Joint Coastal Flooding Subcommittee

January 6, 2020

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- Virginia Coastal Policy Center Annual Conference
- Commonwealth Center for Recurrent Flooding Resiliency
- Some General Observations on Resilience in Virginia

WILLIAM & MARY LAW SCHOOL | VIRGINIA COASTAL POLICY CENTER

THE THREE PS OF RESILIENCE:

Planning, Partnerships, and Paying For It All

THANK YOU TO OUR PARTNERS AND SPONSORS!

TransRe

Virginia Environmental Endowment

CHESAPEAKE BAY FOUNDATION
Saving a National Treasure

VIMS | WILLIAM & MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE

Sea Grant Virginia

Virginia Coastal Zone MANAGEMENT PROGRAM

The Nature Conservancy
nature.org

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

NORTHERN NECK PLANNING DISTRICT COMMISSION

Southern Environmental Law Center

VCPC 2019 Conference – General Overview

- Friday, November 15 – Seventh Annual Conference
- The Three Ps of Resilience: Planning, Partnerships & Paying For It All - Building From May Resilience Funding Forum
- 240+ attendees representing federal, state and local government; nonprofit organizations; academic institutions; and the private sector

VCPC 2019 Conference Agenda: The 3 Ps

- Morning Keynote Speakers: Rear Admiral Ann Phillips & Secretary of Natural Resources Matthew Strickler: EO 45, creating flood risk management standards for state buildings
- Two Coastal States Panels: (1) Rhode Island, Maryland & Boston; (2) SE Florida, North Carolina, South Carolina
- Banking Industry Panel: PNC Financial Services, Atlantic Union Bank & UNC Business School (Formerly Federal Reserve)
- Private Sector Panel: Dominion Energy, Sentara Norfolk General Hospital, Newport News Shipbuilding
- Afternoon Keynote: Leonard Jones, Moody's Investor Services

Some Lessons Learned

- **Funding**

"We have to accept that this is an obligation we have; we can't get resilience for free."

- **Resilience Planning**

"Don't hesitate to bring in the business community as soon as possible. This is risk management. They get it."

Commonwealth Center for Recurrent Flooding Resiliency

Elizabeth Andrews
Virginia Coastal Policy Center
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Emily Steinhilber
Old Dominion University

Mark Luckenbach
Virginia Institute of Marine Science
William & Mary

CCRFR

OLD DOMINION UNIVERSITY

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CCRFR Goals Overview

- Provide coordinated research and technical support for planners and decision makers for adaptation to and mitigation of recurrent flooding in Virginia
- Integrate federal, state, local and nongovernmental data, and provide easy, useful access for all stakeholders
  - Real-time water level and tide gauge data across multiple agencies and jurisdictions
  - Socio-economic analyses and planning tools in support of resiliency planning
  - Legal and policy reviews and guidance related to implementing resiliency actions
- Leverage institutional resources through the Center to bring more federal, foundation and philanthropic support to address flooding resiliency in the Commonwealth
- The legislation provides for $842,094 annually (ODU $403,728, VIMS $303,507, VCPC $135,000).

Overview of Projects – Storm Surge Modeling

- In partnership with VDEM, obtained FEMA money to determine first-floor elevations
- Evaluate storm-surge scenarios

By including 1st floor elevations in the model, output files can provide a more accurate assessment of damage to homes and businesses.

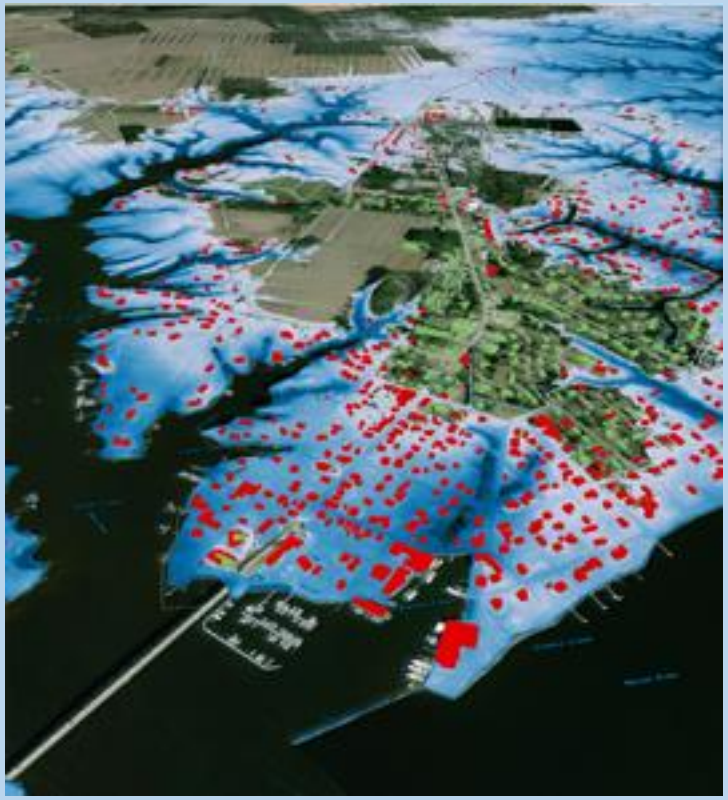
Virginia would not have successfully competed for this FEMA grant without CCRFR involvement and matching dollars.

