

The CI-FLOW Project

Suzanne Van Cooten
Hydrometeorology





CI-FLOW Outline

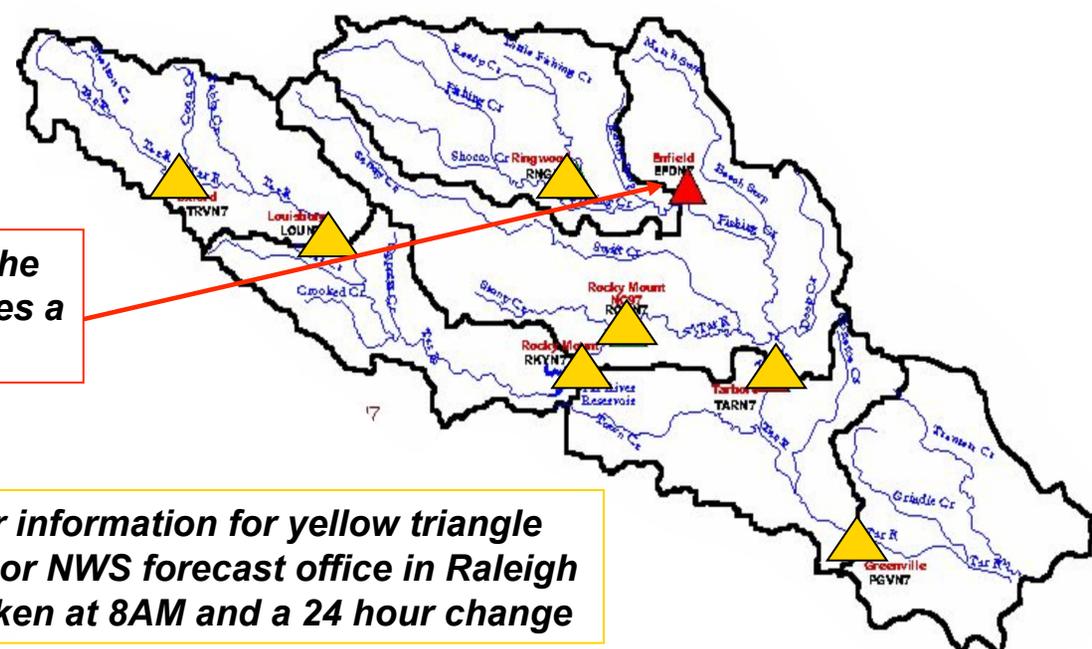
(Coastal and Inland Flood Observation Warning)

Relevance

- Floods are responsible for the highest number of storm related fatalities
- Hydrologic extremes (drought and flood) are responsible for billions of dollars of economic loss annually
- Over half of the nation's population lives in coastal areas of the United States
- CI-FLOW will demonstrate the capacity to track a raindrop from the sky-to the summit-to the sea to increase NOAA's capabilities in providing water quality and quantity information to residents of coastal watersheds



Existing NOAA Hydrologic Information Service Gap- A Need for Coastal Watersheds And Their Tidal Plains



Enfield is the only forecast point in the entire basin which the SERFC produces a 5 day forecast for river stage

In non-flood situations, the only river information for yellow triangle locations from the NOAA NWS SERFC or NWS forecast office in Raleigh or Morehead City is a stage reading taken at 8AM and a 24 hour change



Downstream of Greenville, the NWS does not produce any river forecasts and does not disseminate river stages or forecasts

Increasing Need For Hydrologic Information As Coastal and Migratory Populations Increase



Dare County population has increased almost 5 times since 1970

Brunswick County (Wilmington, NC Area) accounts for the largest number of **seasonal housing** (16,376) followed by **Carteret** and **Dare** Counties

Over half of the housing units in **Dare County** are seasonal

County	1970 Pop.	2004 Pop.	1970-2004 Change (%)	Total Housing Units (2000)	Seasonal Units (2000)	Pop. Dens (Pers. /Sq. Mi)
Beaufort	35,980	45,974	127	22,139	2,166	55
Hyde	5,571	5,521	-100	3,302	855	9
Dare	6,995	33,518	479	26,671	13,445	87
Craven	62,554	91,599	146	38,150	514	129
Washington	14,038	13,335	-105	6,174	217	38
Carteret	31,603	62,034	196	40,947	13,537	119
Pamlico	9,467	12,814	135	6,781	946	38

Halifax	53,884	56,034	104	25,309	936	77
Edgecombe	52,341	54,713	105	24,002	178	108
Pitt	73,900	140,587	190	58,408	329	216
Martin	24,730	24,796	100	10,930	107	146

Inland counties of the Tar River Basin have some of the largest population densities in the region

Pitt County has nearly doubled its population and has the highest population density

