

After Sandy – Who's next?



Bill Read

KPRC Houston Hurricane Expert

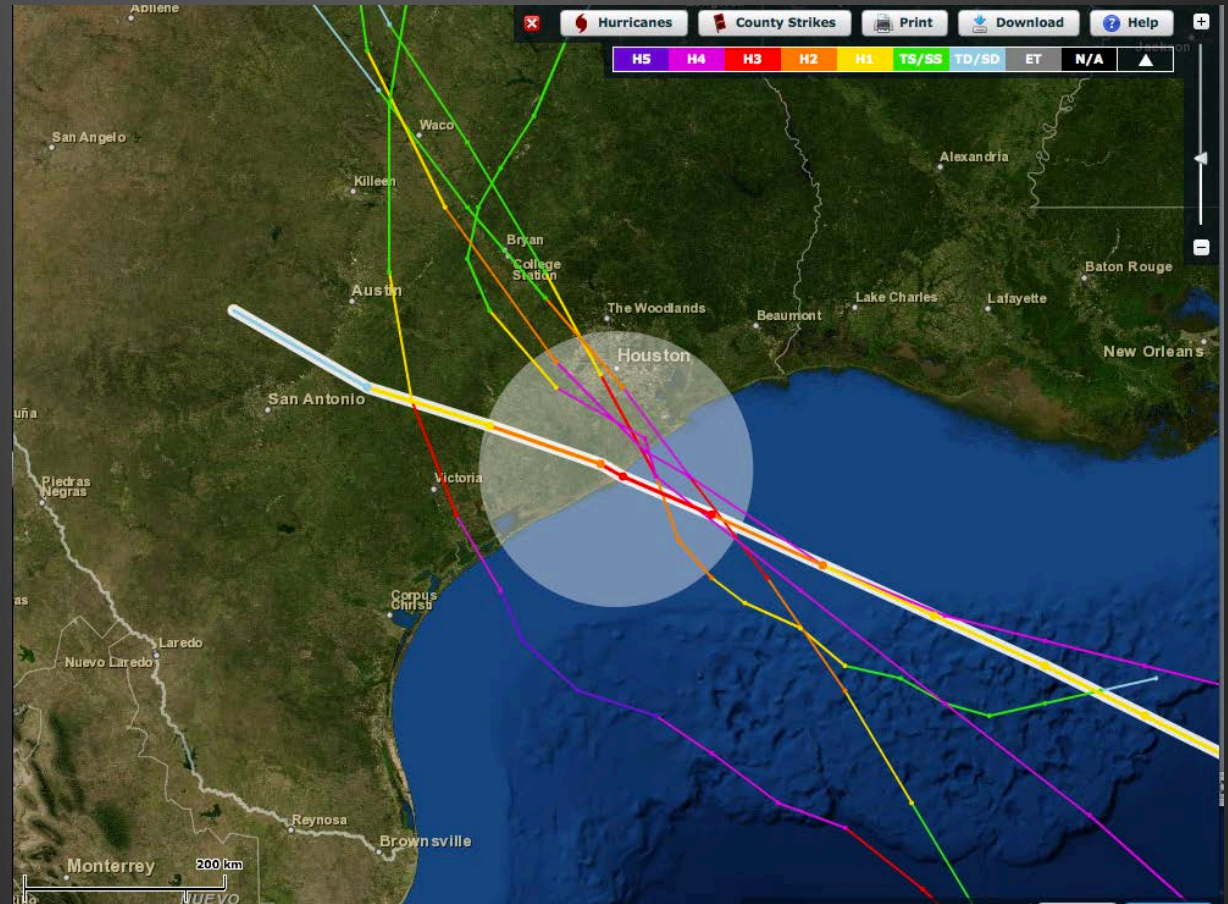
Former Director National Hurricane Center

Historically significant Hurricanes

- ⊗ 1900 Galveston
- ⊗ 1935 Labor Day Keys
- ⊗ 1938 Great New England
- ⊗ 1954 Hazel - Carolinas
- ⊗ 1969 Camille - MS
- ⊗ 1992 Andrew – Miami-Dade
- ⊗ 2005 Katrina

Category 3 and 4 storms

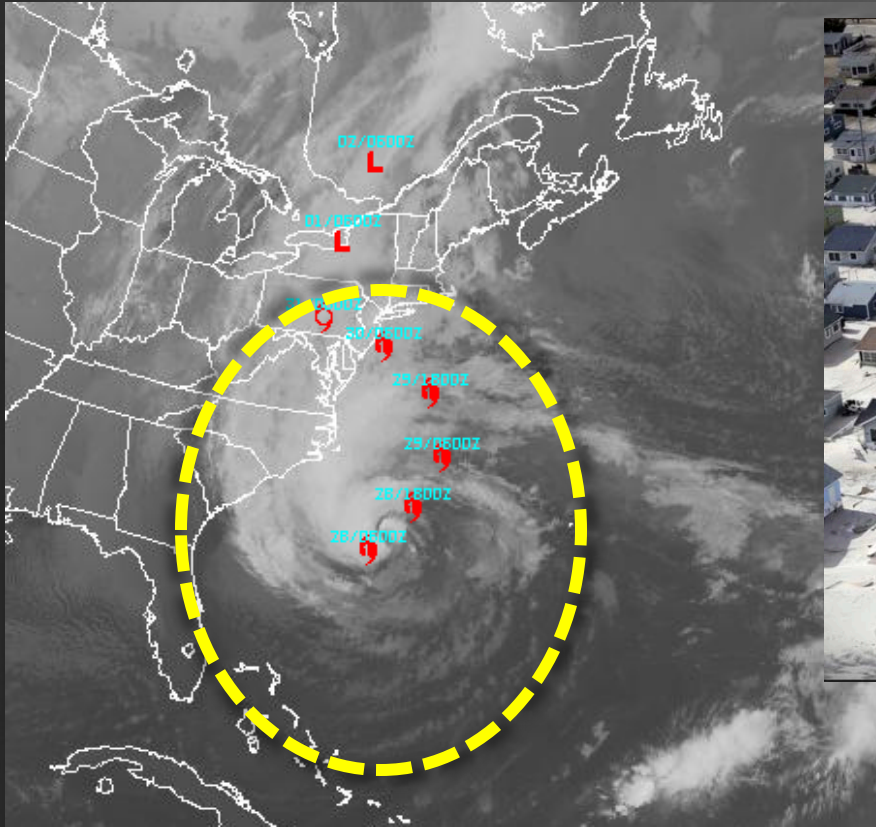
- 1900
- 1909
- 1915
- 1932
- Carla, 1961
- Alicia, 1983



Ike?



Sandy?



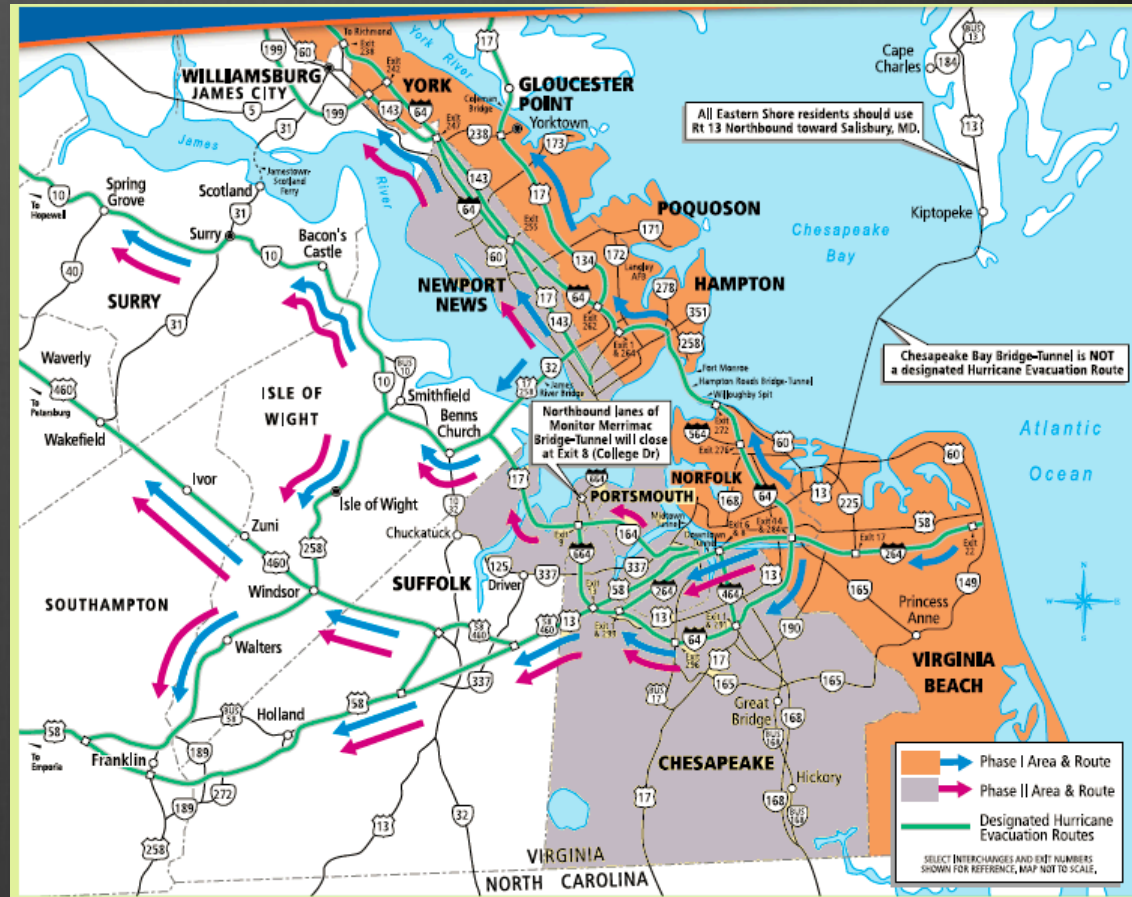
Five candidates

- ❶ Significant population at risk
- ❷ Significant infrastructure at risk
- ❸ Growth
- ❹ Time since last significant storm
- ❺ Touch on H-G area



