

Rising Tides & Real Data

Community Science and
Nature-Based Climate Resilience



Photo: Skip Stiles



NASA Langley Alumni Association
August 11, 2026

MY BACKGROUND



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WETLANDS WATCH

Mission: To enhance natural resilience, bolster community adaptation efforts, and protect and restore wetlands throughout VA. We advance climate adaptation by working collaboratively with a wide variety of stakeholders, and by implementing solution-focused strategies that unify and connect.



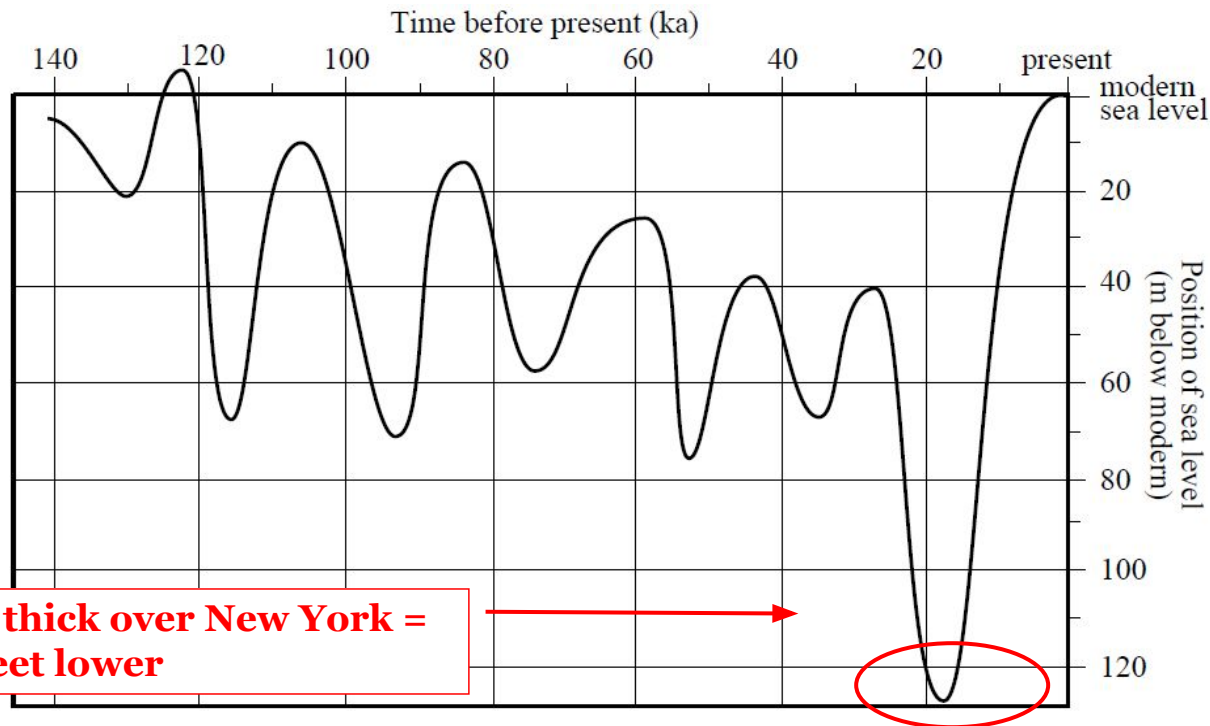
WETLANDS WATCH

Initiatives:

