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Hydrogeology and Water-Quality Conditions in the Surficial, Castle Hayne, and Peedee Aquifers: 2012-2013

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October 28, 2015
Water Supply Summit, Wilmington NC

U.S. Department of the Interior
U.S. Geological Survey

Where did the data come from?

- In October 2011 CFPUA and USGS began a cooperative study of groundwater resources in the greater New Hanover County area
- It had been more than 40 years since the last comprehensive study of groundwater conditions (G. Bain, 1970)
- Updated information would provide a better understanding of how population growth has affected the quantity & quality of groundwater

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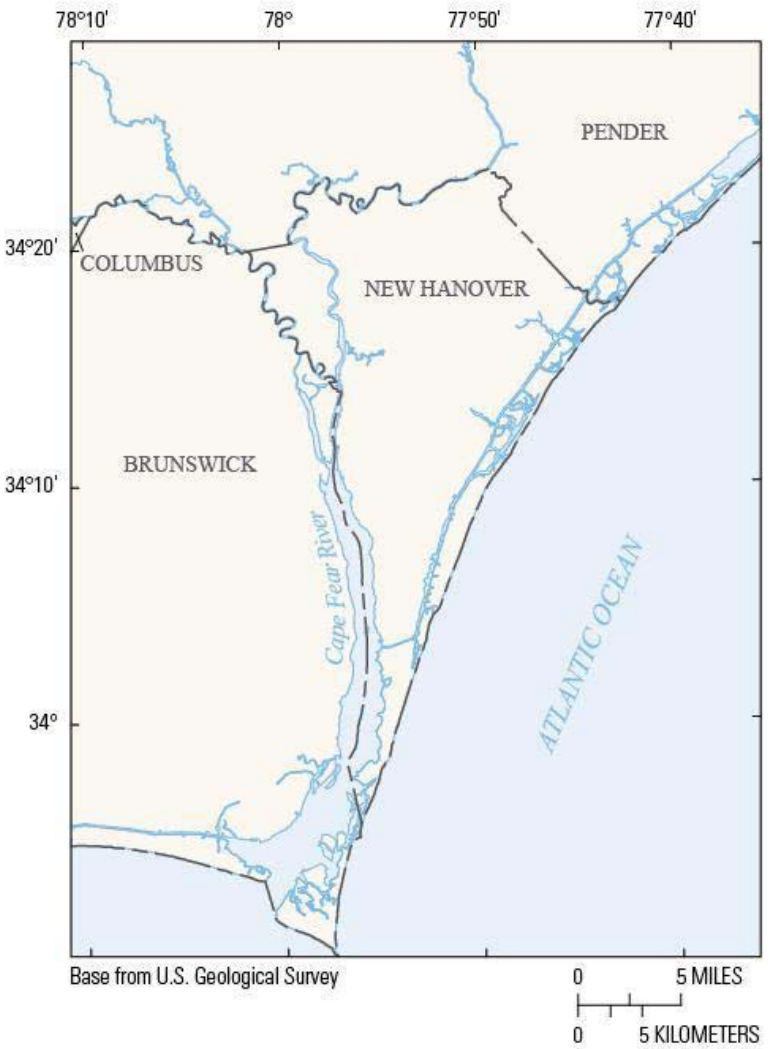
Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

Study Area



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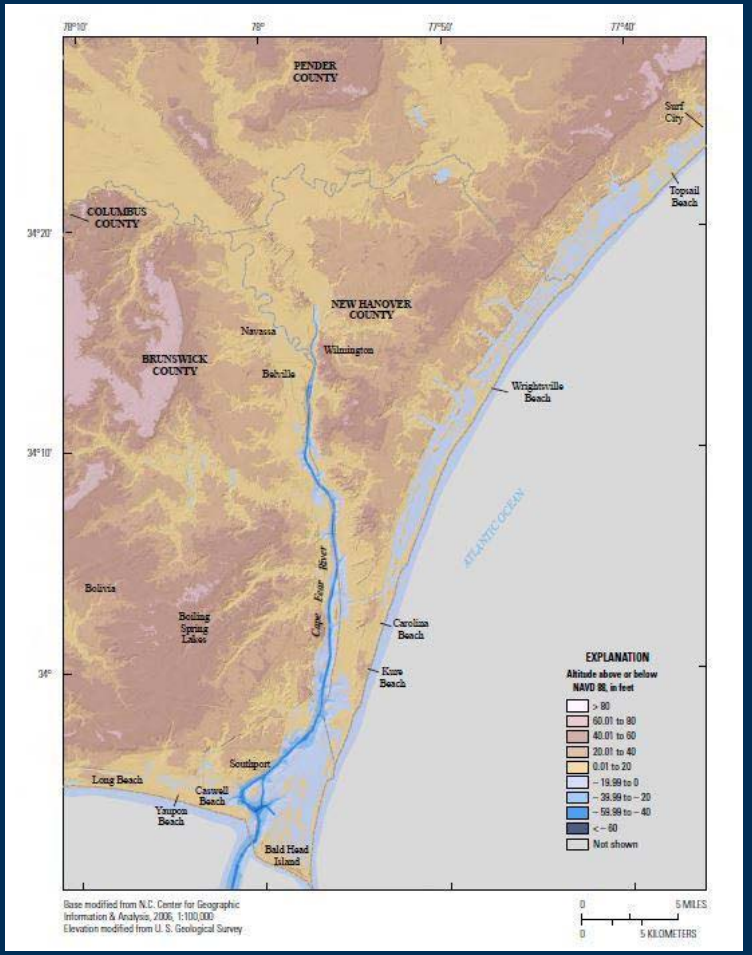
Study Area Geologic/Hydrogeologic Units

