Storm Surge Resources

Surge Background, SLOSH Display Program, and Probabilistic Storm Surge (psurge)

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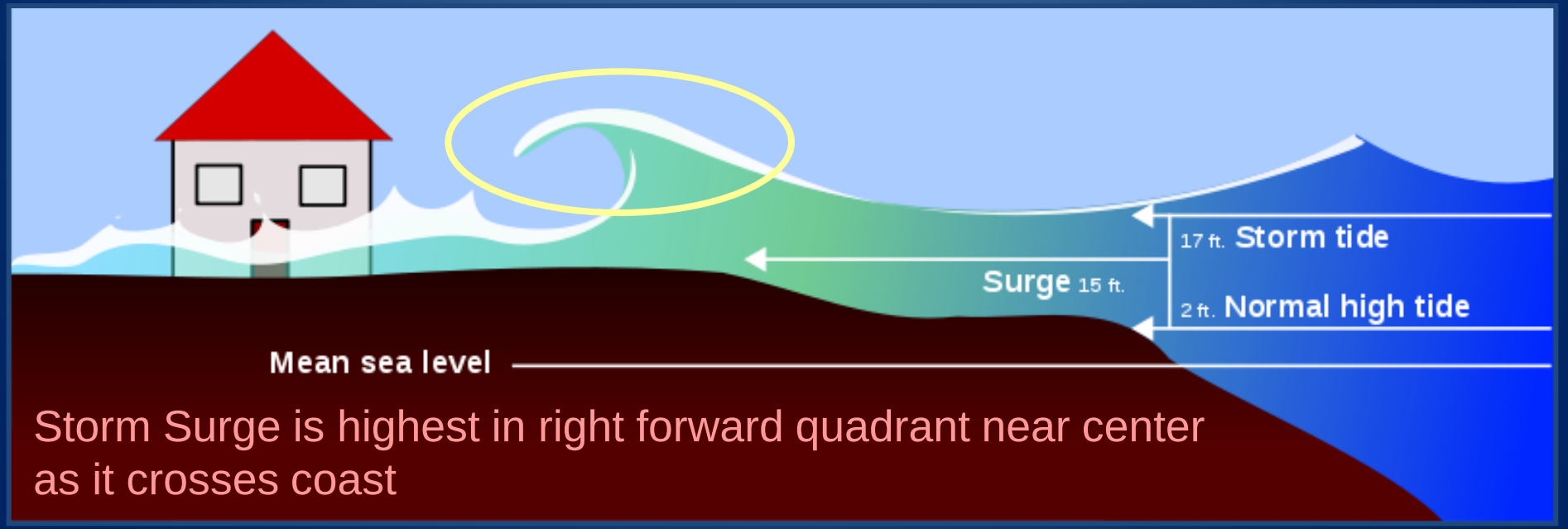
Hurricane Threats

STORM SURGE – The abnormal rise in water level directly associated with the wind and pressure forces associated with a hurricane

