March 13, 2020

Coastal Resilience in the Southeast: Local Government Perspective

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Program Assistant Director

Sea Level Rise

Wetlands Watch

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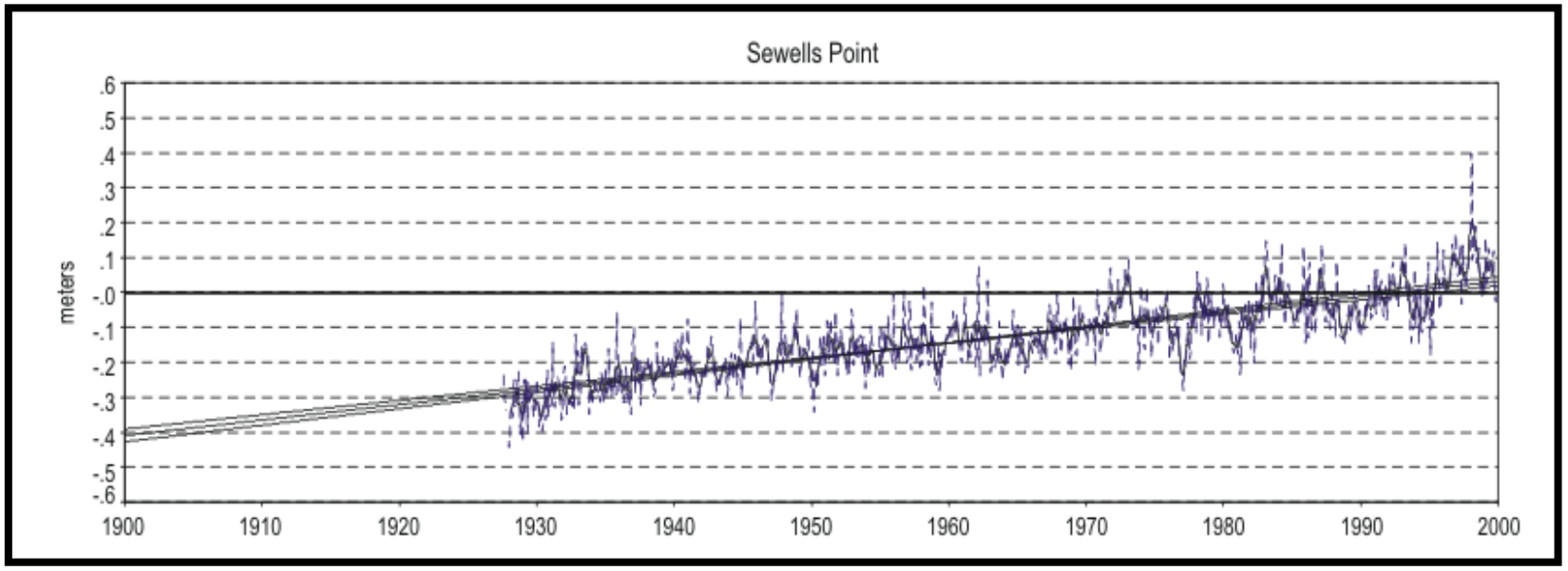
What is happening locally?



Mean sea level trend = 4.42 millimeters/year
(1.45 feet/century)

Avg. SLR in Chesapeake Bay

- 2.5 mm/y for 1953-1983
- 4.7 mm/y for 1983-2013
- 5.4 mm/y for 1996-2014

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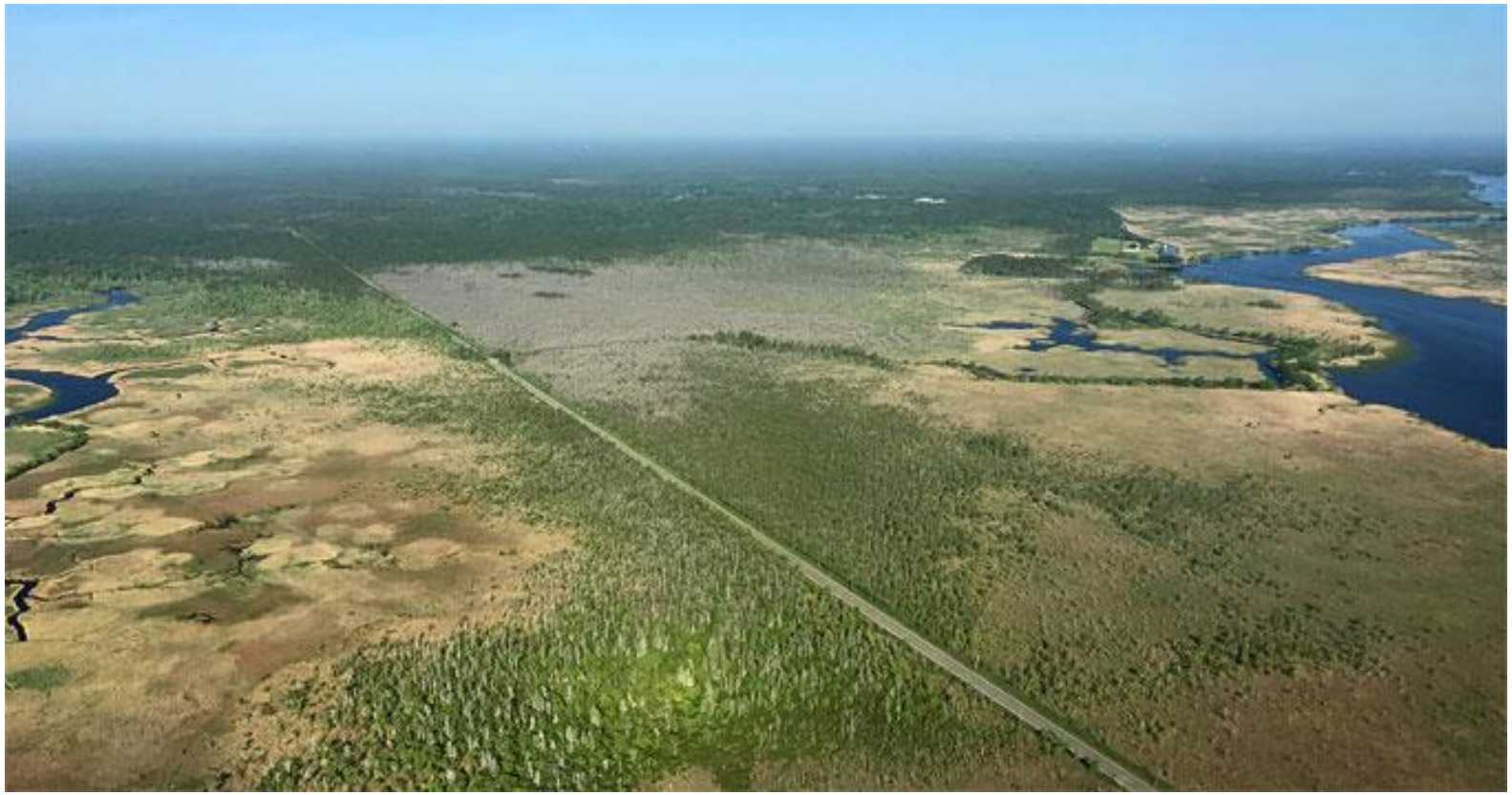
What effects do we see?



