



Tide Monitoring Programs in Virginia's Coastal Plain

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2016 Hampton Roads Water Symposium

September 20, 2016

Outline

- Background
- Permanent Networks
- USGS Storm Tide Program
- USGS SWaTH Network
- Other Data
- Questions

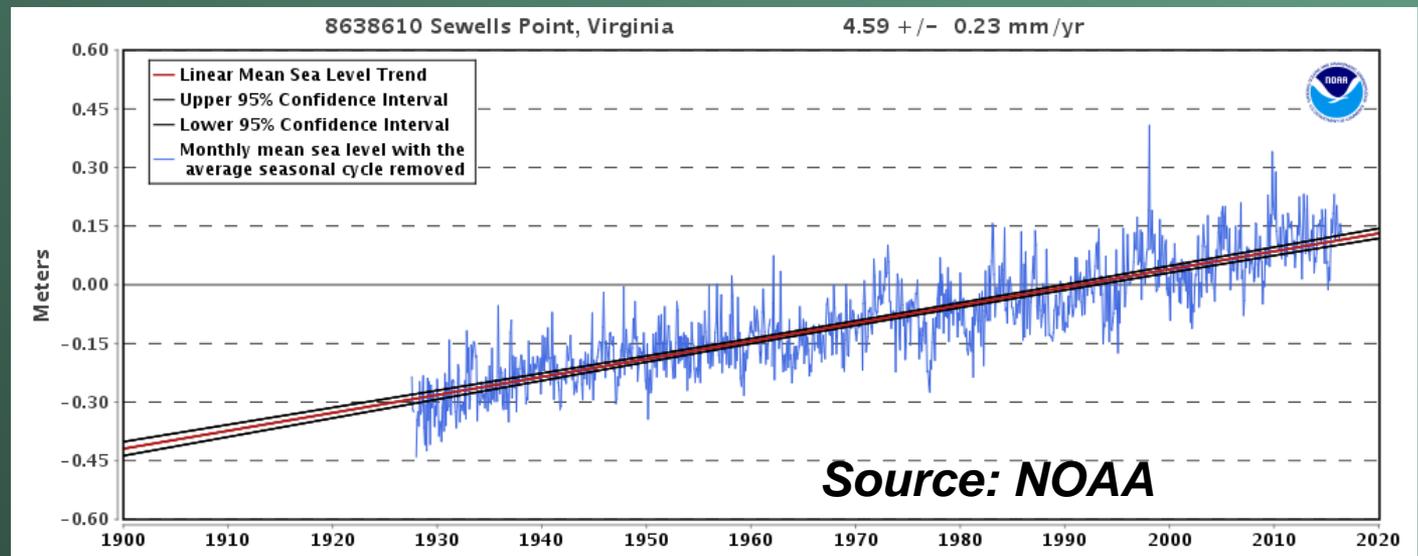


Background

- **Monitoring the water level in the tidal zone provides real data necessary for current and future planning.**

Background

- Monitoring the water level in the tidal zone provides real data necessary for current and future planning.
- Longest continuous record in Hampton Roads area – Sewells Point (1928)

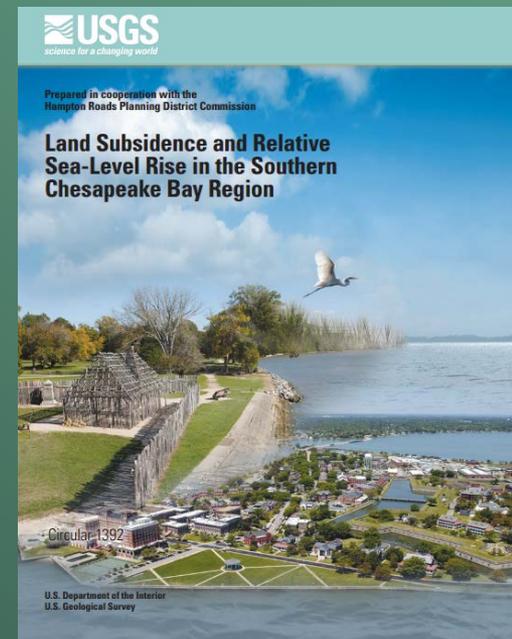


Background

- Hampton Roads region also experiencing land subsidence.
- Sea level rise coupled with land subsidence creates even more complex scenarios.
 - Eggleston and Pope (2013)