Storm Surge Example – hurricane makes landfall at high tide

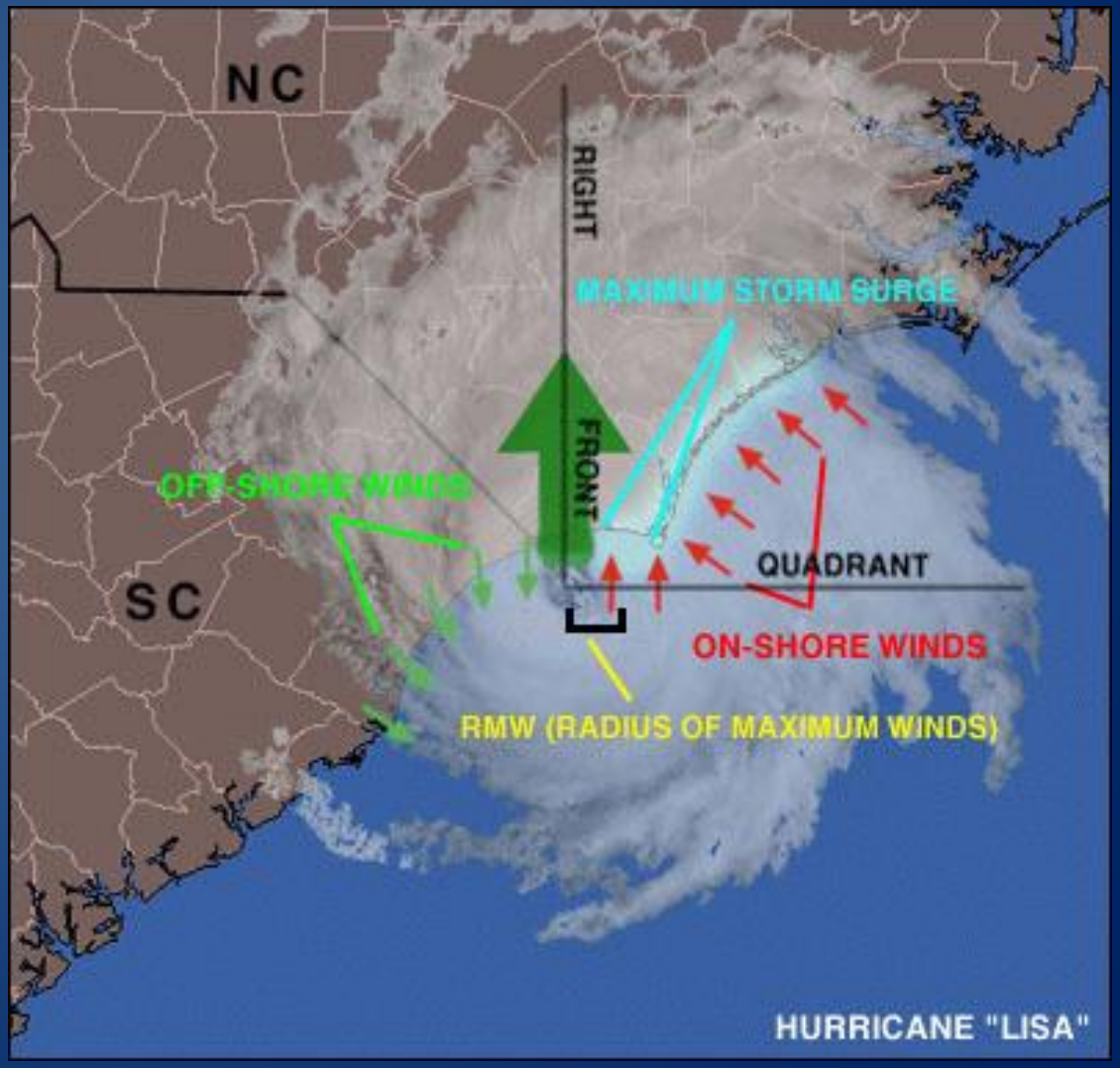


Storm Surge is highest in right forward quadrant near center as it crosses coast

Hurricane Threats

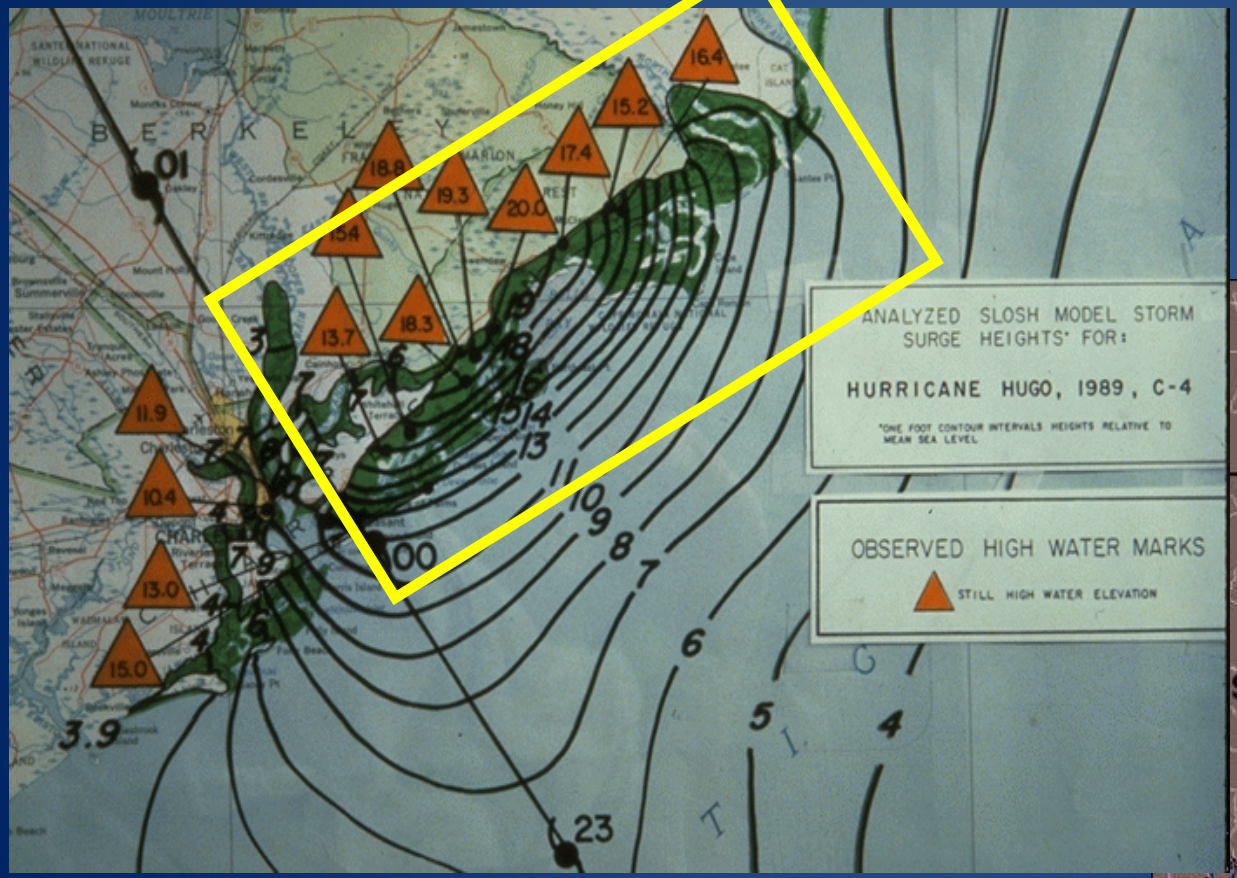
Storm Surge, Strong Winds, Tornadoes

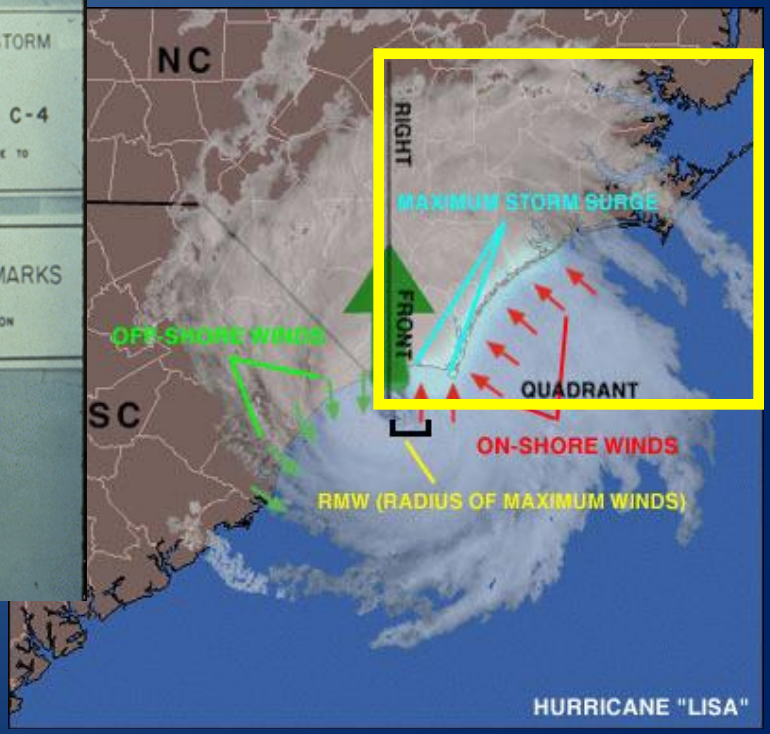
Storm Surge is highest and Winds are greatest in the RIGHT FORWARD QUADRANT close to where center makes landfall



Storm Surge Contd.

Storm Surge Example – Hugo 1989

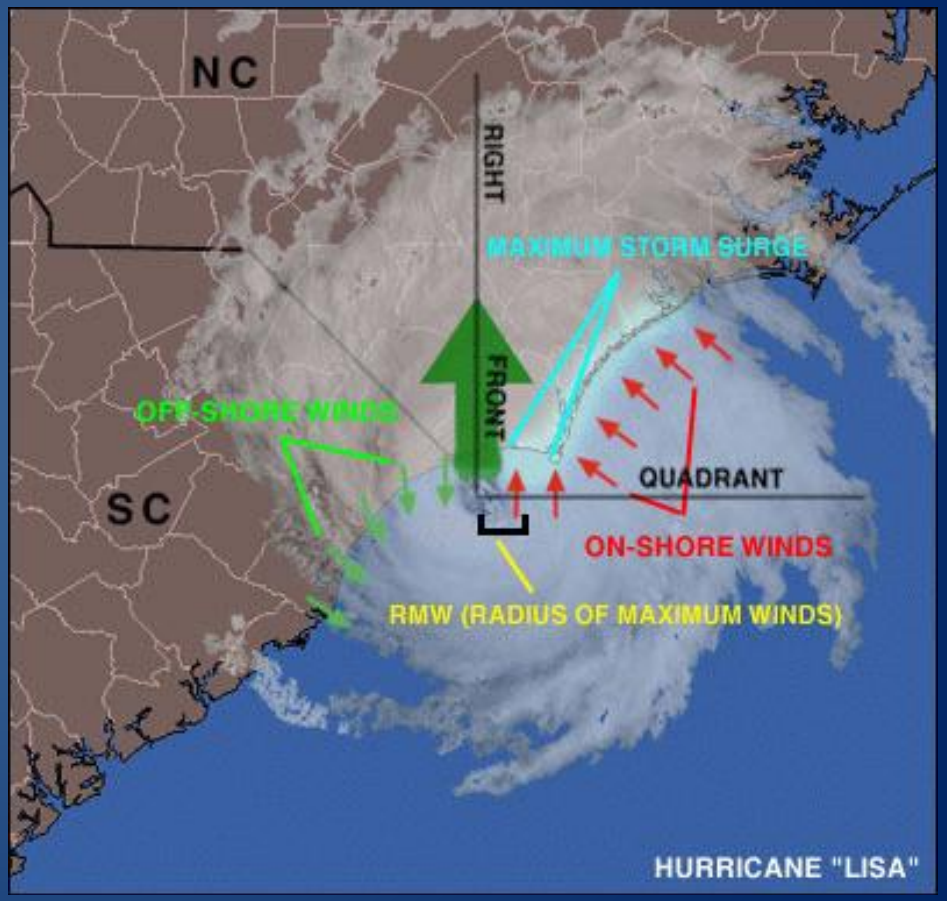




Storm Surge

Storm Surge Factors

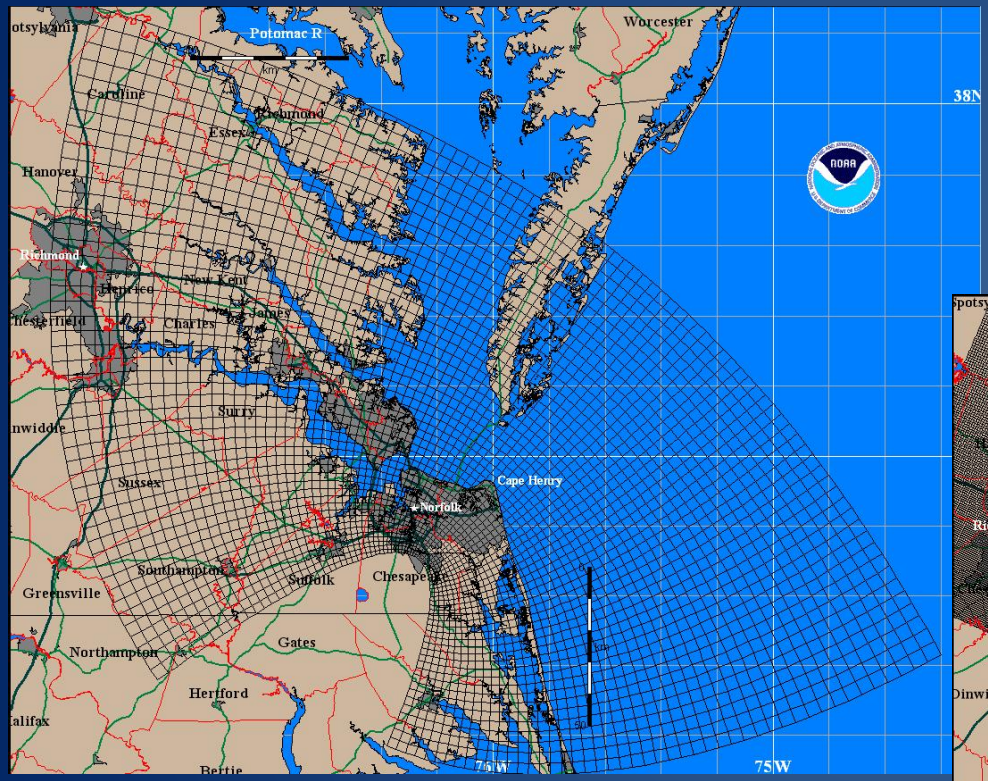
- Storm Intensity and Size
  - Stronger = Higher Surge
  - Larger = Larger Area Affected
- Storm Speed
  - Slower Often Means Higher Surge
- Angle to Coast at Landfall
  - Perpendicular Maximizes Surge (Katrina)



