb-19
2019 Mexico Beach Comprehensive Plan	Jan-19
Mexico Beach Vulnerability Assessment of Coastal Areas	Dec-17
Bay County 2015 Local Mitigation Strategy	Sep-15
City of Mexico Beach Stormwater Master Plan	May-15

# Policy Changes Following Hurricane Michael

- The City of Mexico Beach has adopted Ordinance 720 to **address stormwater treatment and attenuation** associated with new development.
- Newly adopted Ordinance 719 **minimizes the placement of fill within the floodplain** and requires **elevating new construction or substantially improved structures 18 inches above the 500-year flood elevation.**
- City adopted the draft FEMA Flood Insurance Rate Map in development as best available data and **extended the Special Flood Hazard Area Requirements to the entire Shaded X zone.** This meets one of the major FEMA MAT report recommendations (p. vi):
  - **FL-9.** Communities should consider more stringent building requirements for development or reconstruction in the unshaded Zone X (area of minimal flood hazard) and shaded Zone X (area of moderate flood hazard).
- Updated Comprehensive Plan that have **addresses ordinance updates since Hurricane Michael.**
- Intent to **participate in the NFIP Community Rating System** program as a recommendation following on the Stormwater Master Plan
- City adopted a revised building code with higher wind protection

CITY OF MEXICO BEACH  
Land Development Code  
As Amended through August 2019



MEXICO BEACH COMPREHENSIVE PLAN

# Grant Funding Has Been Applied for Regarding the Following Projects

## Regional Stormwater Detention

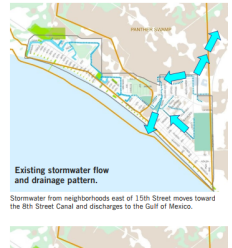
This project includes construction of a regional stormwater facility that will discharge to a restored wetland area for additional treatment. The purpose of the detention pond is to attenuate stormwater floods up to the 100-year flood event and to provide water treatment for the City's stormwater runoff.

### 1 | Regional Stormwater Detention

Proposed Design: New Drainage Pattern

- The city has identified three vacant wetland properties located along the stormwater network where excess stormwater can be diverted and detained. The city prioritized two of the wetlands to consider in the near term for stormwater detention.
- Ponds in the wetland areas can store stormwater and attenuate stormwater flow for flood control during rain events.
- Enhanced wetlands may provide wetland mitigation credits<sup>1</sup> for future development.
- The existing stormwater box culvert can serve as a stormwater vault during rain events and hydrologically connect the proposed wetland ponds.

<sup>1</sup> Wetland mitigation banking is the restoration, creation or enhancement of wetlands for the purpose of compensating impacts to wetlands at another location. Purchasers can buy credits from wetland mitigation banks to compensate for the impact of lost wetlands.



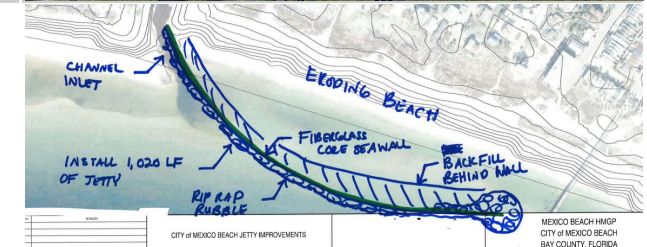
## Wastewater Bypass Pumps

This project involves the purchase and installation of three permanent mount bypass pumps with 6-inch suction/discharge. These pumps will provide back-up pumping capacity and electrical service if the City system is down. The permanent-mount bypass pumps will be elevated above the 500-year flood event.



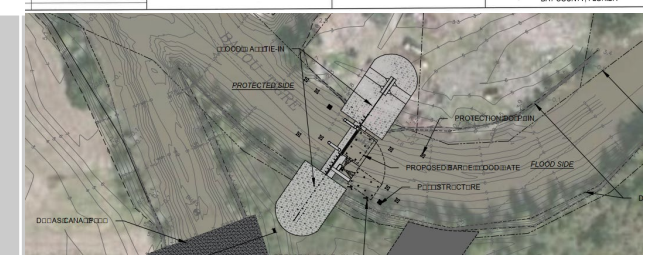
## Jetty Improvements

This project includes the extension of the eastern jetty. The jetty improvements would include installation of a fiberglass core seawall and placement of rip rap rubble to create breakwaters and armoring. The project will protect the critically eroded shoreline on the western portion of Mexico Beach, the canal itself, and approximately 442 structures to the 100-year flood level.



## Flood Control Project (Surge Gates)

The project would incorporate armoring embankments to prevent erosion and installation of a flood control gate that could close the existing channel during a storm surge or high tide event to prevent storm surge and tidal waters from moving inland. The project provides flood protection to approximately 132 homes in the back-canal area against the 100-year flood as well as the marina, the welcome center, and a lift station.



## Hardened Fire and Police Center with Emergency Shelter (Supplemental to Another Project)

The project would also include the hardening (code plus) higher wind speed rating, (at least 160 MPH) and elevation (3 ft about 500yr - per Prelim DFIRMS and in compliance with City Floodplain Ordinance Requirements) of consolidated and relocated public safety structures (separate project) to protect from future wind and flood damage.



# For More Information



## Mexico Beach



## FDEP



Lawrence Frank [lawrence.frank@atkinglobal.com](mailto:lawrence.frank@atkinglobal.com)

Margaret Walton [margaret.walton@atkinglobal.com](mailto:margaret.walton@atkinglobal.com)

## Atkins POC

The Florida Department of Environmental Protection (DEP), through the Florida Resilient Coastlines Program (FRCP) provided financial assistance aimed at preparing coastal Florida communities for current and future effects of rising sea levels, including coastal flooding, erosion, and ecosystem changes. The purpose of the FRCP Resilience Planning Grants (RPG) is to promote community resilience planning, vulnerability assessments, address adaptation plans, and comprehensive plan goals, objectives, policies, regional coordination, along with environmental justice.





# SOUTH ATLANTIC COASTAL STUDY (SACS) APPLYING SACS PRODUCTS

Ashleigh H. Fountain Project Manager  
U.S. Army Corps of Engineers  
Jacksonville District