1. Wetlands & Public Policy
2. Communities
3. Neighborhoods
4. Living Infrastructure
5. Catch the King

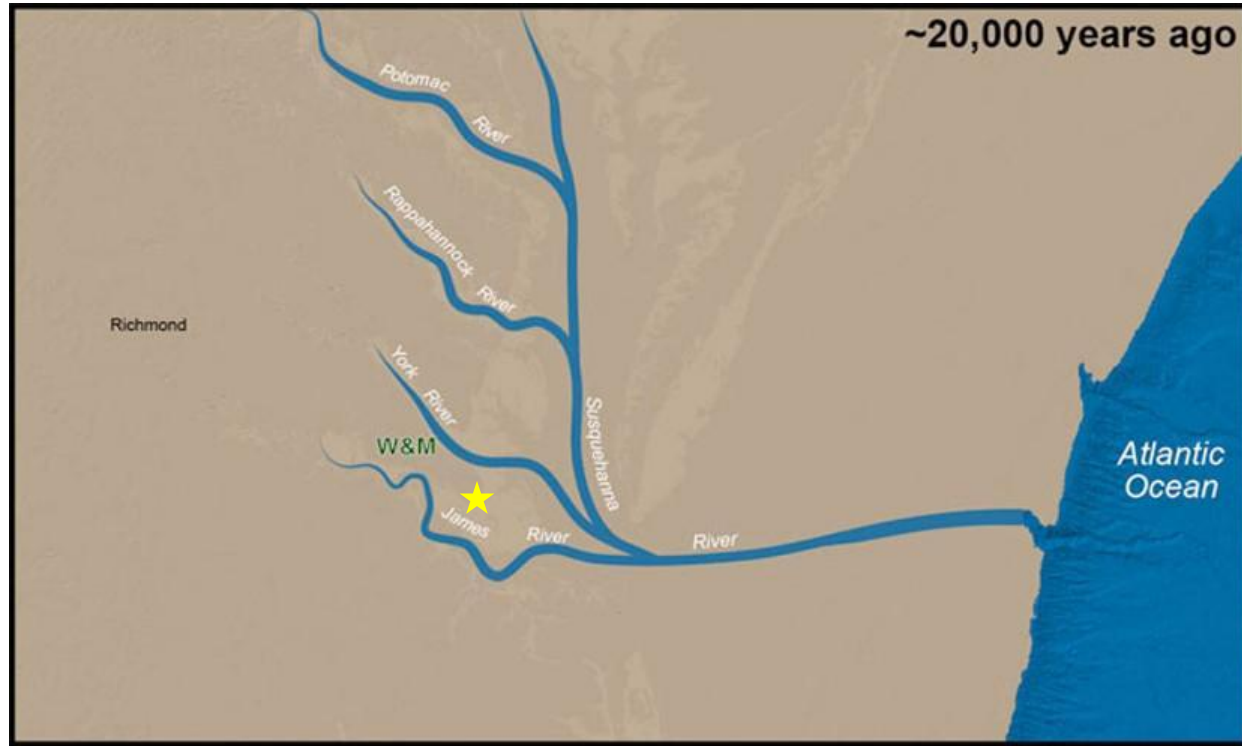


LAST BIG CHILL: 20,000 YEARS AGO



**Glaciers 1 mile thick over New York =
Sea level 360 feet lower**

LAST BIG CHILL: 20,000 YEARS AGO



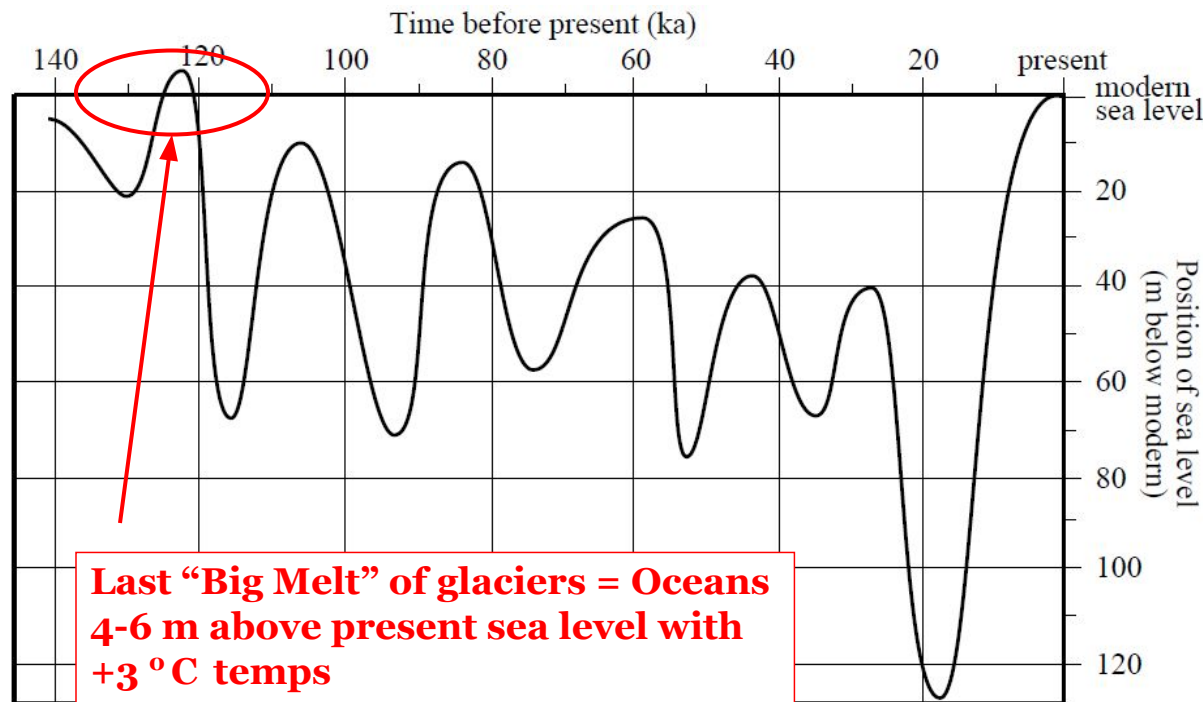
William and Mary

LAST BIG CHILL: ATLANTIC OCEAN

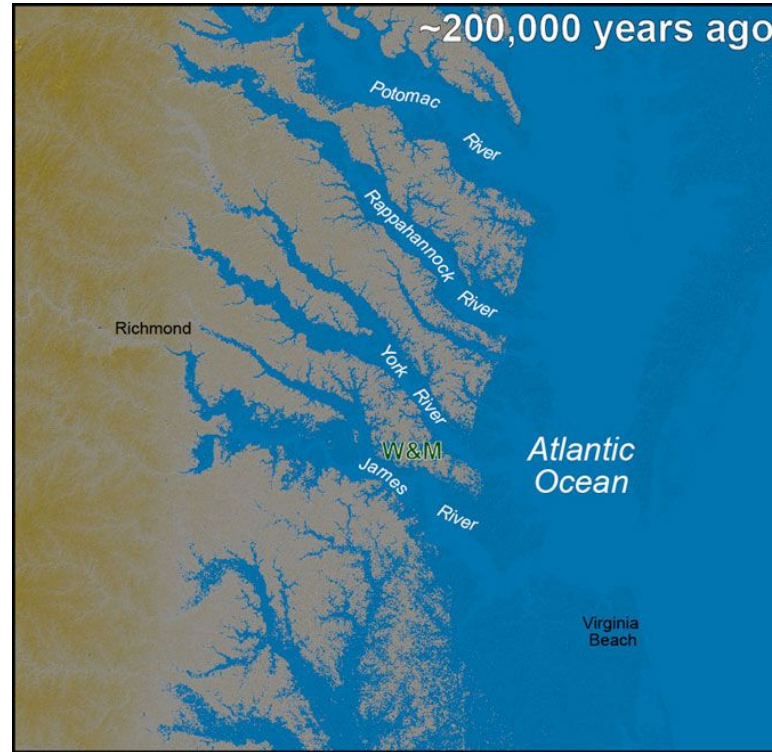


**- 120 Meters
(- 360 Feet)**

LAST BIG MELT: 120,000 YEARS AGO

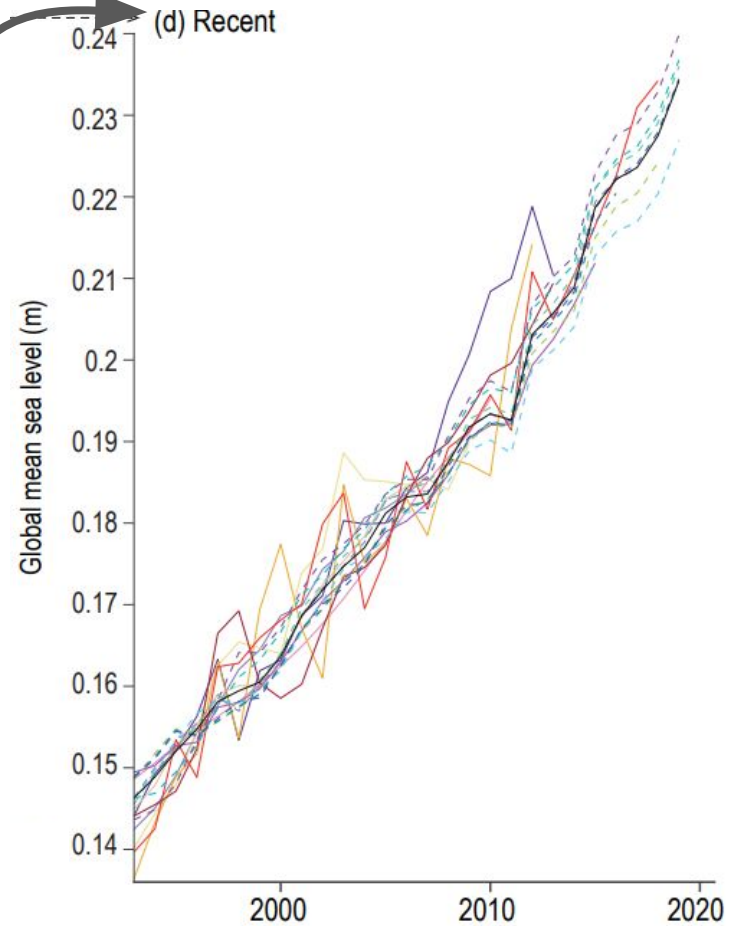
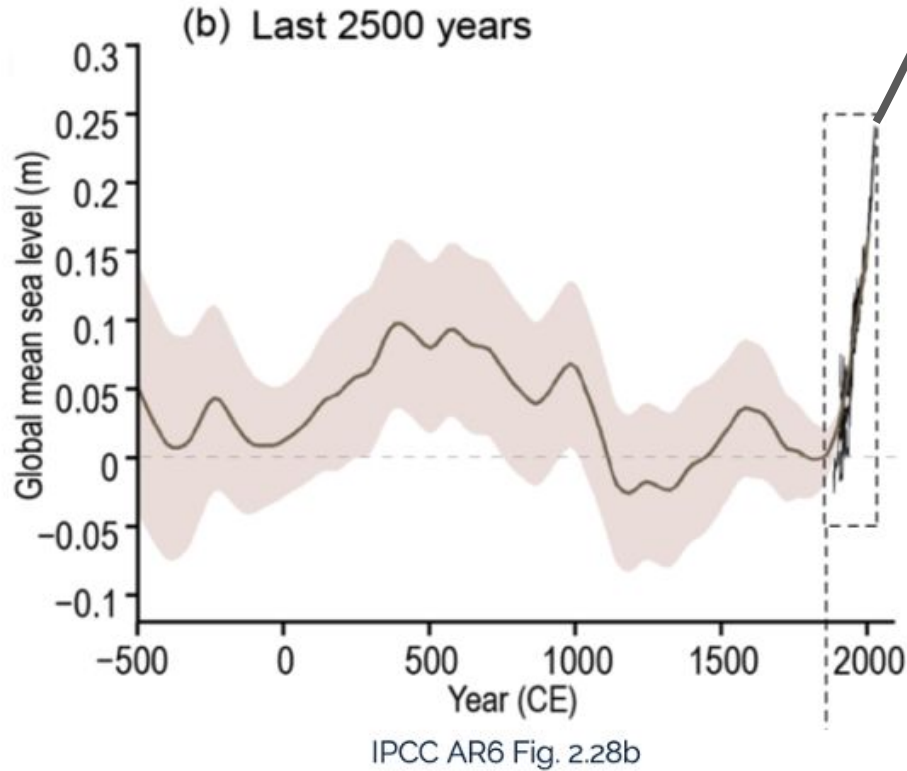


