Sea level rise and flooding: an outlook

VACo Webinar
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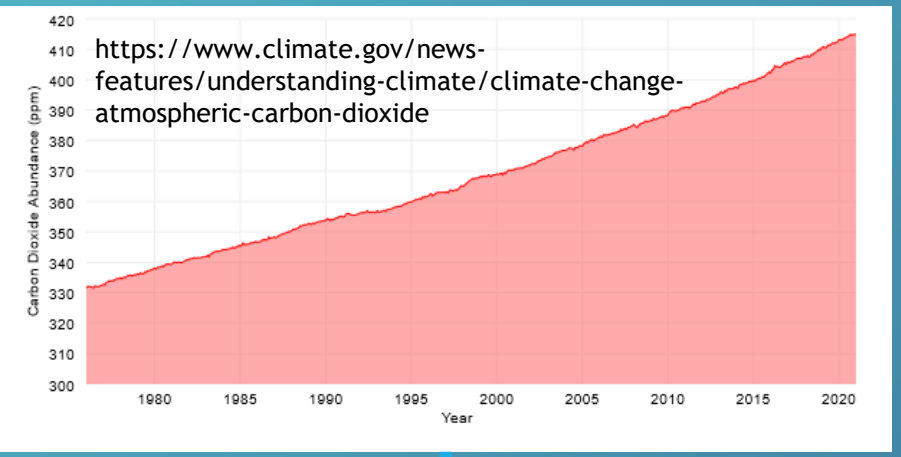
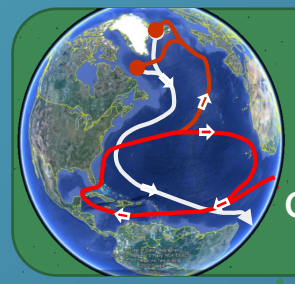
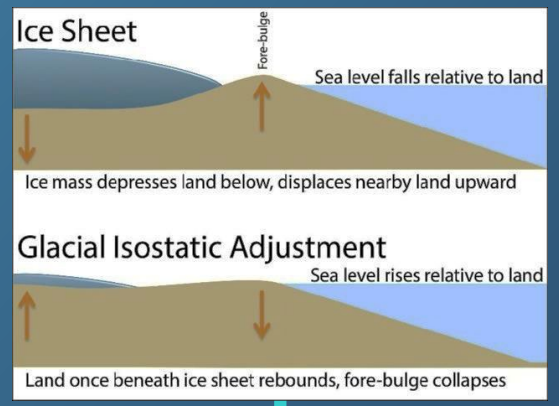




