Northeast Florida and Georgia Surge Study – FEMA

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Overview

* Study Location
* Objectives
* Methodology
  * Wave and Surge Modeling
  * Wind Field Simulation
  * Statistical Approach
  * Overland Wave Modeling
  * Hazard Zone Mapping
* Project Schedule
* Other FEMA Region IV Projects

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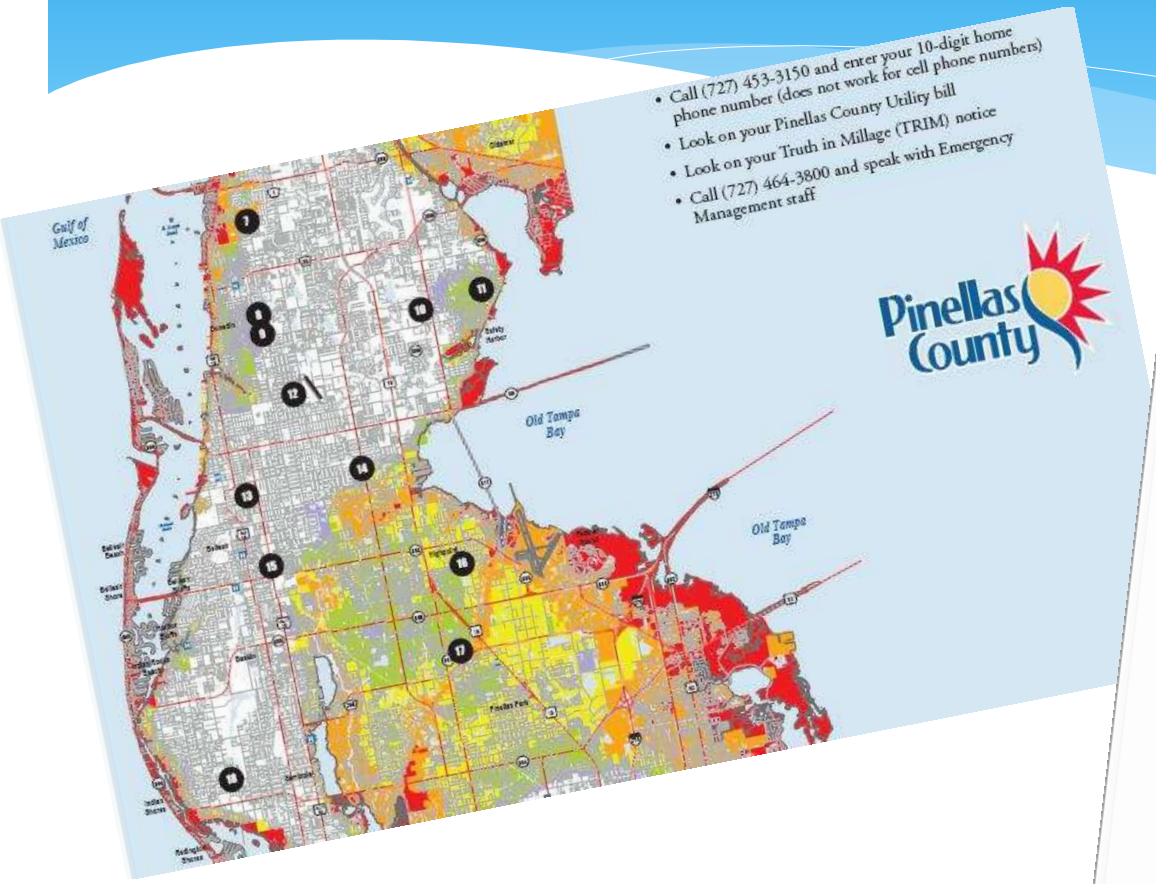
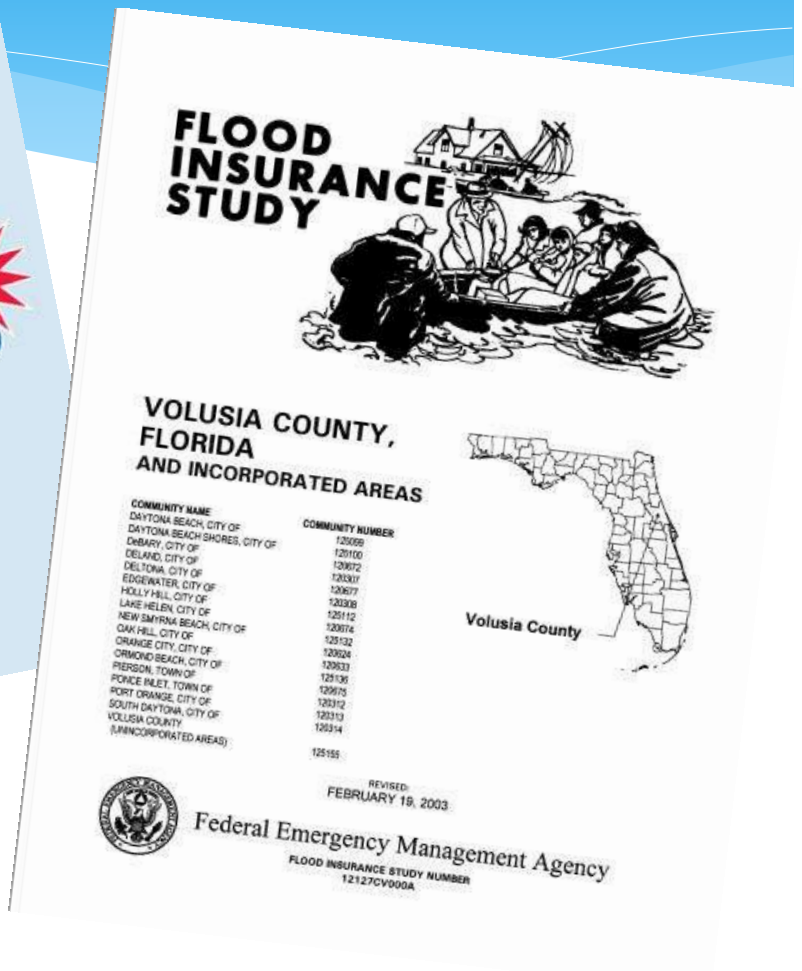
What the Study Is and Isn't