Overview of Projects – Identifying most *At Risk* communities

Collaboration with NASA Langley

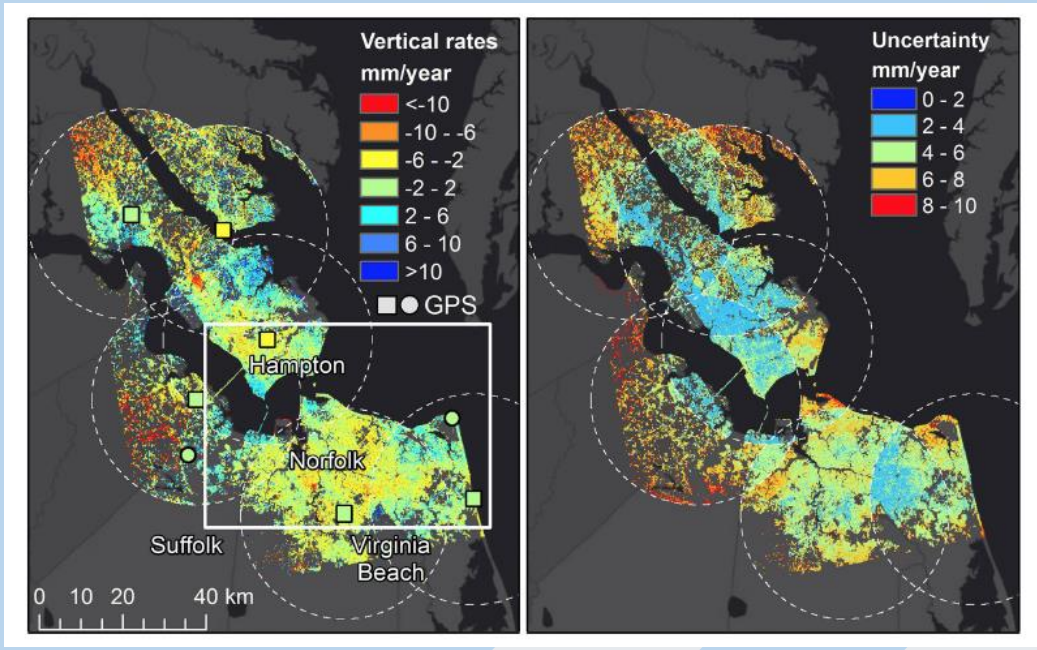
Developing a story map based on reanalysis of Hurricane Irene 2011 in VA and NC

Demo GIS and integration for flood impacts from storm surge models using VIMS SCHISM, satellite SAR, and LiDar elevations, in addition to local data and stakeholder engagement

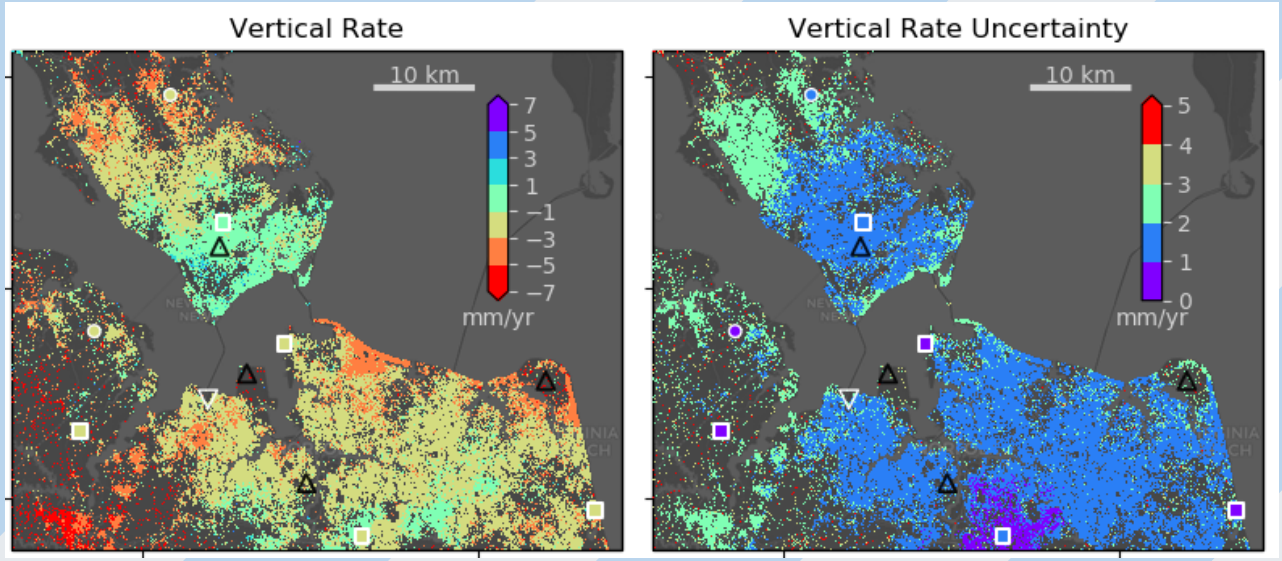


Localized Subsidence Monitoring

- **PHASE 1:**
  - NASA JPL and ODU developed a mechanism for continued monitoring of subsidence in Hampton Roads, which finds the region to be subsiding at about 2 mm/yr albeit with considerable spatial variation and several hot spots.
- **PHASE 2:**
  - **Results presented at AGU in December. Outreach with new maps to localities to follow – w/ HRPDC.**
  - Expanding the study area, and continuing to ingest new data, which we receive every 12 days from the Sentinel-1 satellite.
  - Validating data through USGS in situ GPS stations through HRPDC partnership.
- **Next:**
  - Automating process.
  - Tying subsidence rates to local tide gauges, which will constrain near term (1-10 year) sea level projections.
  - Better understanding of relationship between near term sea level projections of Hampton Roads and the influence of the storm track and its associated wind and pressure patterns.

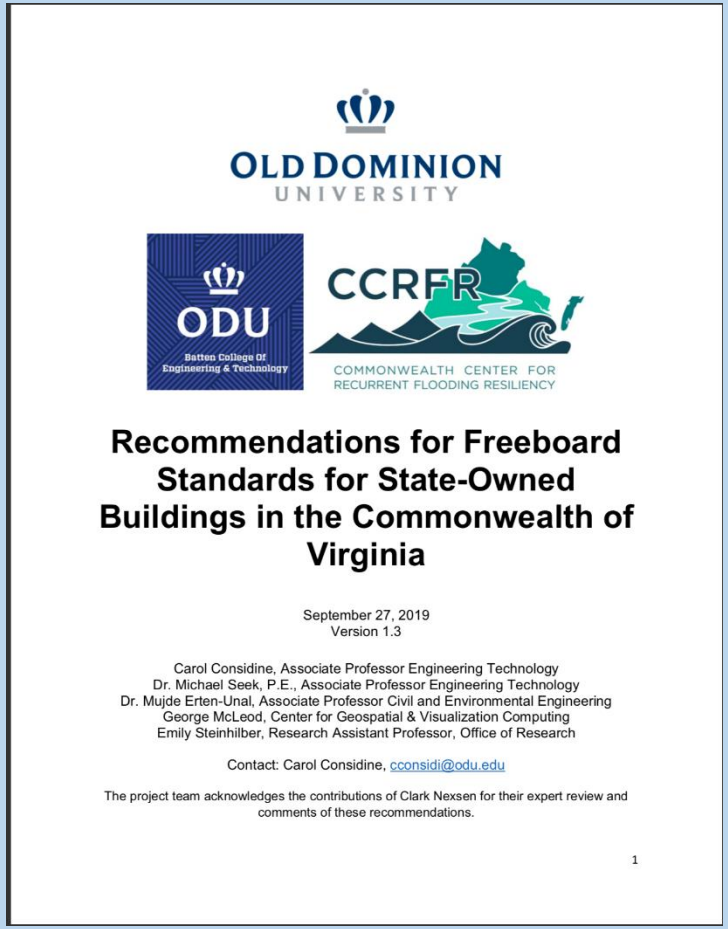


Historic ALOS data between 2009-2011



Sentinel-1 data 2014-2019

Executive Order 24 (2018): Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards



OLD DOMINION UNIVERSITY

ODU Batten College Of Engineering & Technology

CCRFR COMMONWEALTH CENTER FOR RECURRENT FLOODING RESILIENCY

Recommendations for Freeboard Standards for State-Owned Buildings in the Commonwealth of Virginia

September 27, 2019
Version 1.3

Carol Considine, Associate Professor Engineering Technology
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The project team acknowledges the contributions of Clark Nexsen for their expert review and comments of these recommendations.

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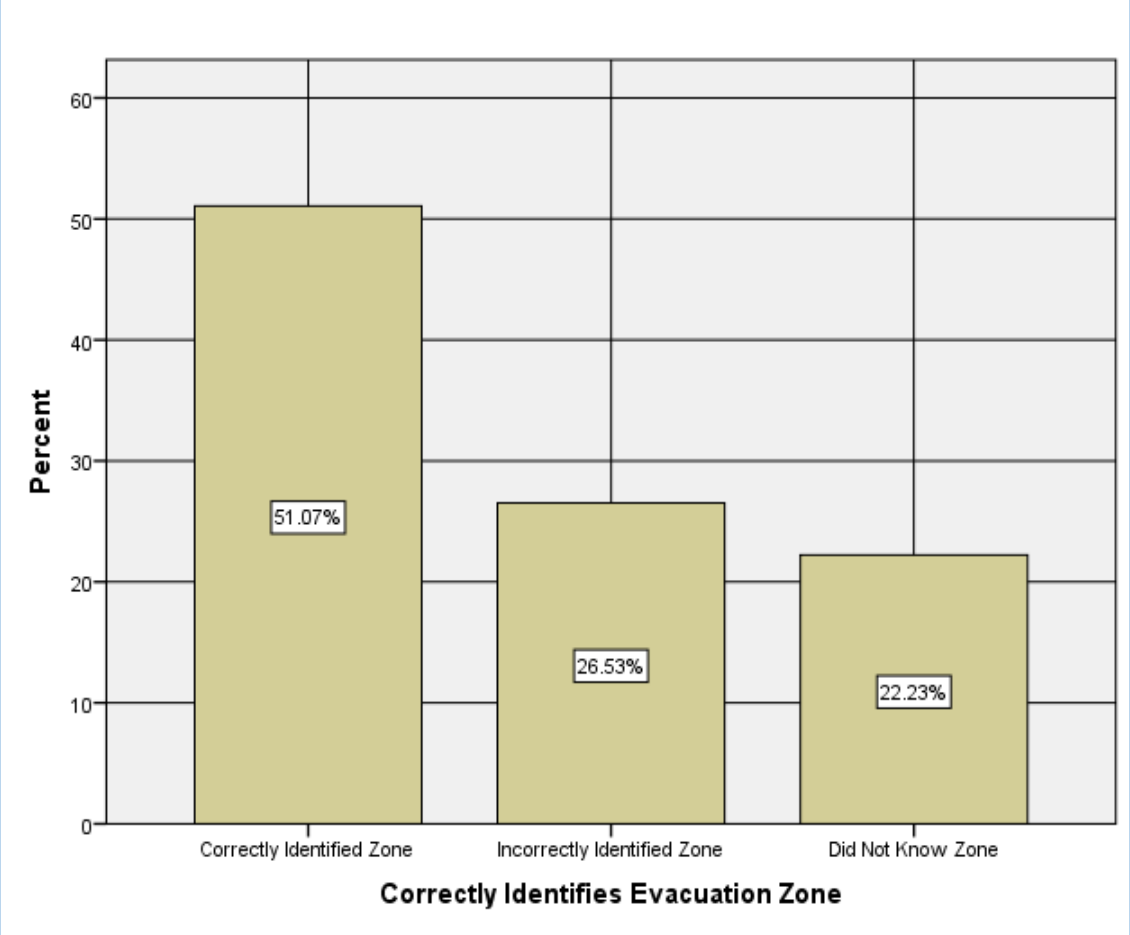
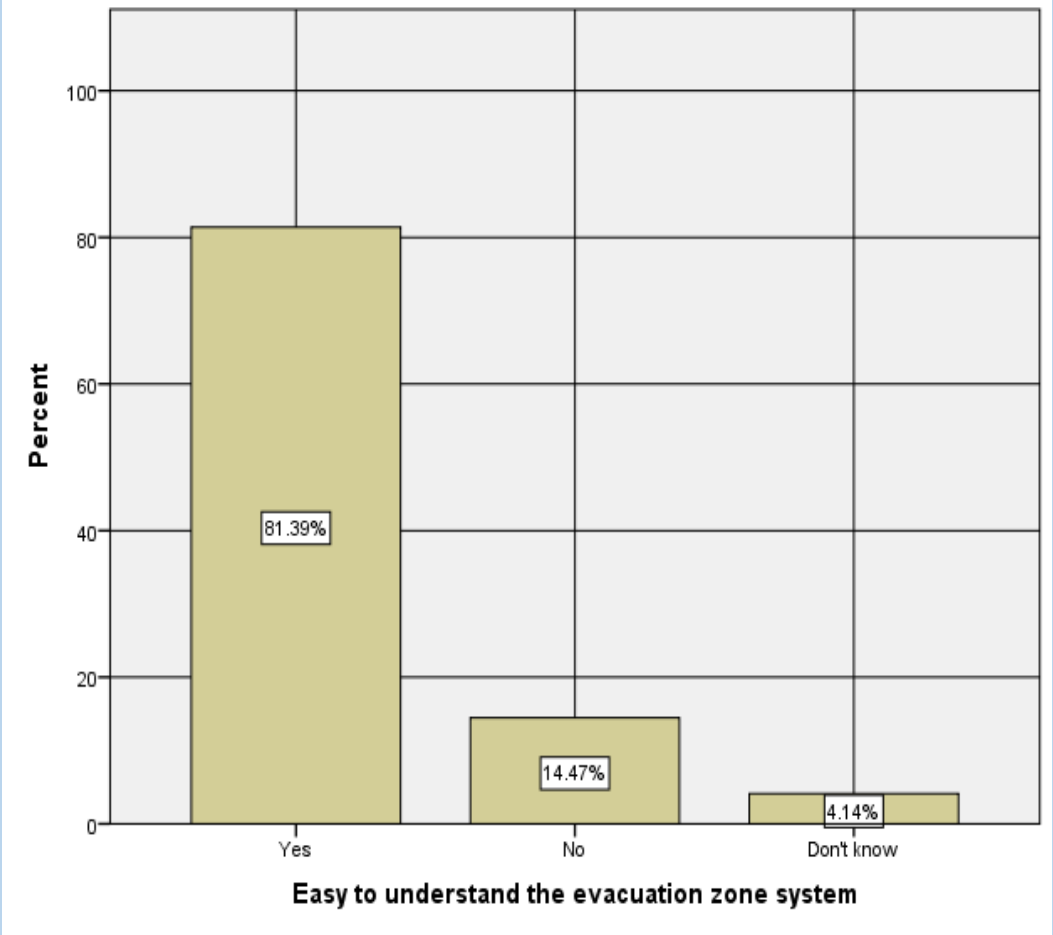
- ODU Completed Report Recommending Freeboard for State-owned Buildings
  - Currently testing application
- VIMS developed SLR planning recommendations
- VCPC Provided Research on Development of a Coastal Resilience Authority
- **Ongoing Collaboration**
  - Developing a Coastal Resilience Master Plan
  - Including inundation modeling and overall planning for CRMP