SLOSH Display Program (SDP)

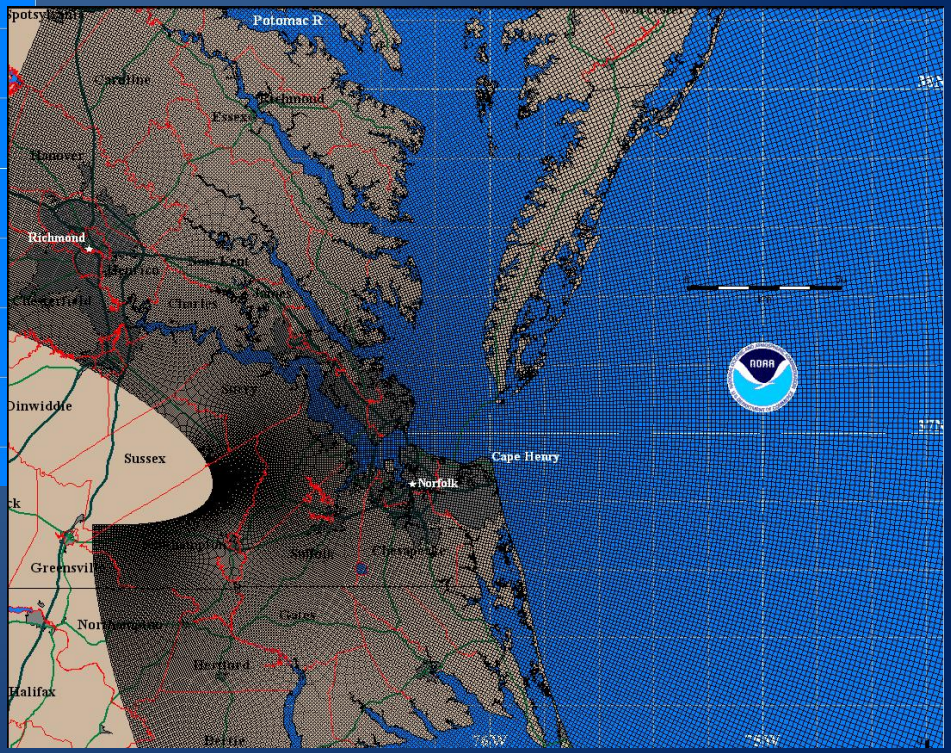
- Provides Guidance for Potential Surge From a Variety of Hurricane Scenarios
  - Display of MEOWs and MOMs
  - Basin Dependent
- MEOW – Maximum Envelope of Water
  - Theoretical Max Surge for a Given Category Storm Moving at X Speed and Direction
- MOM – Maximum of Maximums – used for H.E.S.
  - Theoretical Max Surge for a Given Category Storm (i.e. max of MEOWs for that Category Storm)

