



# FEMA Coastal Hazard Mapping and Beyond

*What FEMA is doing to increase flood communication*



Presented by: Michael DelCharco

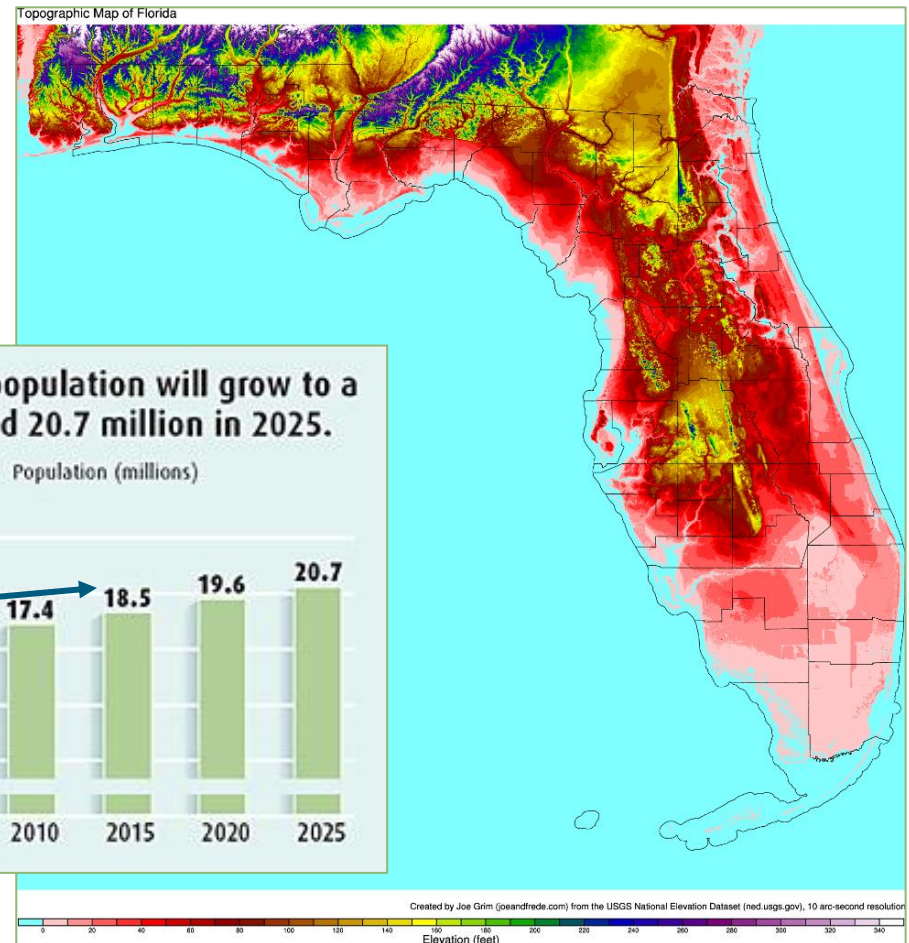
February 2017

# FEMA Coastal Hazard Mapping and Beyond



*Miami-Dade is an example of the exploding population*

*Where we live...  
and will continue to live*



Florida's population will grow to a projected 20.7 million in 2025.

Population (millions)



We beat this –  
actual **20M** in **2015**

# FEMA Coastal Hazard Mapping and Beyond

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- National Flood Insurance Program - 1968
  - Result of flooding along Mississippi
  - Unknown risks
  
- FEMA's focus on NFIP
  - Provide flood insurance
  - Improve floodplain management
  - Develop maps of flood hazards

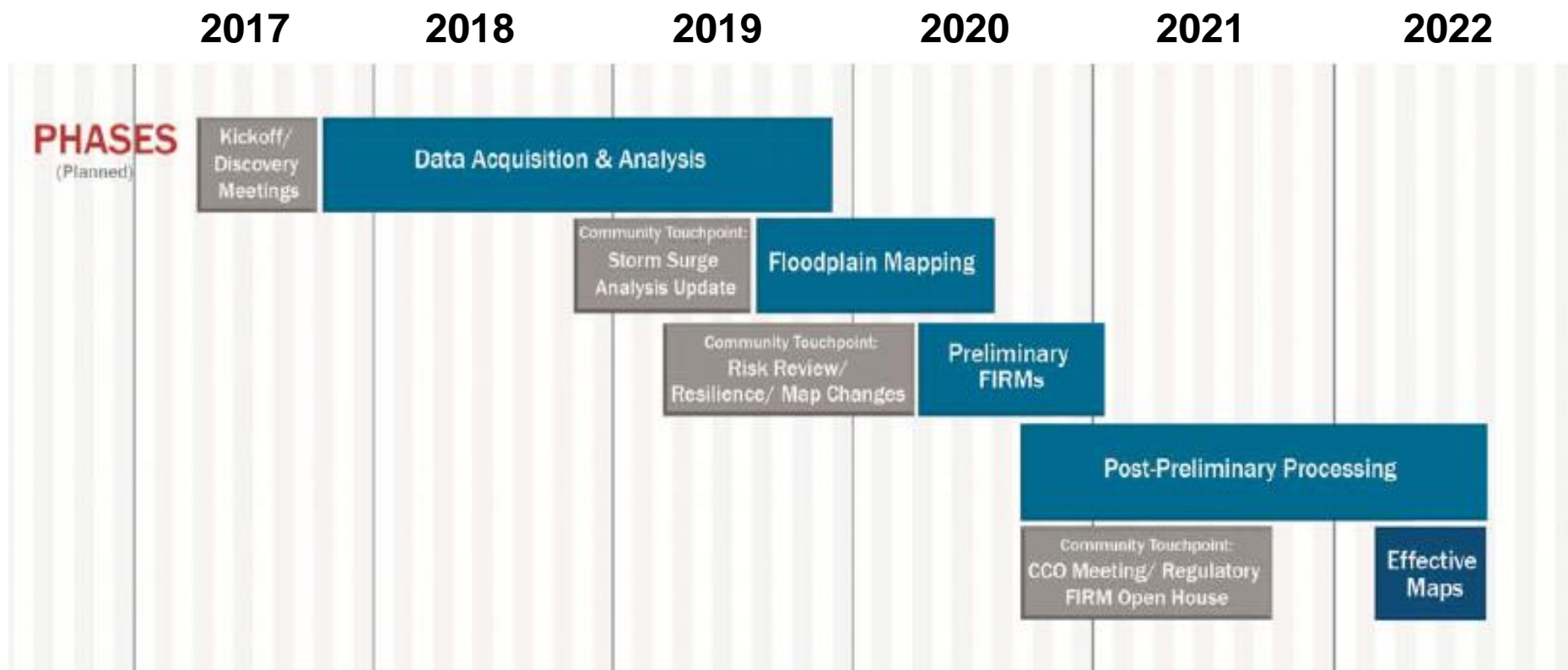
# FEMA Coastal Hazard Mapping and Beyond



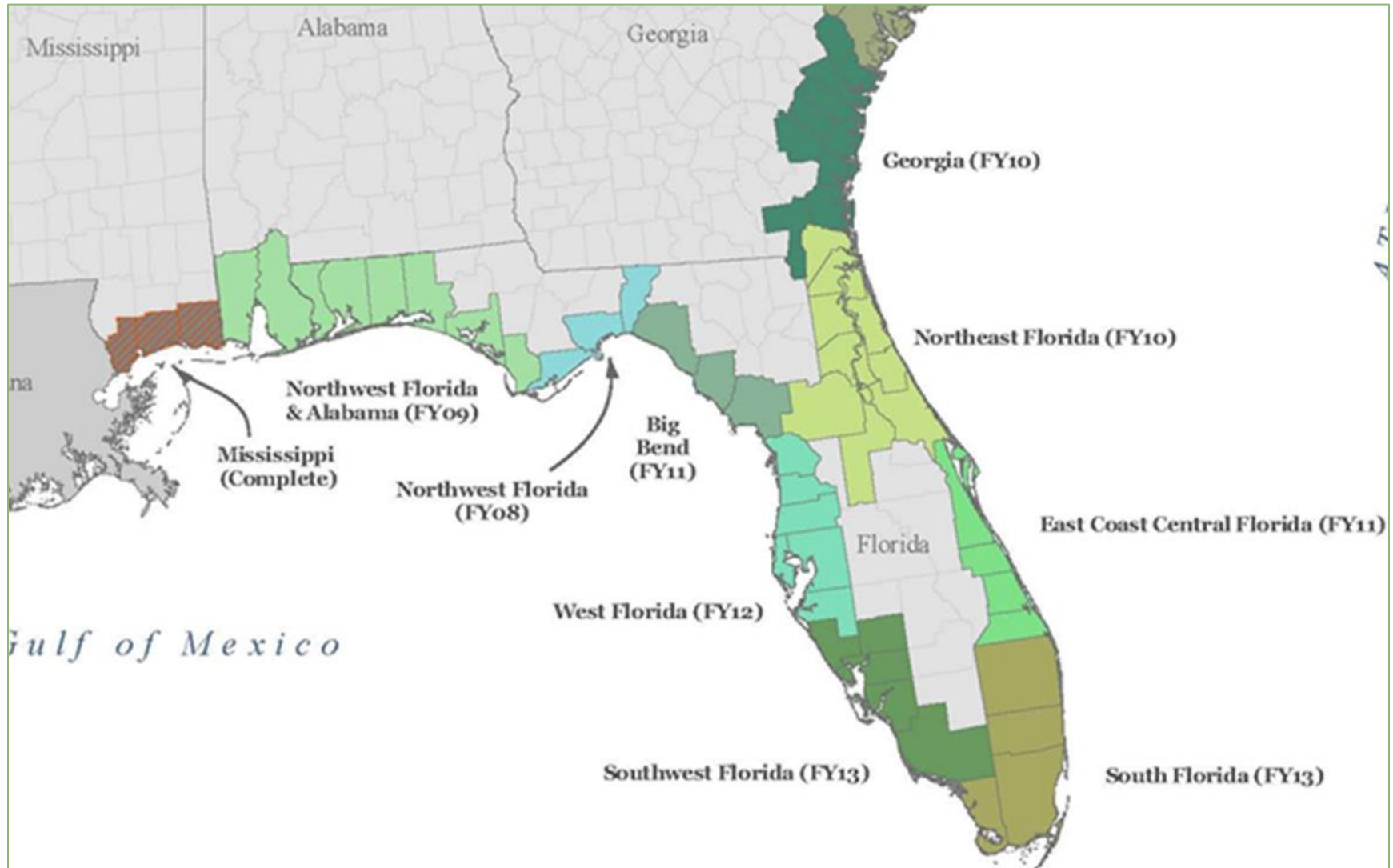
- Risk MAP Objective (Coastal)
  - To provide updated flood hazard data for 100% of the populated U.S. coast