SYSTEM	SERIES	GEOLOGIC UNITS	HYDROGEOLOGIC UNITS	DESCRIPTION
Quaternary	Holocene	Surficial sand deposits	Surficial aquifer	light gray to light yellow sand, silt, and clay
	Pleistocene	Undifferentiated Pleistocene and Pliocene deposits		
Tertiary	Pliocene			
	Oligocene	River Bend Formation [1]	Castle Hayne confining unit	silt, clay, and sandy clay overlies moldic limestone and sand aquifer
	Eocene	Castle Hayne Formation [2]	Castle Hayne aquifer	
	Paleocene	Beaufort Formation [3]		
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee confining unit	gray, fine to medium-grained sand interbedded with black clay
			Peedee aquifer	
		Black Creek Formation	Black Creek confining unit	sandy clay, silty clay, and clay

[1] Exists only in southern New Hanover County (Zarra, 1991).
[2] Unit is discontinuous in study area.
[3] Exists only in southeastern Brunswick and southern New Hanover Counties (Zarra, 1991).

Updated Digital Elevation Surface

- Bathymetry of Cape Fear River from COE dredging Jan to Feb 2012
- Tide adjusted and integrated with existing digital elevation surfaces



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How did we find wells?

Officials in area to conduct groundwater study

Kristen McSwain, a hydrologist with the U.S. Geological Survey, prepares to take a sample at the home of John Nartowicz in Wilmington on April 23, 2012.

Photo by MIke Spencer **Buy Photo**

By Kate Elizabeth Queram
Kate.Queram@StarNewsOnline.com
Published: Tuesday, April 24, 2012 at 11:20 a.m.
Last Modified: Tuesday, April 24, 2012 at 11:20 a.m.

- Impossible to recreate Bain study
- Drilling new wells not an option
- Citizen volunteers
- Press release ran April/May 2012
  - Star News
  - Channel 14/TWC
  - Several smaller e-journals

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Well Inventory

- 167 domestic (homeowner) wells inventoried June 2012
- about 50% ultimately used in the study in some way

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Well Inventory

- Public water supply
- Industrial

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Well Inventory

- Public water supply
- Industrial
- Other large water users
  - Golf courses

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Well Inventory

- Public water supply
- Industrial
- Other large water users
  - Golf courses
- Monitoring wells
- A total of 240 were used in the final report

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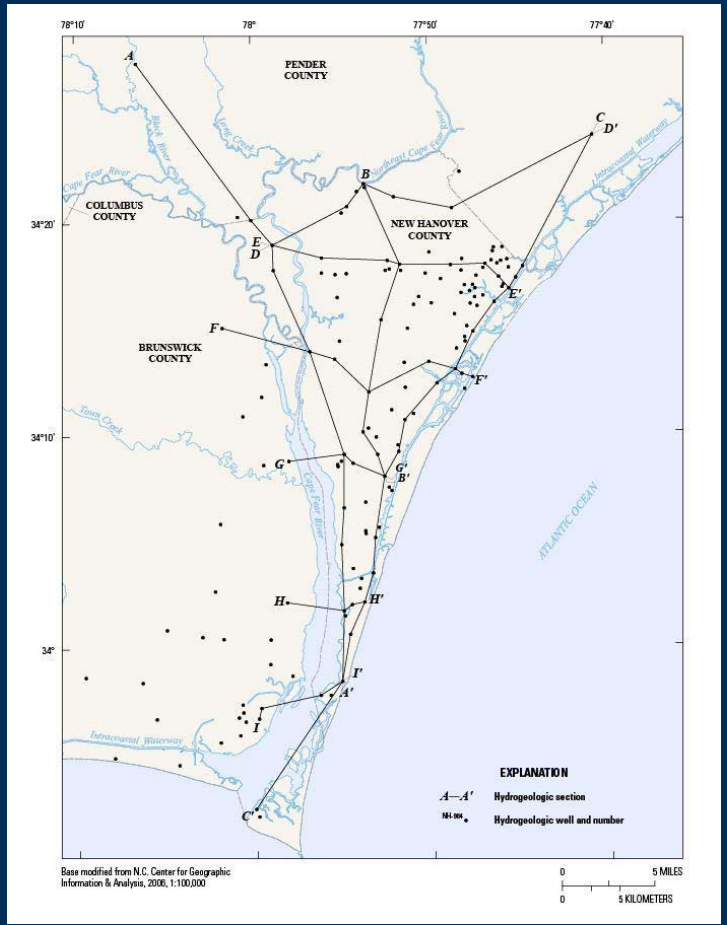
Hydrostratigraphic Framework



- 146 wells with reported data, driller's logs, or geophysical logs
- Spatial positions of major boundaries of the formations – model skeleton
- Interpretation of how sediments were deposited during the geologic past and how they now interconnect to transmit groundwater