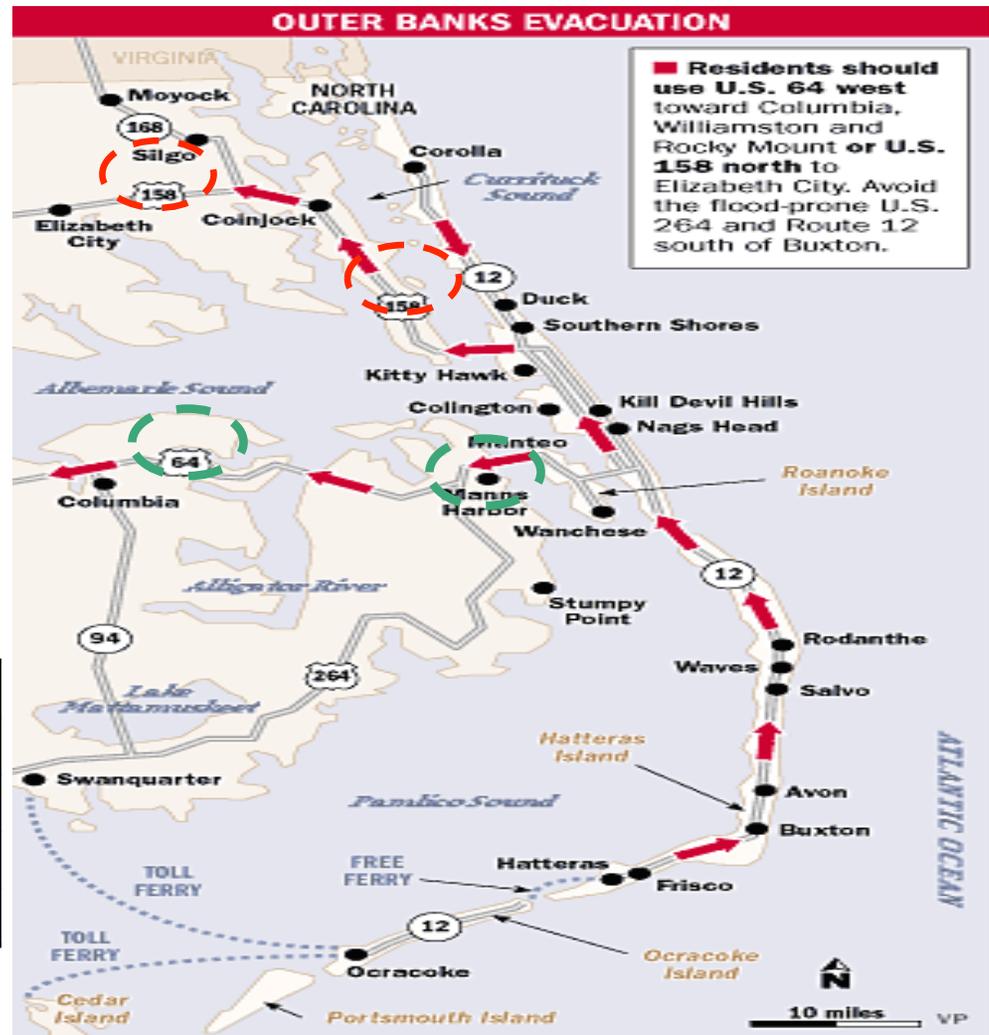


Future Evacuations For Coastal Storms Moves Increasing Numbers of Citizens Inland To Growing Centers Of Population