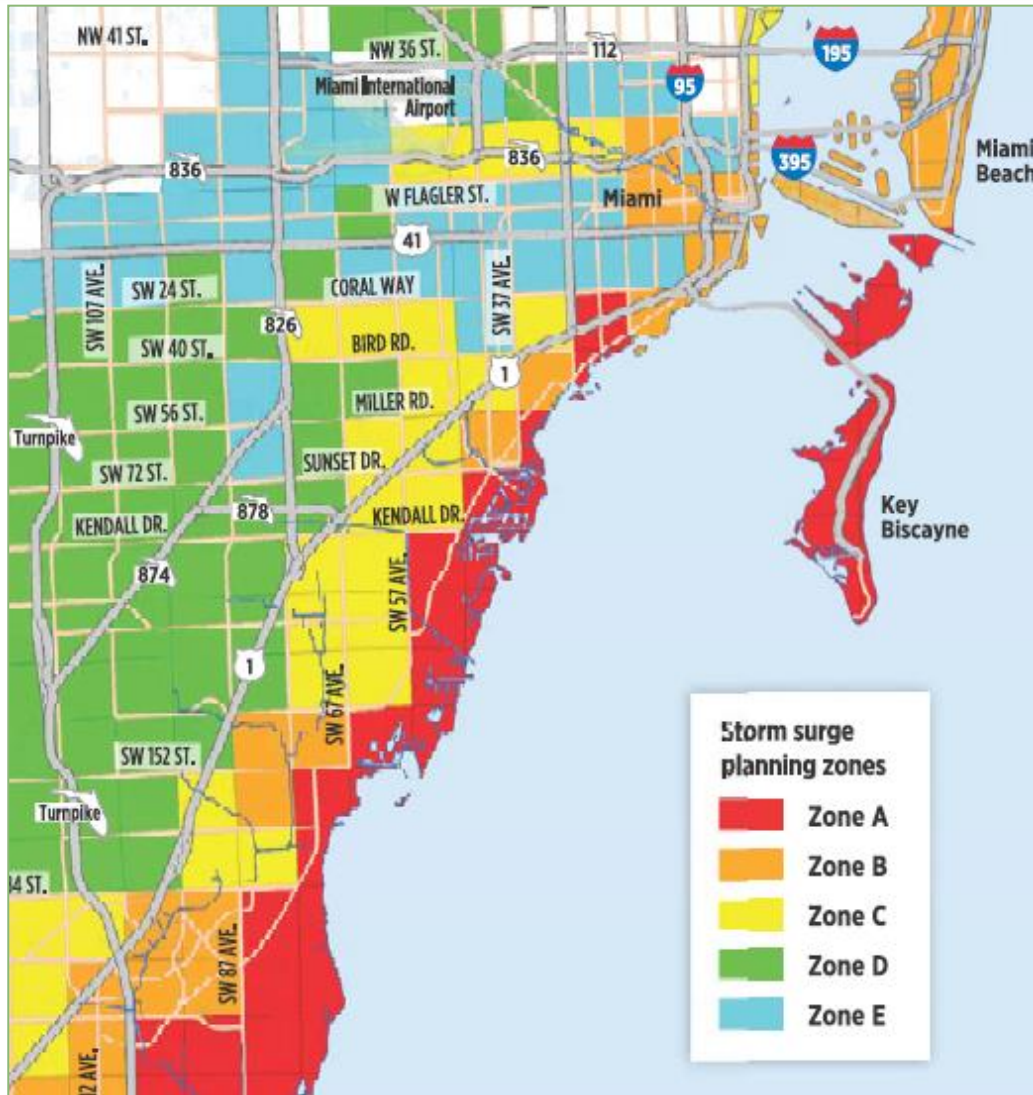
# FEMA Coastal Hazard Mapping and Beyond



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# FEMA Coastal Hazard Mapping and Beyond



The new FEMA Coastal Study is NOT a Hurricane Evacuation Study and is not meant to replace your current Hurricane Evacuation Study.

# FEMA Coastal Hazard Mapping and Beyond

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Discovery

Data Acquisition

Coastal Engineering Analyses

Floodplain Mapping

Produce Preliminary Flood Insurance Rate Maps

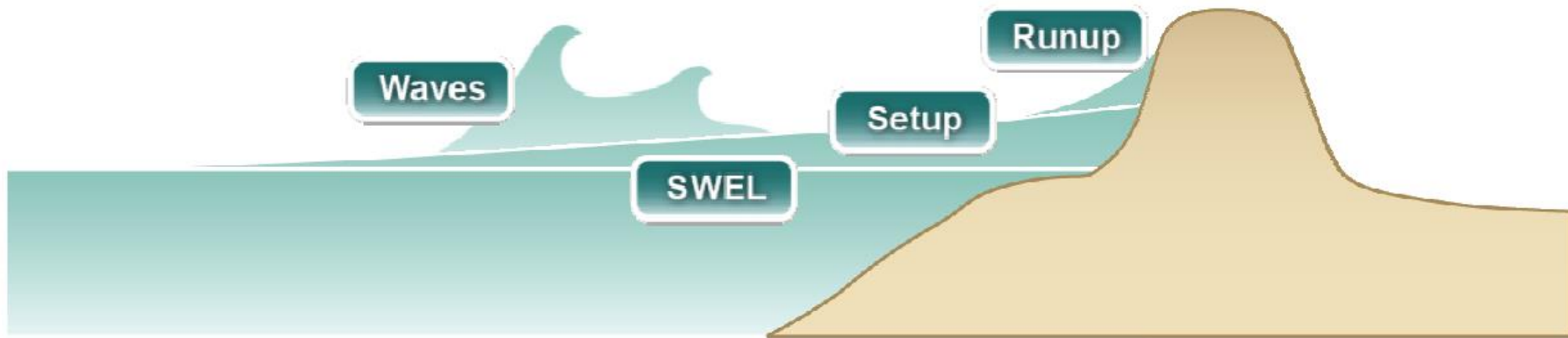
Post-Preliminary Processing



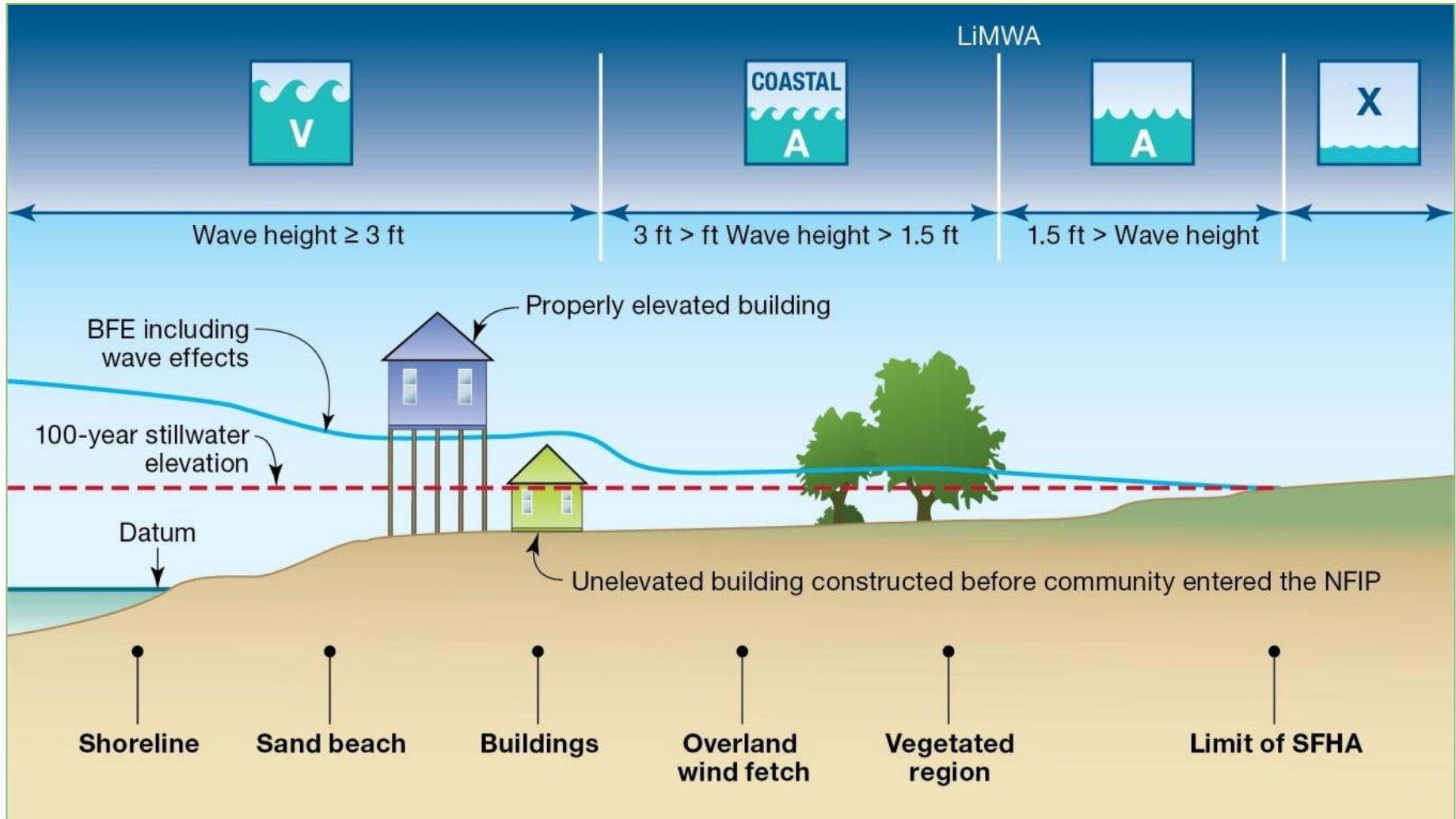
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Base Flood Elevation (BFE) on FIRM includes 4 components:

1. Storm surge stillwater elevation (SWEL)
2. Amount of wave setup
3. Wave height above storm surge (SWEL) elevation
4. Wave runup above storm surge elevation (where present)



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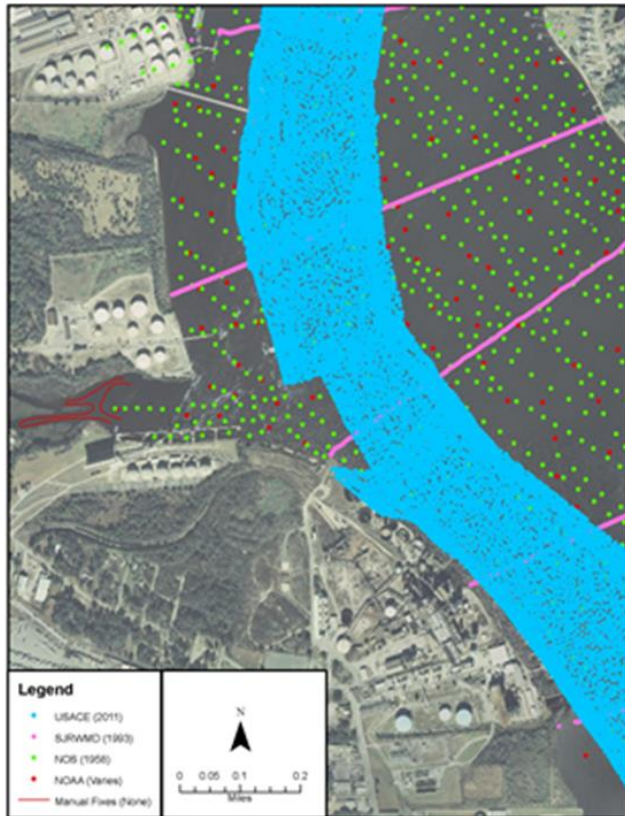


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- Numerical Modeling – combined Advanced Circulation (ADCIRC) and Simulating Waves Near Shore (SWAN)
  - Digital Elevation Model (DEM)
  - Site reconnaissance
  - Mesh development
  - Land cover data analysis
  - Validation
  - JPM-OS storm suite selection
  - Run hundreds of synthetic storms
  - Calculate the statistical 1% annual chance event

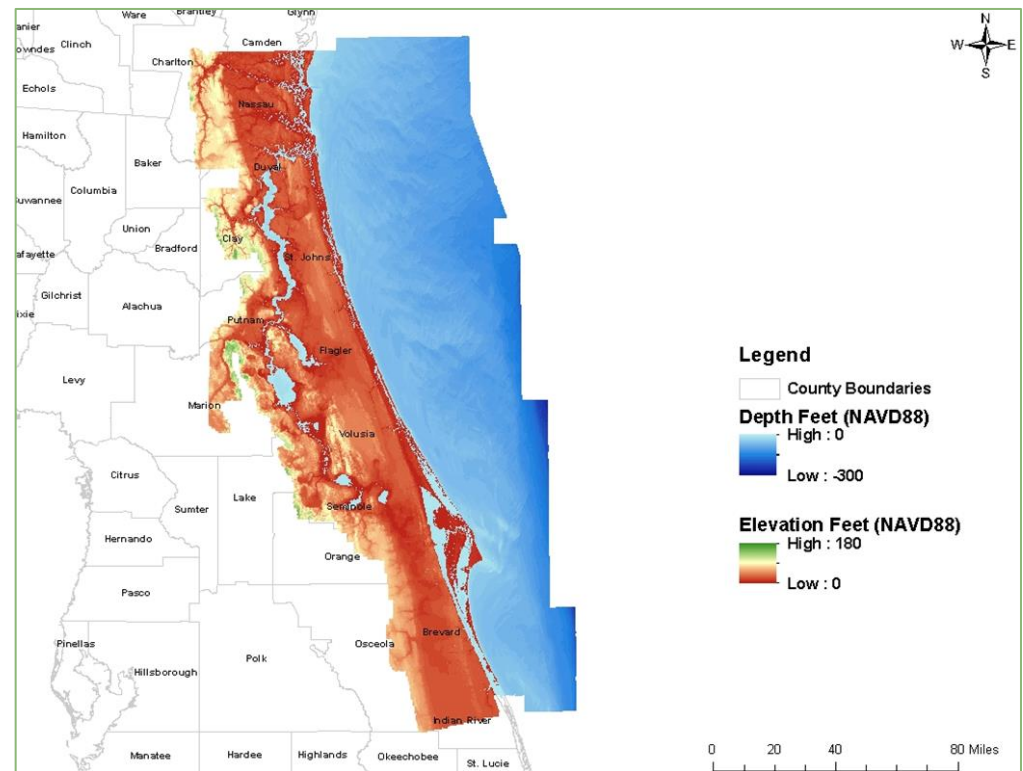
# FEMA Coastal Hazard Mapping and Beyond



