# Current Initiatives to Better Understand, Monitor and Predict Climate-Related Changes

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*2016 Virginia Coastal Partners Workshop*

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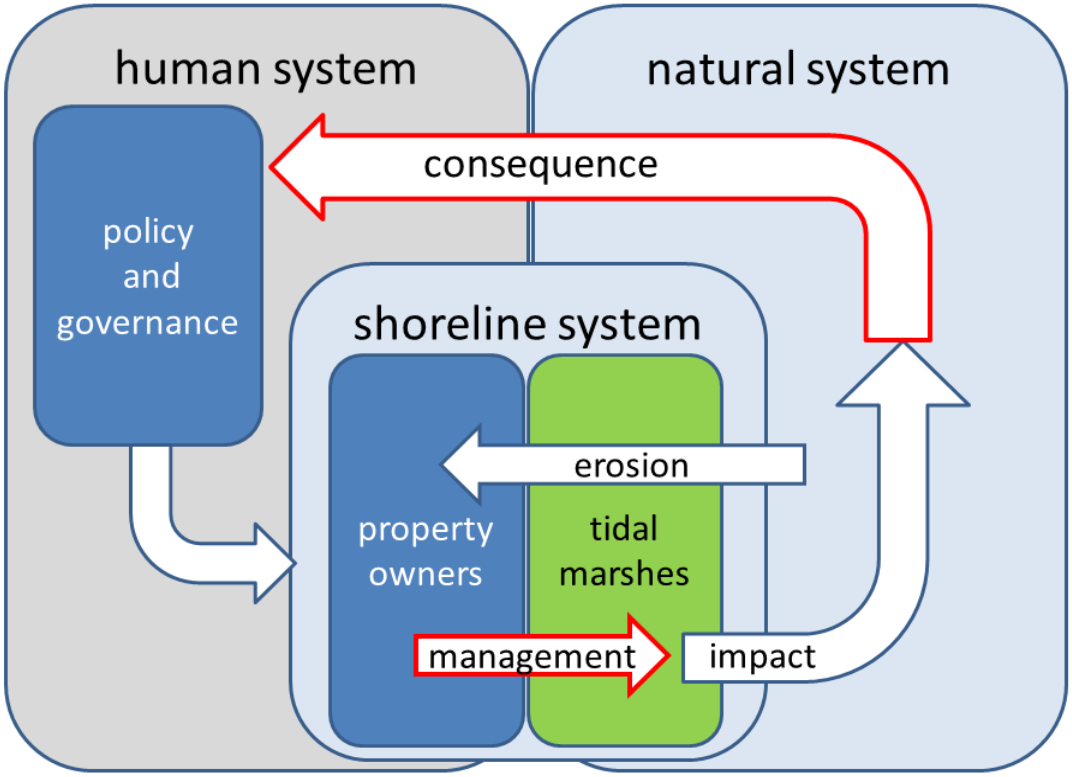
# TOPICS

- Coastal SEEs Initiative: Sustainability in Chesapeake Bay
- Commonwealth Center for Recurrent Flooding Resiliency
- Adapt Virginia – Data Portal
- CBP Climate Resiliency Initiatives and VIMS role

# SUSTAINABILITY IN CHESAPEAKE BAY SHORESCAPES: CLIMATE CHANGE, MANAGEMENT DECISIONS, AND ECOLOGICAL FUNCTIONS

NSF collaborative research (October 2016-2020)




Social-ecological system (SES) framework

Cross-disciplinary Partners:

VIMS- *Carl Hershner, Donna Bilkovic, Molly Mitchell, Joseph Zhang, Jian Shen*

College of W&M – *Randy Chambers, Matthias Leu, Sarah Stafford*

ODU – *Michelle Covi*

University of Georgia- *Shana Jones, Matthew Hauer*

# SHORESCAPES: SHORELINE ZONE THAT INCLUDES RIPARIAN, INTERTIDAL, AND LITTORAL AREAS

# TASK 1. DESCRIBE CURRENT TRAJECTORY OF CHESAPEAKE BAY SHORELINE CONDITIONS

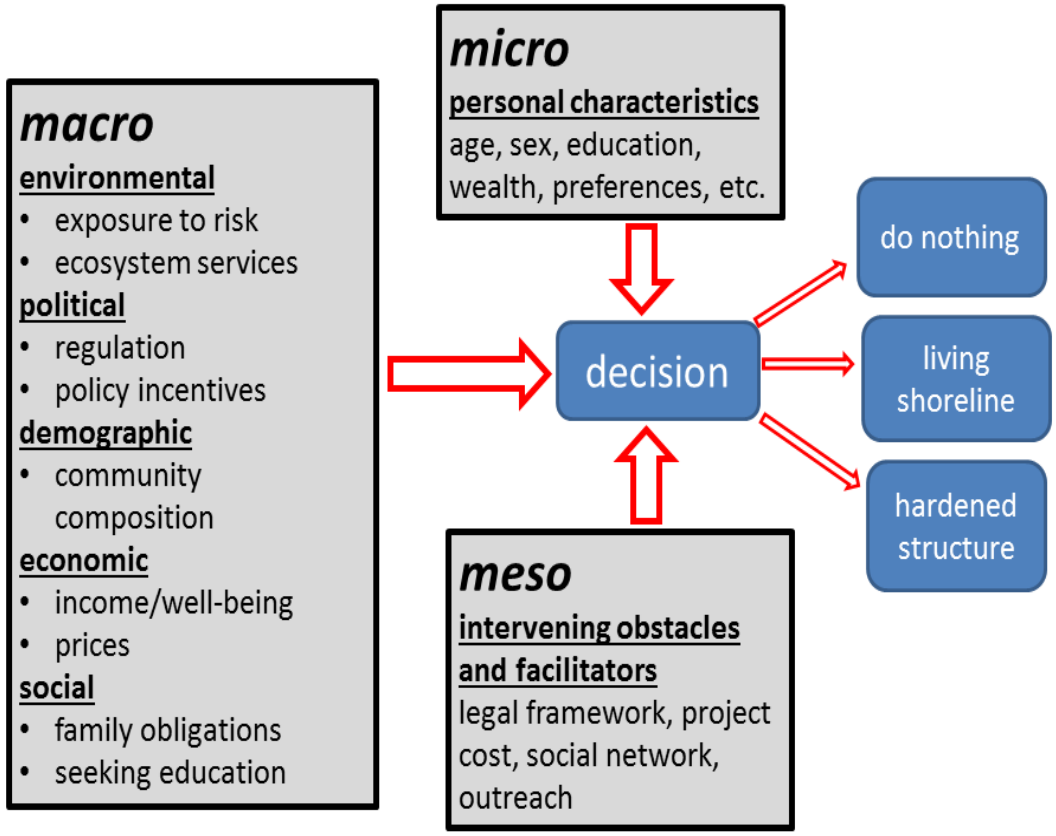
Products will include:

- Descriptive analyses of past changes in tidal marsh distributions in Virginia
- Marsh Evolution Model developed as part of the SCHISM modeling system
- Model of shoreline property owner management decisions that takes into account interactions between physical conditions, socioeconomic factors, and regulatory and governmental contexts
- Comprehensive VA shoreline permit database (early1990s-present)

# TASK 2. IDENTIFY THE DECISION FACTORS INFLUENCING BOTH SHORELINE PROPERTY OWNERS AND THE POLICY/MANAGEMENT PERSONNEL GOVERNING PROPERTY OWNERS

Products will include:

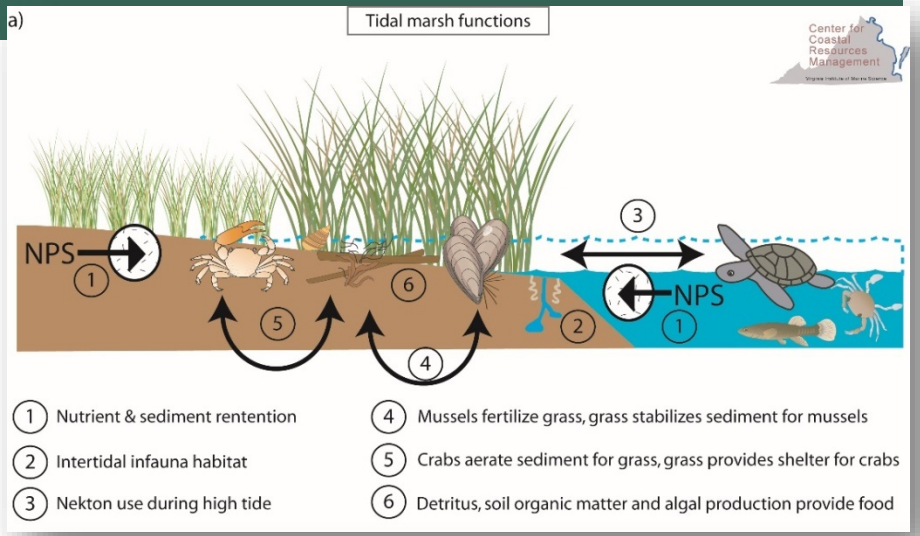
- Identification of factors influencing risk perception and management option decision making in both property owners and governance personnel

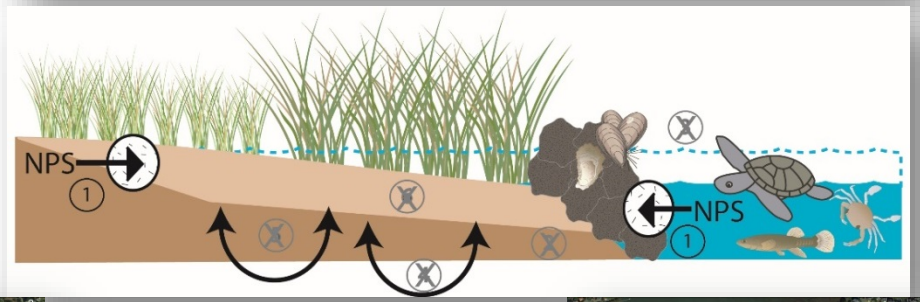


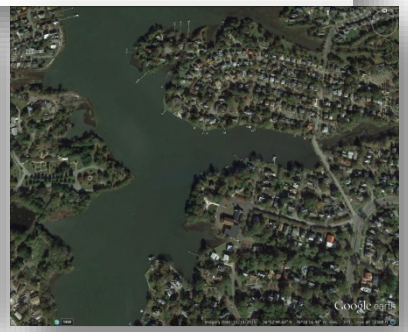
# TASK 3. MARSH FUNCTION MODEL: COMPARE ECOSYSTEM FUNCTIONS OF LIVING SHORELINES AND NATURAL MARSHES IN DIFFERENT SHORESCAPES

Products will include:

- Comparative assessment of ecosystem functions provided by living shorelines and natural marshes
- Estimated relationships between marsh ecosystem function and shorescape setting (rural---urban) for living shorelines and natural fringing salt marshes