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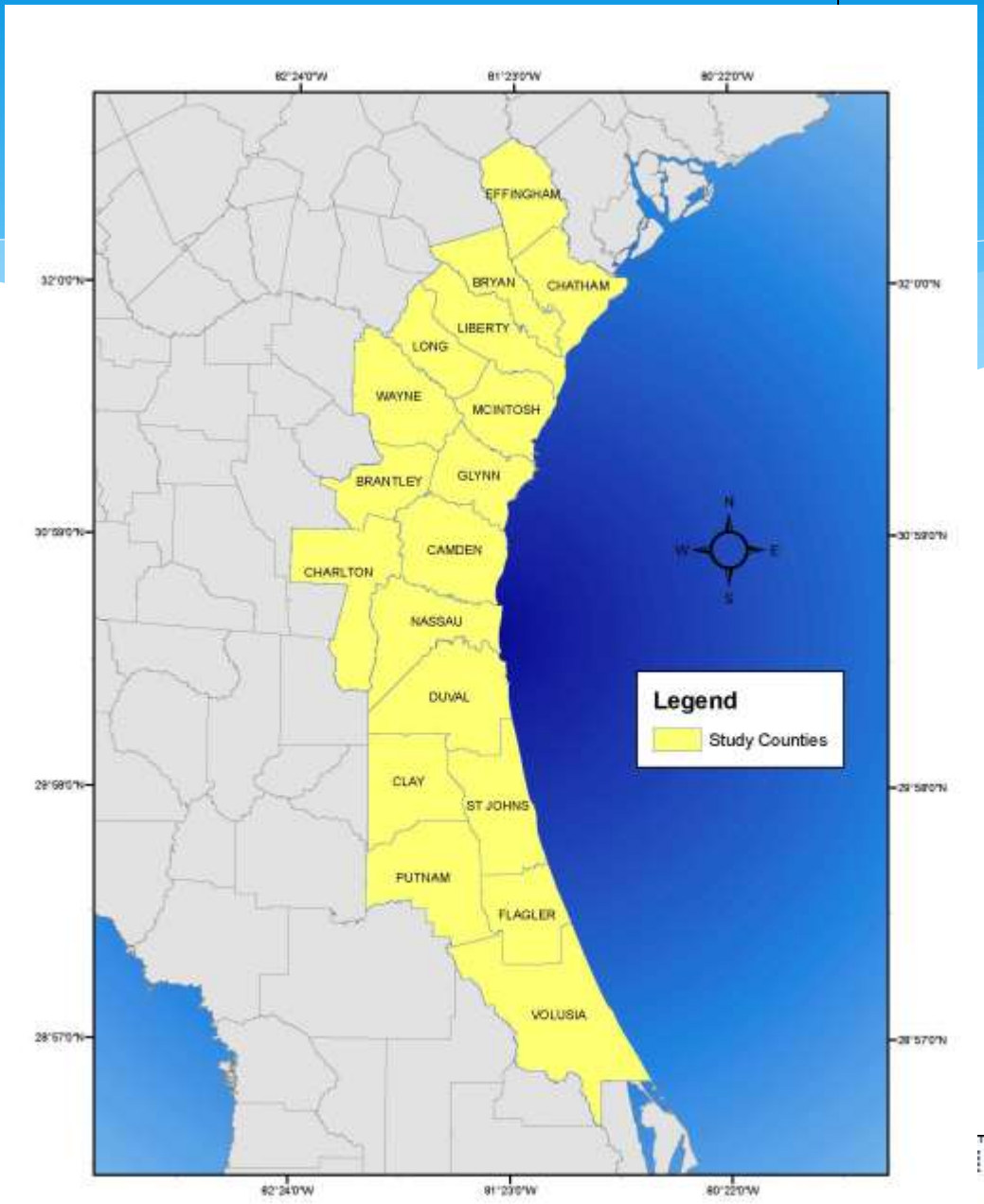
Study Location

* Entire coast of Georgia and Florida counties north of Brevard

* Extend inland to 40 ft contour



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Objectives

* New surge modeling to develop 1% annual chance surge elevations (100-year)
  * Develop 4-percent, 2-percent, and 0.2-percent-annual-chance elevations (a.k.a. 25-, 50-, 500-yr) as well
* New gage data analysis for 50, 20, and 10% annual chance surge elevations (a.k.a 2-, 5-, 10-yr)
* New overland wave modeling
* New flood hazard work maps

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Wave and Surge Modeling

* ADCIRC and SWAN Coupled Model
  * Identical, unstructured mesh with shared parallel computing infrastructure
  * Run sequentially in time
  * Wave induced water level changes
* Mesh Development
  * Good elevation data critical
  * Identification of significant coastal features

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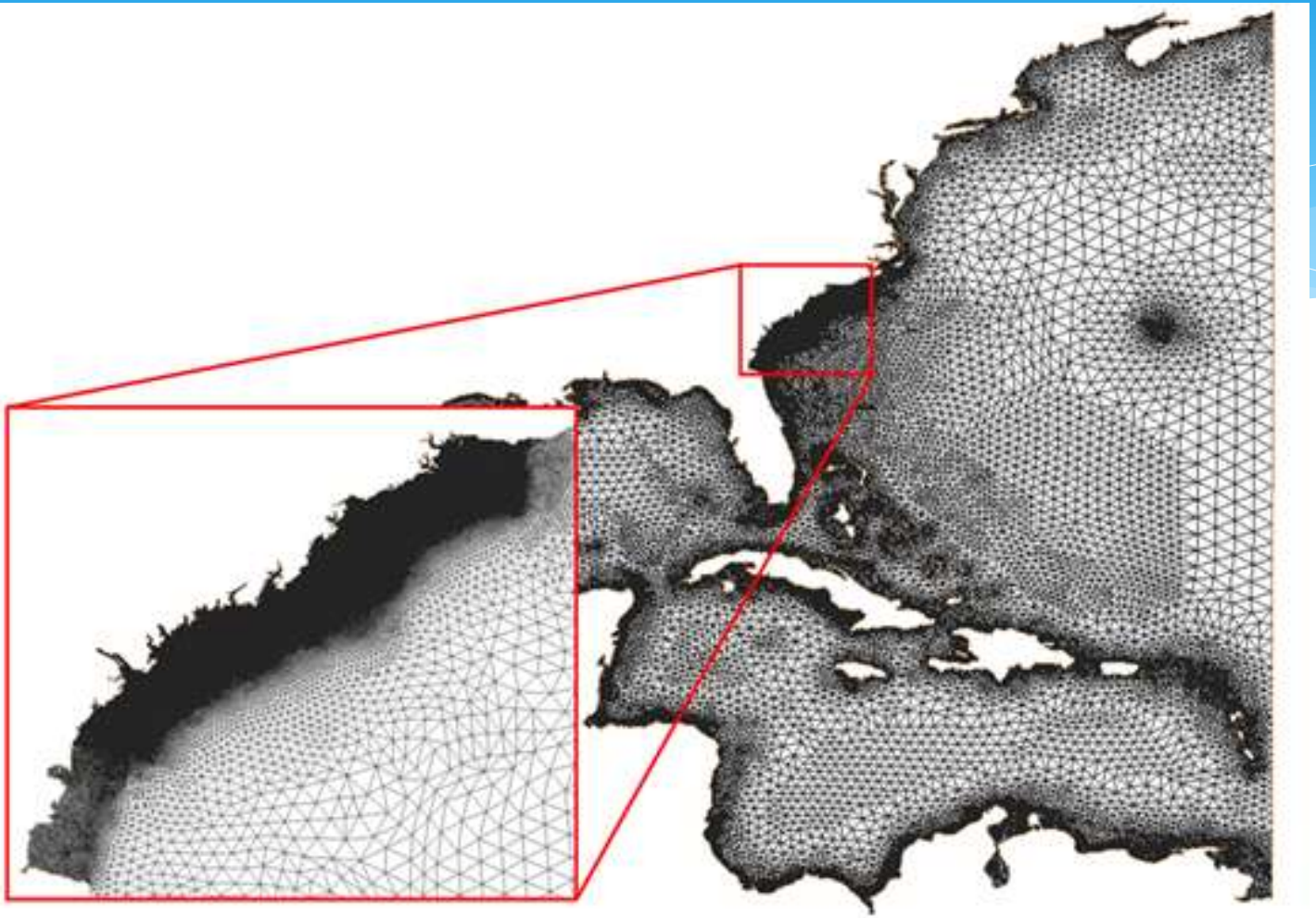
ADCIRC