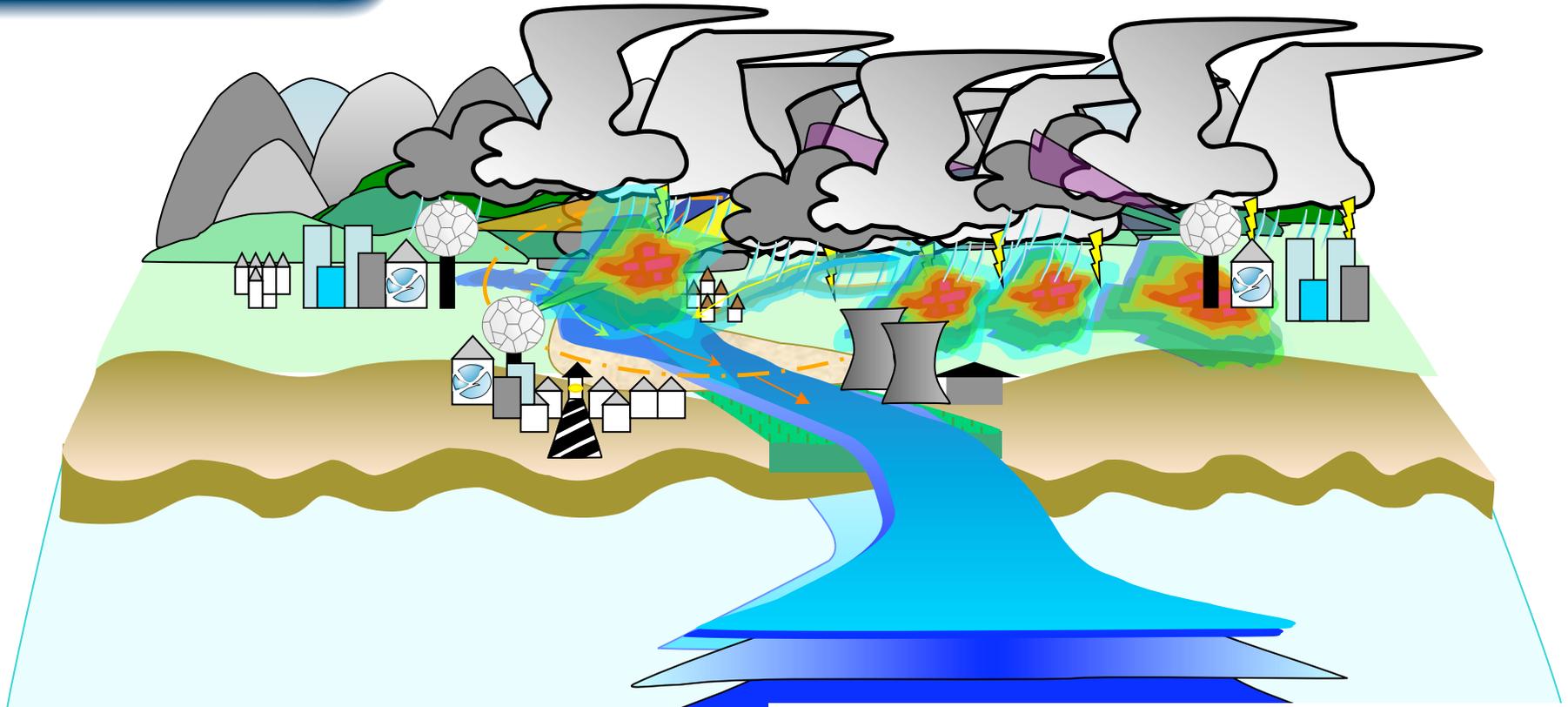
▶ By 2030, at the height of the tourist season, it would take 46 hours to clear **U.S. 158** and 31 hours to clear **U.S. 64** through Columbia.

▶ Number of evacuating vehicles for a Cat. 3 hurricane during high (95%) occupancy

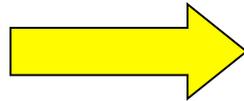
Location	2004	2030
N.C. 12 through Southern Shores	10,627	17,133
Wright Memorial Bridge off Outer Banks	36,875	58,183
US 158 at US 17 in Elizabeth City	14,541	22,749
US 64 from Manns Harbor to Columbia	20,599	32,389



Capturing the Antecedent and Early Storm Conditions



CI-FLOW State of the Science QPE-NSSL, OHD, NESDIS, and RFC Stage 4 Precipitation Estimates Using Radar, Satellite, Lightning, Gauge, and Atmospheric Sounding Data Fields



CI-FLOW River Model Suite Provides Streamflow Simulations for Streams and Mainstem Rivers-

- 1) NWS Hydrology Lab Research Distributed Model (HL-RDHM) and
- 2) Academic Research Models