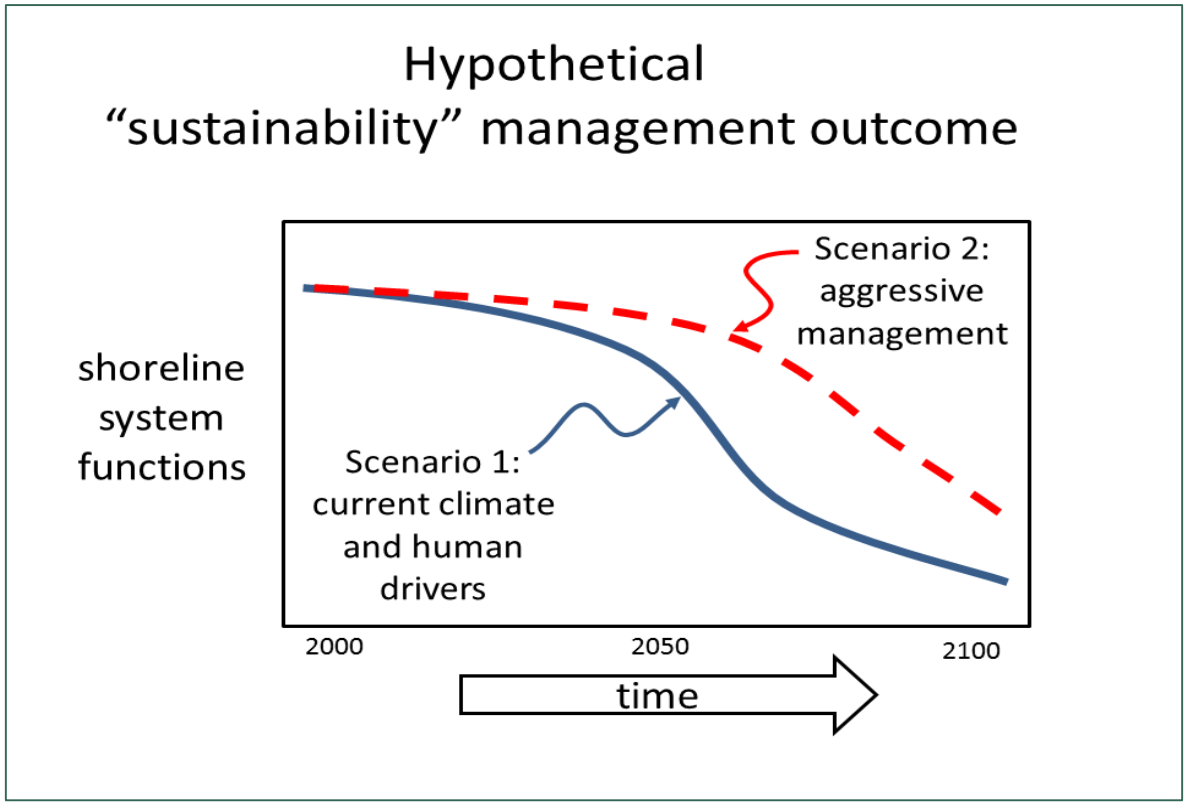



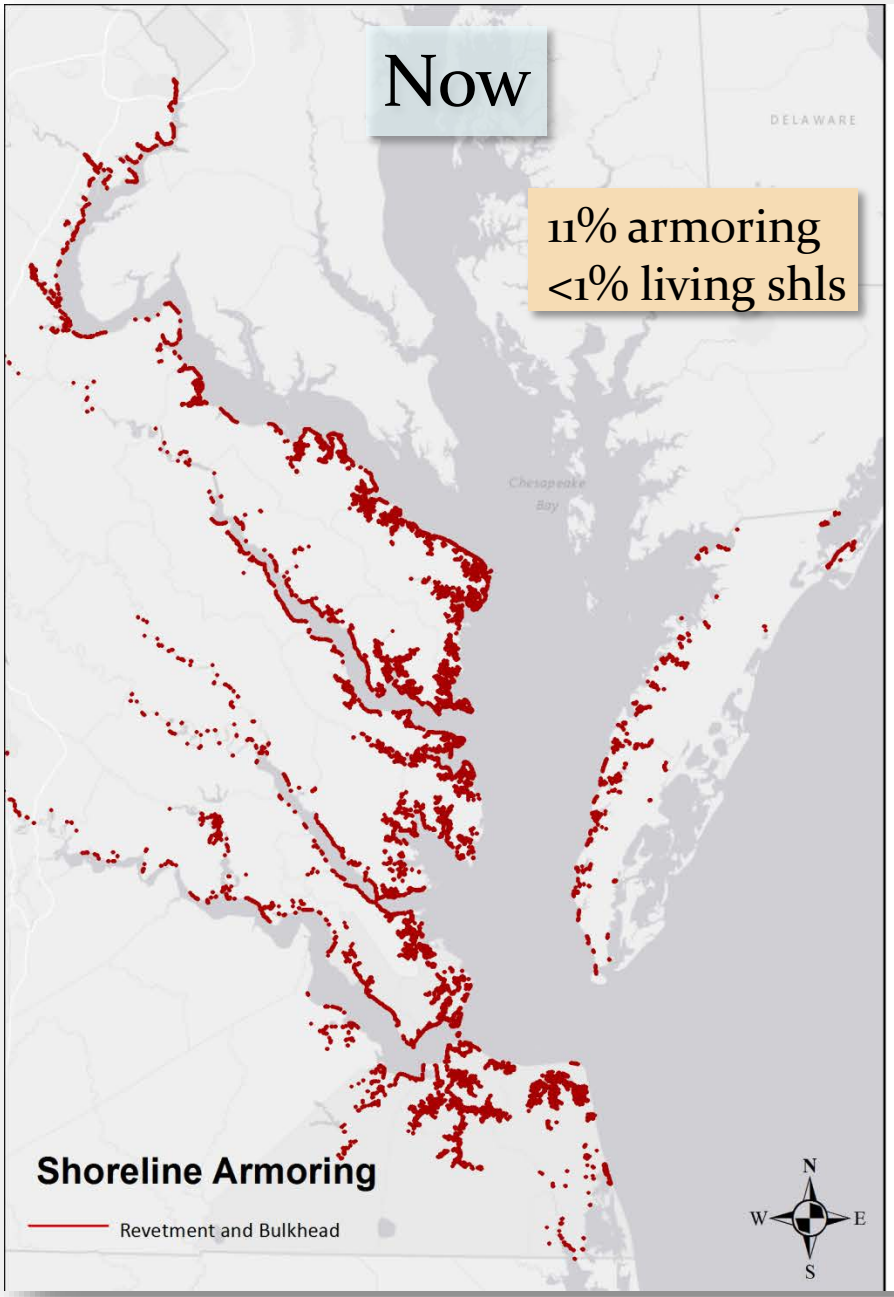



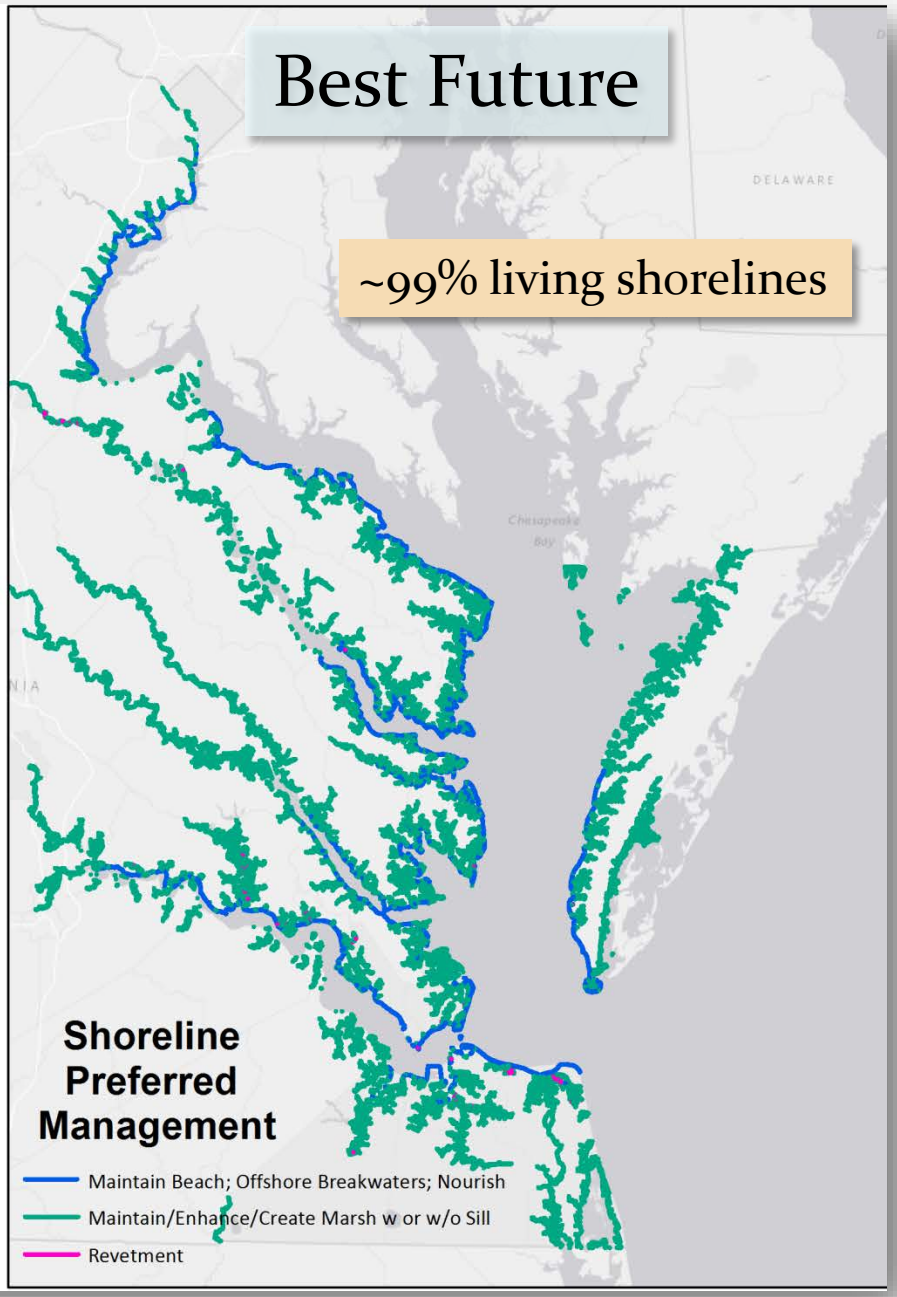
# TASK 4. SYNTHESIS

Products will include:

- An evaluation of the critical elements in the shorescape social-ecological system affecting sustainability




Now
11% armoring
<1% living shls
DELAWARE
Chesapeake Bay
Shoreline Armoring
Revetment and Bulkhead
N
W
E
S


Best Future
~99% living shorelines
DELAWARE
Chesapeake Bay
Shoreline Preferred Management
Maintain Beach; Offshore Breakwaters; Nourish
Maintain/Enhance/Create Marsh w or w/o Sill
Revetment

# ROLE OF THE COMMONWEALTH CENTER FOR RECURRENT FLOODING RESILIENCY

- 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