Hydrostratigraphic Framework

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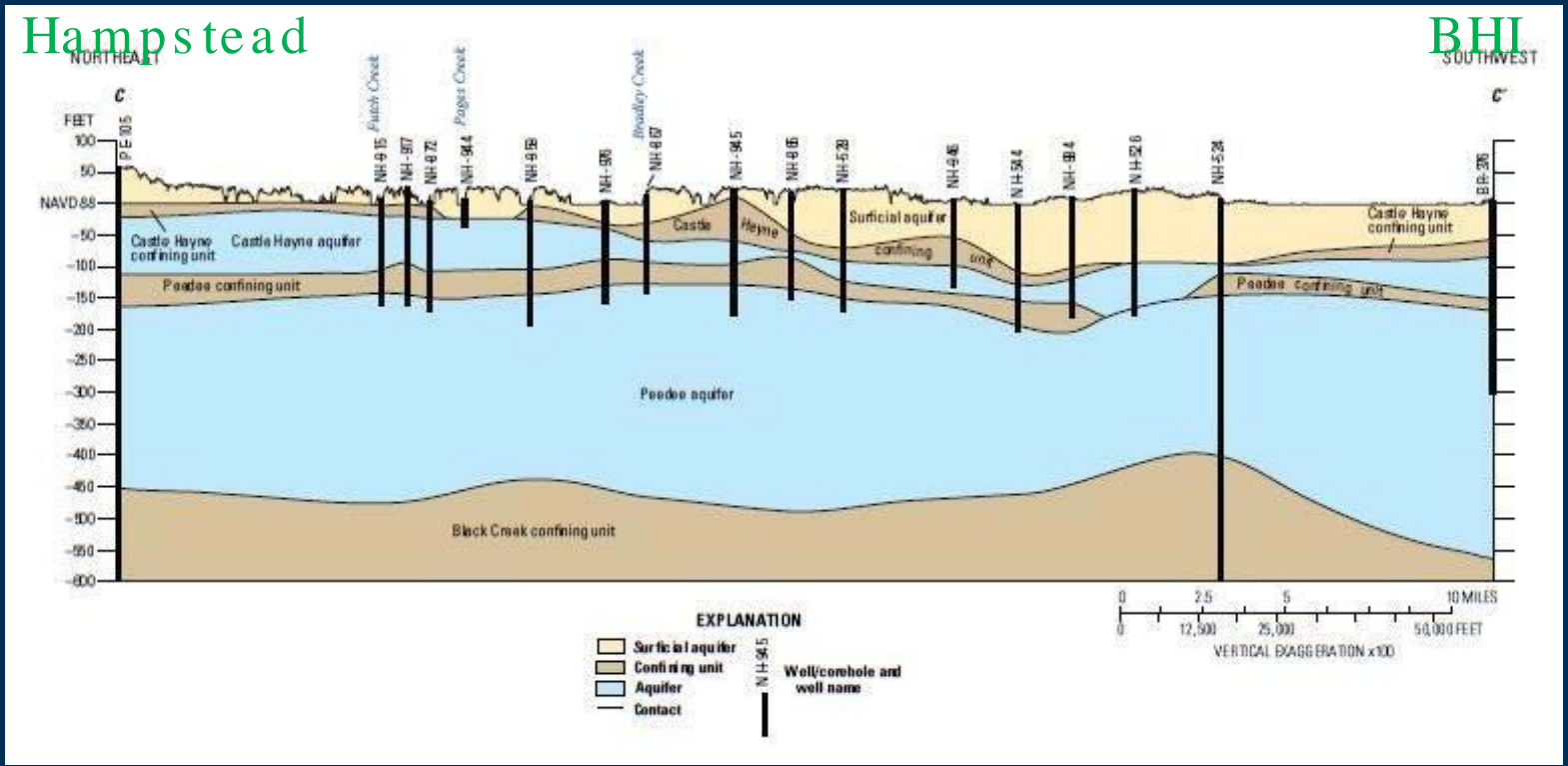
Hydrostratigraphic Framework



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Groundwater Level/Water-Quality Sampling

- Aug/Sept 2012
- Very dry summer, but….

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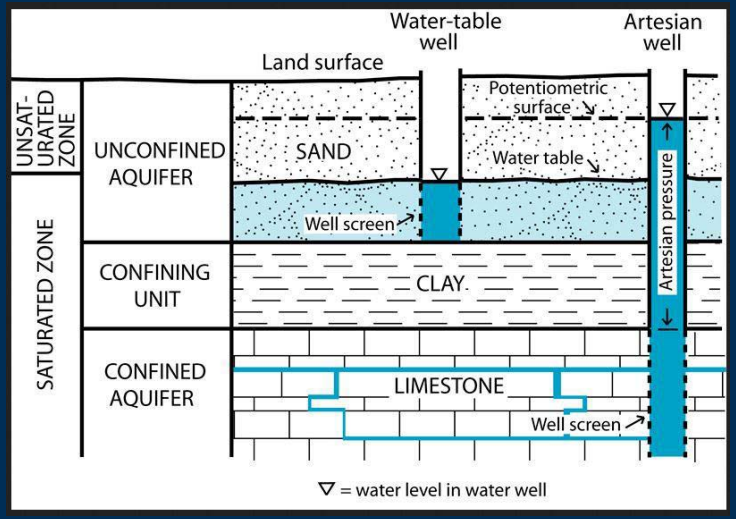
Groundwater Levels