Capturing the Storm Surge

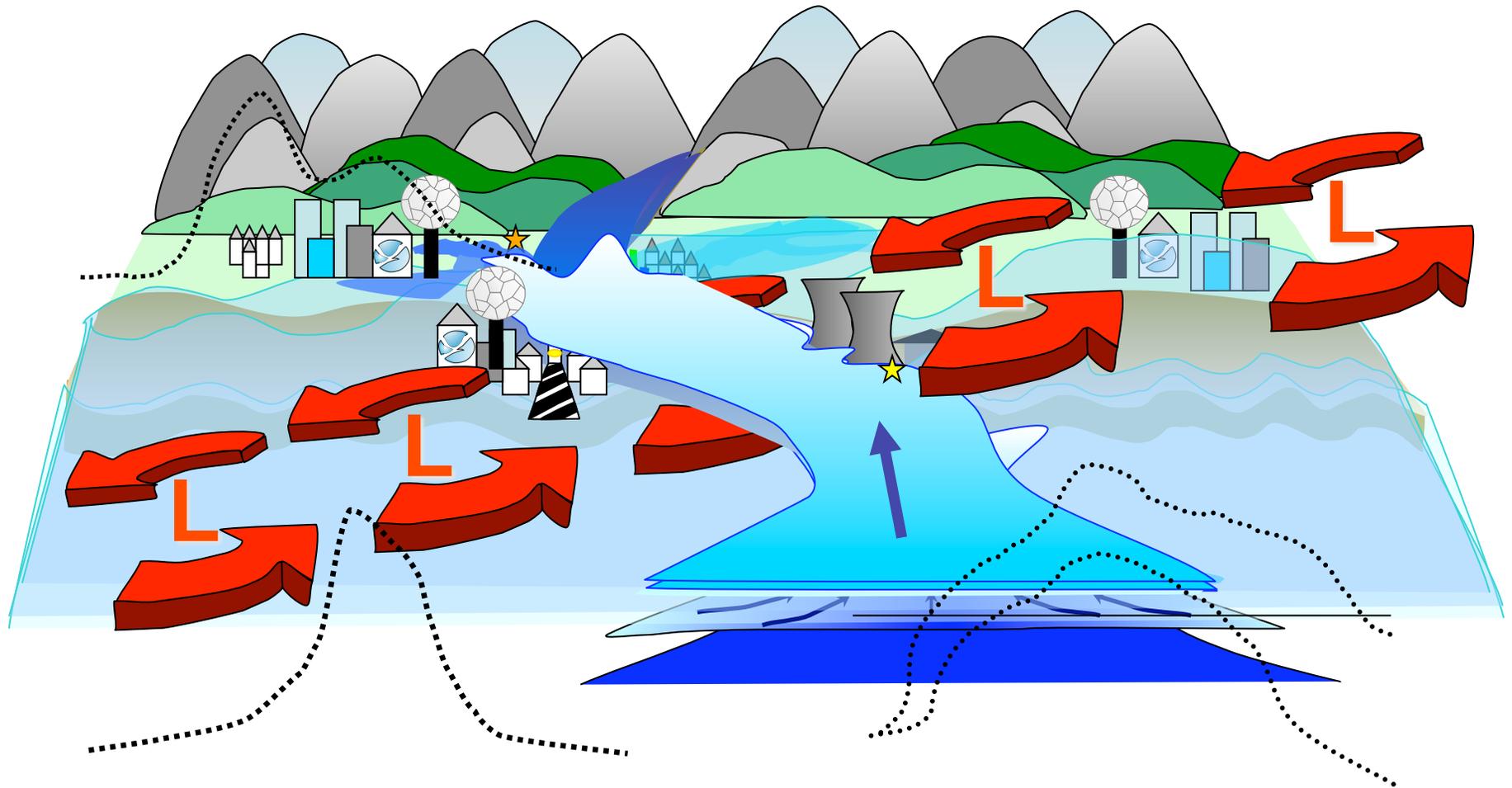


CI-FLOW Ocean Model Suite Provides Storm Surge Simulations (Water Levels) for coastline and for coastal streams, tidal creeks, and bays-

- 1) University of North Carolina- Chapel Hill and University of Oklahoma ADCIRC (IOOS Funding)**
- 2) North Carolina State University Estuary-Lower River Flood Modeling System**



CI-FLOW Will Demonstrate the Capability For A Coupled System Joining The Inland River Model Ensemble and Coastal Ocean Model Ensemble To Provide Simulations of Water Quantity





