

Virginia Recurrent Flooding Study

Marcia Berman
Molly Mitchell

December 6, 2012

VA CZMP Coastal Partners Workshop

Center for
Coastal
Resources
Management

Virginia Institute of Marine Science

WILLIAM & MARY
VIMS

VIRGINIA INSTITUTE OF MARINE SCIENCE
SCHOOL OF MARINE SCIENCE

www.vims.edu

Recurrent Flooding Study

Senate Joint Resolution No. 76

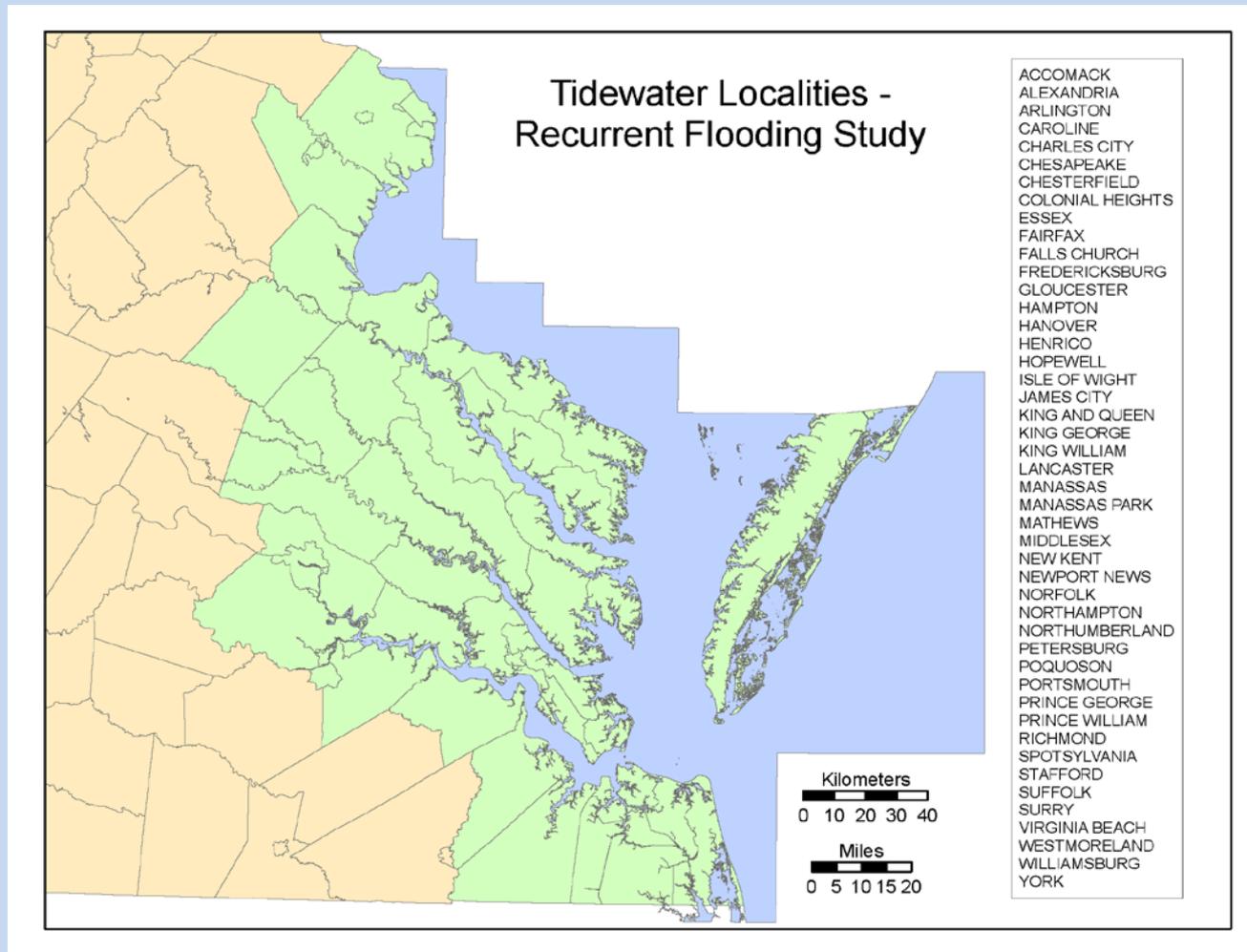
- **Goals**

- Review and develop a comprehensive list of strategies for dealing with recurrent flooding
- Convene a stakeholder advisory panel
- Offer specific recommendations on options for sea level rise adaptation which merit investigation



Collaborators: VIMS, ODU, HRPDC, City of Norfolk, A-NPDC, Wetland Watch, UVA IEN

Map of localities involved in study



Report Scope

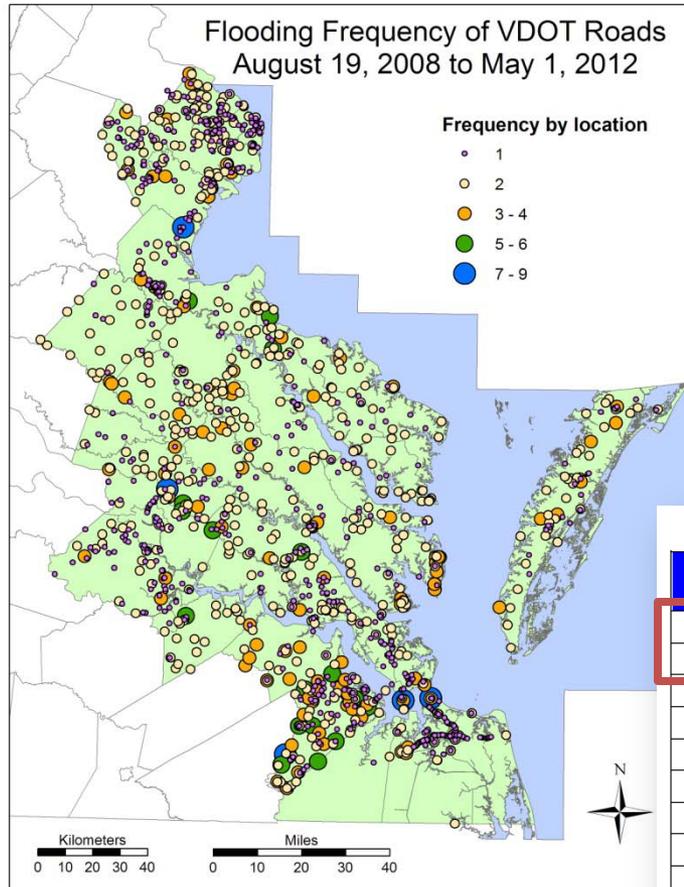
- Risk assessment and analysis
 - Current areas with repetitive flooding problems
 - precipitation flooding
 - tidal/storm surge
 - Predictions of future flooding
 - Risk to natural resources
 - Risk to infrastructure
- Assessment of current activities within localities
- Synthesis of flood management strategies available
- Recommendations of strategies for Coastal Virginia





