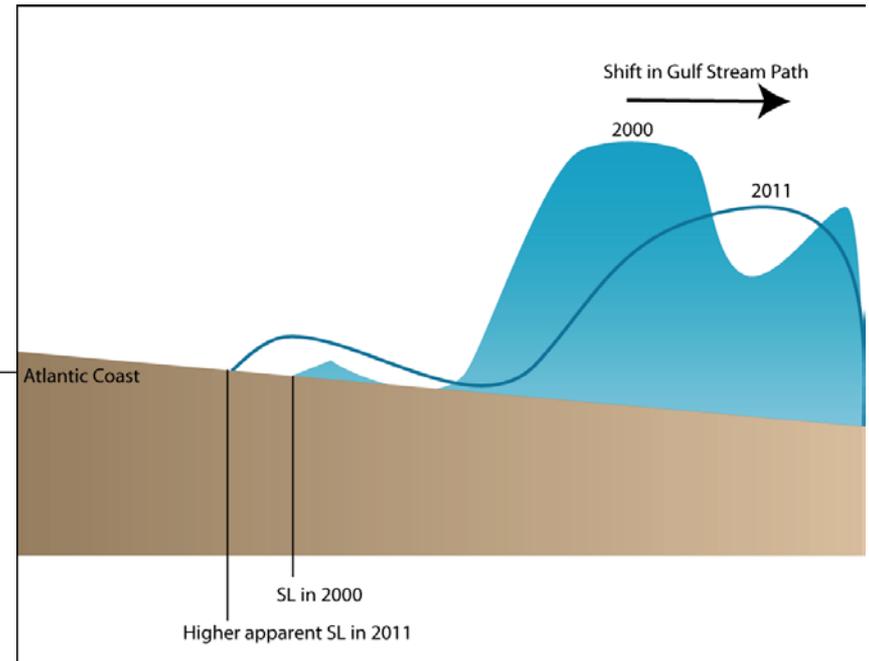
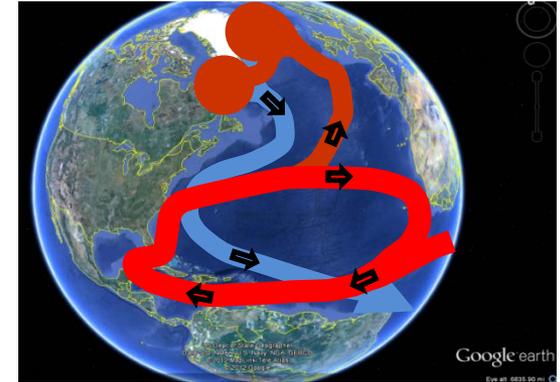
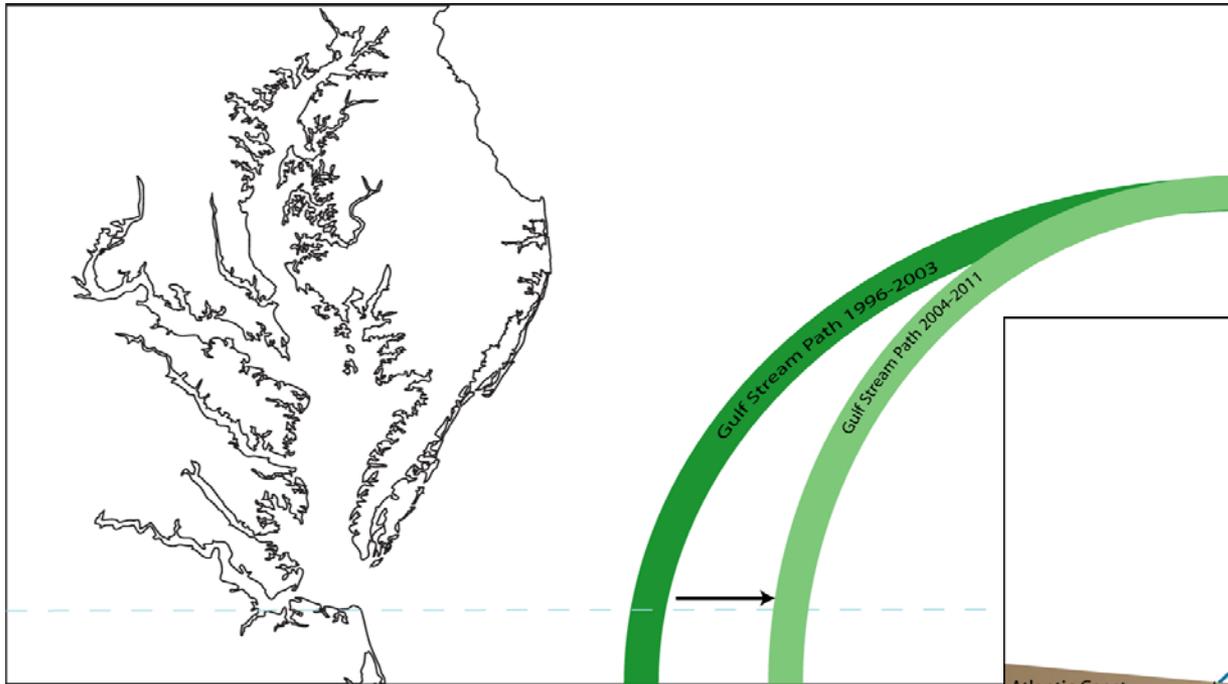