Changing ocean circulation



Increasing **air temperature**

Increasing water temperature

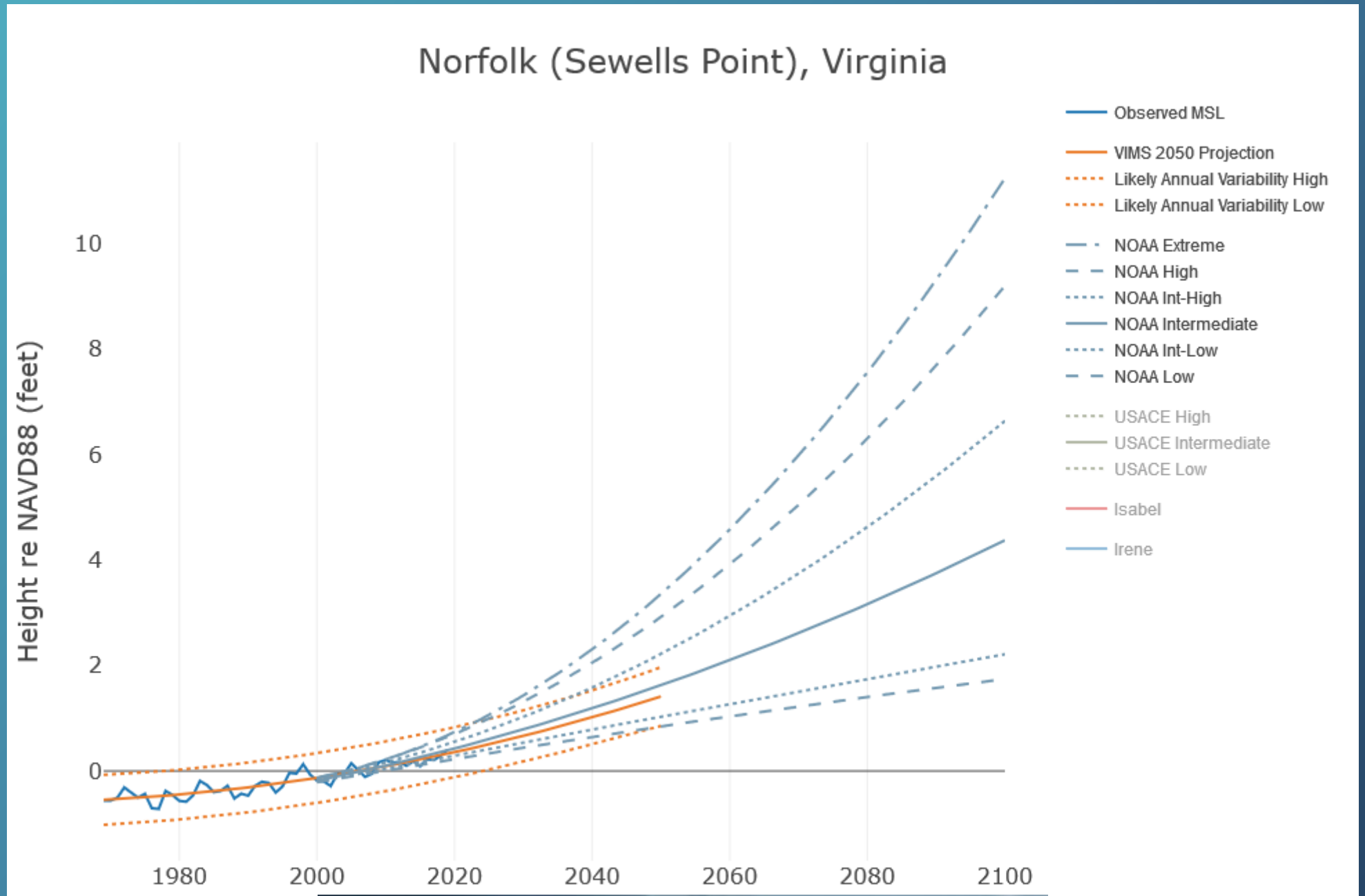
Melting ice sheets

Thermal expansion

Sea level rise

Changing precipitation patterns

Flooding



ADAPTVA

Evidence-based planning for changing climate

Significant Virginia Tidal Floods

https://tidesandcurrents.noaa.gov/est/Top10_form_ft.pdf

Top Ten Highest Water Levels for long-term stations in feet above MHHW (as of 4/2018)

* --- Inferred Level & --- Last Recorded Level # --- High Water Mark

Station Number	Station Name	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth
8594900	Washington, DC	10/17/1942	3/19/1936	9/19/2003	8/23/1933	4/28/1937	6/24/1972	9/9/1996	11/5/1985	1/21/1996	10/15/1954
	(since 1931)	7.88	7.38	7.10	# 6.98	5.58	5.48	4.99	4.97	4.92	4.68
8632200	Kiptopeke, VA	3/7/1962	11/13/2009	10/29/2012	9/18/2003	8/28/2011	12/19/2009	2/5/1998	10/29/2011	10/4/2015	10/7/2006
	(since 1951)	4.13	3.98	3.85	3.58	3.54	3.04	3.02	2.91	2.89	2.86
8635150	Colonial Beach, VA	9/19/2003	11/4/1985	9/6/1996	5/12/2008	11/13/2009	9/6/1979	3/14/2010	2/5/1998	11/1/1991	3/29/1984
	(since 1972)	# 6.66	& 3.95	3.26	2.44	2.19	2.16	2.15	2.14	2.12	2.03
8635750	Lewisetta, VA	9/1/2006	9/19/2003	8/28/2011	3/7/2018	10/4/2015	11/13/2009	11/4/1985	2/5/1998	4/17/2011	2/9/2016
	(since 1974)	4.14	3.96	3.02	2.64	2.63	2.59	2.52	2.33	2.30	2.28
8637624	Gloucester Point, VA	9/18/2003	11/12/2009	8/28/2011	3/7/1962	10/7/2006	10/29/2012	9/1/2006	2/5/1998	11/22/2006	4/27/1978
	(since 1950)	#5.62	4.30	4.04	3.57	3.54	3.43	3.35	3.17	3.14	3.08
8638610	Sewells Point, VA	8/23/1933	9/18/2003	11/12/2009	8/28/2011	3/7/1962	10/29/2012	9/18/1936	11/22/2006	2/5/1998	10/7/2006
	(since 1927)	# 5.26	5.13	4.97	4.80	4.46	4.04	3.96	3.87	3.82	3.76
8638863	Ches Bay Bridge Tnl, VA	11/12/2009	9/18/2003	8/28/2011	10/29/2012	11/22/2006	2/5/1998	10/4/2015	10/7/2006	12/19/2009	1/28/1998
	(since 1975)	4.66	4.64	4.46	4.13	3.75	3.68	3.54	3.44	3.29	3.23