## Legend

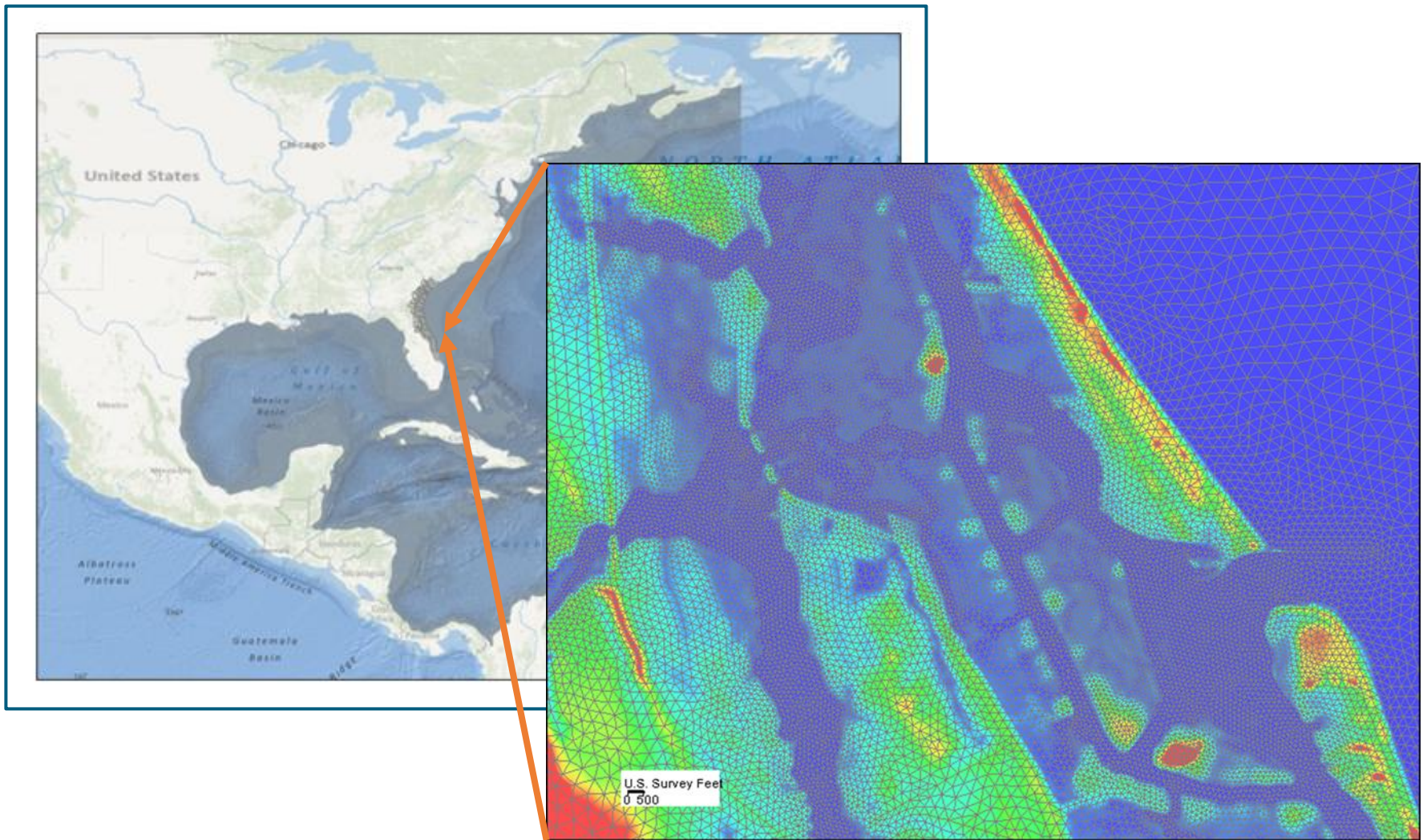
- USACE (2011)
- SJRWMD (1993)
- NOS (1958)
- NOAA (Varies)

*Same area, different data sources, survey dates, and data extents*



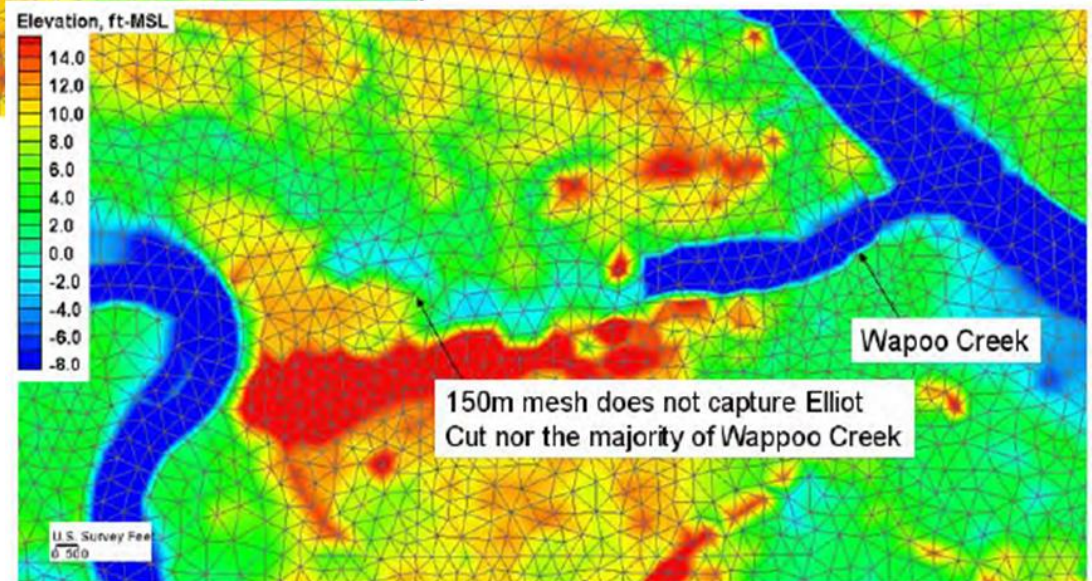
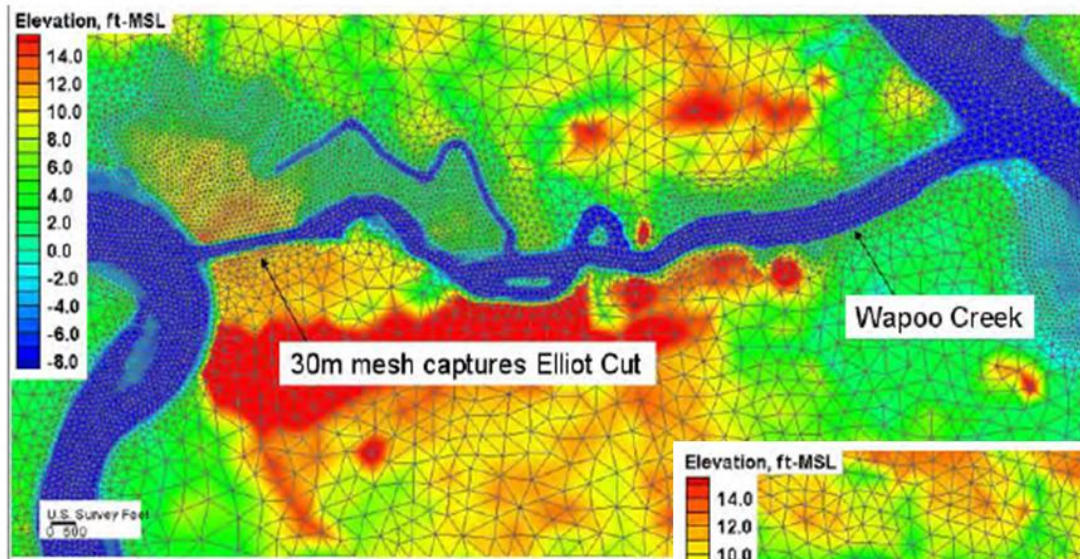


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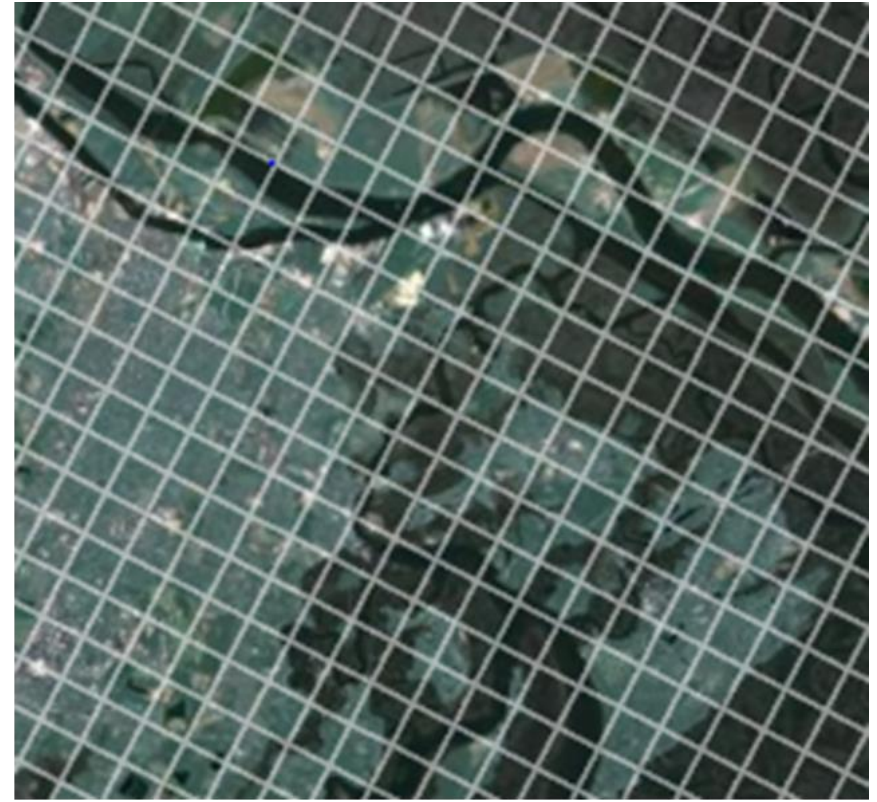
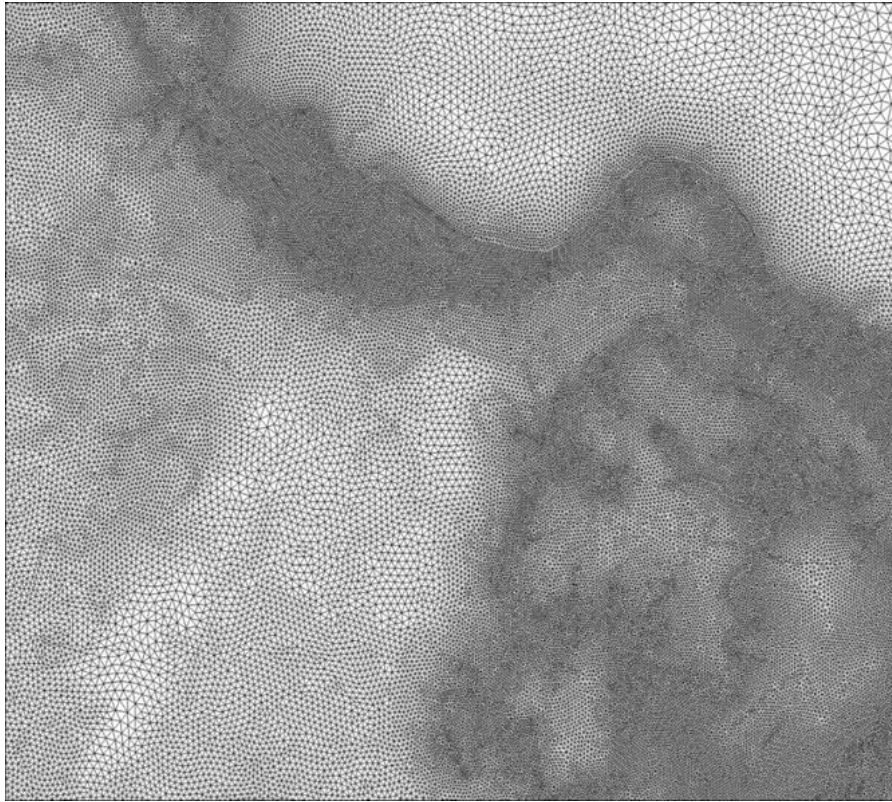
# FEMA Coastal Hazard Mapping and Beyond