ASSESS

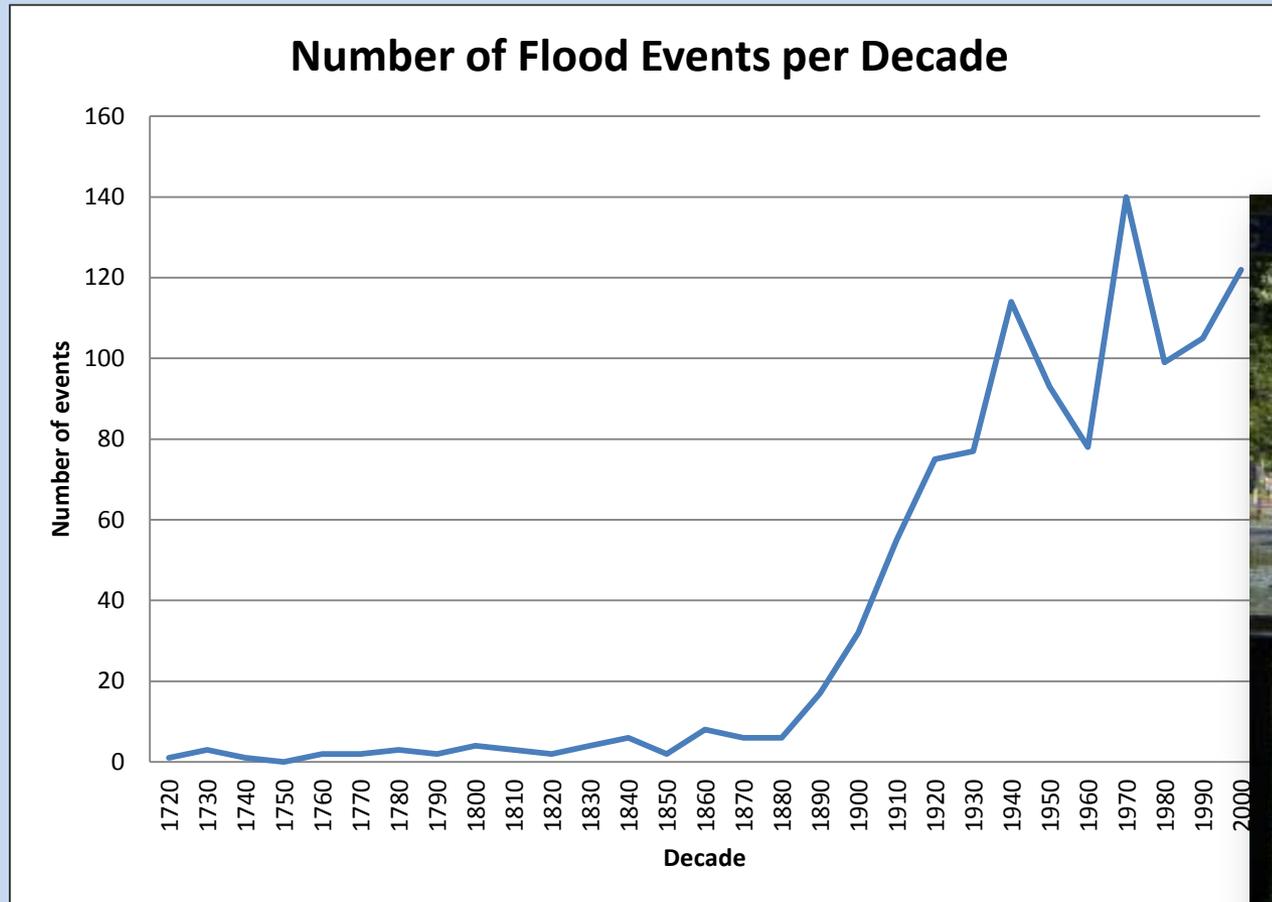
Historic Flood Data



VIRGINIA TOP 15 REPETITIVE LOSS COMMUNITIES

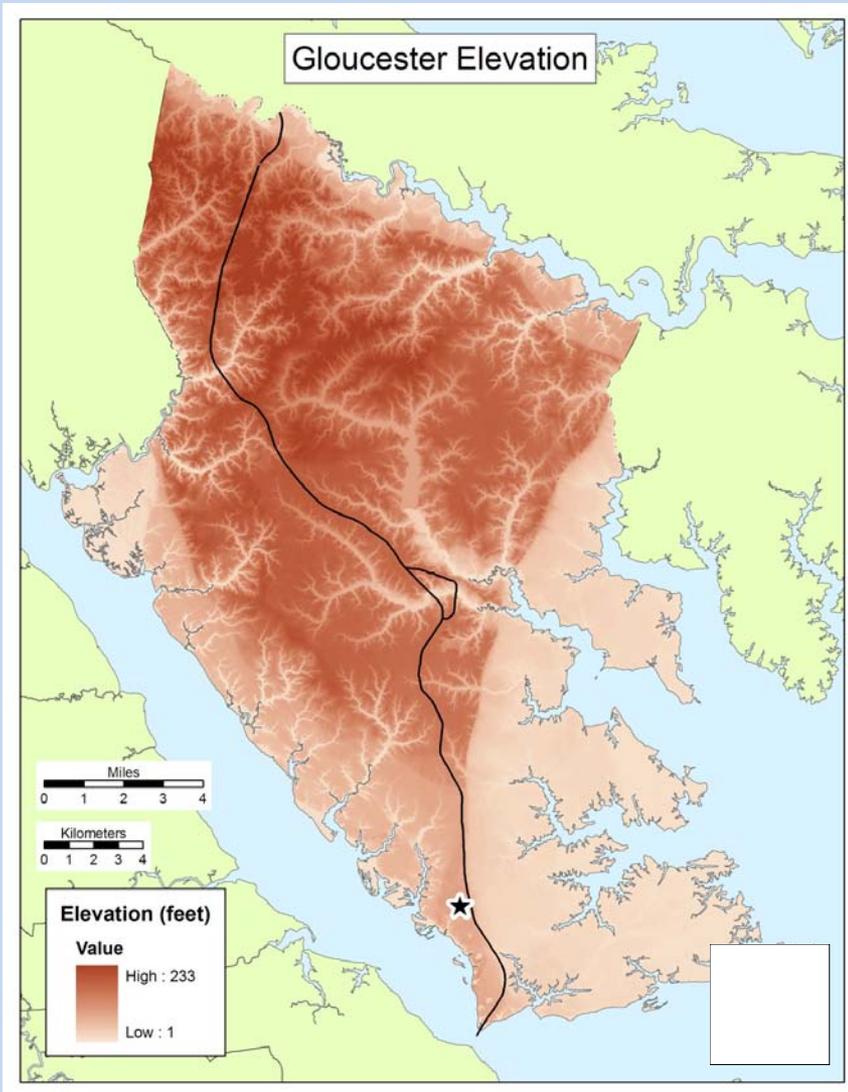
COMMUNITY NAME	TOTAL # CLAIMS	CLAIMS AMOUNT
VIRGINIA BEACH, CITY OF	106	\$1,083,761.77
NORFOLK, CITY OF	41	\$331,915.79
ROANOKE, CITY OF	30	\$377,271.02
WARREN COUNTY *	28	\$742,936.44
BUENA VISTA, CITY OF	27	\$297,052.15
DANVILLE, CITY OF	19	\$167,650.98
SHENANDOAH COUNTY *	19	\$977,333.51
BOTETOURT COUNTY *	18	\$170,209.28
WAYNESBORO, CITY OF	16	\$791,044.42
SALEM, CITY OF	15	\$149,963.68
CLARKE COUNTY *	13	\$345,226.31
HENRICO COUNTY *	13	\$143,208.61
PAGE COUNTY *	13	\$275,590.84
CHESAPEAKE, CITY OF	12	\$56,358.10
GLASGOW, TOWN OF	11	\$301,429.86

