

GIS and New Storm Surge Data



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- Hi, my name is John Allen. I work for DHEC as a GIS Analyst in the Division of Informatics within PHSIS.

Today I want to discuss the new storm surge data along the coast of South Carolina and how this new data effects DHEC licensed health facilities.

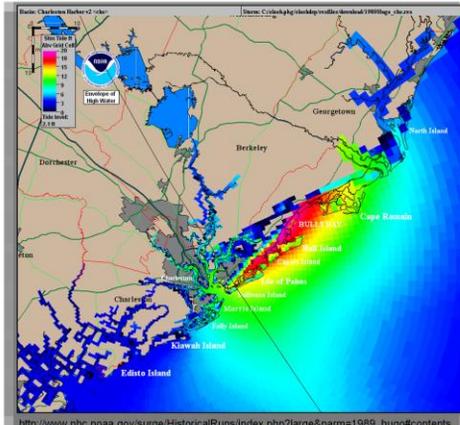
- First, I would like to give some basic background information on how the storm surge data is derived, before we receive it, map it, and use it here at DHEC.

- The storm surge data used by DHEC, comes from the Army Corps of Engineers who created the data based on the SLOSH model, along with other mapping procedures and technologies.

SLOSH Model

Sea, Land, and Overland Surges from Hurricanes

SLOSH Simulation: Hugo



SLOSH Model is developed by:
 National Weather Service

- Estimates storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data.

NOAA / NHC

http://www.nhc.noaa.gov/ssurge/ssurge_slosh.shtml

- The SLOSH model estimates surge heights, hurricane pressure, size, forward speed and path.

- There are essentially three methods that can be used to estimate surge using the SLOSH model:

- 1.Deterministic Approach
- 2.Probabilistic Approach
- 3.Composite Approach

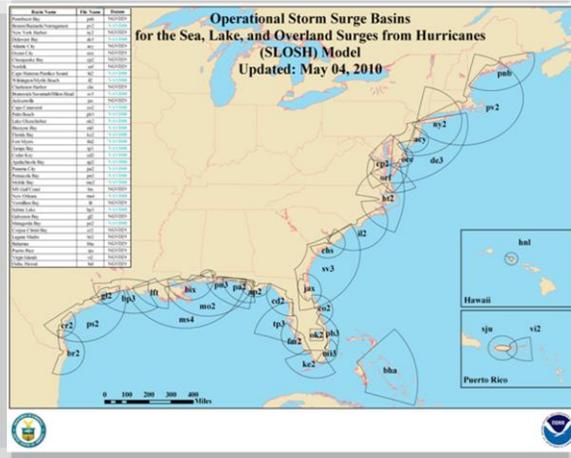
- The storm surge data provided to DHEC and presented in this presentation uses the Composite Approach.

- The Composite Approach predicts storm surge by running SLOSH several thousand times with hypothetical hurricanes under different storm conditions.

The products generated from this approach are the [Maximum Envelopes of Water \(MEOWs\)](#) and the [Maximum of MEOWs \(MOMs\)](#), meaning the highest water level or the “worst case” scenario.

The National Hurricane Center regards this as the best approach for determining storm surge vulnerability for an area since it takes into account forecast uncertainty.

Storm Surge Basins



- SLOSH model coverage is divided into 37 basins.
- Basins are being updated at an average rate of 6 basins per year.
- SC is covered by three basins:
 1. Wilmington, NC basin
 2. Charleston, SC basin
 3. Savannah, GA basin

NOAA / NHC

http://www.nhc.noaa.gov/ssurge/ssurge_slosh.shtml

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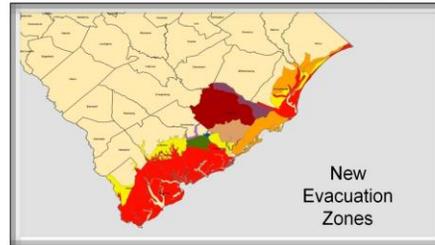
- The SLOSH model is applied to different basins along the nations coast lines.
- Basins are centered on certain features such as: coastal cities with large populations, low-lying topography, and ports.
- As you see here there are 37 basins, with roughly 6 updated per year.
- Updates are driven by a number of different factors such as:
 1. changes to a basin's topography (LIDAR data made available)
 2. overall degree of vulnerability to storm surge
 3. changes to the coast (levees, either added or destroyed from past hurricanes)
- Priority for SLOSH basin updates are governed by the Interagency Coordinating Committee on Hurricanes (ICCOH).
- ICCOH is a tri-agency supported by:
 1. U.S. Army Corps of Engineers (ACE)
 2. Federal Emergency Management Agency (FEMA).