Projected Intensity-Duration-Frequency (IDF) Curve Data Tool for the Chesapeake Bay Watershed and Virginia

MARISA
a NOAA Mid-Atlantic RISA team

Chesapeake Bay Program
Science. Restoration. Partnership.

Technical Resources | Using the Data | Using the Tool

Selection Panel

Return Period
100-year

Emissions Scenario
High RCP 8.5

Time Period
2020-2070

Area of Interest
Both

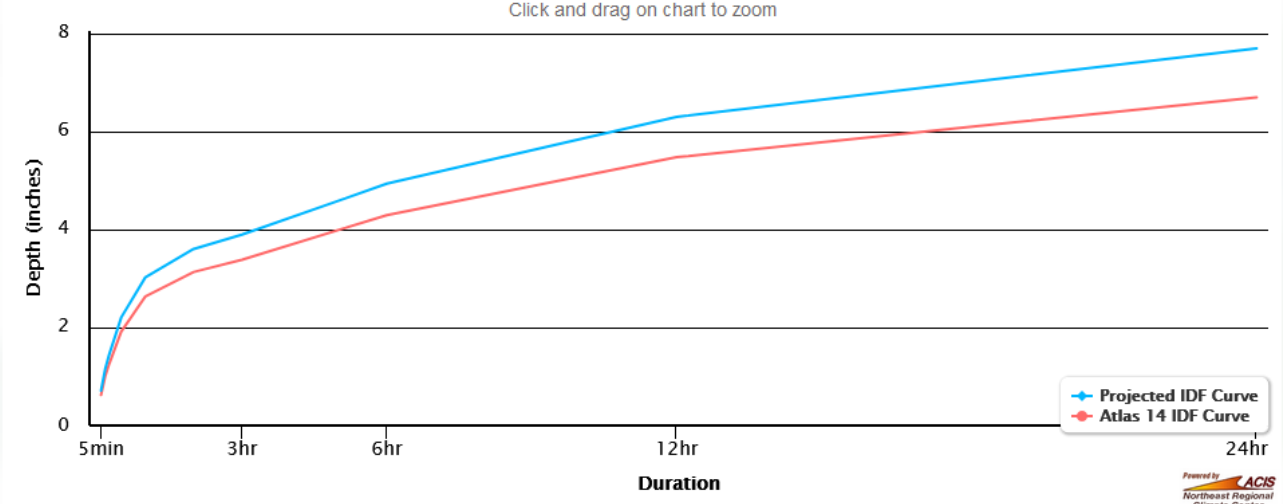
CHART ON

CHART | TABLE | COMPARISON

Toggle Confidence Intervals

WILLIAMSVILLE 2 S

IDF Curve: 100-Year Return Period Under RCP 8.5 From 2020-2070
Click and drag on chart to zoom



Currently Selected
WILLIAMSVILLE...

Saved Stations
To add this station to your favorites click the star.