May 13th, 2020

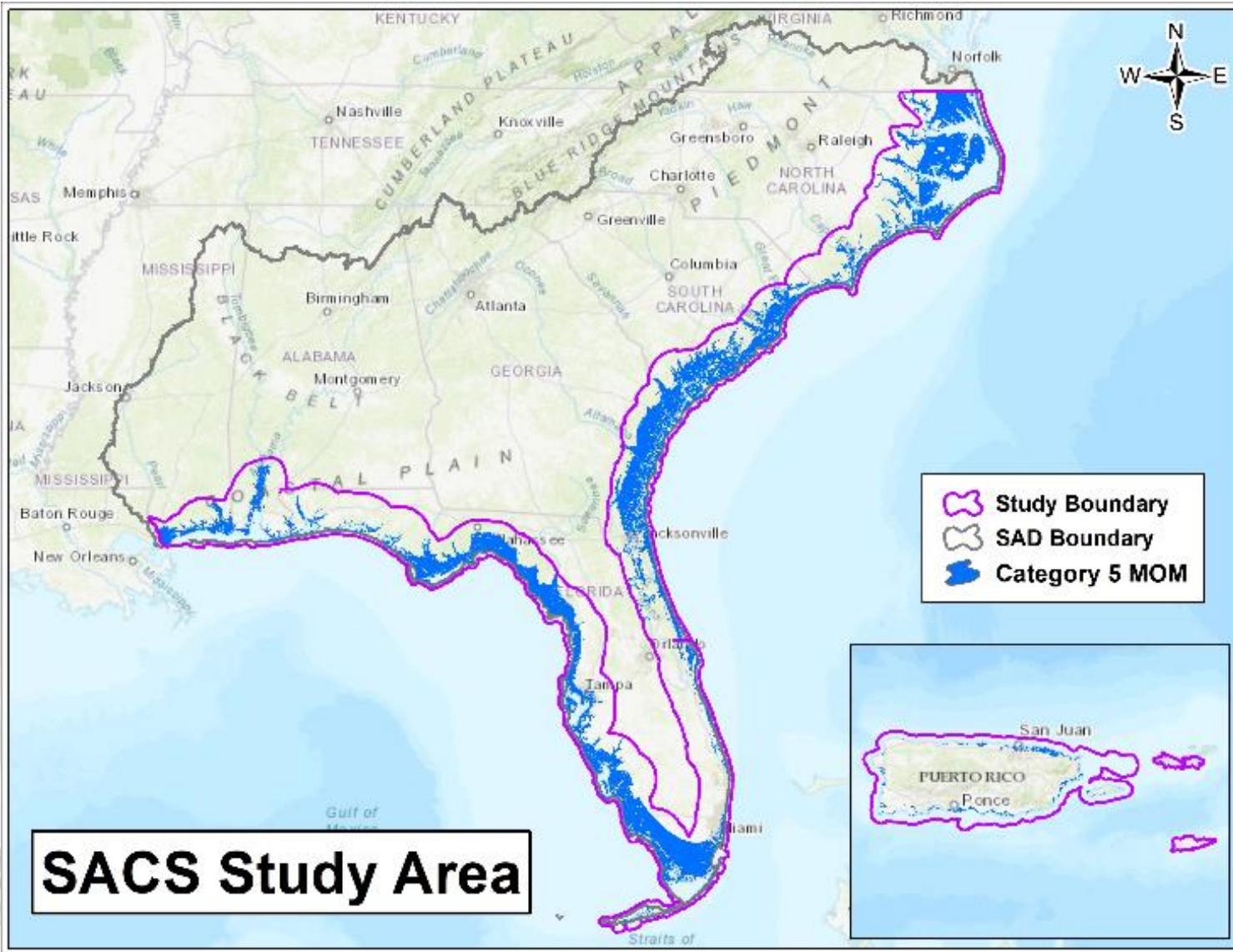


US Army Corps  
of Engineers®



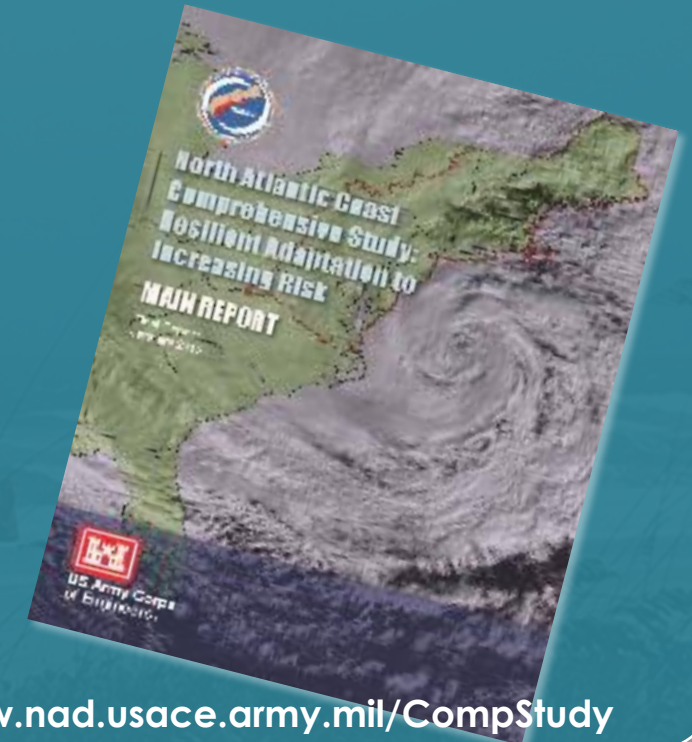


# SACS STUDY AREA



“Joint planning with stakeholders across sectors, regions, and jurisdictions can help identify critical risks arising from interaction among systems ahead of time.”

– National Climate Assessment, 2018



[www.nad.usace.army.mil/CompStudy](http://www.nad.usace.army.mil/CompStudy)



# INSTITUTIONAL & OTHER BARRIERS REPORT



- Identifies institutional and other barriers to providing comprehensive protection for affected coastal areas.

Jacksonville Beach, Florida after 1962 nor'easter - without federal CSRM project



Jacksonville Beach, Florida after Tropical Storm Fay (2008) with federal CSRM project in place

**SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS**

<b>RISK ASSESSMENT</b> Assessment based on exposure of population and infrastructure and social vulnerability to inundation hazards.	<b>REGIONAL SEDIMENT MANAGEMENT (RSM) OPTIMIZATION (SAND)</b> Identifies and quantifies local contribution of RSM projects to projects in the SACS study area that support long-term coastal resiliency.	<b>SAND AVAILABILITY &amp; NEEDS DETERMINATION (SAND)</b> Determines the need and availability of sediment to maintain beaches for the next 50 years.	<b>COASTAL HAZARDS SYSTEM (CHS)</b> Provides current and projected water elevation data for the study area.	<b>GEOPORTAL</b> Provides the public access to study datasets, products, and documentation.	<b>MEASURES &amp; COSTS LIBRARY</b> Detailed list of Coastal Storm Risk Management (CSRM) measures and their costs developed to a screening level for CSRM and stakeholder planning.
<b>COASTAL PROGRAM GUIDE</b> Outreach and information package to help communities better manage coastal risks in a state-wide, statewide or community-wide basis.	<b>STATE &amp; TERRITORY APPENDICES</b> Specific information for each state and territory will be provided in stand-alone appendices to the main report.	<b>PRIORITY ENVIRONMENTAL AREA IDENTIFICATION</b> Priority environmental areas will be identified using Tier 1 data, the USFWS' Wetlands and Report and stakeholder input. Resiliency to coastal storms and sea level rise will be evaluated and measures to increase resiliency will be recommended.	<b>PLANNING AID REPORT</b> Report of priority socioeconomic resource habitats in the Southeastern region that are vulnerable to harm from coastal storms at sea level rise with a focus on areas used by mammals (other than seals) for nesting and other national wildlife refuges.	<b>INSTITUTIONAL &amp; OTHER BARRIERS REPORT</b> Document identifies institutional and other barriers to providing comprehensive protection for affected coastal areas. The report will include information on the performance of existing federal CSRM projects and recommendations for improvement.	<b>FOCUS AREA ACTION STRATEGIES</b> Focus area products in coordination with other resources in the CSRM and other risk reduction strategies with stakeholders. FACS will serve as a model for how vulnerabilities in other risk reduction can be improved.

FOR MORE INFORMATION, VISIT THE SACS WEBSITE: <https://www.sand.usace.army.mil/SACS/>

U.S. ARMY CORPS OF ENGINEERS | SOUTH ATLANTIC DIVISION



# SHARED VISION STATEMENT



"The SACS vision is to provide a common understanding of **risks from** coastal storms and sea level rise to support resilient communities and habitats. This collaborative effort will leverage stakeholders' actions to plan and implement cohesive coastal storm risk management strategies along the South Atlantic and Gulf Coast shorelines, including the territories of Puerto Rico and the U.S. Virgin Islands."

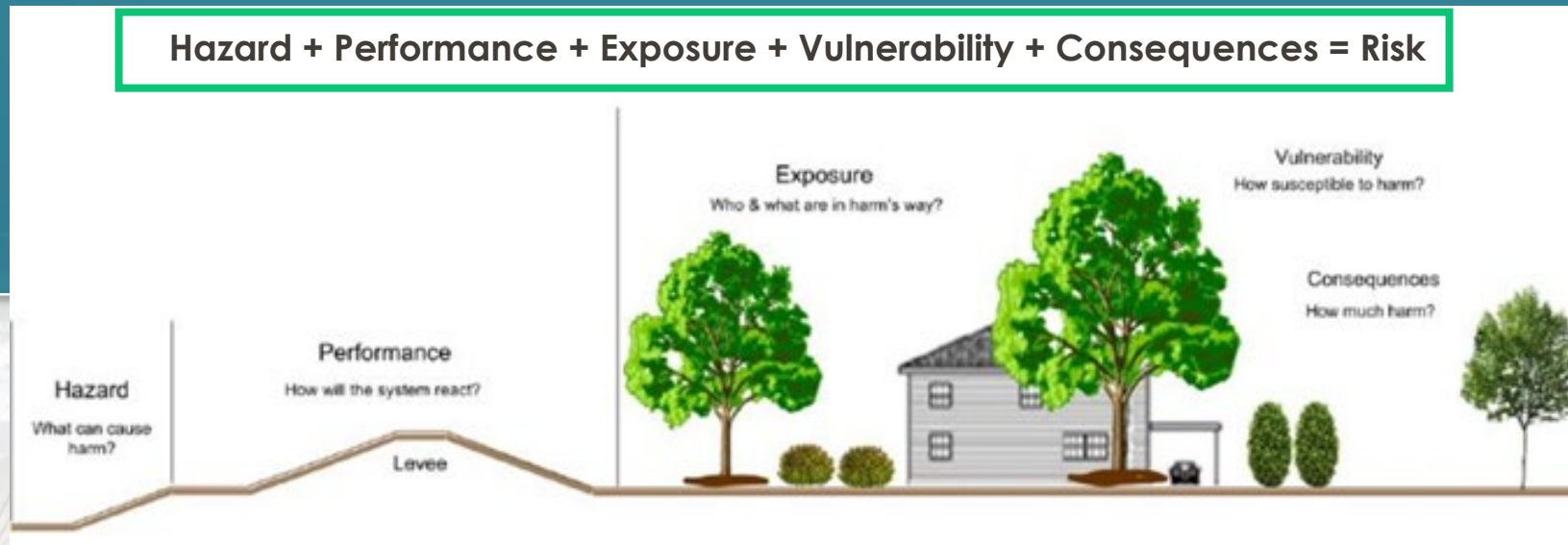


Figure 1: Risk Conceptualized (ER 1105-2-101)



# SACS TIER 1 RISK ASSESSMENT



Composite\_Risk\_Index

Composite Risk Index

- Potential Low Risk
- Potential Medium Risk
- Potential Medium/High Risk
- Potential High Risk

<https://sacs.maps.arcgis.com/apps/MapSeries/index.html?appid=c54beb5072a04632958f2373eb1151cf>

**SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS**

<p><b>RISK ASSESSMENT</b></p> <p>Assessment based on exposure of population and infrastructure and social vulnerability to inundation hazards.</p>	<p><b>REGIONAL SEDIMENT MANAGEMENT (RSM) OPTIMIZATION (SAND)</b></p> <p>Identifies and quantifies local contribution of sediment to projects in the SACS study area that support long-term coastal resiliency.</p>	<p><b>SAND AVAILABILITY &amp; NEEDS DETERMINATION (SAND)</b></p> <p>Determines the need and availability of sediment to maintain beaches for the next 50 years.</p>	<p><b>COASTAL HAZARDS SYSTEM (CHS)</b></p> <p>Provides current and projected water elevation data for the study area.</p>	<p><b>GEOPORTAL</b></p> <p>Provides the public access to study datasets, products, and documentation.</p>	<p><b>MEASURES &amp; COSTS LIBRARY</b></p> <p>Delivered list of Coastal Storm Risk Management (CSR) measures and their costs developed to a screening level for use in RSM and stakeholder planning.</p>
<p><b>COASTAL PROGRAM GUIDE</b></p> <p>Outreach and information package to help communities better manage coastal risk on a statewide, statewide, or communitywide basis.</p>	<p><b>STATE &amp; TERRITORY APPENDICES</b></p> <p>Specific information for each state and territory will be provided in stand-alone appendices to the main report.</p>	<p><b>PRIORITY ENVIRONMENTAL AREA IDENTIFICATION</b></p> <p>Priority environmental areas will be identified using Tier 1 data, the USACE's framework and report and stakeholder input. Resiliency to coastal storms and sea level rise will be evaluated and measures to increase resiliency will be recommended.</p>	<p><b>PLANNING AID REPORT</b></p> <p>Report of priority socioeconomic resource baselines in the South Atlantic region that are vulnerable to harm from coastal storms and sea level rise with a focus on areas used by marshland, water bodies. Report will also include a description of risks to coastal national wildlife refuges.</p>	<p><b>INSTITUTIONAL &amp; OTHER BARRIERS REPORT</b></p> <p>Document identifies institutional and other barriers to providing comprehensive protection for affected coastal areas. The report will include information on the performance of existing coastal CEM projects and recommendations for improvement.</p>	<p><b>FOCUS AREA ACTION STRATEGIES</b></p> <p>Focus area action strategies (FAAS) will use SACS products in combination with other resources to develop actionable risk reduction strategies with stakeholders. FAAS will serve as examples for how vulnerabilities in other high-risk locations can be addressed.</p>