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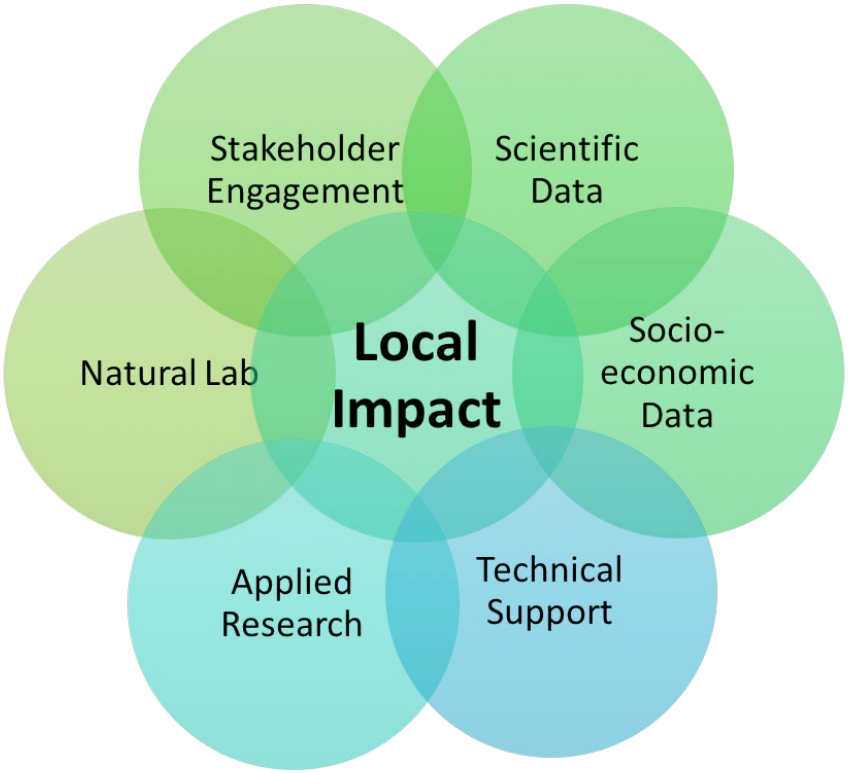
Virginia Coastal Policy Center

Old Dominion University
IDEA Fusion

# ONGOING CCRFR PROJECTS




- Localized Subsidence
- Risk Communication Strategies
- Tourism Resilience
- Economic Impact Analysis
- Street Level Flood Modeling
- Enhanced TideWatch
- Liaisons with federal research partners & local convener
- Data Portal (CCRM)

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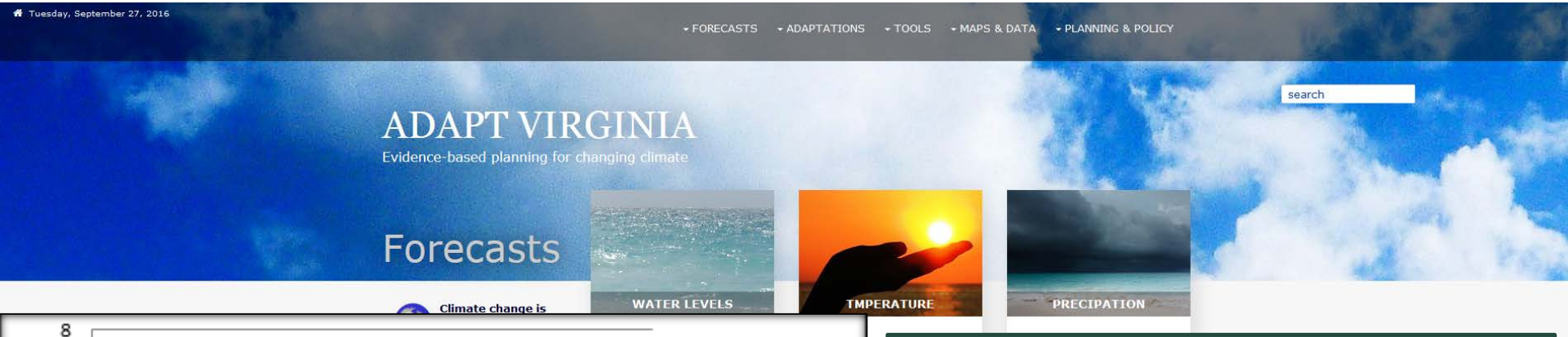
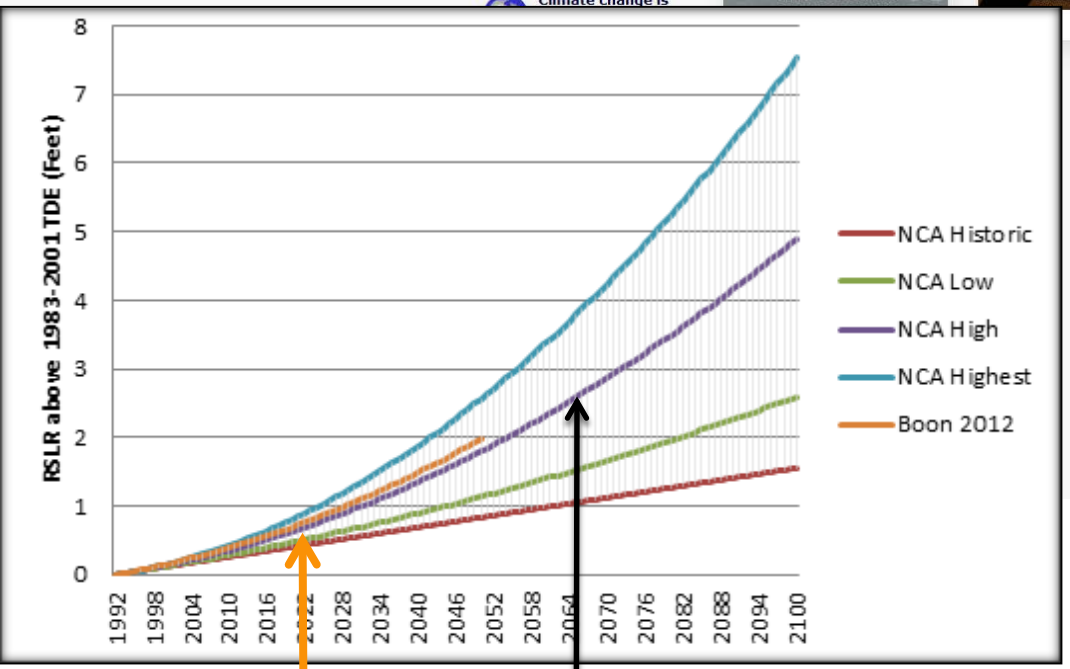
William & Mary Law School
Virginia Coastal Policy Center