LAST BIG MELT: 120,000 YEARS AGO

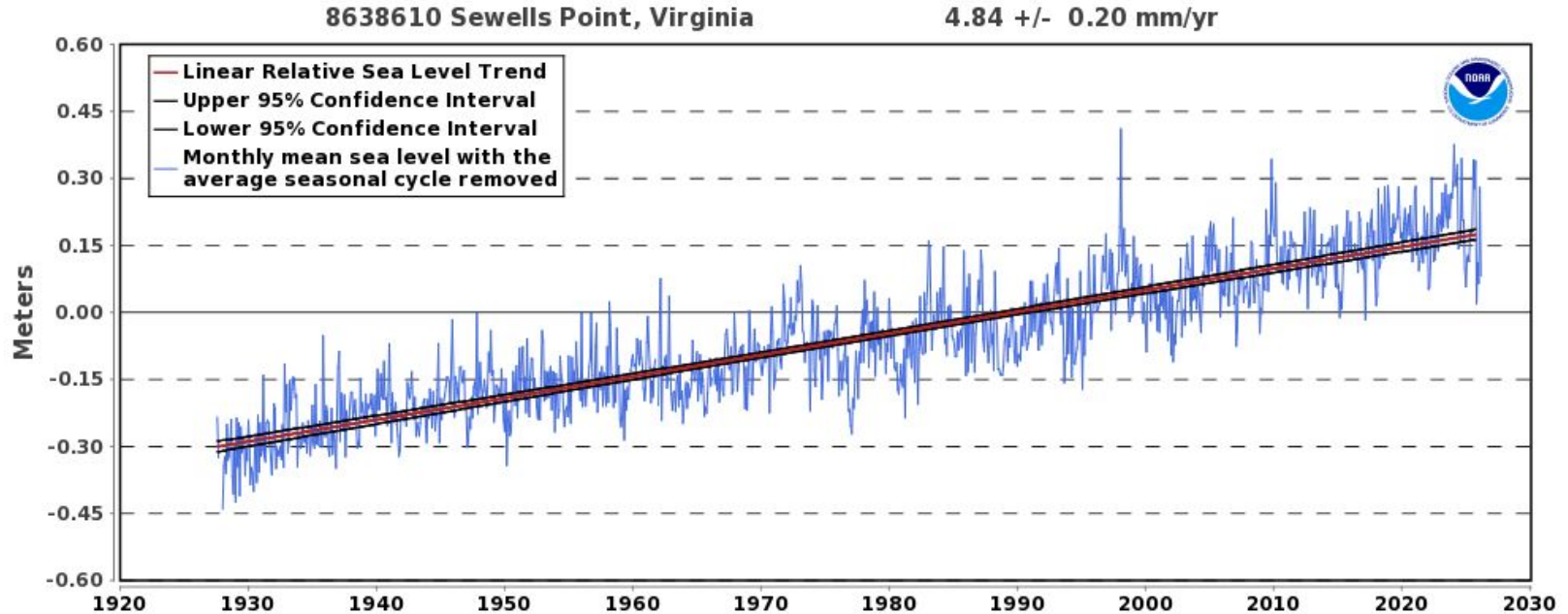


William and Mary

Abrupt sea level rise

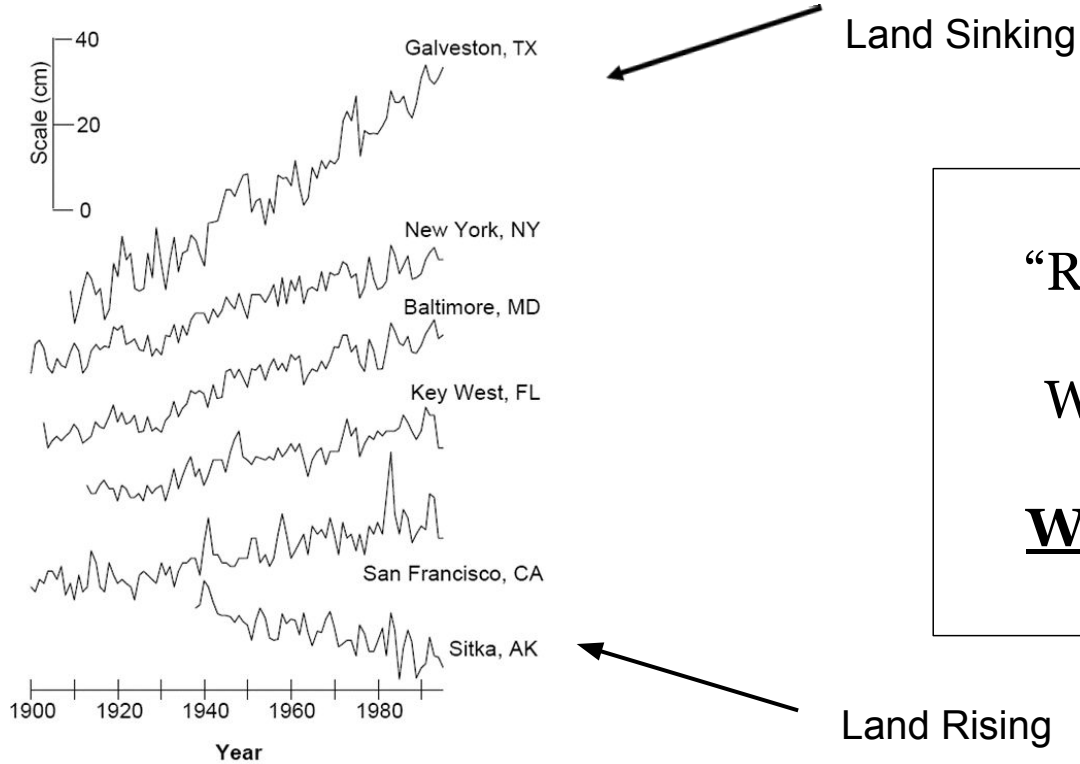


HISTORIC SEA LEVEL RISE: NORFOLK, VA



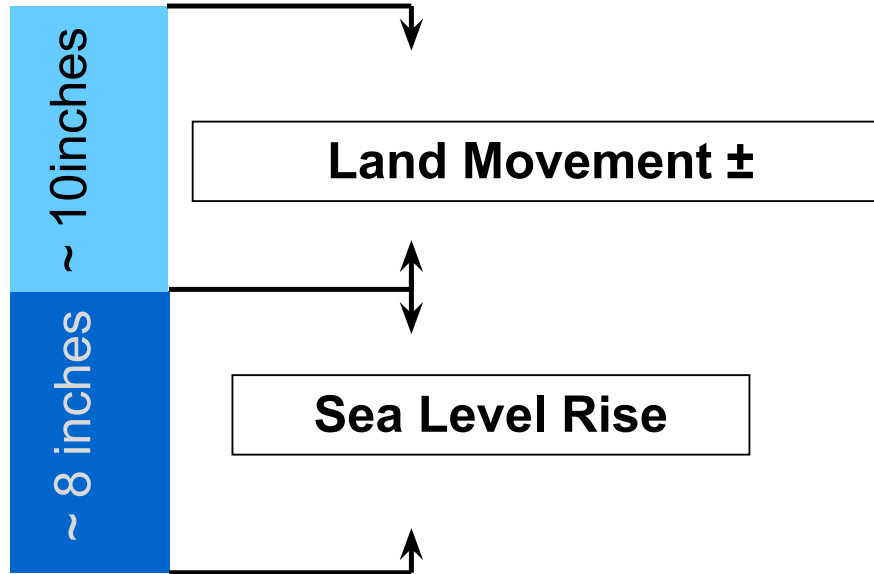
Mean sea level trend = 4.84 millimeters/year
1.59 feet/century = highest rate of *relative* SLR on Atlantic Coast

U.S. Sea Level Trends: 1900-97



“Relative Sea Level Rise” =
What’s the water doing +
What’s the land doing?

WHAT MAKES UP OUR RELATIVE SEA LEVEL RISE?

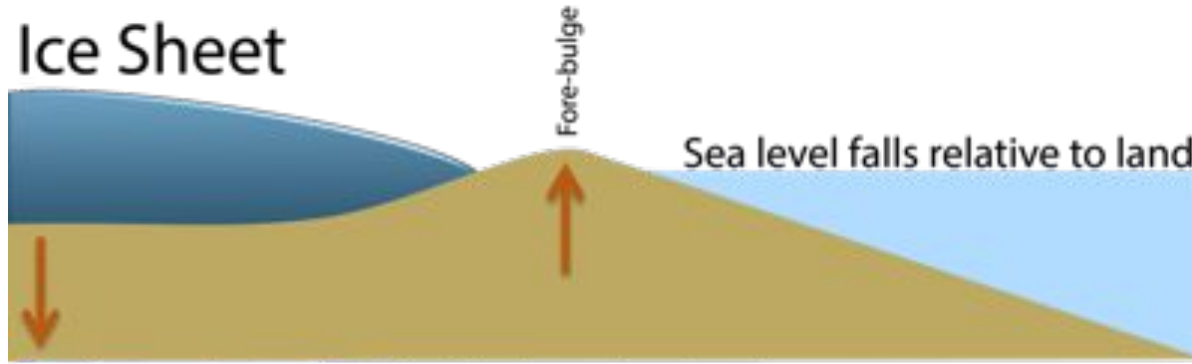


Isostatic Rebound – land is sinking after glaciers to north melted 20 thousand years ago

Groundwater Withdrawal – water table down 100-200 feet from pre-colonial times

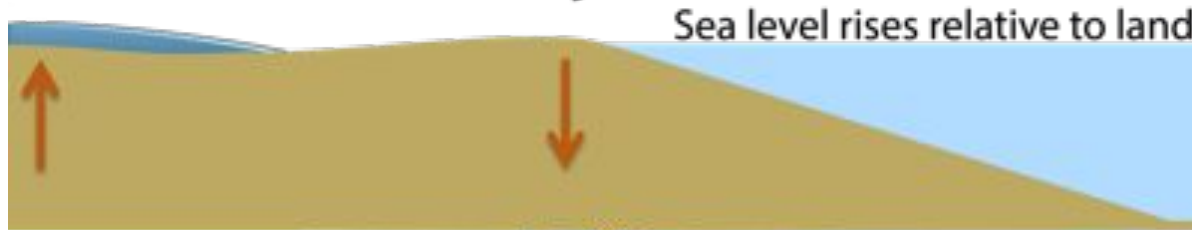
Meteor Crater in southern Chesapeake Bay

Ice Sheet



Ice mass depresses land below, displaces nearby land upward

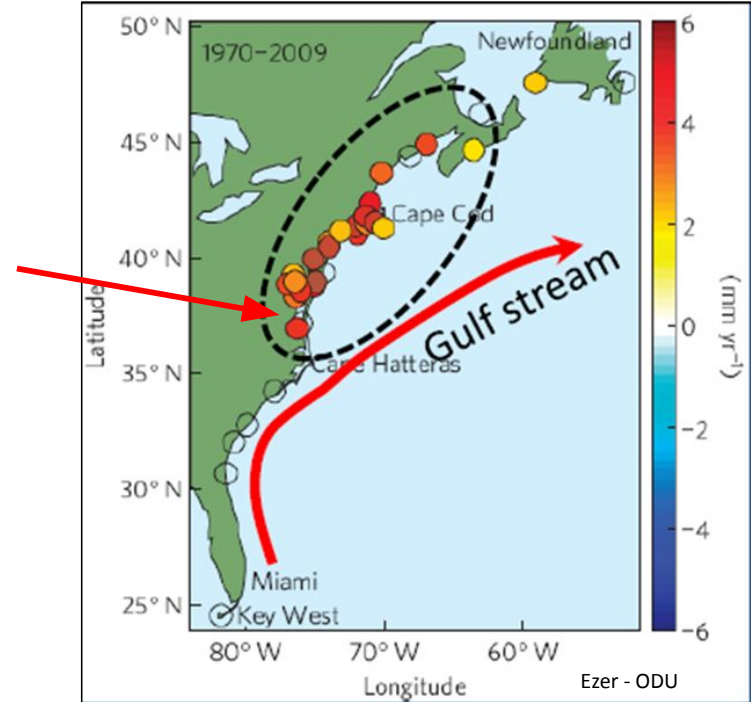
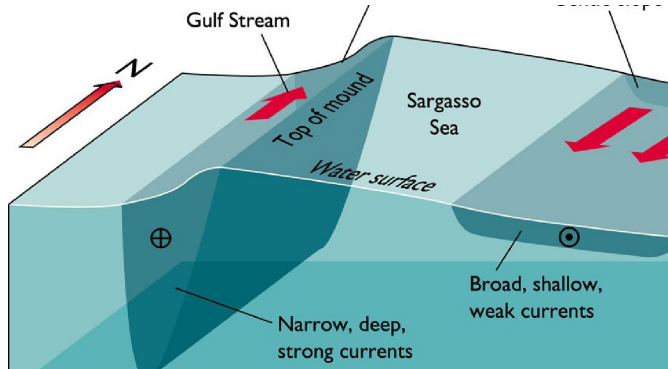
Glacial Isostatic Adjustment



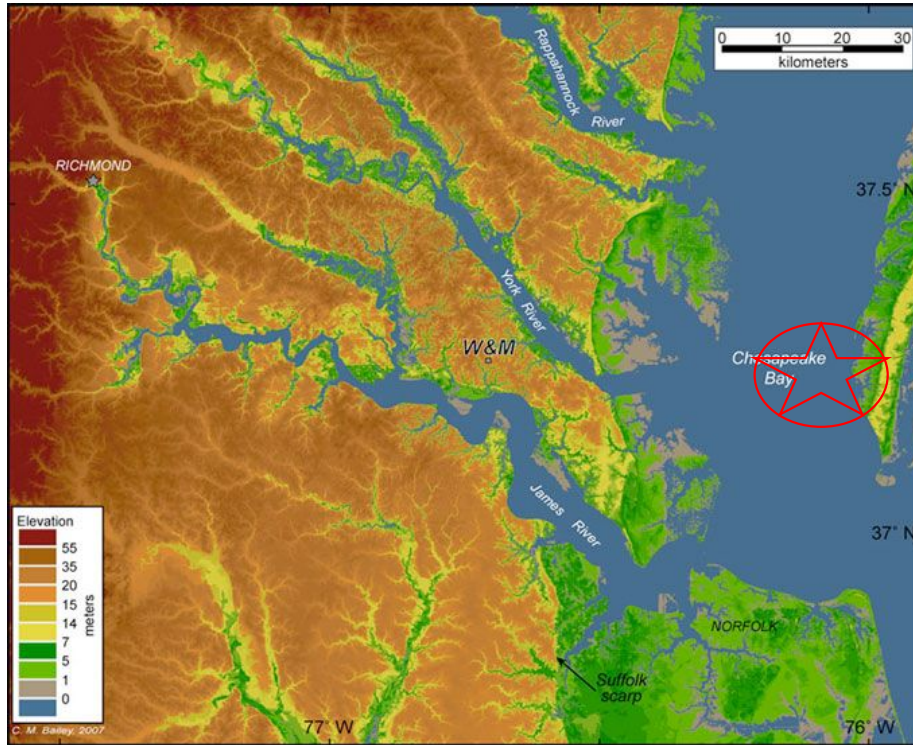
Land once beneath ice sheet rebounds, fore-bulge collapses

SLOWING GULF STREAM = MORE WATER

- Virginia, close to Gulf Stream, experiences higher water already
- Recently slowing Gulf Stream
- Slowing down → water spreads out pushing to us



SUFFOLK SCARP: FUTURE OCEANFRONT

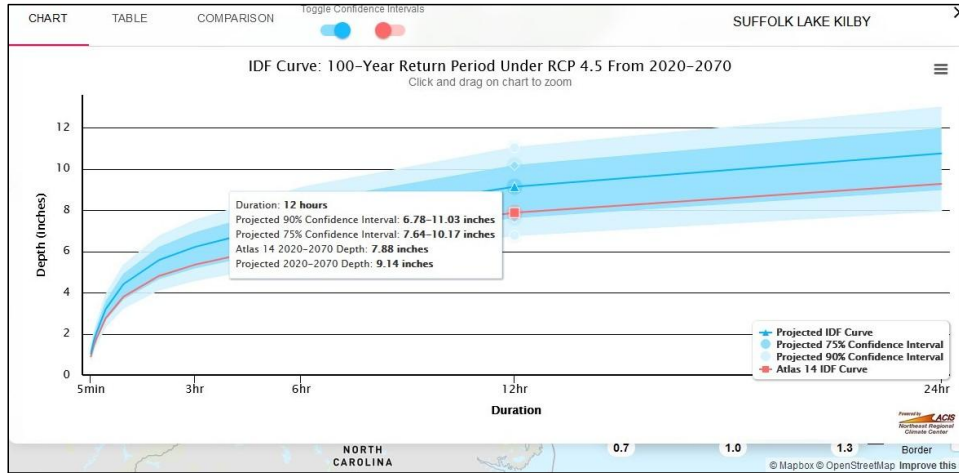


All land east of the
“Suffolk Scarp” is
at high risk

SE VA is shaped
by a meteor
strike ~56
million years ago

It's not just sea level rise....