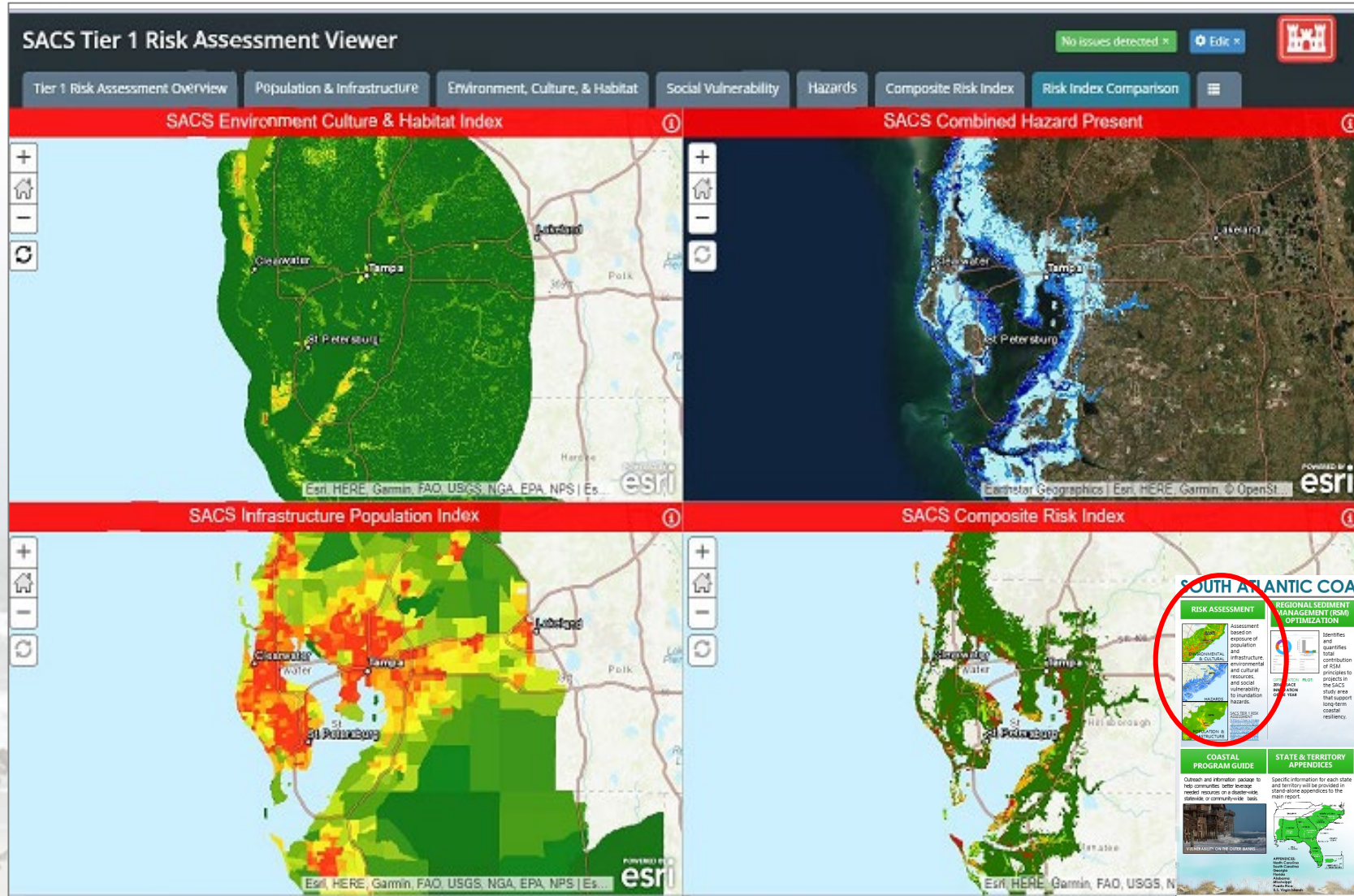
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U.S. ARMY CORPS OF ENGINEERS | SOUTH ATLANTIC DIVISION



# TIER 1 RISK ASSESSMENT:

## Composite Risk Index (CRI) Med High/High by Census Place



### SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS

<b>RISK ASSESSMENT</b> Assessment based on exposure of population and infrastructure, environmental and cultural resources, and social vulnerability to inundation hazards.	<b>REGIONAL SEDIMENT MANAGEMENT (RSM) OPTIMIZATION</b> Identifies and quantifies total contribution of RSM principles to projects in the SACS study area that support long-term coastal resiliency.	<b>SAND AVAILABILITY &amp; NEEDS DETERMINATION (SAND)</b> Determines the need and availability of sediment to maintain beaches for the next 50 years.	<b>COASTAL HAZARDS SYSTEM (CHS)</b> Provides current and projected water elevation data for the study area.	<b>GEOPORTAL</b> Provides the public access to study datasets, products and documentation.	<b>MEASURES &amp; COSTS LIBRARY</b> Detailed list of Coastal Storm Risk Management (CSRM) measures and their costs, developed to a screening level for use in SACS and state/local planning.
<b>COASTAL PROGRAM GUIDE</b> Outreach and information package to help communities better leverage needed resources on a statewide, statewide or community-level basis.	<b>STATE &amp; TERRITORY APPENDICES</b> Specific information for each state and territory will be provided in state/territory appendices to the main report.	<b>PRIORITY ENVIRONMENTAL AREA IDENTIFICATION</b> Priority environmental areas will be identified using Tier 1 data, the Coastal Planning and Report and stakeholder tools. Resiliency to coastal storms and sea level rise will be evaluated and resources to increase resiliency will be recommended.	<b>PLANNING AID REPORT</b> Report of priority biological resource habitats in the South Atlantic region that are vulnerable to harm from coastal storms and sea level rise with a focus on areas used to identify listed species. Report will also include a description of risk to coastal national wildlife refuges.	<b>INSTITUTIONAL &amp; OTHER BARRIERS REPORT</b> Document identifies institutional and other barriers to providing comprehensive protection for affected coastal areas. The report will include information on the performance of existing federal CSRM projects and recommendations for improvement.	<b>FOCUS AREA ACTION STRATEGIES</b> Focus area action strategies (FAAS) will use SACS products in combination with other resources to develop actionable risk reduction strategies with stakeholders. FAAS will serve as examples for how vulnerabilities in other high-risk locations can be addressed.

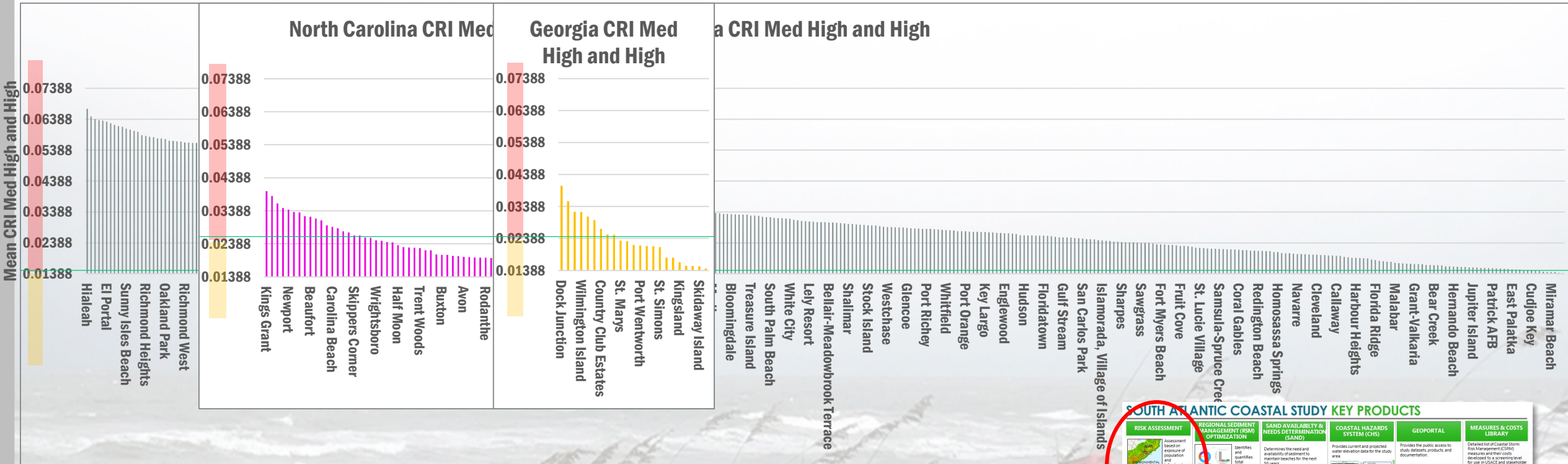
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U.S. ARMY CORPS OF ENGINEERS | SOUTH ATLANTIC DIVISION