Are the number of floods that occur changing?

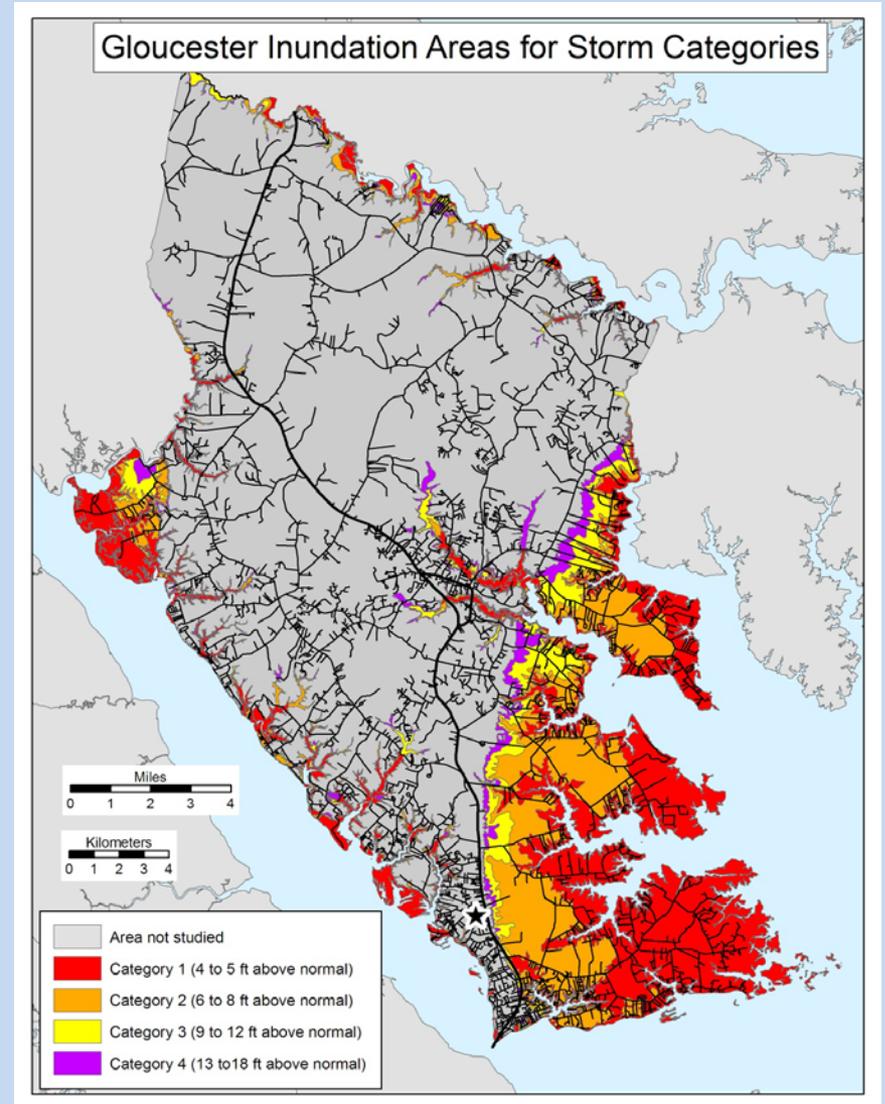


Photographer: Liz Roll/FEMA

From 'The Middle Atlantic River Forecast Center'. The data cover portions of Virginia, West Virginia, Delaware, Maryland, New Jersey, Pennsylvania and New York.