RAINFALL INCREASING: ~18% SINCE 2006



Source:
MARISA

Norfolk, VA: August 4th, 2026

Norfolk hit by '1 in 100-year' rainfall event, officials say

Norfolk's Ghent neighborhood received more than 6 inches of rain in 2-3 hours.

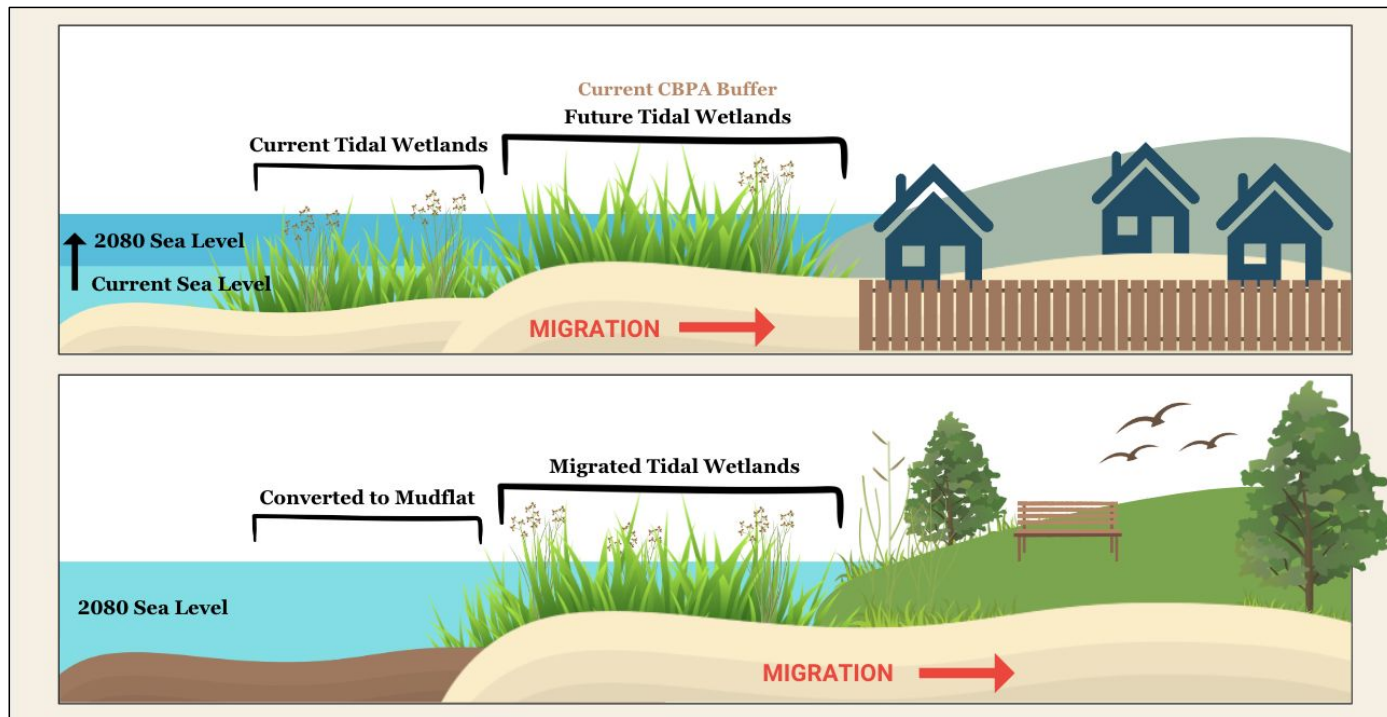


Cars are seen submerged in flood water on Greenway Court in Norfolk's West Ghent area on Tuesday. (John Buzbee/The Virginian-Pilot)

John Buzbee

What are the impacts of climate change today?

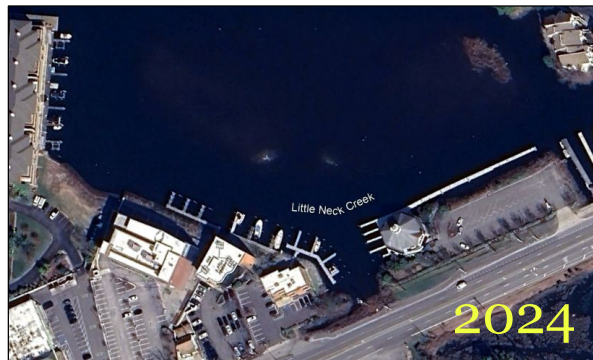
SHORELINE ECOSYSTEMS CHANGE UNDER SEA LEVEL RISE: ZONES SHIFT & HABITAT LOSS



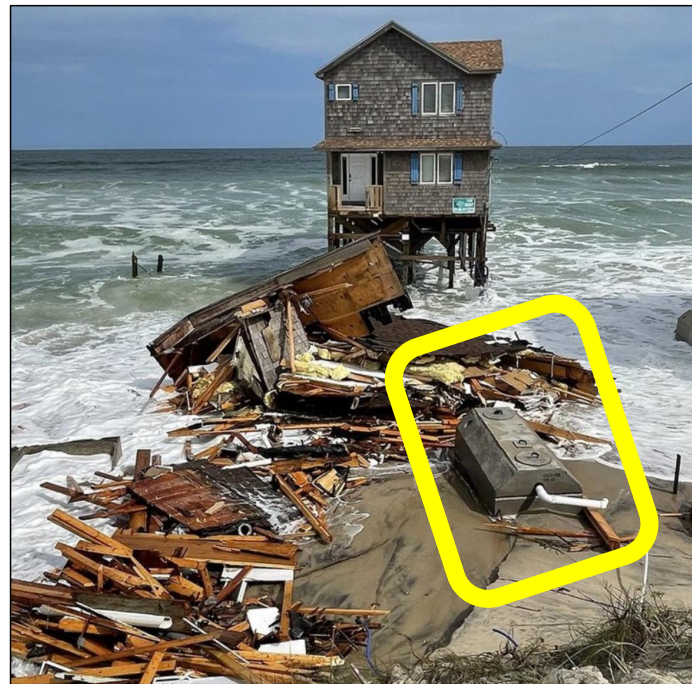
SEA LEVEL RISE = LAND CONVERSION (LOSS OF NATURAL RESOURCES)



NATURAL RESOURCE LOSS: WETLANDS DROWNING



HUMAN & ECOLOGICAL HEALTH IMPACTS



AVAILABLE / SAFE HOUSING IMPACTS



AVAILABLE / SAFE HOUSING IMPACTS



Photo: Red Cross Virginia

TRANSPORTATION SYSTEM IMPACTS



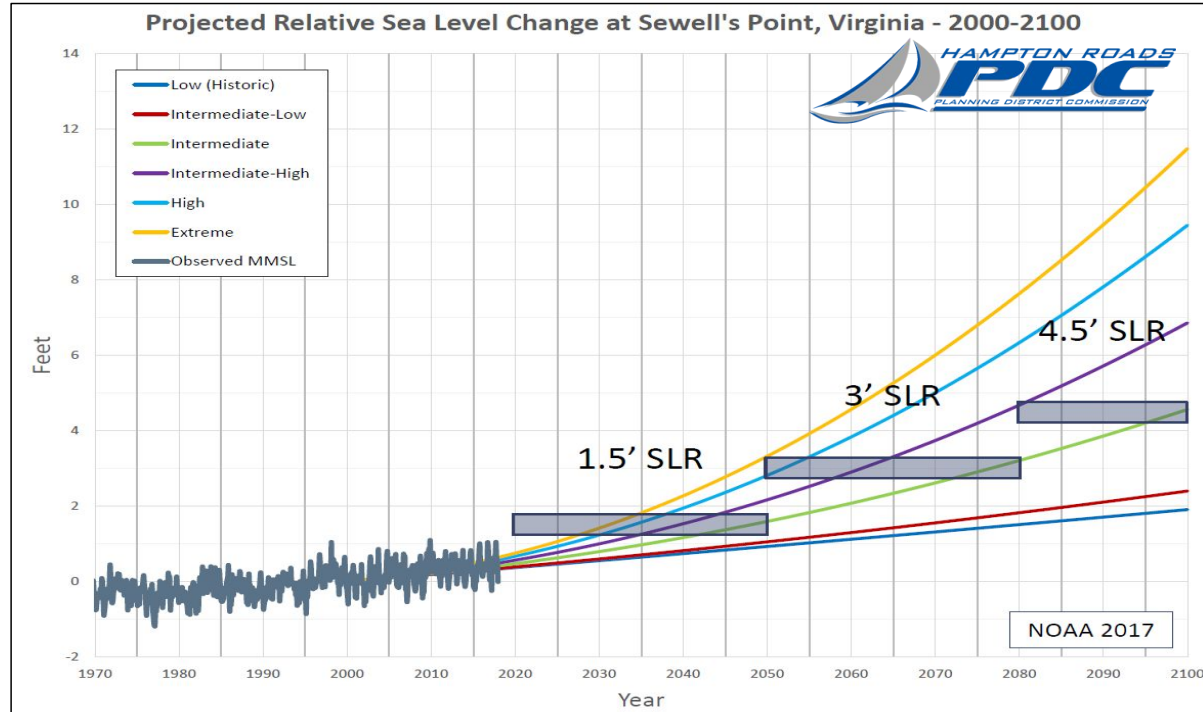
EDUCATION SYSTEM IMPACTS



Source: The Virginian-Pilot

What does future sea level rise look like?