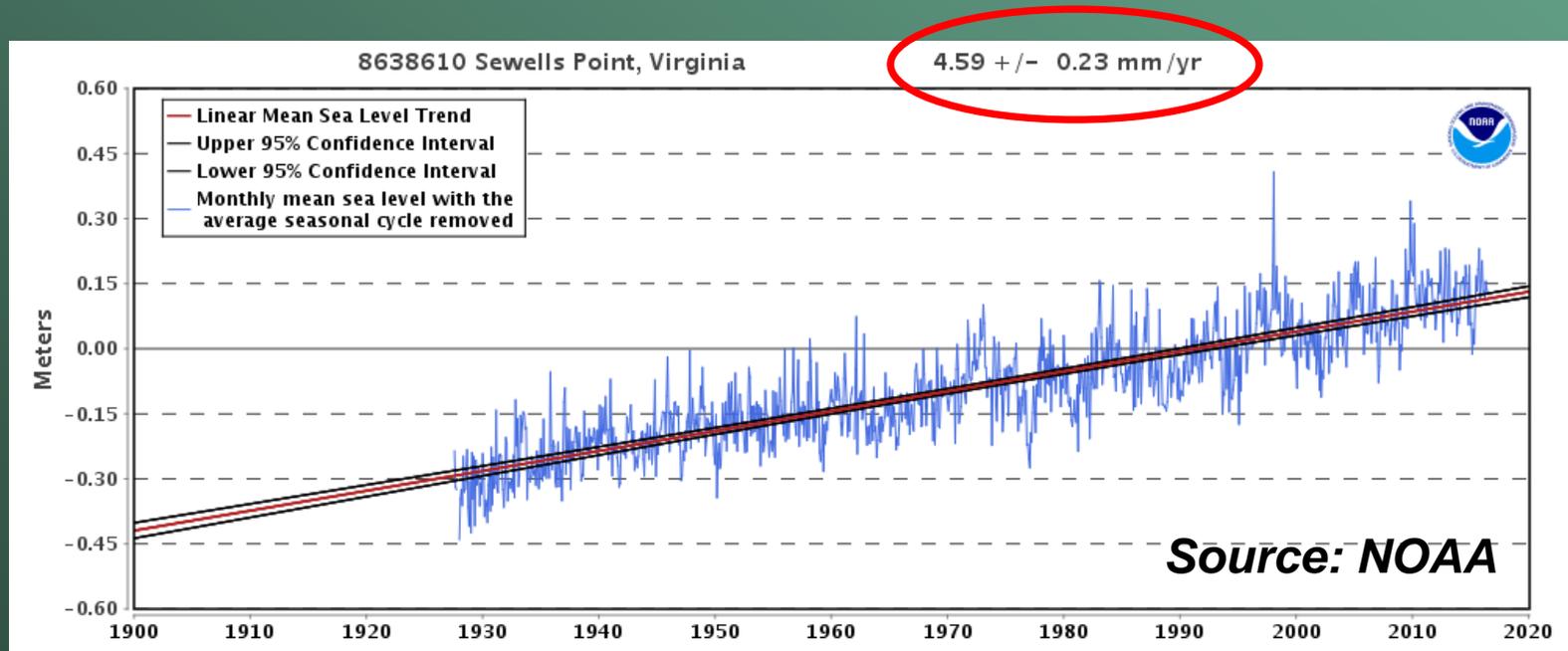
Figure 5. Downtown Franklin, Virginia, during flooding caused by Hurricane Floyd in September 1999. Photograph by John H. Sheally II, courtesy of The Virginian-Pilot, used with permission.