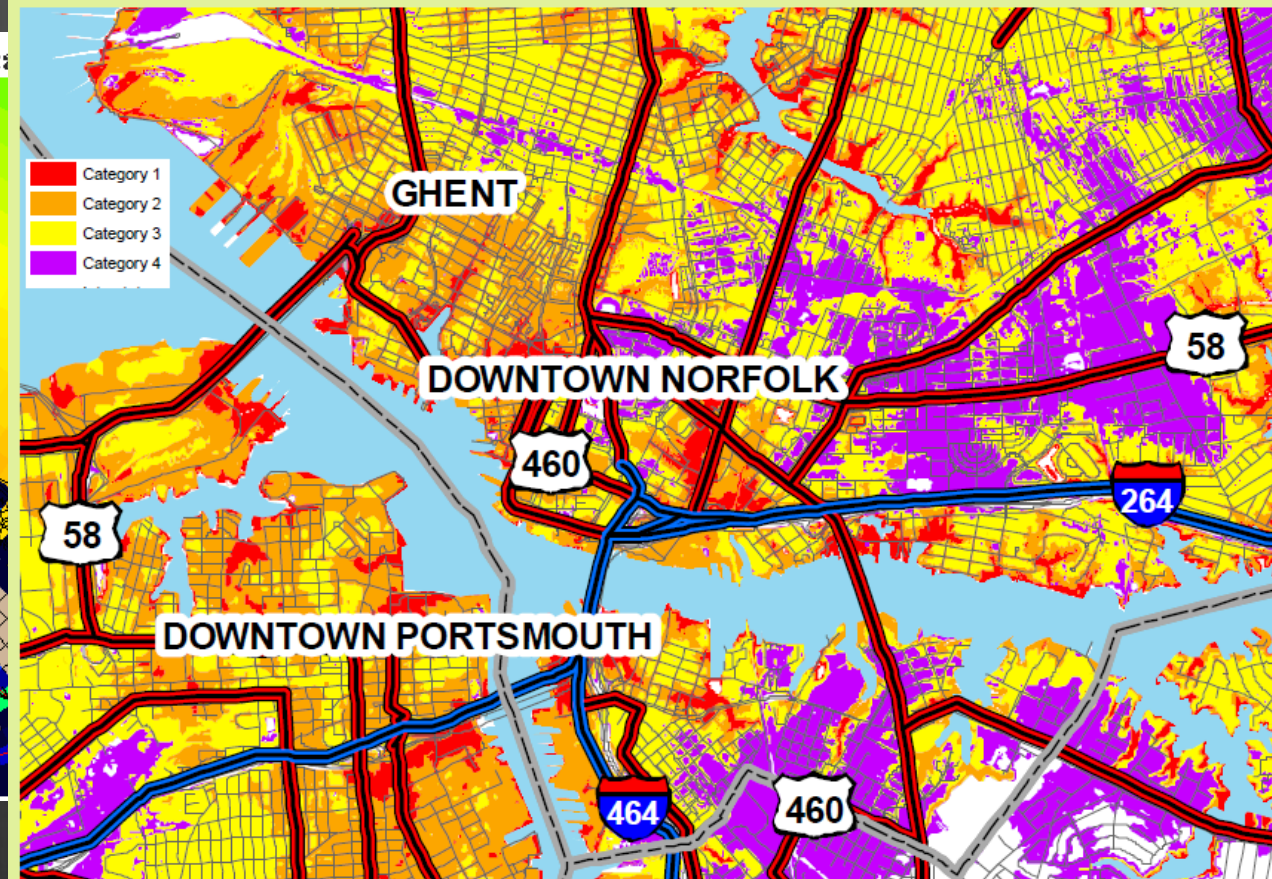
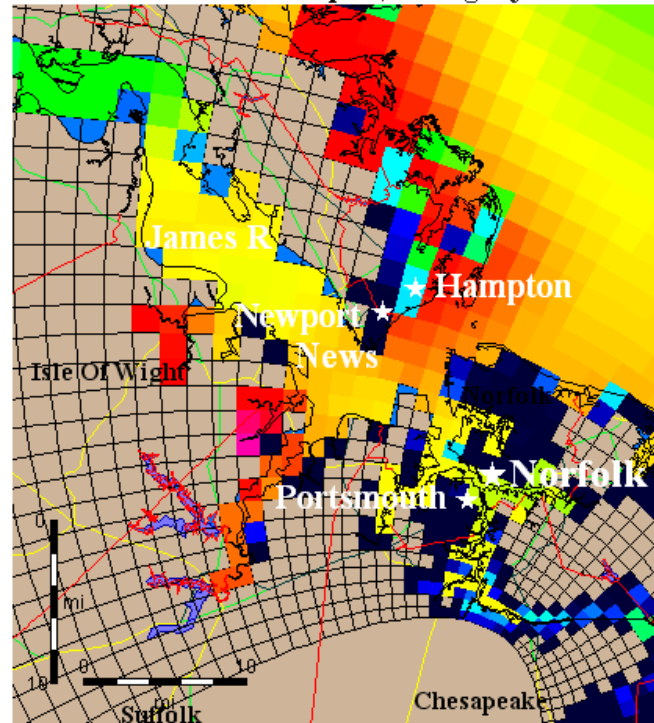
Virginia Tidewater

- More than ½ the 1.7 million people at risk of surge
- Important military presence
- Difficult evacuation scenario
- Close calls 1933 and Isabel, 2003
- “Big One” 1667 and 1749



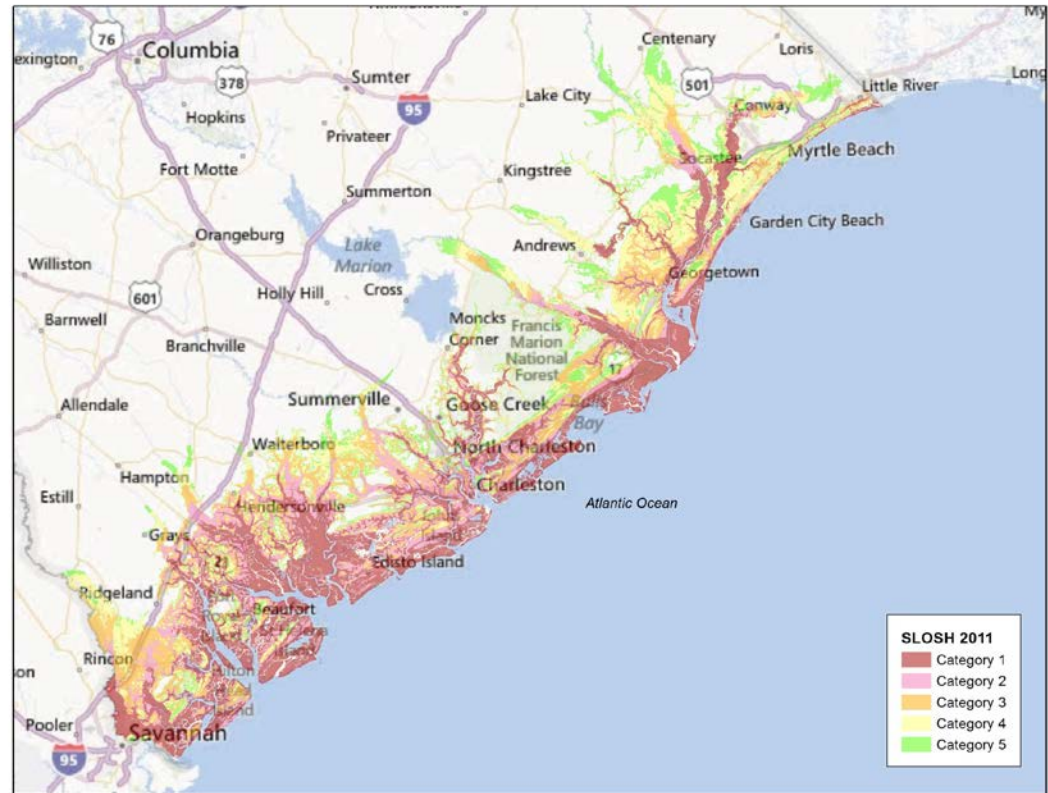
Storm Surge worse in highest developed areas