GOVERNMENTS IN HAMPTON ROADS REGION ACTING TOGETHER



FLOOD EVENTS OF THE PAST ARE WORSE WITH SEA LEVEL RISE

Sewells Pt (SWPV2) Historical Crests (P.O.R= Jul 1927-Present)						
Rank	Ft./MLLW	Ft./MHHW	NAVD88	Date	LST/LDT	Event (blue denotes Tropical)
1	8.02	5.26	6.41	8/23/1933	10:00	Ches-Potomac Hurricane
2	7.89	5.13	6.28	9/18/2003	17:00	Hurricane Isabel
3	7.74	4.98	6.13	11/12/2009	18:30	Ida Remnants *(6)
4	7.55	4.79	5.94	8/27/2011	20:18	Hurricane Irene
5	7.22	4.46	5.61	3/7/1962	10:00	Ash Wednesday Nor'easter
6	6.81	4.05	5.20	10/29/2012	9:12	Hurricane Sandy
7	6.77	4.01	5.16	11/22/2006	10:06	Nor'easter
8	6.72	3.96	5.11	9/18/1936	10:00	Hurricane 13
9	6.60	3.84	4.99	2/5/1998	4:00	Nor'easter *(3)
10	6.53	3.77	4.92	10/7/2006	9:30	Onshore Winds
11	6.50	3.74	4.89	10/4/2015	15:24	Hurricane Joaquin (offshore) *(2)
12	6.41	3.65	4.80	4/27/1978	0:01	
13	6.32	3.56	4.71	4/11/1956	22:00	
14	6.28	3.52	4.67	1/3/2022	10:18	Nor'easter
15	6.18	3.42	4.57	12/19/2009	11:30	Nor'easter
Purple Shading indicates "MAJOR" Flooding Red Shading indicates "MODERATE" Flooding						
*(number) in event column denotes multiple tides hit at least Moderate flood thresholds All Water Levels use Verified 6-min data when available						

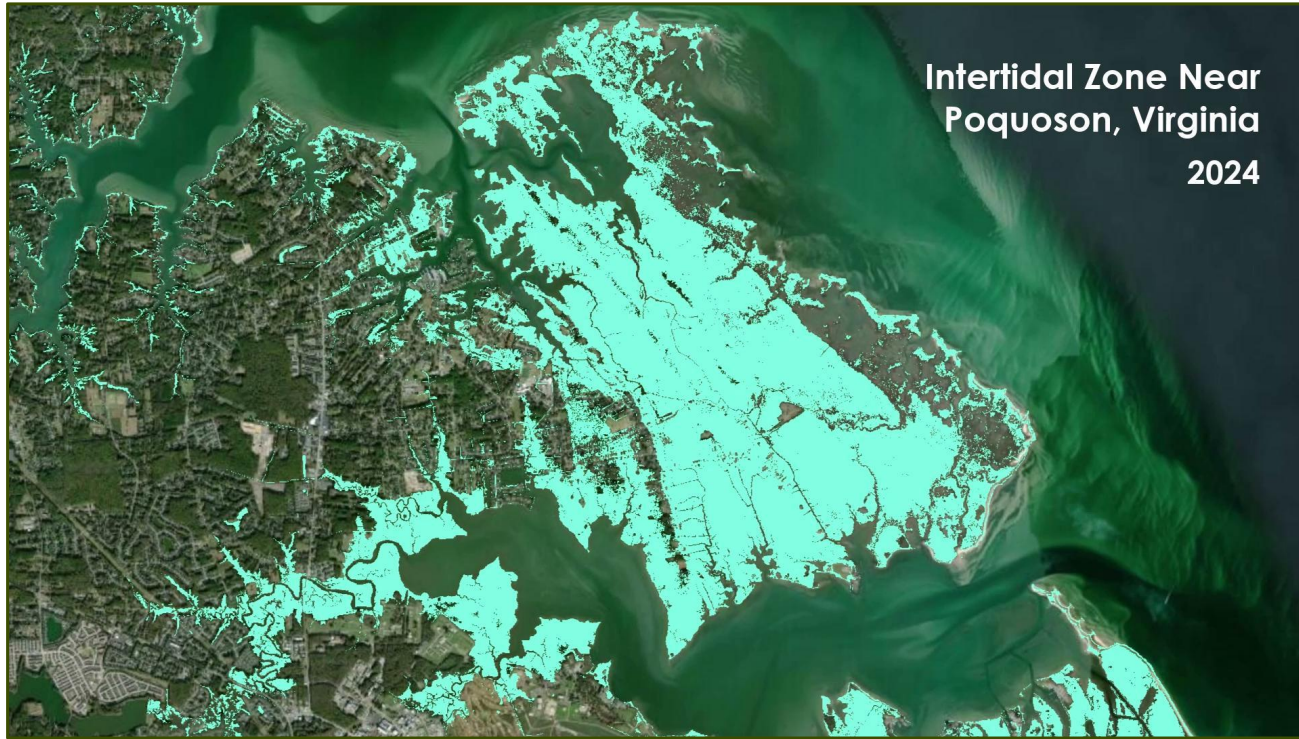
**+2 feet by
2050-2060**

OCTOBER 2025 NOR'EASTER - TOP 15 STORM

ADD 2 FEET OF SEA LEVEL RISE IN 2060!!

