



FEMA

Technical Outreach Southwest Florida

Location: Port Charlotte, Florida

September 23, 2014

RiskMAP

Increasing Resilience Together



Agenda

- **Welcome**
- **Purpose of Meeting**
- **Risk MAP and Coastal Study Overview**
- **Southwest Florida Study Information**
- **Southwest Florida Draft Results**
- **Upcoming Work and Path Forward**
- **Wrap-Up**
- **Breakout Sessions**



Welcome

■ Risk MAP Project Team

- FEMA Region IV
- Florida Division of Emergency Management (FDEM)
- South Florida Water Management District (SFWMD)
- RAMPP staff (study contractor)



Welcome

- **State partners and officials**
- **Officials from local communities**
 - CEOs/Elected officials
 - Floodplain administrators
 - Emergency planners
 - Township engineers
- **Universities**
- **Other federal agency partner representatives**

Purpose of Meeting

- **We are here to...**

- Promote engagement with the technical community
- Provide an overview of FEMA Risk Map Program and Region IV Coastal Study
- Discuss the Southwest Florida Coastal Surge Study and the status of the study
- Discuss the study methodology and initial results
 - Mesh Development
 - Storm Climatology
 - Validation Storms
- Gather technical inputs and feedback from you

Purpose of Meeting

- **Don't we already have a recent study?**
 - Yes, but different project methods and goals...

FDEM Evacuation Study	FY '13 FEMA Surge Study
Inundation levels for evacuation planning	Mapping 1% annual chance flood hazard
Included entire Florida coast	Focus on Southwest Florida counties
Base data includes recent LiDAR data	Base data includes recent LiDAR data
SLOSH model	ADCIRC and SWAN models

Purpose of Meeting

- **Your Role is Important!**

- Share local data or new information
- Identify potential contentious issues
- Provide inputs on coastal study methodology
- Relate study information and status to other stakeholders
- Brainstorm potential mitigation activities and document activities



Purpose of Meeting

- **Outreach Efforts Past and Future**

- Discovery Meetings
 - Charlotte and DeSoto Counties (March 5, 2014 – Port Charlotte)
- Mesh Review Meeting – Today!
- Storm Surge Analysis Meeting – Third Quarter 2016
- Flood Risk Review Meeting – Fourth Quarter 2017
- CCO Meeting – Fourth Quarter 2018

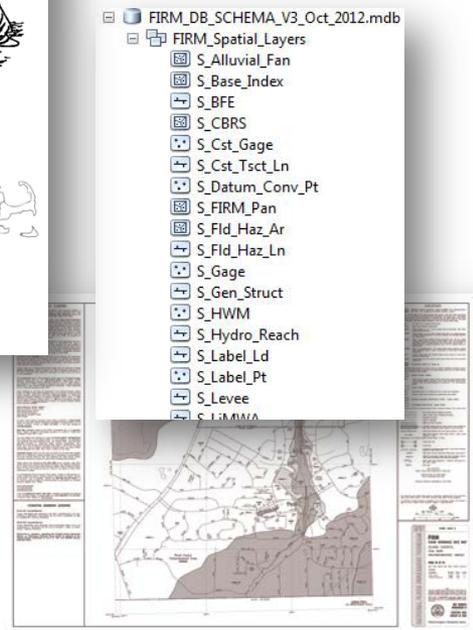
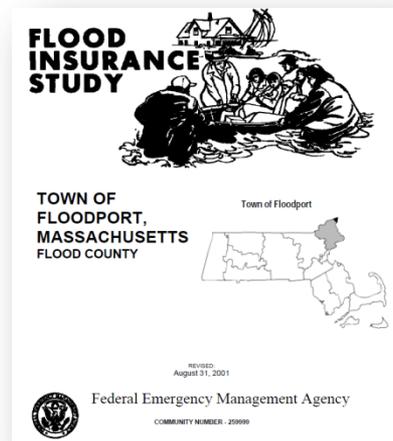
Risk MAP and Coastal Studies

■ Risk MAP Program

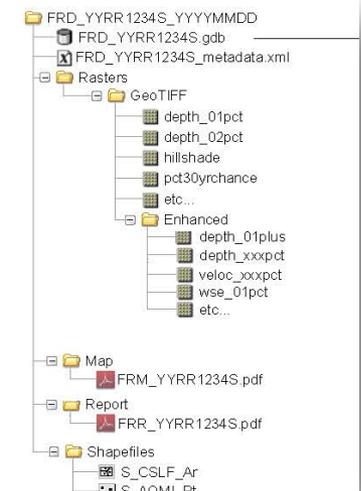
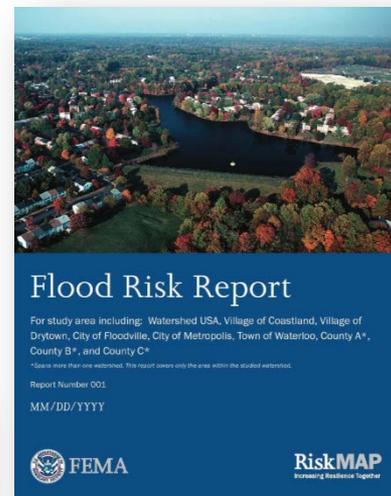
- FEMA works with communities to develop flood risk products and flood hazard maps that are:
 - Based on the best available data from the community and latest technologies
 - Conducted by watershed (Riverine)
 - Conducted by affected communities and counties (Coastal)
 - Strengthened by partnerships
- You can use Risk MAP tools and data to:
 - Create or improve your Local Mitigation Strategies (Hazard Mitigation Plans)
 - Make informed decisions about development, ordinances, and flood mitigation projects
 - Communicate with citizens about flood risk

Risk MAP and Coastal Studies

Regulatory Products

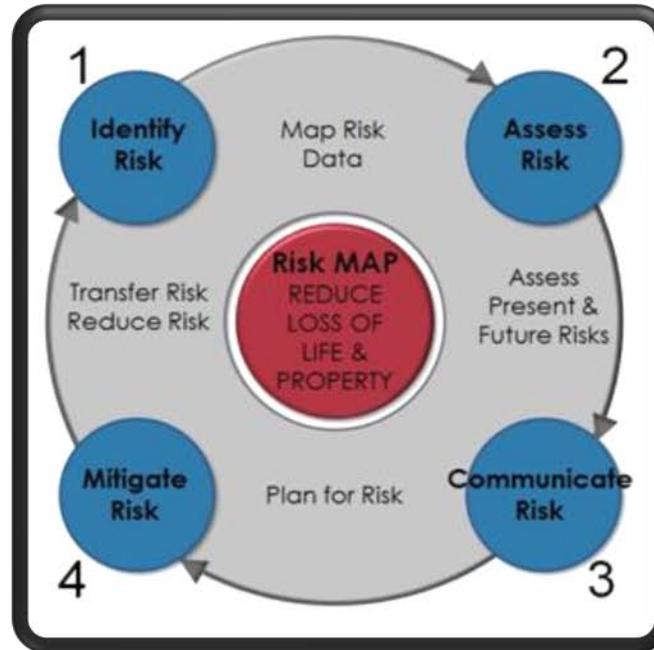


Non-Regulatory Products



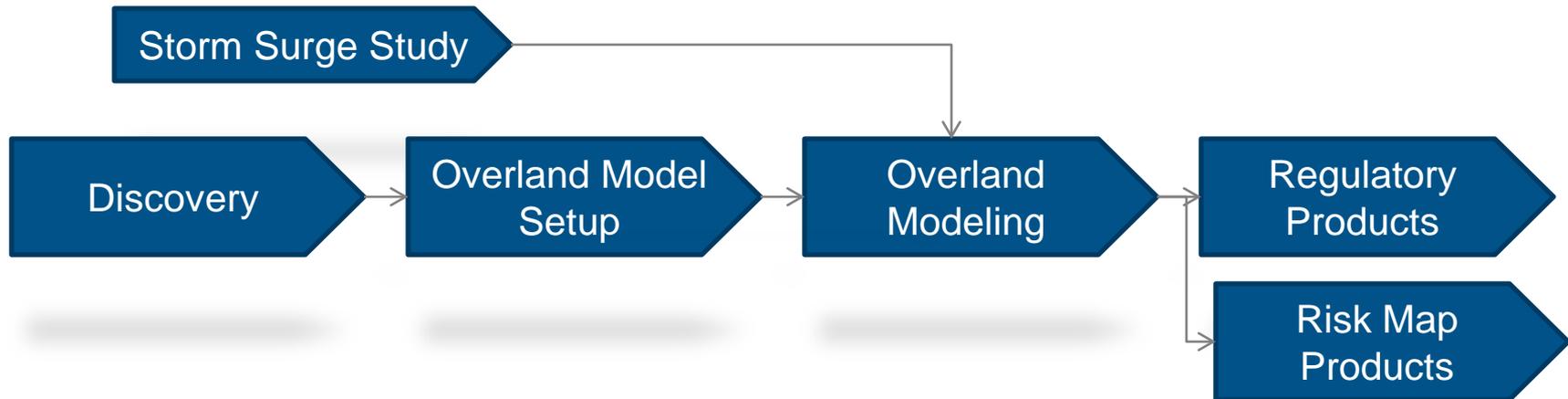
Risk Map and Coastal Studies

- Better defining of risk



Risk Map and Coastal Studies

- **Coastal Storm Surge**



Risk Map and Coastal Studies

■ Coastal Storm Surge

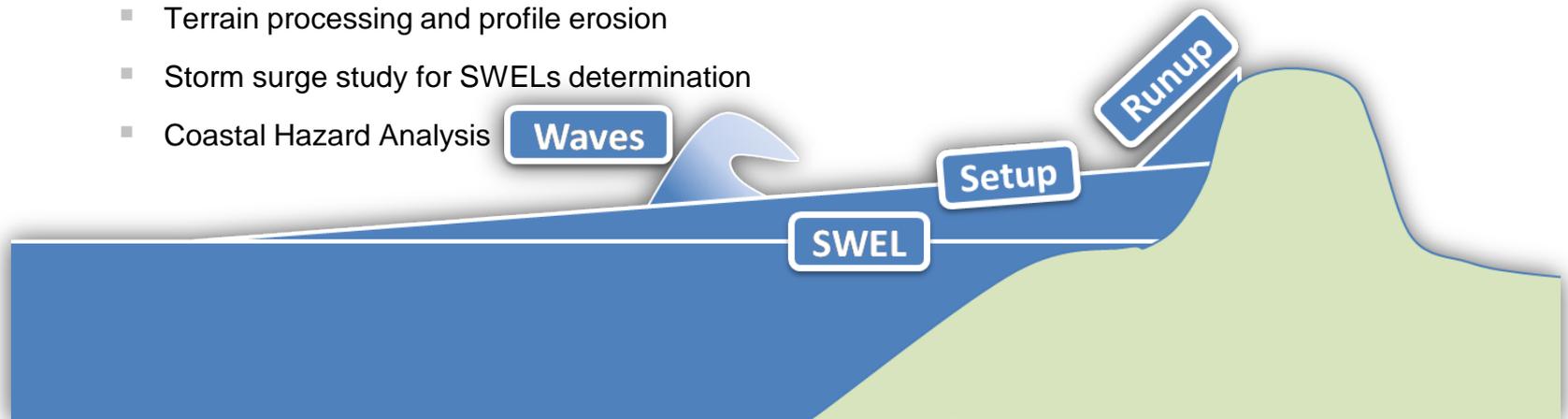
- Base Flood Elevation (BFE) on a FIRM includes 4 components:

- Storm surge stillwater elevation (SWEL)
- Wave setup
- Wave height above total stillwater elevation
- Wave runup above storm surge elevation (where present)

All applied to an eroded beach profile (when applicable)

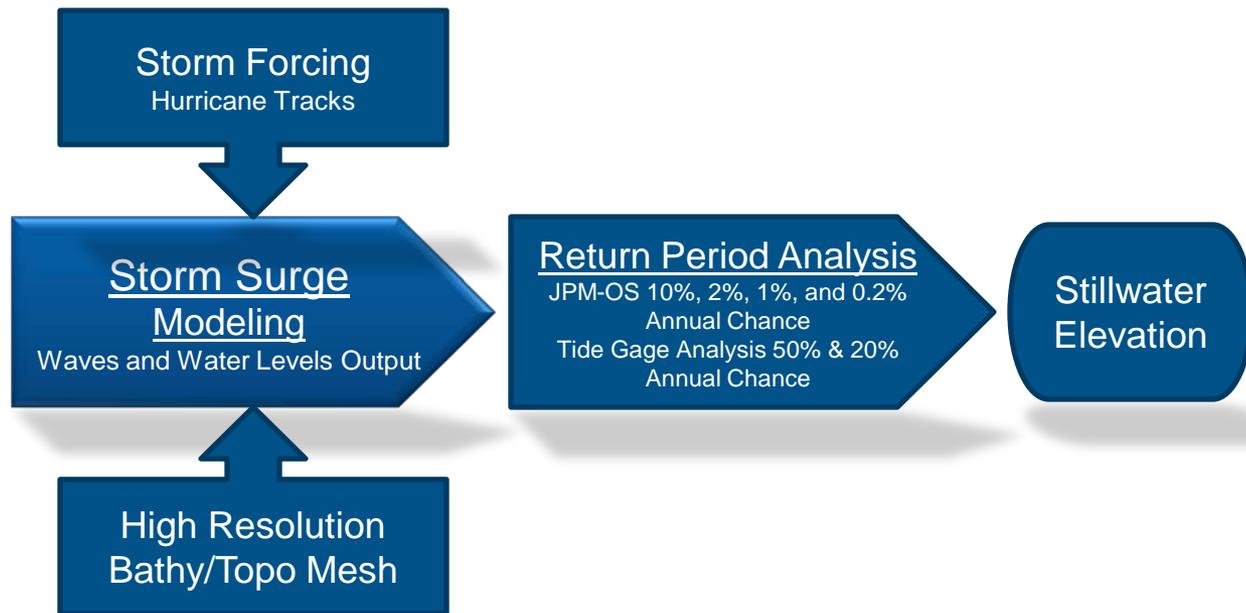
- The above components are computed through