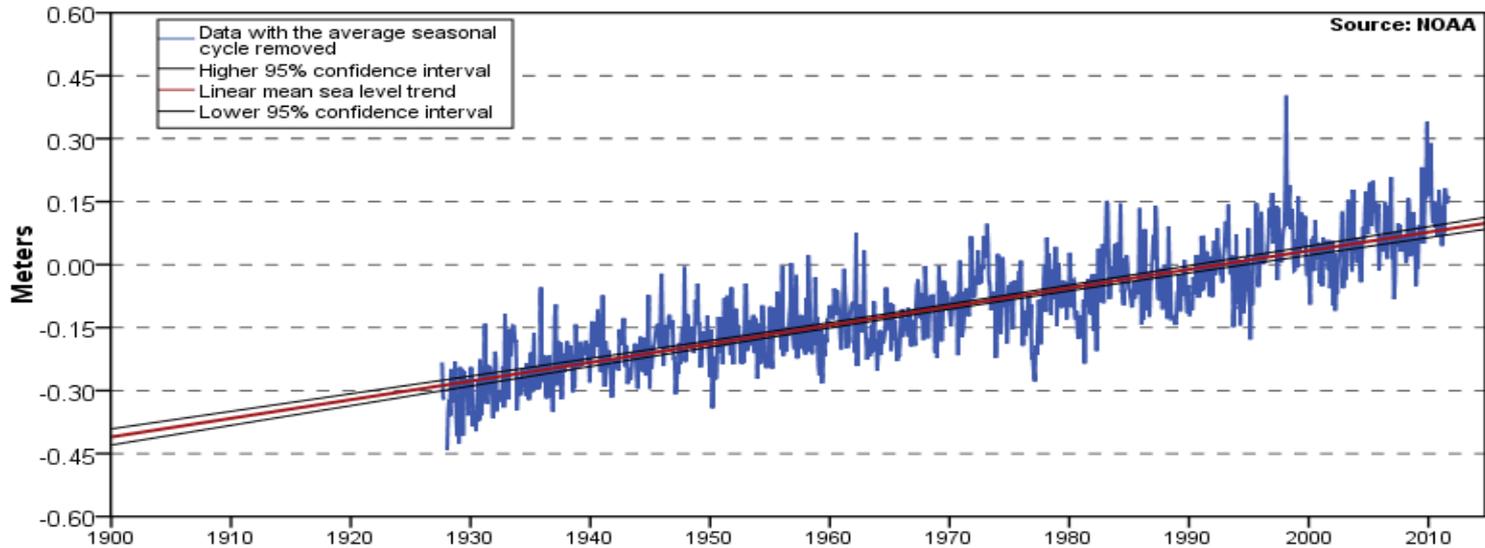
Data Source: 2011 LIDAR



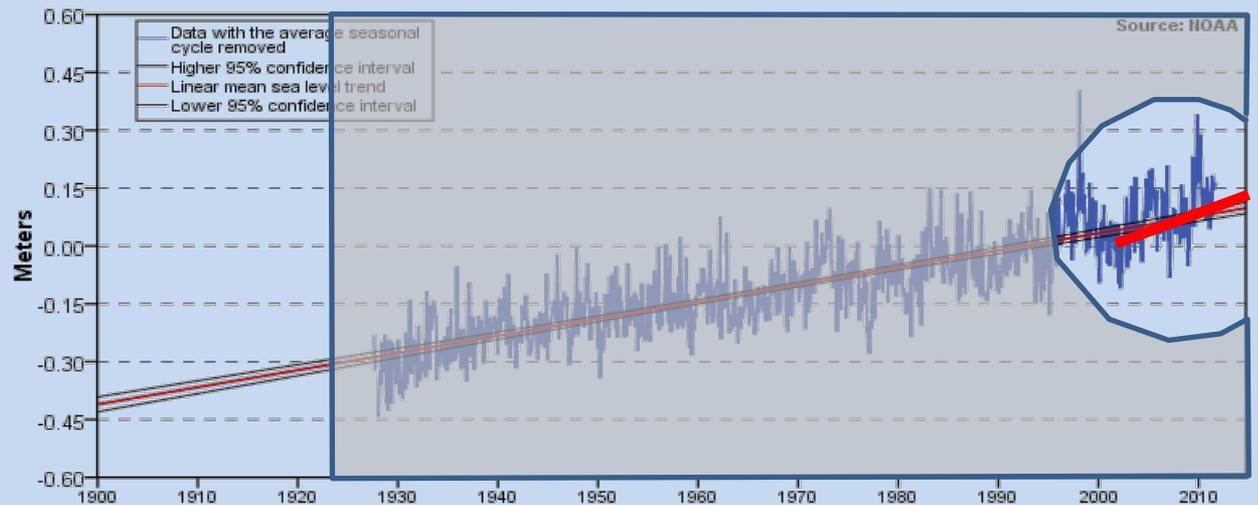
Data Source: VDEM Storm Inundation Zones

Sea level changes in Virginia

Sewells Point, VA 4.44 ± 0.27 mm/yr



Sewells Point, VA 4.44 ± 0.27 mm/yr



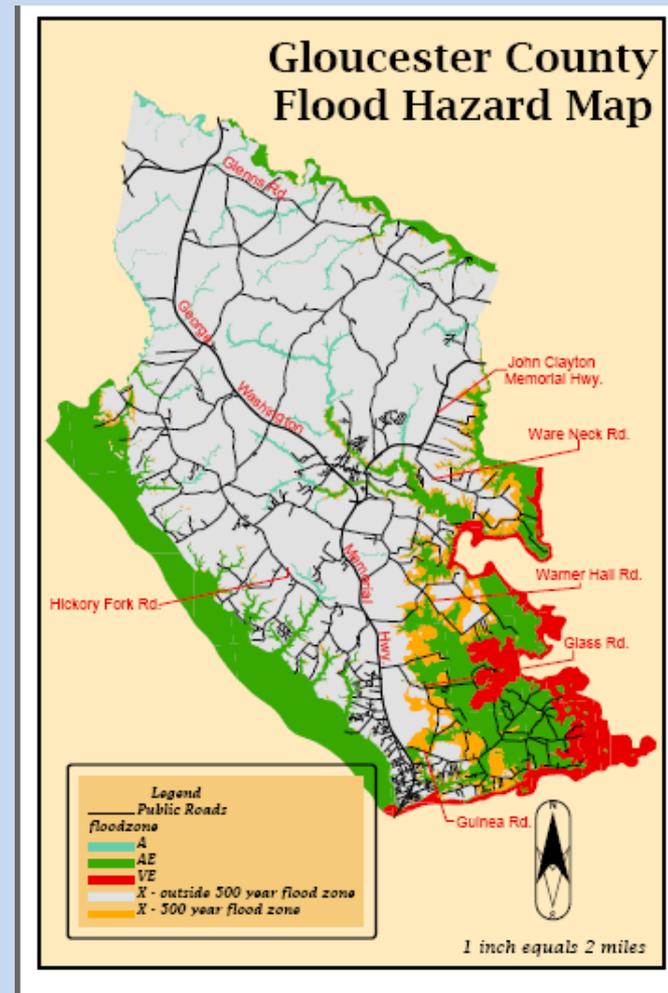
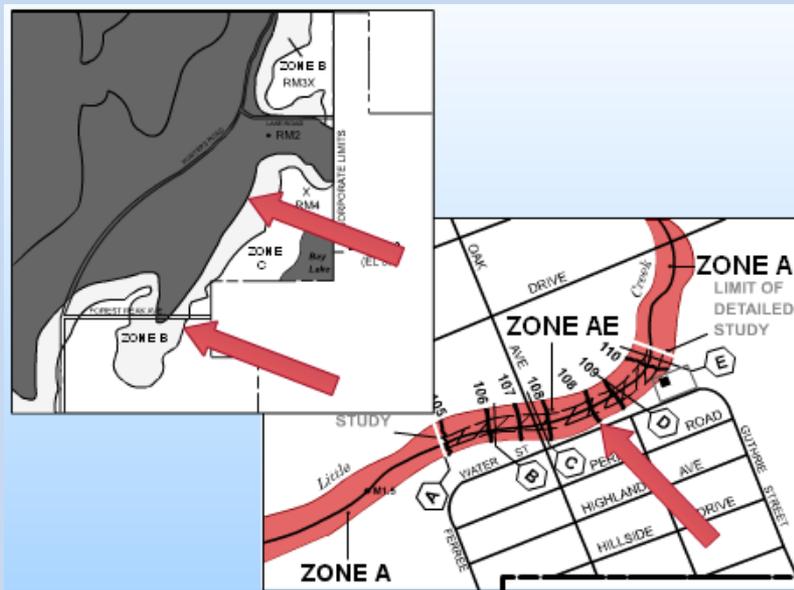


PREDICT

Predictive Flood Data

FIRM Maps (FEMA):