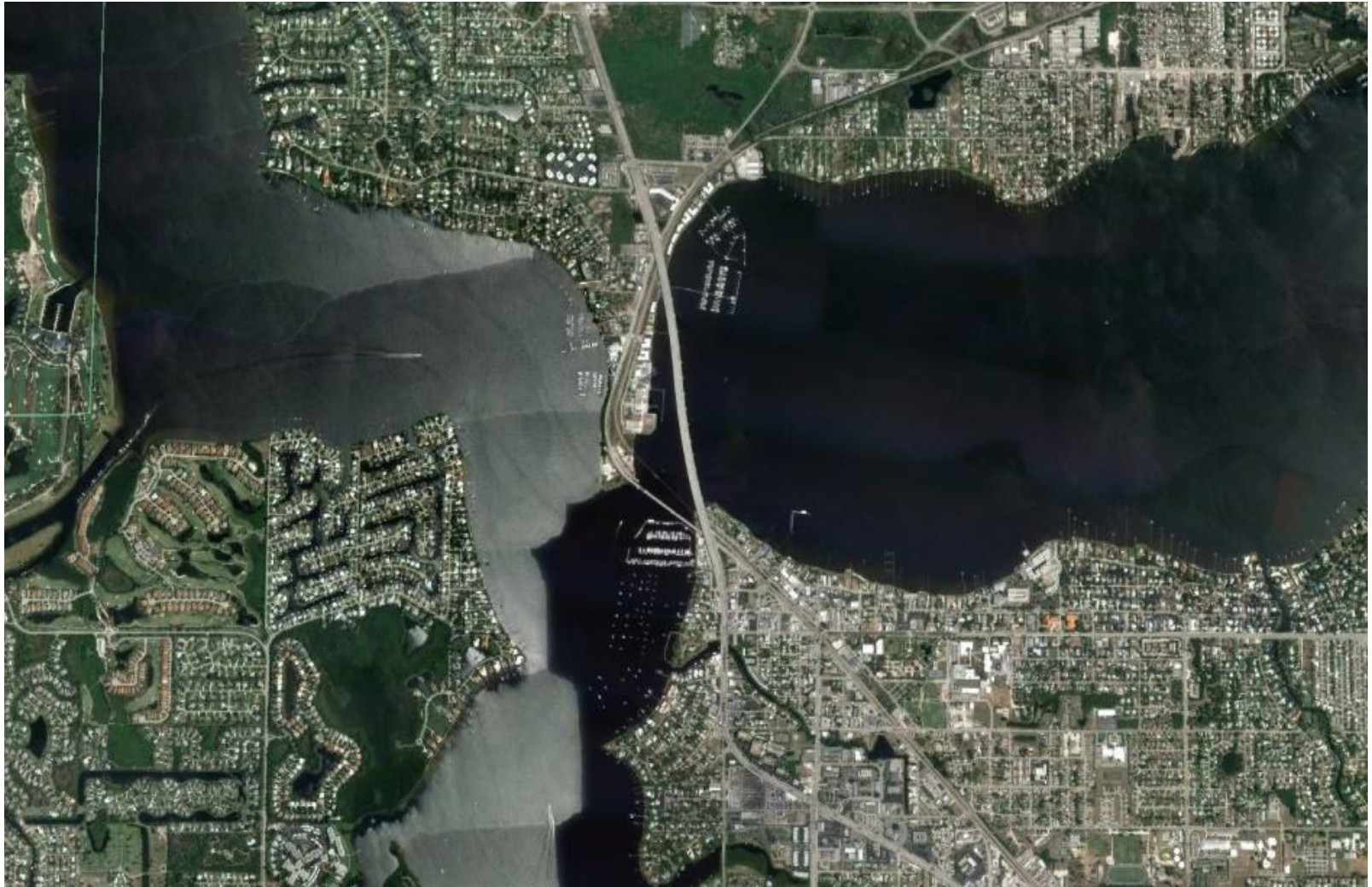
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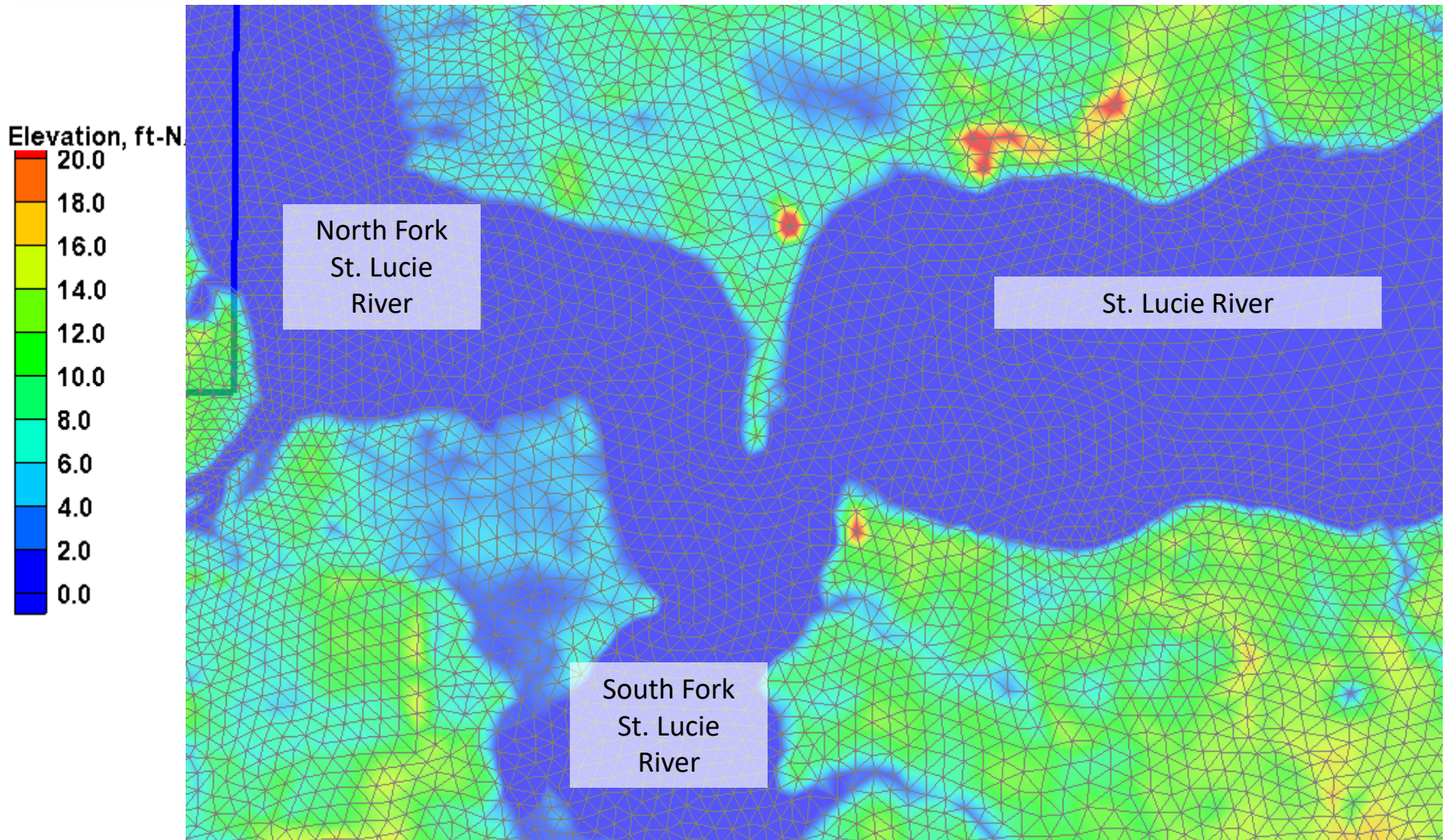
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SWAN+ADCIRC Mesh – Martin County; Stuart



# FEMA Coastal Hazard Mapping and Beyond



SWAN+ADCIRC Mesh – Martin County; Stuart

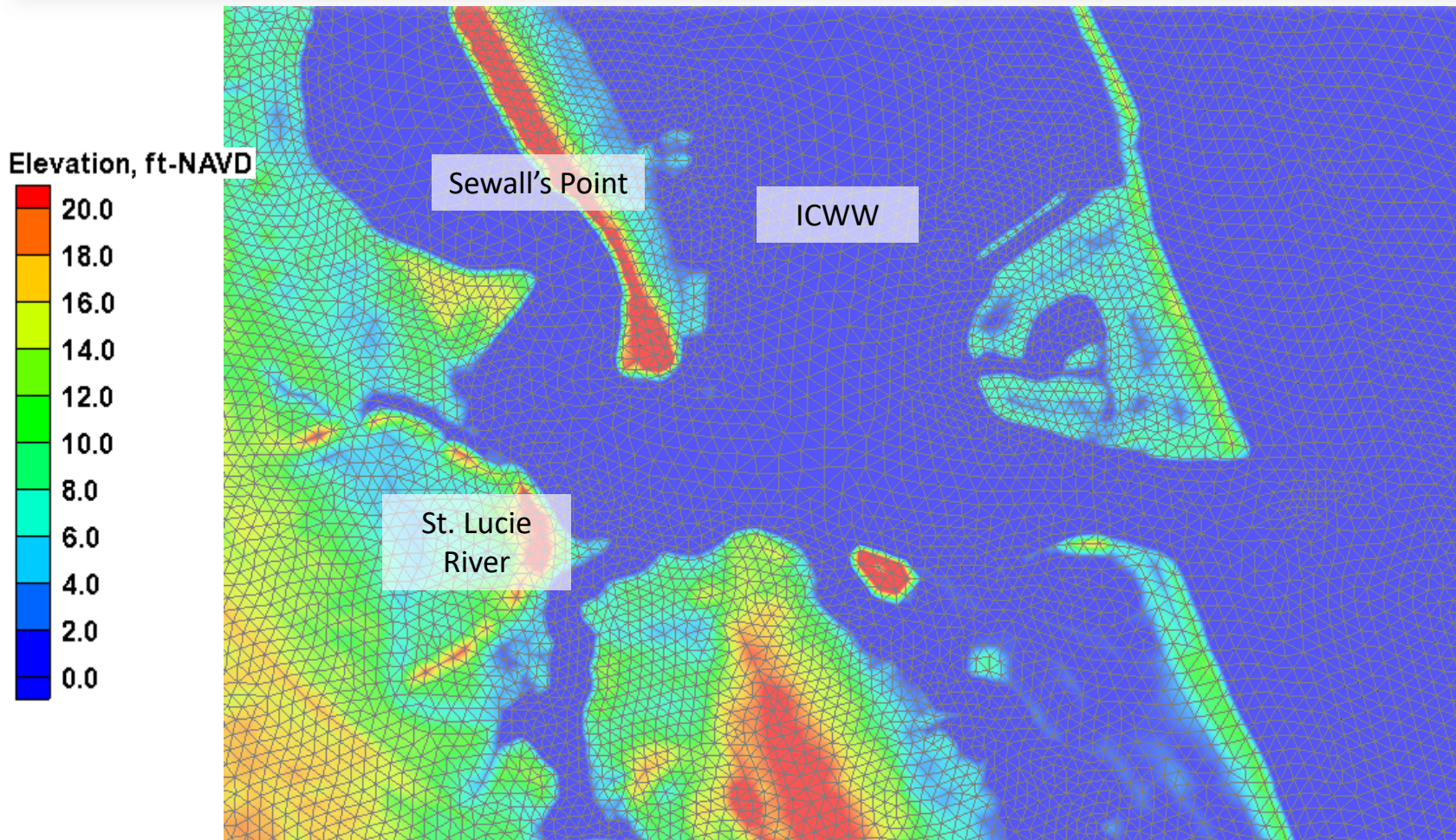
# FEMA Coastal Hazard Mapping and Beyond