Background

Sea Level Rise

~ 4.5 mm/yr



Background

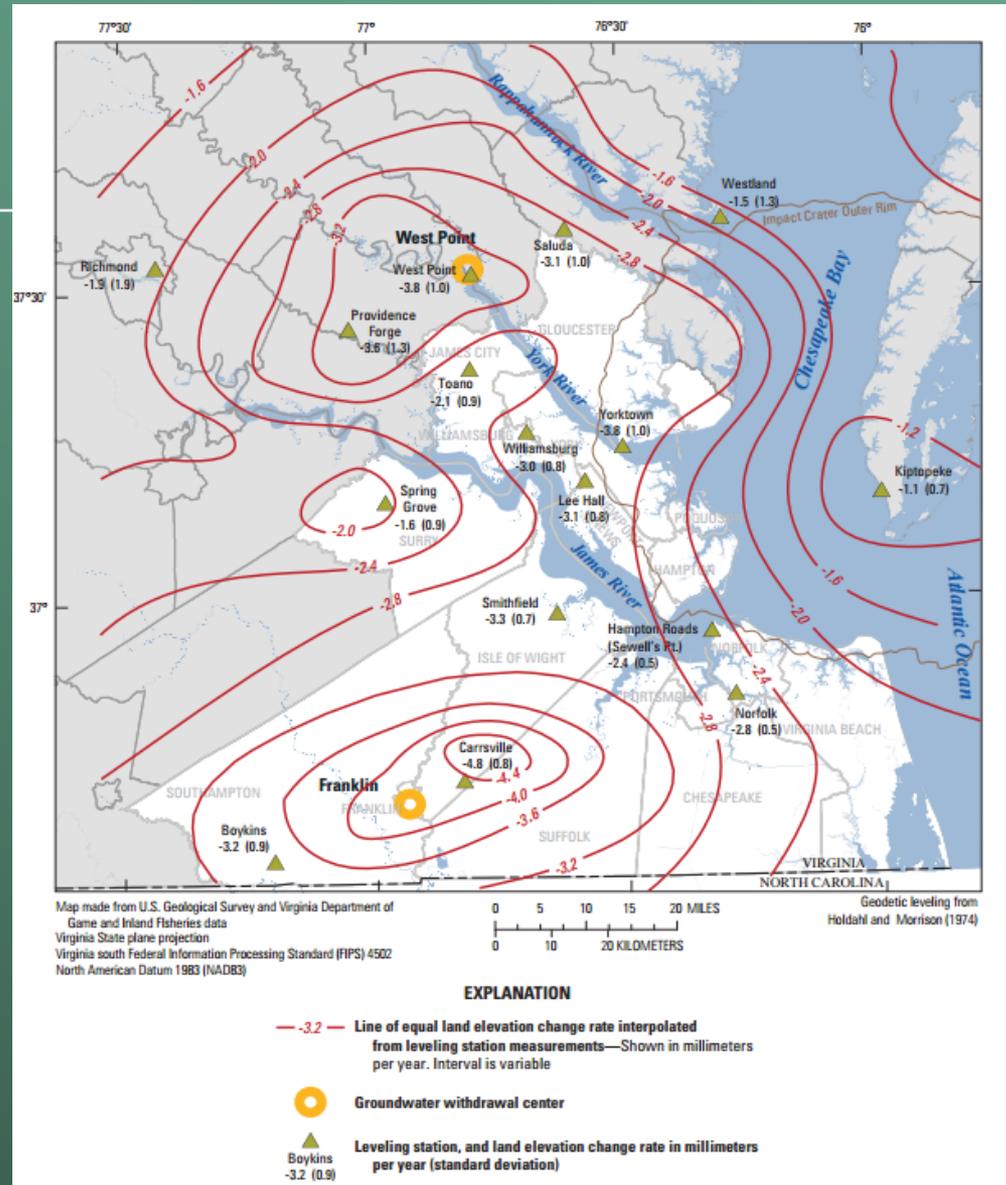
Sea Level Rise

~ 4.5 mm/yr

+

Subsidence

~ 2.0 mm/yr



Source: Eggleston and Pope (2013)