- Terrain processing and profile erosion
- Storm surge study for SWELs determination
- Coastal Hazard Analysis



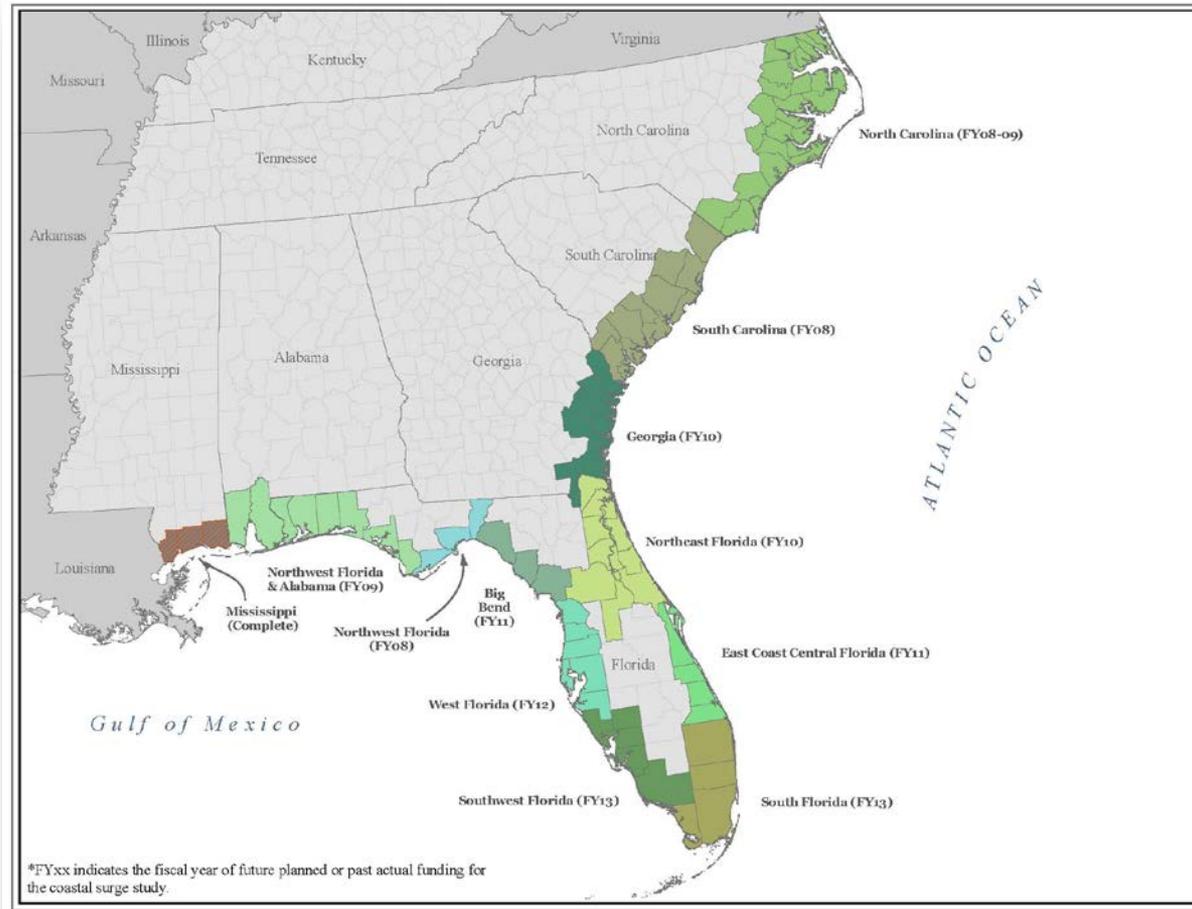
Risk Map and Coastal Studies

- Coastal Storm Surge

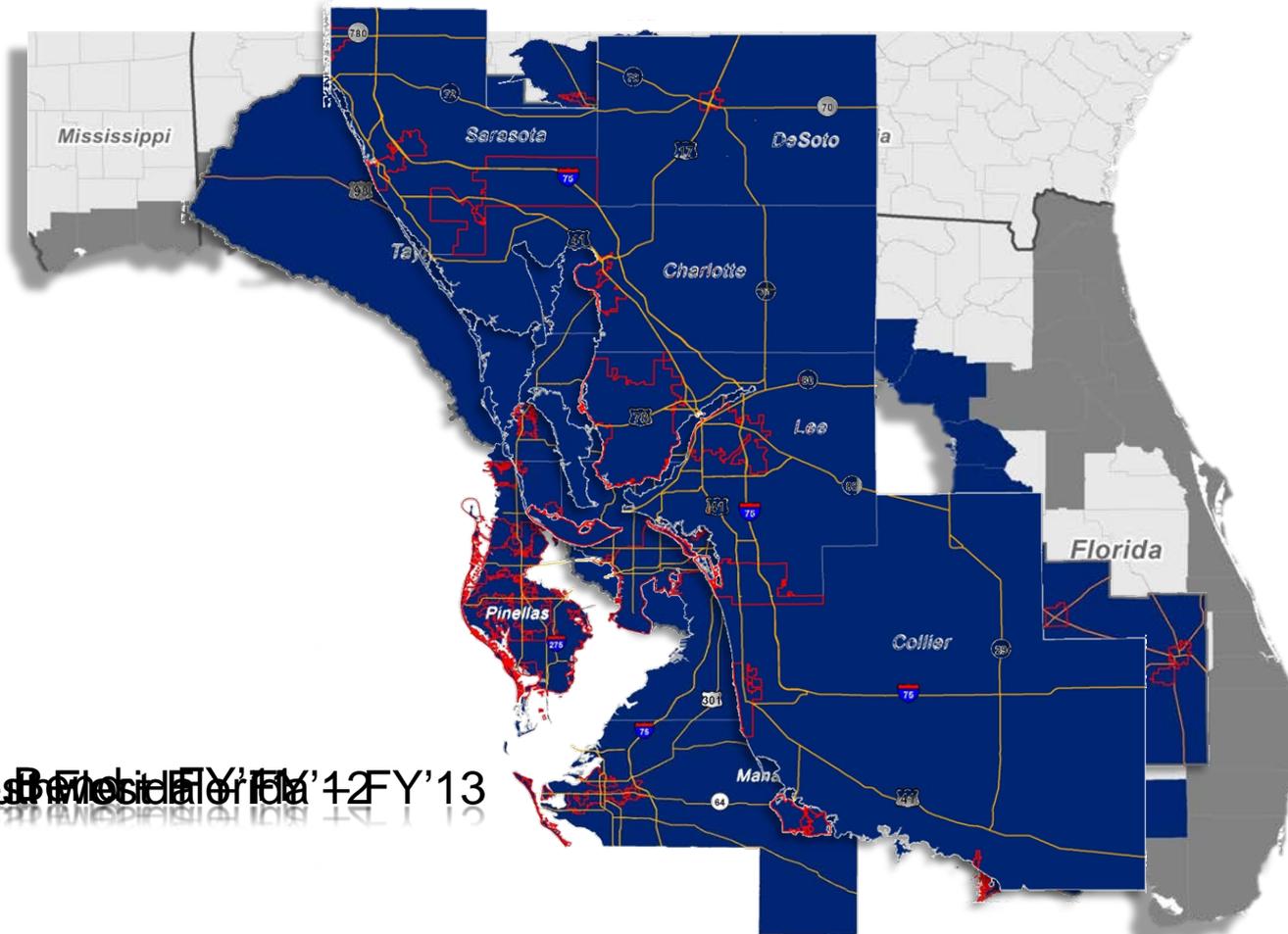


Southwest Florida Study Information

- **FEMA Region IV Coastal Studies and Timeline**



Southwest Florida Study Information



Big Bend Florida FY'11 - FY'13

Southwest Florida Study Information

- **Work Breakdown**

- **Work to be done by RAMPP (PTS):**

- Perform coastal storm surge and wave height analyses
 - Perform coastal floodplain delineation and develop workmaps
 - Develop coastal Risk MAP products
 - Support Discovery and Outreach to create ownership of the coastal analysis at state and local level

- **Work to be done by BakerAECOM (PTS):**

- Perform the preliminary map production
 - Perform post-preliminary map production and CCO/Open House Meeting

CCO: Community Coordination and Outreach

PTS: Production and Technical Services

Southwest Florida Study Information

■ Components and Timeline

- Intermediate Data Submittal #1
 - Digital Elevation Model
 - ADCIRC Mesh
 - Historic Climatology Review
 - Validation Storm Selection
 - *Usually takes about 3 to 4 months*
- Intermediate Data Submittal #2
 - Tide & Storm Surge Validation
 - Joint Probability Methodology setup
 - *Usually takes about 6 to 8 months*
- Intermediate Data Submittal #3
 - Production runs
 - Return Period Analysis
 - *Usually takes about 15 months*

Southwest Florida Study Information

■ Project Status

- Accomplished
 - Discovery Kick-off: February 2014
 - Discovery Meetings: March, 2014
 - Field Reconnaissance: January, 2014
 - Draft Transect Development: February 2014
 - Validation Storm Selection: March 2014
- Ongoing
 - Mesh Development: November 2013 – current
 - Storm Climatology: November 2013 – current
 - Validation Testing: February 2013 – current
 - Sensitivity Testing: February 2013 – current

Southwest Florida Draft Results

- **Mesh Development**

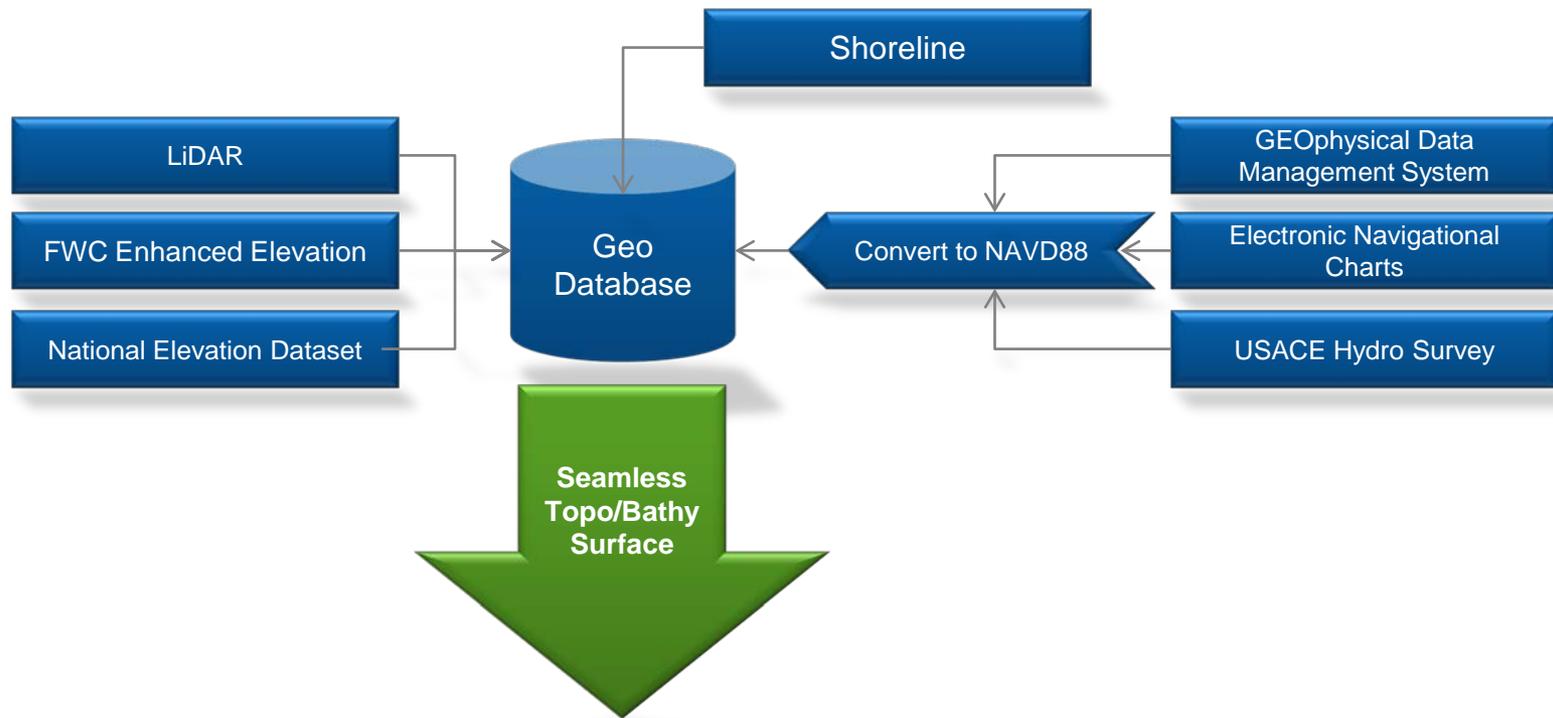
- Development of Seamless Topographic and Bathymetric Data Surface
- Development of ADCIRC Mesh