Norfolk SLOSH Basin Comparison

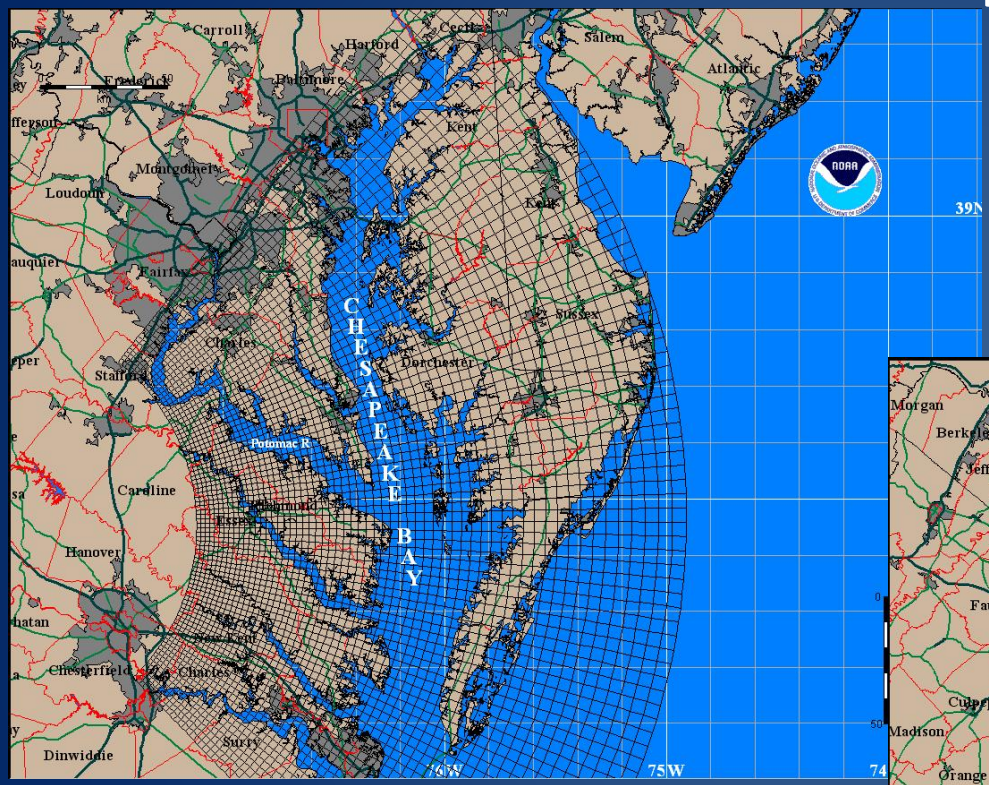


1990s Basin Grid

2012 Basin Grid

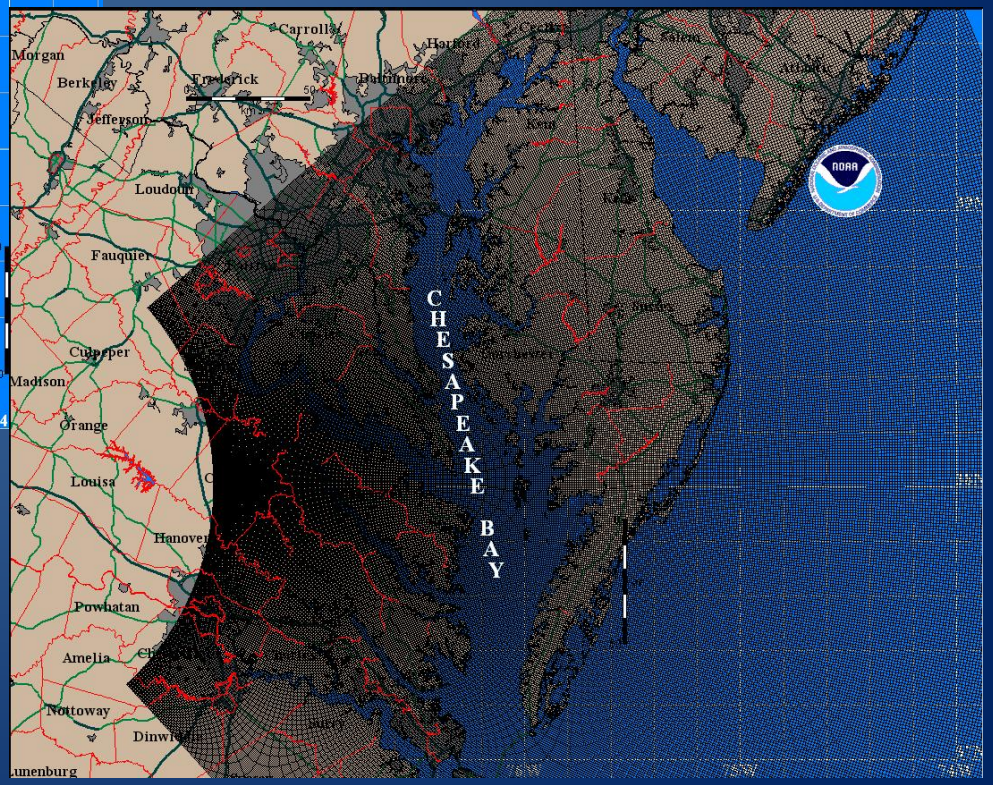


Chesapeake Bay SLOSH Basin Comparison

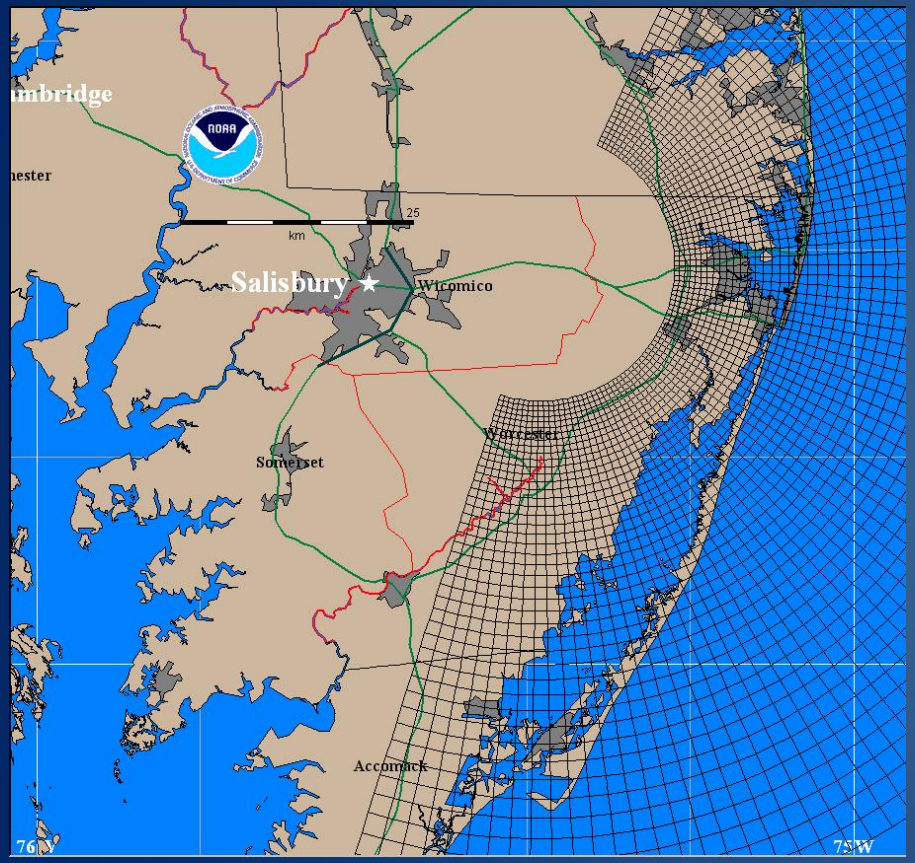


Current Basin Grid

Proposed Future Basin Grid

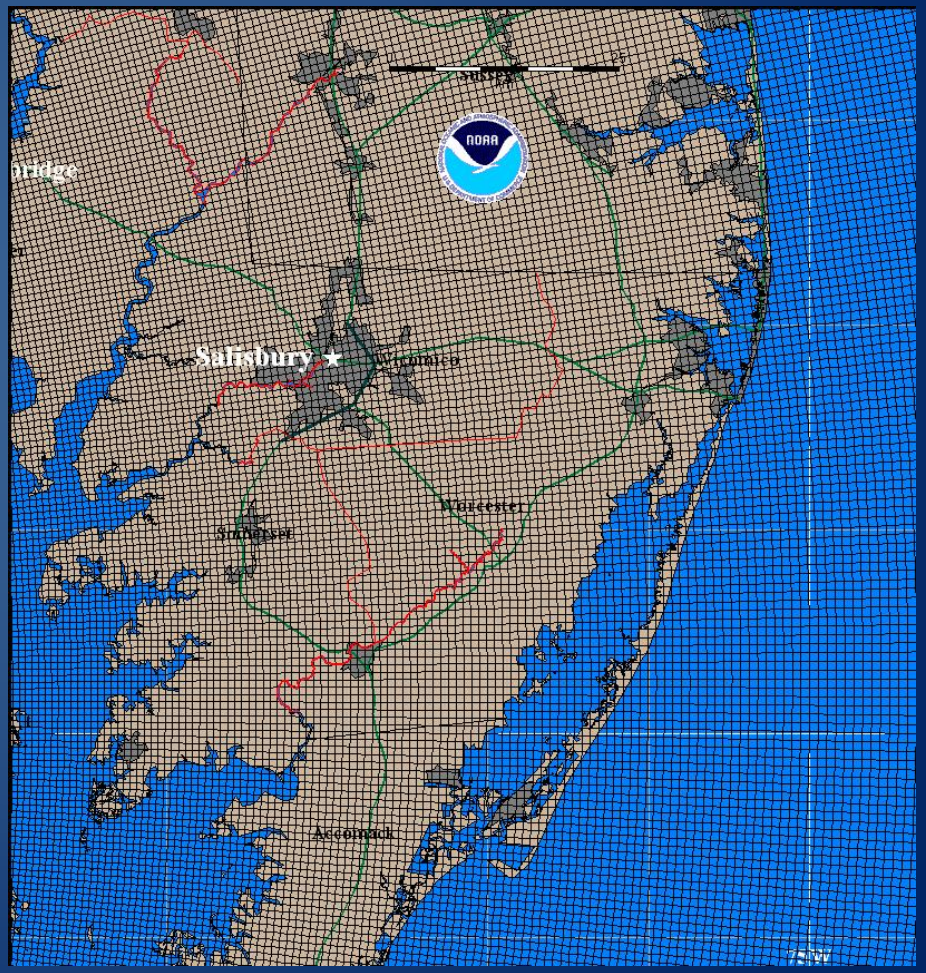


Ocean City SLOSH Basin Comparison



Current Ocean City Basin Grid

Proposed Chesapeake Bay Basin Grid

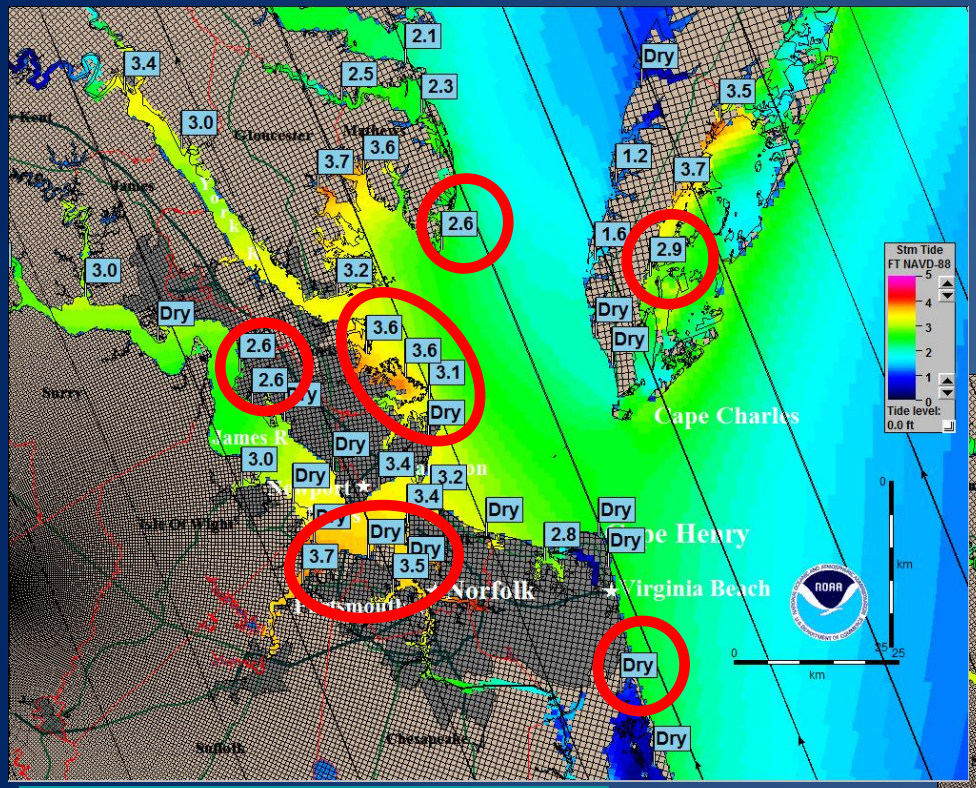


SLOSH Display Program (SDP)

- Primarily Used for Planning (pre-storm and long-term)
- MEOWs - Best Guidance 2 to 5 Days from Impact/Landfall
- SDP Does NOT Provide Storm Surge Timing
- SDP Does NOT Provide a Storm Specific Perspective
- Therefore, Probabilistic Surge (psurge) Best once Watches/Warnings Have Been Issued