# Climate Change Projections and State Adaptation Efforts

- Recent climate projections and scientific findings that affect flooding and coastal resources
- “Who’s Doing What” report
- Current state-level efforts to address climate adaptation

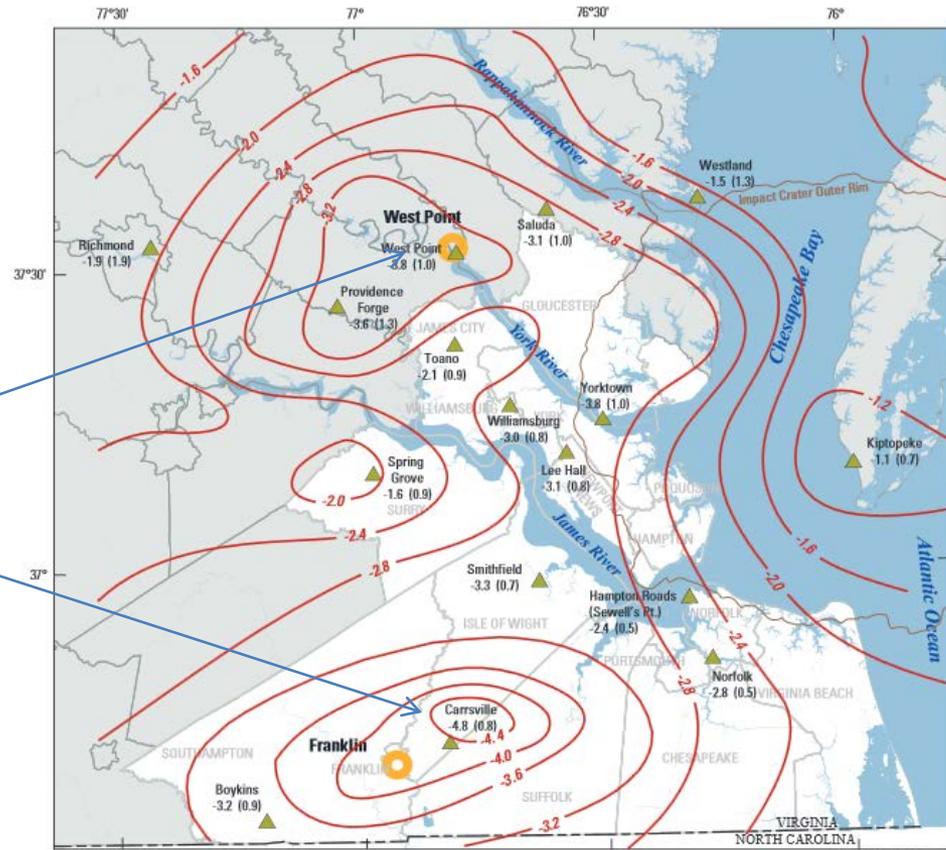
# Local Processes: Shift in Gulf Stream



Ezer, T., L. P. Atkinson, W. B. Corlett and J. L. Blanco (2013), Gulf Stream's induced sea level rise and variability along the U.S. mid-Atlantic coast, *J. Geophys. Res. Oceans*, 118, 685–697