- **Storm Climatology**

- **Validation Storm Selection**

Southwest Florida Draft Results – Mesh

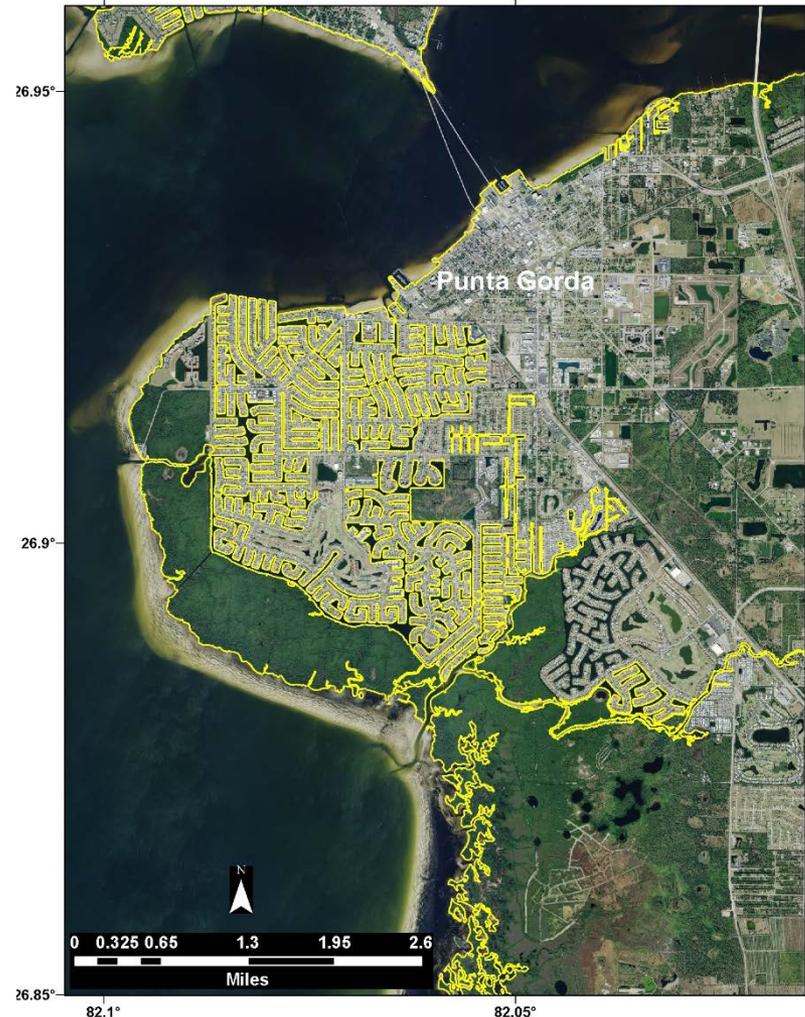
- Development of Seamless Topographic and Bathymetric Data Surface



FWC: Florida Fish and Wildlife Conservation Commission

Southwest Florida Draft Results – Mesh

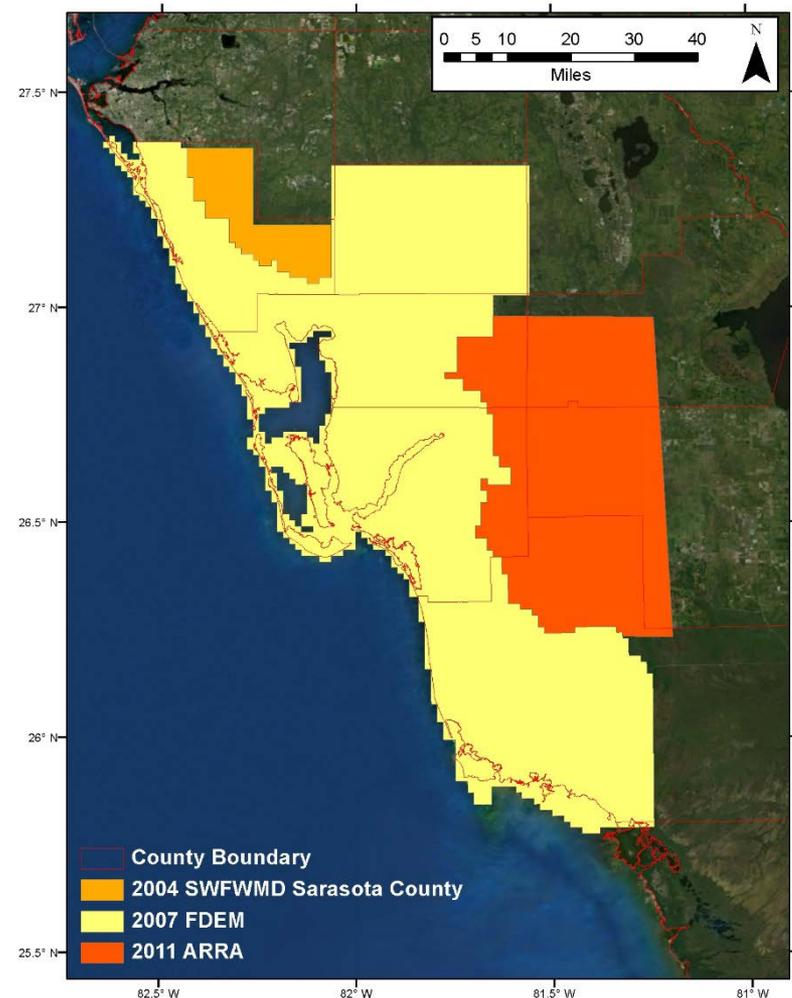
- **Shoreline Construction**
 - Sarasota, Charlotte, and Lee Counties shorelines were derived from 2007 FDEM LiDAR breakline featureclass.



Southwest Florida Draft Results – Mesh

■ Topographic Datasets

- Three separate LiDAR projects used to derive topographic information
 - 2004 SWFWMD – Sarasota County
 - 2007 FDEM LiDAR Project
 - 2011 American Recovery and Reinvestment Act (ARRA) LiDAR Project



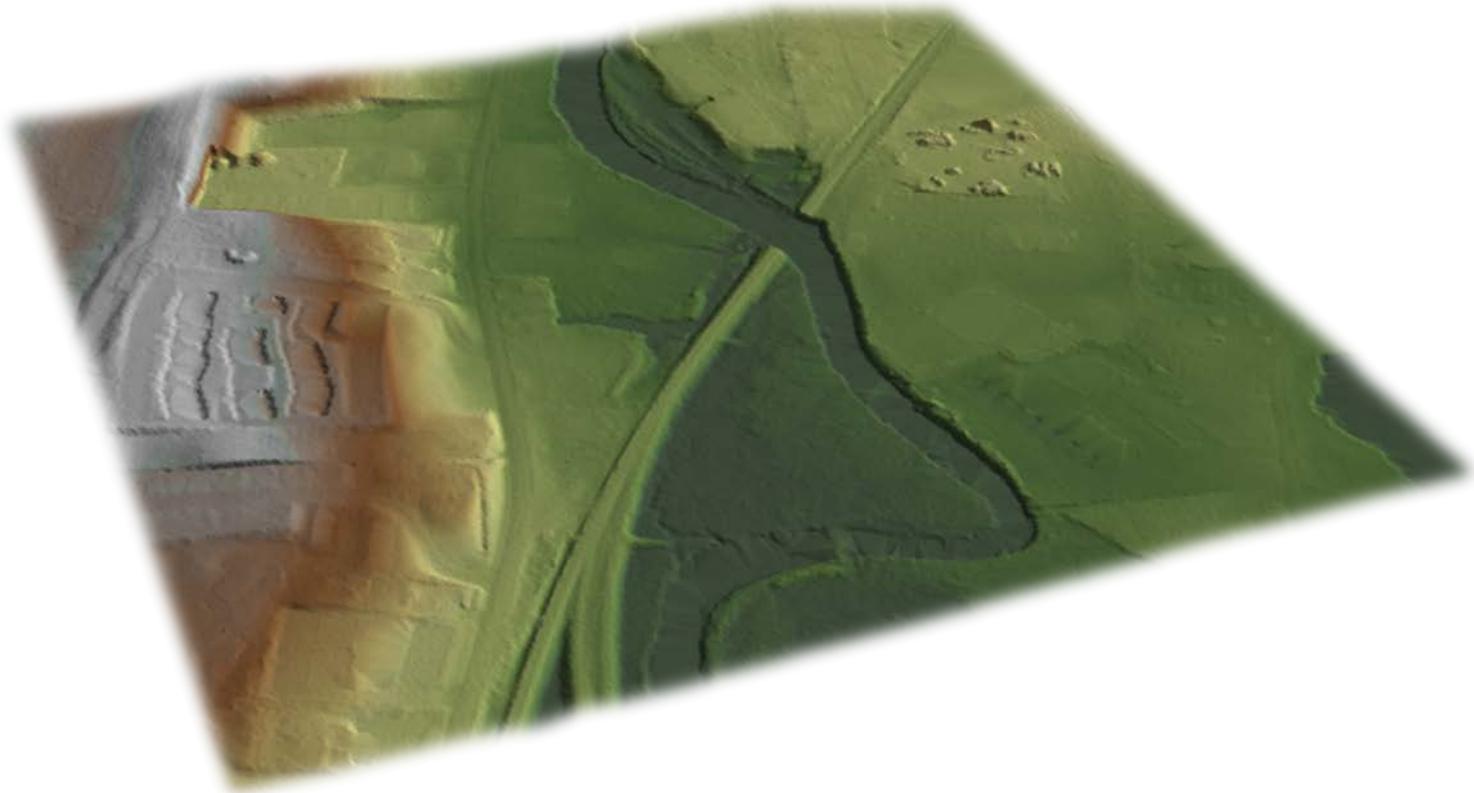
Southwest Florida Draft Results - Mesh

- **LiDAR Example**



Southwest Florida Draft Results – Mesh

- **LiDAR Example**



Southwest Florida Draft Results – Mesh

■ Bathymetric Data Sources

- NOS Surveys (1890's to 1971)
- USACE Channel Surveys (2008 – 2013)
- USACE JALBTCX LiDAR (2010)

NOS: National Ocean Service
ENC: Electronic Navigational Charts
GEODAS: GEOphysical Data Management System



Southwest Florida Draft Results – Mesh

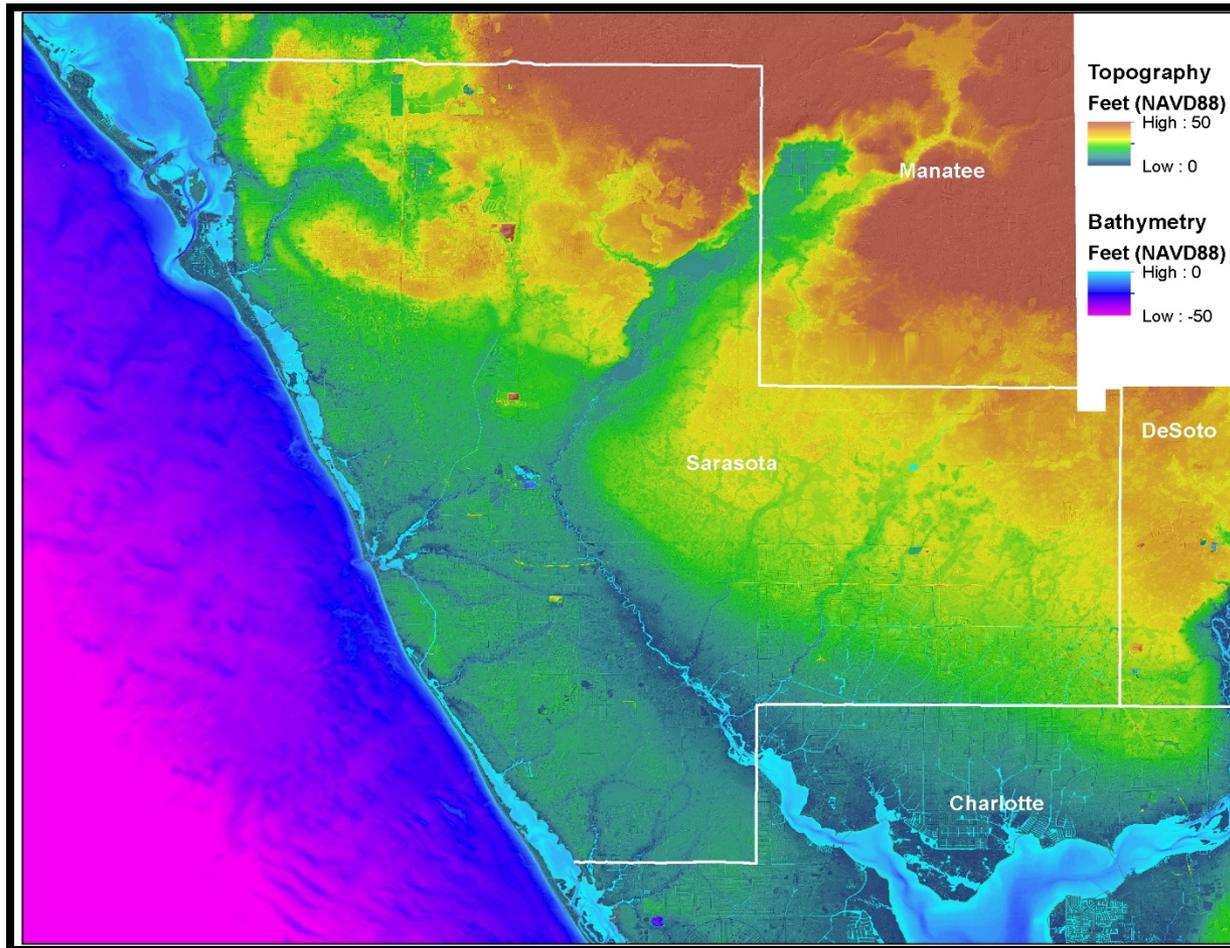
■ USACE Hydrographic Data

Dataset	Year Collected	Vertical Datum
USACE GIWW* CR to AR Charlotte County	2008	MLLW
USACE GIWW* Lee County	2008	MLLW
USACE Venice Inlet (Caseys Pass & IWW)	2008	MLLW
USACE Charlotte Harbor, Boca Grande Pass	2013	MLLW
USACE Fort Myers Beach Harbor	2013	MLLW
USACE Longboat Pass	2013	MLLW