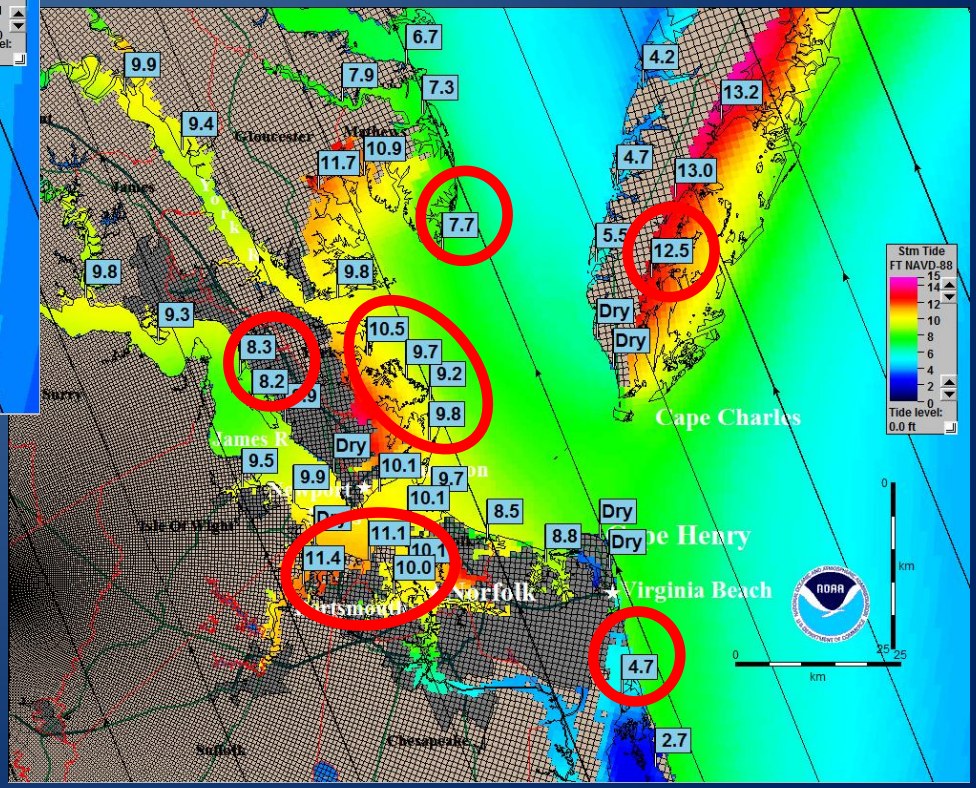
Storm Surge

STORM INTENSITY Influence



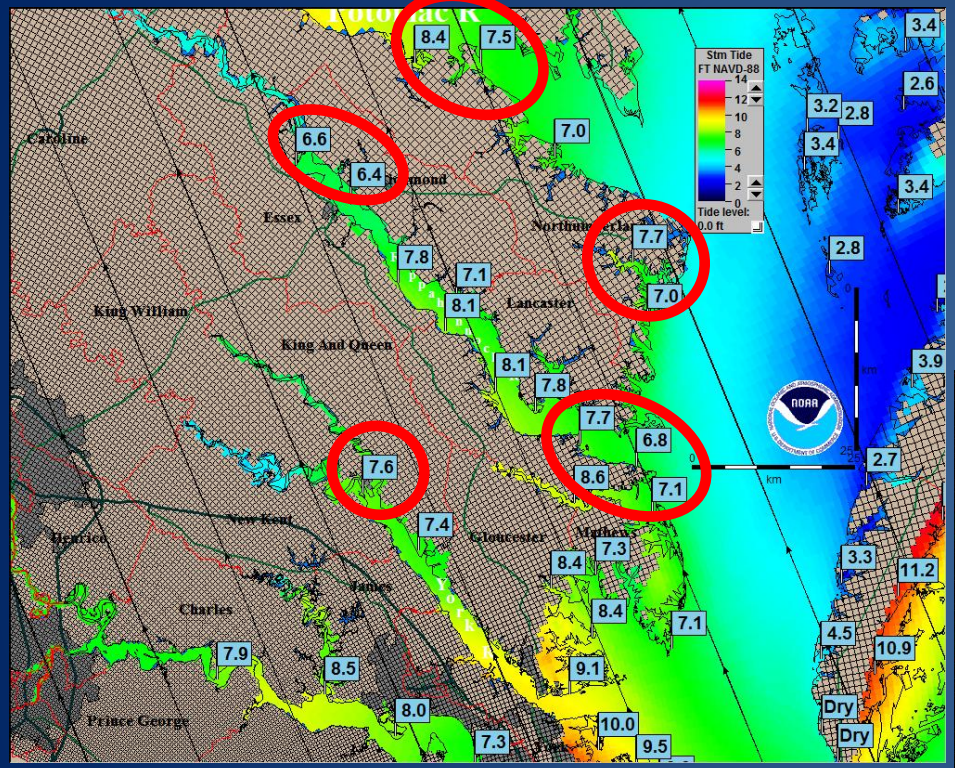
CAT 1 NNW 20 mph

CAT 3 NNW 20 mph



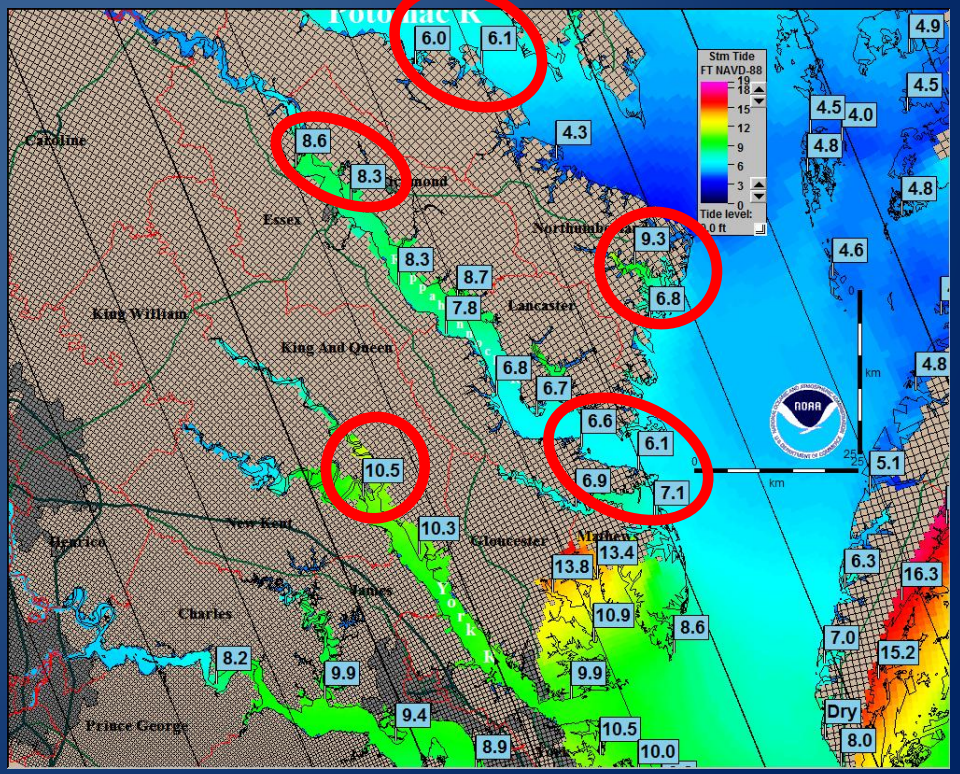
Storm Surge Contd.