National and Regional Teams and Programs

Bringing CI-FLOW into Neighborhoods

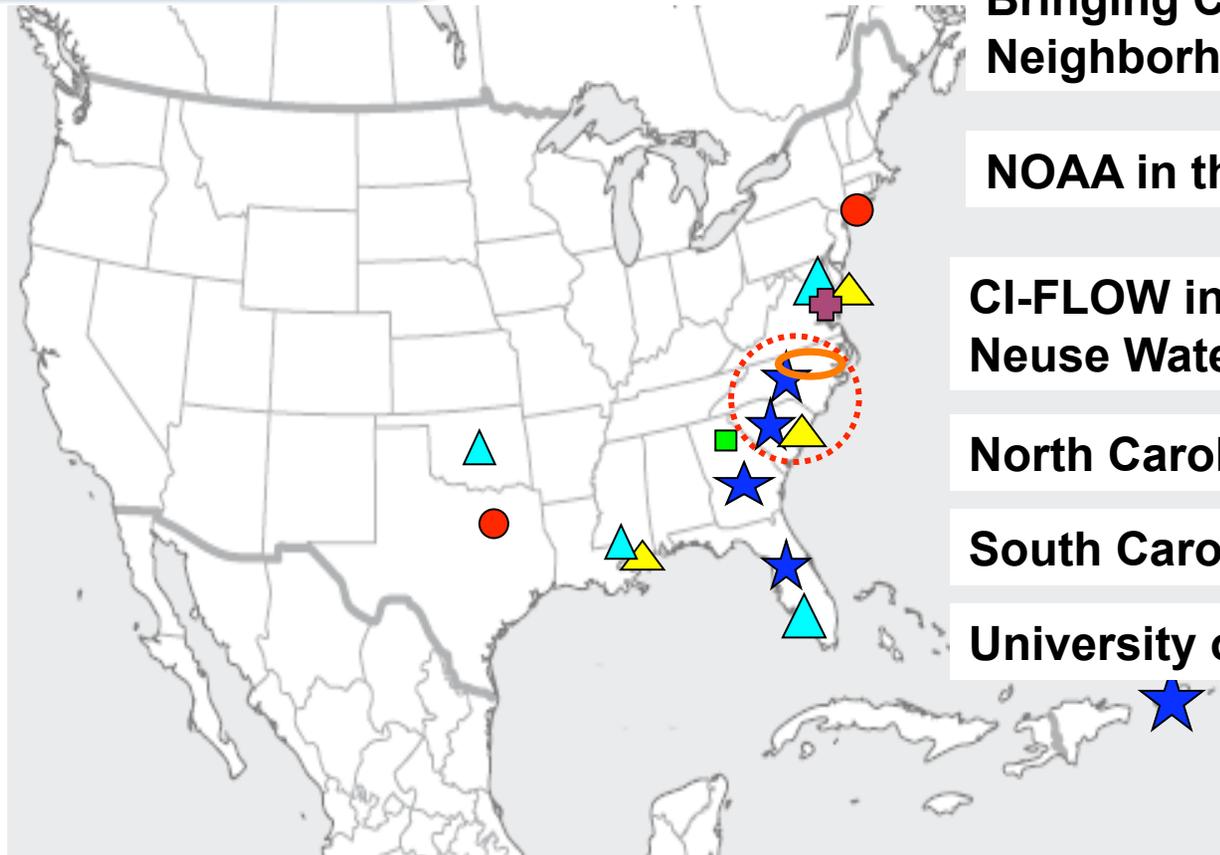
NOAA in the Carolinas

CI-FLOW in the Tar-Pamlico and Neuse Watersheds

North Carolina Sea Grant

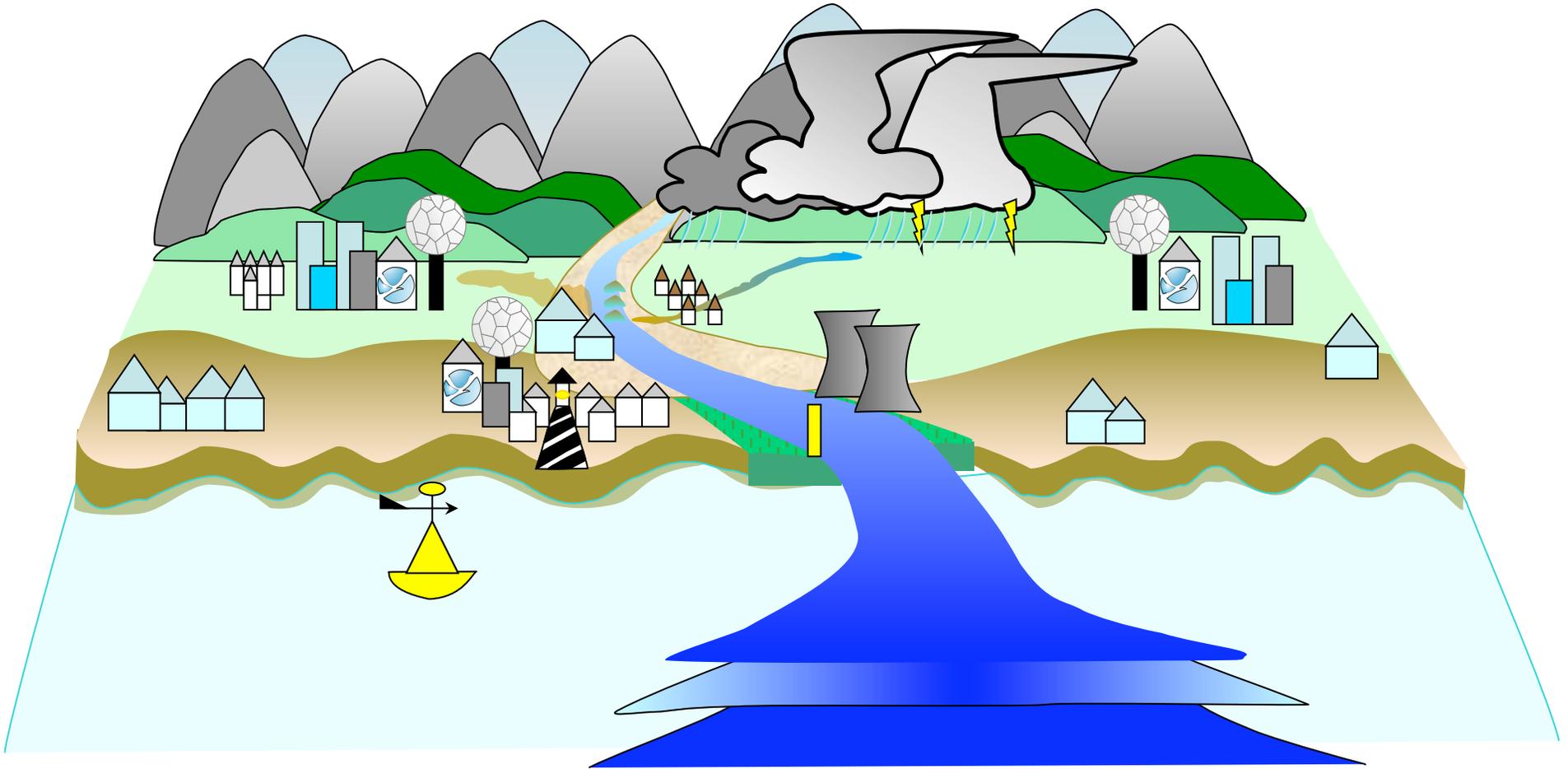
South Carolina Sea Grant

University of Oklahoma Sea Grant





CI-FLOW The Power of Partnerships





Summary

- April milestone: Demonstrate a coupled inland-coastal ocean model system suitable for real-time CI-FLOW demo in tropical season