New Jersey, post Hurricane Sandy

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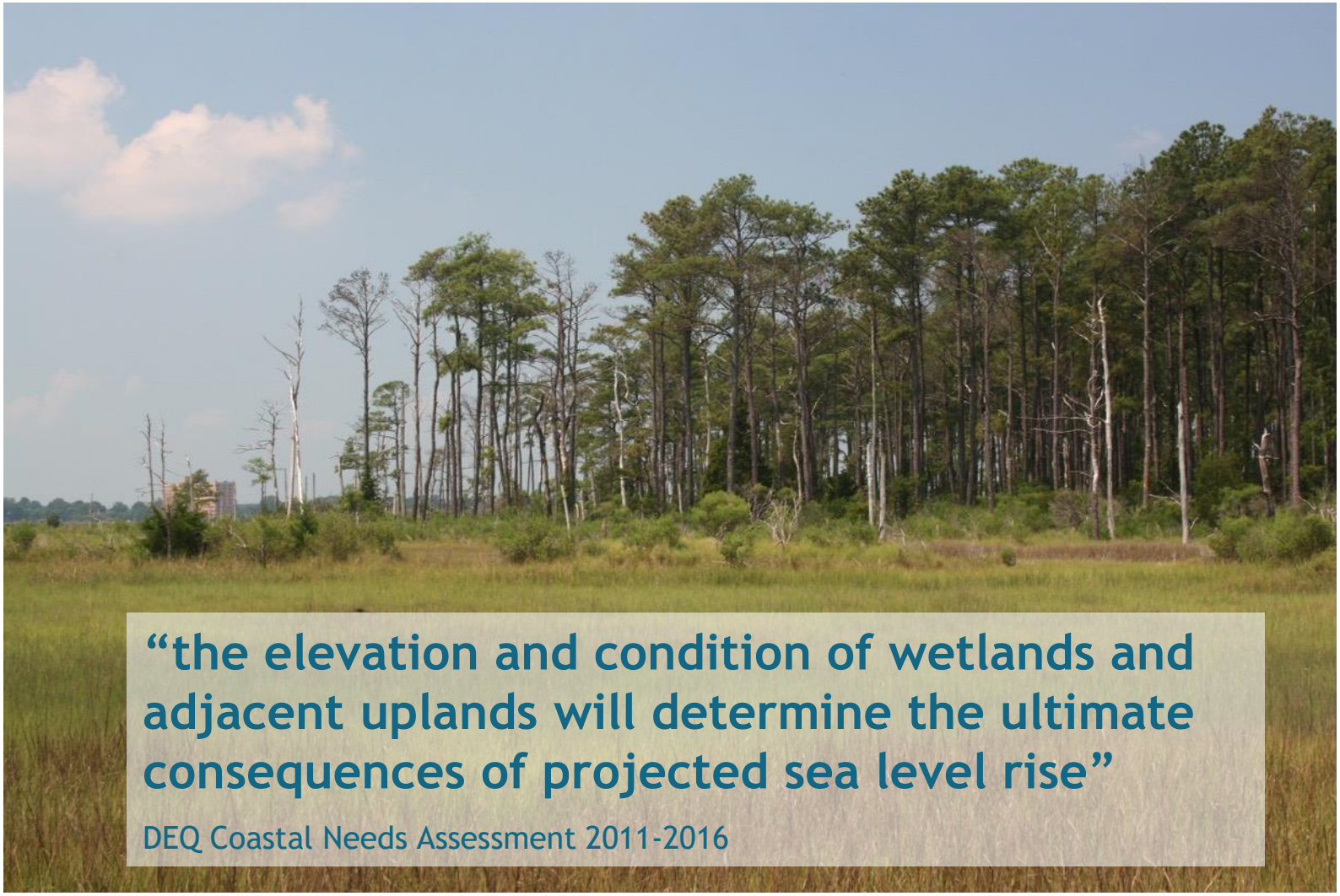
Changes to Coastal Ecosystems



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Future Storm Surge in Hampton Roads

DATE	STORM TYPE/NAME	ABOVE MHHW
August 23, 1933	Hurricane	5.26 feet
September 18, 2003	Hurricane Isabel	5.13 feet
November 12, 2009	Veterans Day Nor'easter	4.99 feet
August 28, 2011	Hurricane Irene	4.76 feet
March 7, 1962	Ash Wednesday Storm	4.46 feet
October 29, 2012	Hurricane Sandy	4.09 feet
September 18, 1936	Hurricane	3.96 feet
November 22, 2006	Thanksgiving Nor'easter	3.87 feet
February 5, 1998	Twin Nor'easter (#2)	3.82 feet
October 6, 2006	Columbus Day Nor'easter	3.76 feet
April 27, 1978	Nor'easter	3.65 feet
April 11, 1956	Nor'easter	3.56 feet
September 16, 1933	Hurricane	3.36 feet
January 28, 1998	Twin Nor'easter (#1)	3.28 feet
September 16, 1999	Hurricane Floyd	3.21 feet