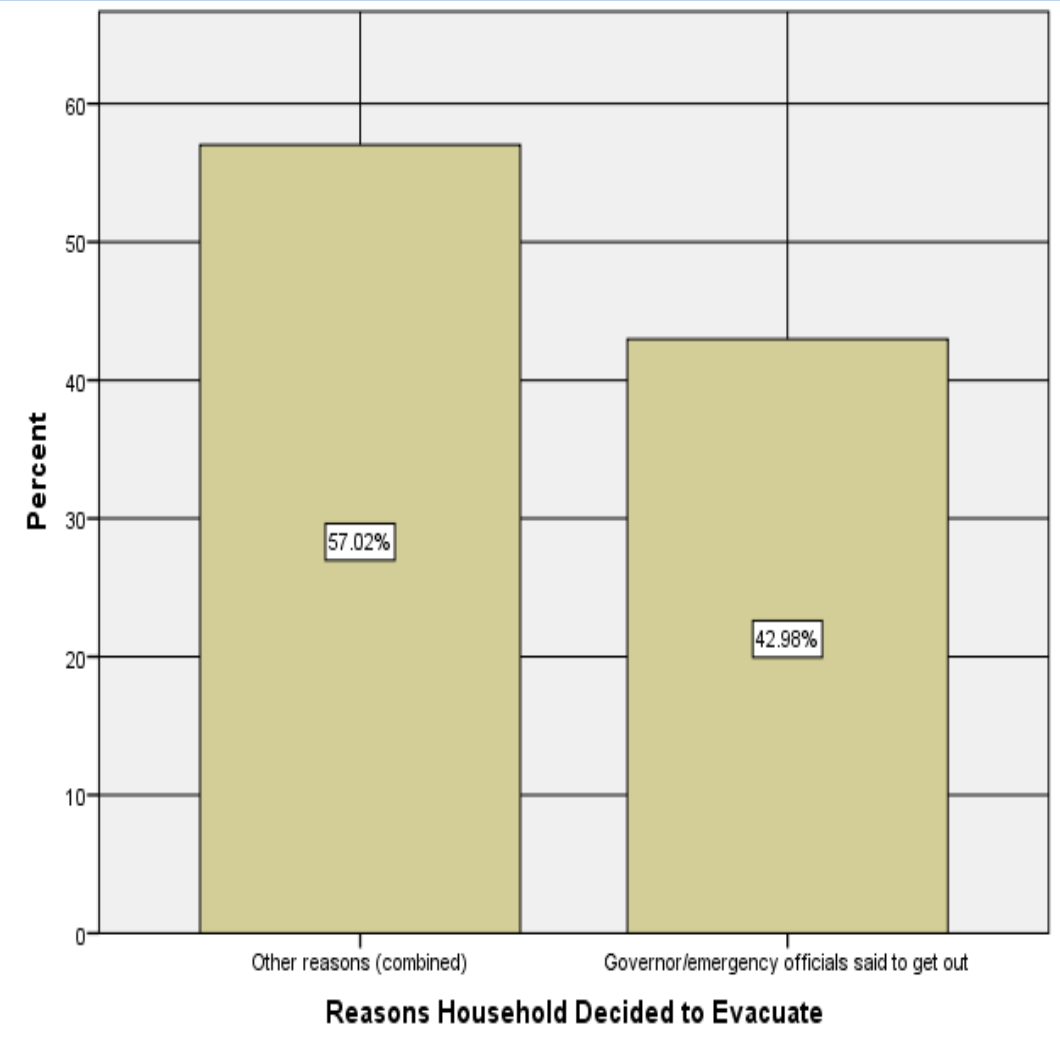
Hurricane Florence: Evacuation Order Response