# SACS TIER 1 RISK ASSESSMENT:

## Composite Risk Index (CRI) Med High/High by Census Place



**SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS**

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<p><b>COASTAL PROGRAM GUIDE</b></p> <p>Outreach and information package to help communities better manage coastal risks on a state-wide, statewide, or community-level basis.</p>	<p><b>STATE &amp; TERRITORY APPENDICES</b></p> <p>Specific information for each state and territory will be provided in stand-alone appendices to the main report.</p>	<p><b>PRIORITY ENVIRONMENTAL AREA IDENTIFICATION</b></p> <p>Priority environmental areas will be identified using Tier 1 data, the USACE framework and report and stakeholder input. Resiliency to coastal storms and sea level rise will be evaluated and measures to increase resiliency will be recommended.</p>	<p><b>PLANNING AID REPORT</b></p> <p>Report of priority socioeconomic resource habitats in the South Atlantic region that are vulnerable to harm from coastal storms and sea level rise with a focus on areas used by marshland waterfowl. Report will also include a description of how to coordinate national wildlife refuges.</p>	<p><b>INSTITUTIONAL &amp; OTHER BARRIERS REPORT</b></p> <p>Document identifies institutional and other barriers to comprehensive protection of affected coastal areas. The report will include information on the performance of existing federal CERA projects and recommendations for improvement.</p>	<p><b>FOCUS AREA ACTION STRATEGIES</b></p> <p>Focus area action strategies (FAAS) will use SACS products in combination with other resources to develop actionable risk reduction strategies with stakeholders. FAAS will serve as examples for how vulnerabilities in other high risk locations can be addressed.</p>

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# SACS RECOMMENDATIONS



- Recommendations **involving ALL stakeholders** may include:
  - policies (new or revisions to existing)
  - modification of institutional and other barriers to providing comprehensive protection to affected coastal areas
  - programs for local/state agencies and multi-agency partnerships
  - Federal and non-Federal programs or projects
  - activities under FPMS, PAS, CAP, or the Tribal Partnership Program
  - identification of design efforts that might be warranted
  - identification of site-specific feasibility studies where there is potential Federal interest

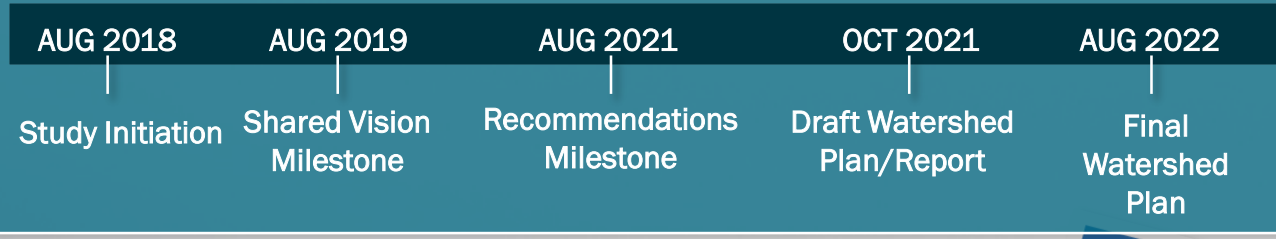




# SACS SCHEDULE

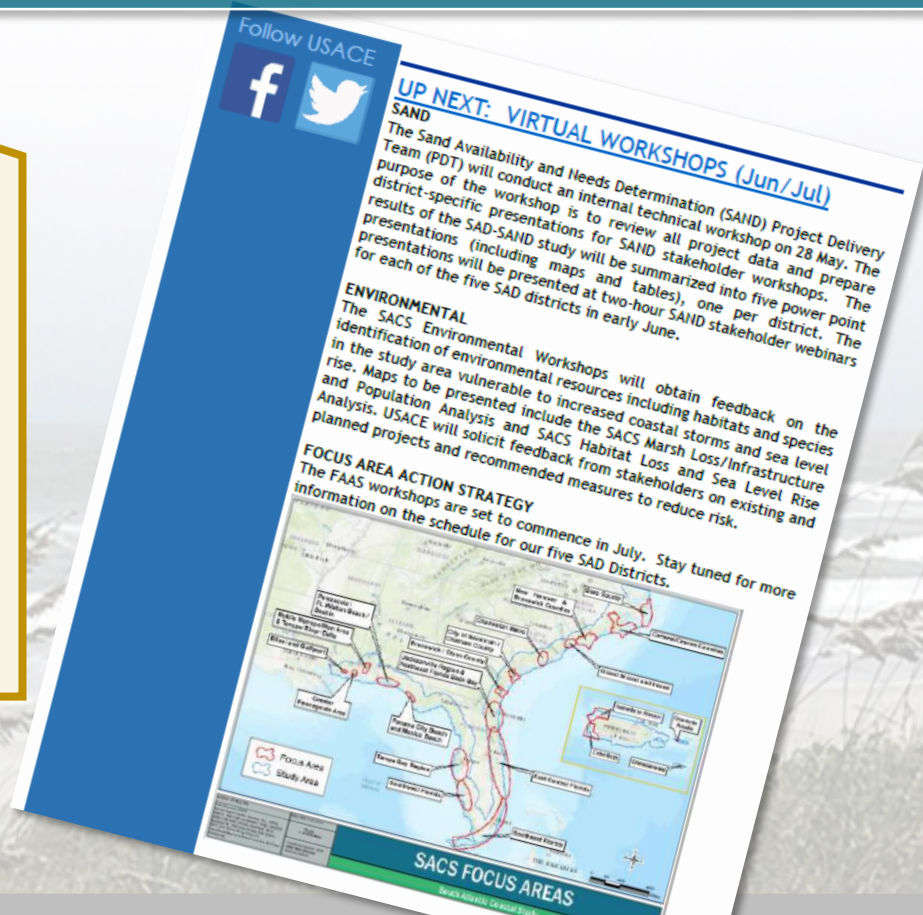


SCHEDULE



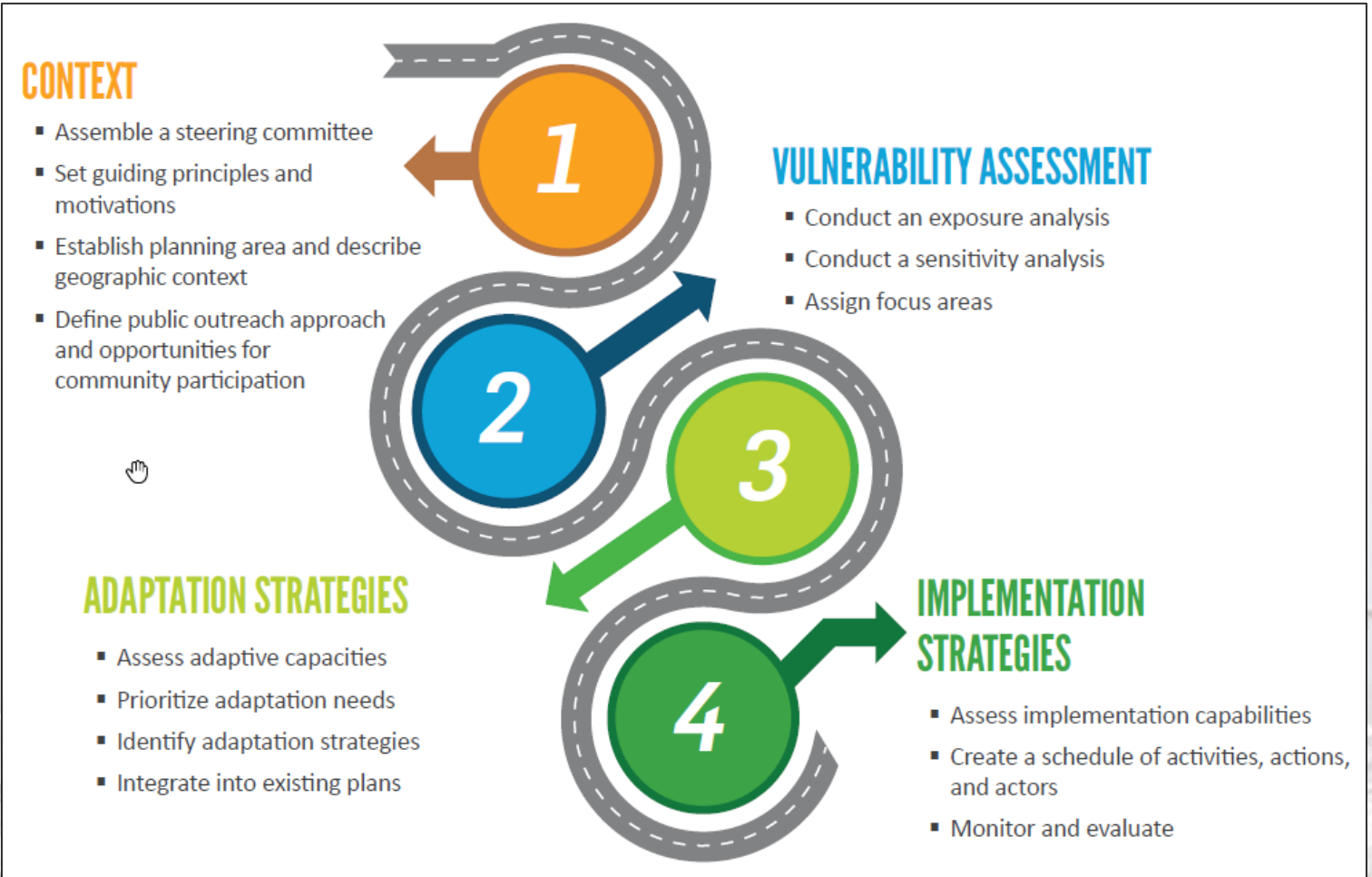
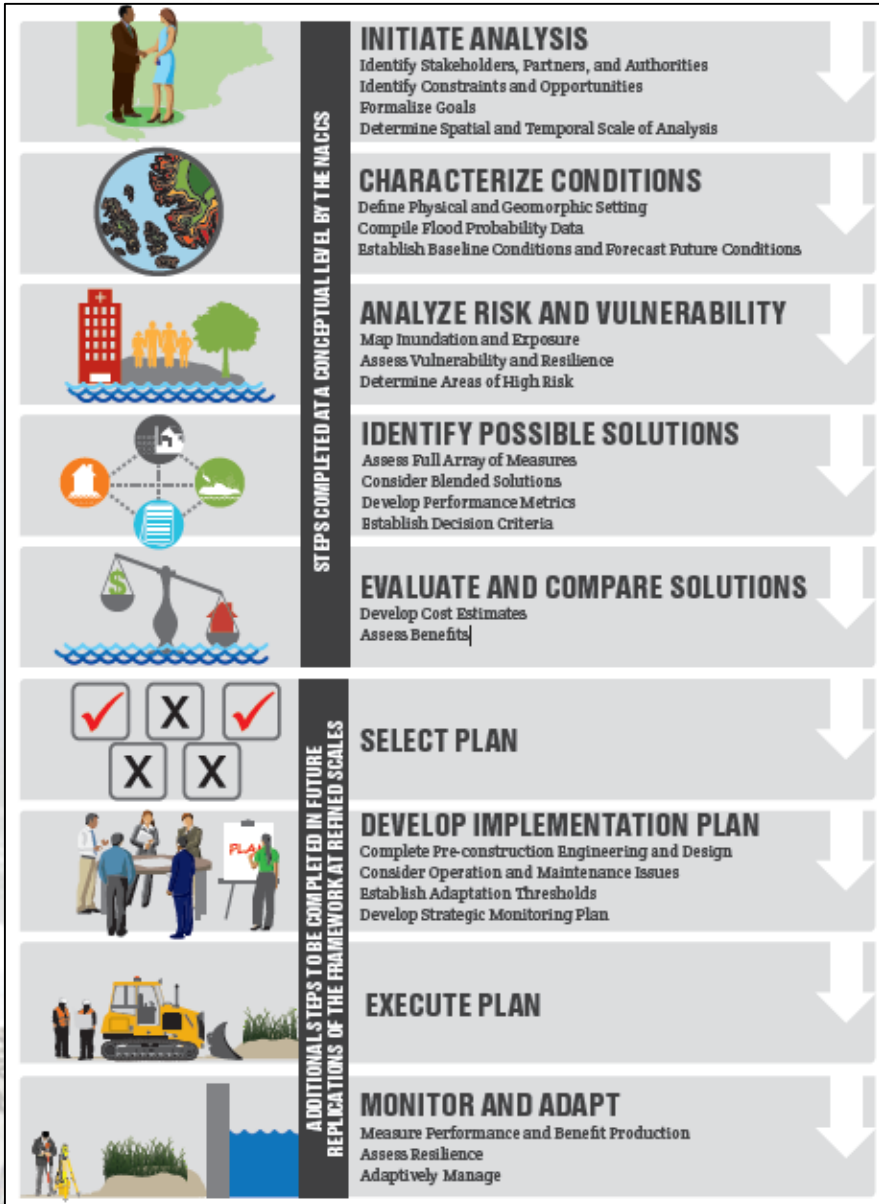
**100% Federal funding - \$16M**