Example of detail in recently completed South Carolina Mesh

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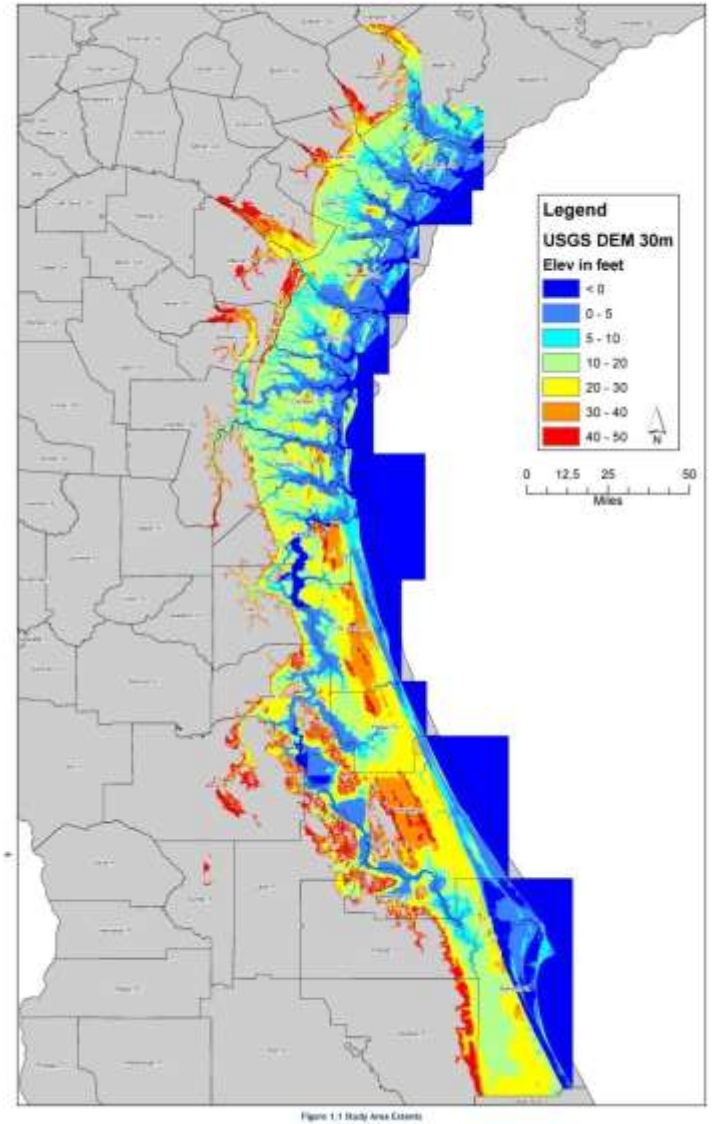
Elevation Data

* LiDAR Data for Georgia and Florida coastlines
* Supplement with USGS DEMs
* Compile NOAA (and other) bathymetric data
* Convert vertical datum to NAVD88



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Field Reconnaissance

* Crews to identify significant coastal features that would affect mesh generation/ADCIRC modeling
* Critical to get features identified by local stakeholders
* Two person crews, two weeks

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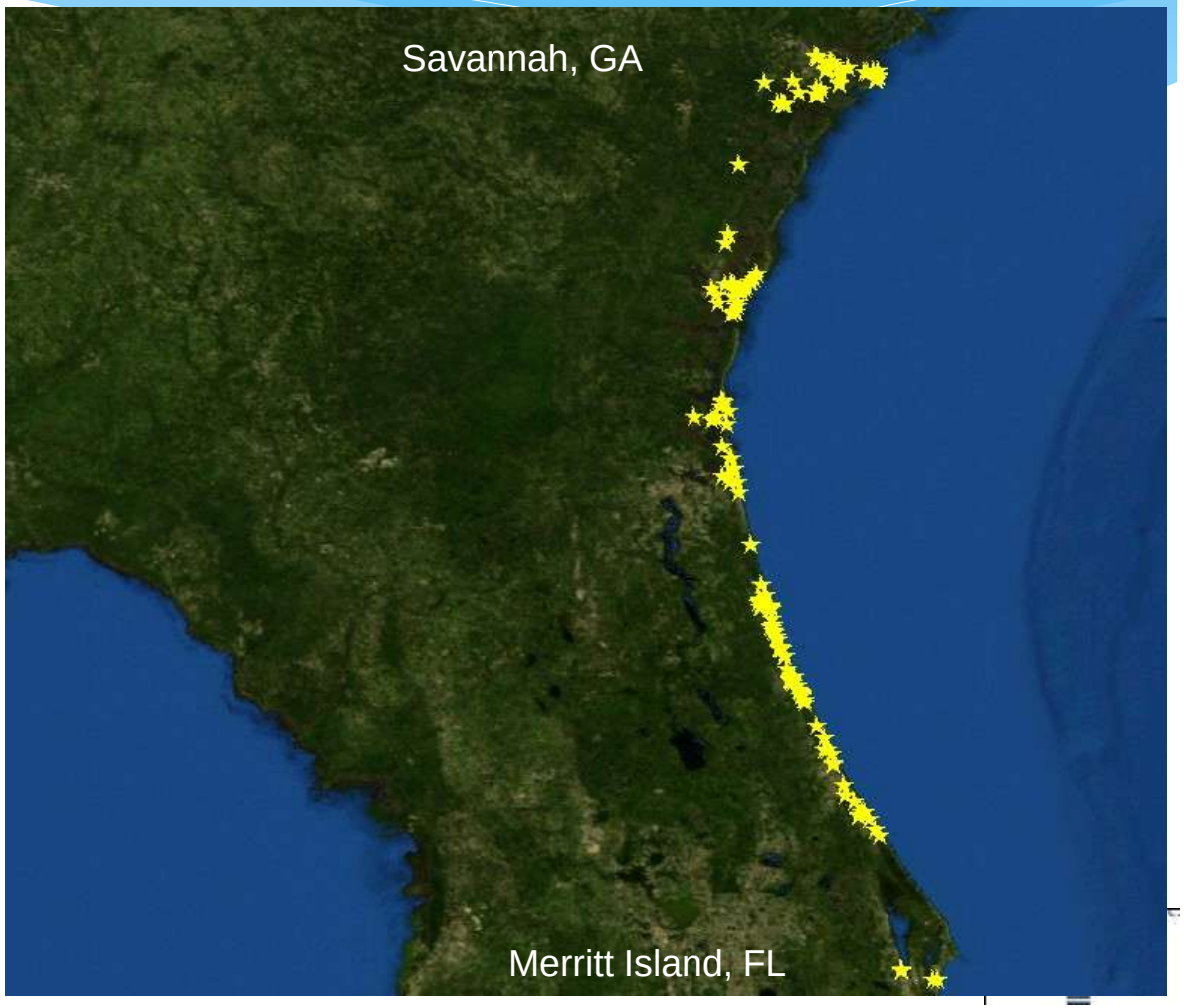
Field Reconnaissance