STORM SPEED Influence



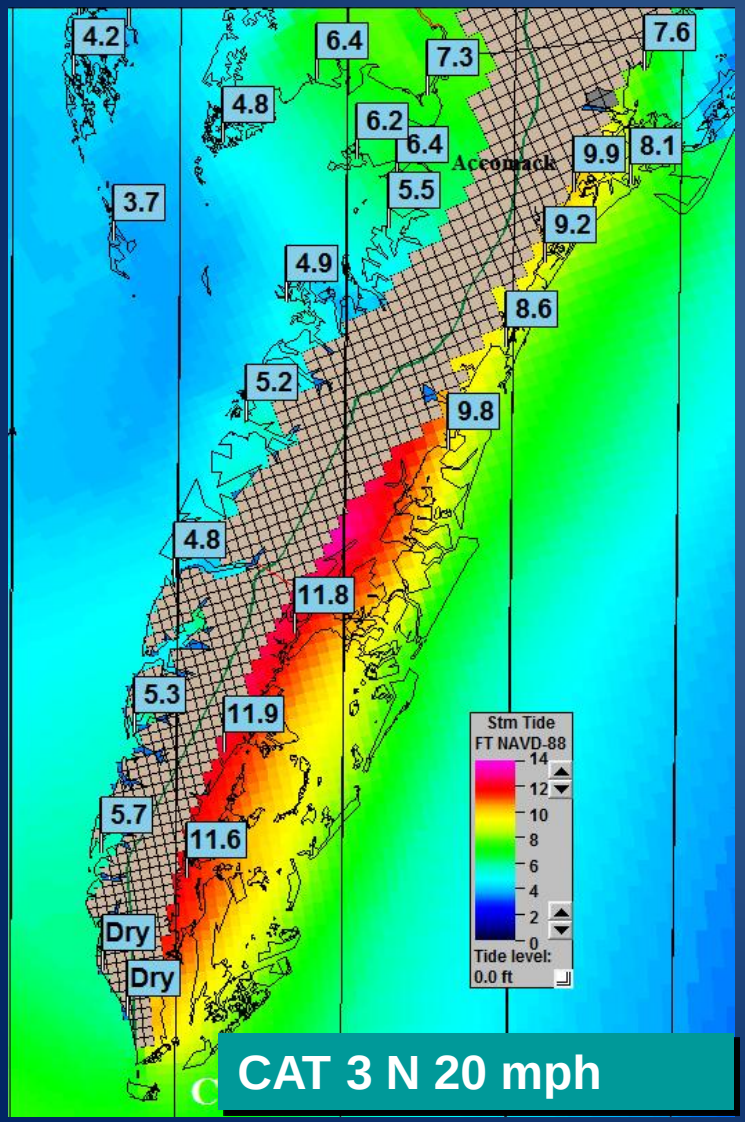
CAT 3 NNW 10 mph

CAT 3 NNW 30 mph

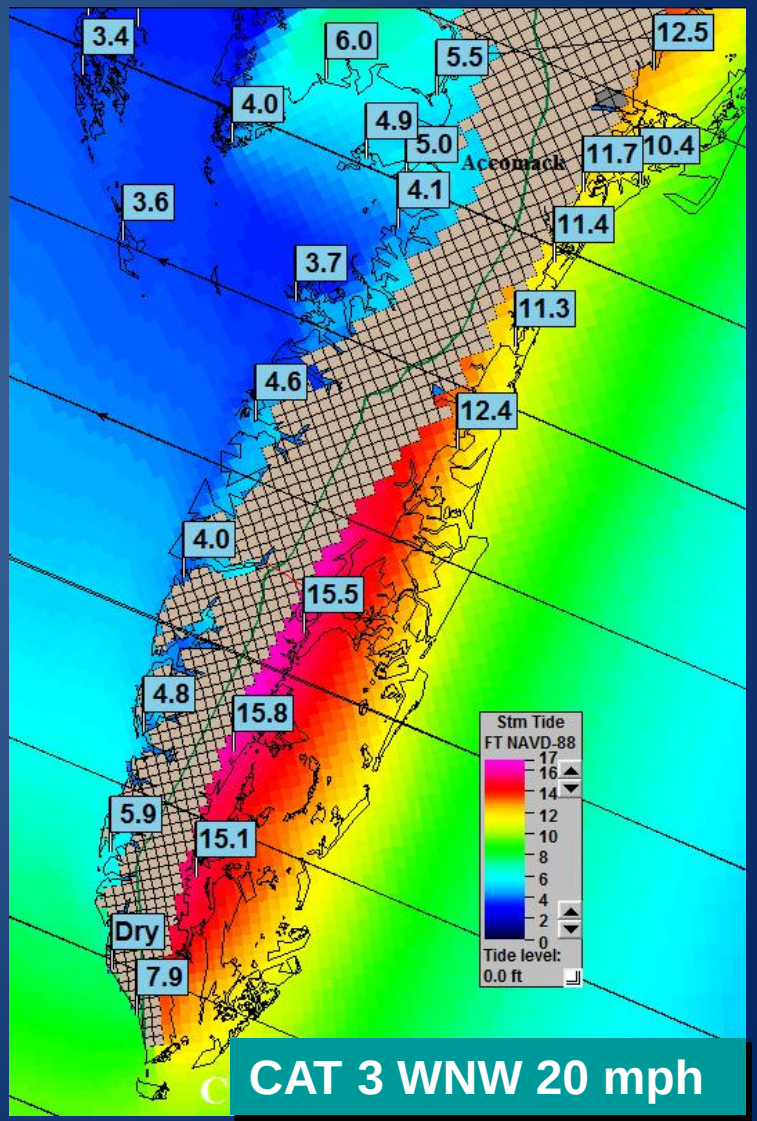


Storm Surge Contd.

ANGLE TO COAST Influence



CAT 3 N 20 mph



CAT 3 WNW 20 mph

2013 SLOSH Changes

- **Real-time SLOSH Runs will no longer be available**
  - **Emphasis on Probabilistic Storm Surge (p-surge)**
- **Norfolk SLOSH Basin Updated in 2012 (Reminder)**
  - **http://slosh.nws.noaa.gov/sloshPub/index.php?L=7#sloshDsp (to get account and download program)**

Now Let's Look at the SLOSH Display Program

http://www.slosh.noaa.gov/

Probabilistic Storm Surge

- Use an ensemble of SLOSH runs to create probabilistic storm surge (p-surge)
  - Intended to be used operationally so it is based on NHC's official advisory
  - P-surge's ensemble perturbations are determined by statistics of past performance of the advisories
  - P-surge uses a representative storm for each portion of the error distribution space rather than a random sampling