- **Monthly Newsletters**
- **Quarterly Webinars**
- **Environmental Workshops (JUN)**
- **SAND Workshops (by state-JUN)**
- **Focus Area Workshops (JUL/AUG)**





# SACS FRAMEWORK & FLORIDA ADAPTATION PLANNING GUIDEBOOK



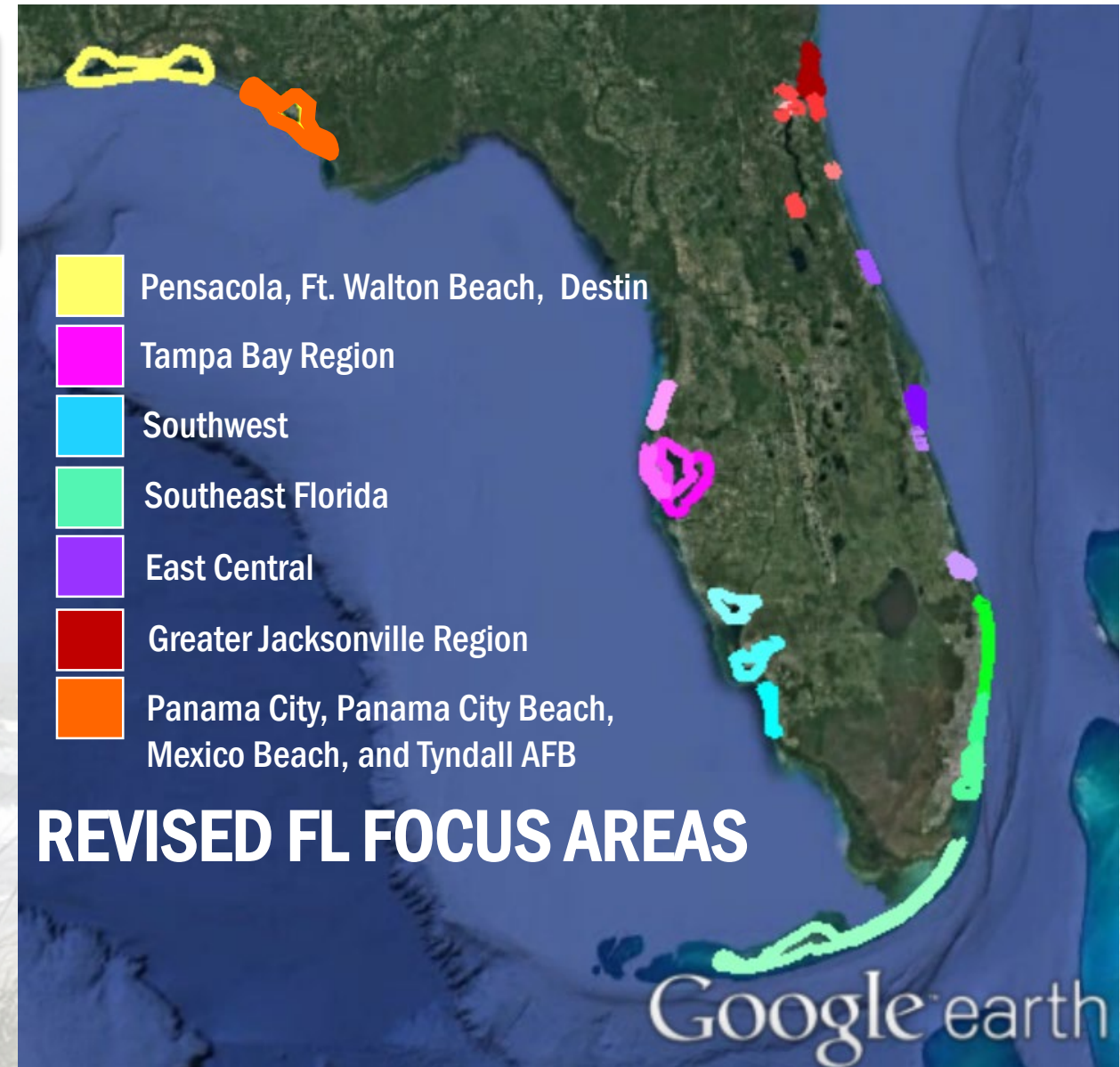


# SACS FLORIDA FOCUS AREAS



**FOCUS AREA:** An area highly vulnerable to storm damages as a result of SLR that warrants additional analysis in the State/Territory Appendix.

- All high risk locations will be referenced in the Florida Appendix, even if not in a Focus Area.
- Study Recommendations can be made for locations within and outside of Focus Areas.
- Various SACS products developed for use across the entire state:
  - Coastal Hazards System
  - Measures & Costs Library





# WALK THRU SACS FRAMEWORK IN FOCUS AREAS



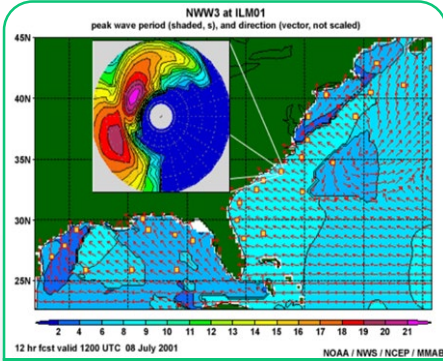
## SACS FRAMEWORK



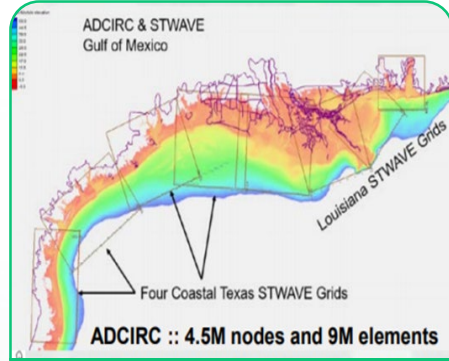
FOCUS AREA A	FOCUS AREA B	FOCUS AREA C
<b>EXISTING DEGREE OF STAKEHOLDER ENGAGEMENT &amp; COLLABORATION</b>		
<b>MORE QUALITATIVE</b>	<b>TIER 1 &amp; TIER 2 DATA</b>	<b>HIGHER RESOLUTION DATA</b>
<b>USACE SLR PROJECTIONS</b>		<b>STAKEHOLDER SLR PROJECTIONS</b>
<b>MEASURES &amp; COST LIBRARY (MCL)</b>		<b>BUILD ON ACTIONS UNDERWAY</b>
<b>LAST STEP IN SACS FRAMEWORK ADDRESSED IN THE FOCUS AREAS</b>		
<b>Document:</b> <ul style="list-style-type: none"> <li>• Actions (steps)</li> <li>• Responsible stakeholders</li> <li>• Sequencing &amp; Priority</li> </ul>	<ul style="list-style-type: none"> <li>• Describe integration into existing plans</li> <li>• General assessment of cost-effectiveness</li> <li>• Responsible stakeholders</li> <li>• Sequencing &amp; Priority</li> </ul>	<ul style="list-style-type: none"> <li>• Tie into existing plans</li> <li>• Advances existing strategies</li> <li>• More quantitative assessment of cost-effectiveness</li> <li>• Responsible stakeholders</li> <li>• Sequencing &amp; Priority</li> </ul>