+1.5 feet by 2050

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Nuisance Flooding

Tidal Flooding: November 2019

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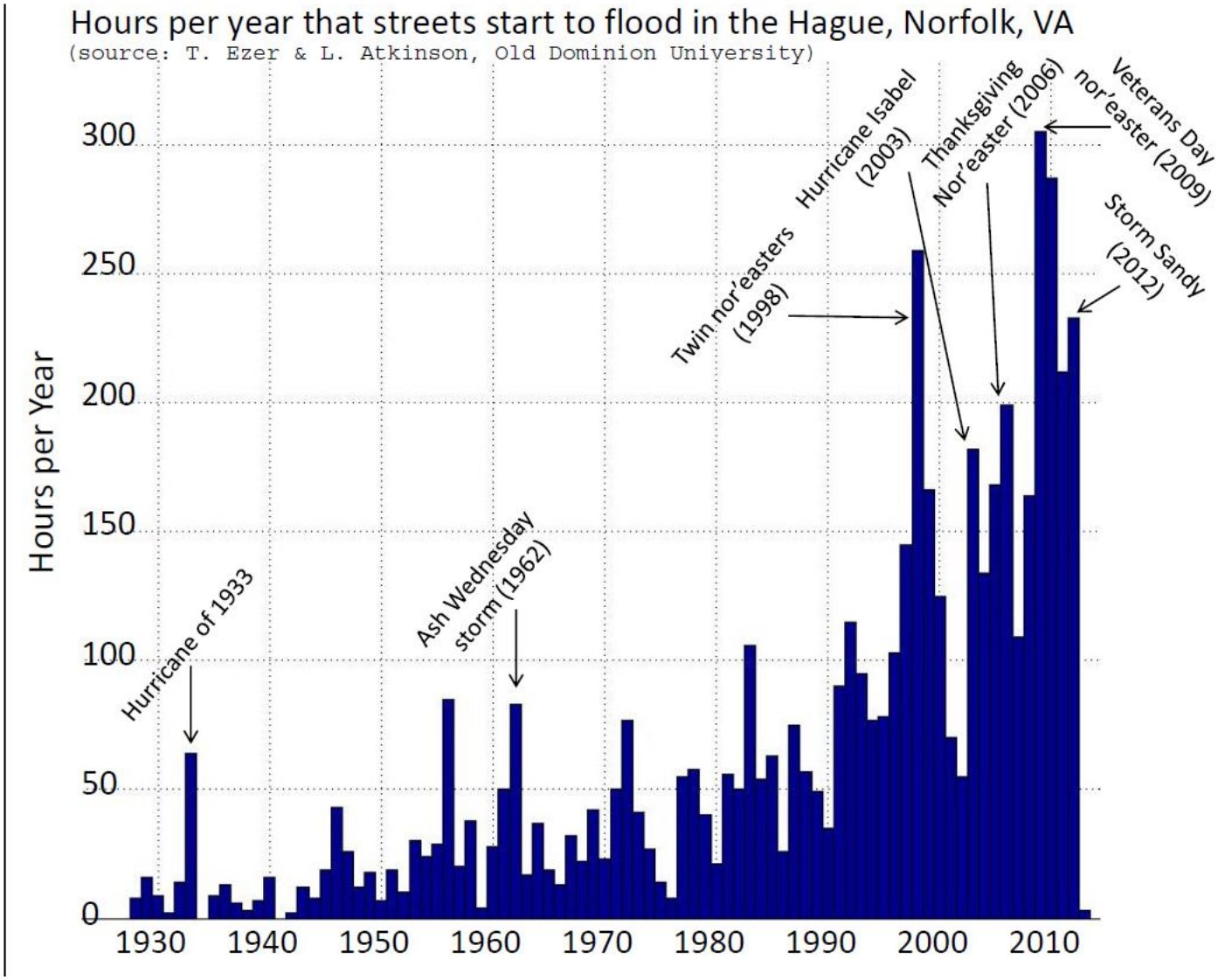
Observed Impacts of Tidal Flooding



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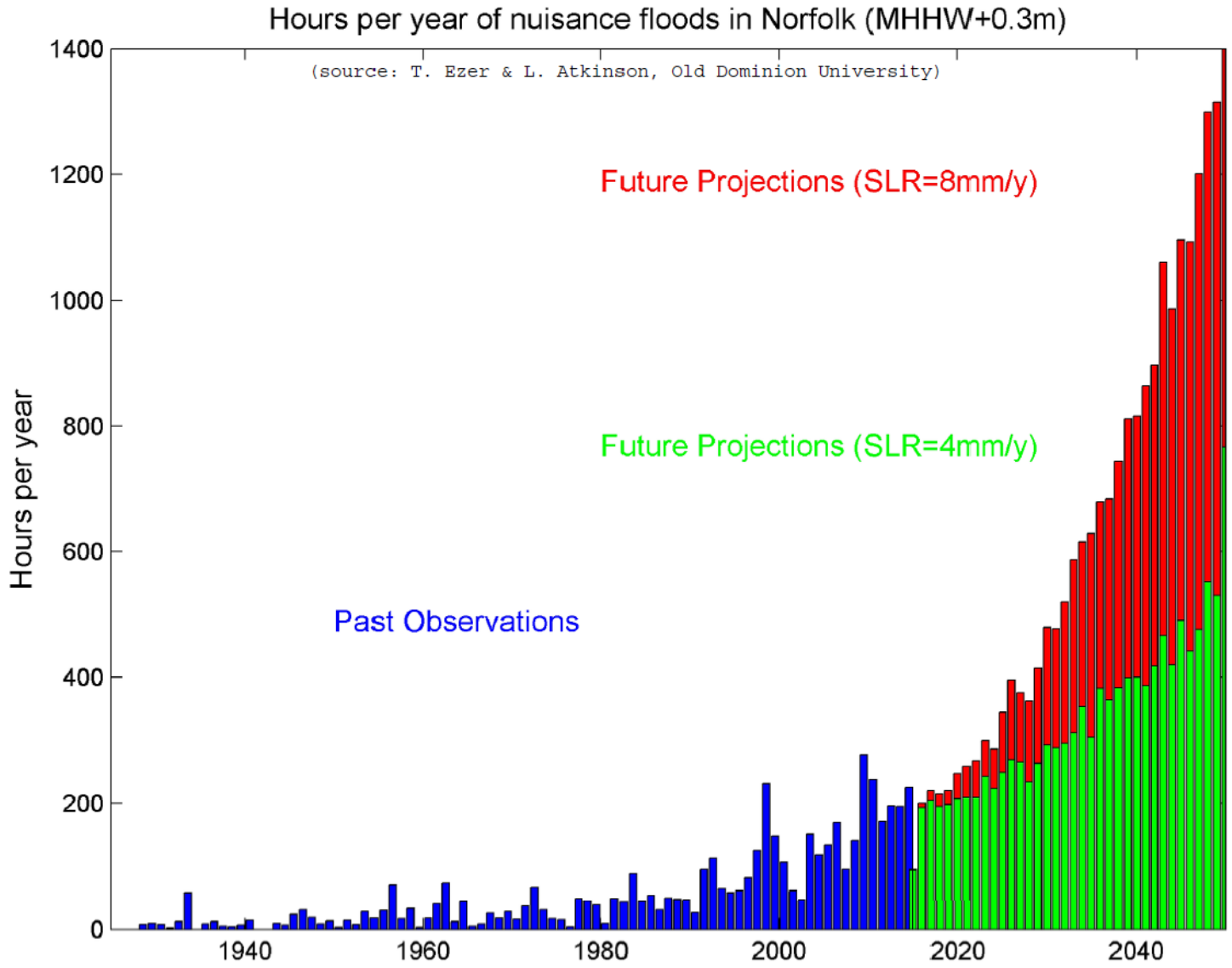
Future Impacts of Tidal Flooding