Maximum water depth, Category 3 Hurricane



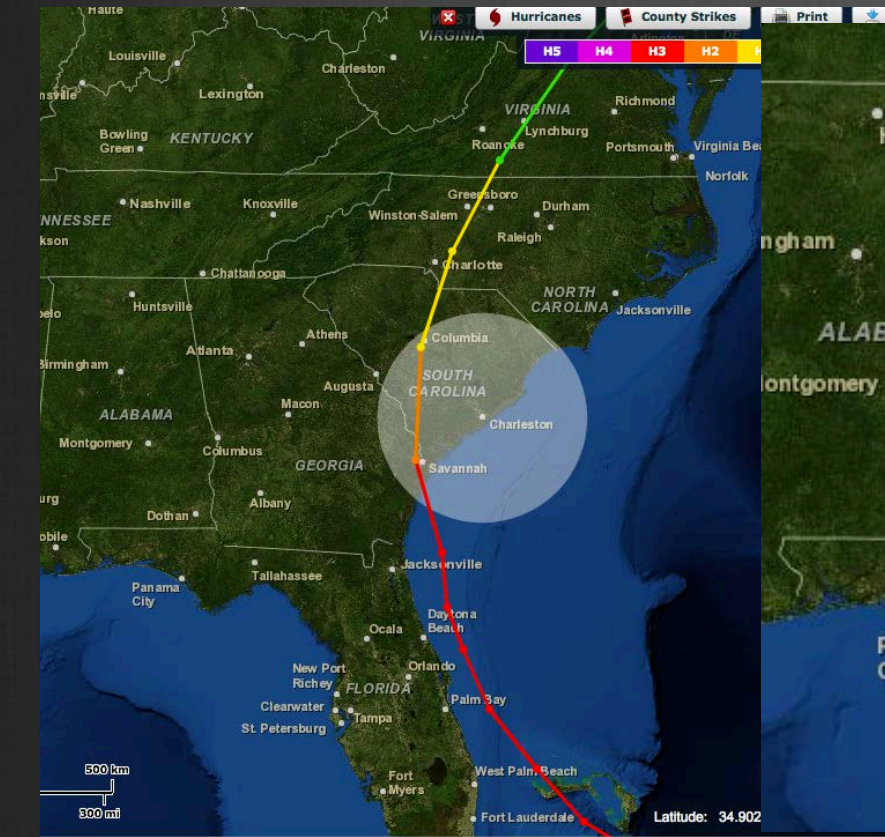
Savannah-Charleston

- ⦿ There's a good reason they call it the "Low Country"
- ⦿ Almost 75% of the population at risk from storm surge
- ⦿ 750,000 in 2010 projected to 1.1 million 2040
- ⦿ Fastest growing demographic is retirees

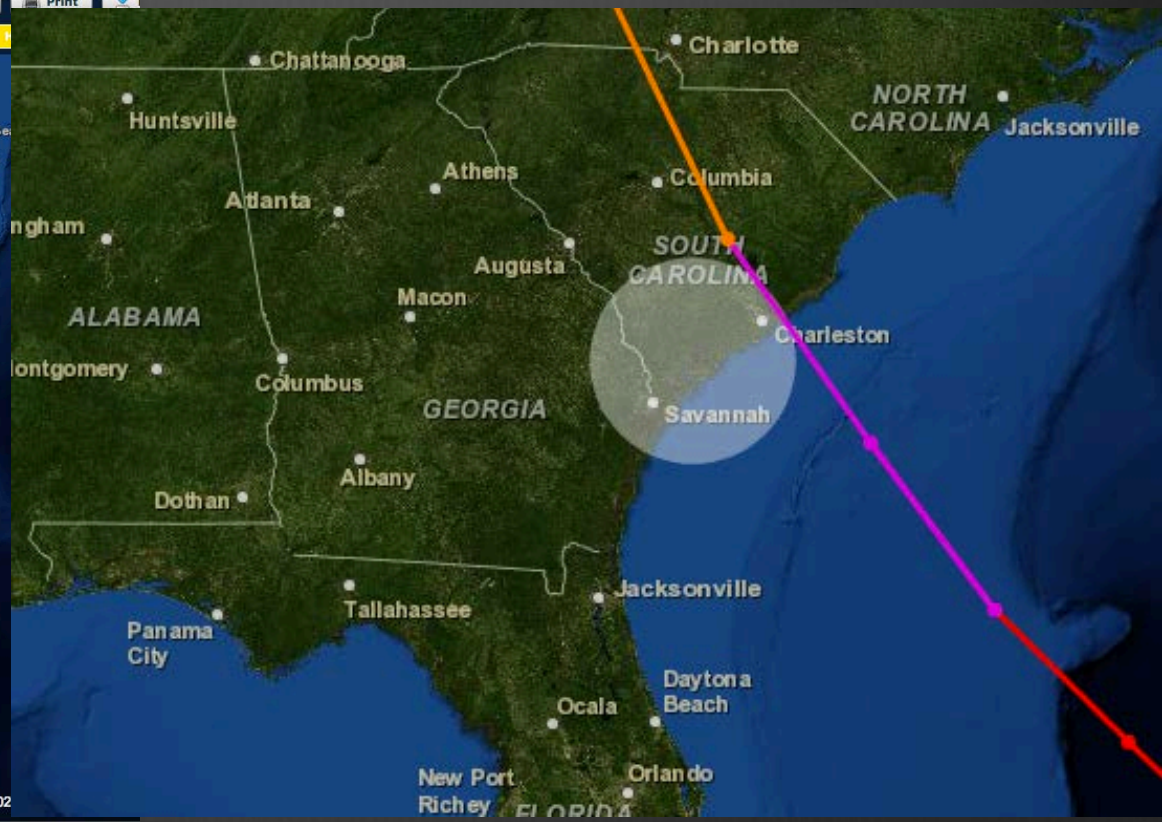


Big events

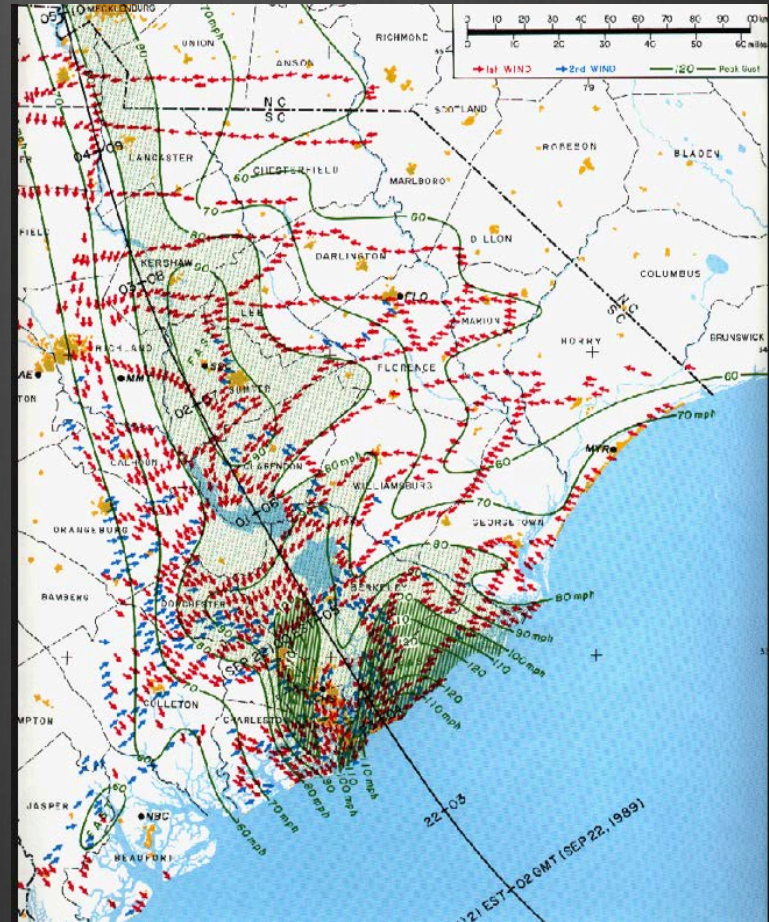
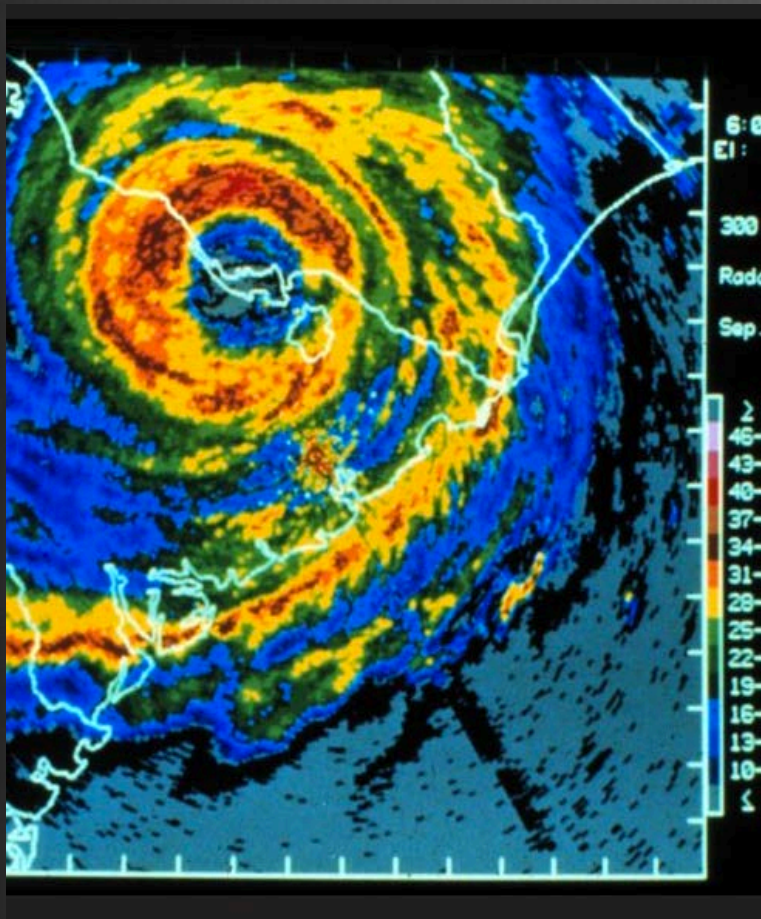
🎬 Sea Islands Hurricane 1893