142 locations included:

* Waterfront Structures
* Beach/Dune Systems
* Bridges
* Wetlands
* ICWW



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Hydraulic Structures

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Beaches and Dunes

Land Cover and Land Use

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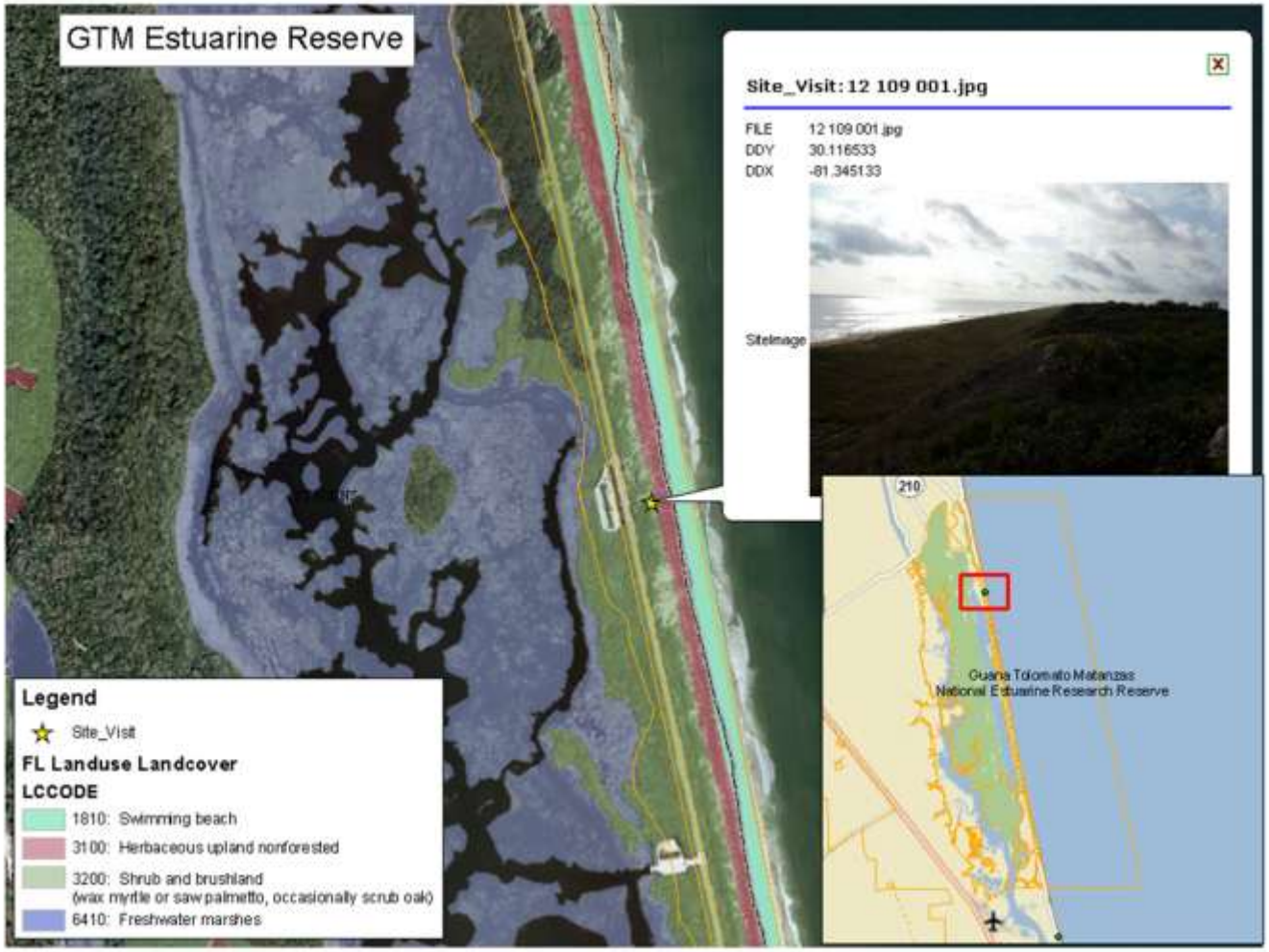
Conveyance Systems

GIS Database



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GIS Database

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ADCIRC Mesh Development

* Grid resolution drives costs
  * What resolution is good enough? Too much or too little?
  * Canal/riverine features, levees/berms, hydraulic constrictions
* Extensive sensitivity analyses
  * Grid sizes, channel features/conveyance
  * Conclusion