Storm Surge & Evacuation Zones

OLD



NEW



- Here is a side by side view of the old and new storm surge zones, combined with the old and new evacuation zones.

- As you can see with the change to the inundation areas comes change to evacuation zones.

- The new hurricane specific evacuation zones, on the lower right of the screen, include areas A,B,C (shown in Red, Yellow, and Orange).

All other colors are conglomerate specific for other evacuation purposes.... such as rain induced flooding.

- DHEC has no role in how evacuation zones or storm surge zones are created.

Category 5 - Storm Surge

OLD



- Area (Sq Mi) = 2,570
- Estimated population = 658,906
- Housing Units by Block = 400, 375

NEW



- Area (Sq Mi) = 3,978
 - 55% increase
- Estimated population = 894,501
 - 36 % increase
- Housing Units by Block = 502,247
 - 25% increase

*Based on any 2010 Census Block that intersects a storm surge zone

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• Again, here is a side by side comparison of the old and new storm surge zones.

• The time frame between these two storm surge data is roughly twelve years. With the newest data made available this year, 2012.

• For category five storm surge, old to new, percent increase:

➤ 55% increase in total area

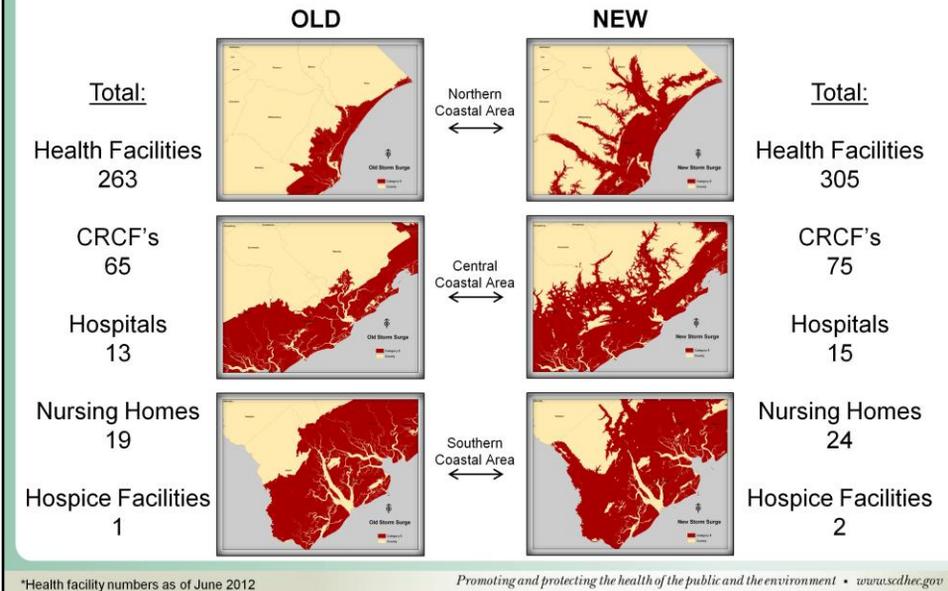
➤ 36% increase in estimated total population

➤ 25% increase in estimated total housing units

• The population and housing units came from the 2010 Census Block data for SC.

• So, how does the new storm surge data effect DHEC in regards to licensed health facilities?

Licensed Health Facilities, Cat. 5 - Storm Surge



- As of June 2012, DHEC has 1801 licensed health facilities.

- 305 of the facilities, whether a nursing home or tattoo shop, lie within the cat.5 storm surge inundation area.