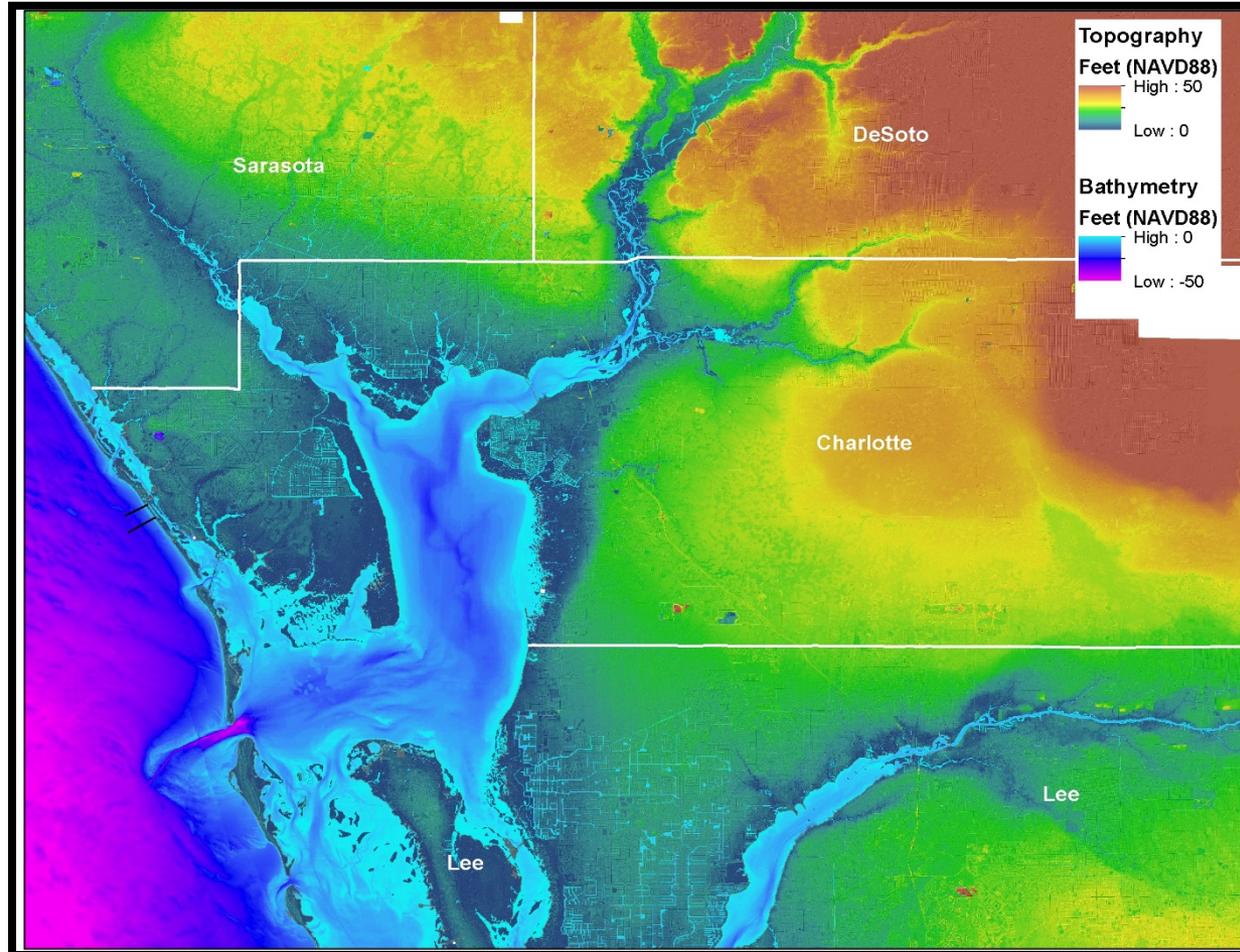
Southwest Florida Draft Results – Mesh

- **Seamless Topographic and Bathymetric Data Surface**



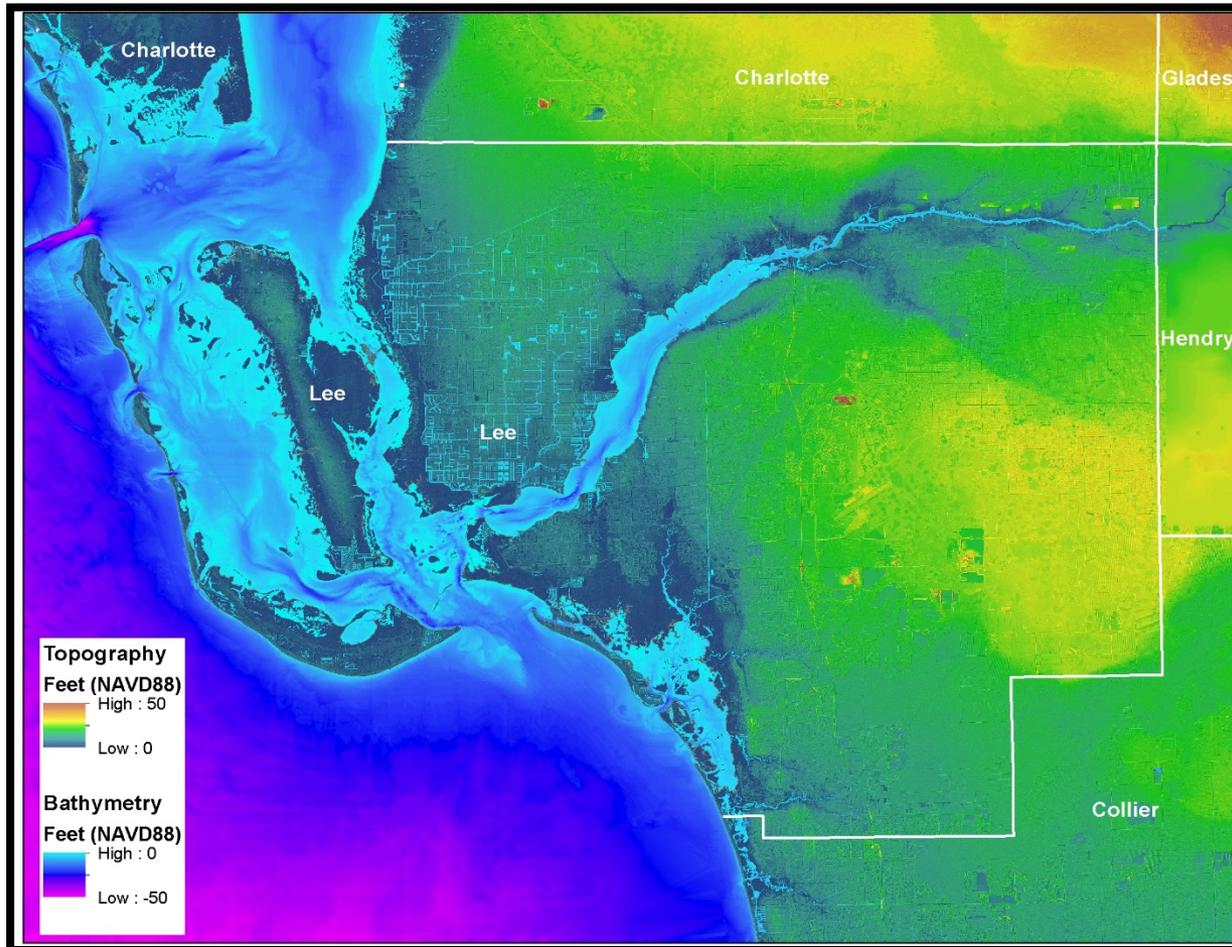
Southwest Florida Draft Results – Mesh

- **Seamless Topographic and Bathymetric Data Surface**



Southwest Florida Draft Results – Mesh

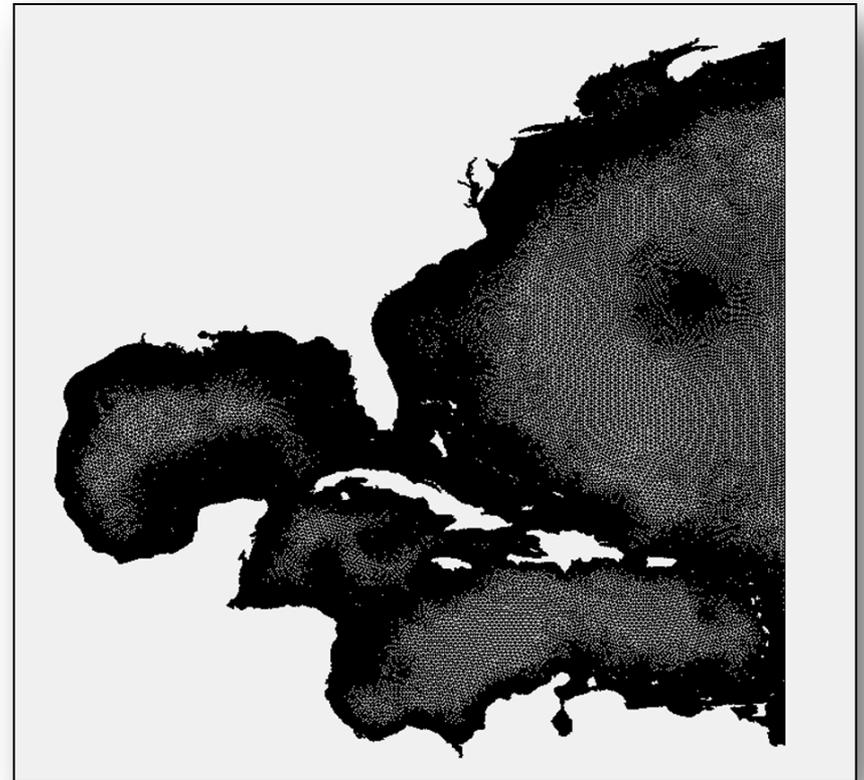
- Seamless Topographic and Bathymetric Data Surface



Southwest Florida Draft Results – Mesh

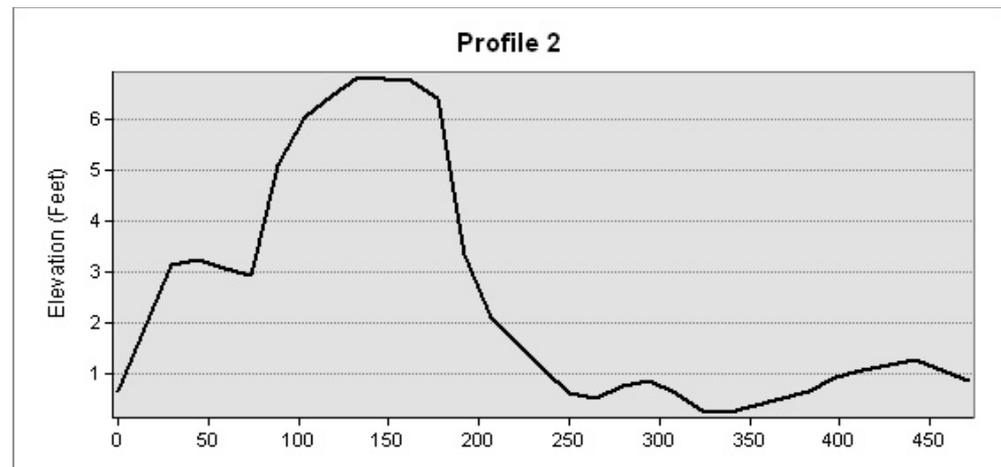
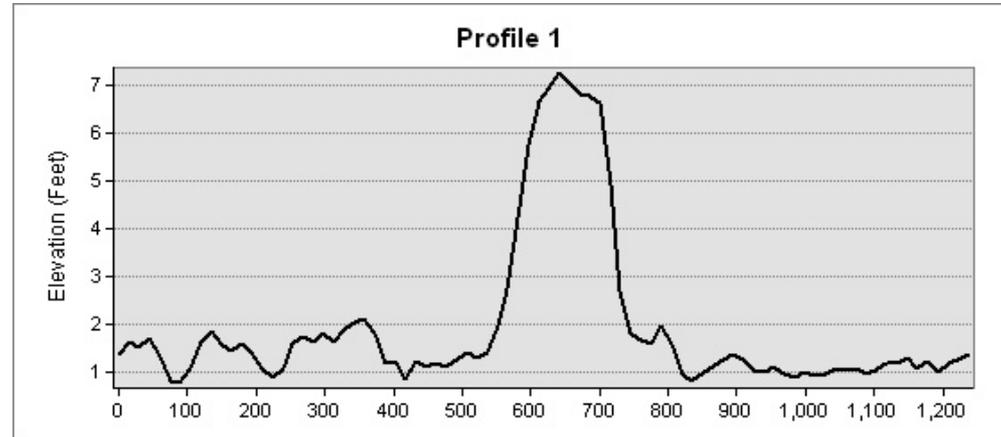
- **Development of ADCIRC
(Advanced CIRCulation Model)
Mesh**