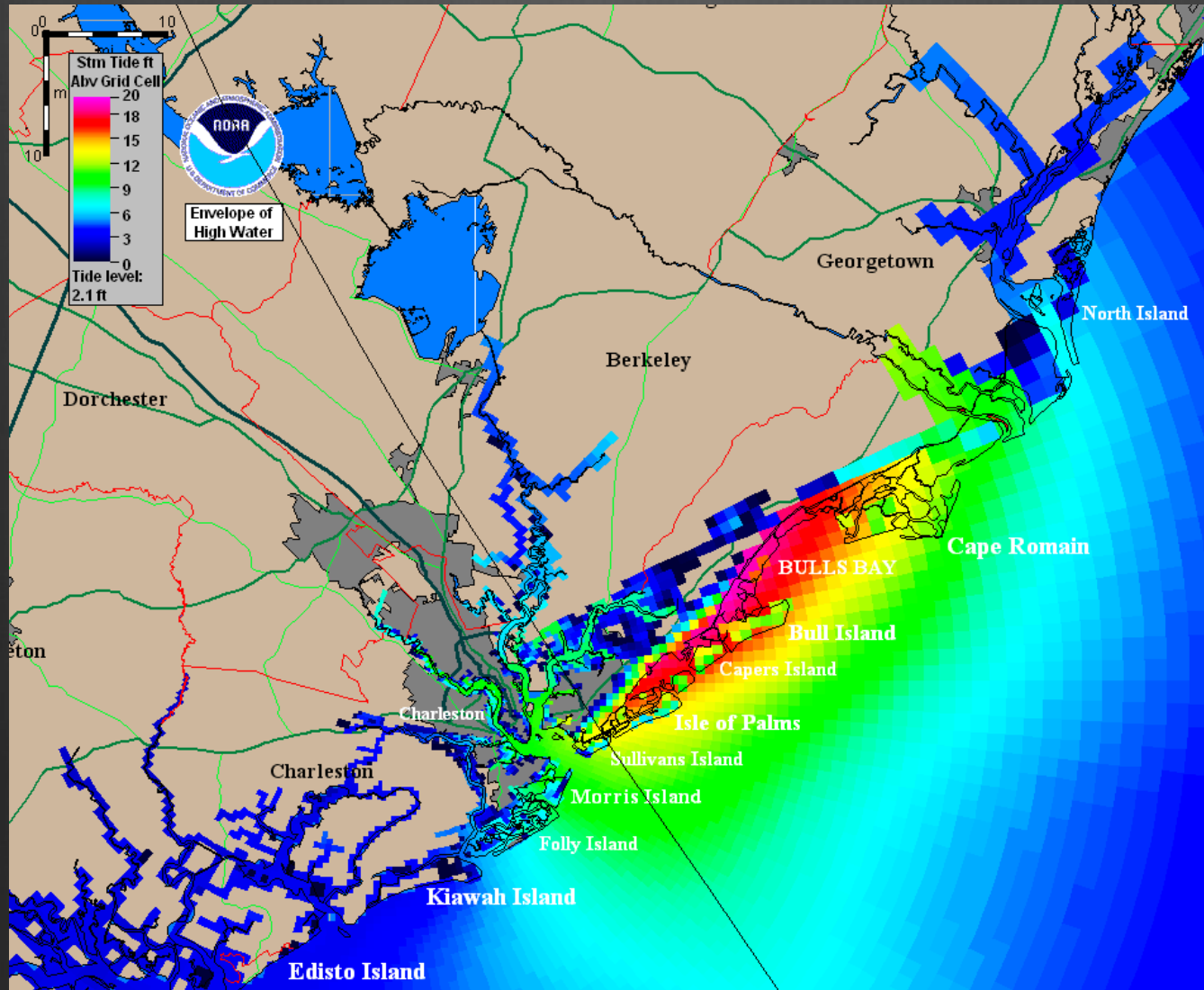
🎬 Hugo 1989



Large eye wall and fast movement - significant inland wind impact



Hugo storm surge



Storm Surge Depth If Hugo Made Landfall at Kiawah Island...



Charleston Peninsula



West Ashley



Park Circle



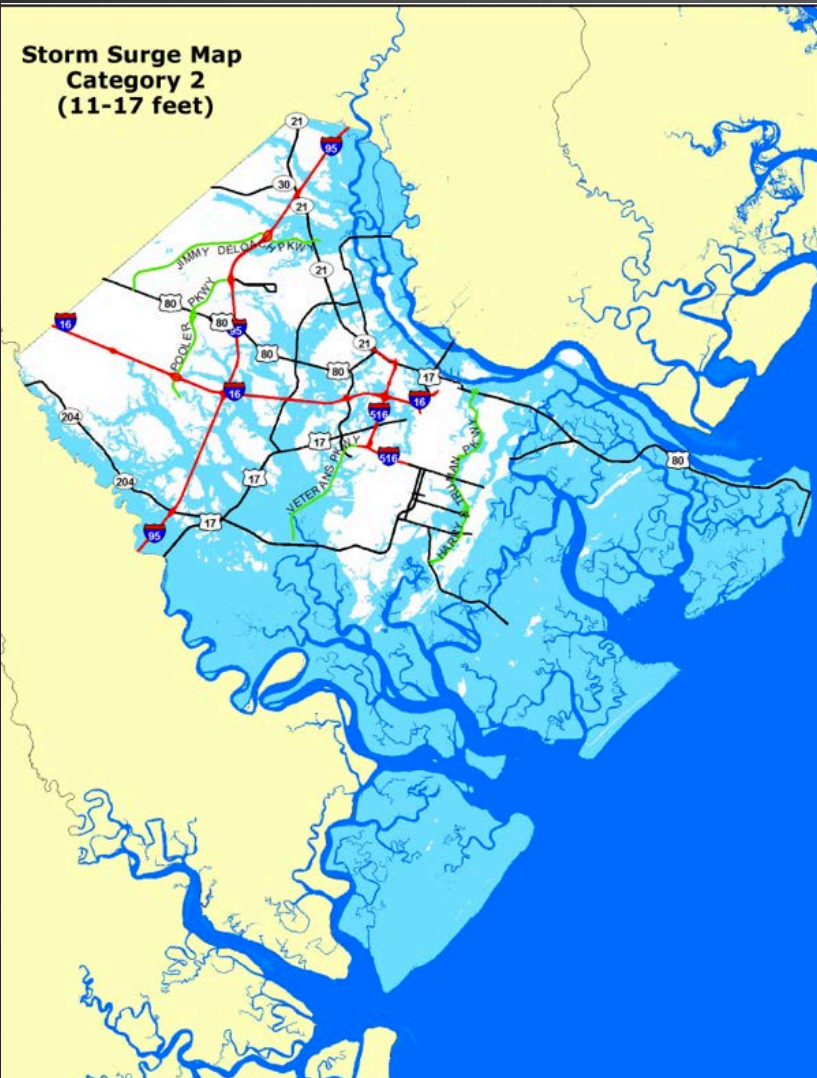
Mount Pleasant



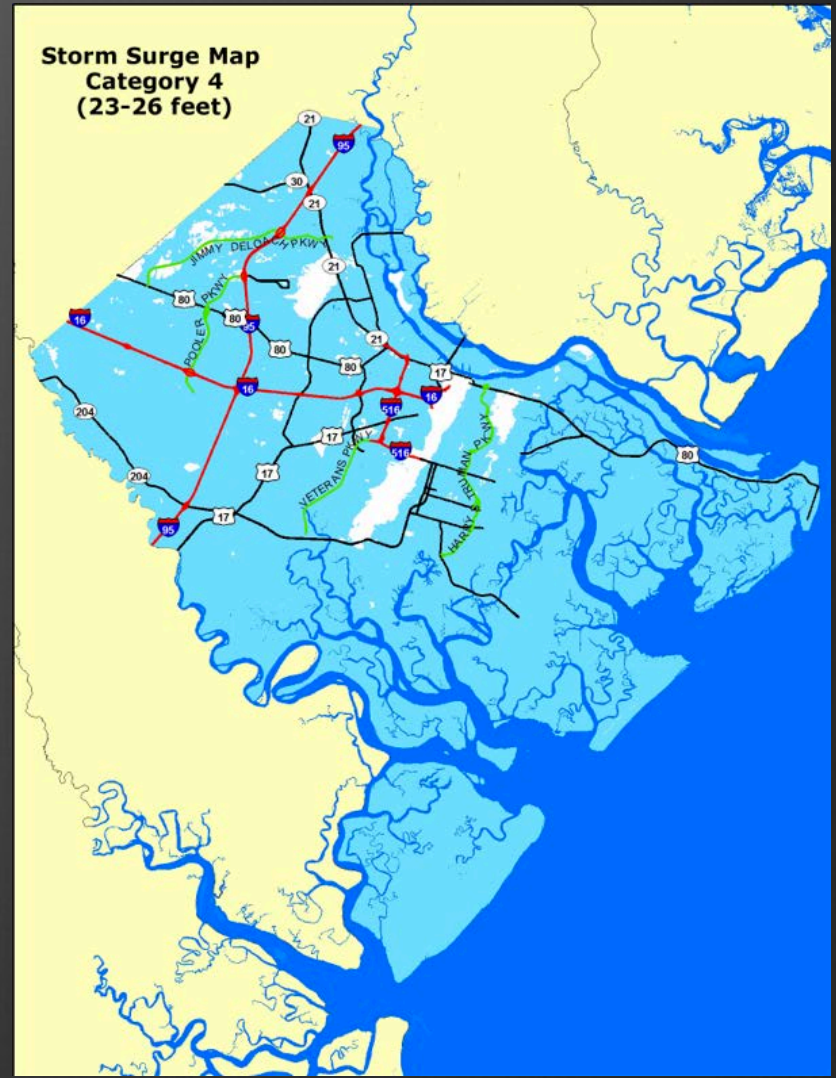
Source: RENCI at East Carolina University