- The four facility types listed on the screen are considered a high-priority to DHEC. Due to the fact these facility types house in-patients, which poses as a higher risk during an evacuation situation.

- Of the four high-priority facilities CRCF's had an additional 10 facilities, Hospitals = 2, Nursing Homes = 5, and Hospice Facilities = 1

- Total additional health facilities = 18

***NOTE:** CRCF's = Critical Residential Care Facilities

Licensed Health Facilities, All Evacuation Zones

OLD



Total:

Health Facilities	286
CRCF's	71
Hospitals	15
Nursing Homes	22
Hospice Facilities	2

NEW



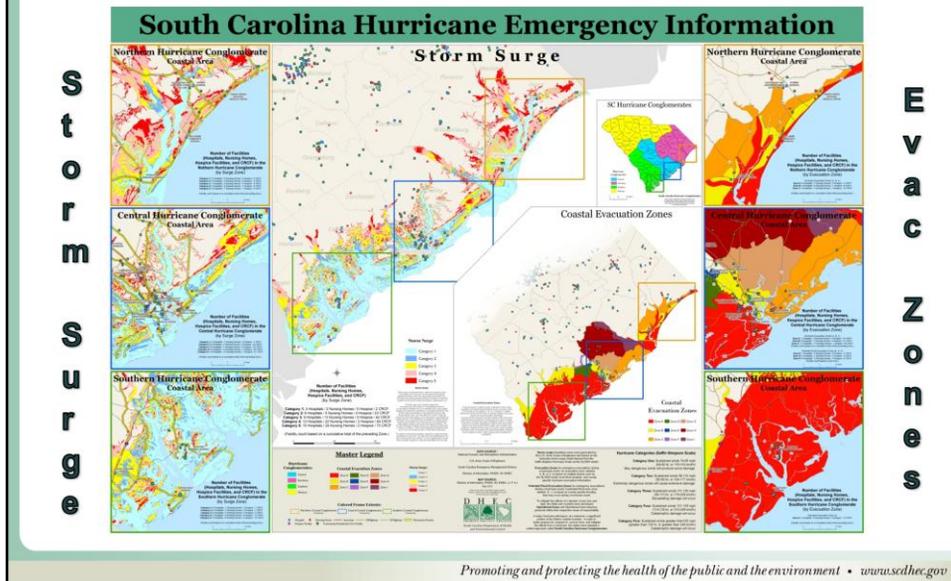
Total:

Health Facilities	384
CRCF's	100
Hospitals	18
Nursing Homes	29
Hospice Facilities	2

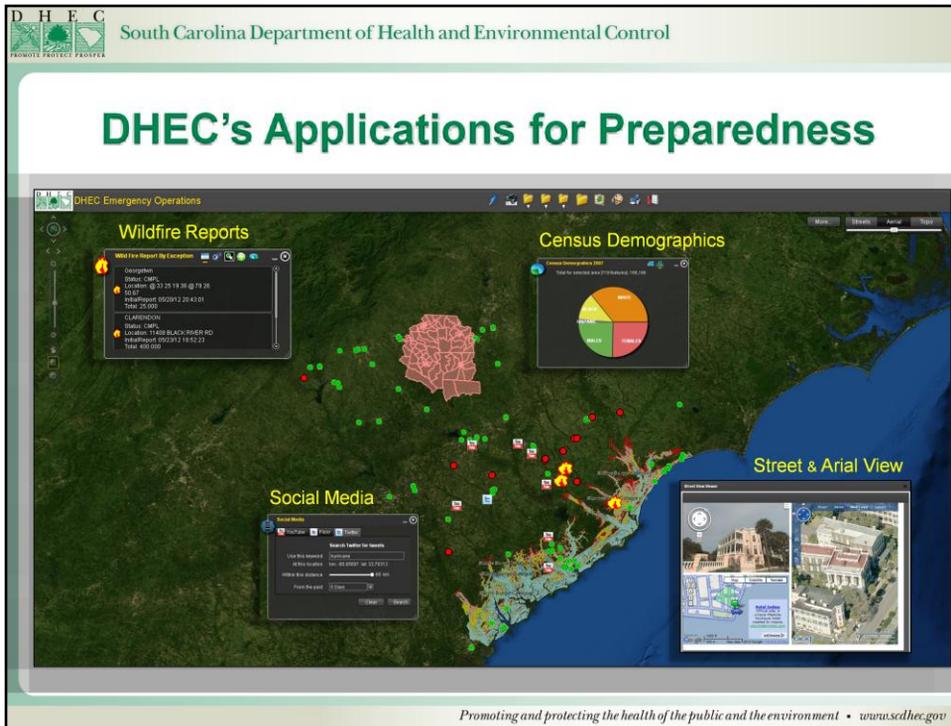
*Health facility numbers as of June 2012
 **How hurricane evacuation zones are classified or interpreted has changed from 2011 (old) to 2012 (new).