SWAN+ADCIRC Mesh – Martin County; St Lucie Inlet



# FEMA Coastal Hazard Mapping and Beyond

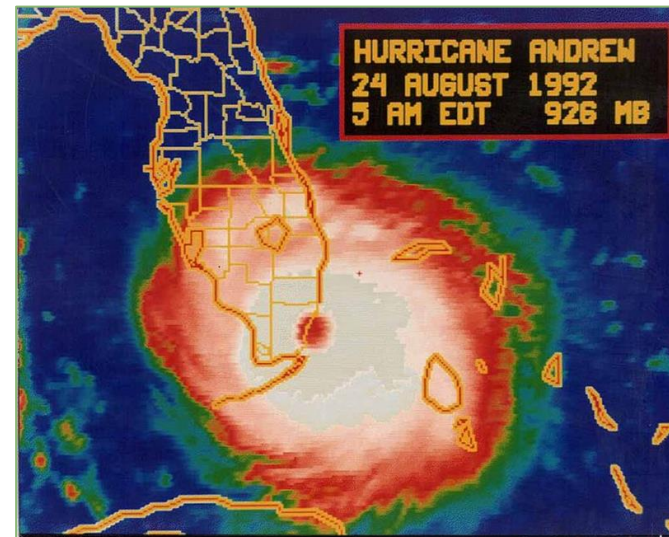
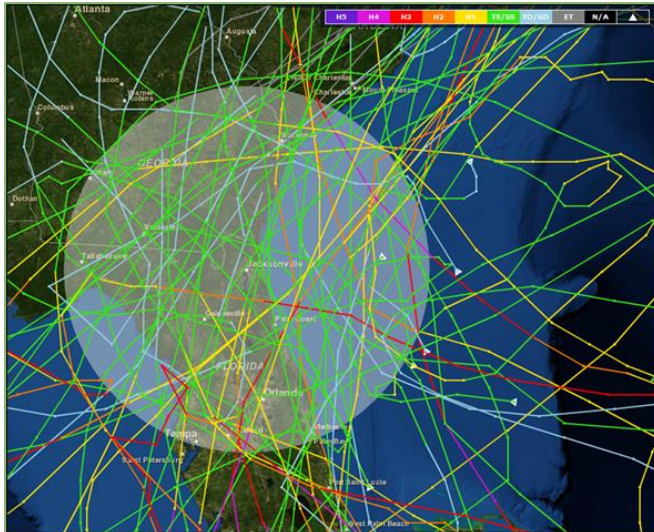


SWAN+ADCIRC Mesh – Martin County; St Lucie Inlet

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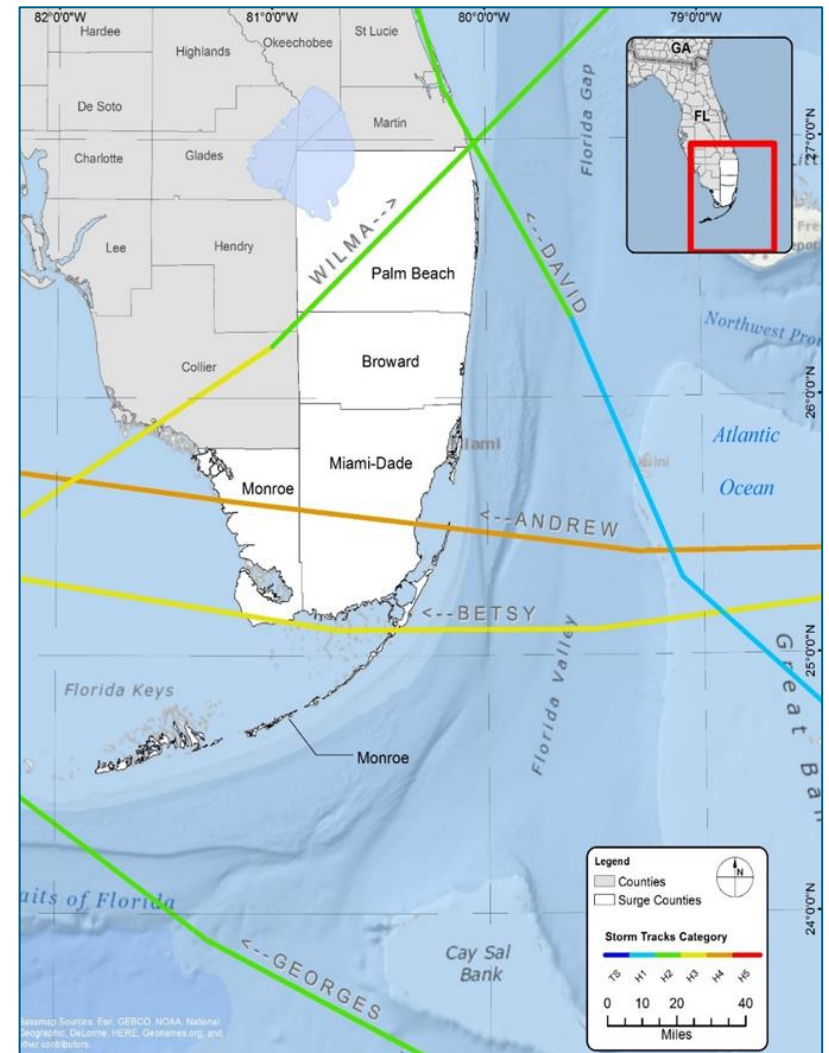
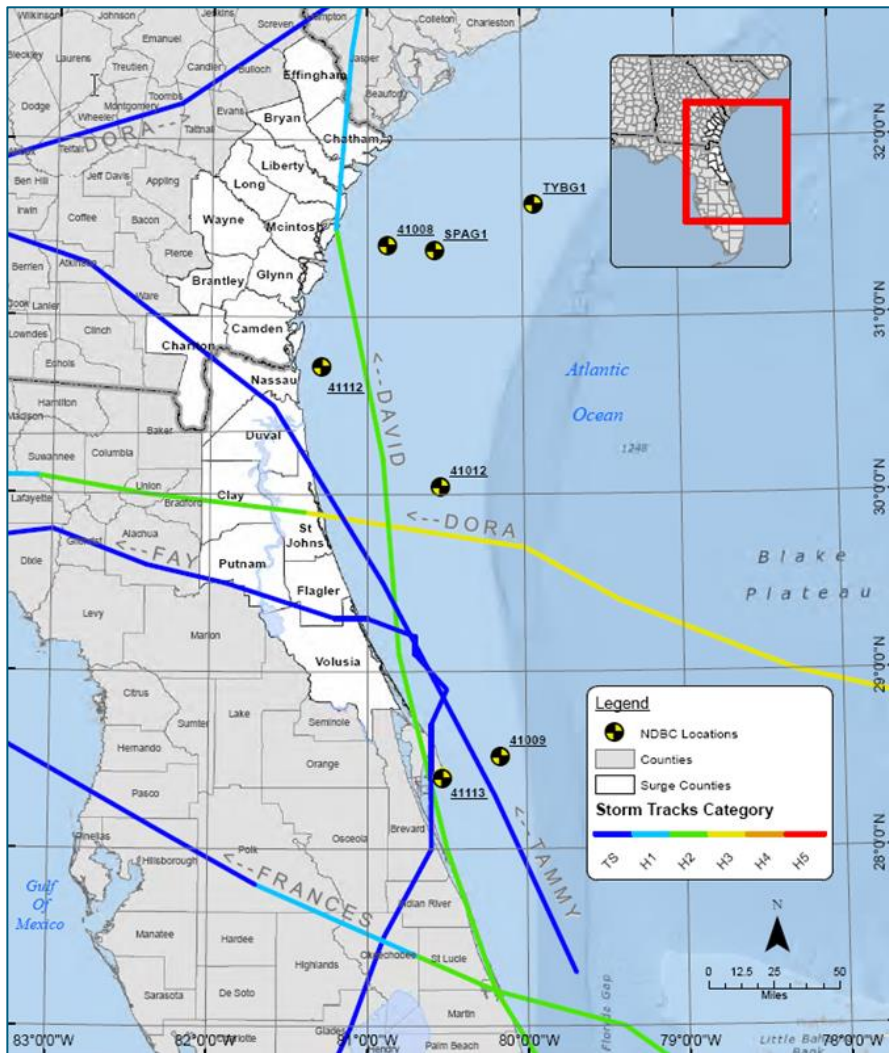
## Storm Climatology

- Review historical storms
- Pick 5 storms to validate the hurricane/surge model
  - Demonstrated model capability to reproduce water levels and waves in project area
  - Comparisons to available data showed reasonable agreement for water levels and waves

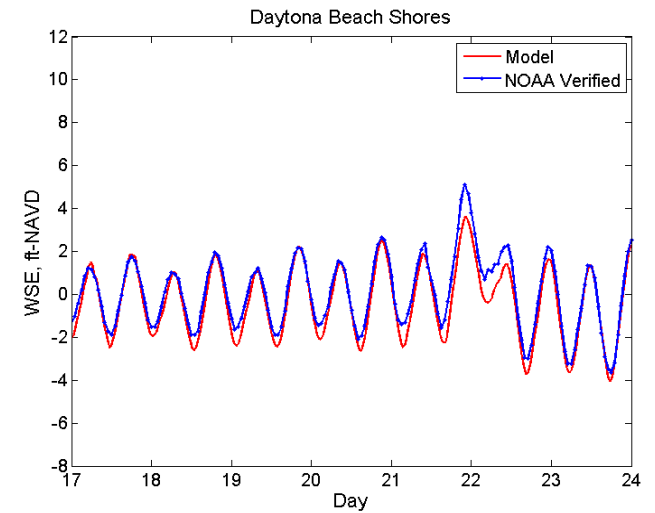
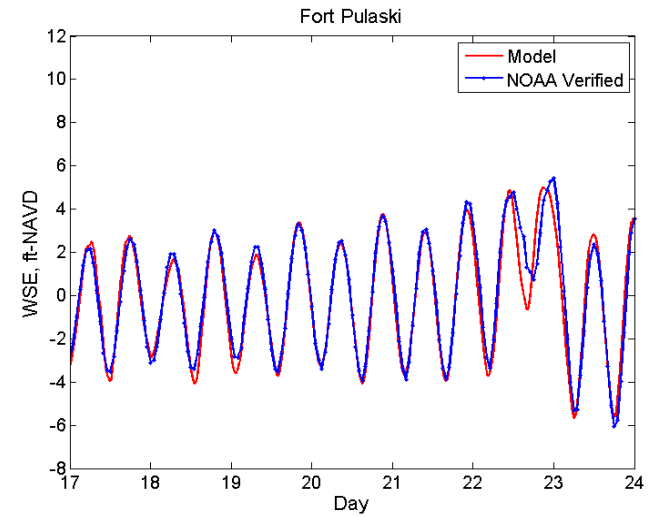
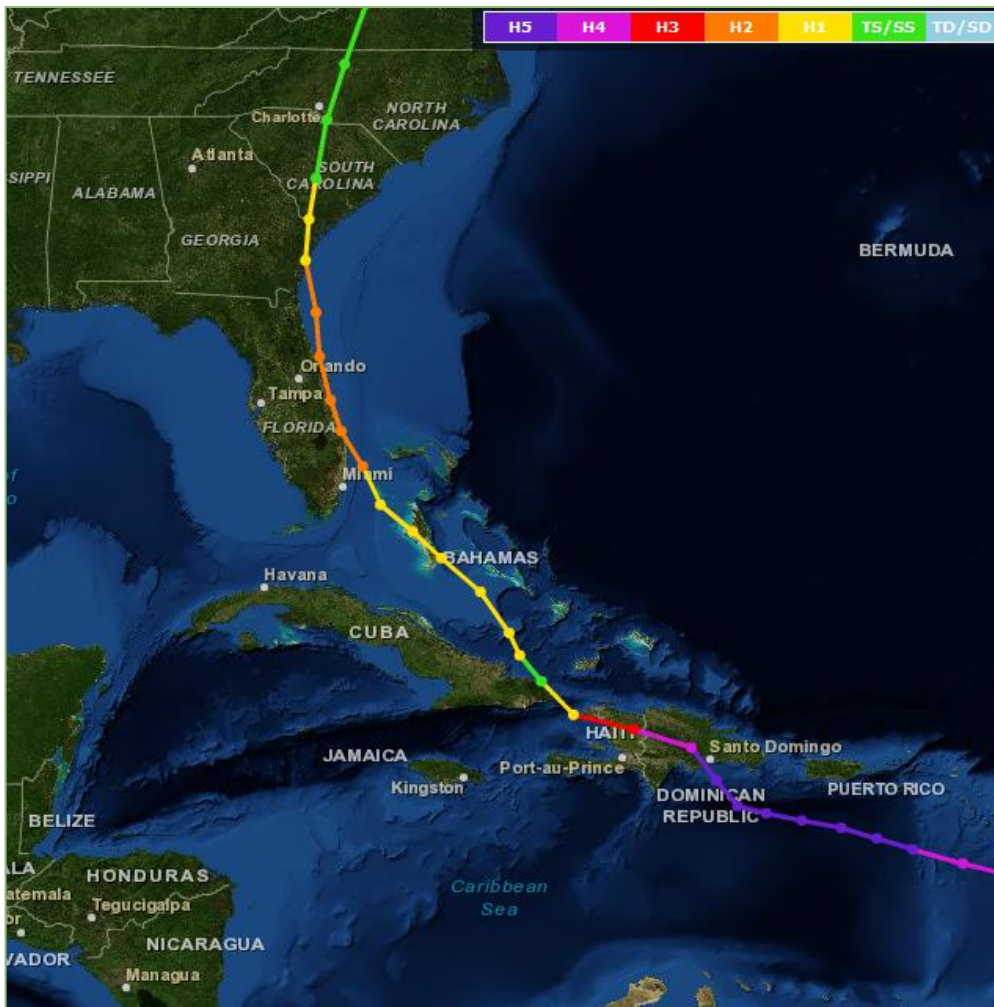