Chatham County (Savannah)

**Storm Surge Map
Category 2
(11-17 feet)**

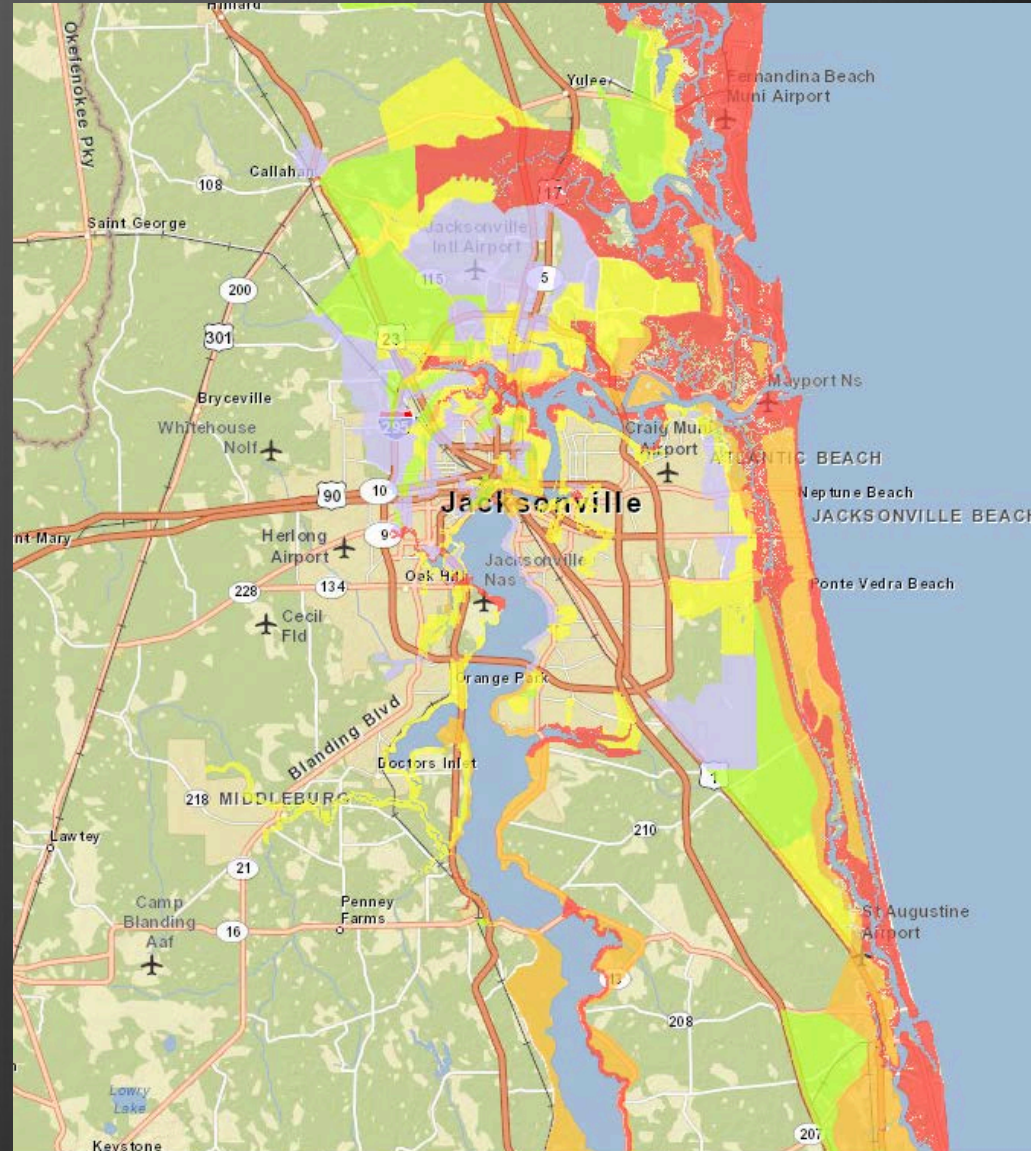


**Storm Surge Map
Category 4
(23-26 feet)**

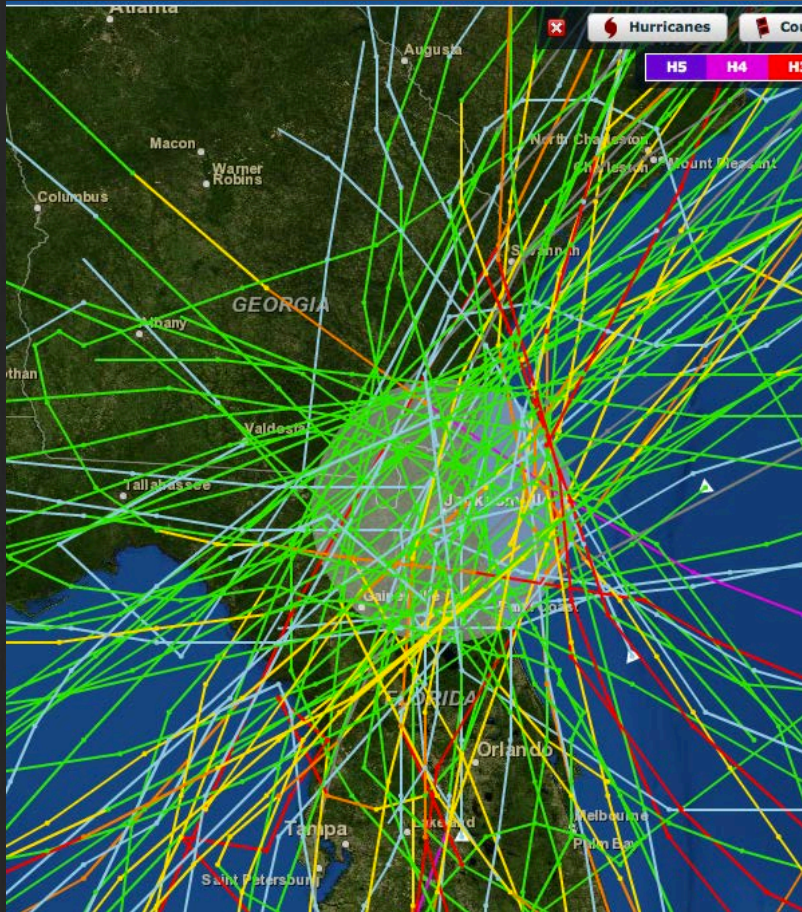


Jacksonville, Florida

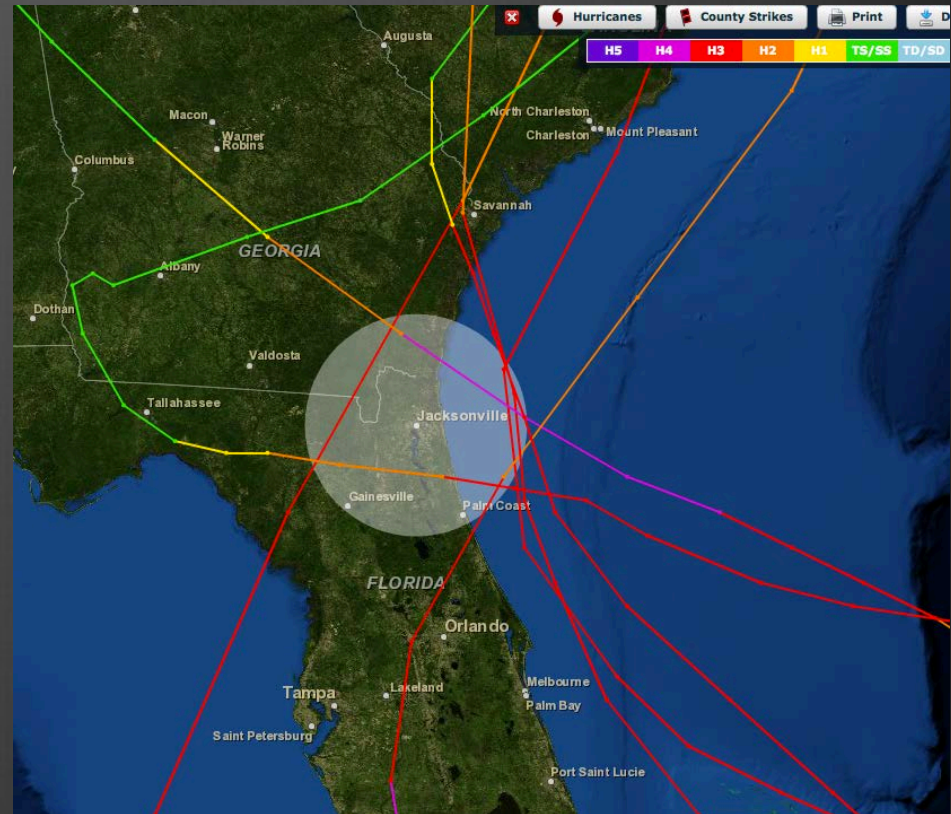
- ❶ Downtown, NAS JAX, NS Mayport, Ponte Vedra all vulnerable to surge
- ❷ 1.4 million people forecast to grow to 1.9 million by 2030
- ❸ Last significant storm 1964
- ❹ Large turnover in population