Background

Sea Level Rise

~ 4.5 mm/yr

+

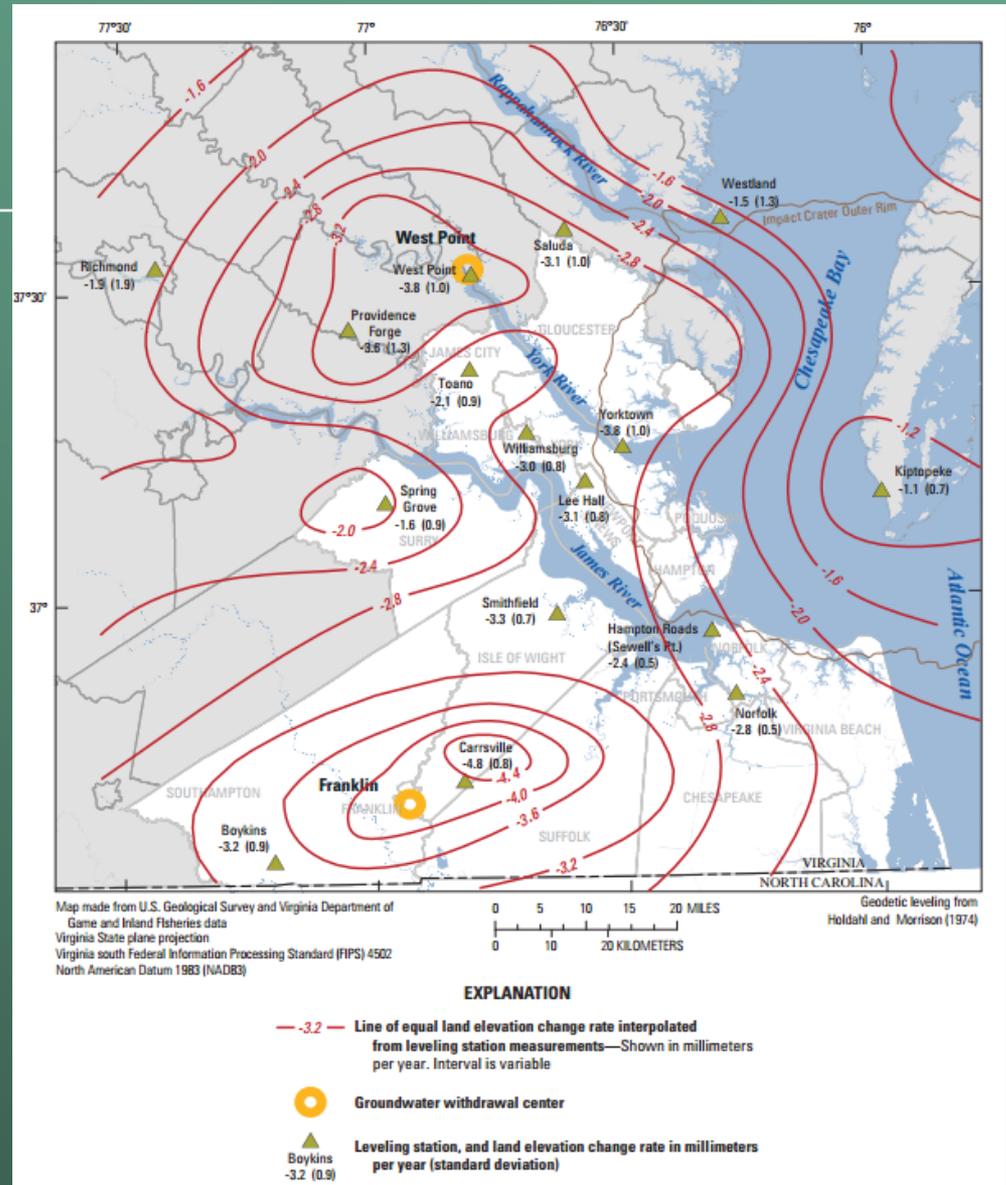
Subsidence

~ 2.0 mm/yr

=

Total Impact

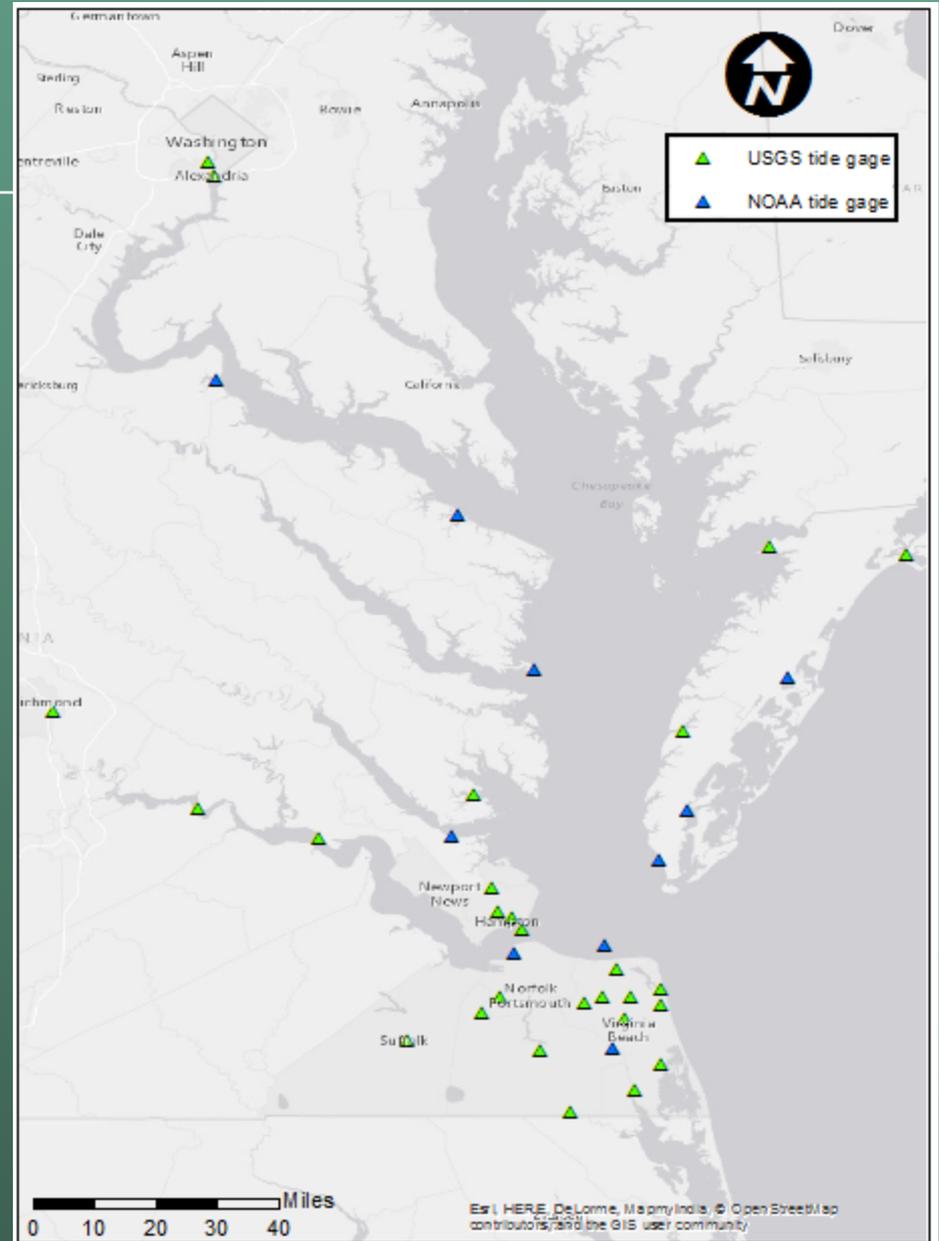
~ 6.5 mm/yr (0.02 ft/yr)



Source: Eggleston and Pope (2013)