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Critical Infrastructure Impacted

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Increased Strain on Stormwater System

Future Rainfall

- Strong evidence of *already observed* increases in heavy precipitation occurrence and intensity at Norfolk and regionally
  - Significant changes have occurred since 2000
  - Uncertainty is increasing about using the stationarity assumption
- Future precipitation-frequency curves increase most notably for 1-10 year events; ex: 2-year event increases by 30%

		Mid-term [2045]		Long-term [2075]	
Return Period, yr	Historical Value, in.	Value, in.	% change	Value, in.	% change
1	1.4	1.3	-8%	1.7	+21%
2	3.2	3.7	**+17%**	3.9	**+22%**
5	4.4	5.4	**+21%**	5.6	**+25%**
10	5.4	6.6	**+22%**	7.0	**+28%**
20	6.5	8.0	+23%	8.5	**+32%**
50	8.0	10.0	+24%	11.0	+37%
100	9.4	11.7	+24%	13.3	+41%

Sudden Rain Events= Closed Streets

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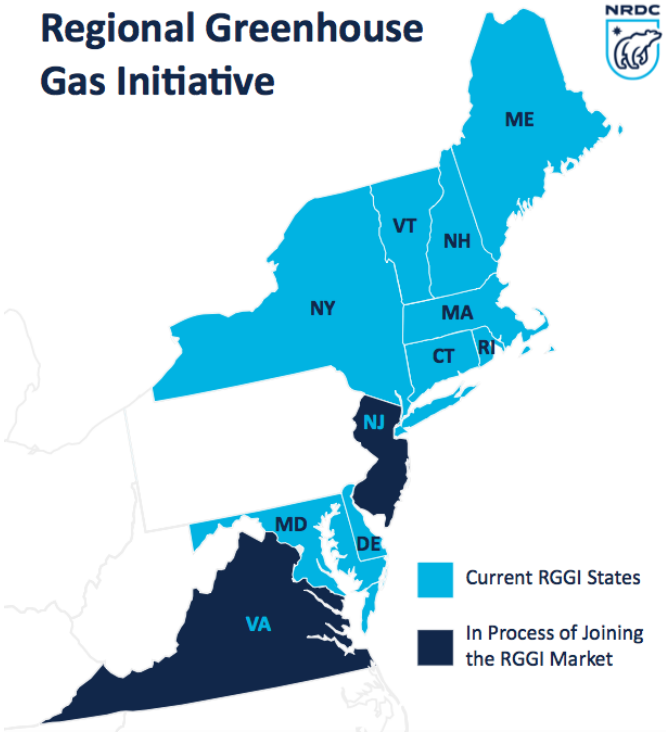
State Action

- Regional Greenhouse Gas Initiative (RGGI)
  - Carbon Cap and Trade System
  - Initial annual revenue estimated at $100 million annually
  - Funds to be used for flood preparedness and energy efficiency



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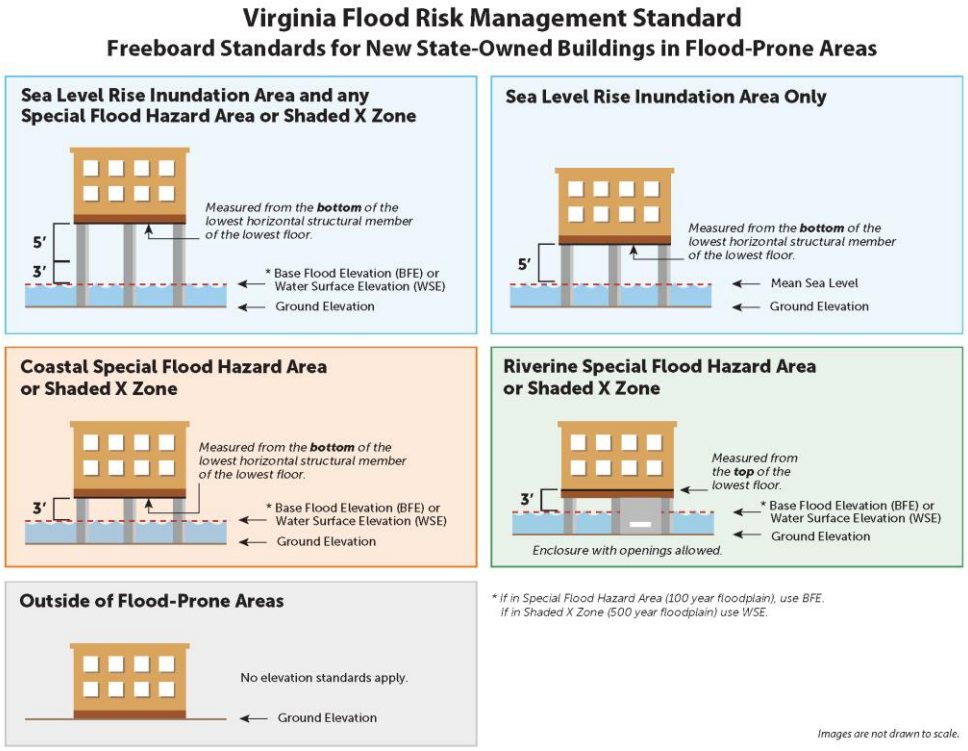
State Action

- Executive Order #24
  - Coastal Master Plan
  - State Flood Risk Management Standard