All Storms

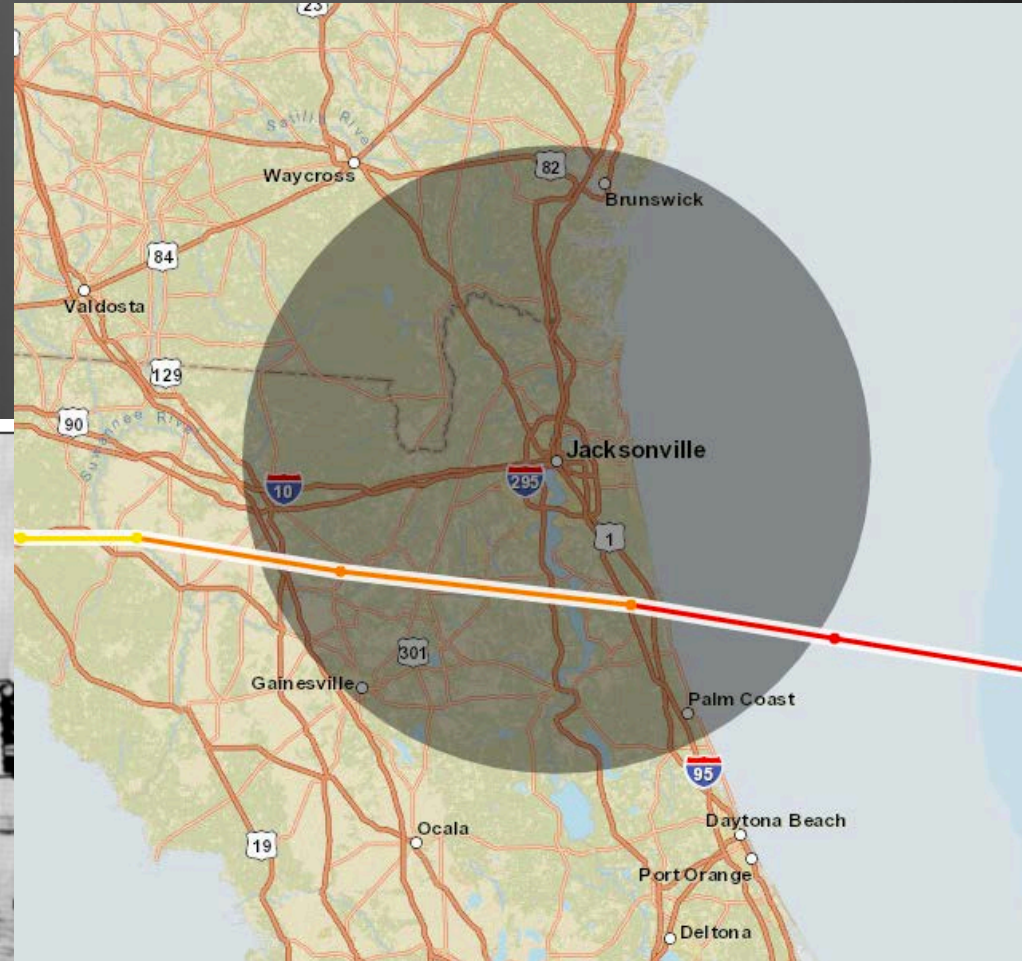


Cat 3 or 4



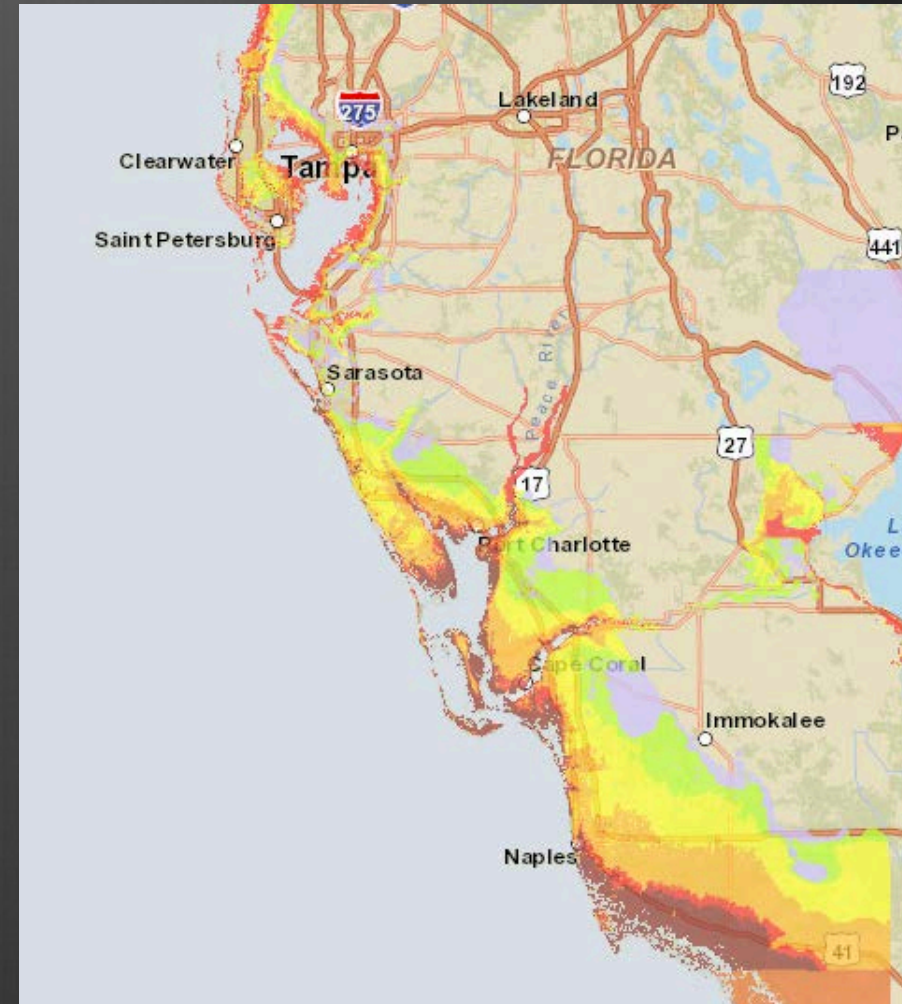
Dora, 1964

- Population 400,000 – only direct hit from Atlantic in Northeast FL – Significant surge
- Areas that flooded on the east side of the St Johns was largely unpopulated then, but not now