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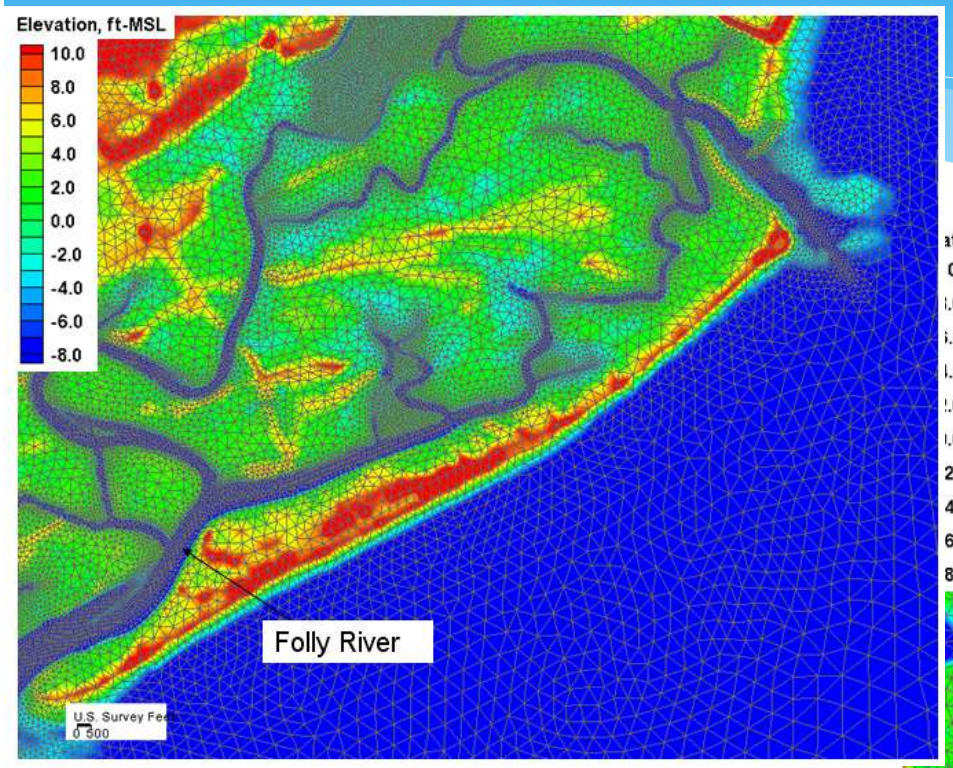
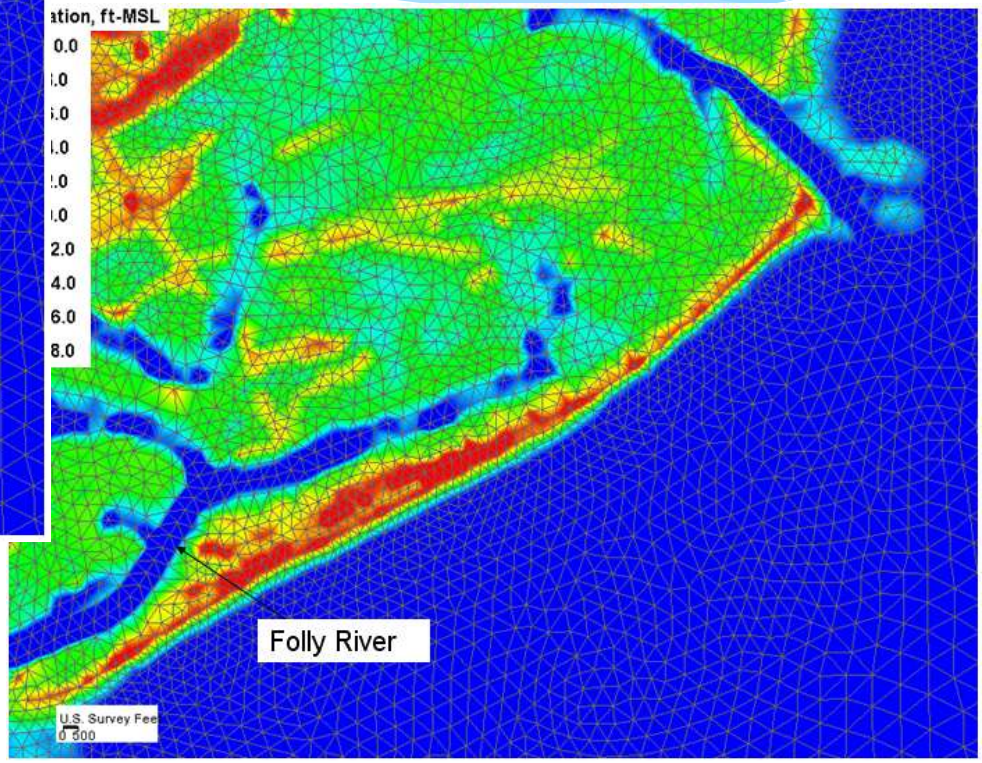
Examples of Mesh Sensitivity Test



30 meter mesh detail



150 meter mesh detail

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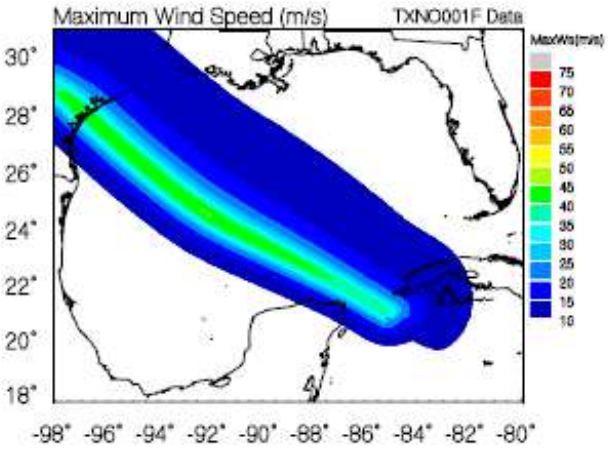
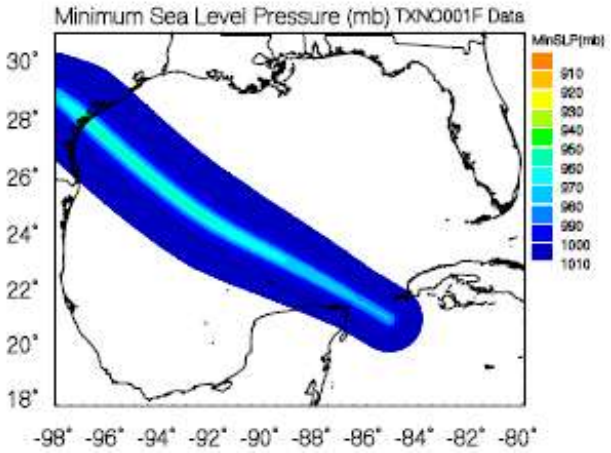
Wind and Pressure Field Development

* Developed with JPM-OS procedure as objective – preliminary estimate of 850 storms
* Wind/pressure fields for the validation storms are based on observed data supplemented with theoretical values
* Team member OceanWeather
* Example Oceanweather wind and pressure field (maximum)





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Model Forcing and Validation

* Tides
  * ADCIRC response to tides
  * Simulate multiple tides and examine results
* Historic Events
  * Explore existing data
  * Create wind field for historic events
  * Simulate event and examine results