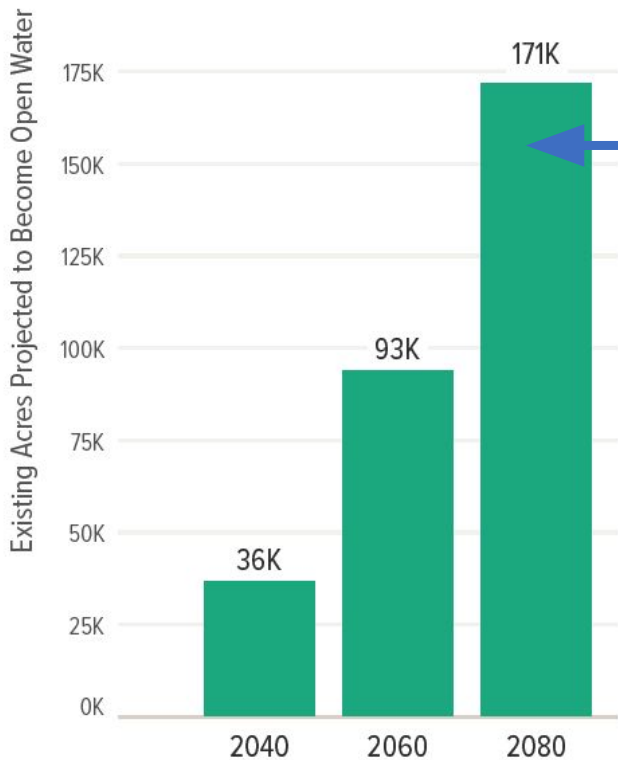


LAND CONVERSION / SHORELINES CHANGE



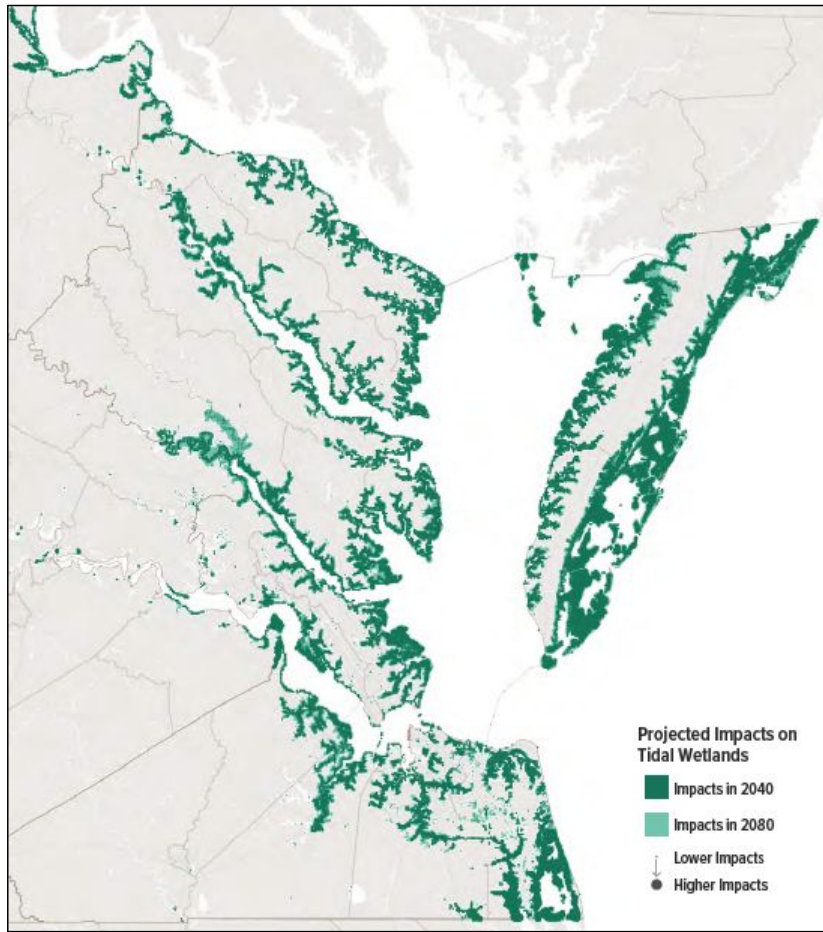
Tidal Wetland Habitat Loss

Relative to habitat in 2020



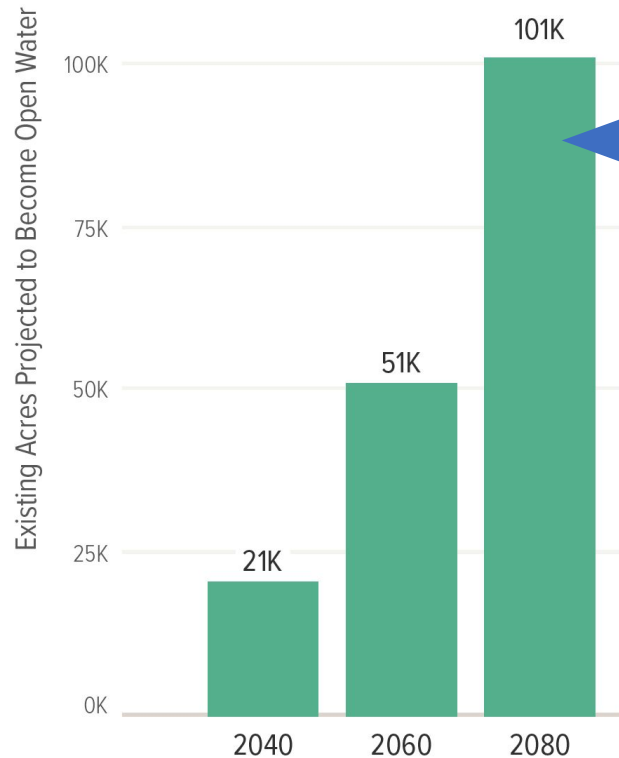
**89%
loss
in
2080**

Source: VA Coastal
Resilience Master
Plan



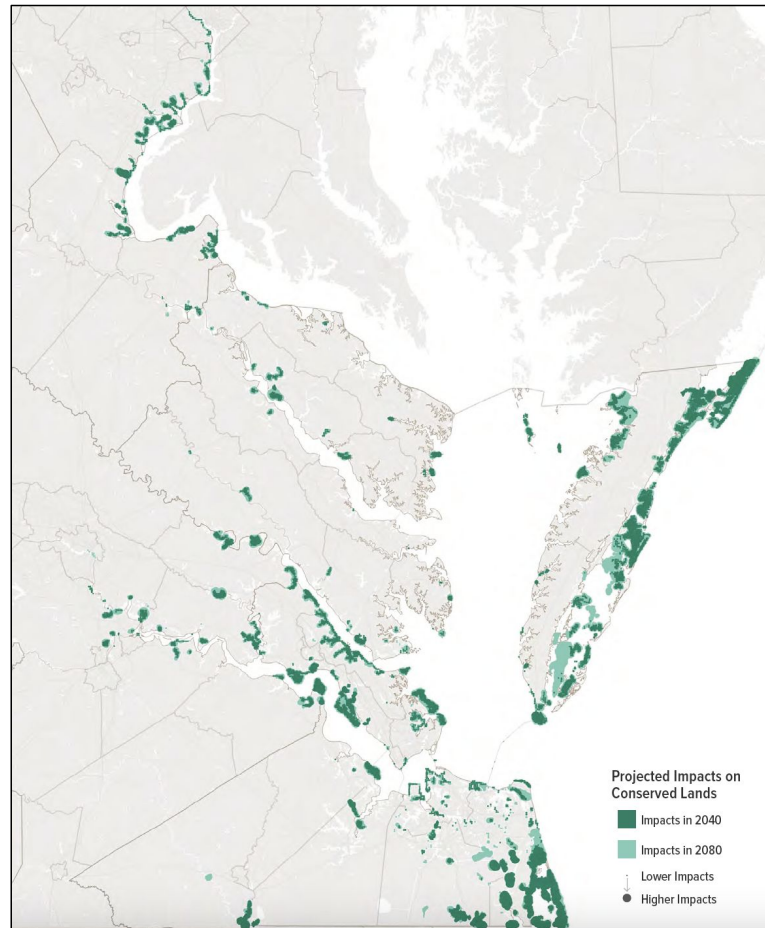
Upland Habitat Loss

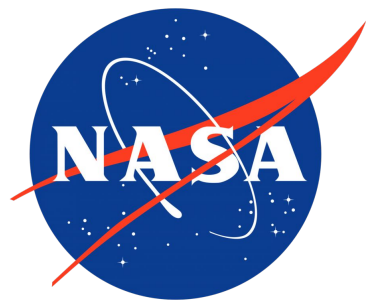
Relative to habitat in 2020



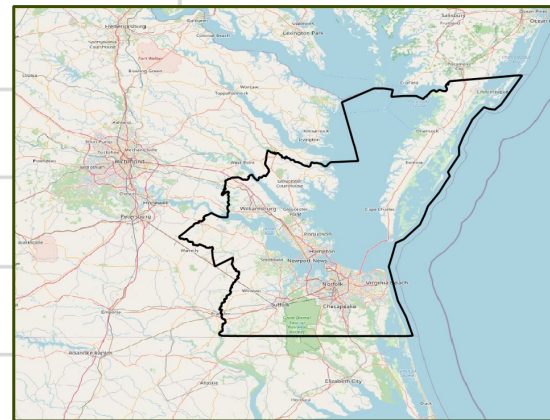
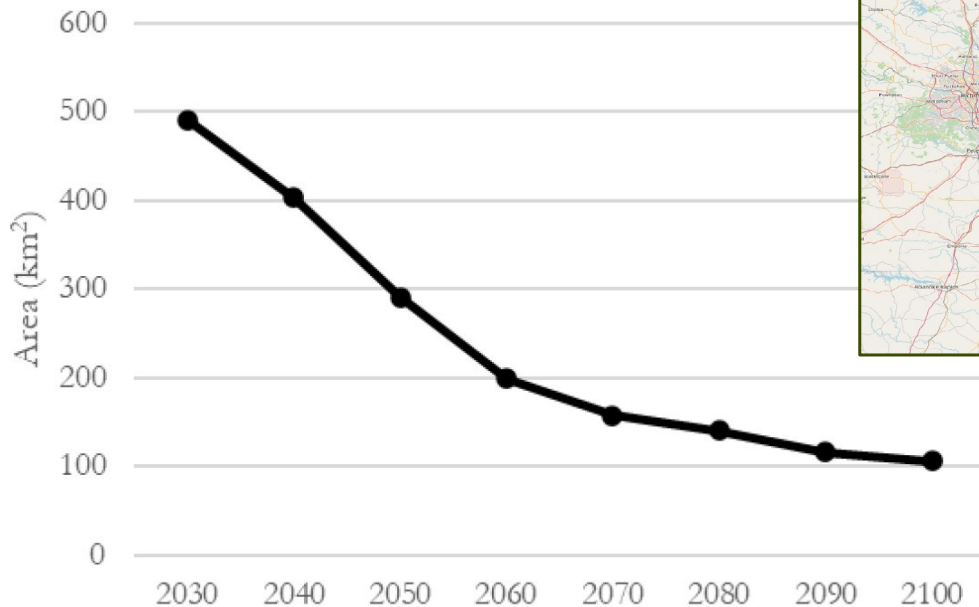
**51%
loss
in
2080**

Source: VA Coastal
Resilience Master
Plan





Forecasted Decline in Wetlands Extent



1 KM =
247 acres

Source: NASA Develop

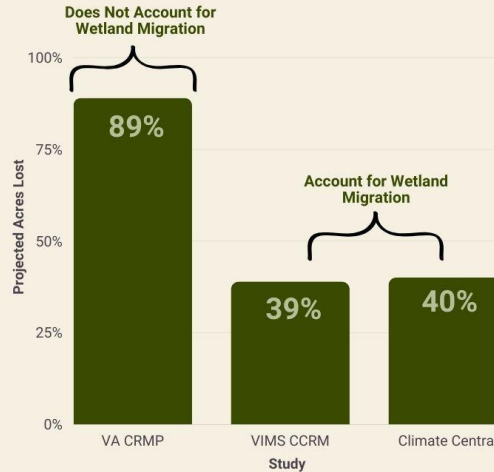
WETLANDS LOSS: ALL ABOUT MIGRATION

The Variability in VA Wetlands Loss Projections by 2080

Recent studies paint an alarming picture of tidal wetland survivability as sea levels rise. Decision-makers have important conservation choices to make as we face the inevitable -- but which projection is best to use?

Data Variability

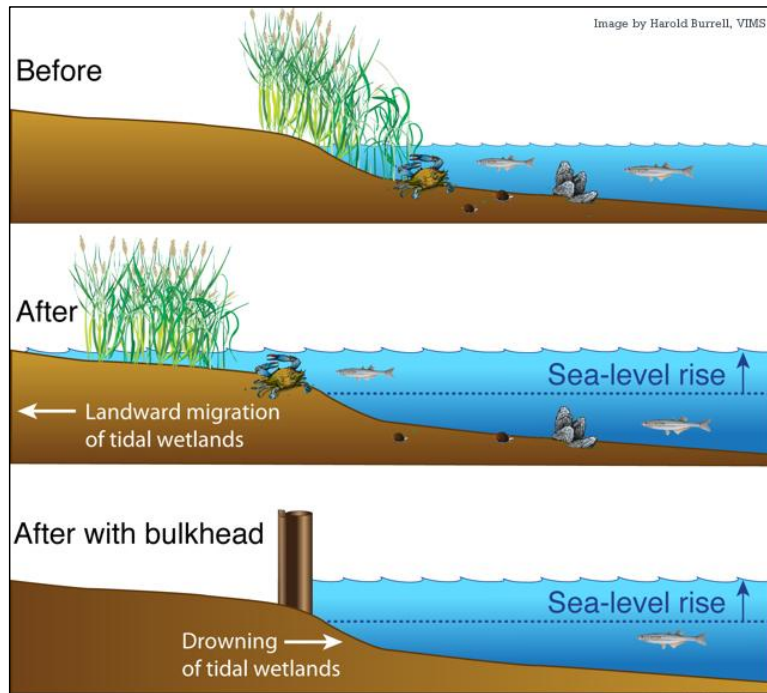
A key difference between the Virginia Coastal Resilience Master Plan (VA CRMP), research from the Virginia Institute of Marine Science, and Climate Central is the consideration of marsh migration. As sea levels rise, tidal wetland plants can move landward on favorable slopes to escape high water -- but only if the built environment does not stand in the way.