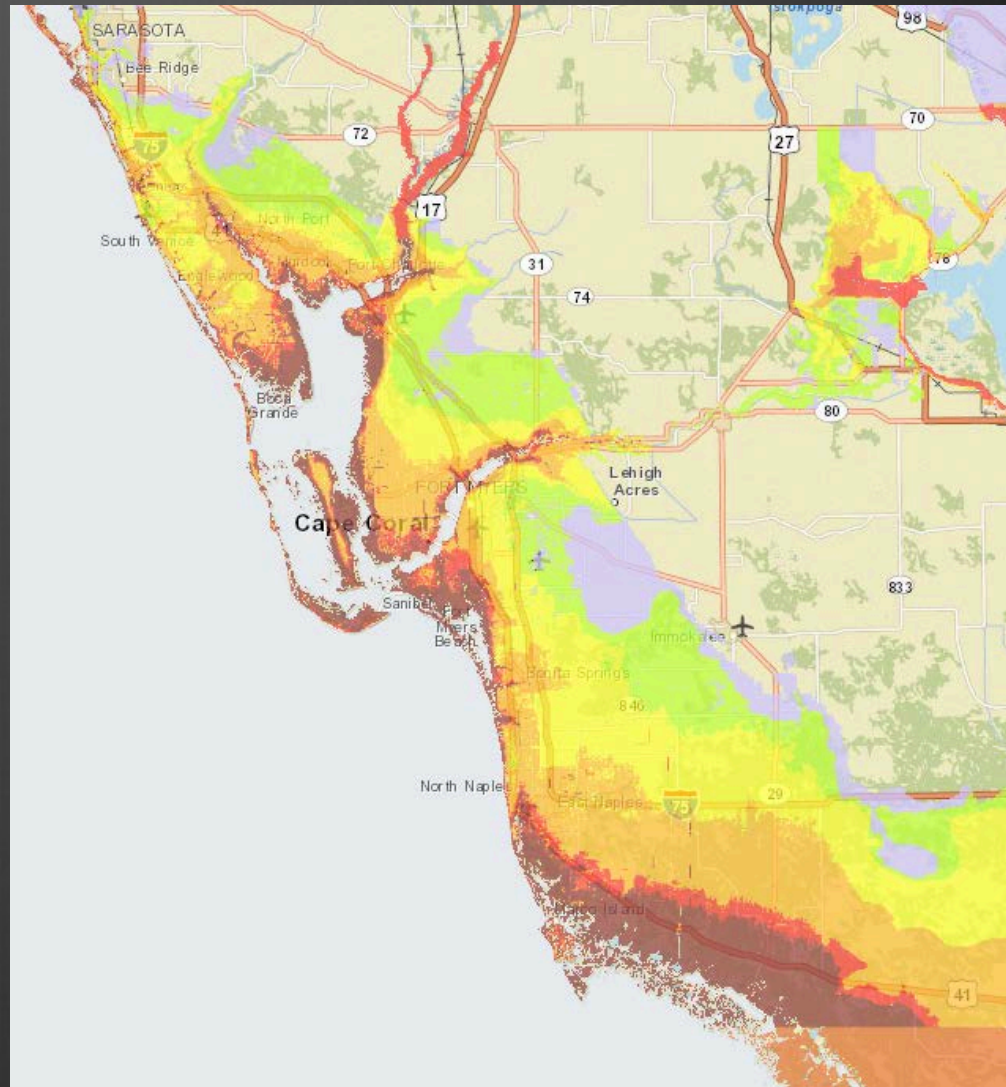
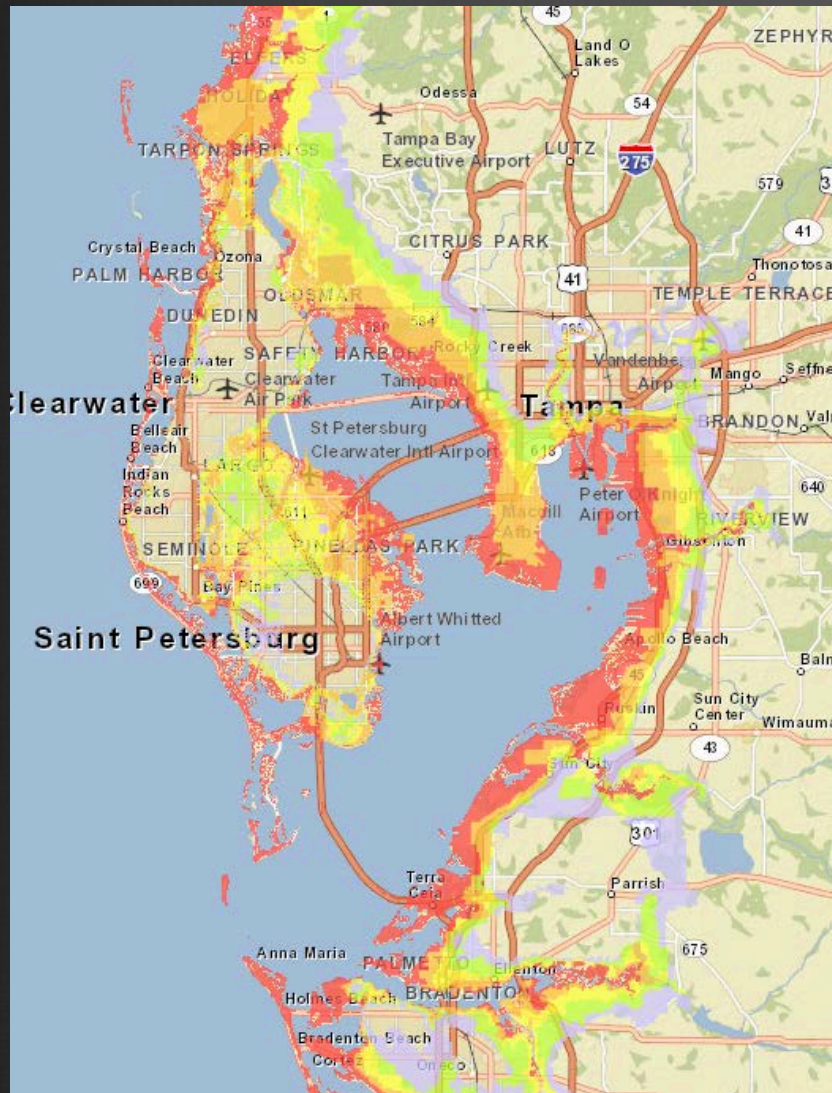


West Coast FL

- ❶ 2010 4.4 million forecast to grow to 6.3 million 2040
- ❷ Highest percentage of retirees of any coastal region
- ❸ Lack of evacuation routes
- ❹ Very vulnerable to storm surge
- ❺ Generations since big surge event

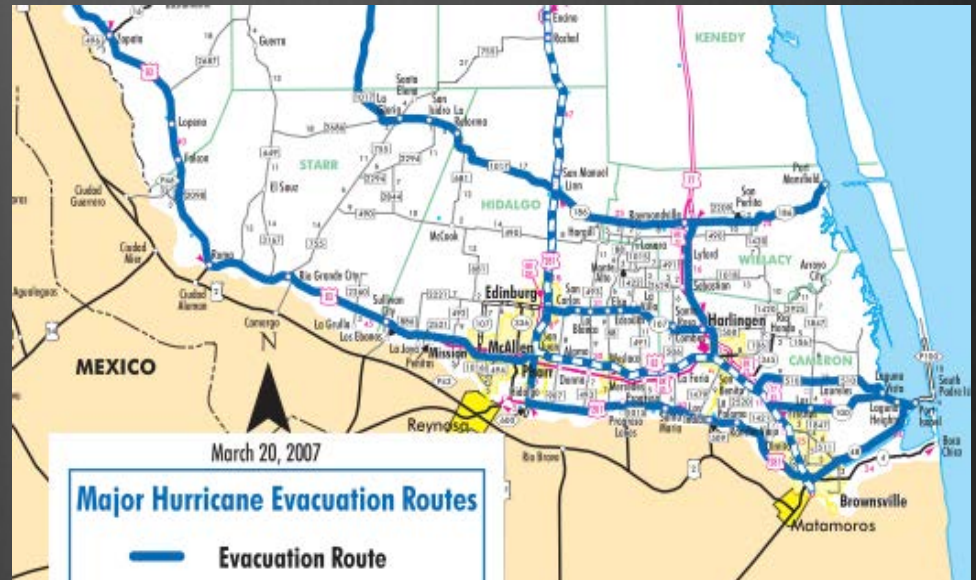


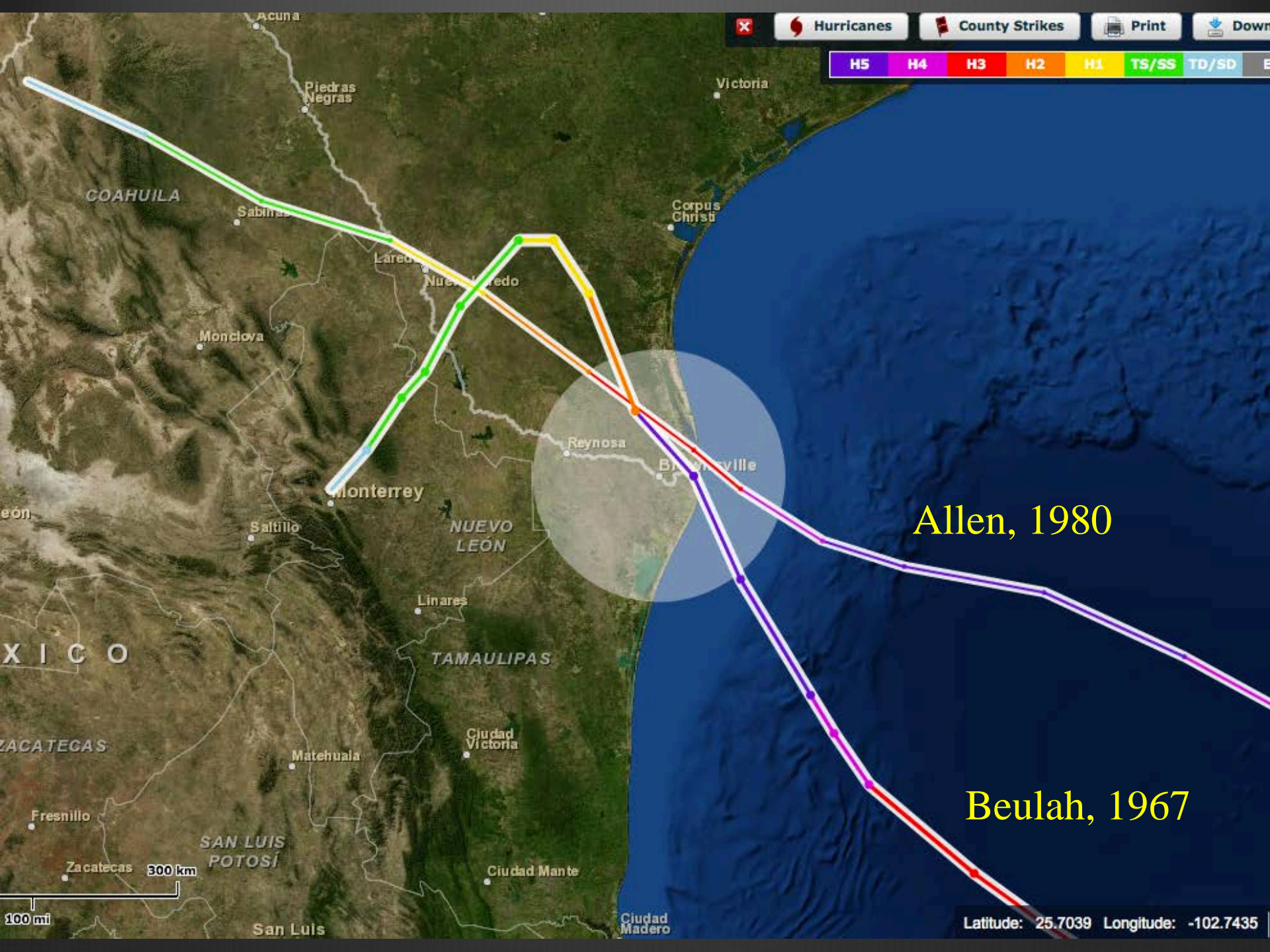
SW Florida Evacuation Zones



Lower Rio Grande Valley

- U.S. 2010 – 1.2 million 2030
- 2.0 million - twice as many
live in Mexico's LRGV
- High flood and wind risk
(residential construction)
- Demographics - low income
– 300,000 live in Colonias
- Evacuation challenges