- 35 Castle Hayne aquifer wells
- 31 Peedee aquifer wells

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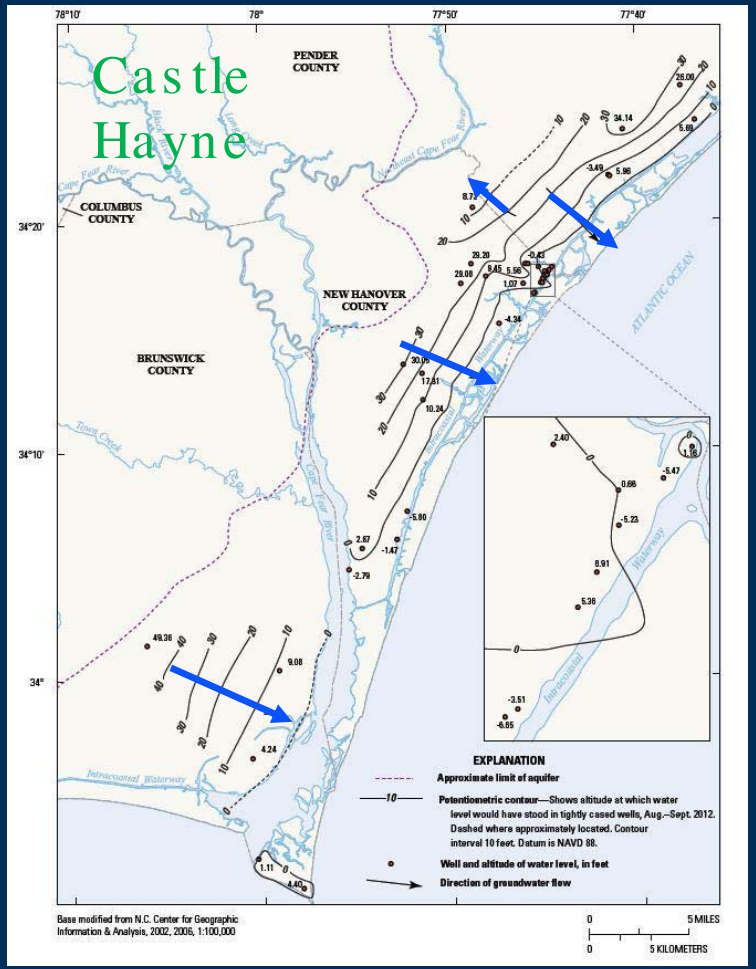