Old Dominion University
IDEA FUSION

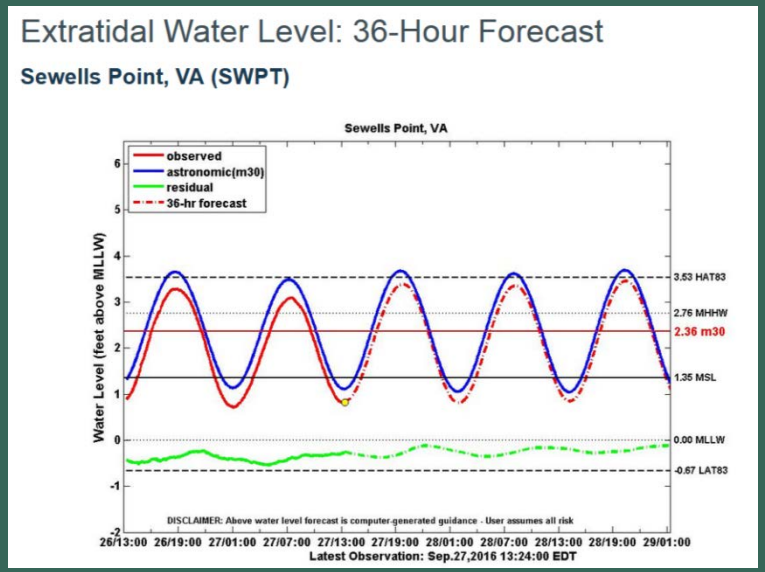
# ON THE HORIZON

- CRS Support - Working with localities to identify long-term projects that will benefit many localities
- Provide continued **liaison** with federal program directors and researchers (e.g. NOAA, NASA, USGS) and with the military concerning national security issues associated with sea level rise.
- Over time, accumulate data leveraging federal, state, local, NGO/Private, and university data to provide easy, **useful access for all stakeholders**.
- Expansion of efforts into western VA
- Provision of legal and policy advice to assist localities in moving research into action




# TIDEWATCH




Long-term projection: based on National Climate Model

Mid-term projection: based on analysis of tide gauge data

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# ADAPT VIRGINIA

Evidence-based planning for changing climate

## Adaptation




Learn how human

Incorporation of forecasted future conditions into decisions increases the opportunity for managed retreat for human habitat and sustainability and resilience for natural habitats.


ADAPT VIRGINIA

## Living Shorelines:

### Using Natural and Nature-Based Features

Living shorelines in lower energy settings can provide long-term protection, restoration, and enhancement of vegetated shoreline habitats through the strategic placement of plants, stone, sand fill and other structural or organic materials.

Explore case studies that highlight the use of natural or nature-based features to adapt to climate impacts.

Navigate through the stories three ways: scrolling down, using the bullet links to the left, or clicking on the list below.

- VIMS Teaching Marsh, Gloucester
- Hermitage Museum & Gardens Oyster Reef and Living Shoreline, Norfolk
- John's Point Living Shoreline, Gloucester
- Haven Creek Wetland and Walking Path Restoration, Norfolk
- Hail Cove Living Shoreline, Maryland
- Holly Point Nature Park, Deltaville
- 46th Street Project, Norfolk
- Virginia Zoo Living Shoreline and Oyster Reef, Norfolk
- Oyster Village/Sunnyside Road Living Shoreline, Oyster
- Hull Springs Farm Living Shoreline, Montross
- Reedville Living Shoreline, Reedville
- Jamestown Beach Restoration, Jamestown
- Phoebus Living Shoreline, Hampton
- Camp Occohannock Living Shoreline, Belle Haven
- Colley Bay Living Shoreline, Norfolk
- Additional Resources

ADAPT Virginia - Adaptation Stories

## Infrastructure Adaptation: Building Modifications

Where we live, work, learn, shop and play, how we get around and the power and water that support us are all subject to climate and flooding effects. Adaptation practices can make our infrastructure more resilient.

Explore these case studies that highlight ways to build new or retrofit older buildings with flood-resistant features.