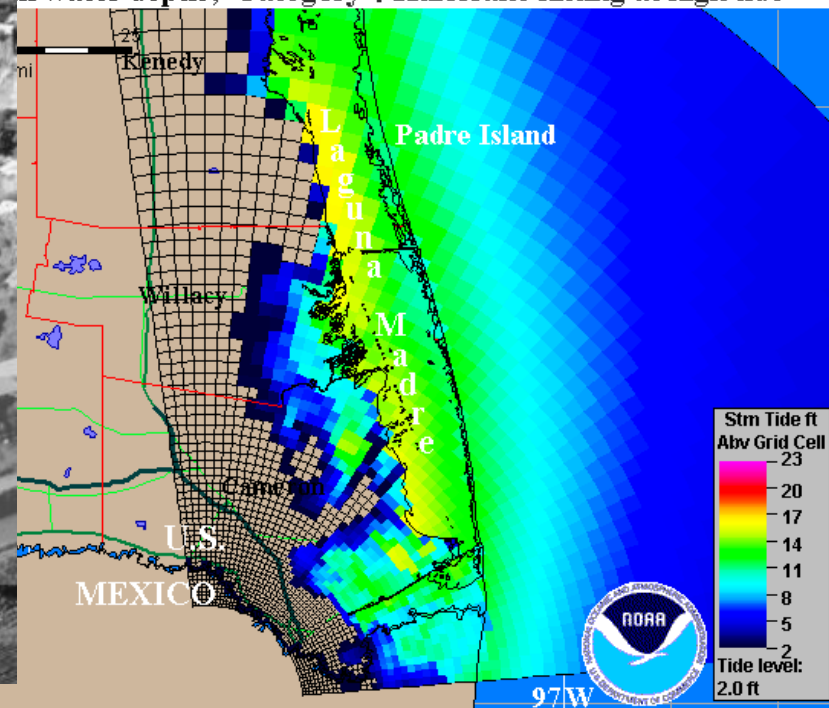
Allen, 1980

Beulah, 1967

Rainwater flooding higher risk than surge for most of Valley



Storm water depth, Category 4 Hurricane hitting at high tide



Beulah, 1967

Houston - Galveston

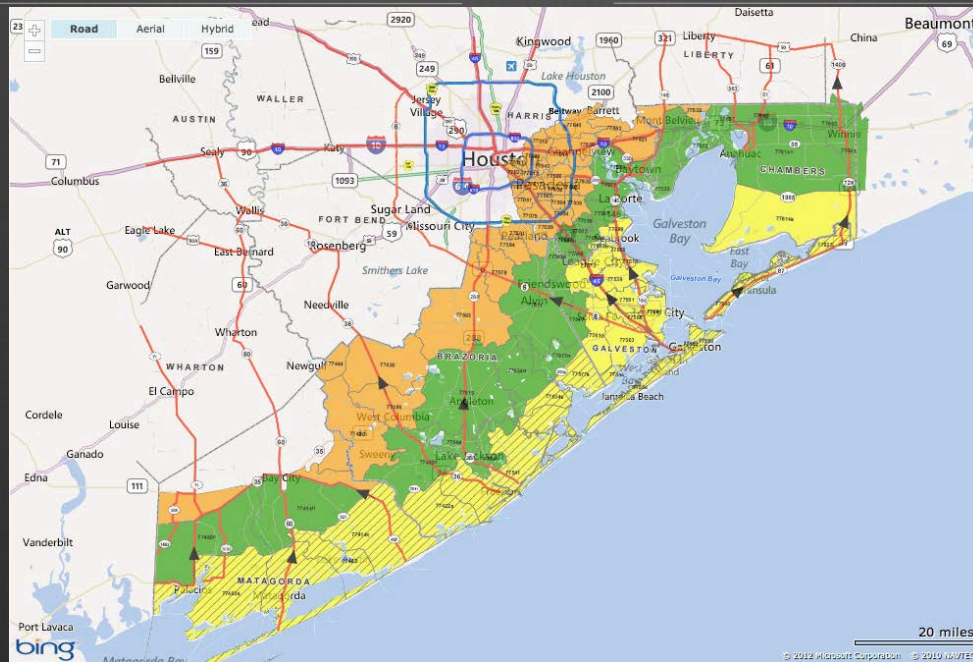
- ⊗ Although Ike being recent takes us out of my criteria, we share other common aspects with other U.S. coastal communities
- ⊗ Growth in surge risk zones continues unabated
- ⊗ Vulnerable infrastructure – ex. - Retirement homes, nursing homes are being built in evacuation zones
- ⊗ Building codes are at the low end of wind risk. Much of Ike's dollar damage was wind related

H-GAC Demographics

1992-2012

2035

- Population 6,500,000 (4M 1992)
- 900,000 evacuation zones (0.5 M 1992)
- 48 hour clearance time (24 hour 1992)



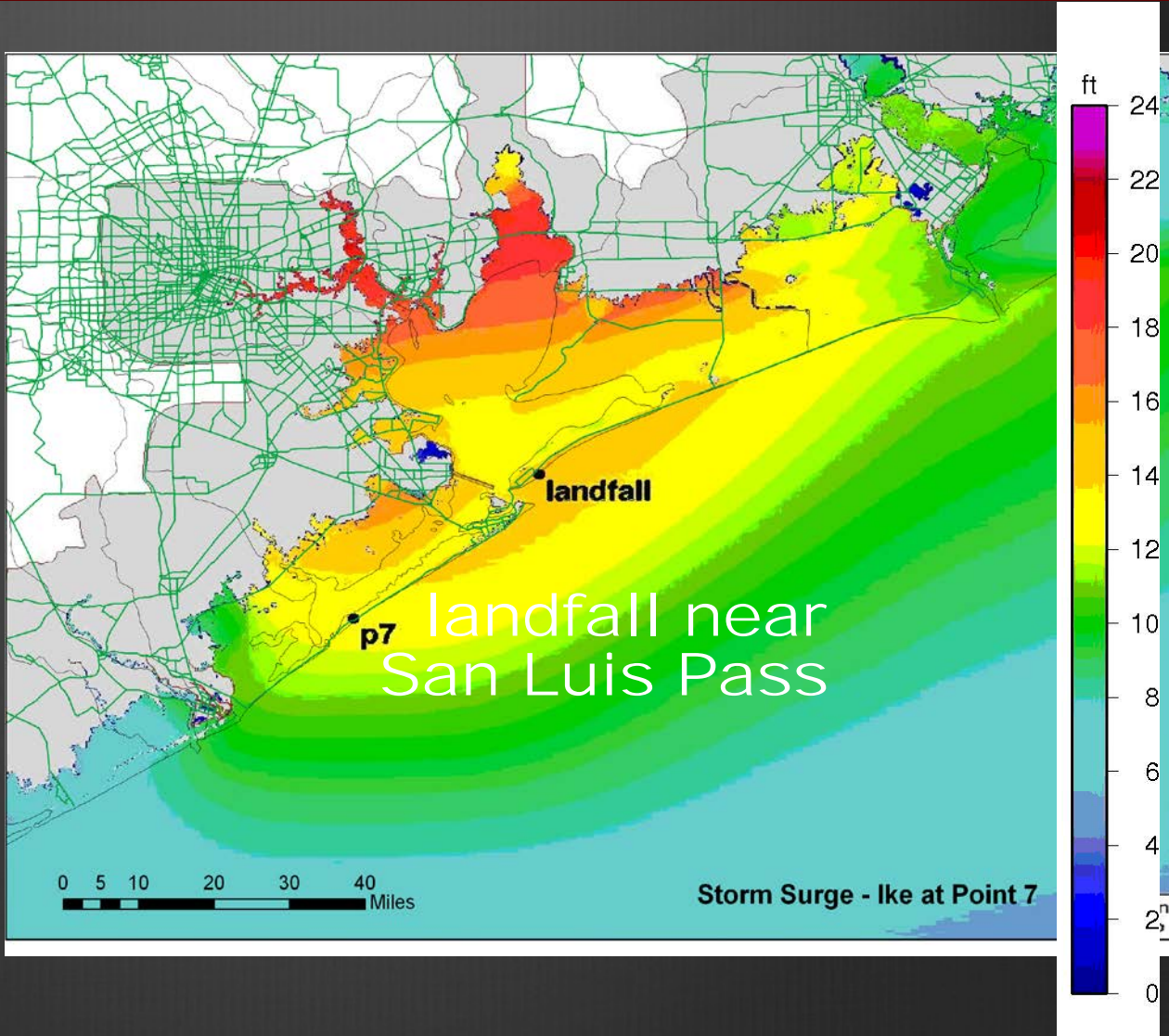
- Population 8,800,000
- 1,600,000 in evacuation zones
- No additional lanes on evacuation routes leaving Houston
- ??? Evacuation clearance time ???

200,000 new people a year move to the H-G area
1,000,000 current residents were not here for Ike



IF IKE MOVED 20 MILES SOUTH

- An addition 170,000 citizens homes flooded
- Flooding of the petrochemical complexes and NASA JSC



Summary

- ⊗ Many vulnerable communities from Maine to Brownsville
- ⊗ Geography and demographics quite variable
- ⊗ People challenge greater than meteorological challenge
- ⊗ Growth in at-risk areas leading to increasingly complex evacuation and response
- ⊗ Hurricane disasters will continue to be more costly, mainly due to our inability to set proper land use and building codes in vulnerable coastal areas.

Questions?