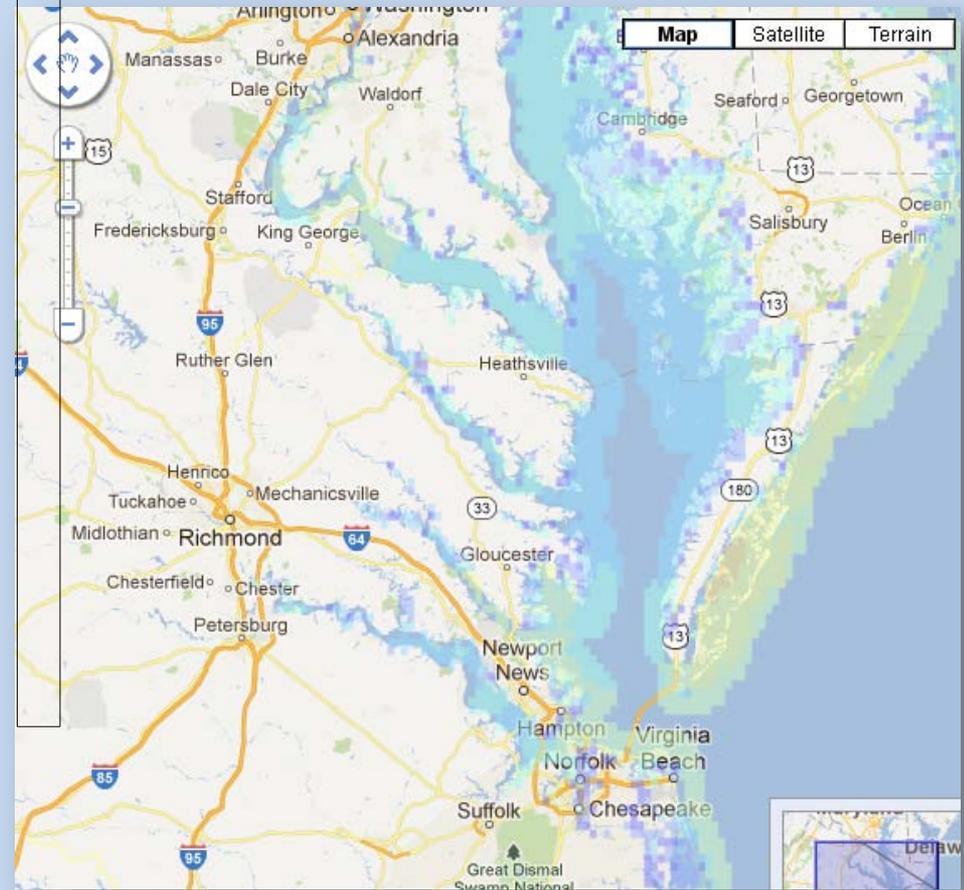
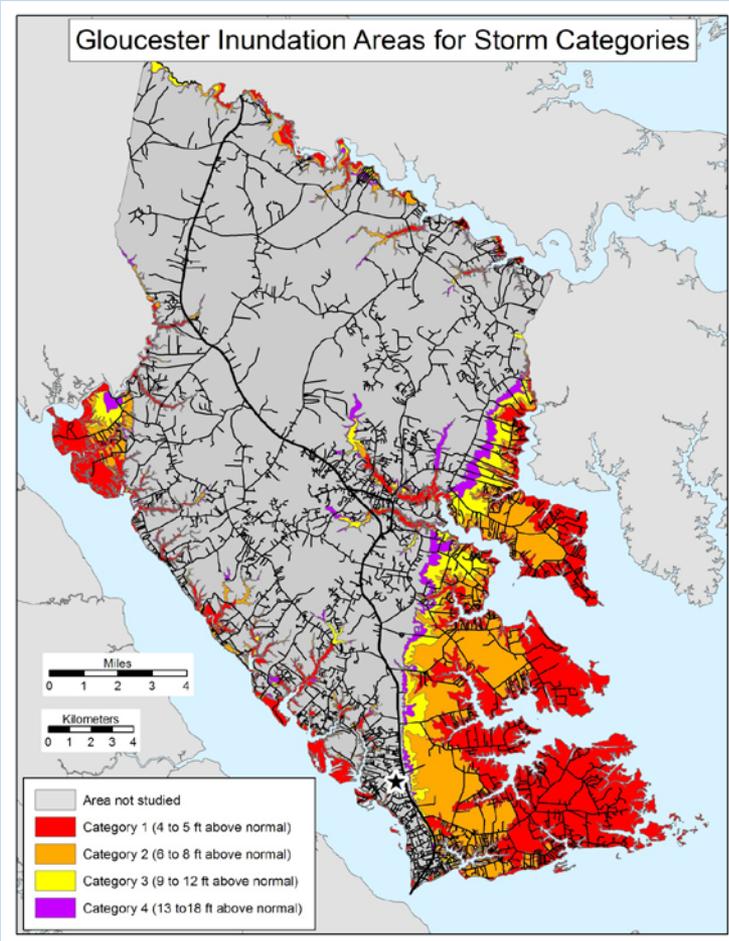
- Special Flood Hazard Areas
- Base (1 percent annual chance) flood elevations or depths
- Areas designated as regulatory floodways
- Undeveloped coastal barriers



Predictive Flood Data

Storm surge maps (NOAA):

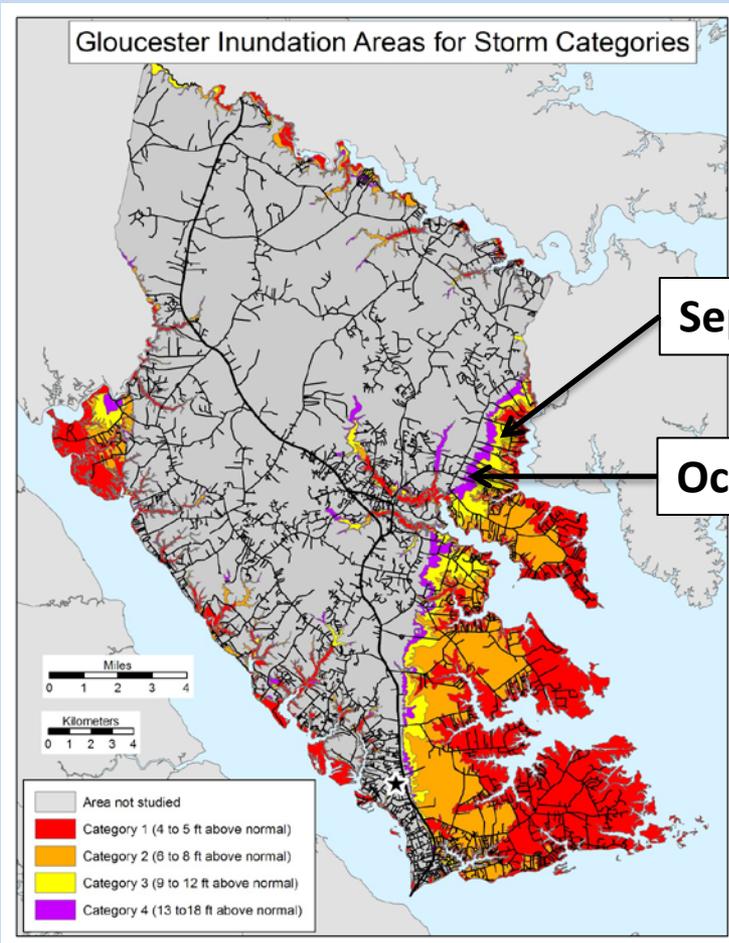
Education tool aimed at providing a national snapshot of maximum potential storm surge resulting from hurricanes (note: not for planning purposes)