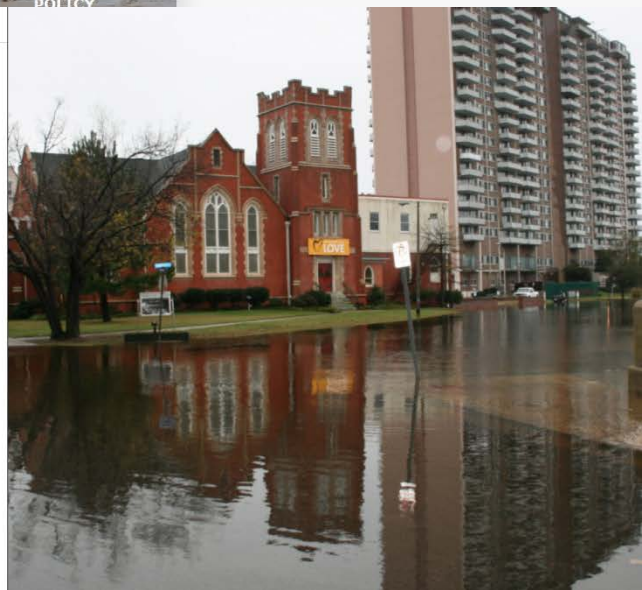
*Navigate through the stories three ways: scrolling down, using the bullet links to the left, or clicking on the list below.*

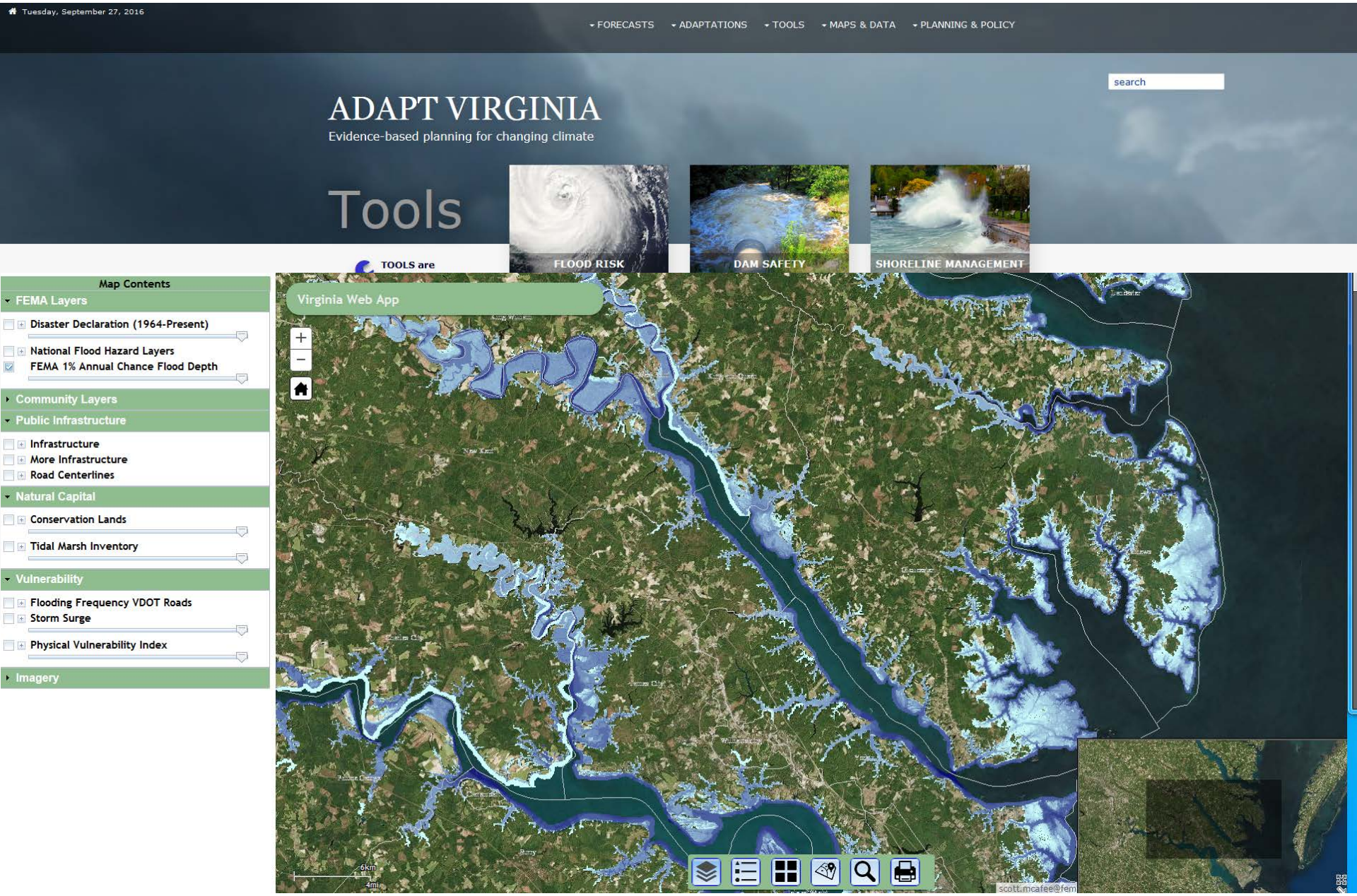
- New Building Floodproofing: VIMS Eastern Shore Seawater Lab, VA
- Floodproofing Retrofit: Burnham Hall, VT
- Floodproofing Retrofit: Chrysler Museum, VA
- Elevating Home: Gloucester, VA
- Elevating Home Utilities: Scituate and Quincy, MA
- Building a New Resilient Community: Queens, NY
- Amphibious Home - New Building: UK
- Amphibious Homes Retrofit: LA
- Additional Resources

*Photo at right: Portions of Norfolk flood during a high tide. Photo: Wetlands Watch*

New Building Floodproofing: VIMS Eastern Shore Seawater Lab, VA



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Tools
FLOOD RISK
DAM SAFETY
SHORELINE MANAGEMENT
TOOLS are
Map Contents
FEMA Layers
Disaster Declaration (1964-Present)
National Flood Hazard Layers
FEMA 1% Annual Chance Flood Depth
Community Layers
Public Infrastructure
Infrastructure
More Infrastructure
Road Centerlines
Natural Capital
Conservation Lands
Tidal Marsh Inventory
Vulnerability
Flooding Frequency VDOT Roads
Storm Surge
Physical Vulnerability Index
Imagery
Virginia Web App
6km
4mi
scott.mcafee@fem

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# ADAPT VIRGINIA

Evidence-based planning for changing climate

## Planning & Policy




Adaptations to

## Virginia Vulnerability Viewer

Zoom In | Zoom Out | Full Extent | Prev Extent | Next Extent | Pan | Getting Started | Locality/Address Search | Metadata