**Getting
to 40%
is the
focus**

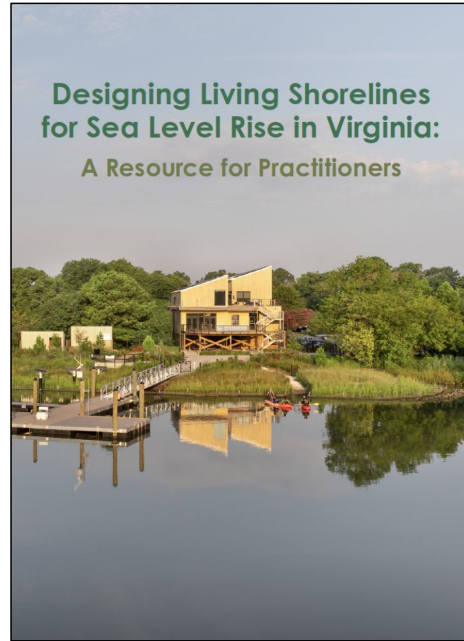


WETLANDS MIGRATION HAPPENS WITHOUT LAND BARRIERS (BULKHEADS) & STEEP SLOPES



**So, what are we (yes, you too)
gonna do about it?**

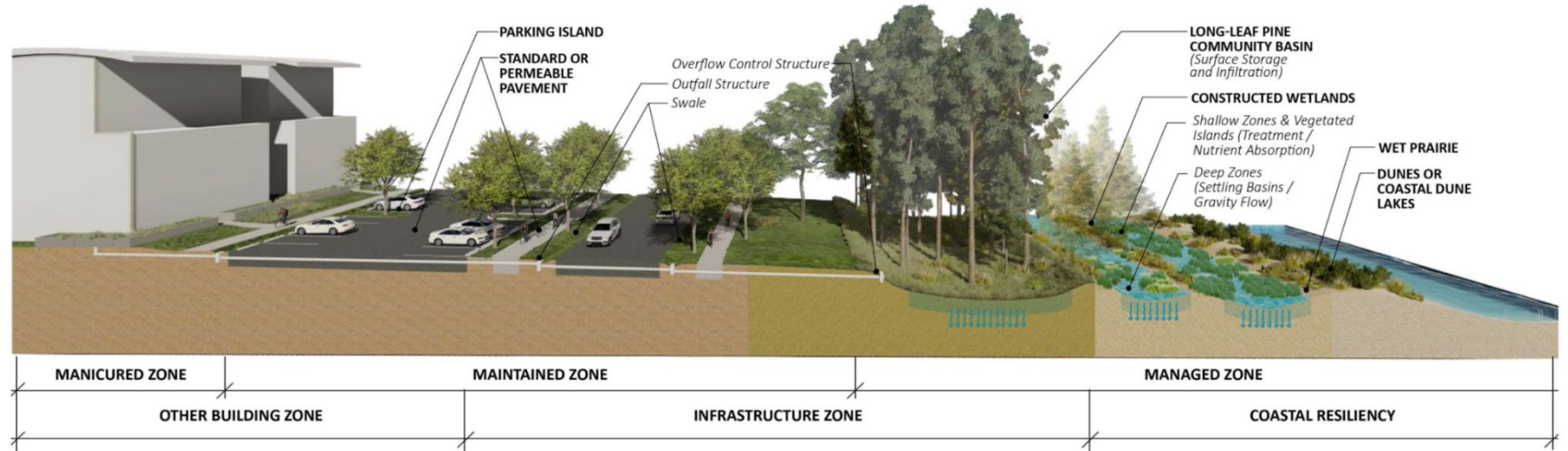
INSTALL LIVING SHORELINES ON YOUR PROPERTY OR HELP BUILD THEM



USE GREEN INFRASTRUCTURE

More rain and tidal flooding → more green infrastructure needed

Exhibit C04-1. Stormwater Treatment Train



JOIN THE GREEN INFRASTRUCTURE WORKFORCE



The power of partnership!



Level 1 Training & Certification

Baseline credential: focus on design, installation, maintenance of stormwater practices and sustainable landscapes and exam

Level 2 Certification Design and/or Install

Intensive Seminar, Assessment and Exam



1 Day Outside Training for Maintenance Crews

Hosted by Local Govt/Facilities Partners



3-Day Riparian Buffers Training for Pros &

Virginia Department of Corrections (State Farm)



Living Shorelines Professional Development Workshop and Certificate Series

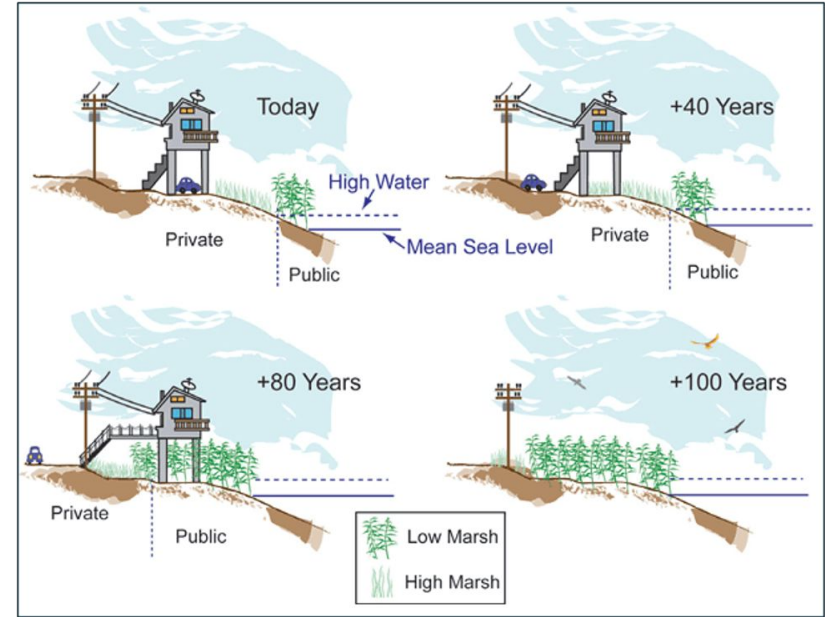
MD and VA 2025



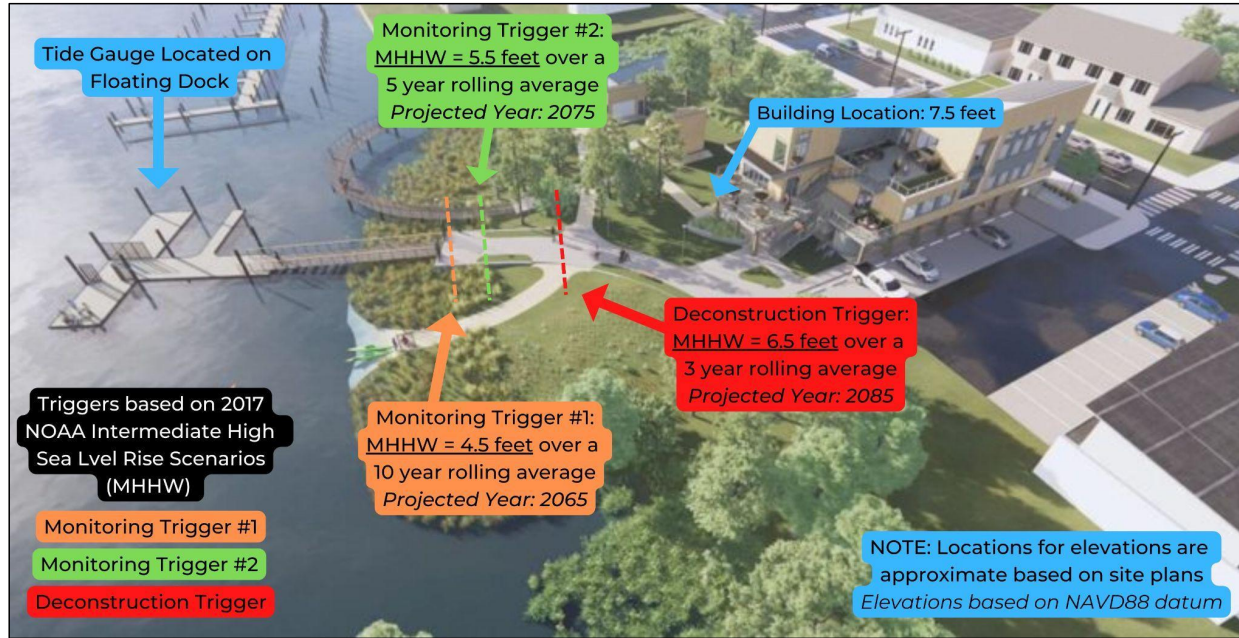
Youth Green Jobs Pathways

VA Board of Education Approved for High Schools as an Industry Credential

SUPPORT SHORELINE CHANGES WITH CHANGING POLICIES AND LAWS



SUPPORT INNOVATION THAT'S A LITTLE (OR A LOT) SCARY

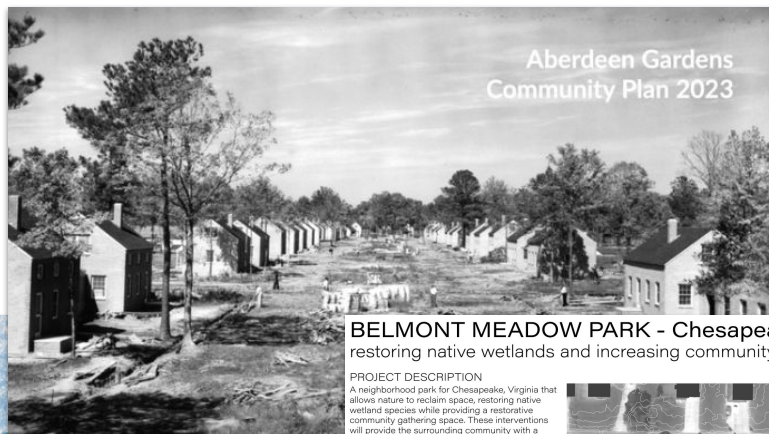
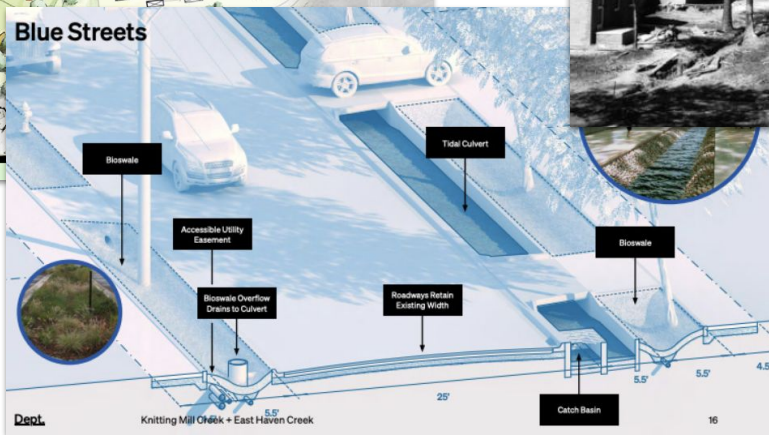


*First in nation
“rolling
conservation
easement”*

HELP COMMUNITIES ADAPT TO CHANGE → PARTICIPATE IN LOCAL GOVERNMENT



WETLANDS
WATCH



PROJECT DESCRIPTION
A neighborhood park for Chesapeake, Virginia that allows nature to reclaim space, restoring native wetland species while providing a restorative community gathering space. These interventions will provide the surrounding community with a relaxing space of recreation while highlighting the aspect of minimal future site maintenance.