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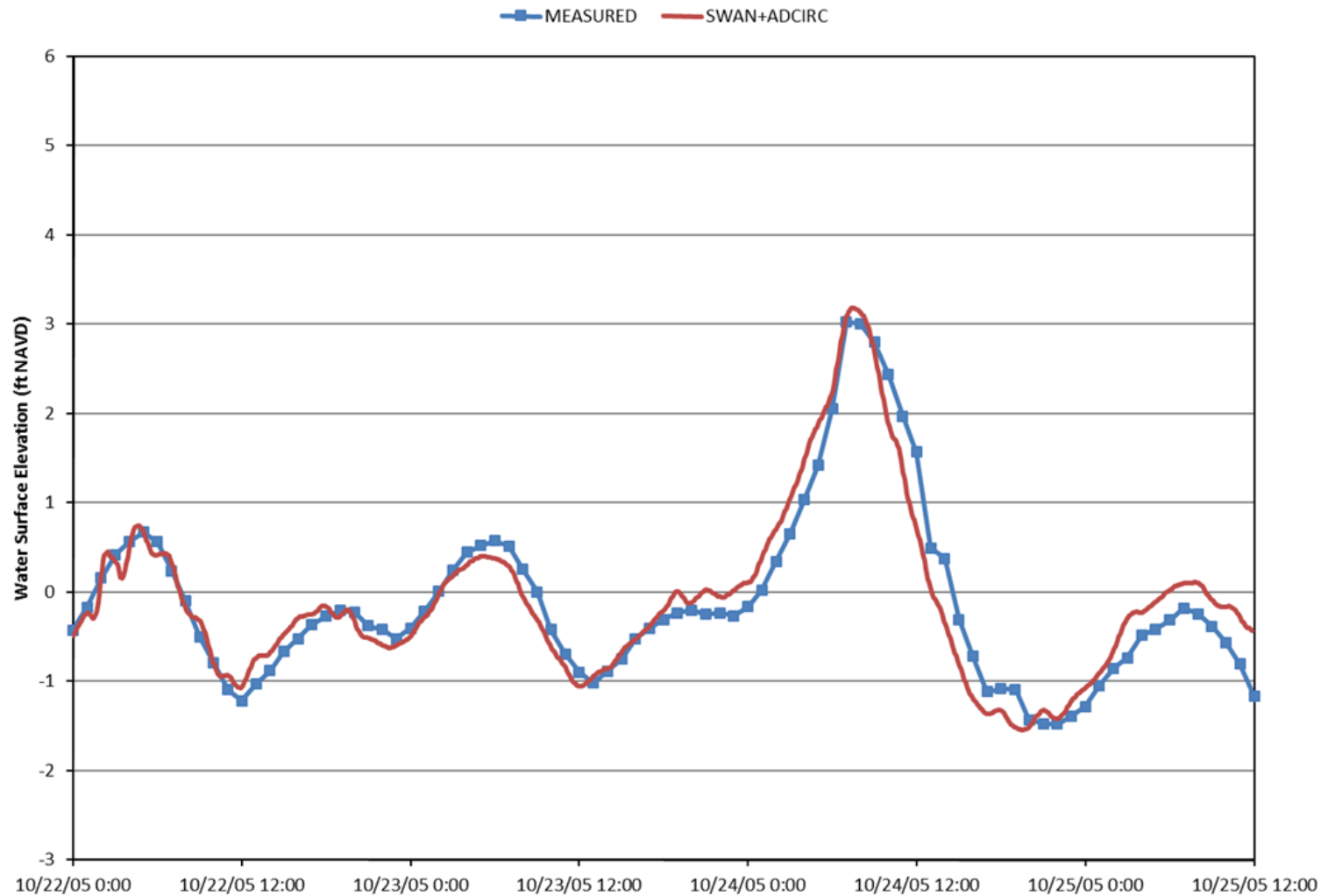


# FEMA Coastal Hazard Mapping and Beyond



# FEMA Coastal Hazard Mapping and Beyond

Wilma, 8724580 (Key West) Station





# FEMA Coastal Hazard Mapping and Beyond

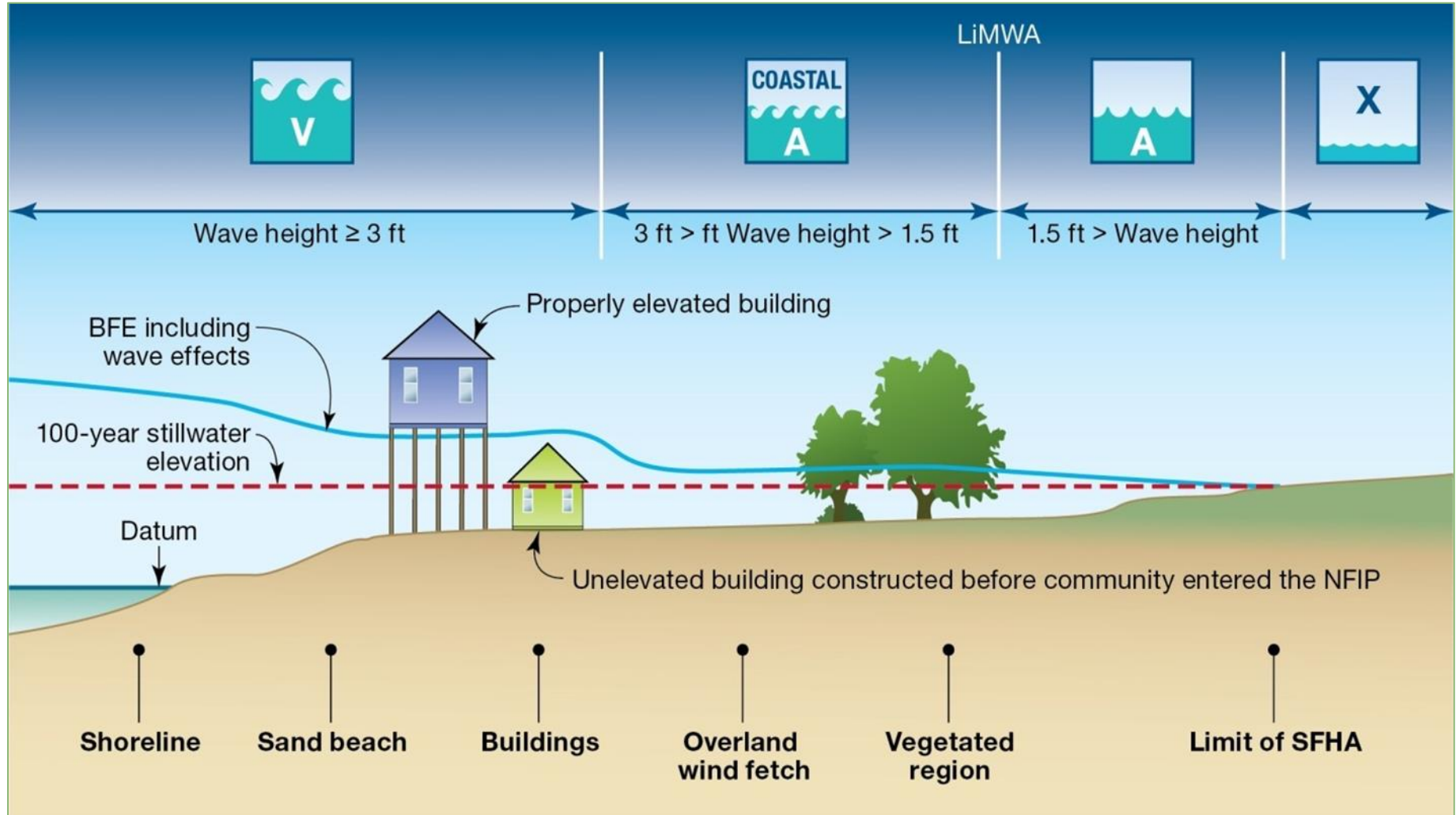
## Storm Climatology

- Generate hundreds of hypothetical storms using 5 parameters
  1. Central pressure
  2. Radius to maximum winds
  3. Forward speed
  4. Storm heading
  5. Holland's B (shape parameter)
- Ensure covers whole range of possible storms for study area based on historic data for the area
- Run storms on super computer
- Calculate the 1% annual chance event



# FEMA Coastal Hazard Mapping and Beyond

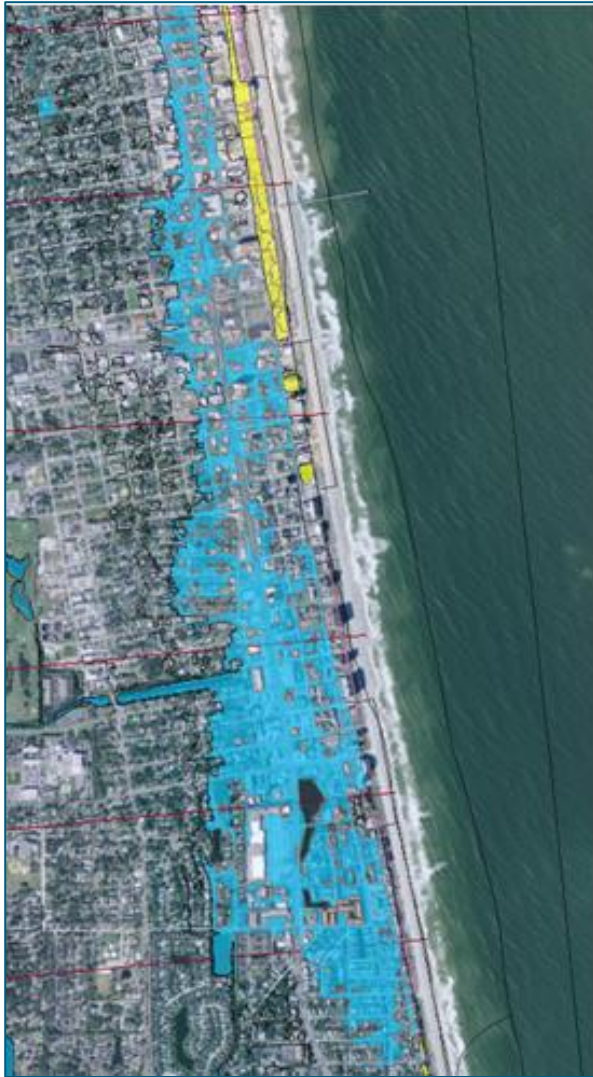
## Understanding Your Risk – 1% Annual Chance Event







# FEMA Coastal Hazard Mapping and Beyond



## Hurricane Dora 1964



The effects of Hurricane Dora's storm surge ingressed in the government streets in the Beaches community.