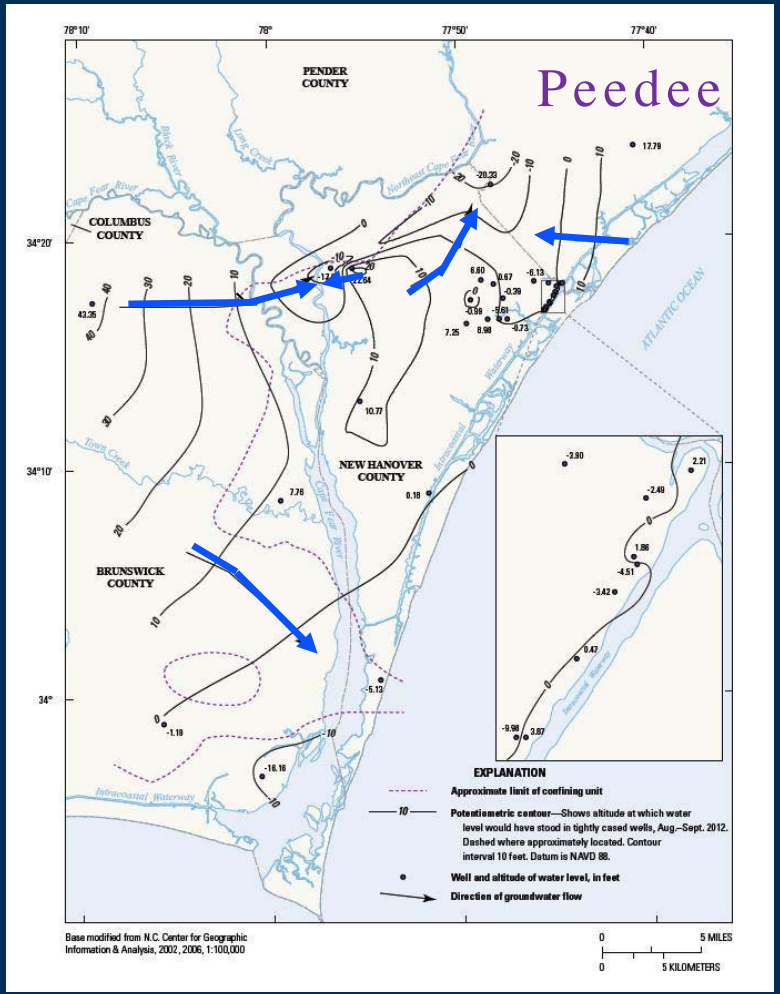
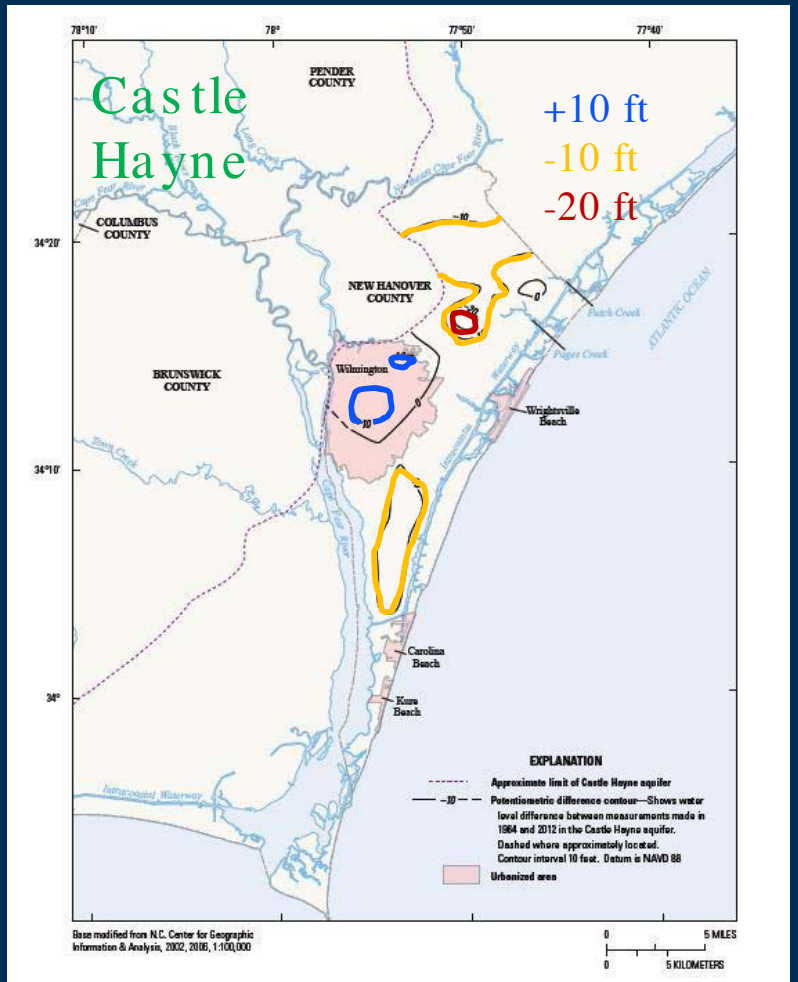
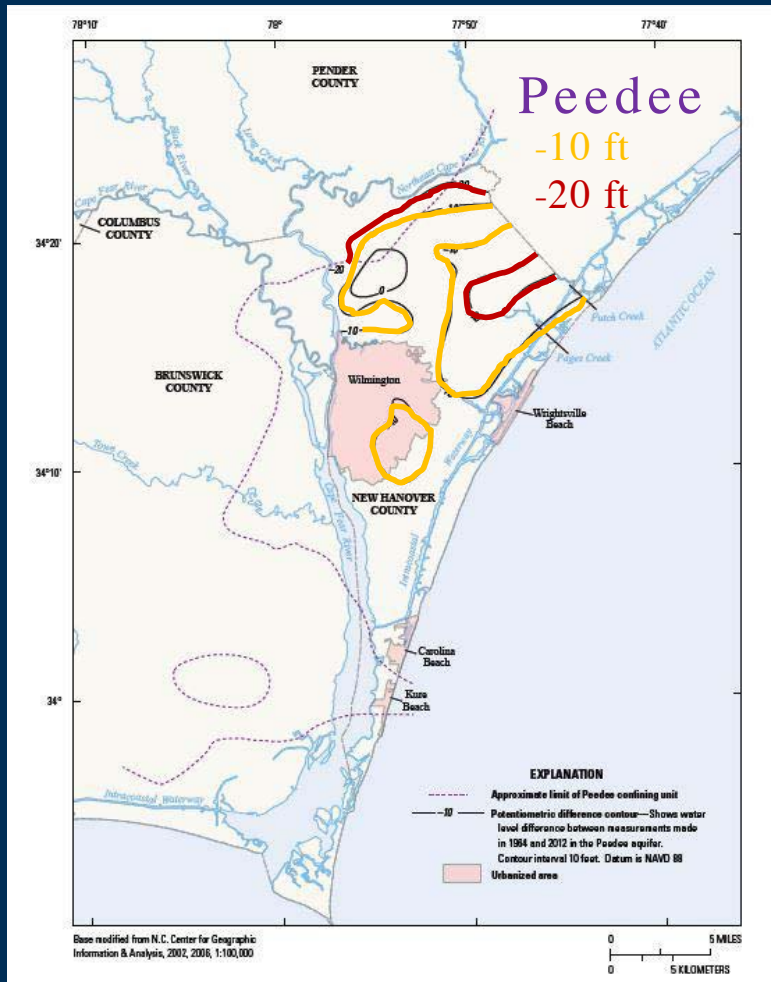
Groundwater Levels