- Finite element model
- Uses unstructured, triangulated mesh
- Node spacing set to accurately represent underlying topography/bathymetry
- Feature arcs created to represent important features in topography/bathymetry (i.e. elevated roads, shoreline, etc)
- Feature arcs set node spacing in mesh



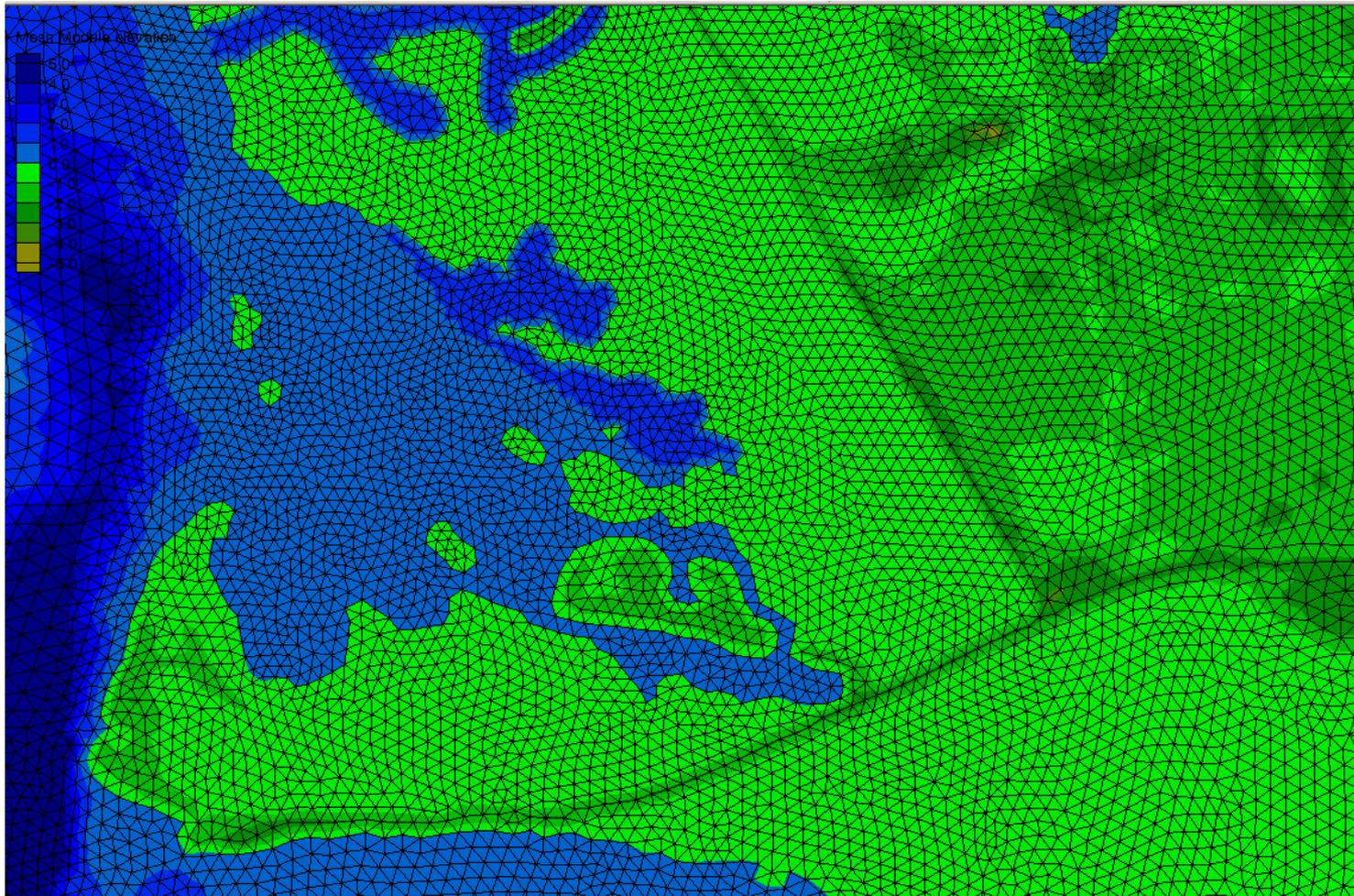
Southwest Florida Draft Results – Mesh

- **Feature Arcs**



Southwest Florida Draft Results – Mesh

- **ADCIRC Mesh**



Southwest Florida Draft Results – Mesh

▪ DEM to ADCIRC Mesh

- ADCIRC uses underlying topographic and bathymetric information to “model” the surface.
- Individual ADCIRC run times are highly dependent on node spacing
- The more nodes you have, the longer to run
- Doubling the number of nodes increases computational time 8x’s
- Current ADCIRC mesh for Southwest Florida is 2,367,680 nodes