Median County Change Factor
0.7
1.0
1.3

Watershed Boundary
State Border

Preston
Berkeley
Frederick
Fauquier
Manassas Park
Prince William
Stafford
Fredericksburg
King George
Spotsylvania
Caroline
Louisa
Greene
Orange
Pocahontas
Augusta
Bath
Waynesboro
Albemarle
Greenbrier
Alleghany
Rockbridge
Buena Vista
Nelson
Amherst

mapbox
© Mapbox © OpenStreetMap Improve this map

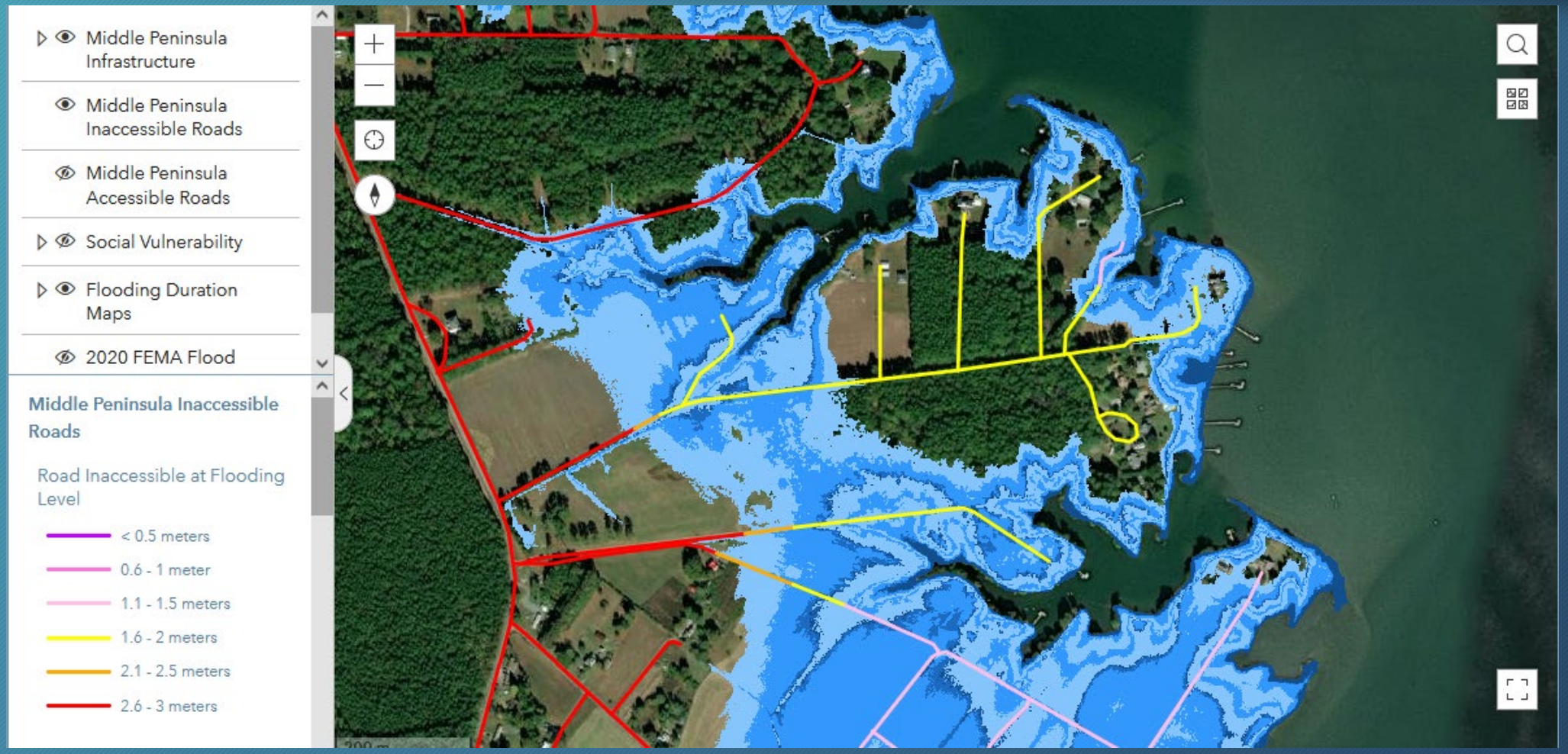
https://midatlantic-idf.rcc-acis.org/

Significant Virginia Fluvial Floods

https://www.weather.gov/safety/flood-states-va

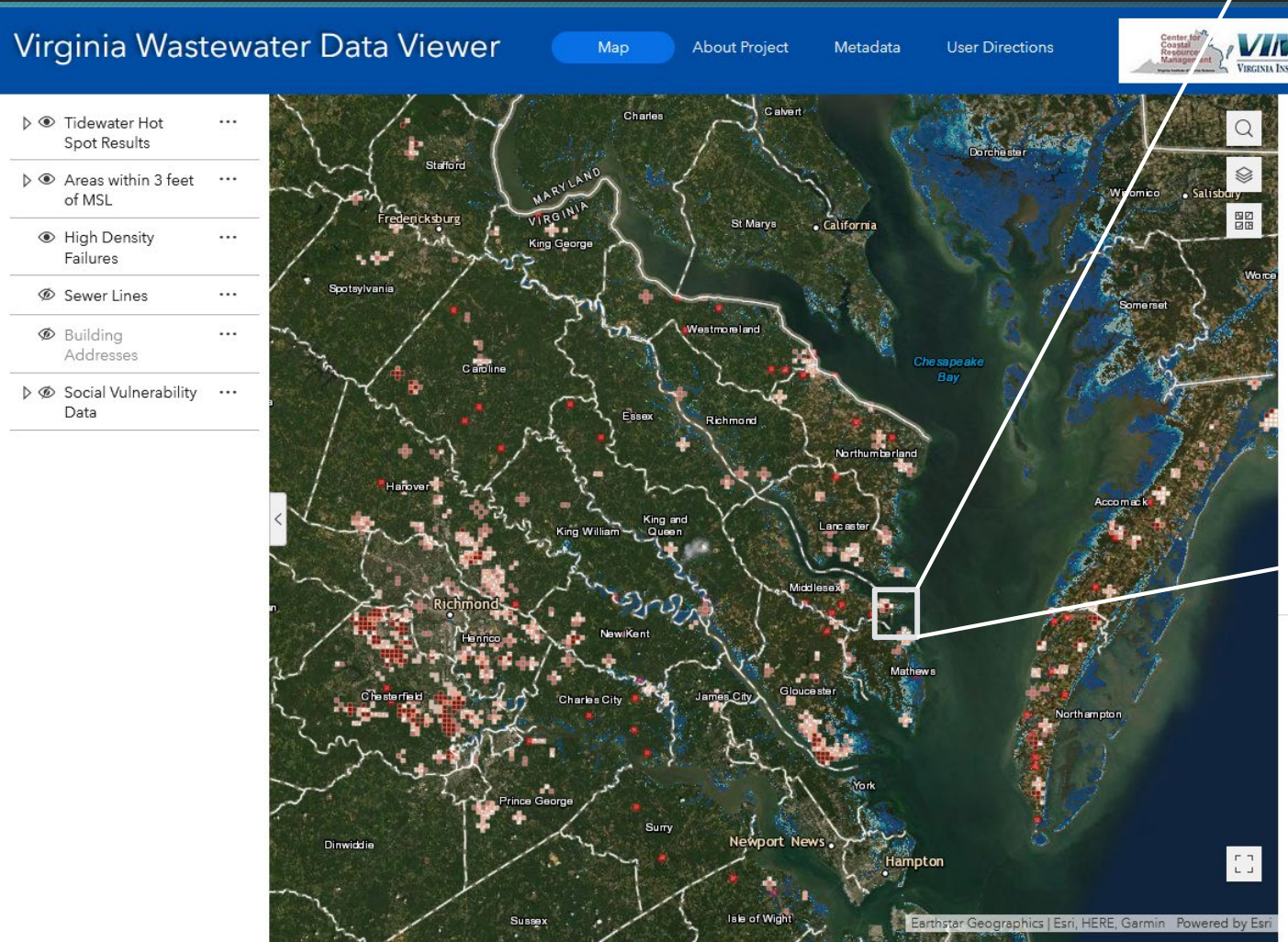
- **Election Day Flood (4-5 Nov 1985) Fatalities = 22 people; Cost = $800 million**
  - Rainfall = 6 -14 inches were common with a high of 19.70 inches reported in Montebello, VA
  - The city of Roanoke saw water levels rise nearly 19 feet in 12 hours, cresting at a record height of 23.35 feet.
- **Hurricane Agnes (21-24 June 1972) Fatalities = 13 people; Cost = $222 million dollars**
  - Rainfall = 5 – 14+ inches of rain across much of central and western Virginia
  - A crest of 22 feet was reached at Little Falls, VA and at least 11 river gage locations measured water levels that were all-time record high levels
- **Hurricane Camille (19-20 Aug 1969) Fatalities = 153 people; Cost = $113-$140 million dollars**
  - Rainfall = 10 - 30 inches, with the heaviest rain across Rockbridge, Amherst and Nelson counties
  - At Palmyra, on the Rivanna River, the river reached a record height of 39.85 ft
- **Hurricane Fran (5-8 Sept 1996) Fatalities = 6 people; Cost = $350 million**
  - Rainfall = 7 – 15 inches
  - major flooding occurred from the Roanoke River basin northward through the James, Shenandoah and Potomac River basins, including 4 locations in the Shenandoah Basin which recorded all time record river levels