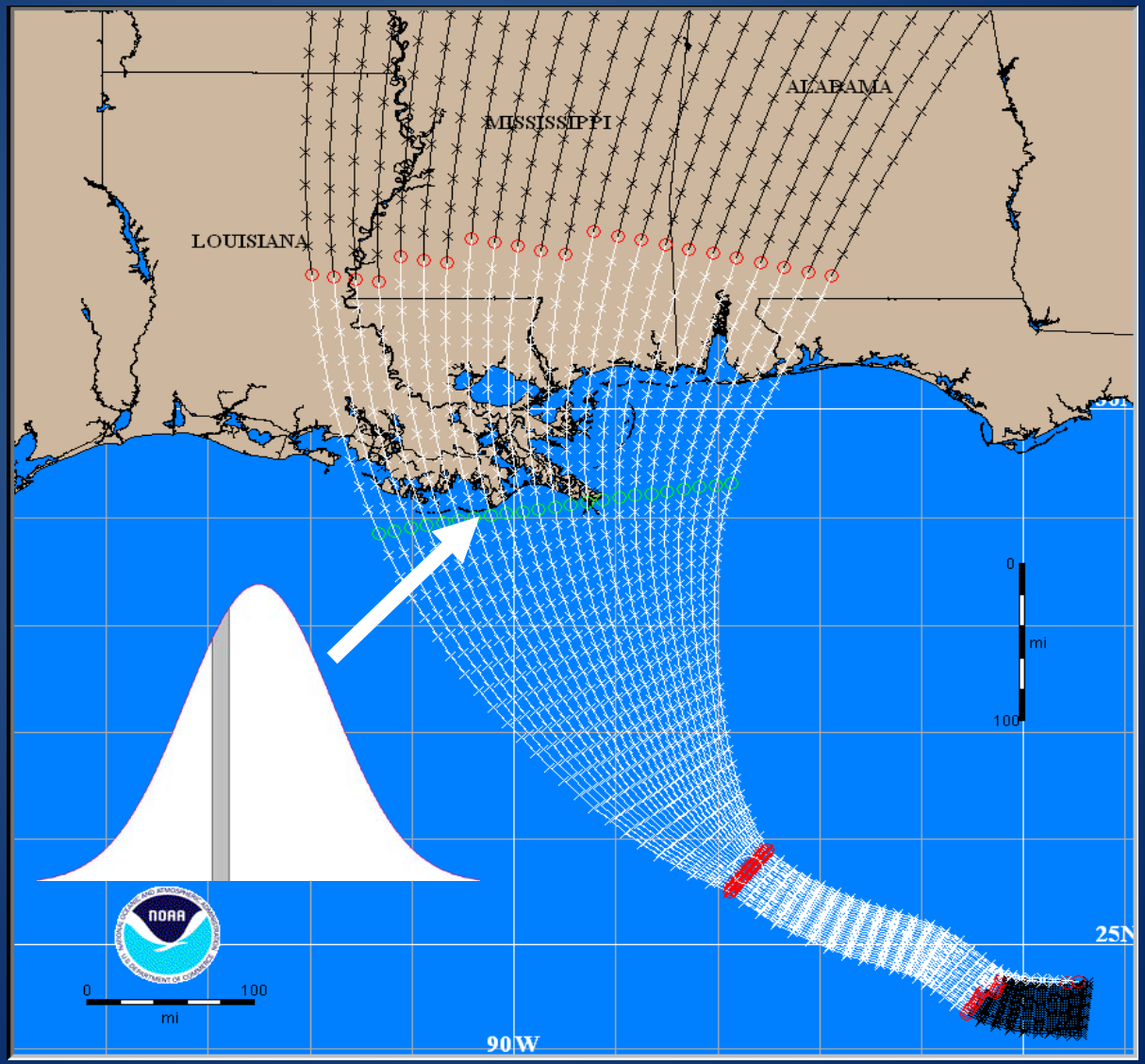
http://www.nws.noaa.gov/mdl/psurge/

Errors Used by P-Surge

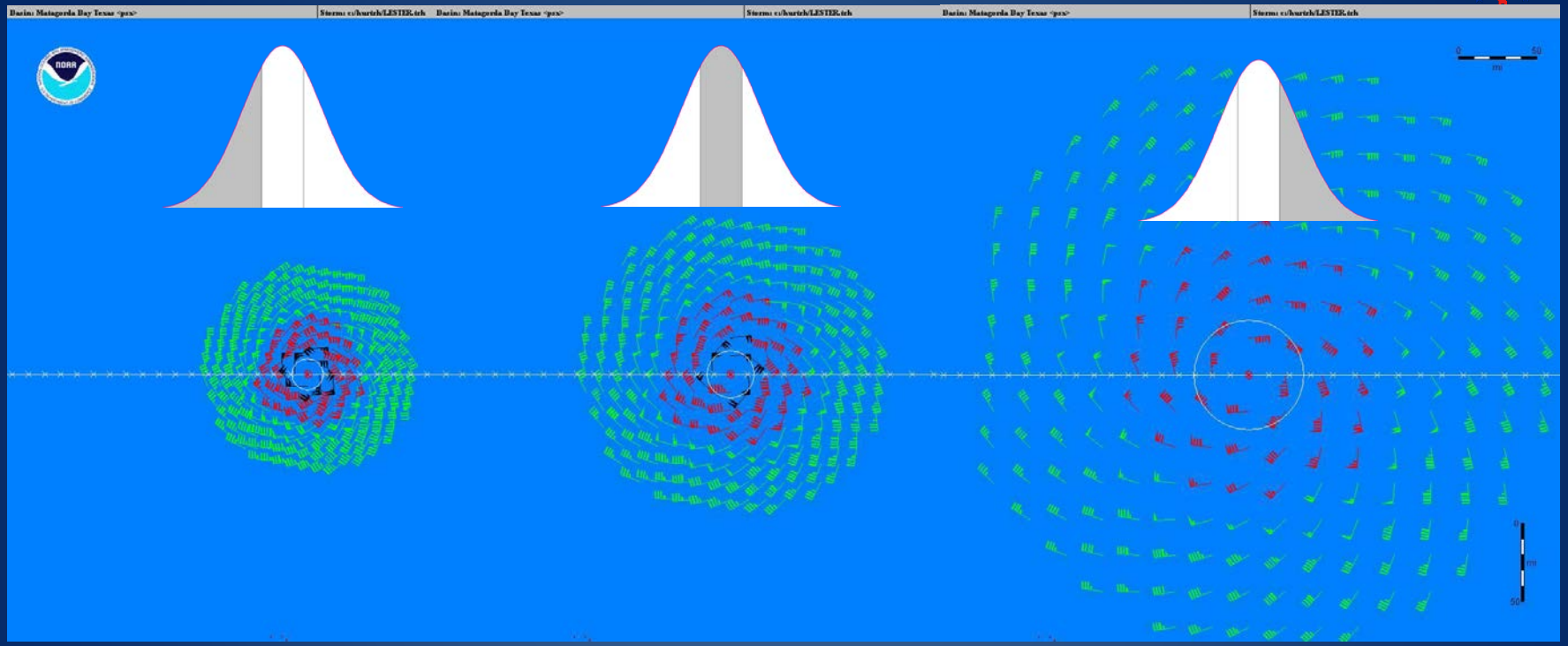
- The ensemble is based on distributions of the following:
  - Cross track error (impacts Location)
  - Along track error (impacts Forward Speed, Timing)
  - Intensity error (impacts Pressure)
  - Rmax error (impacts Size)

http://www.nws.noaa.gov/mdl/psurge/

Example: Cross Track Error



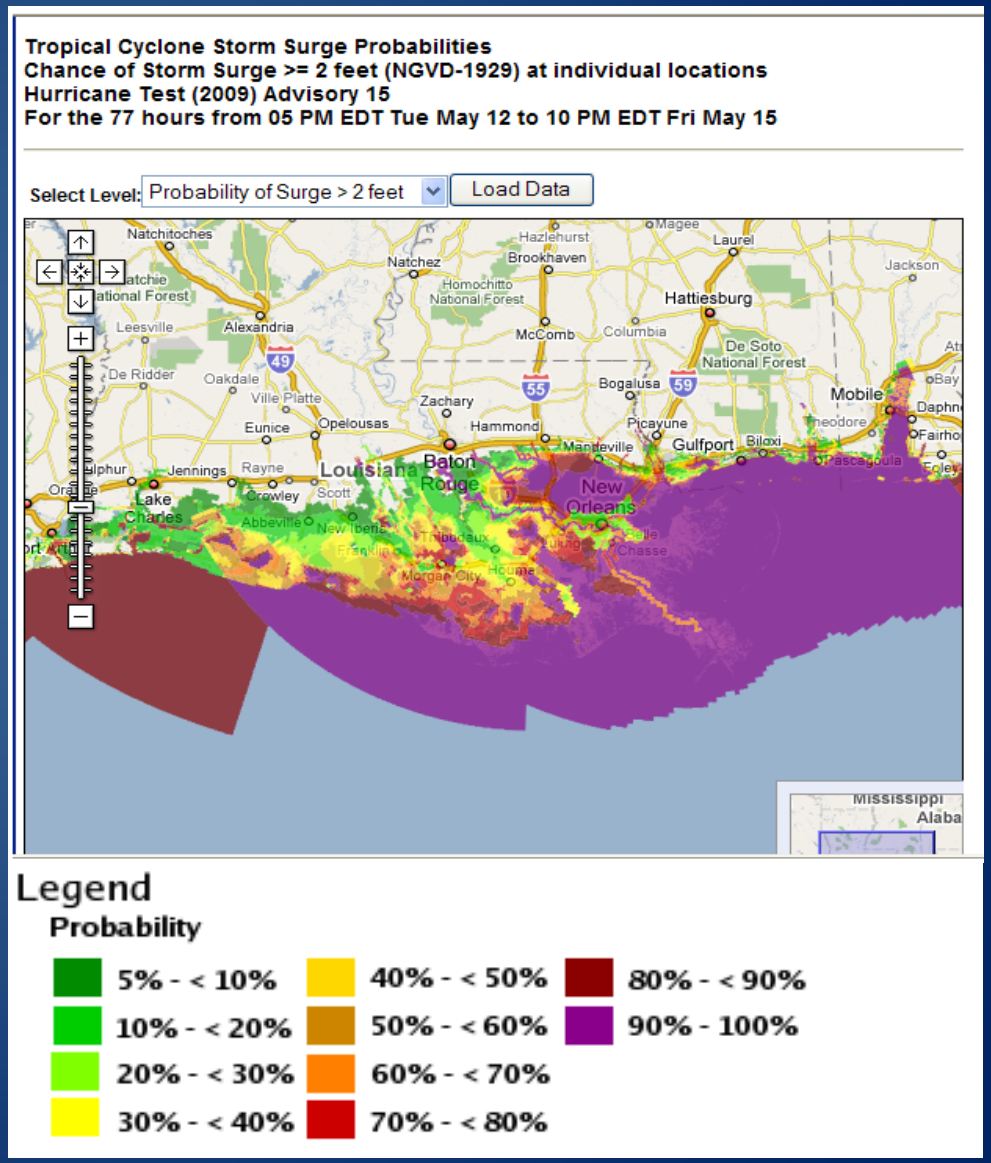
Varying the Other Parameters



- Size: Small (30%), Medium (40%), Large (30%)
- Forward Speed: Fast (30%), Medium (40%), Slow (30%)
- Intensity: Strong (30%), Medium (40%), Weak (30%)

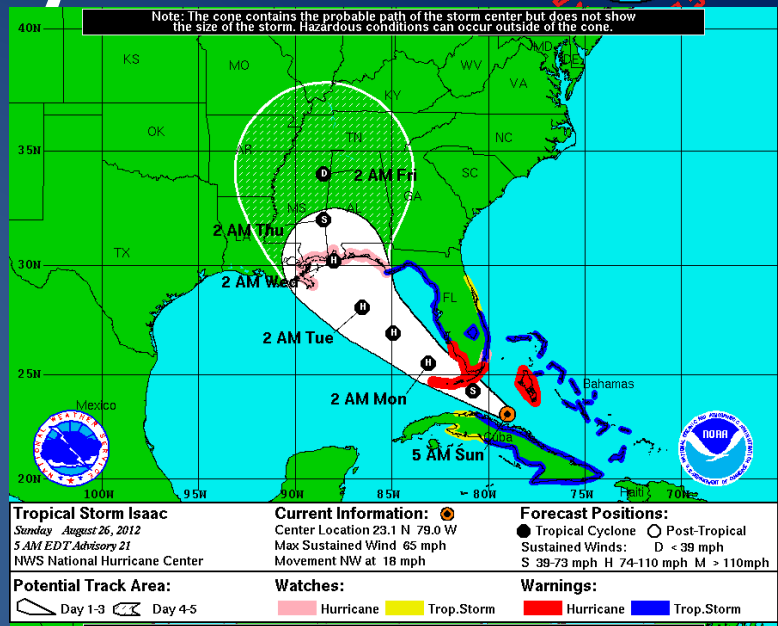
When is P-surge Available?