# Local Processes: Subsidence

Highest rates of subsidence



Map made from U.S. Geological Survey and Virginia Department of Game and Inland Fisheries data  
 Virginia State plane projection  
 Virginia south Federal Information Processing Standard (FIPS) 4502  
 North American Datum 1983 (NAD83)

Geodetic leveling from Holdahl and Morrison (1974)

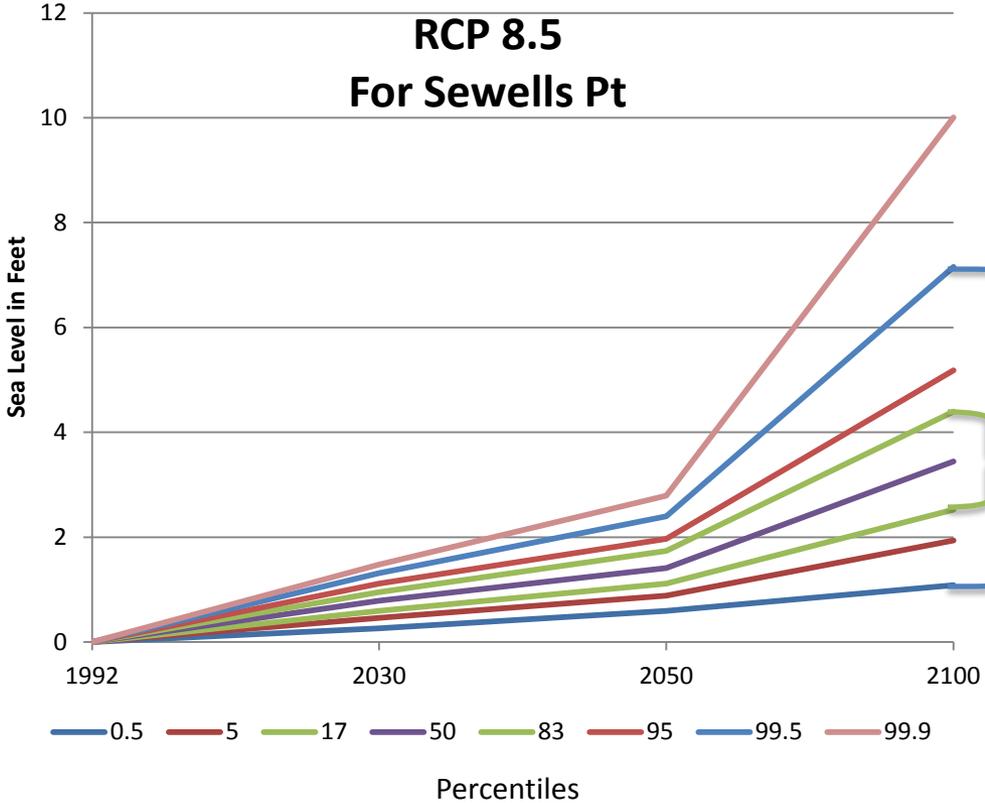
- EXPLANATION**
- -3.2 — Line of equal land elevation change rate interpolated from leveling station measurements—Shown in millimeters per year. Interval is variable
  - Groundwater withdrawal center
  - ▲ Leveling station, and land elevation change rate in millimeters per year (standard deviation)

Eggleston, Jack, and Pope, Jason, 2013, Land subsidence and relative sea-level rise in the southern Chesapeake Bay region: U.S. Geological Survey Circular 1392, 30 p., <http://dx.doi.org/10.3133/cir1392>.

# Global & Local model: Probabilistic model of SLR

See paper for other scenarios, locations and dates

Global SLR variance primarily due to thermal expansion until ~2060, then ice sheet melting



Expect about 6 (1-in 10yr) flood events in 30 years (or twice the anticipated!)

VERY LIKELY

Data from: Kopp, R. E., R. M. Horton, C. M. Little, J. X. Mitrovica, M. Oppenheimer, D. J. Rasmussen, B. H. Strauss, and C. Tebaldi (2014), Probabilistic 21st and 22<sup>nd</sup> century sea-level projections at a global network of tide-gauge sites, Earth's Future, 2, 383–406, doi:10.1002/2014EF000239.