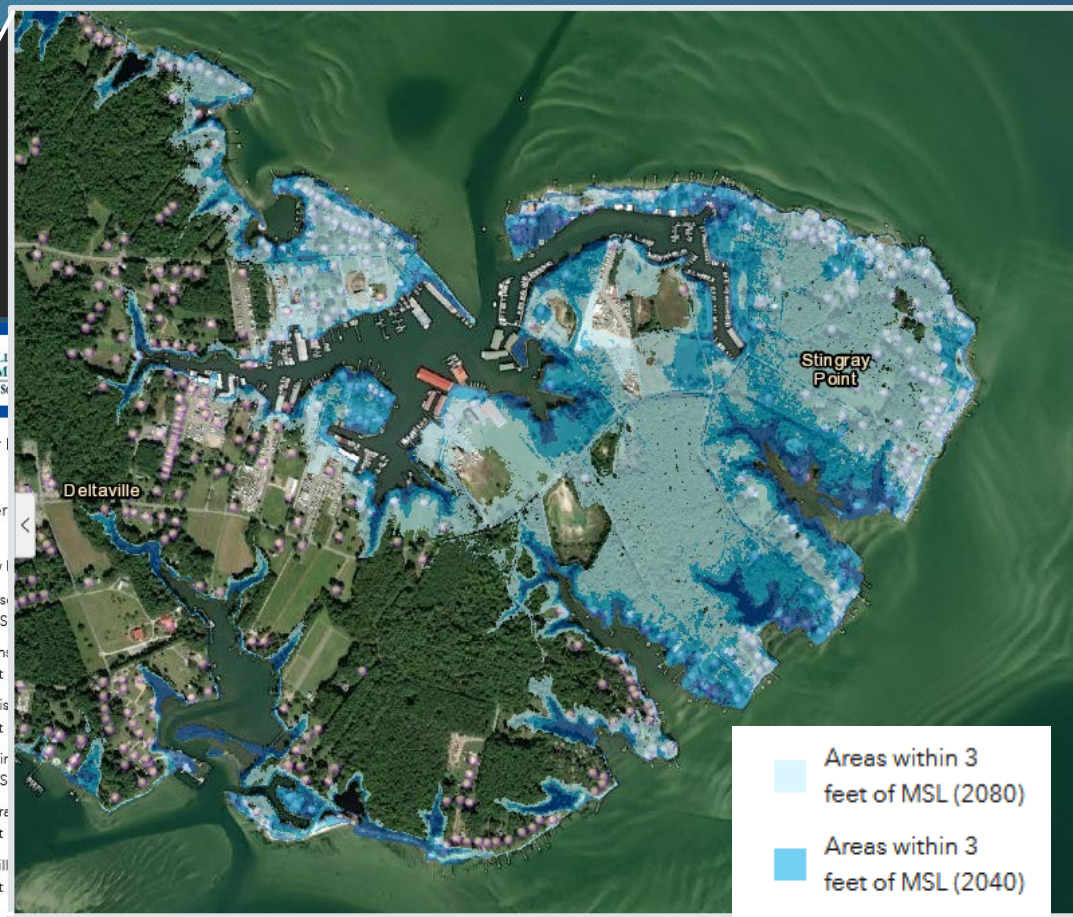
Road Flooding



ADAPT VA
Evidence-based planning for changing climate

Septic Issues





Areas within 3 feet of MSL (2080)

Areas within 3 feet of MSL (2040)

Areas within 3 feet of MSL (2020)