Predictive Flood Data

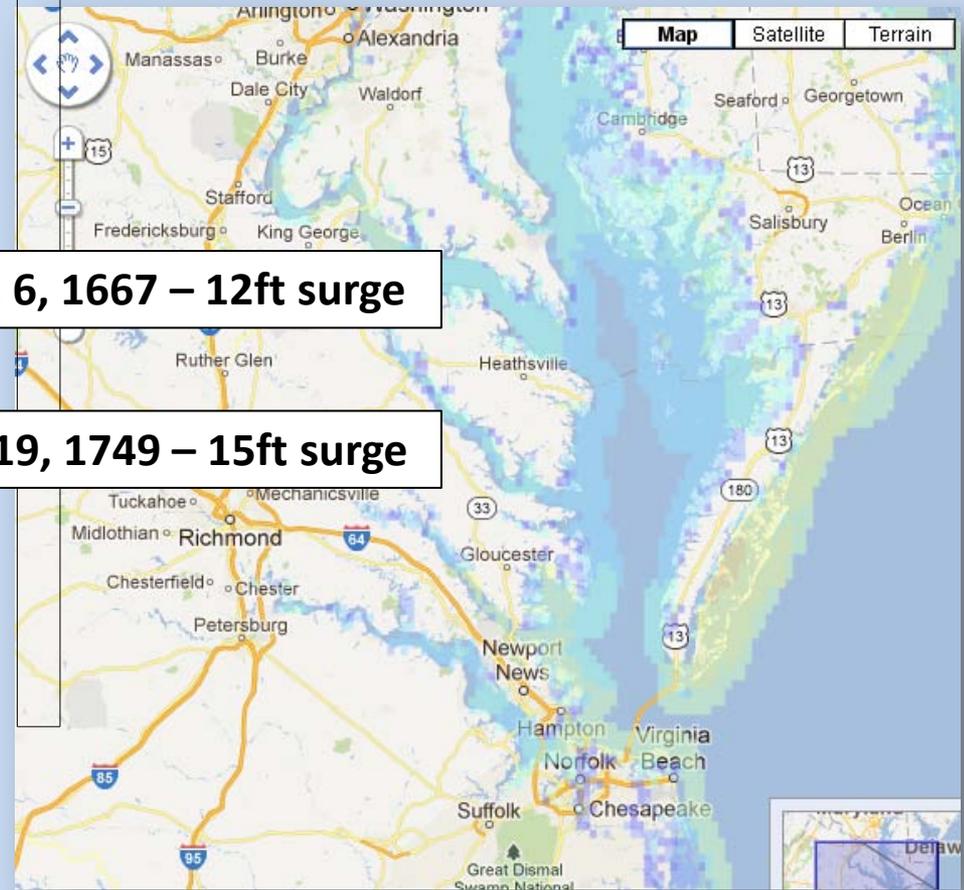
Storm surge maps (NOAA):

Education tool aimed at providing a national snapshot of maximum potential storm surge resulting from hurricanes (note: not for planning purposes)

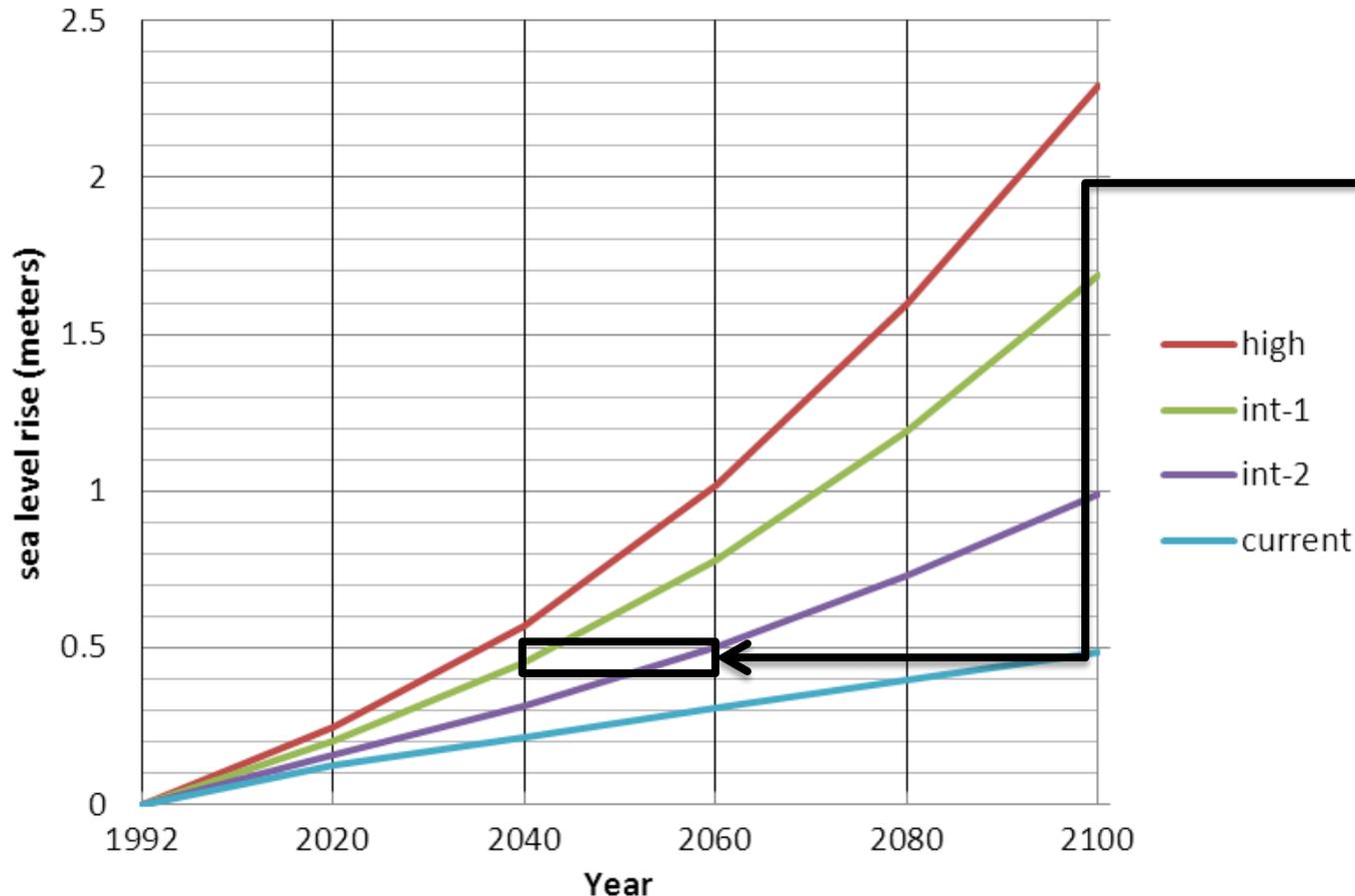


Sept. 6, 1667 – 12ft surge

Oct. 19, 1749 – 15ft surge



SE Virginia sea level rise scenarios



1.5 ft rise within
a 20 year
planning horizon

Based on 2012 National Climate Assessment global sea level rise scenarios + 0.27mm/yr local subsidence