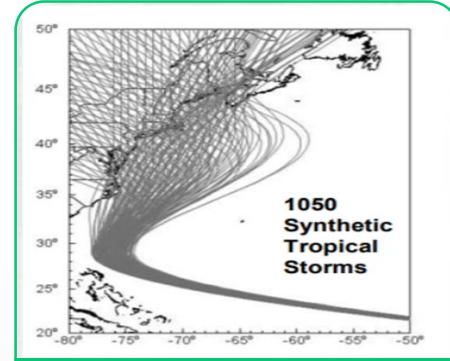
# COASTAL HAZARDS SYSTEM



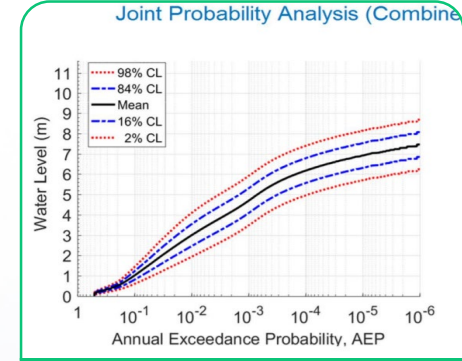
### WaveWatch III



### ADCIRC and STWAVE



### CSTORM Coupler



### Joint Probability

- Deepwater Waves for
  - Atlantic / Caribbean Basin
  - Gulf of Mexico Basin

- Southeast Atlantic Mainland
- Northeast Gulf of Mexico
- Puerto Rico and USVI

- 1000's of storms through each ADCIRC / STWAVE Grid

- Report and archive statistics associated with plausible storms

### SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS

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U.S. ARMY CORPS OF ENGINEERS | SOUTH ATLANTIC DIVISION

POC: Kelly Rankin Legault, PhD, P.E.

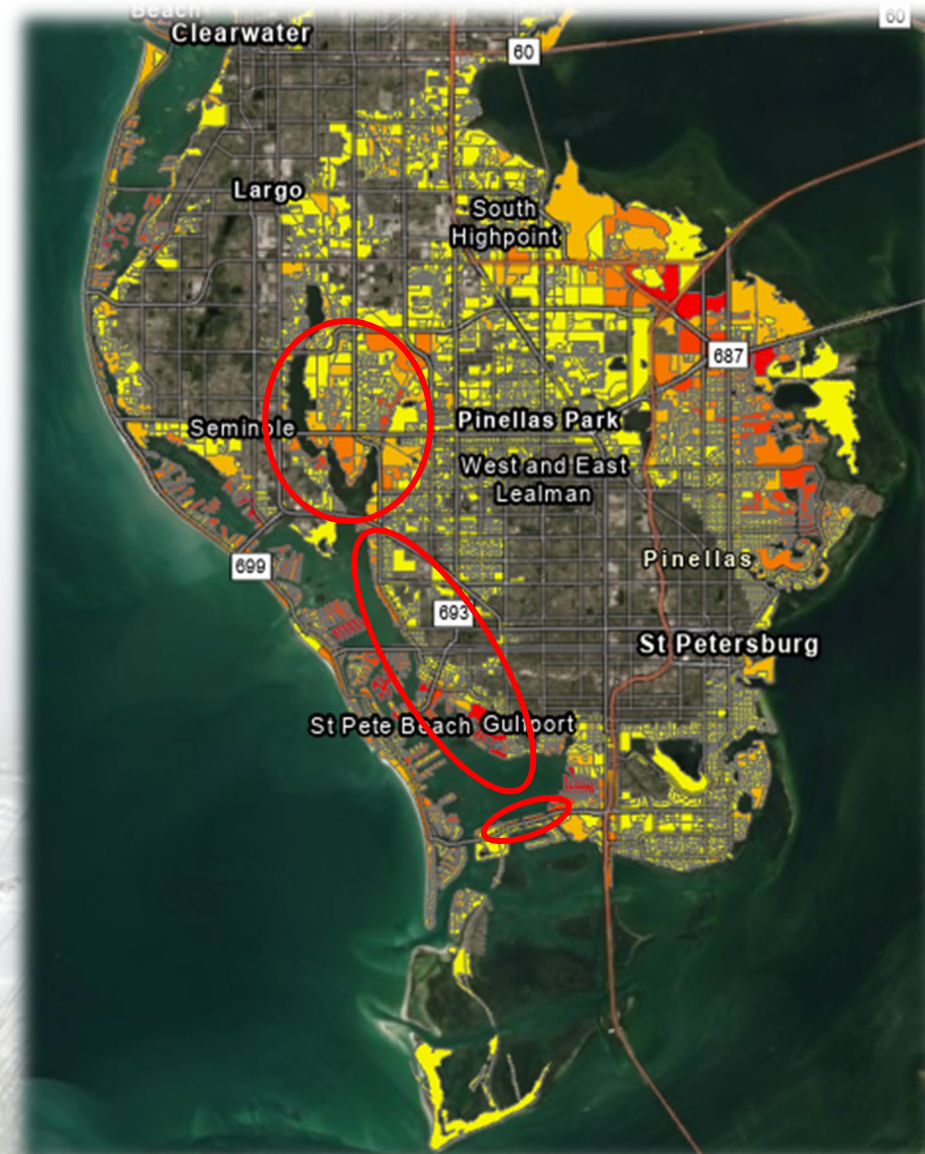


# STEP 3 – ANALYZE RISK & VULNERABILITY



## SACS FRAMEWORK

	LEVEL BY THE MACCS	<b>INITIATE ANALYSIS</b> Identify Stakeholders, Partners, and Authorities Identify Constraints and Opportunities Formalize Goals Determine Spatial and Temporal Scale of Analysis
		<b>CHARACTERIZE CONDITIONS</b> Define Physical and Geomorphic Setting Compile Flood Probability Data Establish Baseline Conditions and Forecast Future Conditions
	A CONCEPTUAL	<b>ANALYZE RISK AND VULNERABILITY</b> Map Inundation and Exposure Assess Vulnerability and Resilience Determine Areas of High Risk
	STEPS COMPLETED	<b>IDENTIFY POSSIBLE SOLUTIONS</b> Assess Full Array of Measures Consider Blended Solutions Develop Performance Metrics Establish Decision Criteria
		<b>EVALUATE AND COMPARE SOLUTIONS</b> Develop Cost Estimates Assess Benefits
	ADDITIONAL STEPS TO BE COMPLETED IN FUTURE REPLICATIONS OF THE FRAMEWORK AT REFINED SCALES	<b>SELECT PLAN</b>
		<b>DEVELOP IMPLEMENTATION PLAN</b> Complete Pre-construction Engineering and Design Consider Operation and Maintenance Issues Establish Adaptation Thresholds Develop Strategic Monitoring Plan
		<b>EXECUTE PLAN</b>
		<b>MONITOR AND ADAPT</b> Measure Performance and Benefit Production Assess Resilience Adaptively Manage

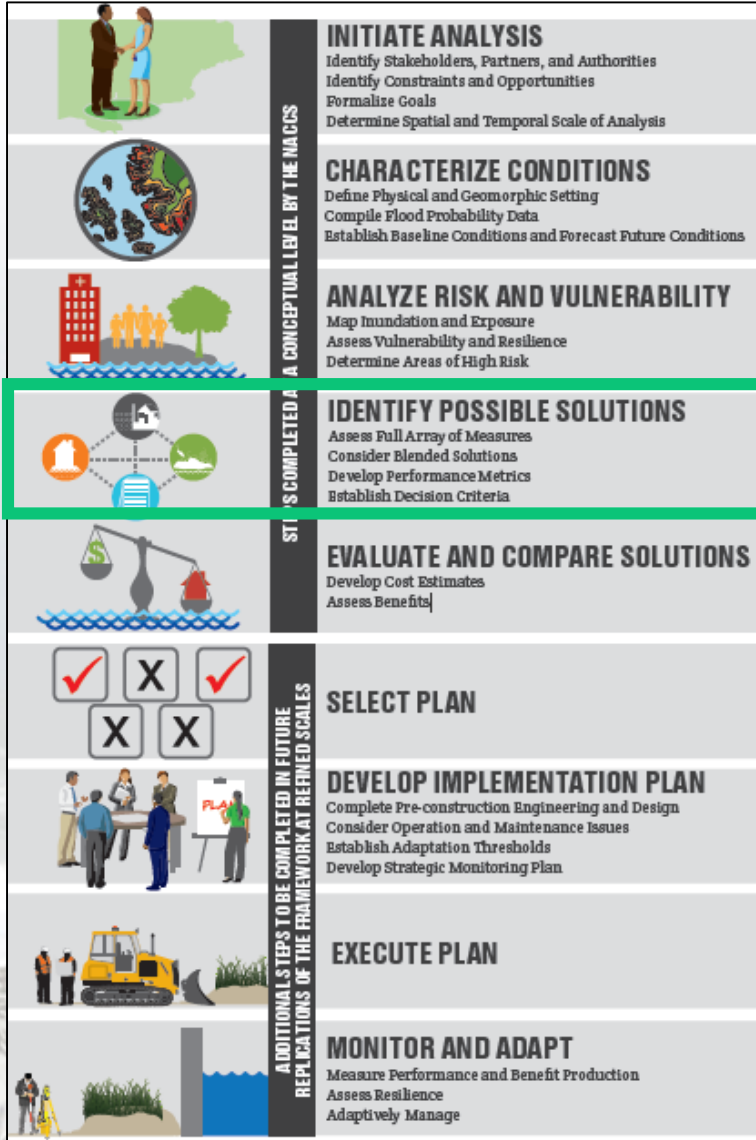




# STEP 4 – IDENTIFY POSSIBLE SOLUTIONS



## SACS FRAMEWORK

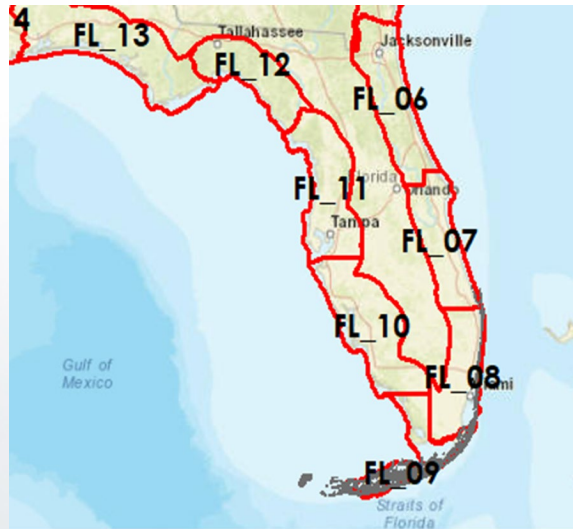


- Identify hazards & shoreline types related to problem
- Compute risk in census blocks
- Compute risk w/SLR in census blocks