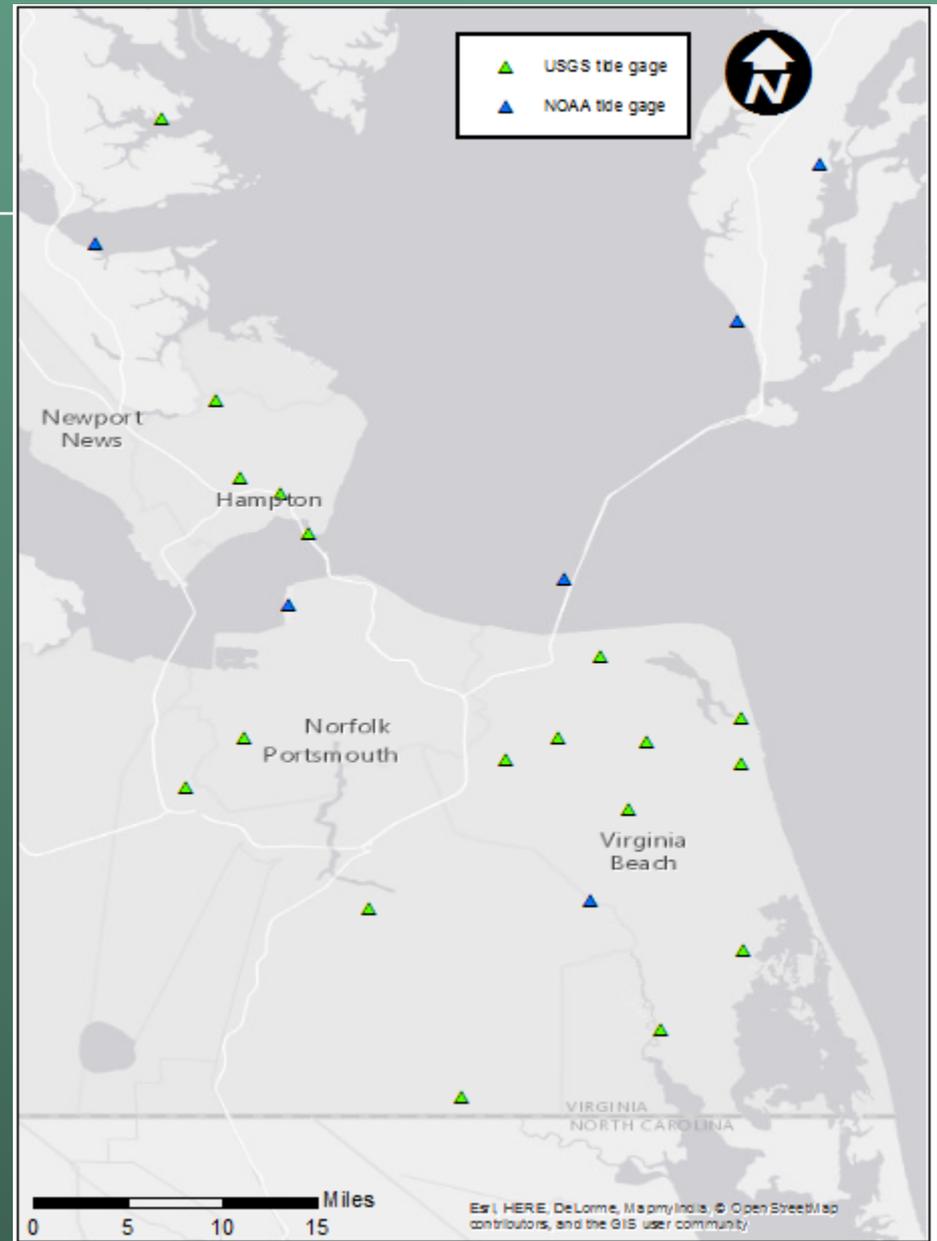
Permanent Networks

- USGS operates 27 tide gages in VA
- NAVD88 referenced
- Data:
 - NWISweb
 - AHPS (converted to MLLW where possible)



Permanent Networks

- Major expansion in Hampton Roads area since Sandy
- Funded by numerous localities
- Coordination between USGS and NOAA
- Water level, wind speed/direction, and rainfall



USGS Storm Tide Program

- Program began in 2005 after Hurricane Katrina
- Purpose
 - To study effects of coastal storms to better understand potential impacts on coastal communities and habitats.
 - To provide data for forecast model development and enhancement .

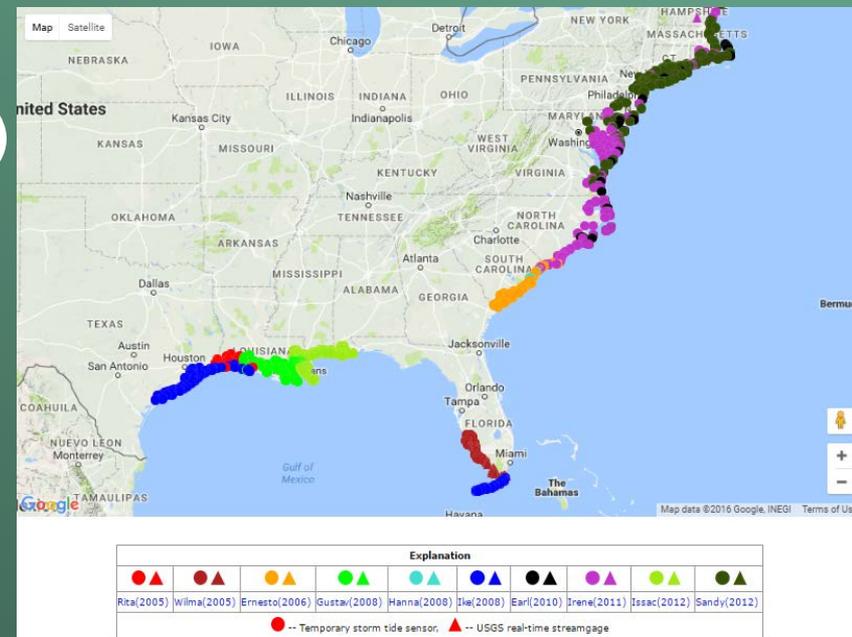
USGS Storm-Tide Monitoring Program

- **Approach**

- Instead of relying on static, post-event high-water marks, directly measure the event where greatest impacts are forecast.
- Establish a dense network of sensors that can be deployed just before landfall.