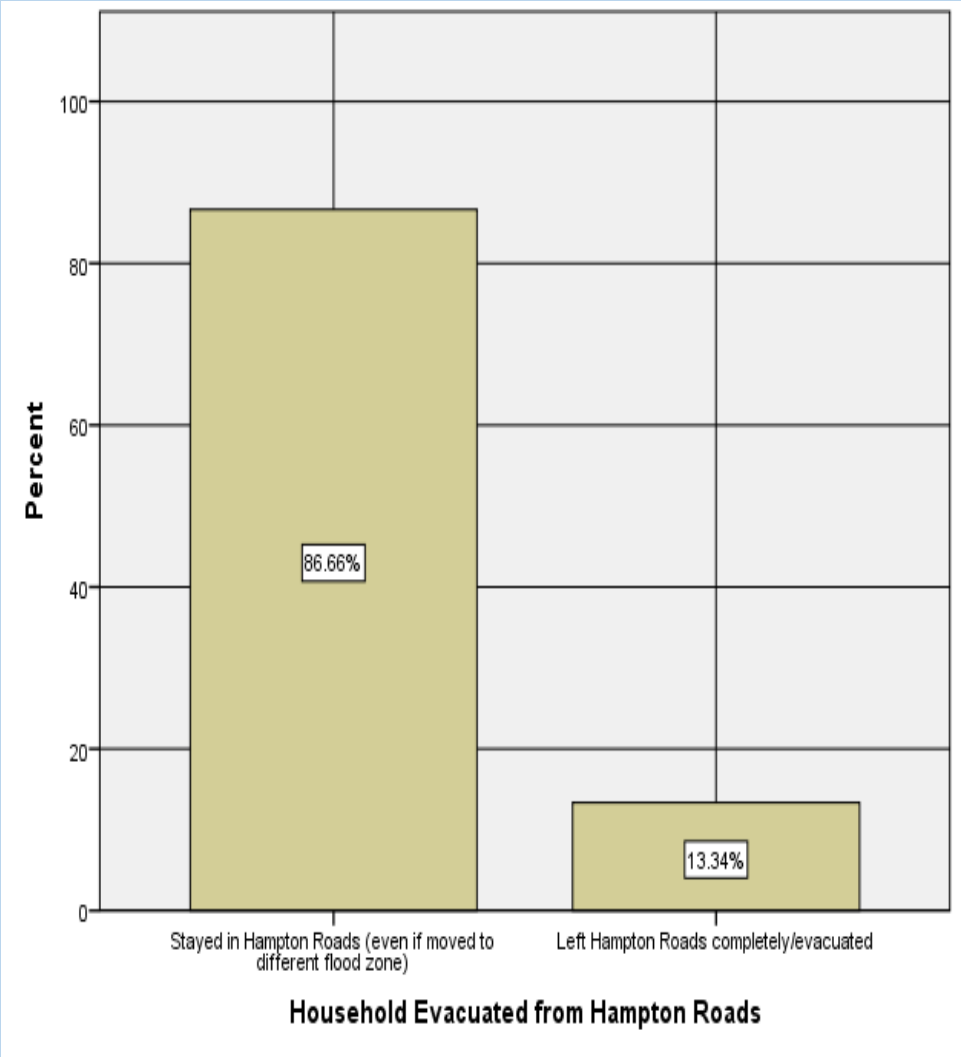
- Random, stratified sampling of over 1,200 households conducted by ODU's Social Science Research Center in coordination with VMASC
- Households within Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, and Virginia Beach surveyed and geocoded
- Able to compare analysis of evacuation behaviors during Hurricane Irene (no Zones or mandatory evacuation order) with those during Hurricane Florence

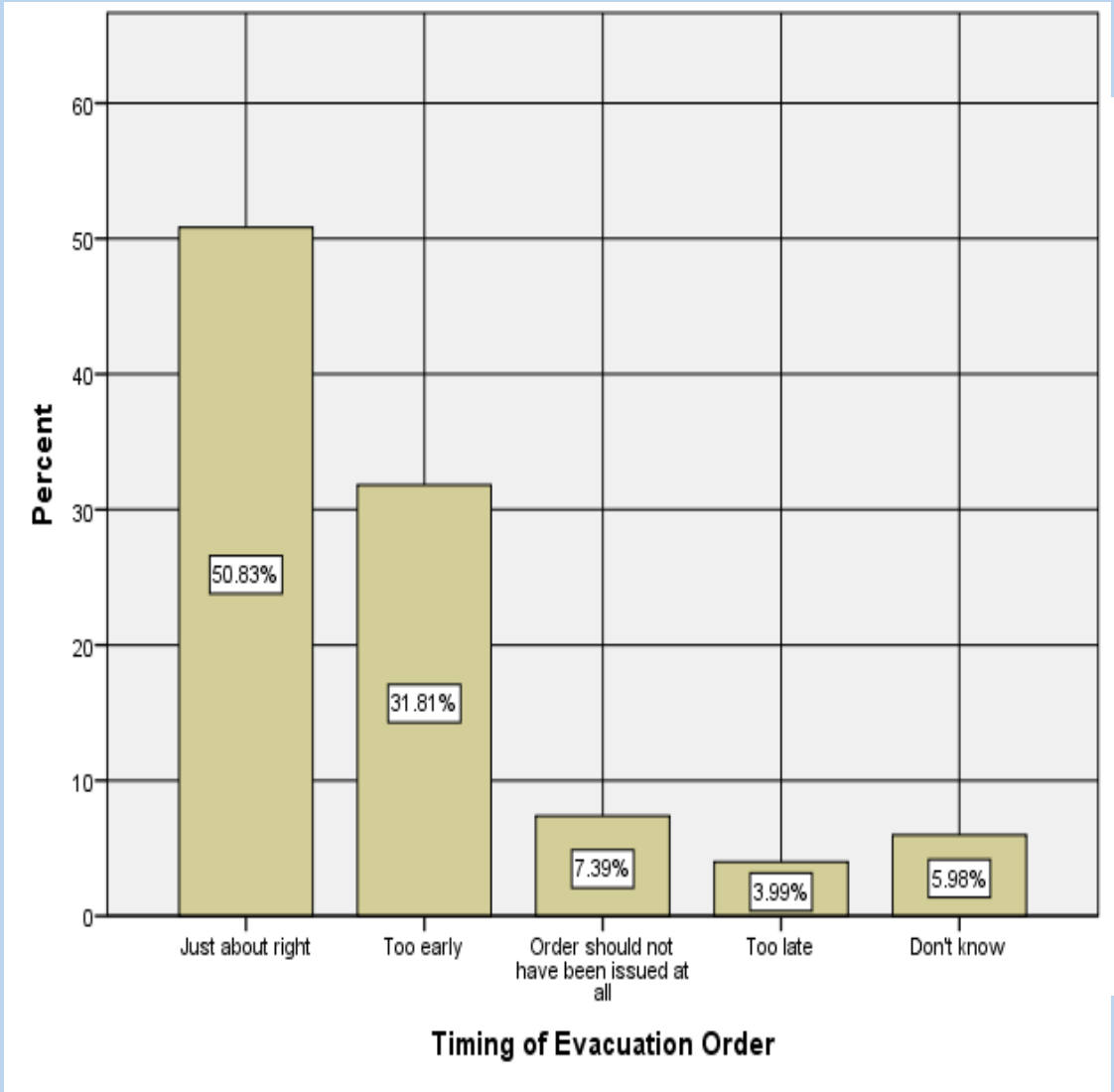
At first glance:

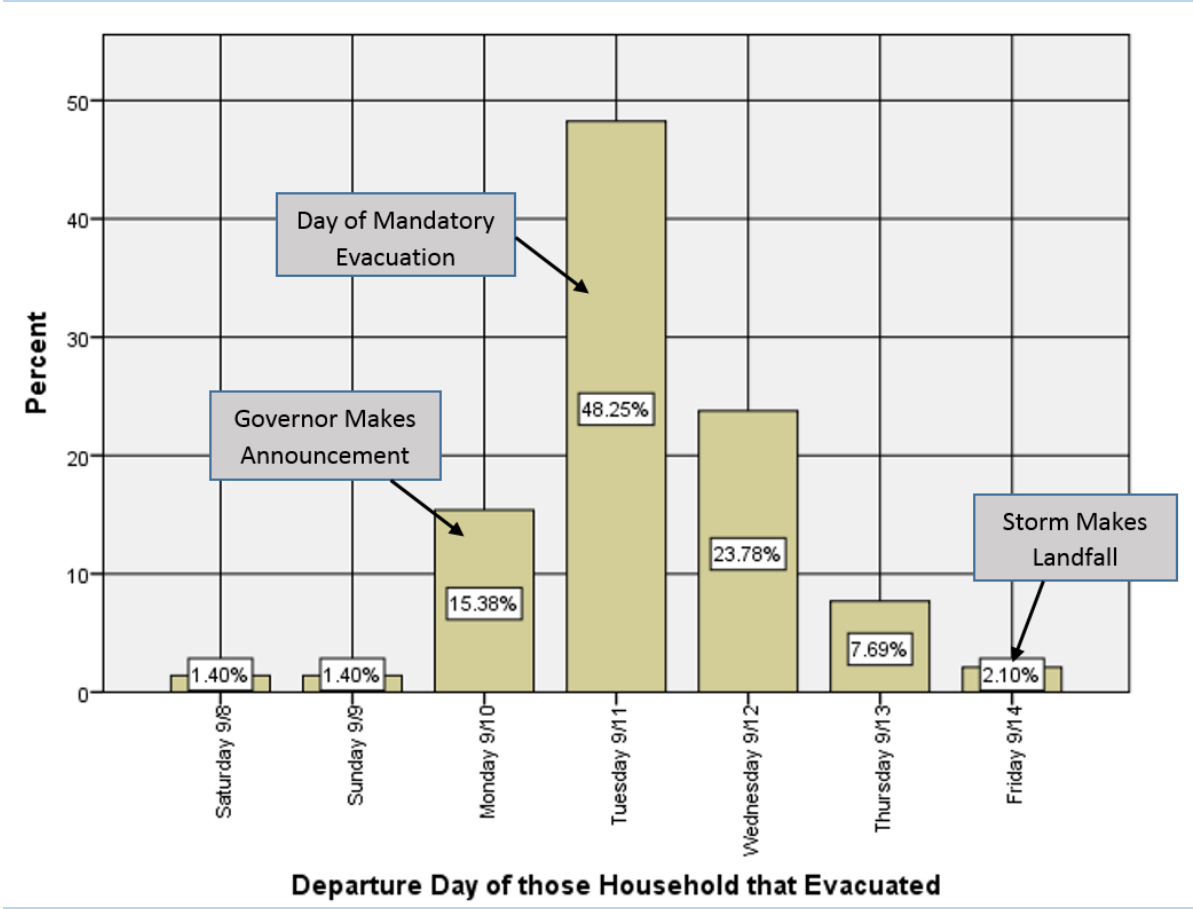


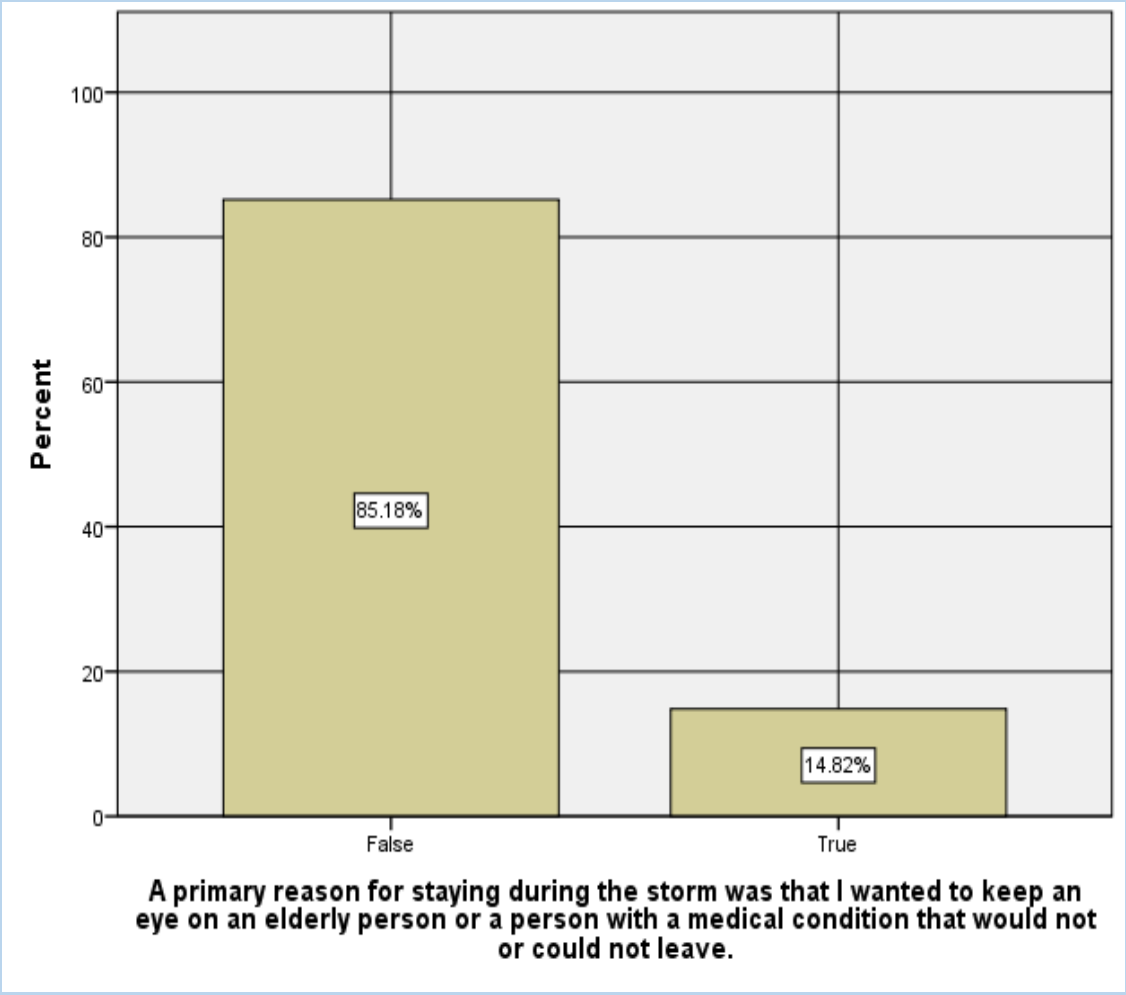



Percent
60
50
40
30
20
10
0
57.02%
42.98%
Other reasons (combined)
Governor/emergency officials said to get out
Reasons Household Decided to Evacuate

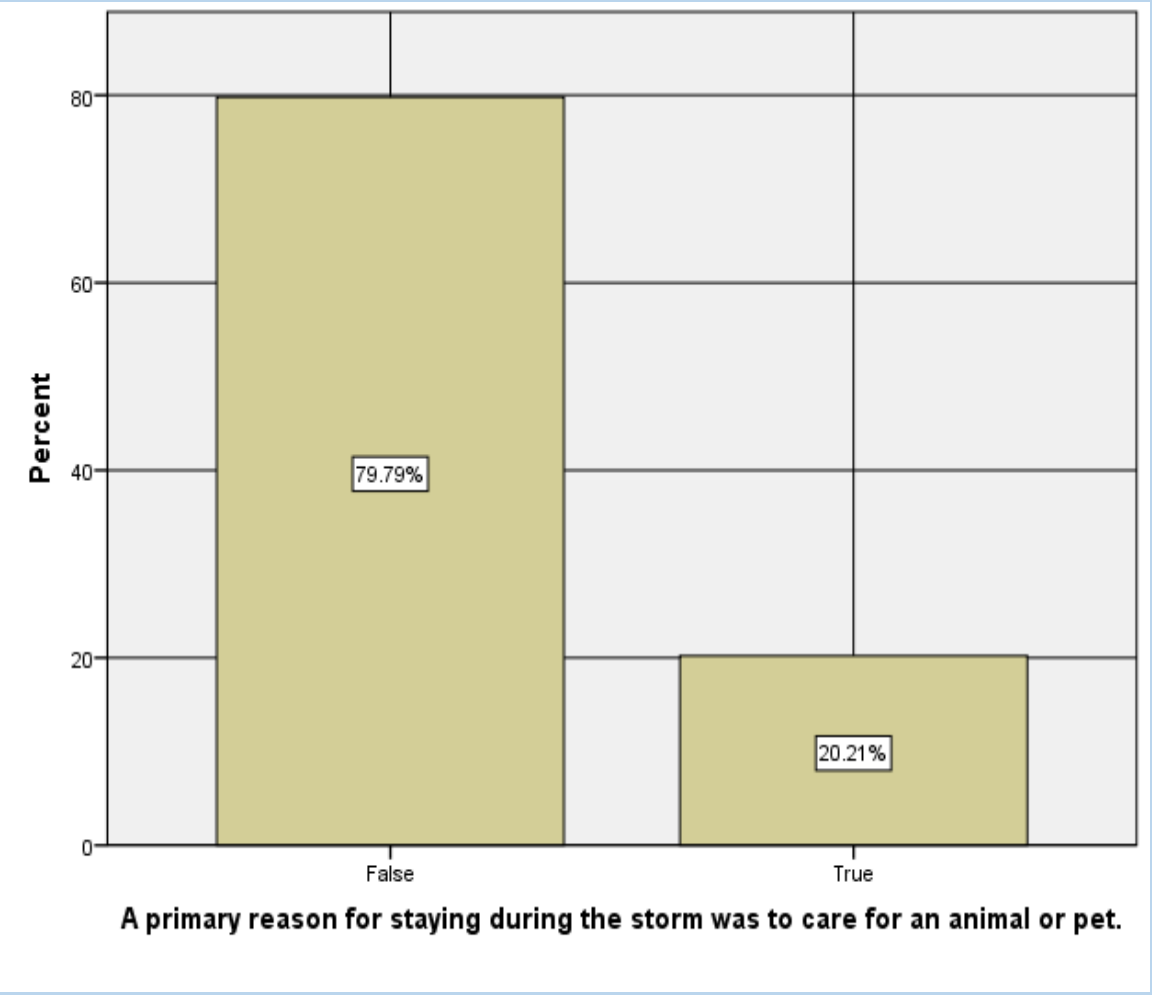

Percent
100
80
60
40
20
0
86.66%
13.34%
Stayed in Hampton Roads (even if moved to different flood zone)
Left Hampton Roads completely/evacuated
Household Evacuated from Hampton Roads


Percent
60
50
40
30
20
10
0
50.83%
31.81%
7.39%
3.99%
5.98%
Just about right
Too early
Order should not have been issued at all
Too late
Don't know
Timing of Evacuation Order


Percent
50
40
30
20
10
0
Day of Mandatory Evacuation
Governor Makes Announcement
Storm Makes Landfall
1.40%
1.40%
15.38%
48.25%
23.78%
7.69%
2.10%
Saturday 9/8
Sunday 9/9
Monday 9/10
Tuesday 9/11
Wednesday 9/12
Thursday 9/13
Friday 9/14
Departure Day of those Household that Evacuated