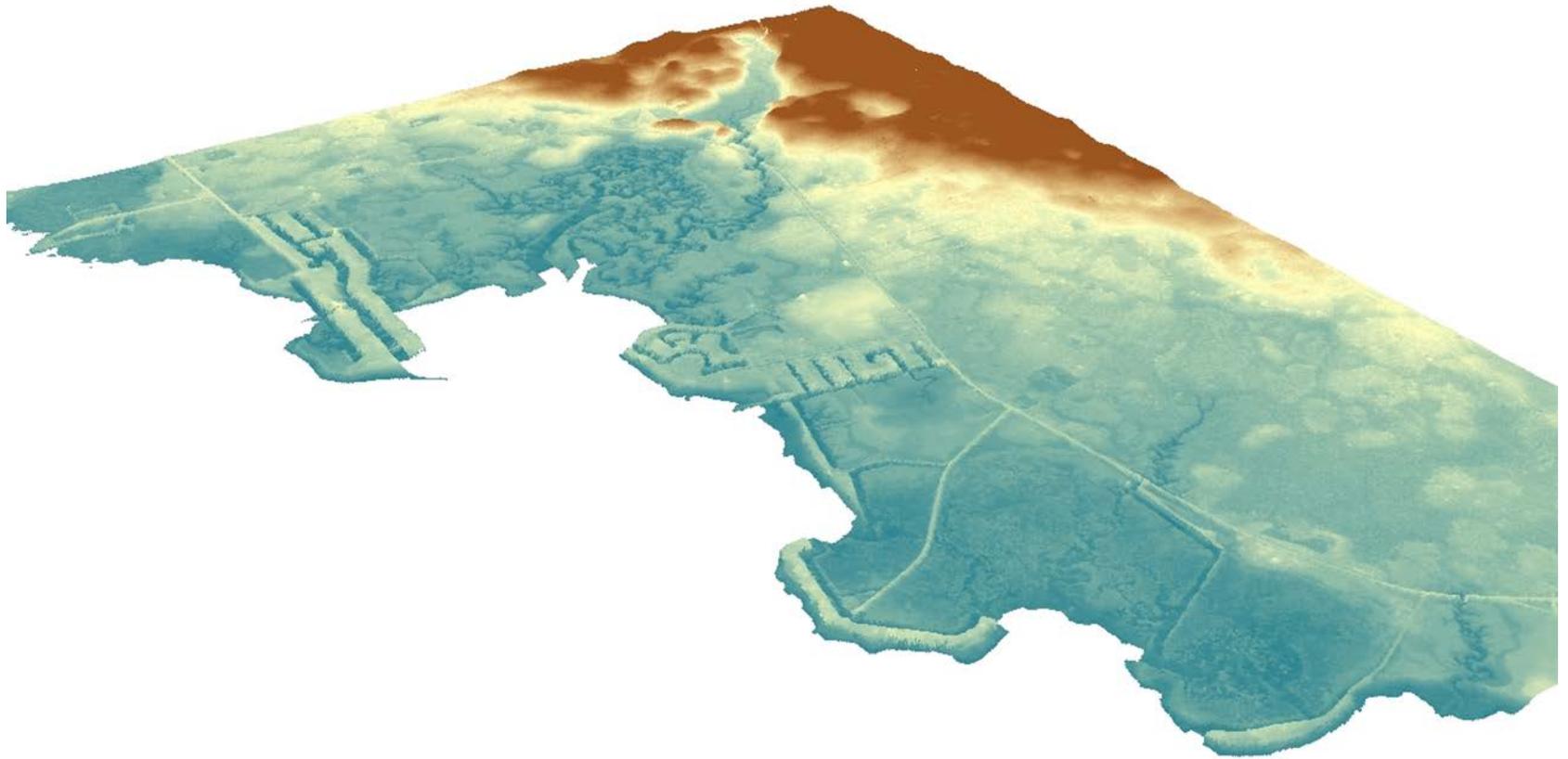
Southwest Florida Draft Results – Mesh

- **DEM to ADCIRC Mesh – Step 1**



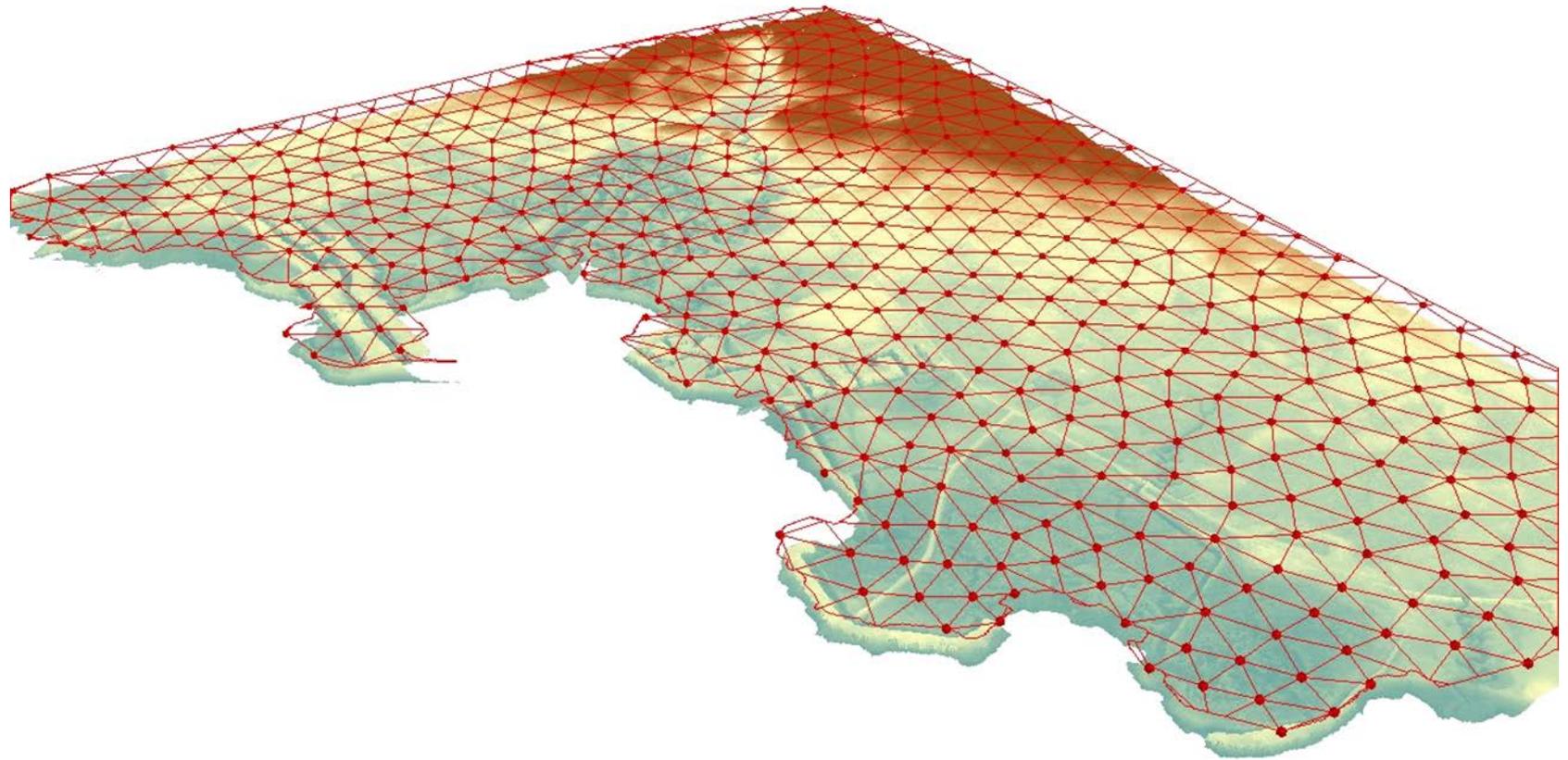
Southwest Florida Draft Results – Mesh

- **DEM to ADCIRC Mesh – Step 2**



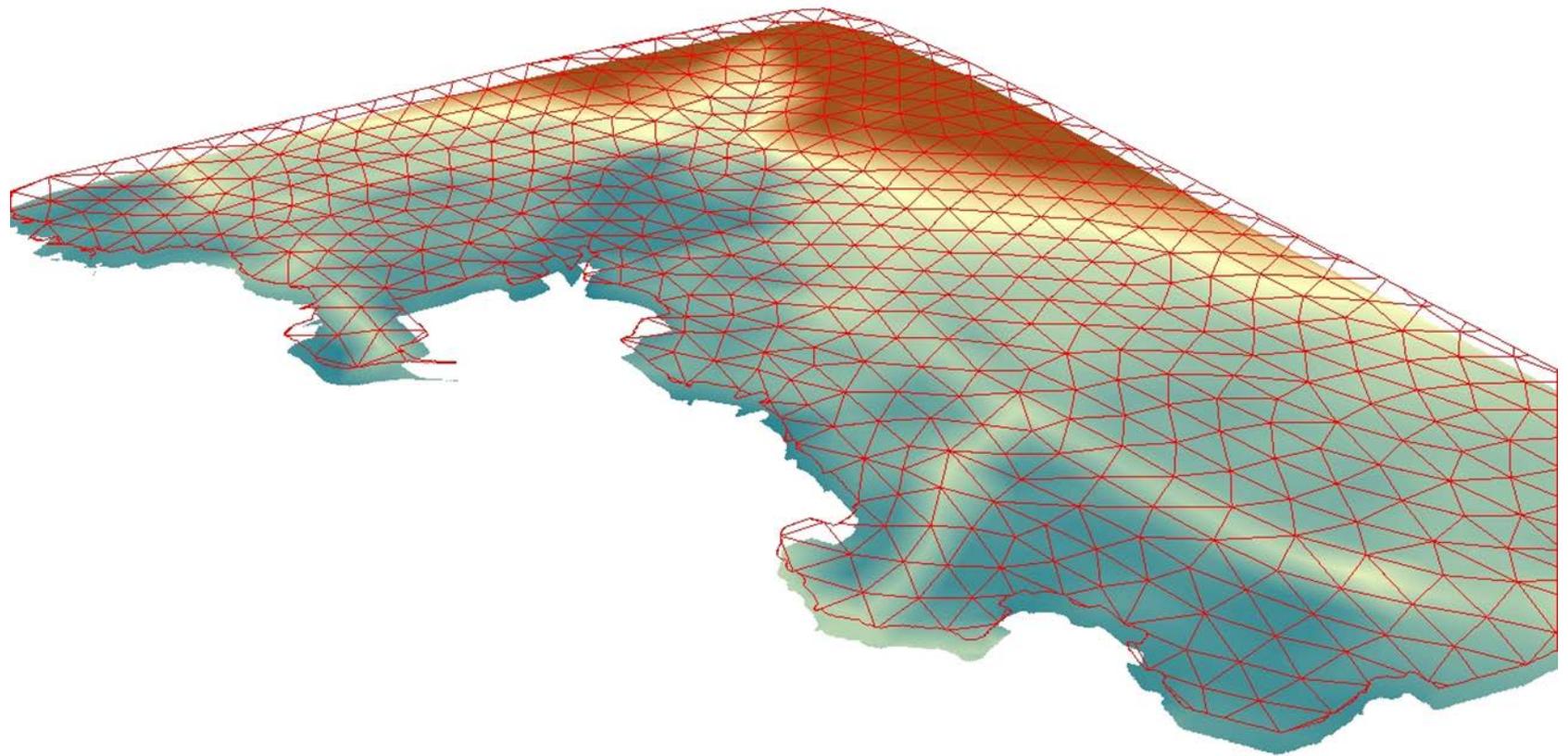
Southwest Florida Draft Results – Mesh

- **DEM to ADCIRC Mesh – Step 3**



Southwest Florida Draft Results – Mesh

- **DEM to ADCIRC Mesh – Step 4**



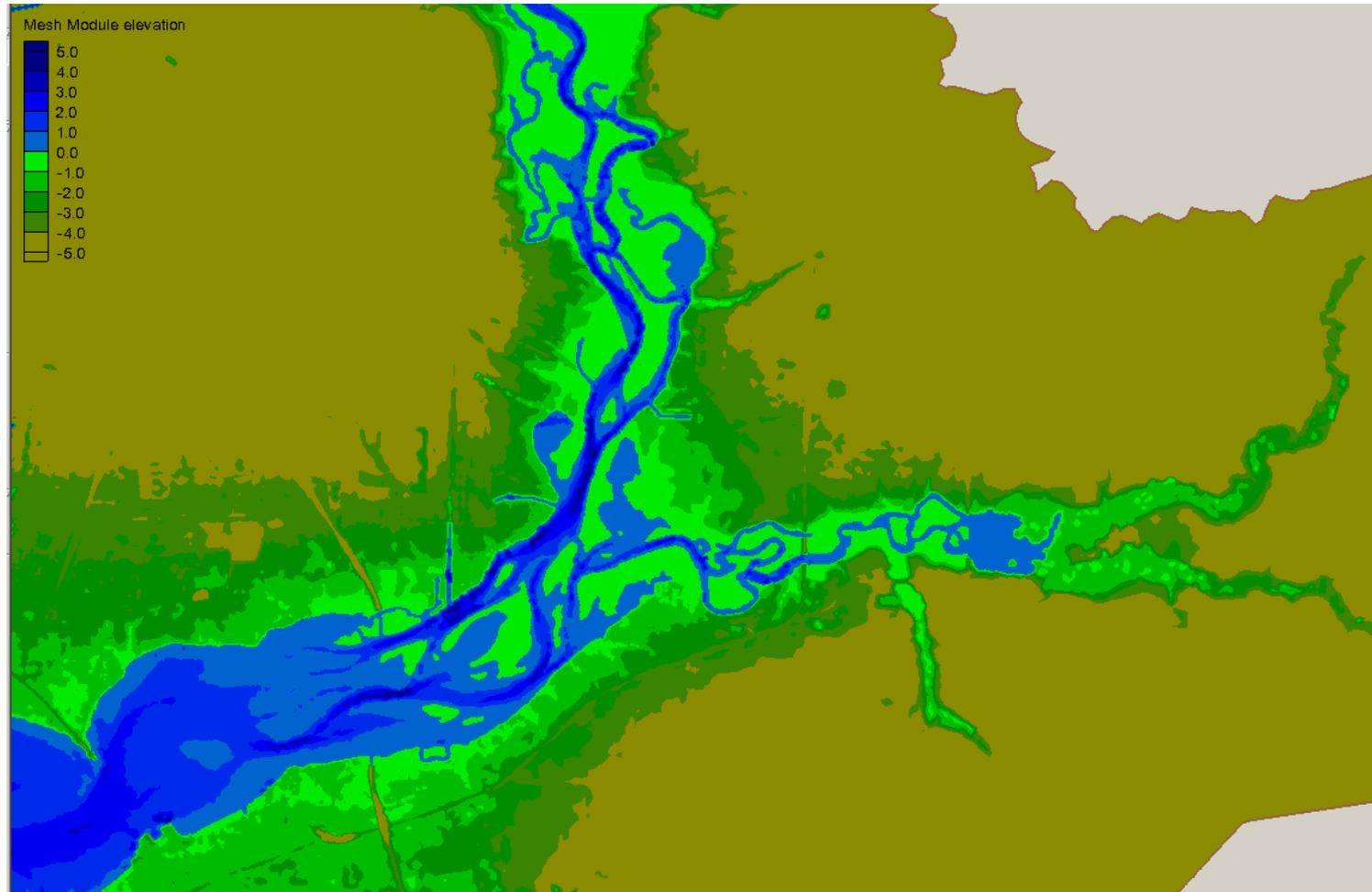
Southwest Florida Draft Results – Mesh

- Peace River



Southwest Florida Draft Results – Mesh

- **Peace River**



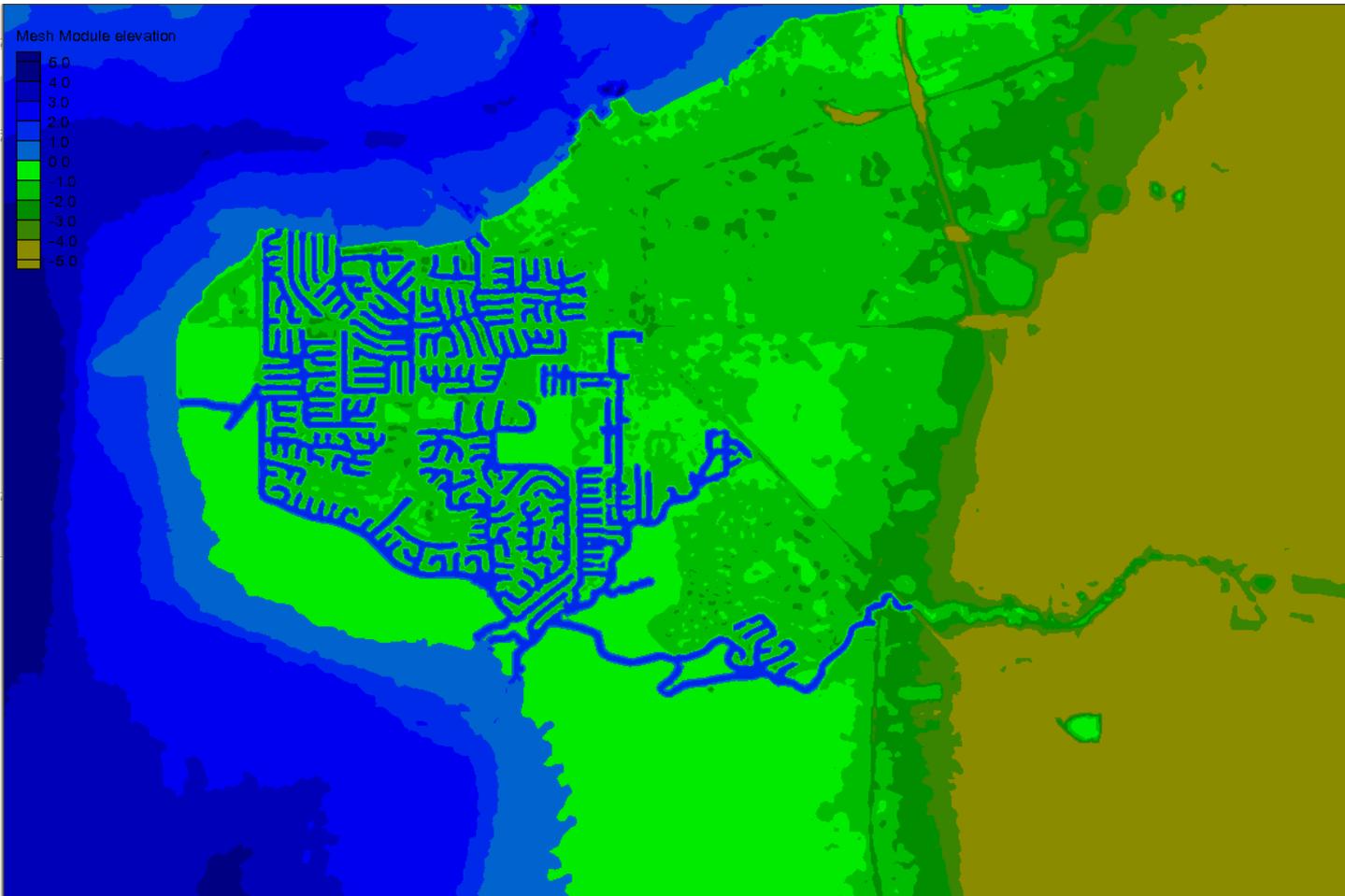