# FEMA Coastal Hazard Mapping and Beyond





# FEMA Coastal Hazard Mapping and Beyond





# FEMA Coastal Hazard Mapping and Beyond





# FEMA Coastal Hazard Mapping and Beyond

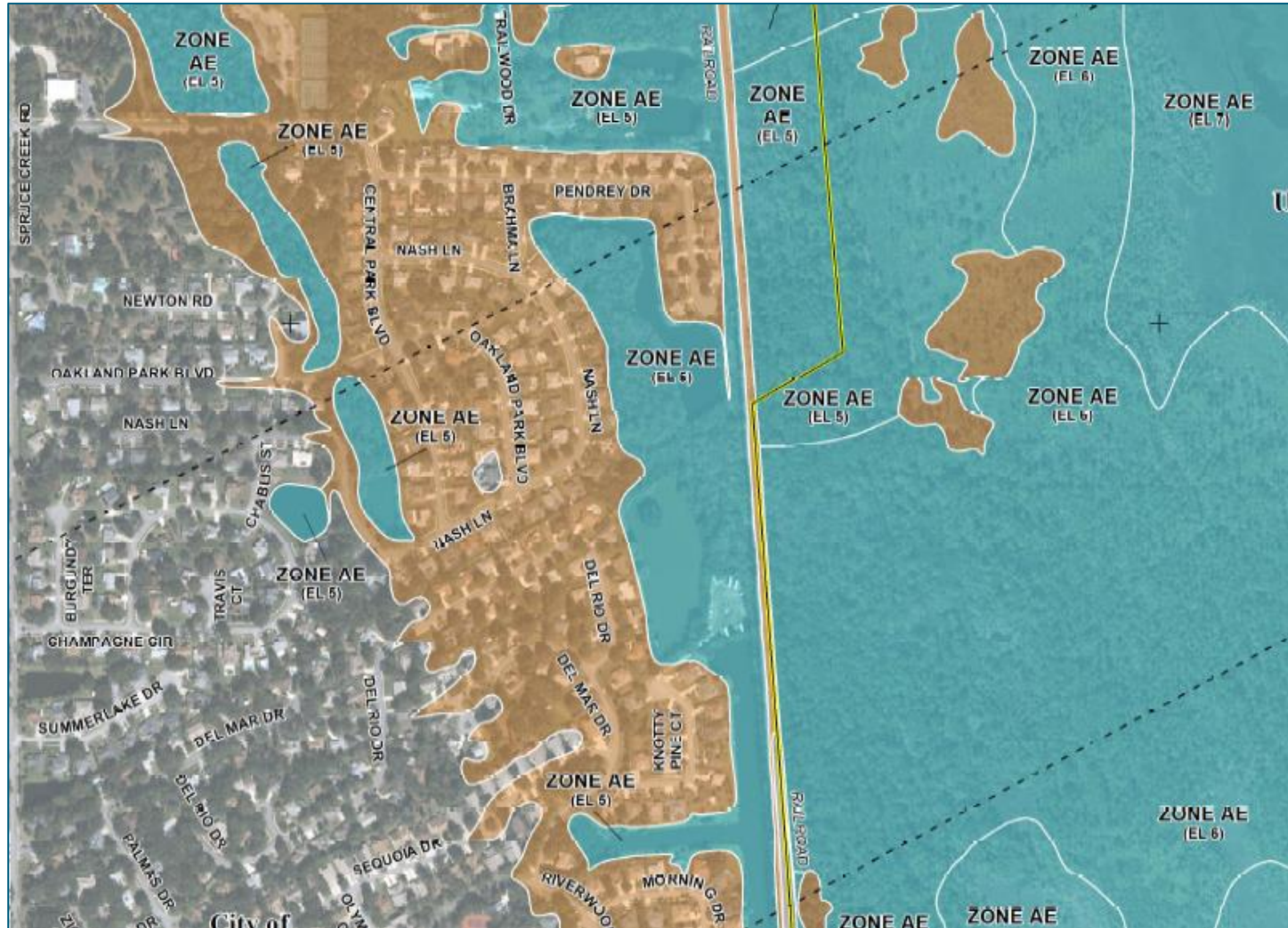
## Understanding Your Risk – 1% Annual Chance Event





# FEMA Coastal Hazard Mapping and Beyond

## *Understanding Your Risk – 1% Annual Chance Event*





# FEMA Coastal Hazard Mapping and Beyond

## New Flood Insurance Study Format

Table 17: Coastal Transect Parameters

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88)				
		Significant Wave Height $H_s$ (ft)	Peak Wave Period $T_p$ (sec)	Range of Stillwater Elevations (ft NAVD88)				
				10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Atlantic Ocean	1	10.44	9.59	6.7 5.3 - 6.8	7.2 5.7 - 7.3	8.9 7.0 - 9.0	10.2 8.9 - 10.4	13.2 12.5 - 13.3
Atlantic Ocean	2	10.69	9.70	6.7 4.7 - 6.7	7.2 5.0 - 7.2	8.9 6.0 - 8.1	10.2 8.7 - 10.2	13.2 12.2 - 13.3
Atlantic Ocean	3	18.14	12.50	6.6 4.7 - 6.8	7.1 5.0 - 7.3	8.8 6.2 - 9.0	10.1 8.7 - 10.4	13.3 12.4 - 13.5
Atlantic Ocean	4	18.23	12.45	6.7 5.5 - 6.8	7.2 5.9 - 7.5	8.9 7.3 - 9.2	10.2 9.0 - 10.6	13.2 12.2 - 13.7
Atlantic Ocean	5	18.36	12.22	6.7 5.7 - 6.9	7.2 6.1 - 7.4	8.9 7.6 - 9.2	10.2 9.0 - 10.8	13.2 12.1 - 13.8
Atlantic Ocean	6	18.21	11.70	6.6 5.7 - 6.7	7.1 6.1 - 7.3	8.7 7.6 - 9.0	10.1 9.0 - 10.5	13.1 12.0 - 13.5
Atlantic Ocean	7	18.10	11.56	6.6 5.9 - 6.7	7.0 6.3 - 7.2	8.7 7.5 - 8.9	9.9 8.9 - 10.3	13.1 11.8 - 13.5
Atlantic Ocean	8	17.14	12.63	6.6 5.9 - 6.6	7.1 6.1 - 7.11	8.6 7.6 - 8.8	10.0 8.9 - 10.0	12.9 11.8 - 13.0
Atlantic	a	16.95	12.62	6.4	6.9	8.4	9.7	12.6

Figure 8: 1% Annual Chance Total Stillwater Elevations for Coastal Areas



# FEMA Coastal Hazard Mapping and Beyond

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## *Understanding Your Risk – 1% Annual Chance Event*

- We have all this data...
- Brainstorming!
- Non-Regulatory Products

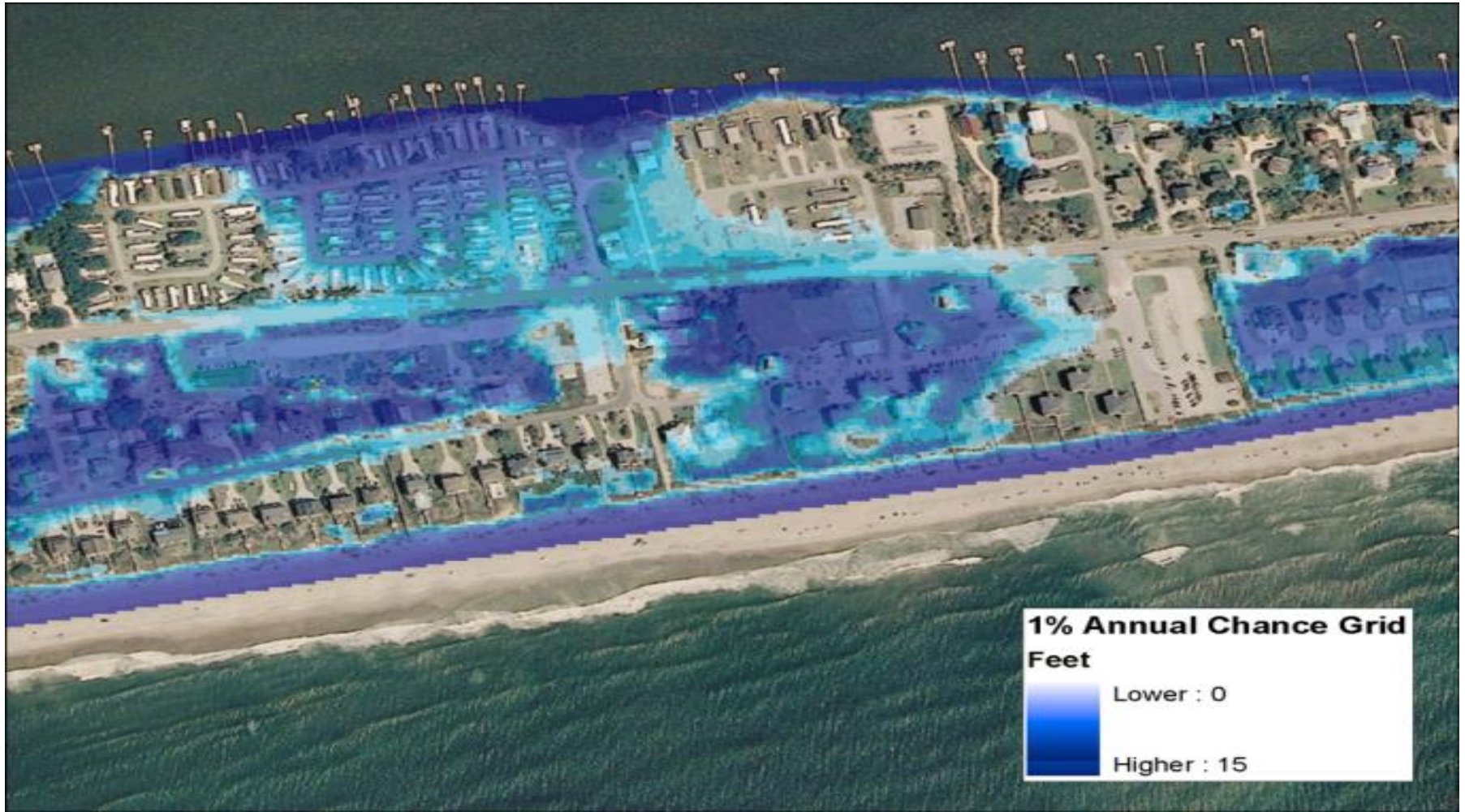
# FEMA Coastal Hazard Mapping and Beyond

- Makes it easy for communities and homeowners to identify impacts of new FIRM
- Assists in prioritizing mitigation actions
- Helps identify reasons for changes