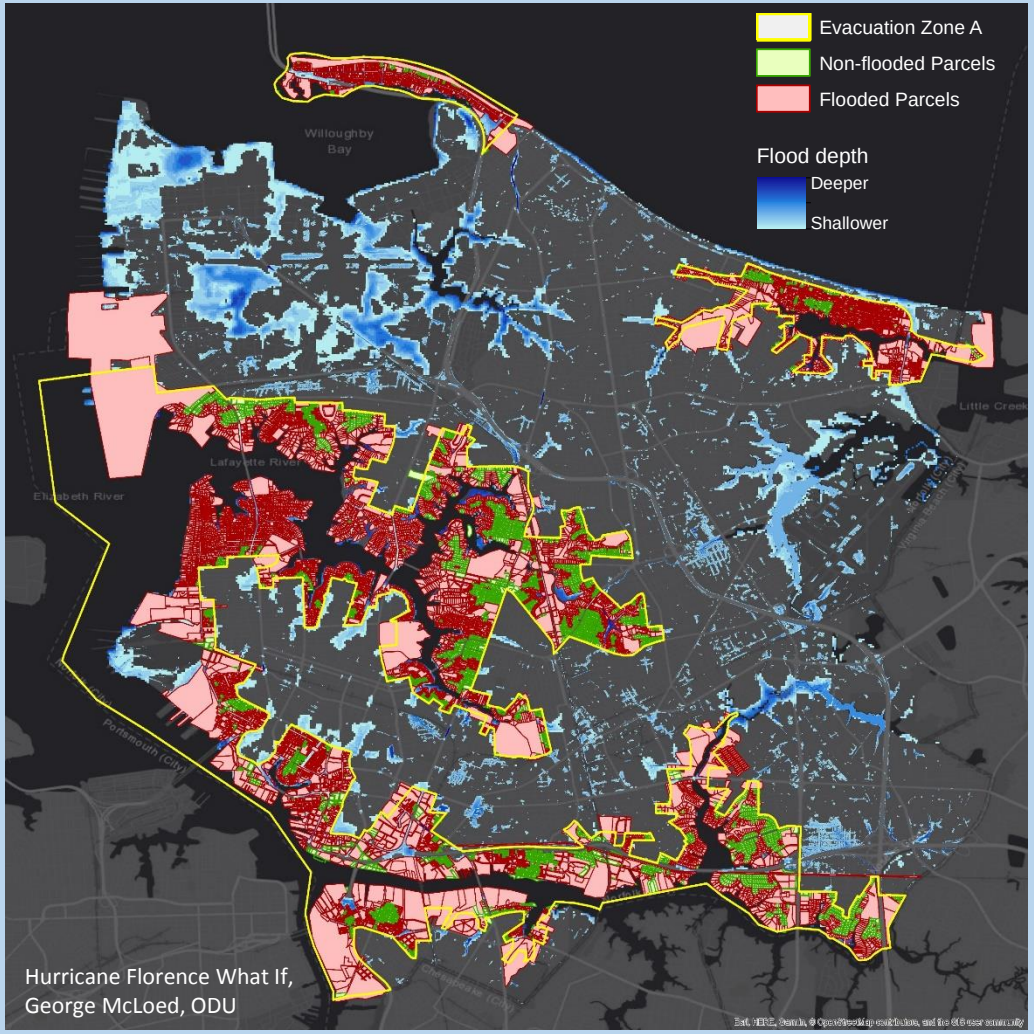
A primary reason for staying during the storm was that I wanted to keep an eye on an elderly person or a person with a medical condition that would not or could not leave.



A primary reason for staying during the storm was to care for an animal or pet.

Hurricane Florence: What If

- Briefed Governor Northam, Cabinet, and Directors at annual Preparedness Workshop
- Putting together projected wind and water damage, we estimate the total physical damage resulting from a Florence- type hurricane striking Hampton Roads would approach $18 billion.
- Approximately 38,000 structures in Hampton Roads would be damaged, with residential housing taking the brunt.
- Wind and water would combine to create over 2.4 million tons of debris, requiring over 50,000 25-ton truck trips to landfills across and outside the Commonwealth.
- Over 200,000 people would be immediately displaced in the aftermath of the storm, and almost 16,000 would seek accommodation in a public shelter.

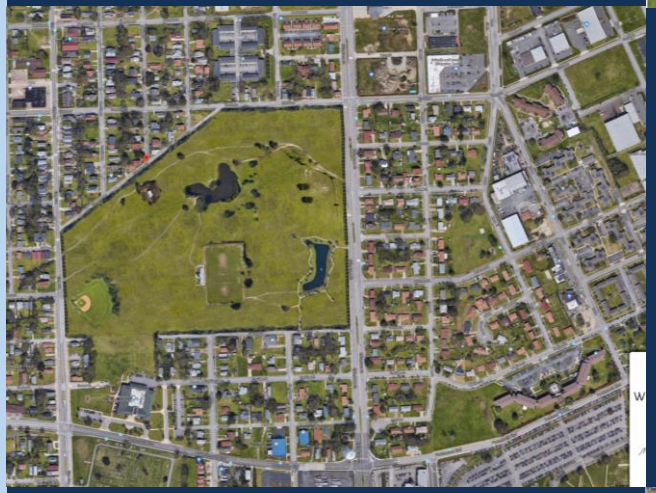


Hurricane Florence What If, George McLoed, ODU

Residential Building Resilience & Green Infrastructure

- Model area with high flood and social vulnerability to measure ROI in terms of safety/health/wellbeing for deploying resilient building codes and development practices.
- Assessment of value and acquisition costs show full return on investment with just one major event.
- Paper just won **Andrew Bradbury Award from the Institute for Civil Engineers.**
- **Next Steps:**
  - Homeowner Web Tool to enable homeowners to apply this research to their own property
  - “Communities of Tomorrow” Project in partnership with VCPC and Portsmouth to use analysis to show how communities can build resilience over time

Flood vents only work 50% of the time – and are only applicable in homes with a raised crawl space.



Retention Basin Co-benefit: Recreation

Retention Basin Co-benefit: Decreased Downstream Flooding

Some General Observations about Resilience

- **The need for funding**
  - Traditional municipal bond funding will not be enough
  - Alternative funding mechanisms
  - Moody's takeaway: Regional efforts
- **The need for planning**
  - Moody's takeaway: Have a good plan
  - Sea level rise in local comprehensive plans, state infrastructure plans (all state capital outlays should be tied to resilience)
  - ***Multiple benefits*** – Water Quality *and* Flooding Resilience
    - Living shorelines; wetlands as flood buffers & carbon sinks; plan for wetlands migration
  - ***Affordable housing*** – take care of socially & physically vulnerable residents
- **The need for difficult discussions**
  - Community by community; public and private sector – *What are we going to save?*
  - Community awareness of the risk – AdaptVa.com, The RAFT
  - Short term vs. long term – cost of pre-disaster adaptation/mitigation vs. cost of recovery
    - Almost $18B in physical damage in Hampton Roads alone from a Florence-level hurricane