Water-Level Difference 1964-2012





Water-Quality Sampling

- 97 well sites
  - 7 surficial aq
  - 42 Castle Hayne aq
  - 43 Peedee aq
  - 5 multiple aq
- 4 surface water sites

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Dissolved Iron

- Aesthetic nuisance on EPA Secondary DWS at 300 ug/L
- Natural microbial process

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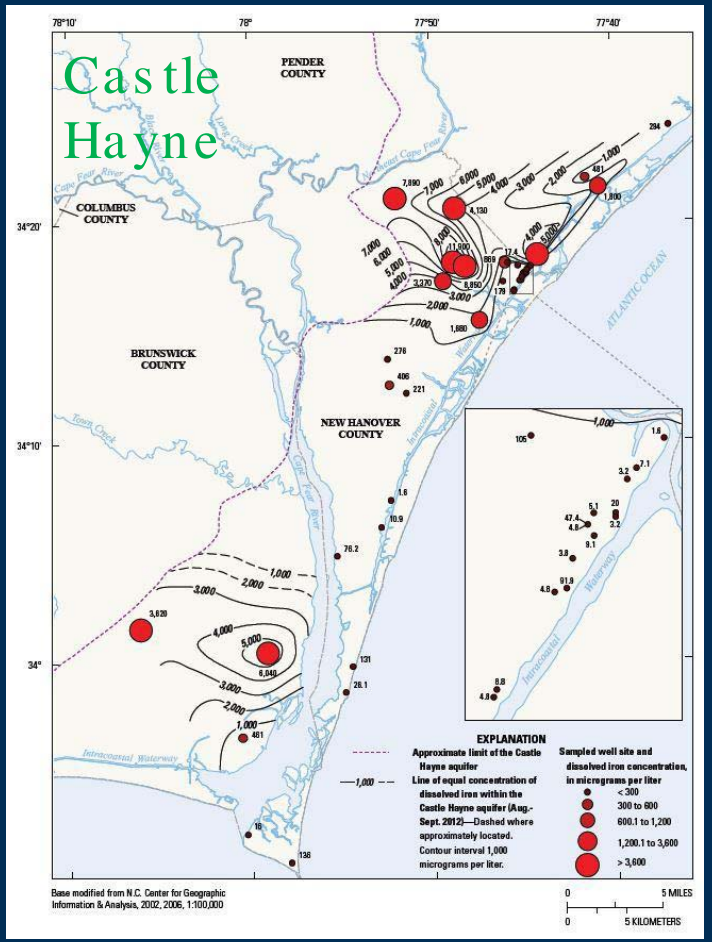
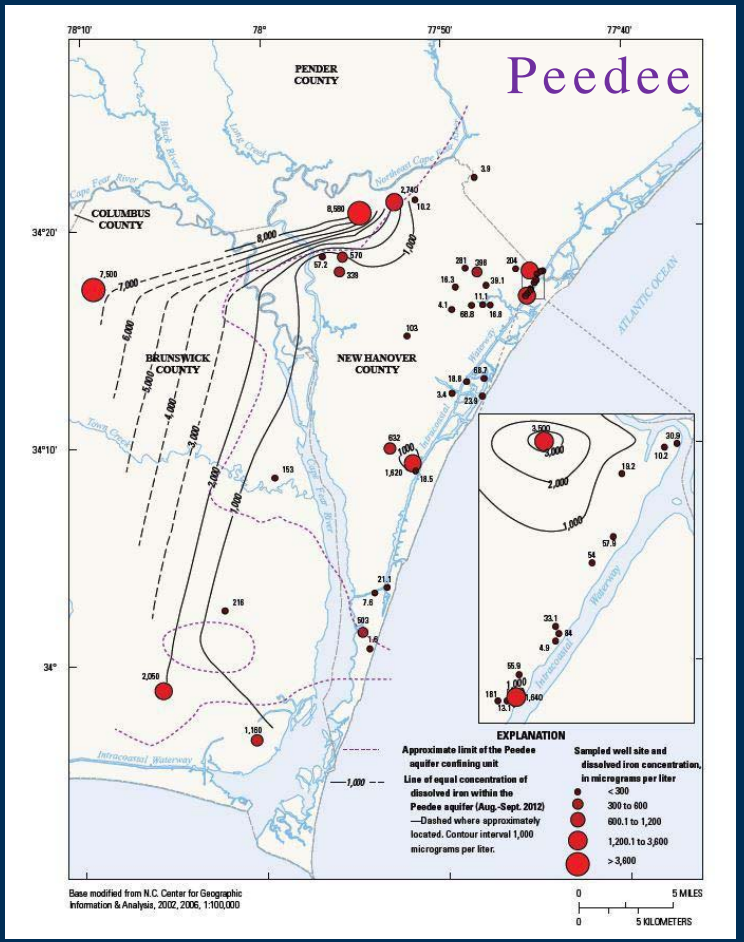
Dissolved Iron





Dissolved Chloride

- 250 mg/L on EPA Secondary DWS because of taste
- Highest chloride measured in the Castle Hayne aq was 7,350 mg/L
- In the Peedee aq it was 919 mg/L
- Both in domestic wells near Futch Creek Rd