USGS Storm-Tide Monitoring Program

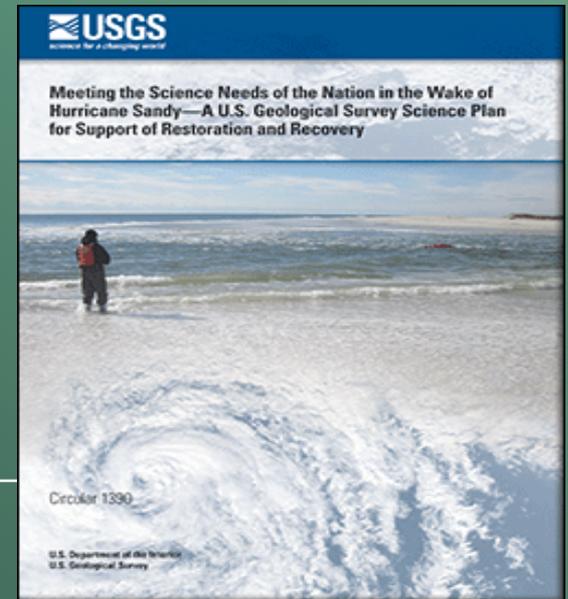
- Sensors have been deployed for:
 - Rita and Wilma (2005)
 - Ernesto (2006)
 - Gustav, Hana, and Ike (2008)
 - Ida (2009)
 - Earl (2010)
 - Irene (2011)
 - Isaac and Sandy (2012)
 - Joaquin (2015)
 - Nor'easter of January 2016



USGS SWaTH Network

In response to Hurricane Sandy, the USGS, using supplemental appropriations provided to the DOI, developed a Hurricane Sandy Science Plan to support recovery, restoration, and rebuilding efforts.