Focus Area B					
Reach: FL_06 - Northeast Florida	NS-1	NS-2	NS-3	NS-4	NS-X
Sub-area: back bay	Buyout_Acquisition	Elevation_Bldgs	Dry_Flood_Proofing	Wet_Flood_Proofing	Land Conservation/Preservation
Shoreline Type					
Manmade Structures (Exposed)	X	X	X	X	X
Manmade Structures (Sheltered)	X	X	X	X	X
Rocky Shores (Sheltered)					X
Sandy Beaches (Exposed)	X	X	X	X	X
Scarps and Steep Slopes					X
Wetland/Marshes/Swamps (Exposed)	X	X	X	X	X
Wetlands/Marshes/ Swamps (Sheltered)	X	X	X	X	X
Rocky Shores (Exposed)	X	X	X	X	X
Mangroves					X
Sandy Beaches (Sheltered)	X	X	X	X	X
Bluffs and Steep Slopes	X	X	X	X	X
Coral Reef & Hardbottom	X	X	X	X	X



# MEASURES & COST LIBRARY



- Detailed list of structural, non-structural, and natural and nature-based coastal storm risk management measures per SACS planning reach.
- Cost developed to a screening level for use in stakeholder and USACE planning.

<b>Measure Code</b>	S-4	<b>Description</b>  Bulkheads are vertical shoreline stabilization structures that primarily retain or prevent sliding of the land. A secondary purpose is to protect the upland against erosion due to low- to moderate waves. Types of bulkheads consist primarily of anchored and cantilevered walls commonly built of vinyl, concrete, steel, aluminum or timber.
<b>Measure Name</b>	Bulkhead	
<b>Measure Category</b>	Structural	
<b>Unit</b>	Cost/LF	
<b>Unit Cost Reference Array</b>	S_4	
<b>Technician Accountable</b>		

Compute ROM Cost Ranges for S-4			
S-4: ROM Cost Range Computation: 1) Using the MCL Tool, select the planning reach of interest from the drop down list. 2) Enter the LF of bulkhead. The total cost range provides the estimated cost in constant dollar terms. The annualized cost ranges provide the cost in annualized terms and can be compared to HAZUS-MH dollar damage risk computations.	<b>Select Planning Reach:</b>		FL_06
	<b>Enter the bulkhead length in LF:</b>		100
	<b>Total S-4 Cost</b>	<b>Low</b>	\$1,687,011
	<b>Range</b>	<b>High</b>	\$2,370,632
	<b>Annualized S-4 Cost Range</b>	<b>Low</b>	\$62,488
	<b>High</b>	\$87,810	

**SOUTH ATLANTIC COASTAL STUDY KEY PRODUCTS**

**“Every dollar spent before an event saves four to five dollars in reconstruction costs after.”**  
 – National Research Council, 2014

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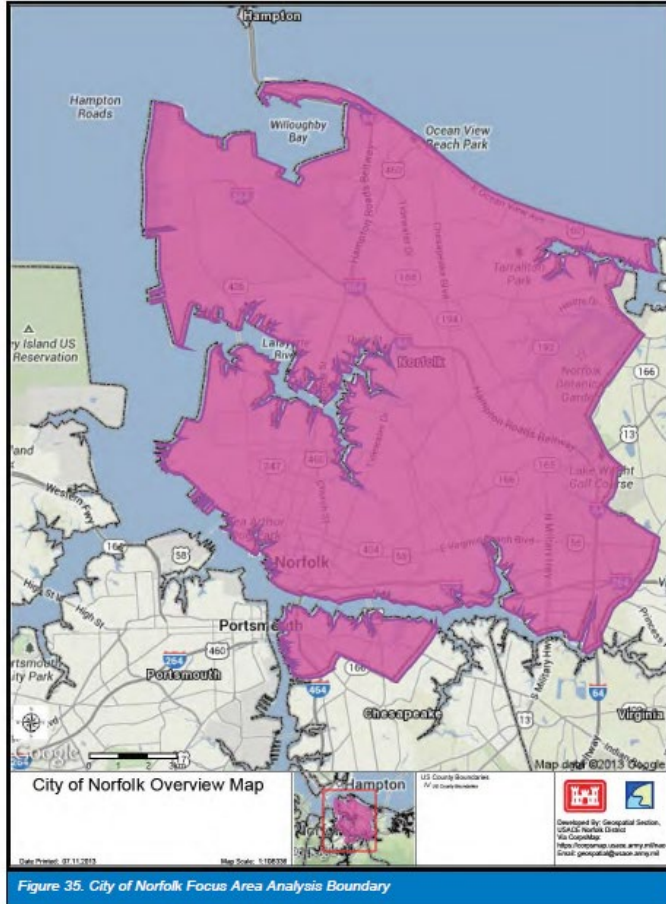




# FOCUS AREA ACTION STRATEGIES EXAMPLE



North Atlantic Coast Comprehensive Study (NACCS)  
United States Army Corps of Engineers



A number of causes contribute to the flooding experienced by the City of Norfolk. The city is surrounded by water on three sides, the Chesapeake Bay to the north, and the Elizabeth River to the West and

92 - D-10: Commonwealth of Virginia

North Atlantic Coast Comprehensive Study (NACCS)  
United States Army Corps of Engineers

Table 14. Measures for Additional Analysis

Area	Structural Measures							Non-Structural Measures			Comments
	Beach Replenishment	Berm, Levee	Floodwall, Bulkhead	Flood or Tide Gate	Road Raise	Shoreline Protection	Stormwater Improvements	Bayou/Relocation	House Raising	Restore Natural Storage	
Area 1	X	X	X	X	X		X	X	X		
Bay Shoreline	X										
Pretty Lake			X	X	X		X	X	X		
Mason Creek			X	X			X	X	X		Improve existing tide gate.
Lake Whitehurst		X	X		X						Protect freshwater in lake from outside flooding sources.
Area 2			X	X	X	X	X	X	X		
Watershed Protection			X	X	X		X	X	X		
Localized Neighborhoods			X			X	X	X	X		
Lamberts Point						X					Erosion protection from storm surge events.
Area 3		X	X	X	X		X	X	X		
West Ghent		X	X				X	X	X		
Fort Norfolk			X				X				
The Hague (Ghent)			X	X	X		X				
Freemason			X				X				
Downtown Norfolk			X				X				Increase level of protection existing Floodwall.
Area 4			X	X	X		X	X	X	X	
Tidewater Dr.			X	X	X		X	X	X	X	
Ohio Creek			X	X	X		X	X	X	X	
Broad Creek			X	X	X		X	X	X	X	
Berkley and Campostella			X		X		X	X	X	X	