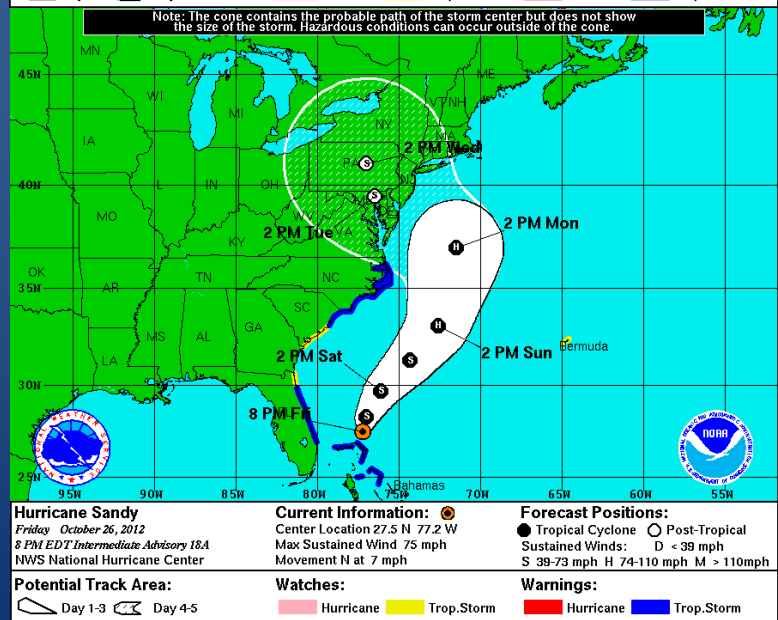
- Whenever a hurricane (occasionally TS) watch or warning is in effect
- Available 30-45 minutes after the advisory release time



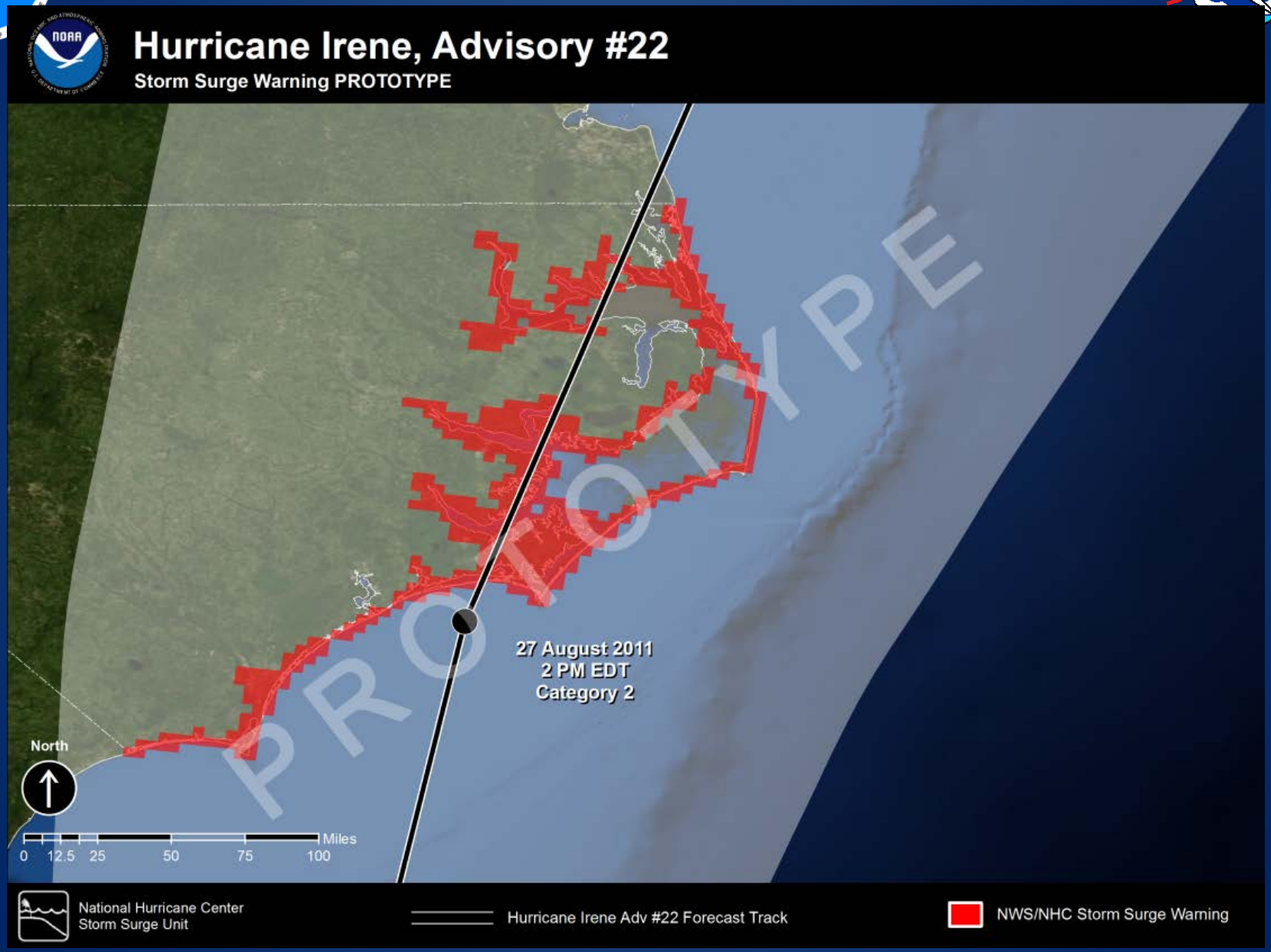
Meeting the Warning Challenges for 2013 and Beyond

- Tropical storm/hurricane watch and warning definitions broadened to allow them to be used for post-tropical cyclones that pose a significant risk to life and property (e.g. Sandy).
- NHC may continue advisory products on post-tropical cyclones that pose a risk to life/property and when the transfer of responsibility to another office would result in discontinuity in service.
- A storm surge warning could be operational by 2015.

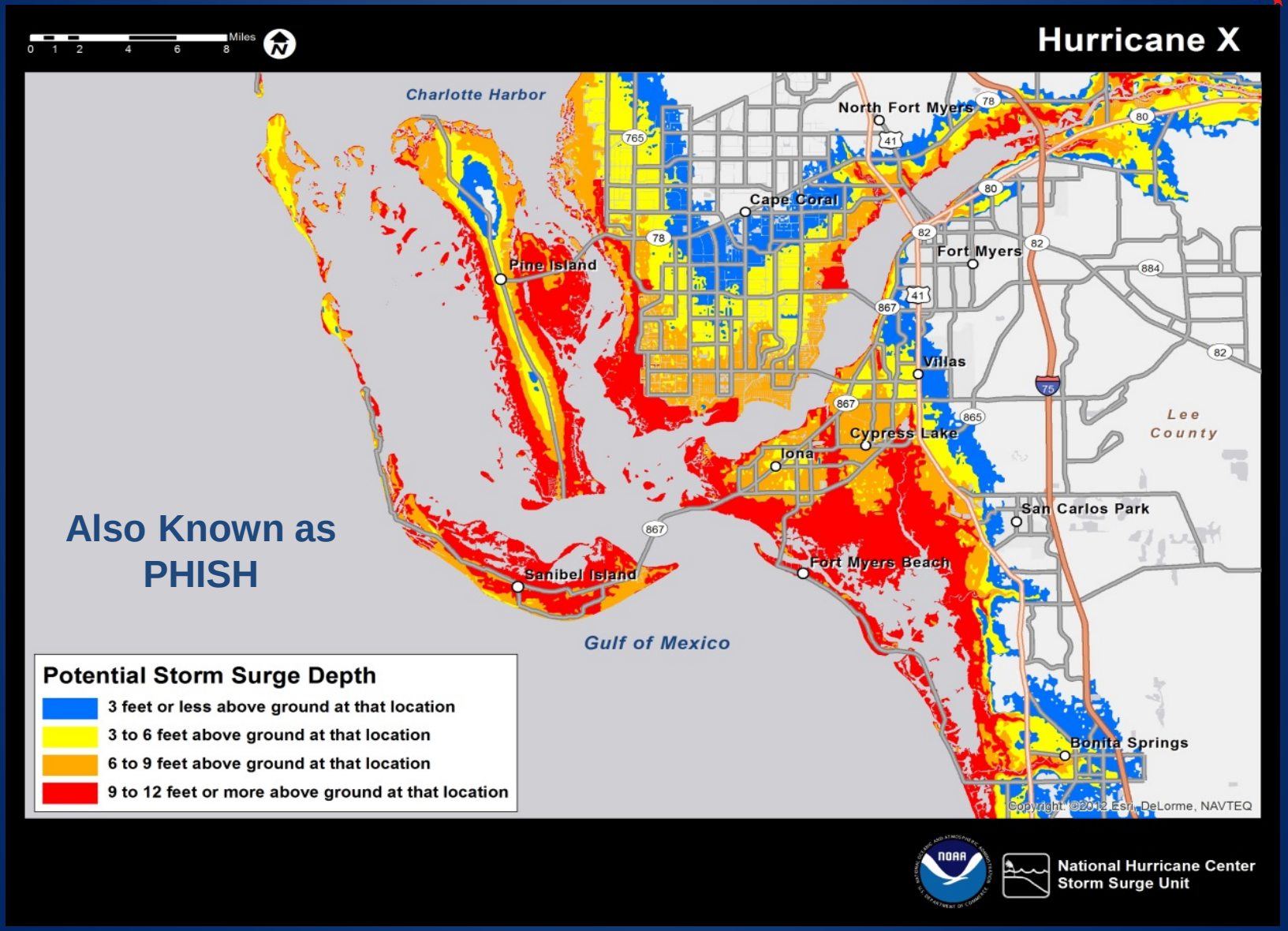




Prototype of Storm Surge Warning



Potential Storm Surge Inundation Graphic



The End!!

Are There Any Additional Questions?

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