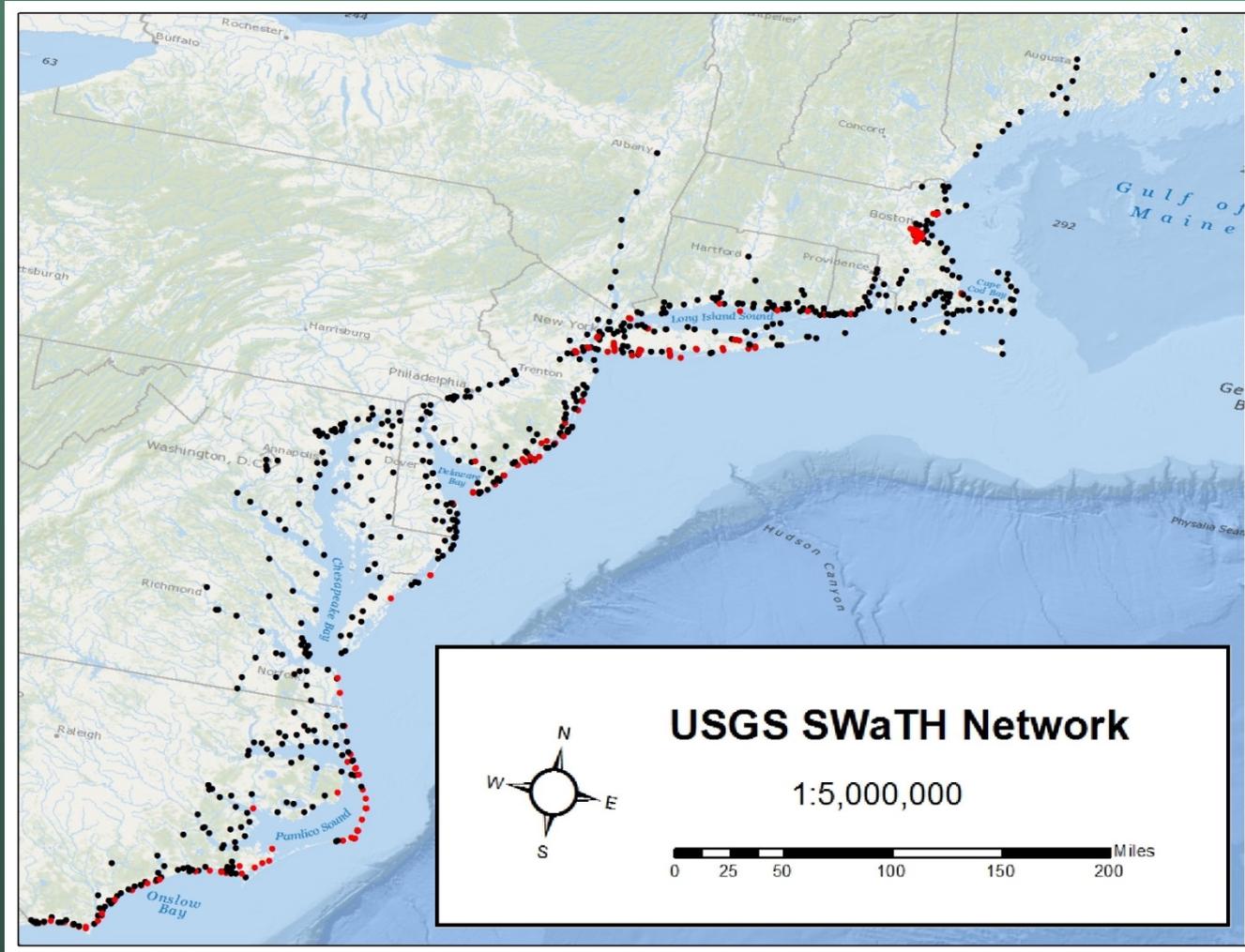
<http://pubs.usgs.gov/circ/1390>



USGS SWaTH Network

- **Surge, Wave, and Tide Hydrodynamics**
 - Expansion of existing Storm-Tide program to provide a more efficient way of recording, processing, and disseminating data.
 - Includes deployment for major Nor'easters, in addition to tropical systems.
 - Increases capabilities of network with more real-time data to support production of real-time storm-surge forecasts, watches, and warnings.

USGS SWaTH Network



USGS SWaTH Network

Flood Event Viewer (FEV)

- Provides real-time data before, during, and after storm.
- Mapper includes site data, hydrologic-data files, hydrographs, and photographs.
- Delivered directly into operational computers using web services.

The screenshot shows the USGS website's 'Flood Information' section. The top navigation bar includes 'Home', 'Data', 'Publications', 'Maps/GIS', 'Software', 'Multimedia', 'Programs', 'Education', 'About Us', 'Contact', and 'Internal'. The main content area is titled 'USGS Flood Information' and features a 'USGS Flood Event Viewer: Providing Hurricane and Flood Response Data' section. This section includes a map of the United States with a red dot indicating a location, and text describing the viewer's capabilities and the Short-Term Network (STN) project. A 'Suggested Citation' box is also visible, providing the URL for the FEV data portal.

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Regional and Local Flood Alerts

USGS Flood Information

CURRENT FLOODING HISTORICAL FLOODING FLOOD RESOURCES INTERNAL

USGS Flood Event Viewer: Providing Hurricane and Flood Response Data

The USGS Flood Event Viewer provides convenient, map-based access to storm-surge and other event-based data collected by the USGS Short-Term Network (STN). The USGS streamgage network is the largest streamgage network in the US, but even with over 8,000 real-time stations, more data is needed for certain storms. During large events, the USGS collects additional data (high-water marks, additional sensor deployments) to aid in documenting high-water events.

The USGS Short-Term Network (STN) project has evolved from a small database that was designed to support a small cooperative project focused on flood response to a national-scale application and database designed to support USGS Storm-Tide Program and High-Water Mark (HWM) data collection efforts. Data dissemination tools were developed initially for USGS storm-tide monitoring data associated with Hurricane Irene in 2011 and were further refined with Hurricanes Isaac and Sandy in 2012. The coastal and riverine projects were combined, due to similarities in data collection needs, into the STN. The STN has recently been upgraded to support the USGS Surge, Wave, and Tide Hydrodynamic (SWaTH) Network in the Northeast to help the USGS prepare for the next storm response.

The Flood Event Viewer (FEV) application and Short-Term Network (STN) database are designed to encourage, but not require, repeated visits to temporary sensor deployment (wave or water level) or HWM

Suggested Citation
U.S. Geological Survey, [year]. Short-Term Network Data Portal, accessed on [full date], at <http://water.usgs.gov/floods/FEV/>
Please reference the USGS Flood Event Viewer in all publications that use data from this system.



<http://water.usgs.gov/floods/FEV/>

Other Data

- Borehole Extensometers
 - Franklin
 - Suffolk
 - Nansemond (new)
- Measures compaction and expansion of an aquifer system