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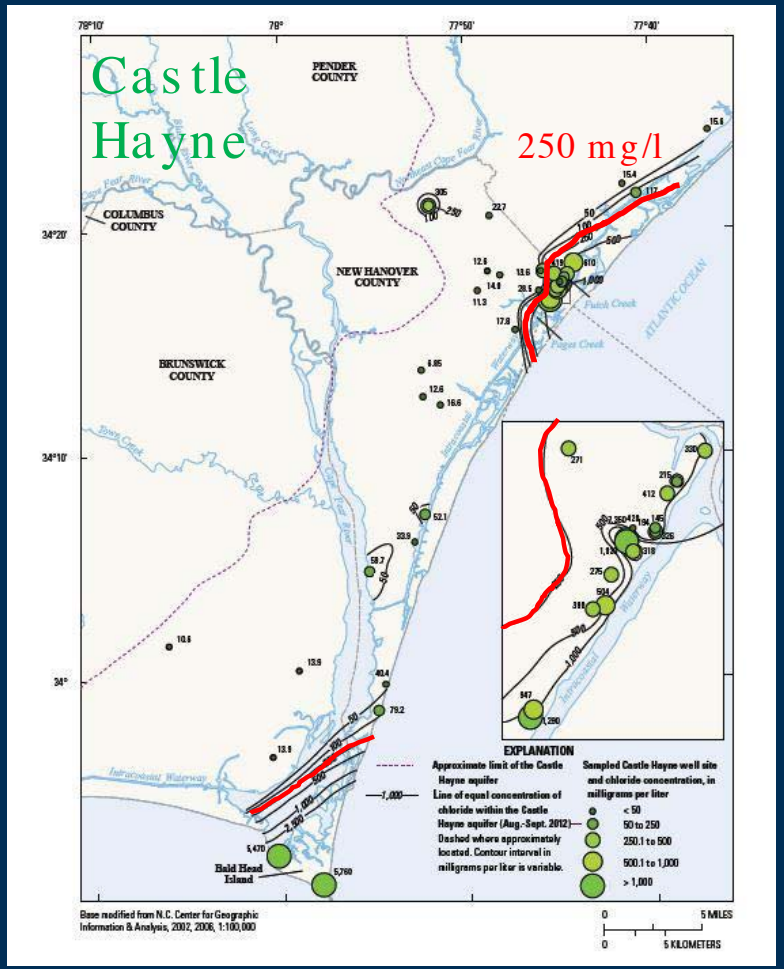
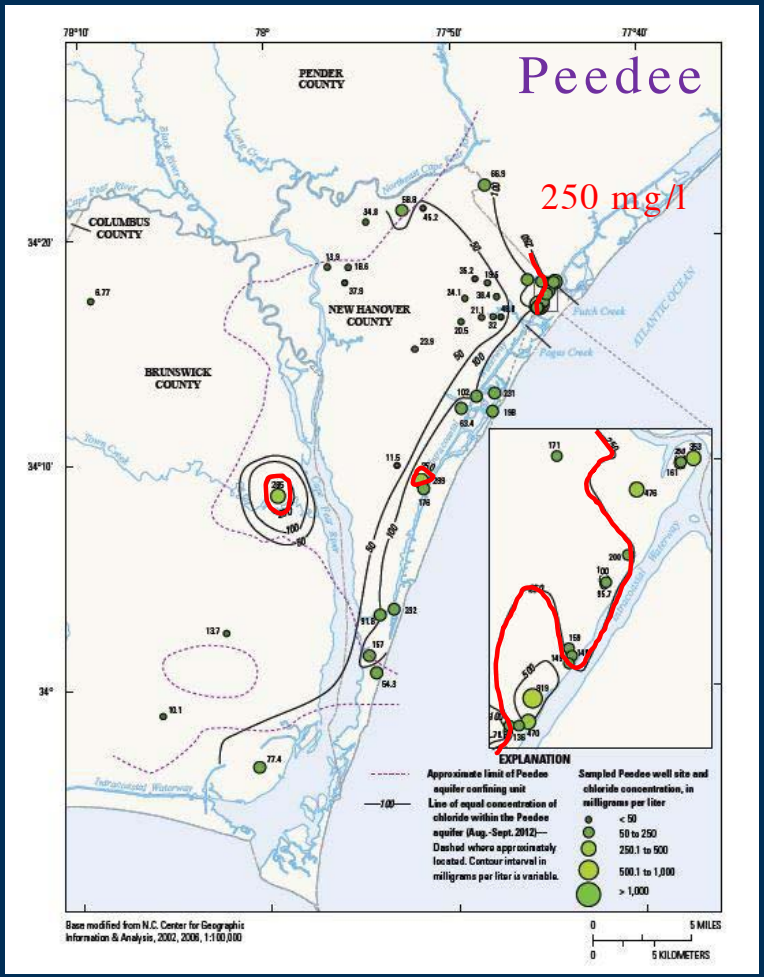
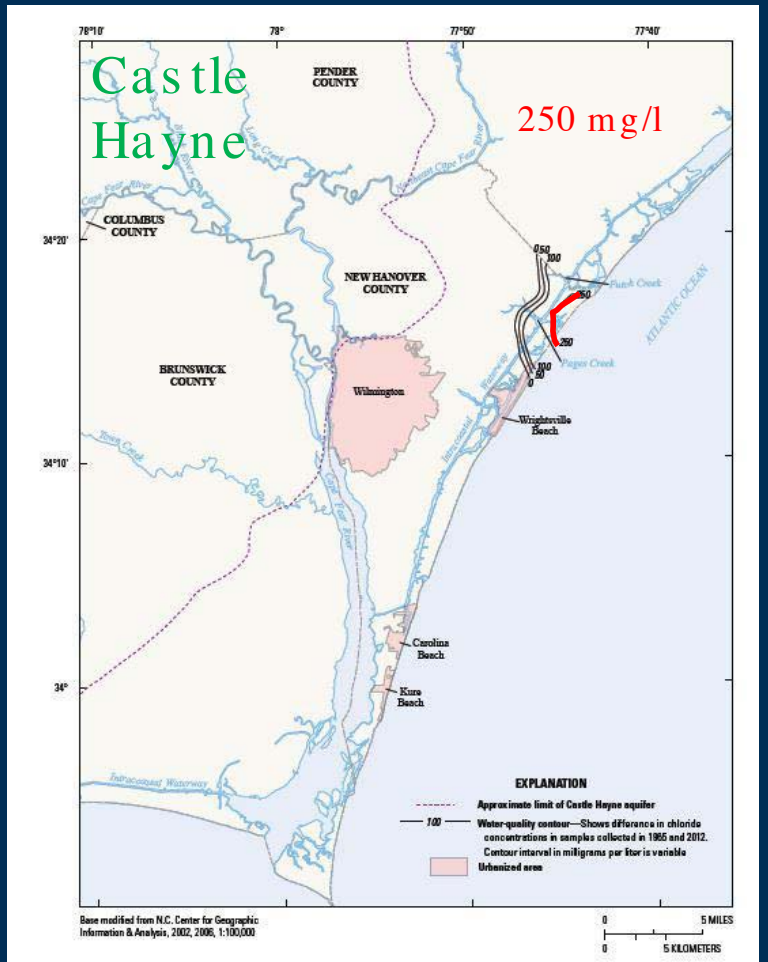
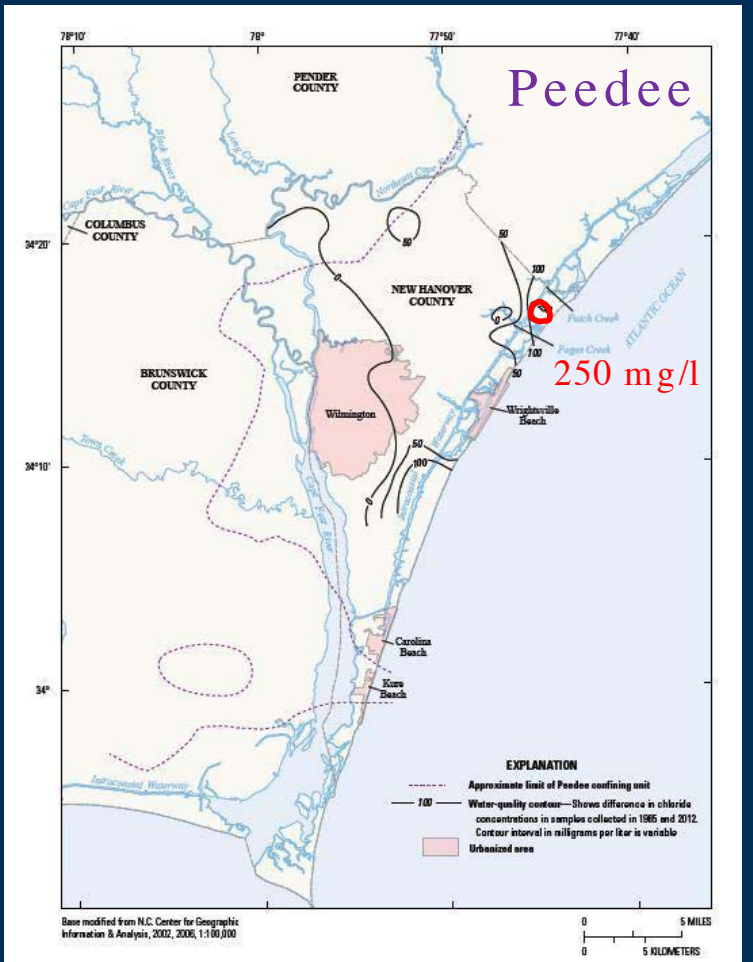
Dissolved Chloride