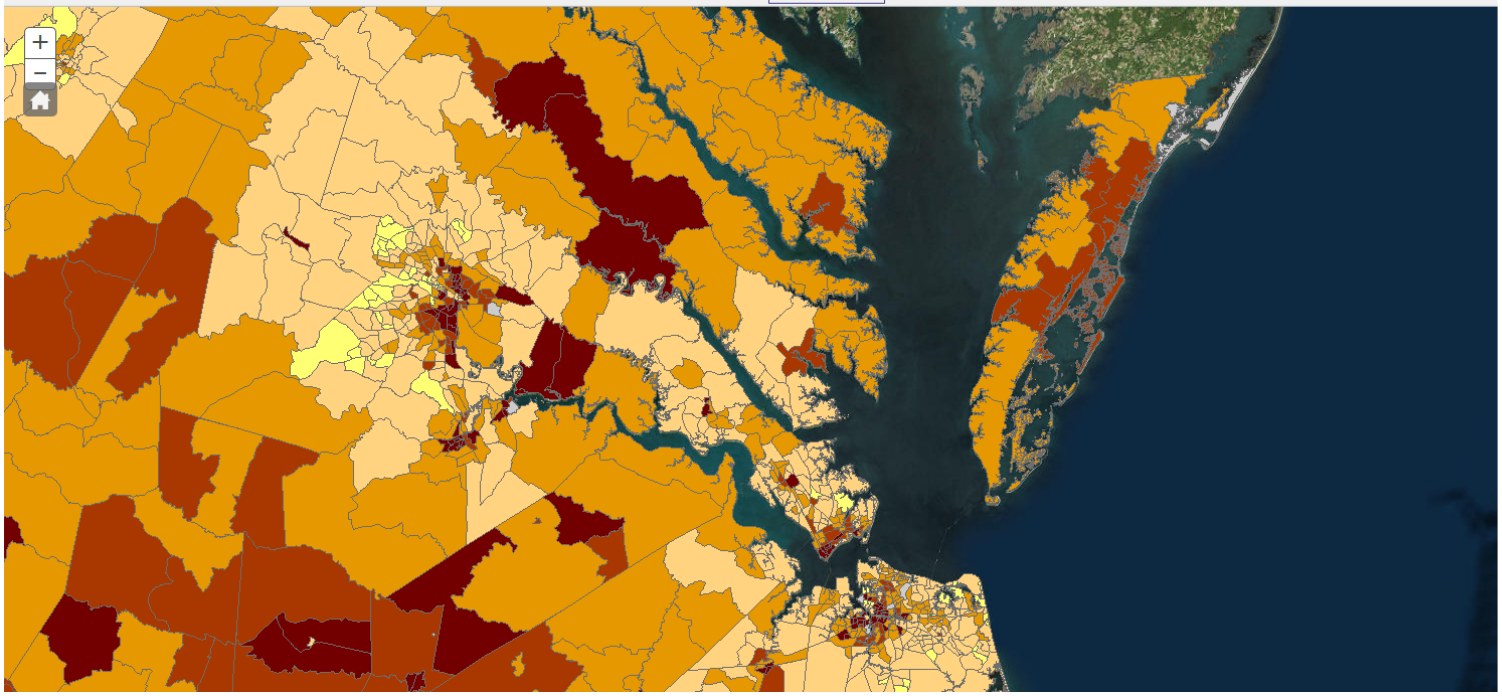


Table of Contents/Legend

- Social Vulnerability Classification
- Social Vulnerability Index Score
- Vulnerable Housing Classification
- Hazardous/Toxic Index Score

Social Vulnerability Index Score

- Very Low Social Vulnerability
- Low Social Vulnerability
- Moderate Social Vulnerability
- High Social Vulnerability
- Very High Social Vulnerability
- Not inlcuded in the analysis

Social Vulnerability Classification - Overview

Vulnerability Index Score - Overview

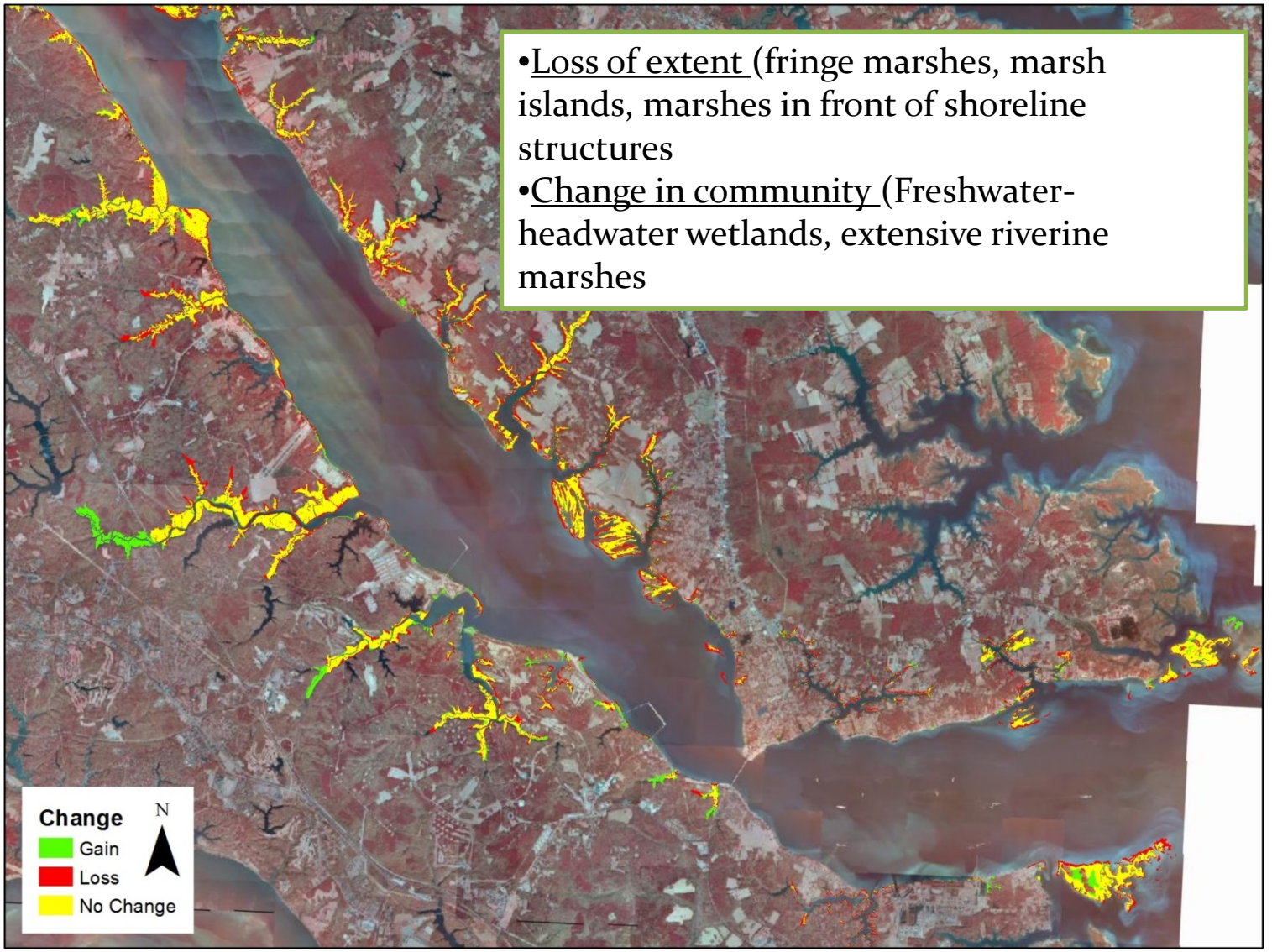
Vulnerable Housing - Overview

Hazardous/Toxic Index Score - Overview

# CBP CLIMATE RESILIENCY WORKSHOPS

- Climate Resiliency Workgroup is helping incorporate climate change into Bay Model
- 2 workshops this year:
  - Picking appropriate climatic shifts (temperature, precipitation)
  - Picking appropriate sea level rise scenarios
  - Extending those changes to shifts in natural resources (tidal marshes, seagrass, oysters, etc.)