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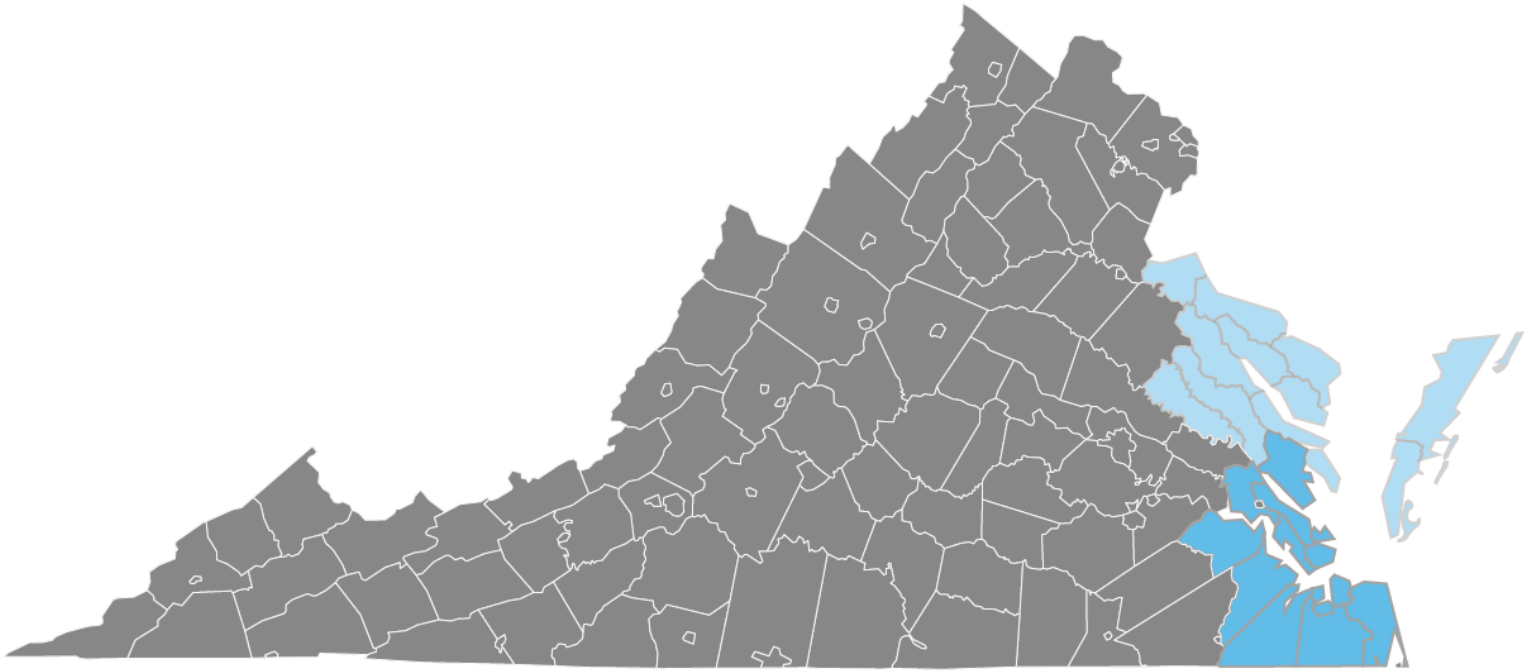
VA Gen Assembly: Planning for Sea Level Rise Mandate



Code of Virginia, § 15.2-2223.2: Comp. Plans **must** include a Comprehensive Coastal Resource Management Plan [required for localities within the Tidewater Region]

Code of Virginia, § 15.2-2223.3: Comp. Plans **must** incorporate strategies to combat projected SLR [required for localities within the Hampton Roads Planning District Commission]

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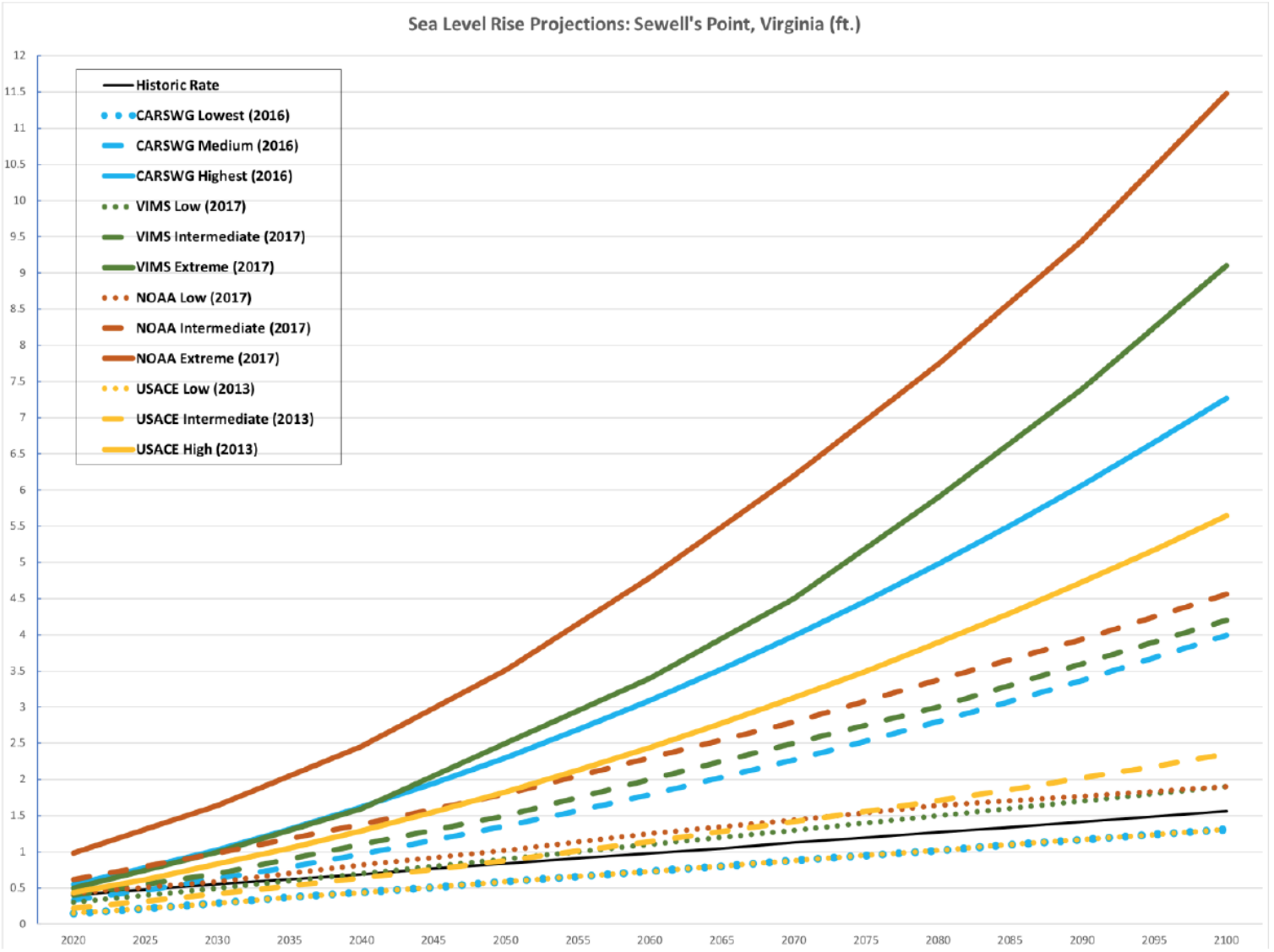
Address Data Needs and Inconsistencies
Sea Level Rise Scenarios