## Changes Since Last FIRM

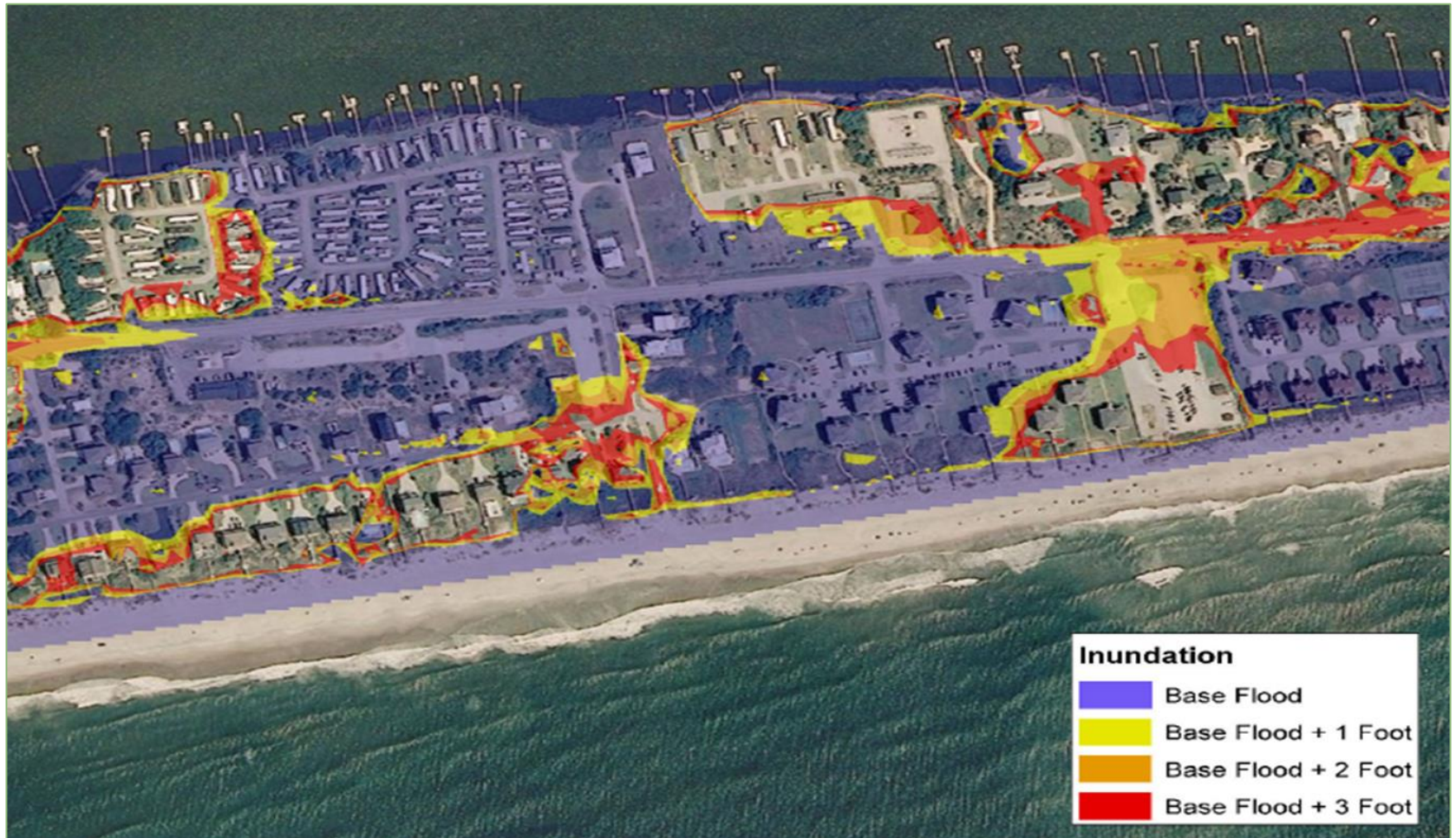
	SFHA Decrease
	Floodway Decrease
	SFHA Increase
	Floodway Increase
	No Zone Change
	Non-SFHA Decrease
	Non-SFHA Increase

# FEMA Coastal Hazard Mapping and Beyond





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# FEMA Coastal Hazard Mapping and Beyond





# FEMA Coastal Hazard Mapping and Beyond

## Community Engagement Tools

- E-Bulletins
- Webinar Updates
- Project Charter

## Website

[www.southeastcoastalmaps.com](http://www.southeastcoastalmaps.com)

- Meeting Materials
- Periodic Updates

## Community Engagement

## Meetings

- Discovery and Kick-off
- Storm Surge Analysis Update
- Flood Risk Review
- Resilience
- CCO/Open House

## Contacts

- FEMA Study Manager
- Project Manger
- Discovery Lead



# FEMA Coastal Hazard Mapping and Beyond

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## Region IV Coastal Analysis and Mapping

Information for the Southeast United States

Alabama | Florida | Georgia | Mississippi | North Carolina | South Carolina




**Find Your Flood Map**

Locate the flood map for your address at the [Map Service Center](#)

**Information For**

- Information for Homeowners, Renters, Business Owners, and General Public
- Information for Federal, State, and Local Agencies and Elected Officials
- Information for Floodplain Managers, Engineers, Surveyors, and Architects



[Learn more about this project >>](#)

As part of its **nationwide effort** to update the Nation's flood hazard maps, FEMA is paying particular attention to coastal areas. With approximately 39 percent of the Nation's population living in a coastal county (i.e., a county that is contiguous with the Atlantic or Pacific Ocean, Gulf of Mexico, or Great Lakes coast or that has Special Flood Hazard Areas caused by coastal flooding identified), it is vital that residents and businesses in these communities have accurate flood hazard information, know their flood risk, and take steps to protect their lives and

- Project Info >>
- Analysis Overview >>
- Resources >>
- Glossary >>
- FAQs >>
- Other Federal
- Coastal Study
- Español (Sp
- Kreyòl ay
- Creole)
- Tiếng



## Coastal Flood Risk Study Meetings

**Coastal Flood Risk Study Process Emphasizes Coordination and Engagement with Officials and Other Stakeholders**

As with other Risk MAP program projects, coastal flood risk studies include close coordination with, and engagement of, community officials. The project's risk assessment and community engagement phases of a study include multiple formal and informal meetings with community officials, residents, and other stakeholders.

**Key Coastal Mapping Terms**

The following are presented on preliminary and final versions of the updated digital Flood Insurance Rate Map (FIRM) panels for coastal communities.

- **Special Flood Hazard Area (SFHA)** - An area subject to flooding by the 1-percent annual-chance flood.
- **Coastal High Hazard Area (CHHA)** - An SFHA, labeled Zone VE on the FIRM, that represents the area exposed to wave heights of 3 feet or greater. The CHHA is sometimes referred to as a high-velocity zone.
- **Limit of Moderate Wave Action (LIMWA)** - The boundary line for the 1.5-foot wave. Post-storm assessments and laboratory research have shown that waves as small as 1.5 feet can cause significant structural damage in these areas of moderate coastal flood hazard.
- **Coastal A Zone** - An SFHA, labeled Zone AE on the FIRM, that represents the area subject to wave heights that are greater than or equal to 1.5 feet but are less than 3 feet. The LIMWA forms the landward boundary of the Coastal A Zone.
- **Primary Frontal Dune (PFD)** - A continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.

**Overview of the Coastal Flood Risk Study Process**

The coastal flood risk study process for most study areas will include the five phases shown in Figure 1 on page 2 and summarized below. Through these phases, FEMA works with communities to identify, study, and map their flood hazards. Mitigation actions are identified, planned, and implemented throughout the study lifecycle.

**Phase 1 - Kickoff and Discovery Meetings**

During the Discovery Phase, or Phase 1, FEMA meets with coastal communities. State representatives, and other key stakeholders will collaboratively determine needs, and identify the best path forward. As shown in Figure 1, Phase 1 activities can include data collection and stakeholder coordination; a kickoff meeting; Discovery Meeting(s); and the creation and distribution of a Discovery Map, Discovery Report, and Project Charter.

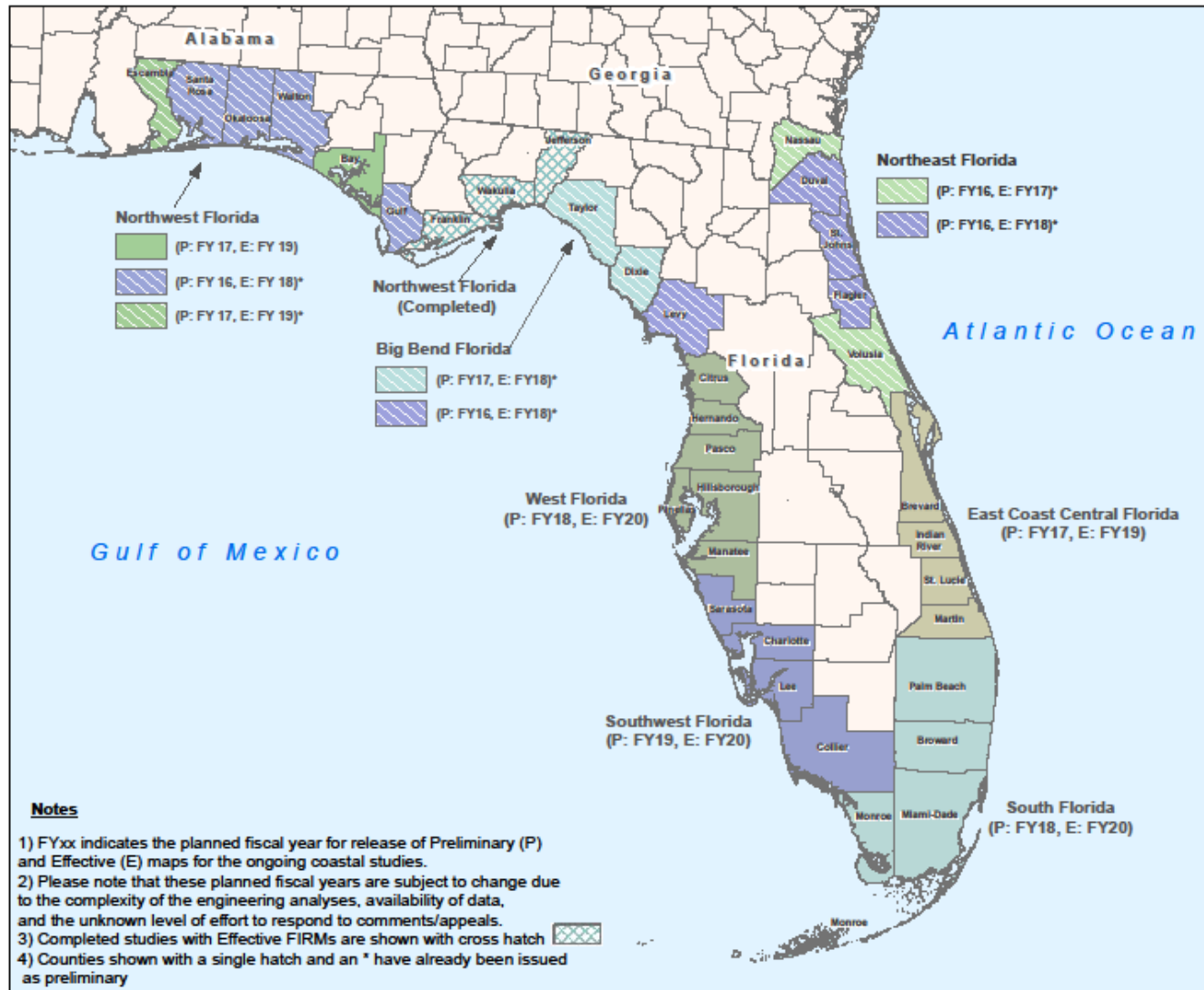
**Phases 2 and 3 - Technical Outreach Meetings**

During Phases 2 and 3, the Project Team conducts technical outreach meetings with community FPAs and other technical staff.

• **During Technical Update Meetings**, the Project Team presents an overview of the coastal study methodology, the planned production schedule, and results of the study to date. Discussions during these meetings focus on technical topics, such as storm surge model development, identification and classification of storm parameters, and storm validation.

• **During Storm Surge Analysis Update Meetings**, the Project Team summarizes activities to date, reviews the results of the storm surge and stillwater analysis portions of the study, explains how the storm surge and stillwater analyses may be used to update the information shown on the effective FIRMs, and Flood Insurance Study (FIS) reports, and describes the other components that will be used in conjunction with the storm surge to create the updated FIRMs and FIS reports.

# FEMA Coastal Hazard Mapping and Beyond



Florida: FEMA Coastal Study Status (as of 1/30/2017)



*We don't know all the flood hazards...*



*Questions?*