# Changes in marsh community from sea level changes



High marsh  
to low marsh

Marsh  
persistence will  
require routes  
for landward  
migration



Freshwater  
marsh to salt  
marsh



# Who's doing what?

## SLR adaptation in Virginia

- Academia
  - activities at 6 institutions throughout Virginia
- NGOS
  - Several national NGOs are doing work specific to Virginia
  - Local groups tend to be focused on the Hampton Roads area
- Commonwealth of Virginia
  - Several agencies are doing work, some highlights are:
    - **VA Department of Environmental Quality's Office of Water Supply** has been conducting research on the land subsidence that can be accounted for from groundwater pumping and its significant contribution to sea-level rise
    - **Hampton Roads Transportation Planning Organization** issued a study in 2013 that estimates impacts from sea level rise and storm surge to the network of highways and roads serving area military installations
  - Federal-state partnerships represent a lot of the activity and include:  
**Virginia Coastal Zone Management Program, Virginia Sea Grant Program, Virginia Silver Jackets**

# Who's doing what?

## SLR adaptation in Virginia

### con't...

- State legislature
  - **Coastal Resource Management Law** (2011)
  - **Recurrent Flooding Report** (2012)
  - **Recurrent Flooding Sub-Panel** (2013-2014)
  - **General Assembly Joint Subcommittee on Recurrent Flooding** (2014)
  - **Virginia Governor's Climate Change Commission** (2008 and 2014)
- Federal
  - A variety of agencies are involved although most activity is on a national scale
  - Military bases have been studying the local issues

See the full report at: <http://ccrm.vims.edu/>  
Virginia Accomplishments Since the 2008 Climate Action Plan Release. Appendix 6.

# Secure Commonwealth Sub-Panel on Recurrent Flooding

There were 20 recommendations, summarized below:

- Better coordination between state, federal and regional efforts
- Establish an Incident Command System & identify a “Resilience Coordinator”
- Establish a four year time scale for planning
- The Commonwealth should identify or establish a fund to assist localities with the costs of adaptation.
- Collect necessary data for an ongoing vulnerability assessment throughout the Commonwealth
- Leverage Social Media and Crowdsourcing Technology
- Develop project and resource prioritization criteria and funding eligibility in advance of crisis
- Consider modification to Real Estate disclosures to include flood-related damages

See the full report at: [ccrm.vims.edu/SCPRecommendationsReport\\_Sept2014.pdf](http://ccrm.vims.edu/SCPRecommendationsReport_Sept2014.pdf)

Virginia Accomplishments Since the 2008 Climate Action Plan Release. Appendix 6.



# General Assembly Joint Subcommittee on Recurrent Flooding

- Initial meeting of the Joint Subcommittee to address recurrent flooding was held July 2014
  - Chair: Delegate Chris Stolle
  - Vice Chair: Senator Mamie Locke
- The Joint Subcommittee was created by the passage of HJR16 (Stolle) and SJR3 (Locke).
- Resolution was to accomplish the following:
  - formulate recommendations for the development of a comprehensive and coordinated planning effort to address recurrent flooding
  - recommend short-term and long-term strategies for minimizing the impact of recurrent flooding.
  - Coordinate with the executive branch effort.
  - Review proposed legislation that addresses recurrent flooding.
  - Recommend practical legislative and budgetary proposals to mitigate the harmful impacts of recurrent coastal flooding on people and property

[http://dls.virginia.gov/interim\\_studies\\_flooding.html](http://dls.virginia.gov/interim_studies_flooding.html)

# Governor's Commission

- Executive Order 19, convened the Governor's Climate Change and Resiliency Update Commission (Governor McAuliffe, 2014)
- The Commission is charged with conducting an assessment of the recommendations from the 2008 Climate Change Action Plan. Specifically, the Commission will:
  - Determine which recommendations from the original report were implemented;
  - Update and prioritize the recommendations; and,
  - Identify sources of funding to support the implementation of the recommendations.
- The commission convened at the Virginia Coastal Policy Clinic's second annual conference on the topic of "Adaptive Planning for Flooding and Coastal Change in Virginia: Next Steps for the Commonwealth." (Dec 2014); accomplishments include:
  - Creation of workgroups
  - Selection of a Resiliency Coordinator
  - Appointment of a liaison with the Joint Legislative Committee
  - Presentation of the first report, reviewing actions accomplished since the 2008 Governors Climate Commission
    - Can be found: [http://ccrm.vims.edu/Report\\_FINAL\\_ExeSum.pdf](http://ccrm.vims.edu/Report_FINAL_ExeSum.pdf)