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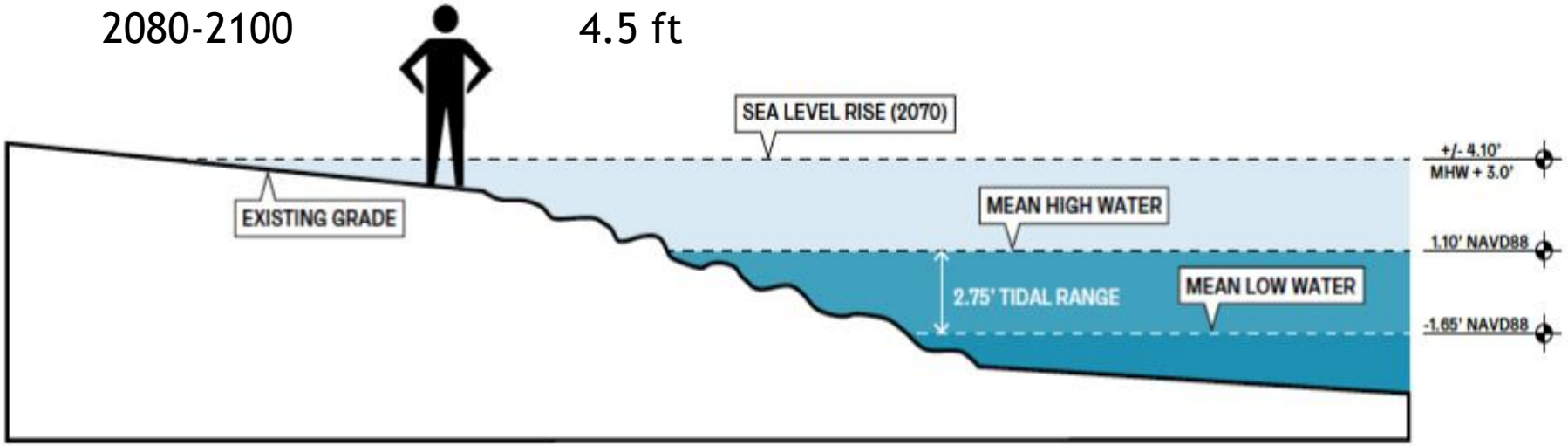
Planning & Design Considerations

Project Lifespan, Location, Cost-Benefits, Mitigation

HAMPTON ROADS PLANNING DISTRICT COMMISSION – Member localities resolution to adopt following for planning purposes

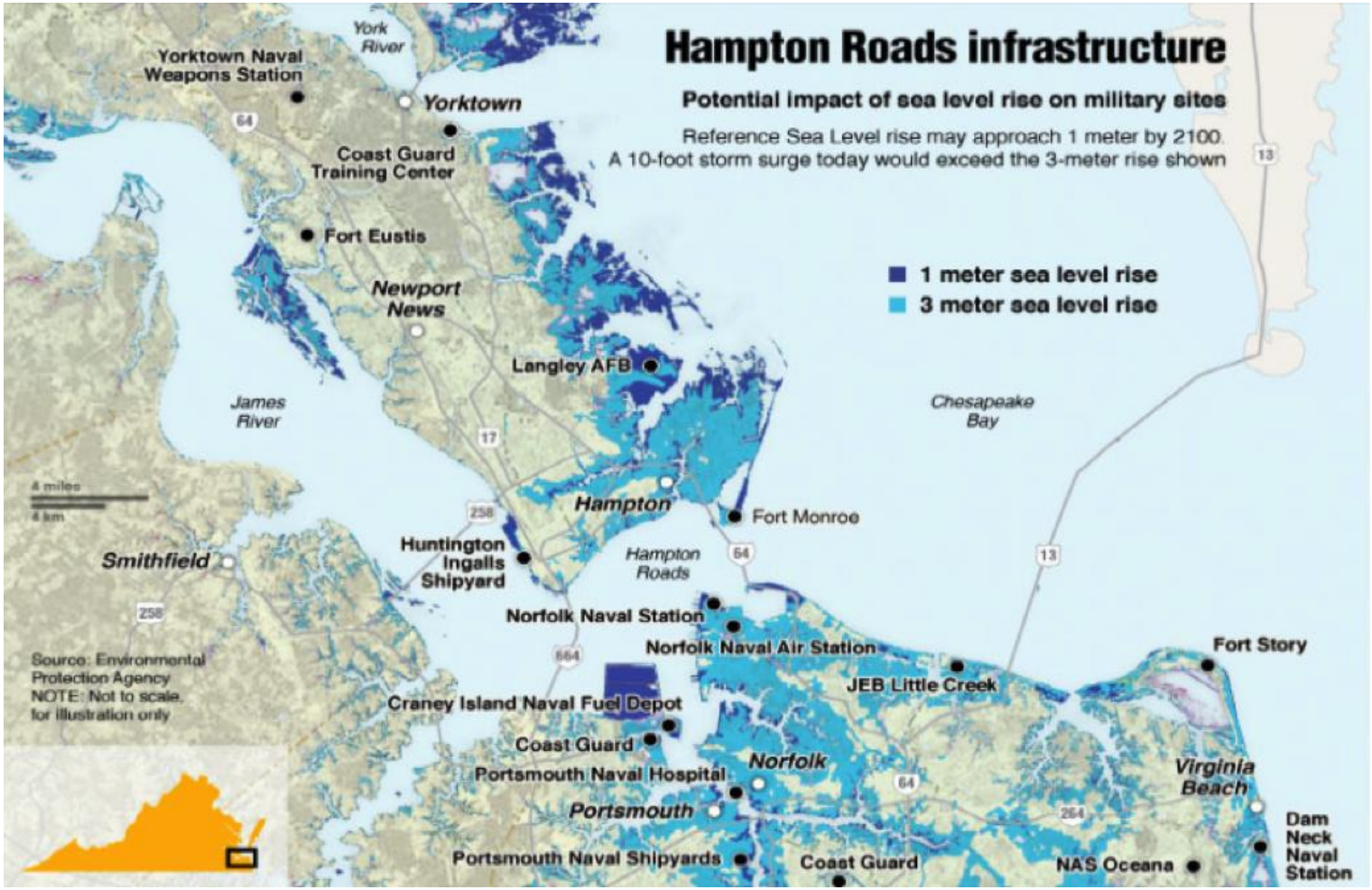
Period	Feet Sea Level Rise
2018-2050	1.5 ft
2050-2080	3.0 ft
2080-2100	4.5 ft