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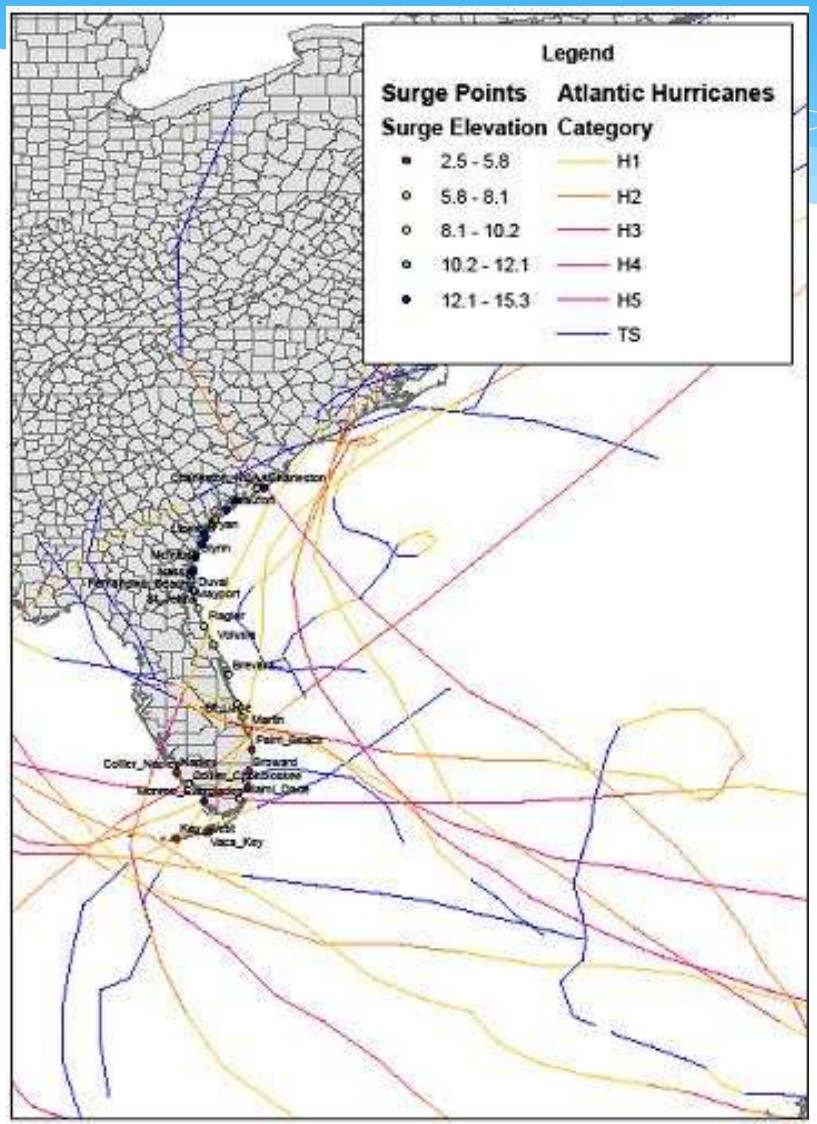
Historic Events



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Statistical Approach

Joint Probability-Optimal Solution (JPM-OS) method,

* Develop an array of synthetic storms
* Five primary parameters
  * Central pressure deficit
  * Radius to maximum wind speeds
  * Storm track heading
  * Forward velocity
  * Shoreline crossing point
* Run enough storms to give valid statistical sample set

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Statistical Approach

* 4-percent, 2-percent, 1-percent, and 0.2-percent-annual-chance elevations (a.k.a. 25-, 50-, 100-, 500-yr)
  * Compute storm surge statistics
  * Combine storm surge elevations with tides and account for nonlinear interaction between the two
  * Construct storm surge histograms at each target site
  * Adjust each storm surge histogram for secondary contributions

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Statistical Approach

* 50-percent, 20-percent, and 10-percent-annual-chance elevations use tide gauge analyses (a.k.a 2-, 5-, 10-yr)
  * Compile available tide gage data
  * Supplement these with simplified hydrodynamic modeling or regression analysis where necessary
  * Perform a statistical analysis of the data

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Results: New Surge Elevations

* Combine statistical results into a 2-d surge surface
* Been a long time since FEMA has done this in Florida
  * Most studies in 70's and 80's
* Will be presented in FIS text, as you have had in past

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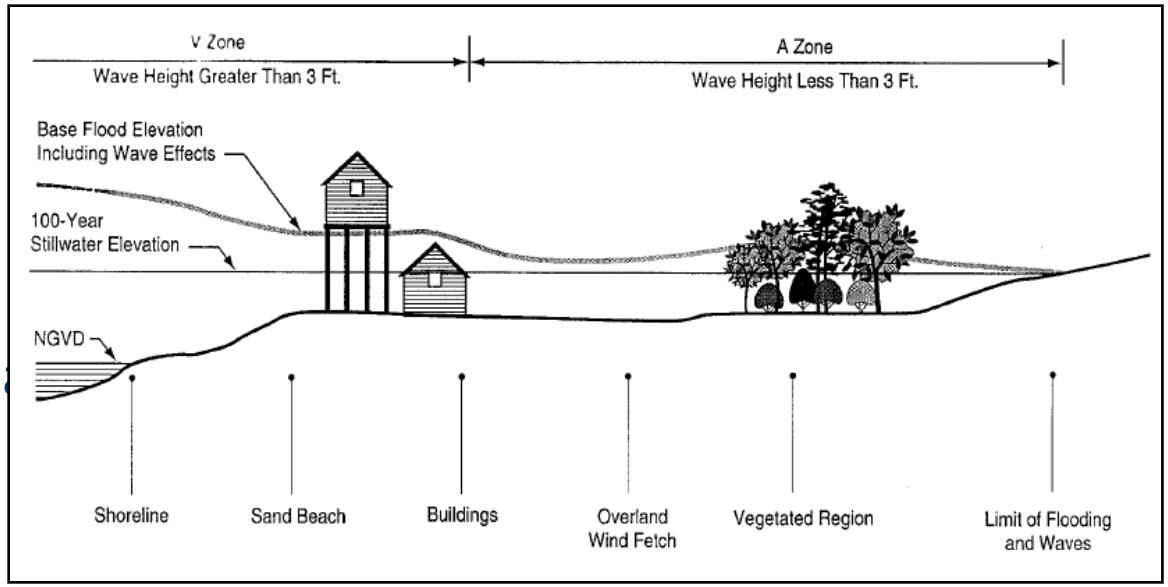
Overland Wave Modeling

* Wave Height Analysis for Flood Insurance Studies – WHAFIS
  * 1-D model – using GIS allows huge amount of transects
  * Capable of variable obstructions including vegetation types (rigid & flexible) and buildings (area of obstruction)