Southwest Florida Draft Results – Mesh

- **Punta Gorda**



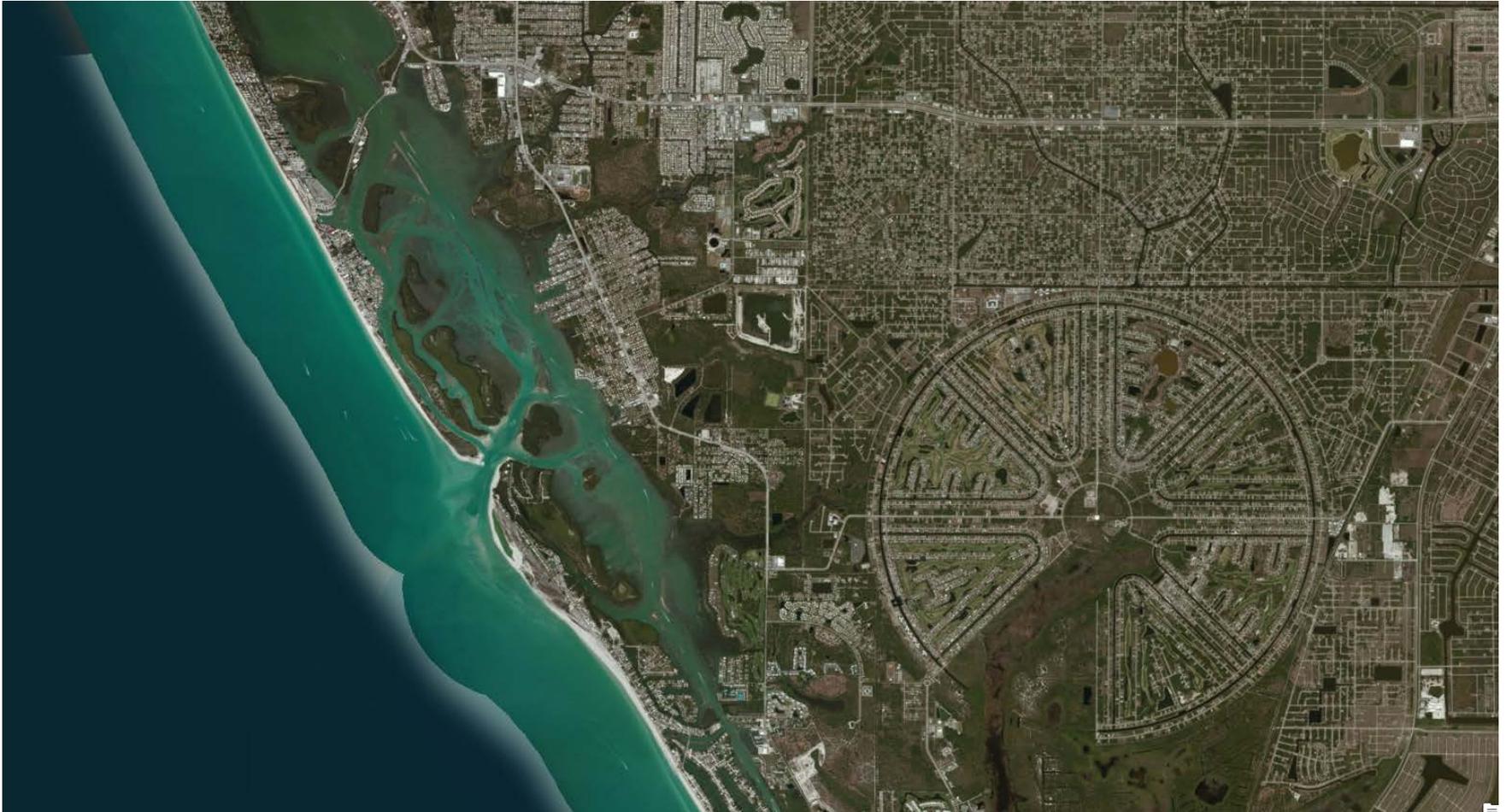
Southwest Florida Draft Results – Mesh

- **Punta Gorda**



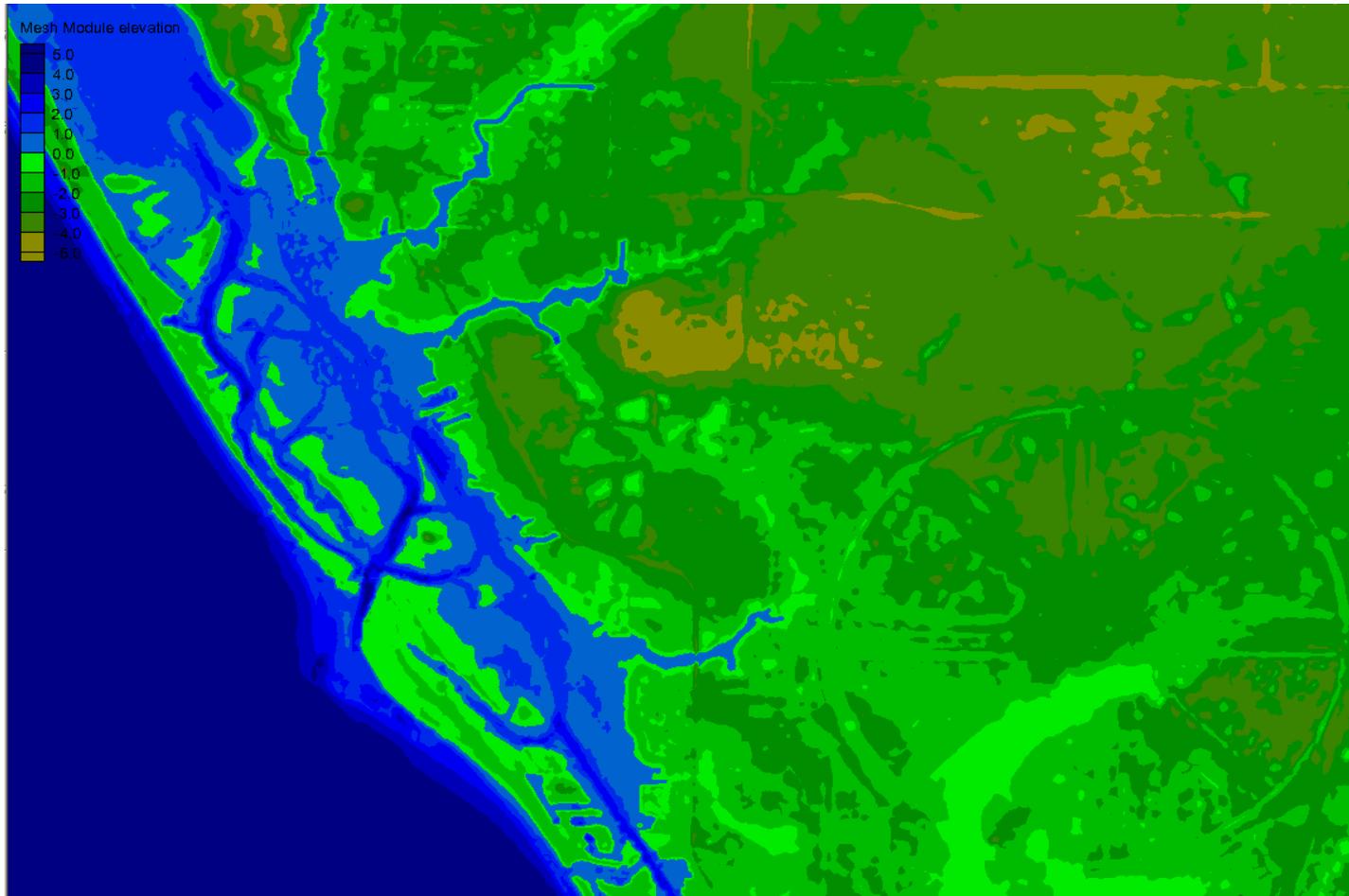
Southwest Florida Draft Results – Mesh

- **Lemon Bay, Little Gasparilla Island**



Southwest Florida Draft Results – Mesh

- **Lemon Bay, Little Gasparilla Island**

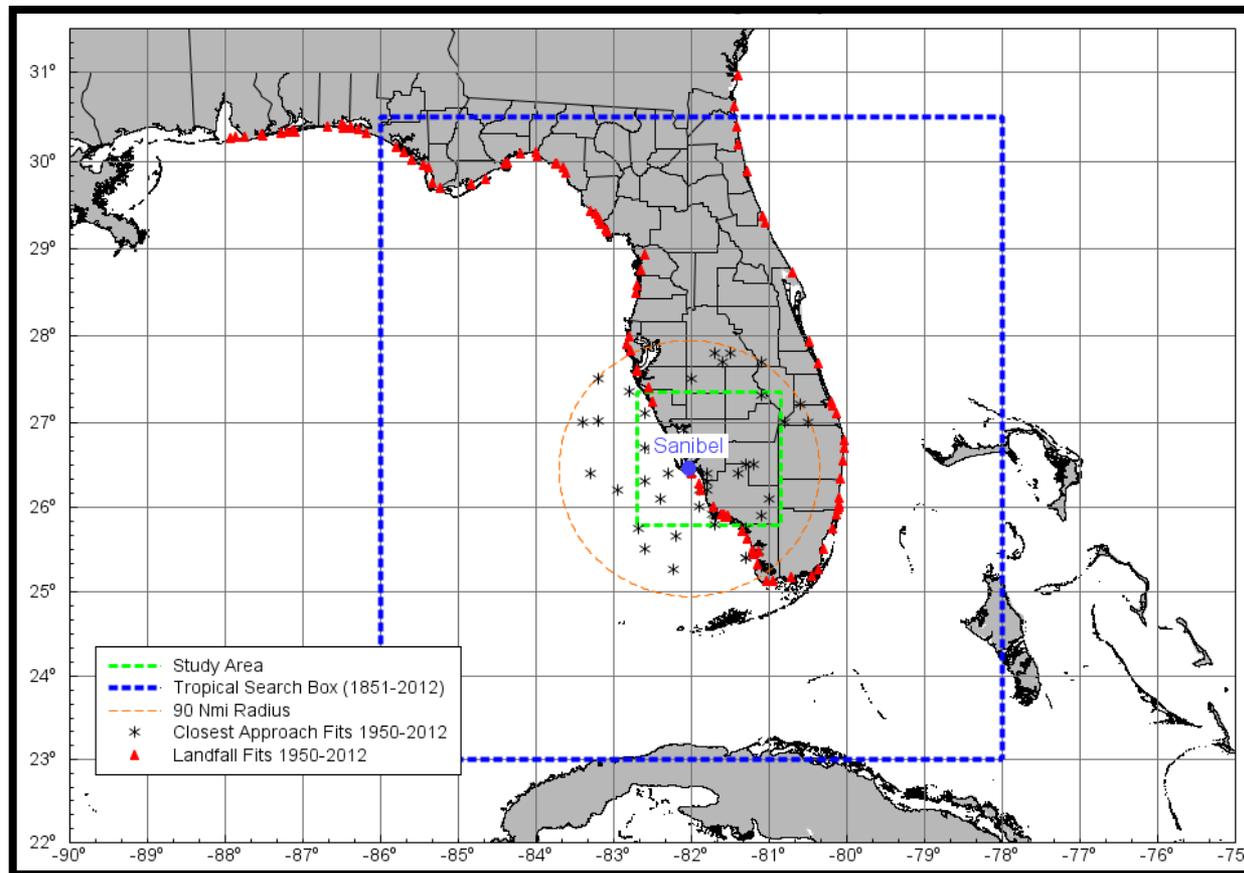


Southwest Florida Draft Results

- **Mesh Development**
 - Development of Seamless Topographic and Bathymetric Data Surface
 - Development of ADCIRC Mesh
- **Storm Climatology**
- **Validation Storm Selection**