Designing for Future Water Levels

The diagram above illustrates the water level (Mean High Water) in 2070 with 3' of relative sea level rise, the "high" curve in the top graphs.

Military Infrastructure



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Regional Action

Joint Land Use Studies (JLUS)

"community-driven, cooperative, strategic planning processes among localities, states, and military installations"

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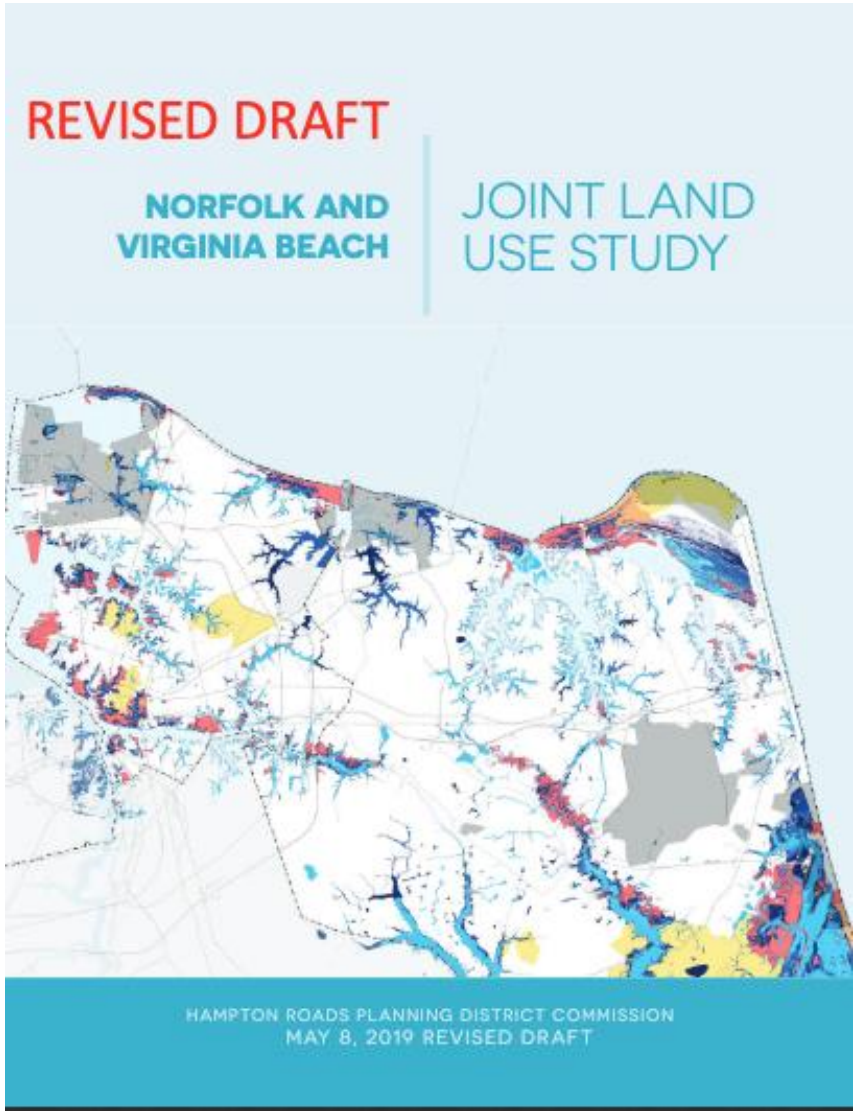

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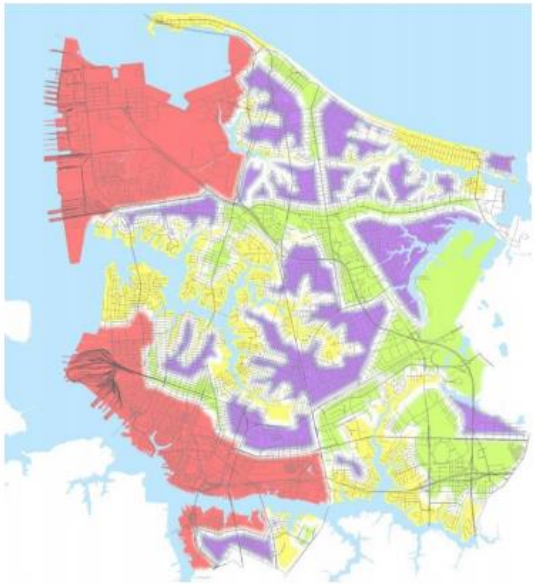
LOCAL ACTION: NORFOLK

Citywide Resilience Zoning Strategy

1. Ground-floor elevations 16" to 3ft above grade
2. Resilience quotient
3. Enhanced buffering, landscape, open space standards
4. Incentivizing adaptive re-use and retrofits of existing buildings