- Here is a side by side comparison of old and new evacuation zones.
- Of the four high-priority facilities CRCF's had an additional 29 facilities, Hospitals = 3, Nursing Homes = 7, and Hospice Facilities = 0
- Total additional health facilities = 39
- I will note that how hurricane evacuation zones are classified or interpreted has changed from 2011 to 2012.
- I included every evacuation zone type, for both old and new, for the total health facility numbers shown here.
- 39 new health facilities means more emergency planning and contact with facilities during an emergency situation by DHEC employees.

S.C. Hurricane Emergency Information Map



- Now, here is the map you all passed when entering the auditorium.
- For the past two years we've compiled and updated this map for our reference purposes here at DHEC.
- The map has two main themes. 1. Storm Surge Areas 2. Evacuation Zones
 - The two themes are seen in the middle portion of the map in whole form, as well as on each side of the map
 - The colored boxes (Orange, Blue, and Green) in the middle of the map, reflect the zoomed in area for Storm Surge and Evacuation Zones along the sides.
 - The map displays the four high-priority health facilities (Hospital, Nursing Homes, CRCF's, and Hospice Facilities) as mentioned in slides 5 and 6.
 - Each conglomerates coastal area, the three colored boxes on the left and right, give the cumulative total of the four health facility types for each category of storm surge and evacuation zone.
 - Descriptions of what labels and titles mean can be found in the master legend located at the bottom of the map.
- This map presents a good understanding of where DHEC licensed health facilities are located, though this information becomes dated as soon as I click the print button.



- Yes we do use paper maps for planning, but we also take the data shown in this presentation and tie it into DHEC web applications real time updating.
- Of the multiple applications implemented here at DHEC, we try to incorporate GIS capabilities into each one, to see where our people, resources, and infrastructure are during emergency situations.
- On the screen you are viewing the: DHEC Emergency Operations application.
- This application can provide DHEC personnel loads of data for any emergency event, not just for hurricanes.

Such as:

- Incorporated Google & Bing Street/Aerial View – For viewing where a hurricane shelter is and what it looks like if you’ve never been there before.
- Social media mapping capabilities to see how the public is responding to an emergency event, before official government agencies have a chance to.
- Population demographics – Get a general idea as to how many people, male or female, young or old, there are in a emergency area. Will we need more hurricane shelters open if this number is high?

Questions?



Sources:

- Army Corps of Engineers (ACE)
 - Michael Schuster – Team Leader / Program Manager
 - <http://www.iwr.usace.army.mil/nhp/>
- NOAA - National Weather Service - National Hurricane Center
 - Jamie Rhome – Storm Surge Specialist – NHC
 - SLOSH Model: http://www.nhc.noaa.gov/ssurge/ssurge_slosh.shtml
 - http://www.nhc.noaa.gov/ssurge/HistoricalRuns/index.php?large&parm=1989_hugo#contents
 - <http://www.nhc.noaa.gov/ssurge/>
- South Carolina Hurricane Study
 - <http://chps.sam.usace.army.mil/ushesdata/SC/SCmainreportpage.htm>
- SC EMD
 - Susan Dunham – GIS Analyst
- SC DHEC Division of Informatics, PHSIS
- SC DHEC Office of Public Health Preparedness