Recommend



Elevated house in Mississippi
Photo by Robert Harris/FEMA

Adaptation Strategies

- Management/Retreat
- Accommodation
- Protection



Levee in North Dakota
Photo by Andrea Booher/FEMA



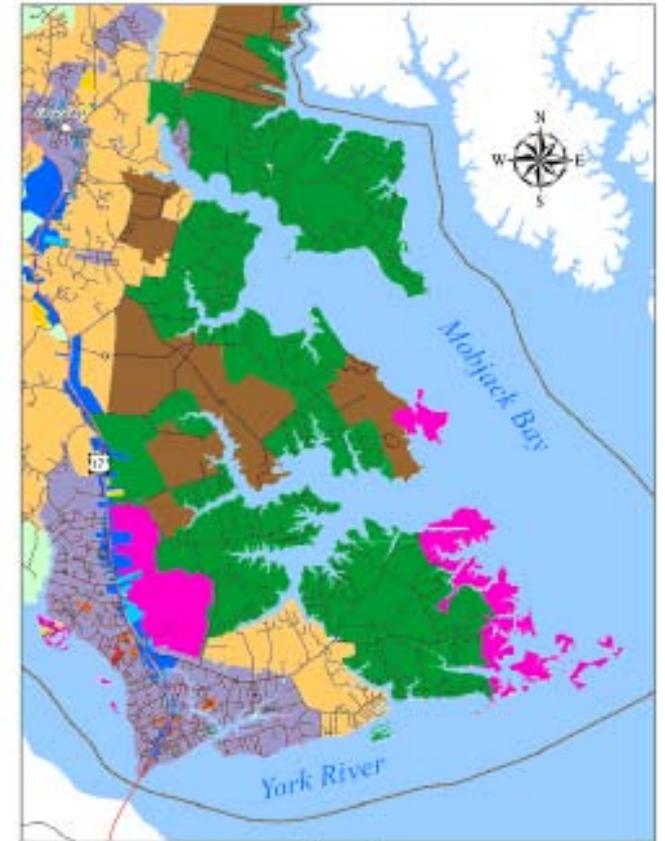
Controllable: Methods to reduce vulnerability to flooding.

ADAPTATION STRATEGIES

Management



Gloucester County Zoning (Southeastern Portion Inset)

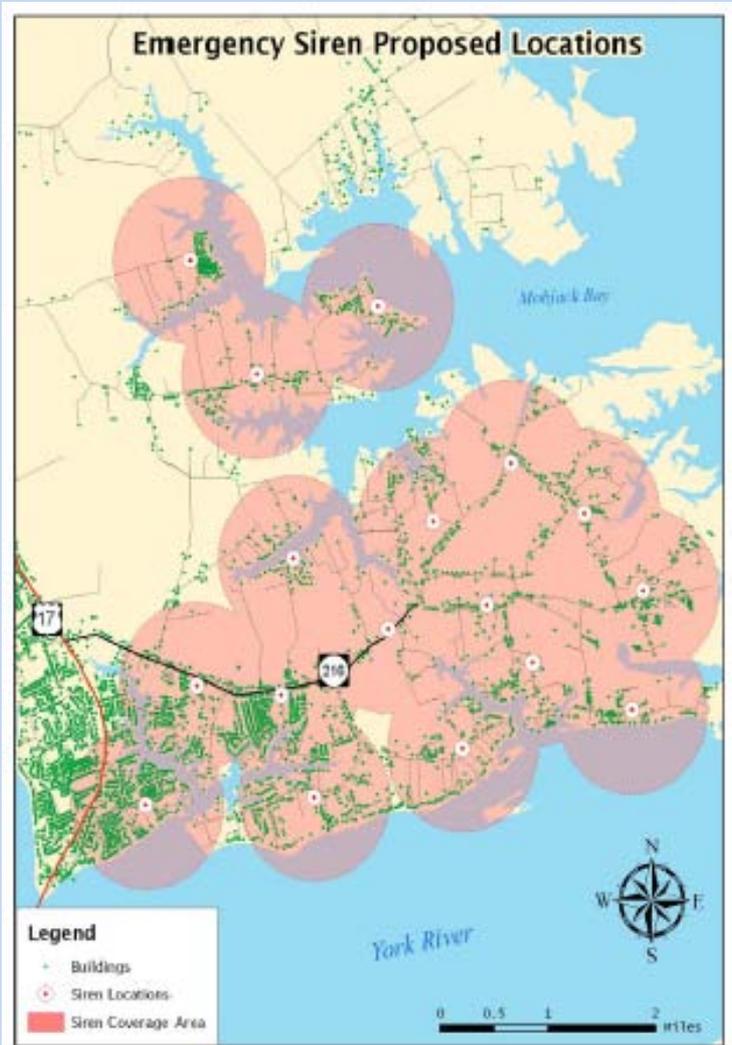


Legend

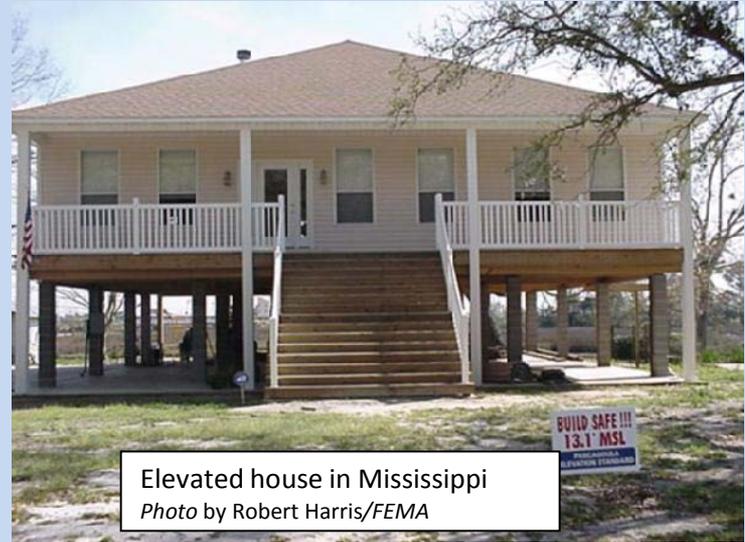
Gloucester Zoning District	Color	Gloucester Zoning District	Color
Conservation (C-1)	Pink	Medium-density Multi-Family Residential (MF-1)	Orange
Bayside Conservation (C-2)	Light Green	Suburban Countryside (SC-1)	Yellow
Rural Countryside (RC-1)	Light Green	Single-Family Detached Residential (SF-1)	Purple
Rural Conservation (RC-2)	Dark Green	Planned Unit Development (PUD-1)	Red
Business (B-1)	Blue	Office Business (O-1)	Light Blue
Village Business (B-2)	Dark Blue	Rural Business (B-4)	Light Blue
Office Business (O-1)	Light Blue	Light Industrial (I-1)	Yellow
Rural Business (B-4)	Light Blue		
Light Industrial (I-1)	Yellow		