5. Coastal Resilience Overlay
6. Upland Resilience Overlay
7. Neighborhood Resilience Overlay

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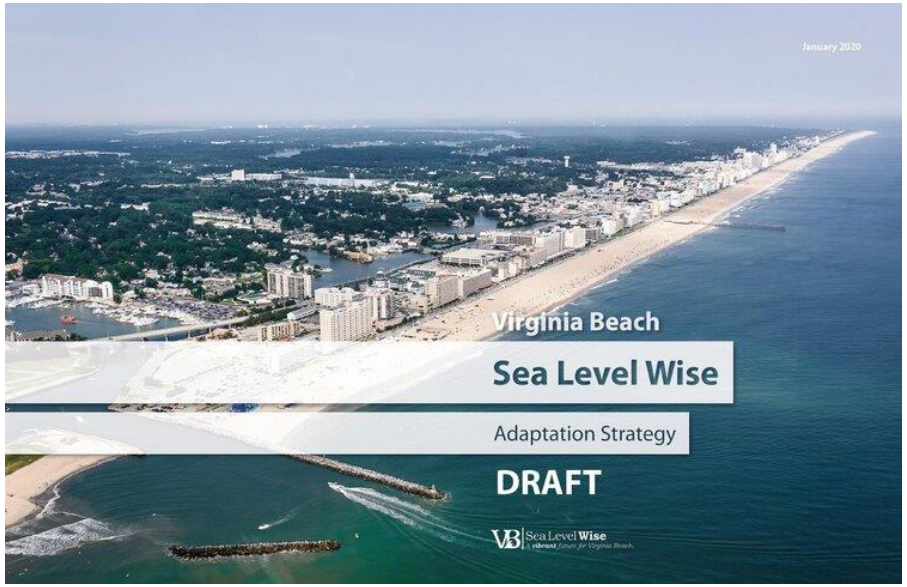
THE CITY OF NORFOLK

Ohio Creek Project

Images Source:
Waggoner & Ball,
City of Norfolk Ohio
Creek Project

Local Action: Virginia Beach

- Virginia Beach SLR Strategy
- Increased Stormwater Standards
- Saying No to Unwise Development



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Hampton: Vehicular No Wake Zones in Localities

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Major Challenges Remain

FEMA Funding is insufficient

TABLE 2 - REPETITIVE LOSS DATA BY LOCALITY

LOCALITY	# OF REPETITIVE LOSS PROPERTIES	AVERAGE COST OF MITIGATION	TOTAL COST OF MITIGATION	AVERAGE ANNUAL FEMA FUNDING	# OF YEARS TO MITIGATE W/ FEMA FUNDING ALONE
Chesapeake	409	$250,000	$102,250,000	$787,500	130 years
Hampton	863	$75,000*	$64,725,000	$833,333	78 years
Norfolk	900	$162,500	$146,250,000	$778,000	188 years
Portsmouth	186	$75,000*	$13,950,000	NA	NA
Virginia Beach	561	$185,000	$103,785,000	$725,000	143 years
TOTAL	**2,919**	**NA**	**$430,960,000**	**NA**	**NA**

*No average mitigation costs were available, so the statewide average of $75,000 was used.

FEMA Funding Levels:

- Hampton has received $2,500,000 since 2011
- Chesapeake has received $6,300,000 since 2006
- Norfolk has received $3,890,000 since 2009
- Virginia Beach has received $2,900,000 since 2010

Note: The most recent data available for Chesapeake, Norfolk, and Virginia Beach is from September 2014; for Hampton, data is from 2013.

Incentivizing Green Infrastructure Mitigation and Adaptation – A Strategy in Development

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ADAPT VA

Evidence-based planning for changing climate

FORECASTS

Forecasting water levels, temperature, and precipitation helps mitigate impacts and plan resilient communities. Access a tide forecast & sea level projections for Virginia

ADAPTATIONS

Case studies and story maps illustrate how adaptation works, and can be financed, through zoning, planning, engineering, and policy practices.

TOOLS

Tools assess risk and and inform preparation and response to a changing environment. Access flood risk maps, shoreline recommendations, and an interactive comprehensive map of adaptation strategies.

DATA

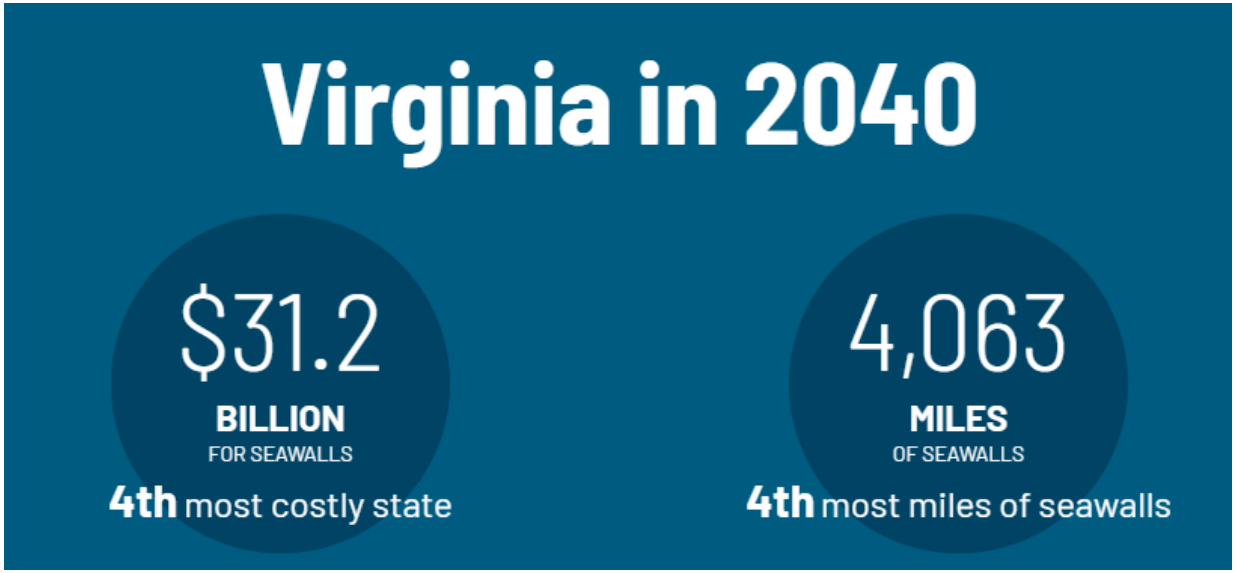
Adapt Virginia's comprehensive Geoportal provides easy and convenient ways to access, download, and share geospatial data. Search for data via map or search engine

PLANNING & POLICY

Management strategies from local and State code to socioeconomic issues and the Community Rating System. Learn about social vulnerability, relevant local ordinances, state legislation, and legal issues.

Major Challenges Remain

- Virginia: Buyer Beware on Flood Risk
  - HB 858
- Significant Barriers to Grant Applications for Localities
- Army Corps Cost Benefit Analysis
- Atlas 14 Update
- Funding, Funding, Funding



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THANK YOU!

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Sea Level Rise