Building Addresses

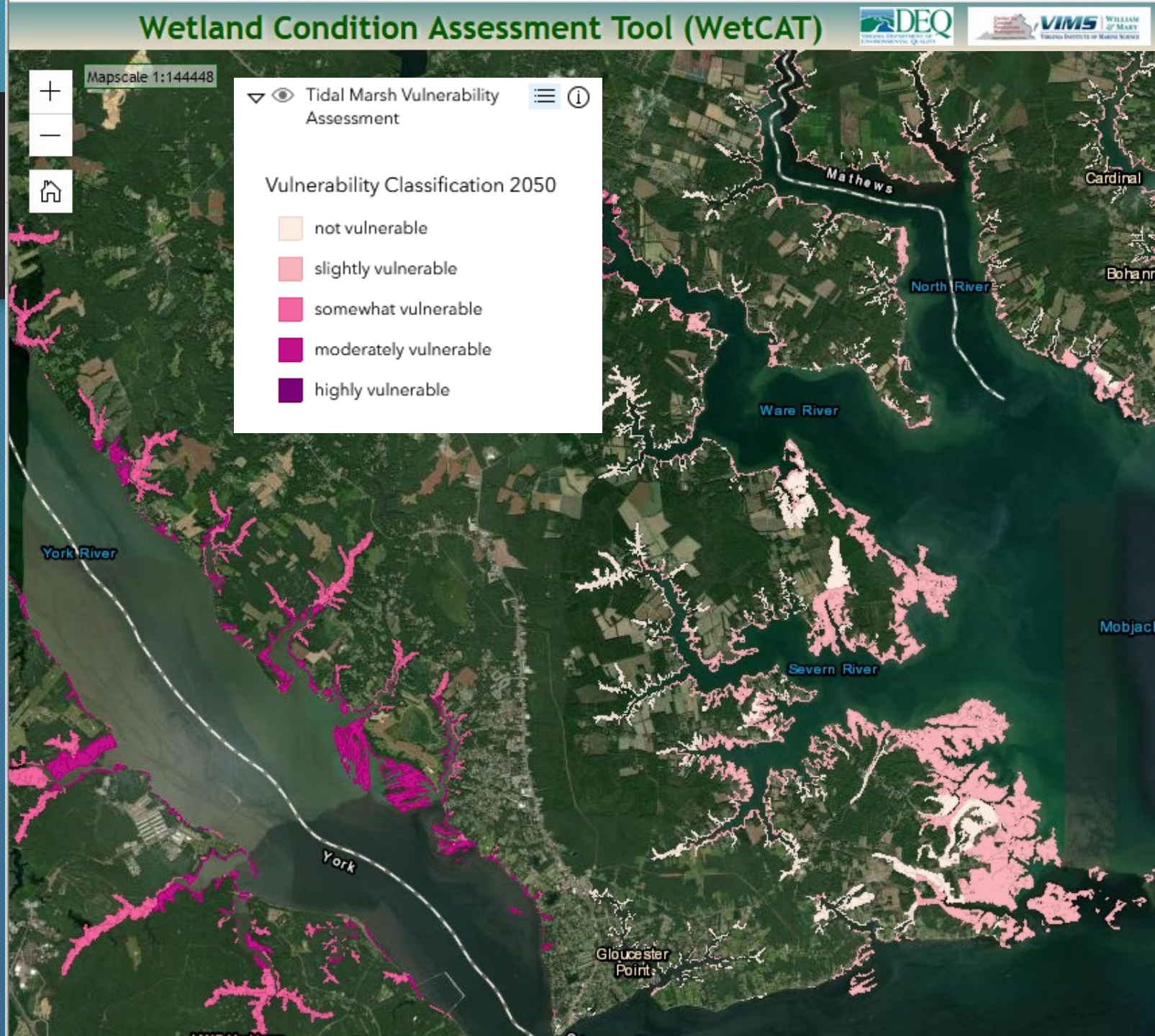
ADAPT VA

Evidence-based planning for changing climate

Tidal marshes

This project assess the vulnerability of tidal marshes to climate change for the time periods 2050 and 2100 throughout Virginia.

The vulnerability scores given to the marshes combine exposure, sensitivity and adaptive capacity of wetland habitats within tidally-connected wetland complexes.



Takeaway messages

- Flood risk is increasing in both coastal and inland Virginia
- We are already seeing impacts to infrastructure
- We anticipate impacts to increase rapidly (accelerating change), disrupting communities