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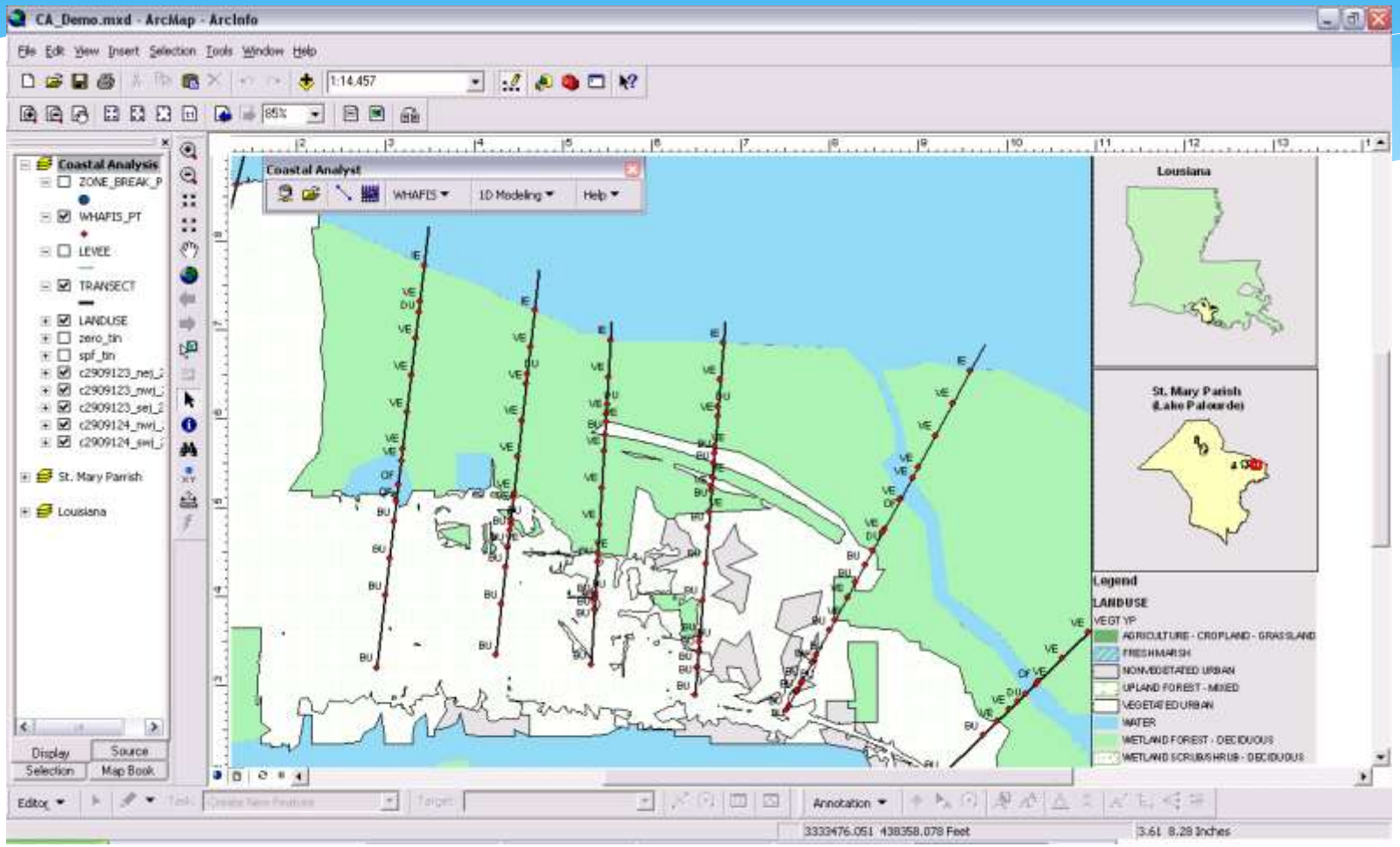
Coastal Flood Hazard Work Maps



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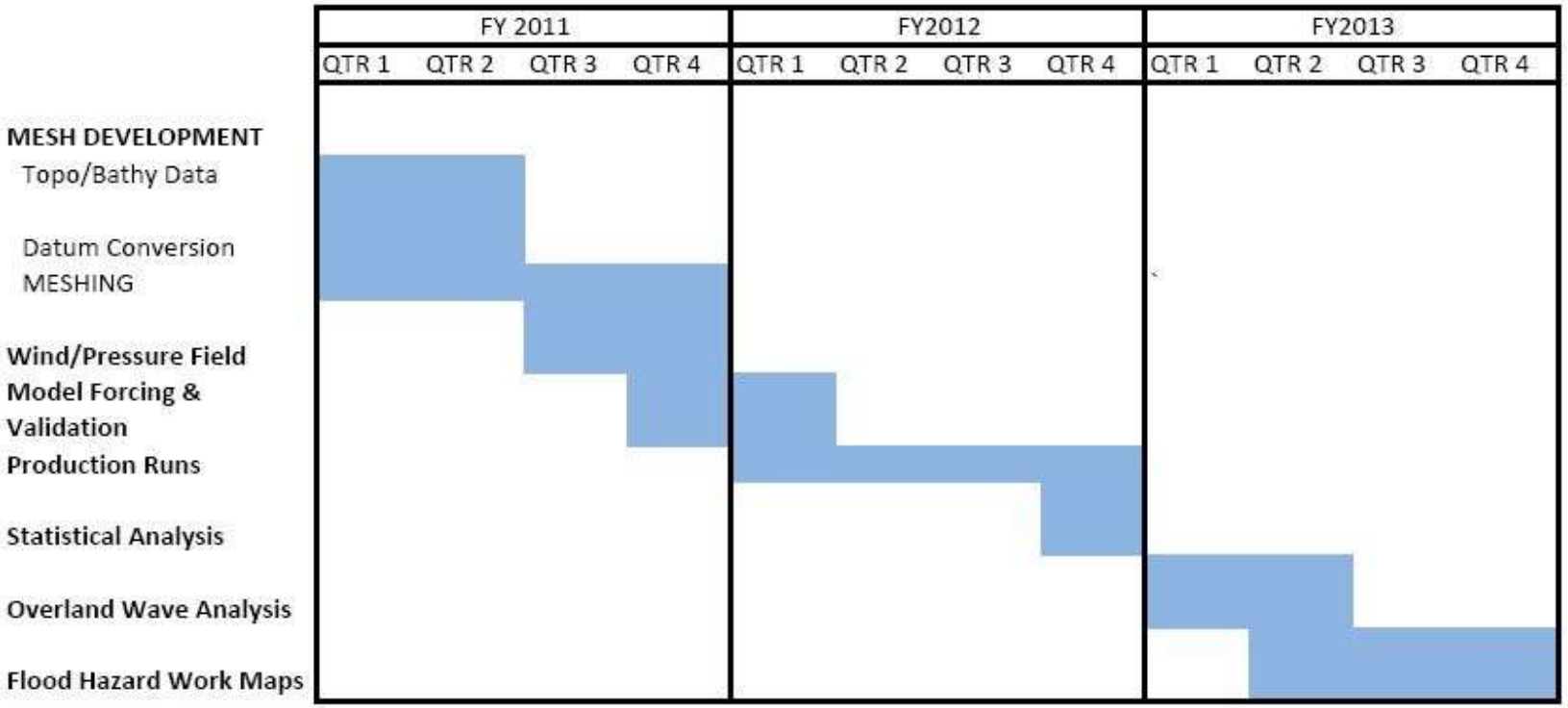
Project Schedule