Southwest Florida Draft Results – Climatology

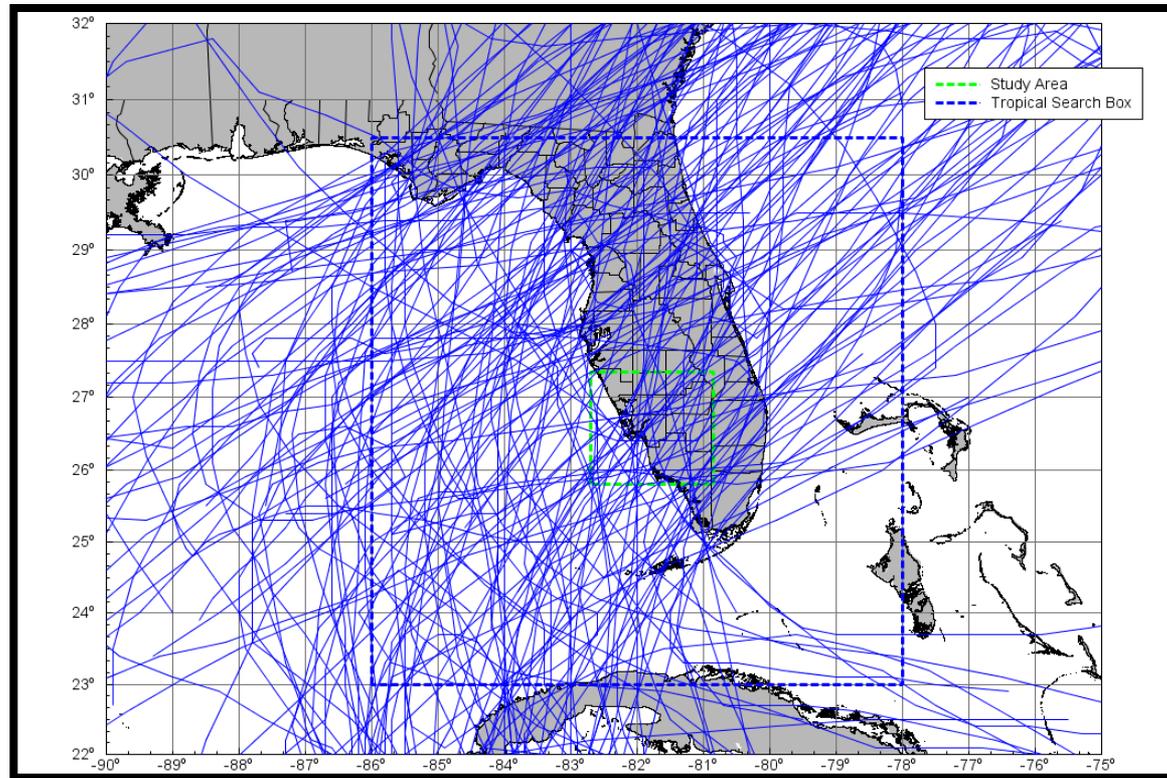
■ Geographic Search Domain



Southwest Florida Draft Results – Climatology

- **All Land-Fall Tracks**

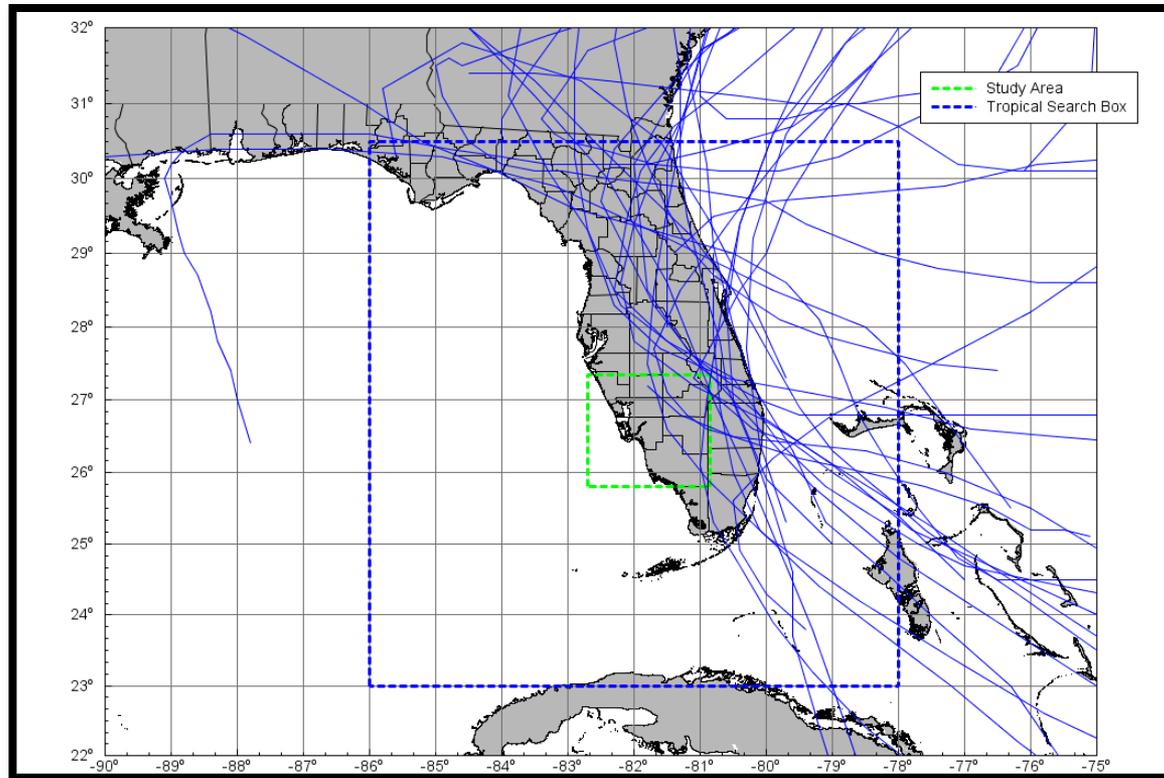
- Search Box 23–30.5N and 86–78W



Southwest Florida Draft Results – Climatology

■ Inland Storms

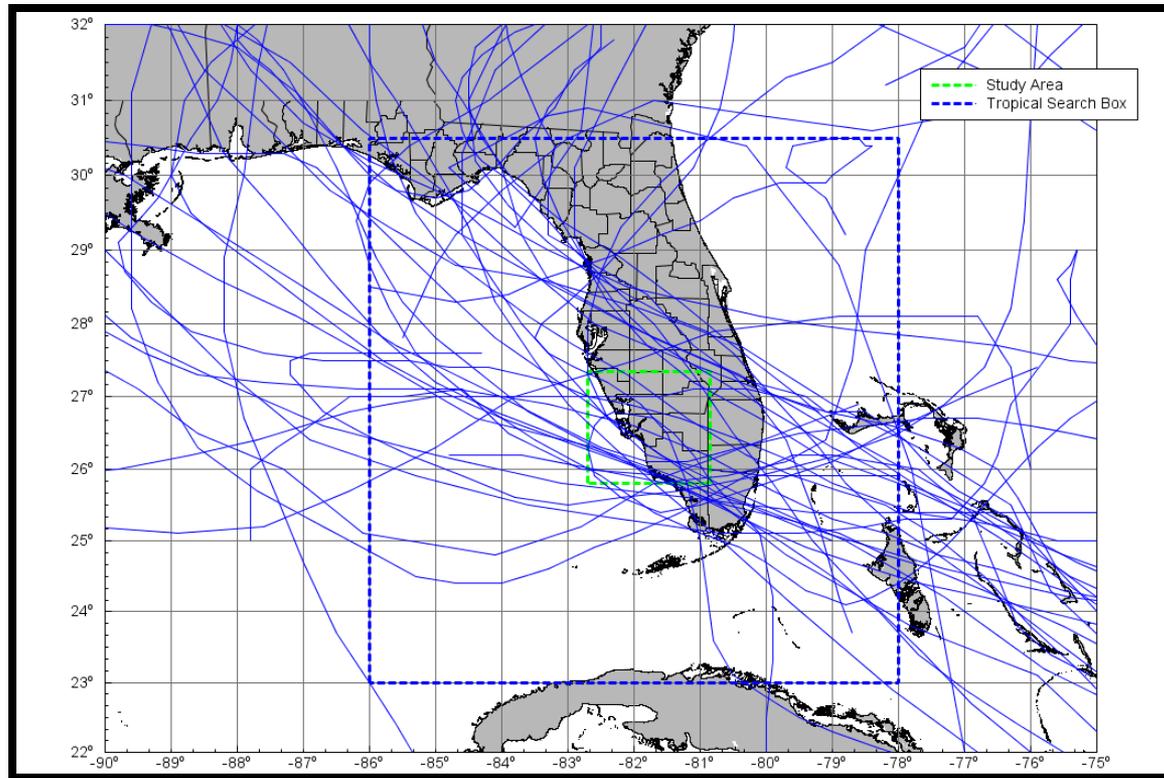
- Storms with tracks primarily over Florida



Southwest Florida Draft Results – Climatology

■ Land Exit Storms

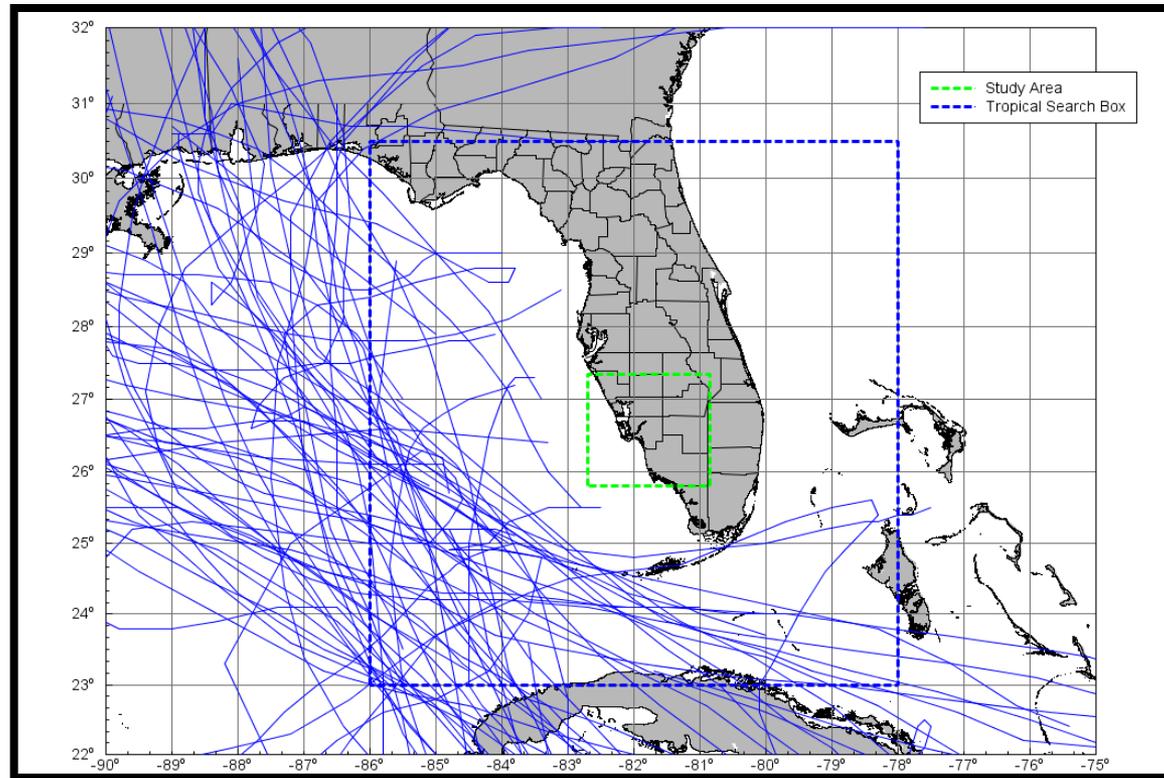
- Storms with tracks over Florida which enter the Gulf of Mexico



Southwest Florida Draft Results – Climatology

■ Offshore Storms

- Storms which did not make US land fall within search box

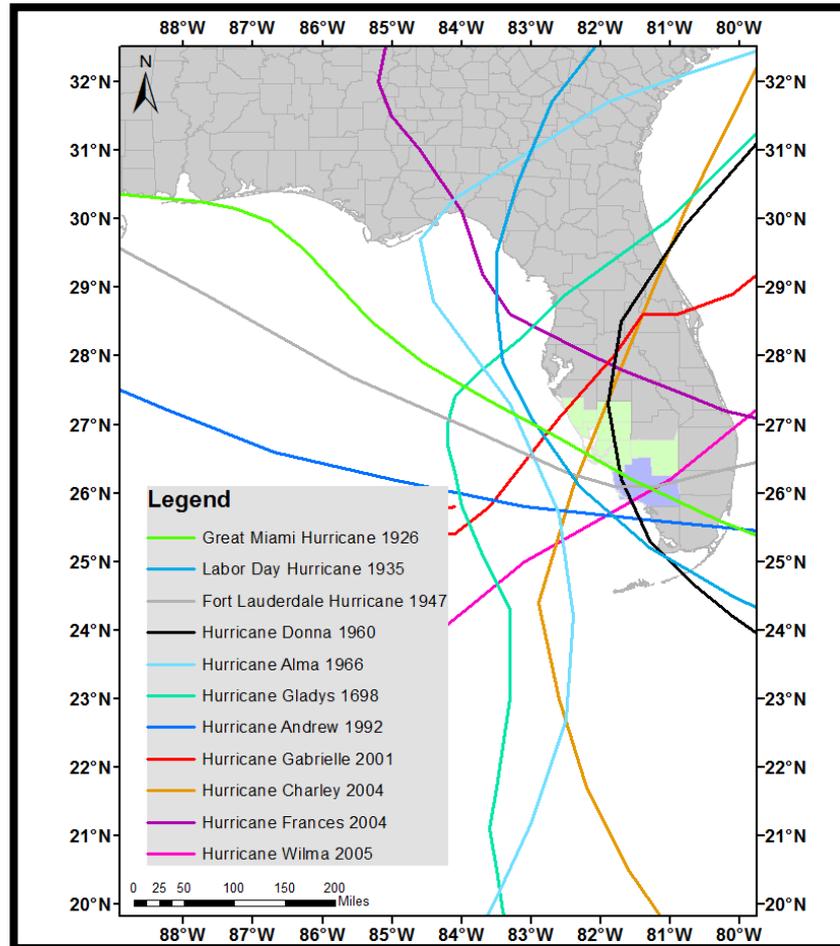


Southwest Florida Draft Results

- **Mesh Development**
 - Development of Seamless Topographic and Bathymetric Data Surface
 - Development of ADCIRC Mesh
- **Storm Climatology**
- **Validation Storm Selection**

Southwest Florida Draft Results – Validation

- Hurricane tracks from major events



Southwest Florida Draft Results – Validation

- **Significant Surge Events at the Fort Myers, FL NOAA Gage**

Event Name	Date	Surge at Fort Myers, FL unless otherwise noted (feet NAVD88)	Storm Intensity at Landfall
Tampa Bay Hurricane	10/25/1921	7 ft above normal high tide ¹	Category 3
Great Miami Hurricane	9/18/1926	12.0 ²	Category 4
Hurricane Donna	9/11/1960	11.8 ³	Category 4
Hurricane Alma	6/09/1966	4.1	Category 3
Tropical Storm Gabrielle	9/14/2001	3.3	Tropical Storm
Hurricane Charley	8/11/2004	8.2 ⁴	Category 5
Hurricane Frances	9/06/2004	3.0	Category 2

¹ Monthly Weather Review (October 1921) at Punta Gorda, FL

² U.S. Weather Bureau report (1963), in Punta Rassa-Fort Myers area, referenced to MSL

³ U.S. Weather Bureau report (1963) near Estero, FL, referenced to MSL

⁴ FEMA high water mark report (2004) at Fort Myers Beach

Southwest Florida Draft Results – Validation

- **Validation Storm Selection**
 - Hurricane Donna (1960)
 - Tropical Storm Gabrielle (2001)
 - Hurricane Charley (2004)



Upcoming Work

- Storm surge model validation (and finalize mesh in the process)
- Synthetic storm development
- Production runs (with synthetic storms)
- Frequency analysis (0.2, 1, 5, 10, 20, and 50% annual chance storms)
- Overland wave height analysis
- Workmap production



Next Steps

- **Questions & Answers**
 - We can meet you at the back of the room and capture your input
- **Pick up RIV Coastal Analysis handout**
- **Based on today's discussion, we will finalize and forward to you:**
 - Meeting Minutes and Presentation
- **Within two weeks of receiving that email:**
 - Your feedback and comments

Thank you

We look forward to continuing to work with you to help the Southwest Florida coastal area become more resilient to flooding.



Questions

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<http://www.southeastcoastalmaps.com/Pages/Projects/Southwest-Florida.aspx>



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