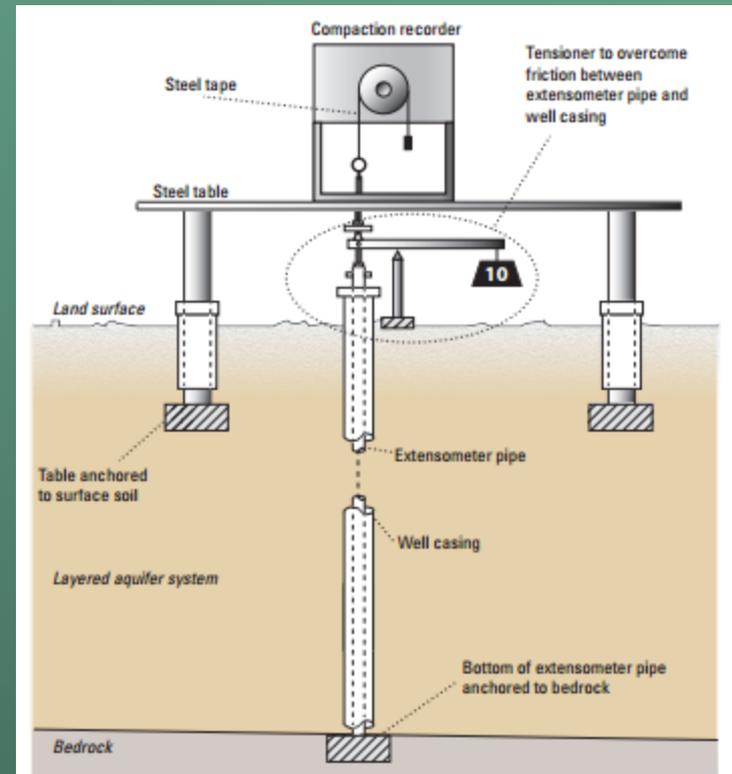
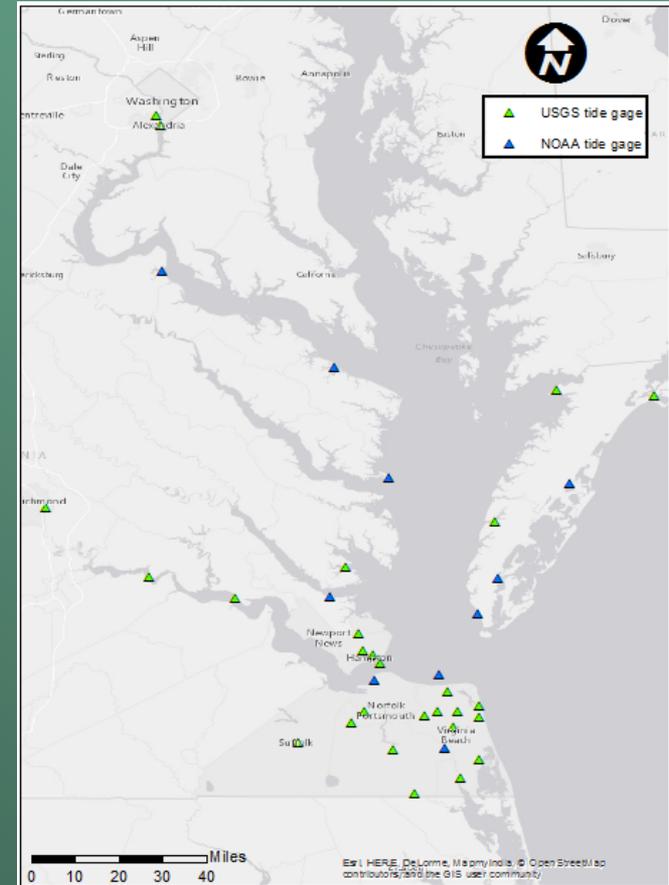


Figure 8. The borehole extensometer in Franklin, Virginia. Modified from Pope (2002).

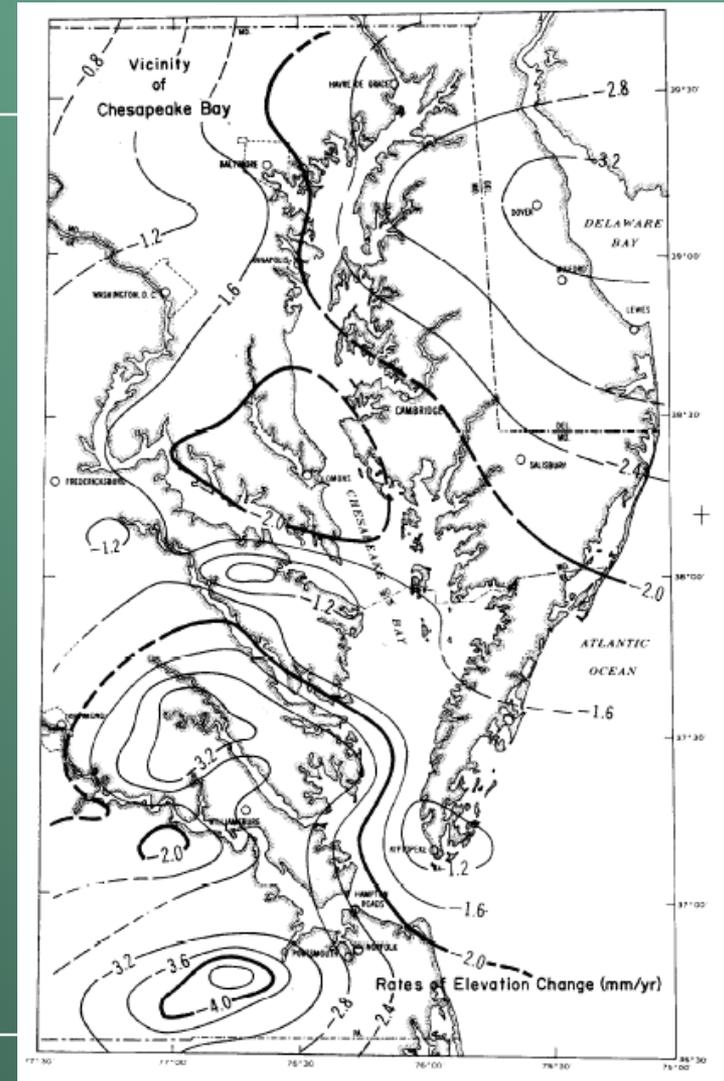
Other Data

- Borehole Extensometers
- Tide gage datum surveys
 - Conducted annually at USGS tide gages
 - Conventional and GNSS surveys



Other Data

- Borehole Extensometers
- Tide gage datum surveys
- Benchmark Monitoring
 - Potential project with HRPDC
 - Annual GNSS surveys of select benchmarks
 - Tie-back to Holdahl and Morrison (1974)



Questions