- An ensemble modeling approach will be used
 - Sea Grant and other NOAA outreach and engagement activities is critical to capitalize on interdisciplinary expertise
- CI-FLOW will demonstrate the capacity to address a NOAA service gap in providing water quality and quantity information to residents of coastal watersheds which can be carried forward through emerging NOAA coastal programming efforts

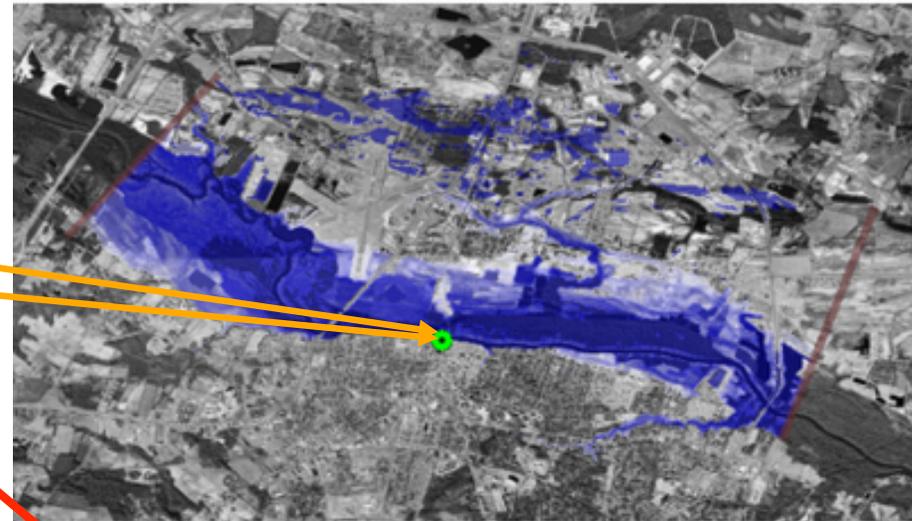
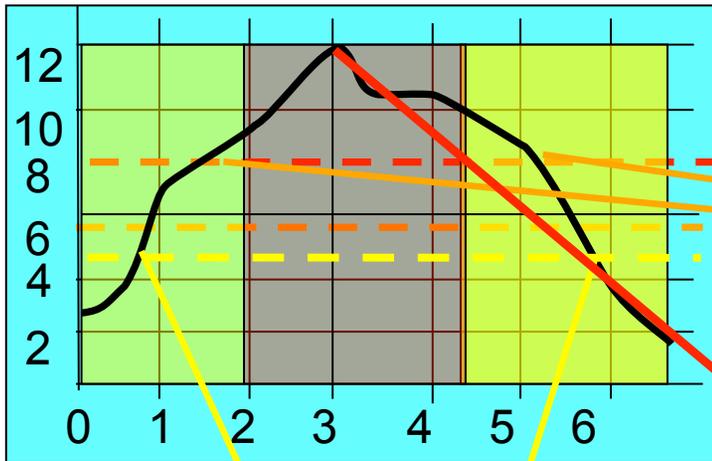


Questions:

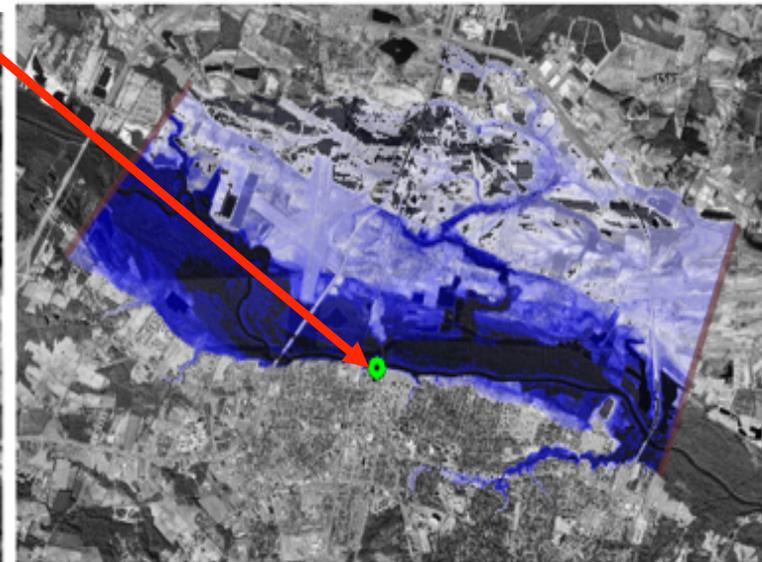
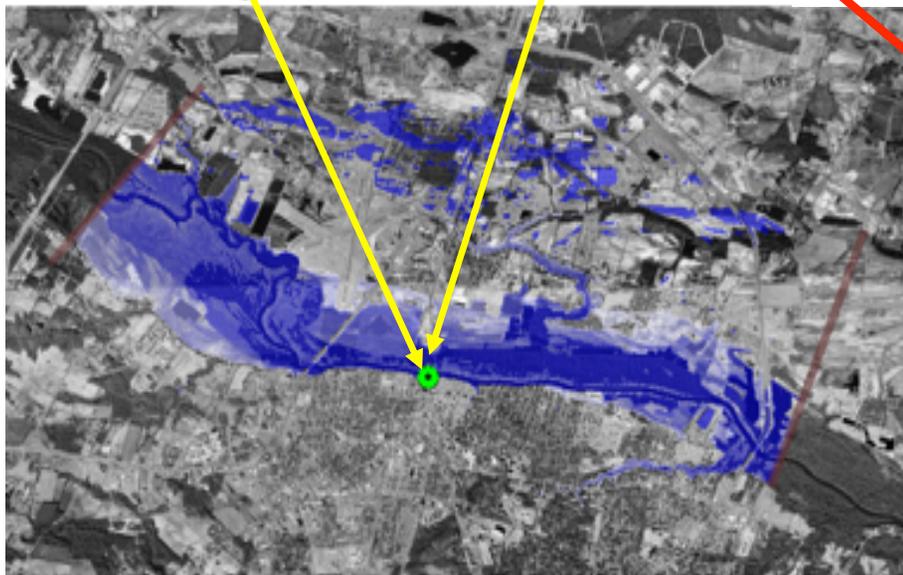
www.nssl.noaa.gov/ciflow



Leverage NOAA Visualization Tools To Provide Citizens Hydrologic Hazard Information (Illustration Purposes Only)



Graphical representation of inundation for NWS flood categories are based on steady state hydrologic modeling water surface elevations for incremented discharges. Map shows approximate inundation areas for given water surface elevations and should not be used for navigation or permitting other legal purposes, but strictly as a planning reference tool.