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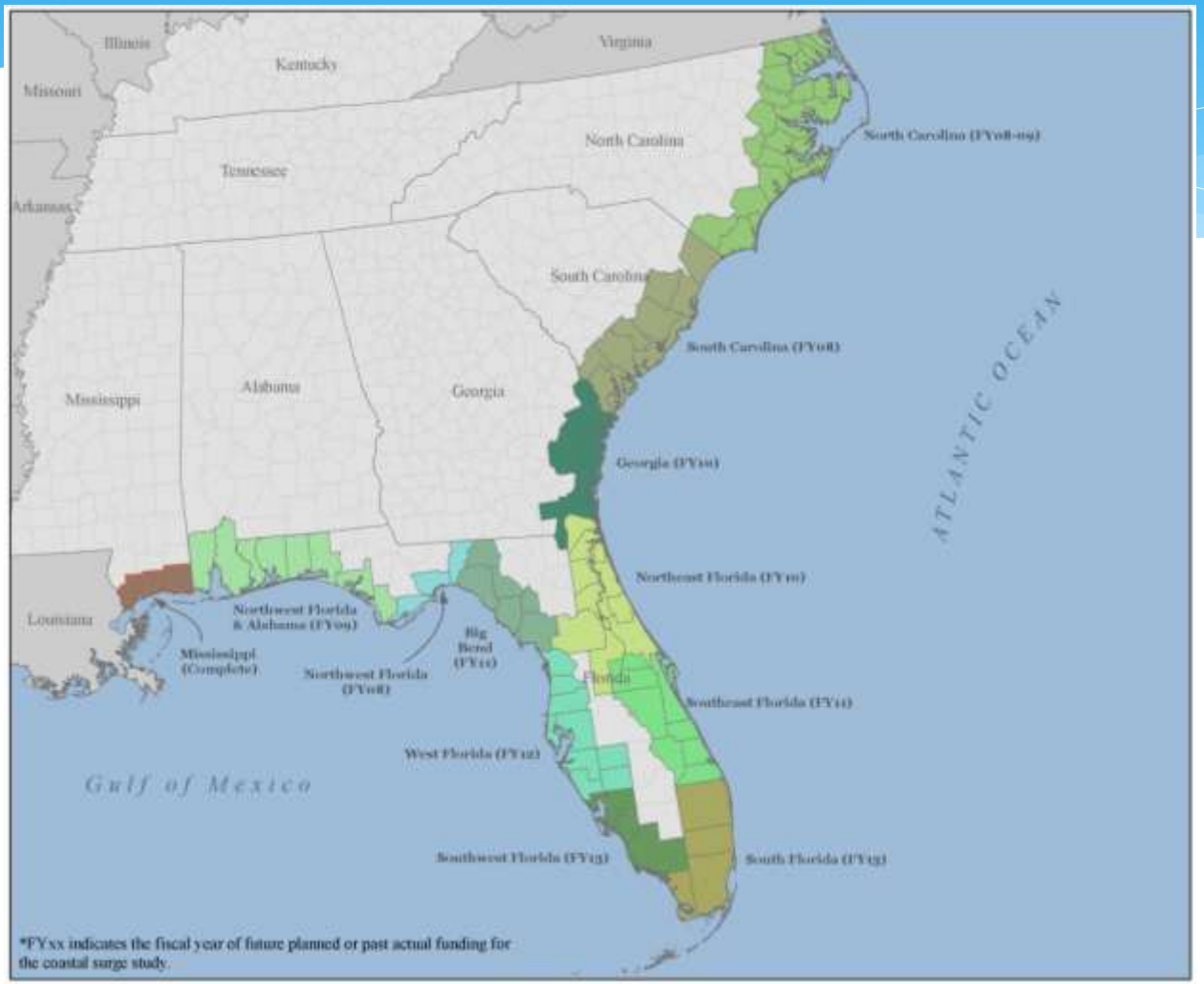
FEMA Region IV Surge Studies



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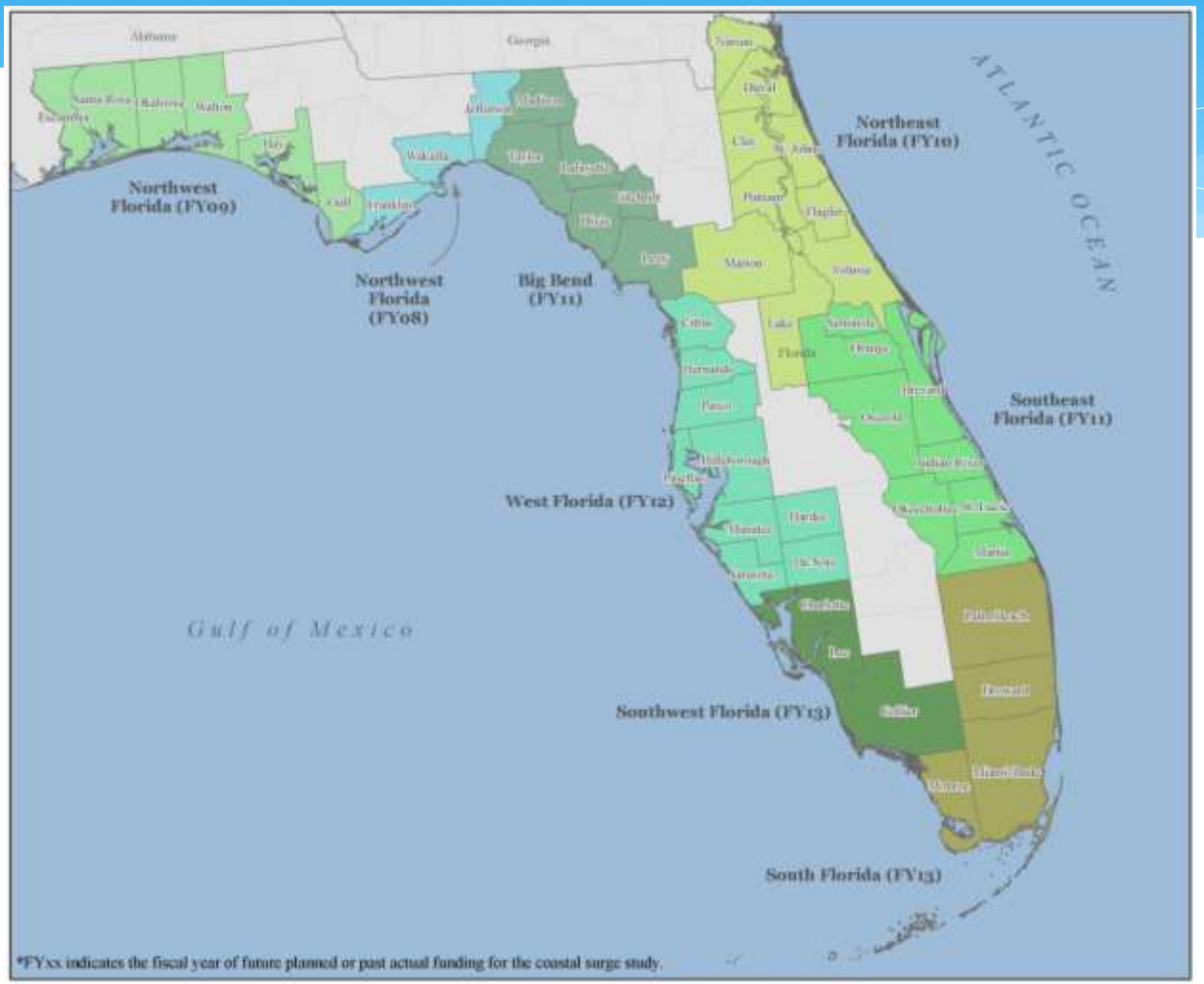
FEMA Florida Surge Studies



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Questions?

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