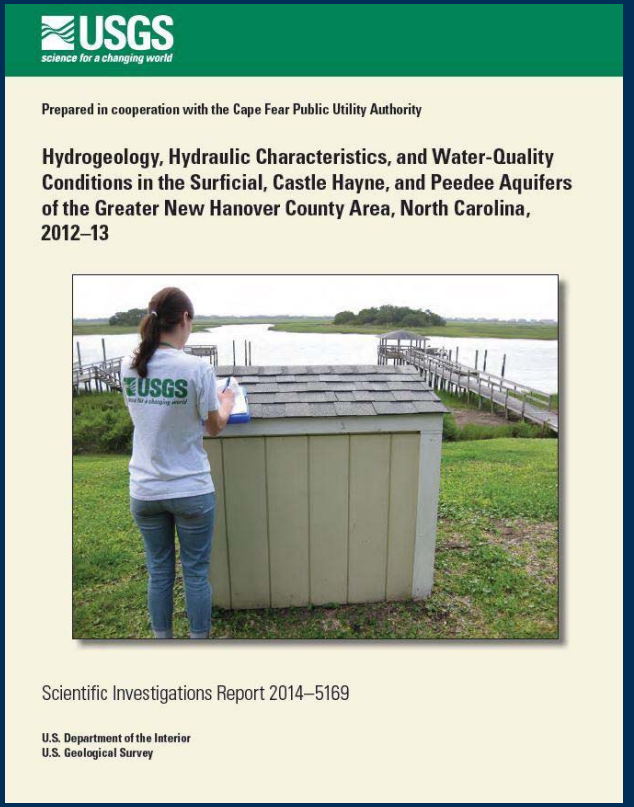
Chloride Concentration Difference 1965-2012





For More Detailed Information

- Available at http://pubs.usgs.gov/sir/2014/5169/
- Data sets available for digital downloading



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Questions?

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