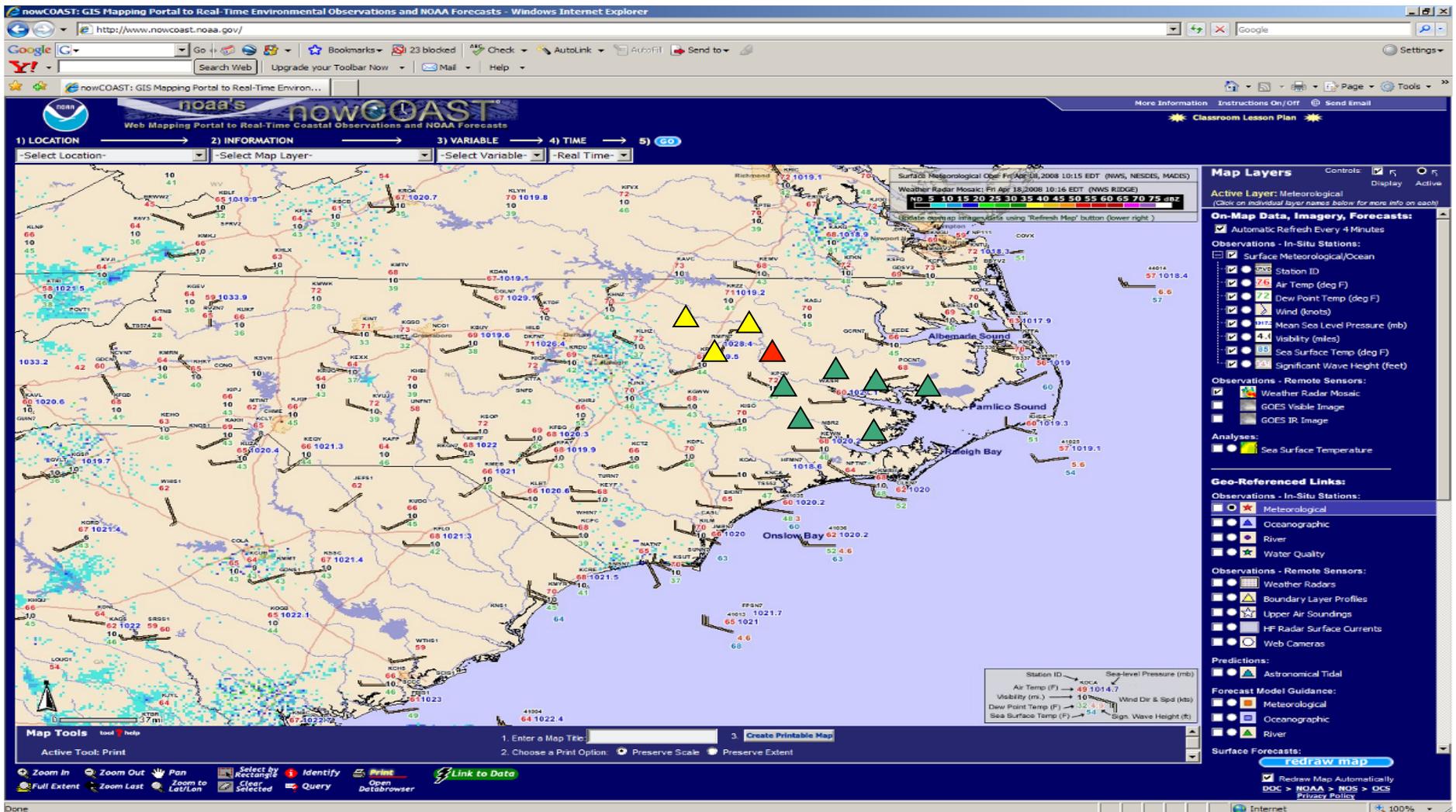


Graphical representation of flood inundation for NWS flood categories are based on steady state hydrologic modeling water surface elevations for incremented discharges. Map shows approximate inundation areas for given water surface elevations and should not be used for navigation or permitting other legal purposes, but strictly as a planning reference tool.

2375 4750 9500 Feet

2375 4750 9500 Feet

The Interdisciplinary, Multi-Agency, Multi NOAA Line Offices CI-FLOW Team (Educators, Social Scientists, CI-FLOW Researchers) Will Leverage NOAA Visualization Tools To Sustain A Dialog With Stakeholders To Increase Utility of CI-FLOW Tidal Zone Demonstration Information

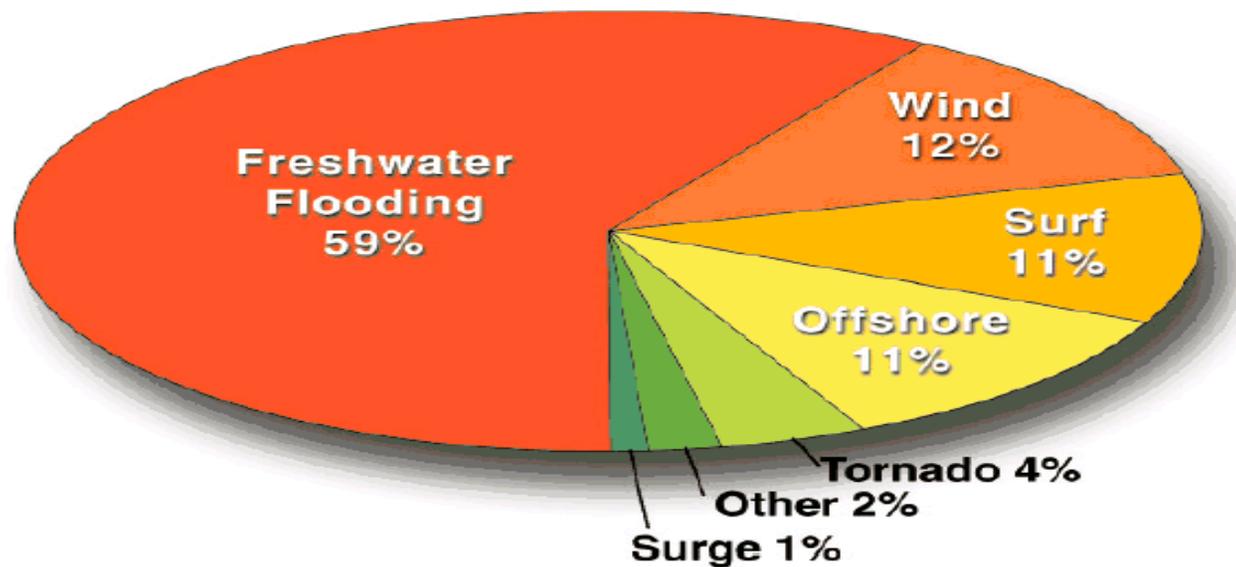




Heavy Rainfall Ahead and During Coastal Storms Floods Inland Portions of Coastal Watersheds

Coastal Evacuations Transport Large Numbers Of Summer Visitors Out Of The Storm Surge Zone But Into Communities Threatened By Floodwaters Increasing A Region's Exposure To Risk

Leading Causes of Tropical Cyclone Deaths in the U.S 1970-1999



Source: Edward Rappaport—Chief, Technical Support Branch, Tropical Prediction Center