# STEP 5(A) – EVALUATE & COMPARE SOLUTIONS



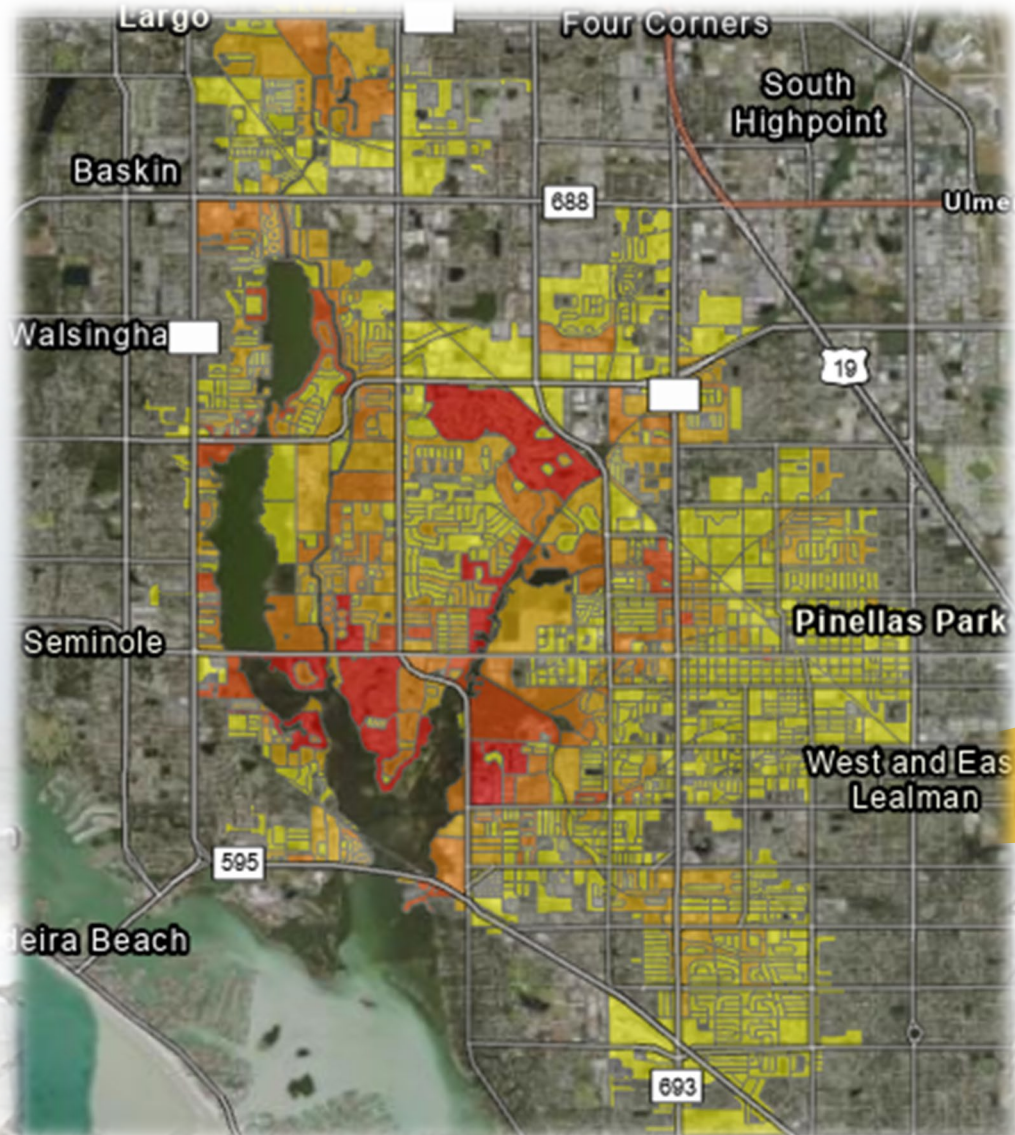
## SACS FRAMEWORK



- Focus Area A evaluation/ comparison will be more qualitative.
- Hazus and MCL ROM cost comparison (may be more applicable in Focus Area C)
- Select the planning reach and shoreline type from the MCL tool
- Note list of measures for relevant shoreline types
- Supplement list with best professional judgment



# STEP 5 - EXAMPLE (1)



## MEASURES & COSTS LIBRARY OUTPUTS

Risk	P1		
	Existing Dollar Damage Risk (Low)	(\$)	\$
Existing Dollar Damage Risk (High)	(\$)	\$	73,015,690
Future Dollar Damage Risk (Low)	(\$)	\$	170,399,629
Future Dollar Damage Risk (High)	(\$)	\$	179,134,088
Shoreline Types	Mangroves	(ft)	186,478
	Manmade Structures (Exposed)	(ft)	2,886
	Manmade Structures (Sheltered)	(ft)	57,343
	Wetland/Marshes/Swamps (Sheltered)	(ft)	158,220

## HAZUS OUTPUTS

**HAZARD SOURCES: INLET / BRIDGE , SHORELINES**

**POSSIBLE MEASURE: S-9 SURGE BARRIER**

**LENGTH: 1830 FT**

**ANNUALIZED COST RANGE: \$16.5M - \$26.98M**

**EC RISK RANGE: \$72.1M - \$73M**

**FC RISK RANGE: \$170.4M - \$179.1M**

**CONCLUSION: "POTENTIALLY JUSTIFIED"**



# STEP 5 – EXAMPLE (2)



## MEASURES & COSTS LIBRARY OUTPUTS

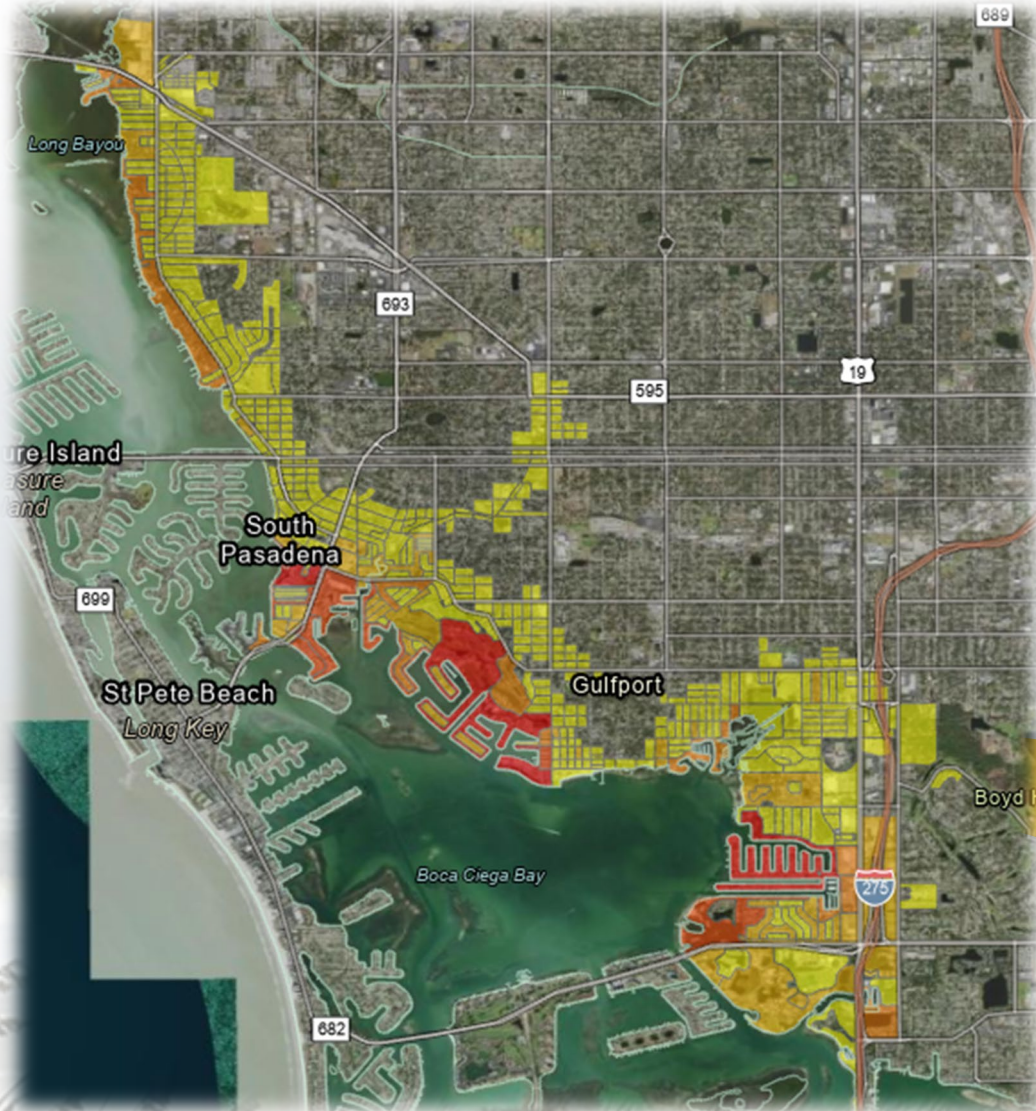
Risk	P3		
	Existing Dollar Damage Risk (Low)	(\$)	\$ 658,500
Existing Dollar Damage Risk (High)	(\$)	\$ 1,292,553	
Future Dollar Damage Risk (Low)	(\$)	\$ 3,933,400	
Future Dollar Damage Risk (High)	(\$)	\$ 6,219,946	
Shoreline Types	Manmade Structures (Exposed)	(ft)	6205
	Sandy Beaches (Exposed)	(ft)	539
	Wetland/Marshes/Swamps (Exposed)	(ft)	684

## HAZUS OUTPUTS

Hazard Source: Shorelines  
 Possible Measure: S-2 Seawall  
 Length: 6800 ft  
 Ann Cost Range: \$1.6M - \$2.8M  
 EC Risk Range: \$0.658M - \$1.3M  
 FC Risk Range: \$3.9M - \$6.2M  
 Conclusion: "Ehh Maybe..."



# STEP 5 – EXAMPLE (3)



## MEASURES & COSTS LIBRARY OUTPUTS

Risk	P2		
	Existing Dollar Damage Risk (Low)	(\$)	\$ 68,409,081
Existing Dollar Damage Risk (High)	(\$)	\$ 122,745,109	
Future Dollar Damage Risk (Low)	(\$)	\$ 80,553,315	
Future Dollar Damage Risk (High)	(\$)	\$ 262,801,032	
Shoreline Types	Mangroves	(ft)	44037
	Manmade Structures (Exposed)	(ft)	42050
	Manmade Structures (Sheltered)	(ft)	124741
	Rocky Shores (Sheltered)	(ft)	560
	Sandy Beaches (Exposed)	(ft)	3527
	Sandy Beaches (Sheltered)	(ft)	2403
	Wetland/Marshes/Swamps (Exposed)	(ft)	12859

## HAZUS OUTPUTS

**HAZARD SOURCE: SHORELINES**  
**POSSIBLE MEASURE: S-6 FLOODWALL**  
**LENGTH: 40,128 FT**  
**ANN COST RANGE: \$758.6M - \$1.239B**  
**EC RISK RANGE: \$68.4M - \$122.7M**  
**FC RISK RANGE: \$80.5M - \$262.8M**  
**CONCLUSION: "NO WAY"**



# STEP 5(B) – FOCUS AREA ACTION STRATEGIES



## SACS FRAMEWORK



Measure	Measure Implemented/Planned/ Needed	Location	Description	Responsible Stakeholder	Summary of Specific Actions Needed to Implement	Timeframe (short, mid, long-term)	Priority (1 = high, 2 = medium, 3 = low)
<b>Focus Area B</b>							
<b>Reach: FL_06 - Northeast Florida</b>							
<b>Sub-area: back bay</b>							
Buyout_Acquisition	needed	back bay A Beach		Property owners, city, FEMA, HUD		long	3
Outreach	implemented					NA	NA
Analysis: SLR scenario impacts	planned						2
Analysis: SLR scenario impacts	needed	back bay			Agreement on SLR scenario(s).	short	1
Bulkhead	implemented	Numerous private properties		Property owners, respective cities, counties, USACE (regulatory)		NA	NA
Bulkhead	needed	City parks		Respective cities		short, mid	2
Wetland	needed	Near marinas.	Thin layer placement to increase marsh elevation.	City, planning council, marinas		mid, long	3
Living Shoreline Vegetation	planned	private properties				short	3



# THANK YOU!

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