Source: County Base GIS layers were provided by United States Census Bureau and the County Zoning GIS layers were provided by Gloucester County Information Technology / GIS Department.

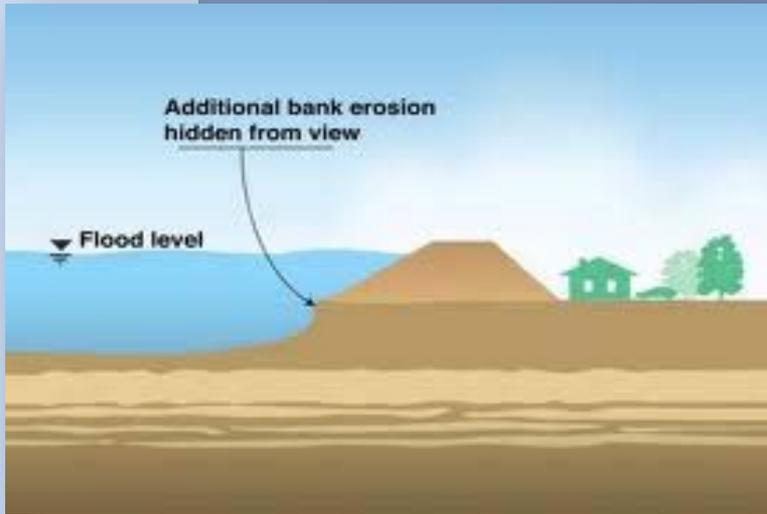
Accommodation



Source: County Base GIS layers were provided by United States Census Bureau and the County Addressed Building GIS Layer was provided by Gloucester County Information Technology GIS Department.



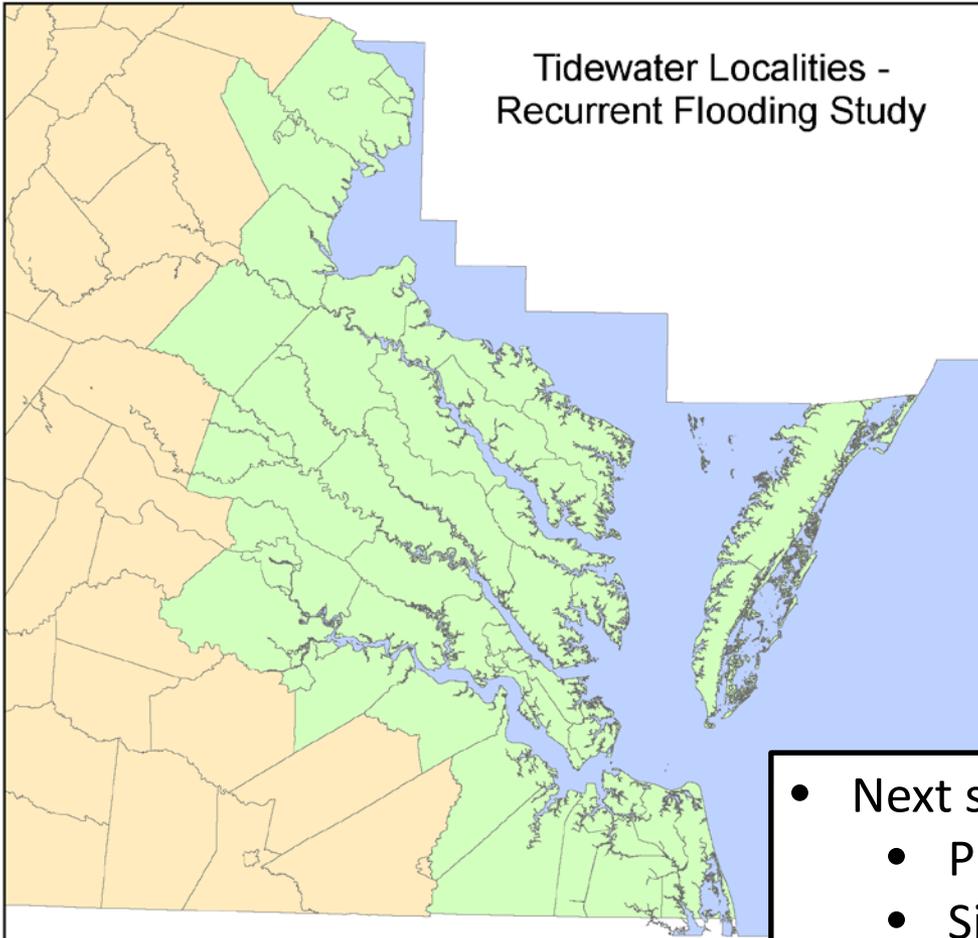
Protection



Stakeholder Engagement

- Meetings with local PDCs and Municipal Officials
- Meetings with State Emergency Managers
- Stakeholder Advisory Committee

Tidewater Localities - Recurrent Flooding Study



ACCOMACK
ALEXANDRIA
ARLINGTON
CAROLINE
CHARLES CITY
CHESAPEAKE
CHESTERFIELD
COLONIAL HEIGHTS
ESSEX
FAIRFAX
FALLS CHURCH
FREDERICKSBURG
GLOUCESTER
HAMPTON
HANOVER
HENRICO
HOPEWELL
ISLE OF WIGHT
JAMES CITY
KING AND QUEEN
KING GEORGE
KING WILLIAM
LANCASTER
MANASSAS
MANASSAS PARK
MATHEWS
MIDDLESEX
NEW KENT
NEWPORT NEWS
NORFOLK
NORTHAMPTON
NORTHUMBERLAND
PETERSBURG
POQUOSON
PORTSMOUTH
PRINCE GEORGE
PRINCE WILLIAM
RICHMOND

- Next steps include:
 - Prioritization of flood prone areas
 - Site specific and engineering studies of priority areas
 - Cost-benefit analysis of adaptation strategies

Questions?



(AP Photo/Carolyn Kaster) http://www.boston.com/bigpicture/2009/03/red_river_flooding.html