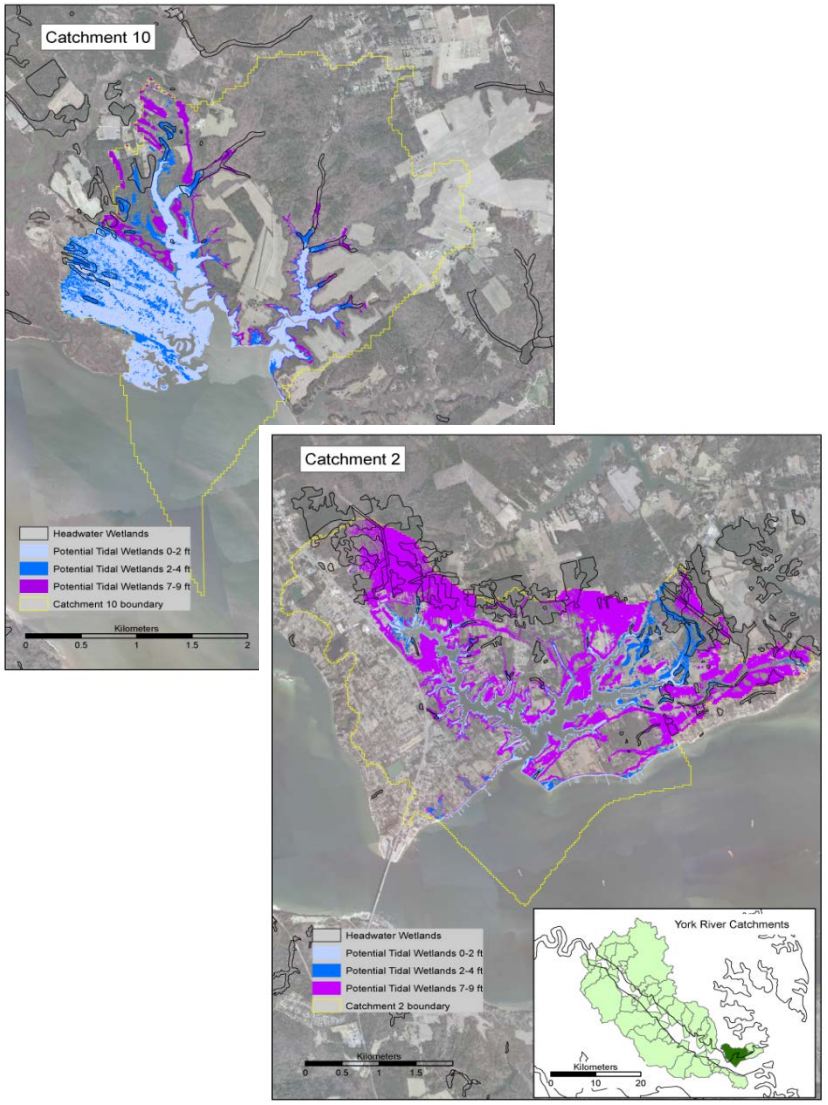
# SHIFTS IN TIDAL MARSHES WITH SEA LEVEL RISE



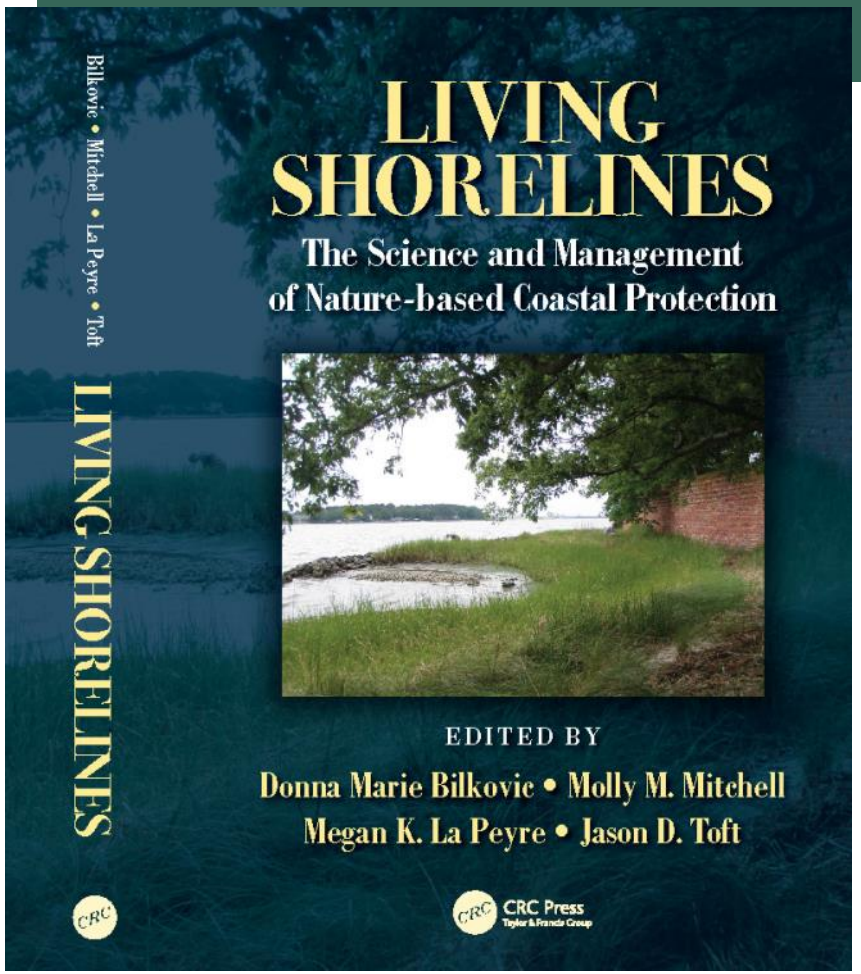
# WHAT ARE WE SEEING?

- There are site specific drivers of change (such as topography, local sediment supply & erosion rates) that complicate the overall patterns of change

- Human shoreline use will be a <u>key determinant</u> of future marsh distribution



# QUESTIONS?




New Book on Living Shorelines –to be published by CRC Press March 2017

www.crcpress.com

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*THANK YOU!*

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