CONCEPT DIAGRAM



PARTICIPATE IN COMMUNITY SCIENCE

- Guinness World Record-holding community science program!
- Since 2017, ~2,300 volunteers have been mapping tides and flooding in Virginia during king tide season.
- Uses Sea Level Rise app designed to equip individuals with tools to report & trace flooding in their neighborhoods .
- Mapping data contributes to VIMS flood modeling and sea level rise predictions.
- Volunteers span from Alexandria to Virginia Beach and the Eastern Shore. All ages!





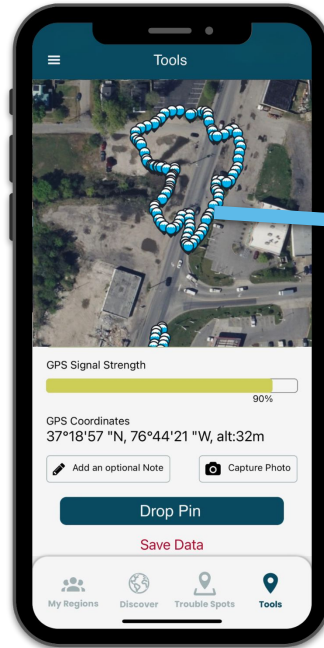
Glimpse Into Volunteer Experience

- Volunteers map during peak high tide (~2 hour window) on the predicted days.
- They capture street-level flooding impacts in real-time seen in their community.
- Take photos of flood impacts to build and natural infrastructure.
- Form teams and share flood experiences in their neighborhood.
- Learn about climate change impacts & become part of the solution!



Sea Level Rise App Data

Each data point corresponds to time-stamped coordinates and accuracy information.



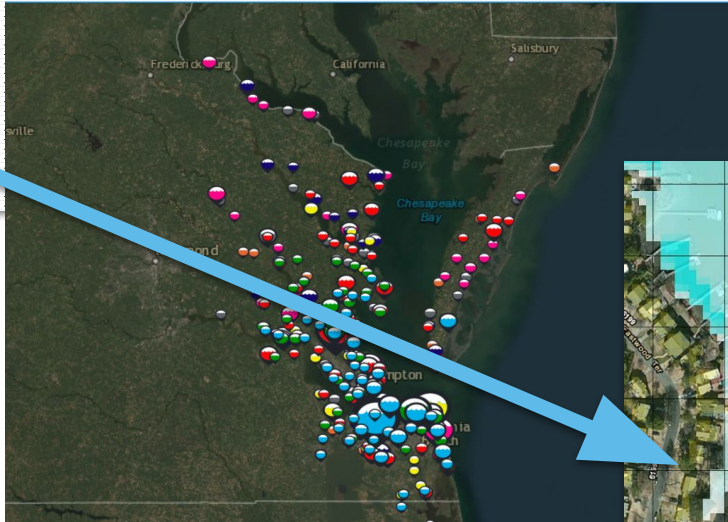
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From Sea Level Rise App Data → VIMS



CTK 2017-2025 Comparison

1	A	B	C	D	E
1	ID	Profile	Profile	Created	Latitude
1174	362519	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94043800000000
1175	362520	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94043700000000
1176	362521	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94042250000000
1177	362522	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94040100000000
1178	362523	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94039900000000
1179	362524	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94035450000000
1180	362525	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94034160000000
1181	362526	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94030000000000
1182	362527	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94029140000000
1183	362528	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94028570000000
1184	362529	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94024520000000
1185	362530	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94022040000000
1186	362531	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94021550000000
1187	362532	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94018850000000
1188	362533	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94018950000000
1189	362534	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94017000000000
1190	362535	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94016500000000
1191	362536	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94014000000000
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1193	362538	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94009000000000
1194	362539	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94008500000000
1195	362542	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94007400000000
1196	362543	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94005130000000
1197	362544	17332	CTK 2024 Norfolk	2024-10-17 11:18	36.94003950000000



WILLIAM
& MARY



Batten School of Coastal & Marine Sciences



Validating accuracy of
VIMS' predictive
models:



≈2.27 in.



≈23.6 ft.

Data Use Case Study: Evaluating Recent Resilience Solutions

Two new 4 ft. (above NAVD88) berms were deployed as flooding resiliency measures along the Lafayette River in Norfolk's Larchmont and Edgewater neighborhoods.

Impacts were estimated by VIMS' Tidewatch and street-level hydrodynamic models.

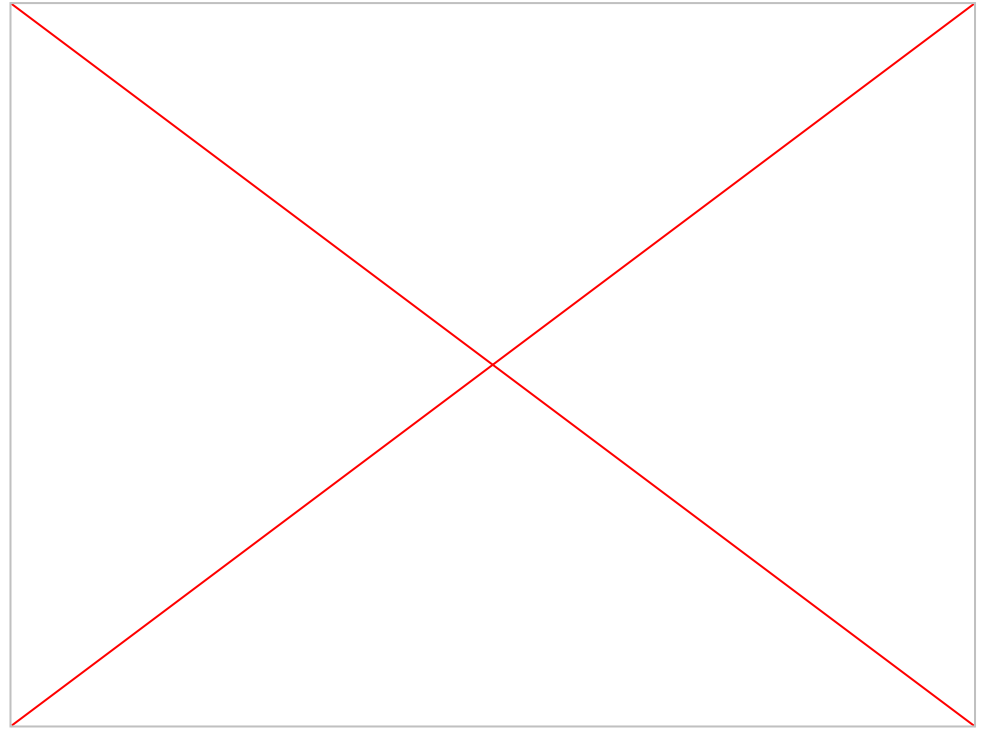


Drone Images Captured on Sept. 11, 2025 @ 12:30 PM EDT

Data Use Case Study: Evaluating Recent Resilience Solutions

Flood verification conducted via orthocertified drone imagery using Drone2Map and CTK/SLR App data.

At Sylvan St & Walnut Hill (cost $\approx$ \$800,000), the new 4ft berm typically prevents 784.18 m³ (27,693.40 ft³) of tidal flood water inundation.



 : Drone Video Captured on October 12, 2025 @ 3:00 PM EDT
at Bouch's Bluff at Sylvan St. & Walnut Hill in Norfolk, VA

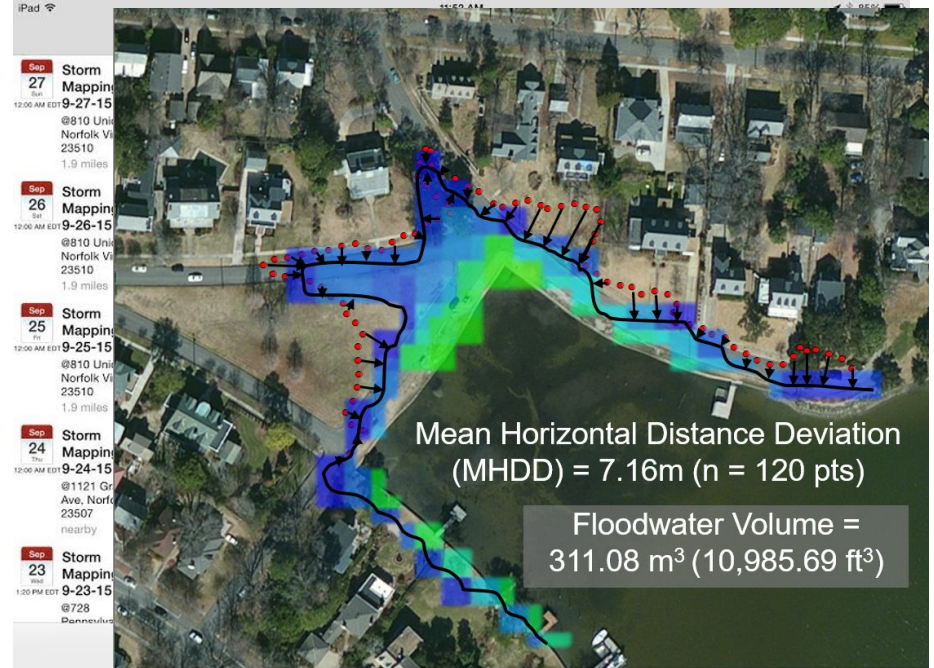
Data Use Case Study: Evaluating Recent Resilience Solutions

Cambridge Dog Park @ Cambridge Pl. & Carroll Pl.

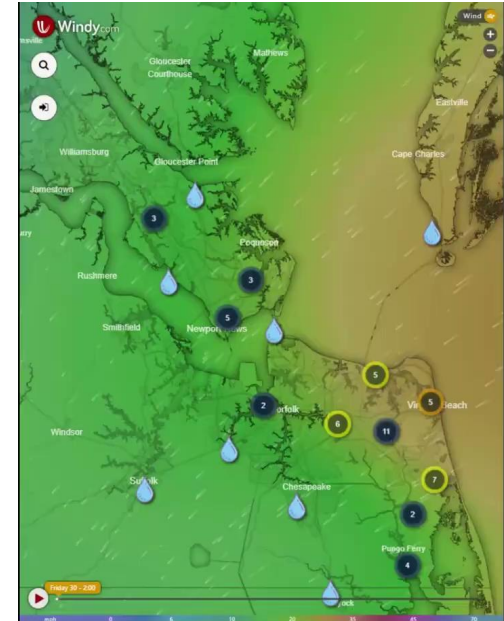
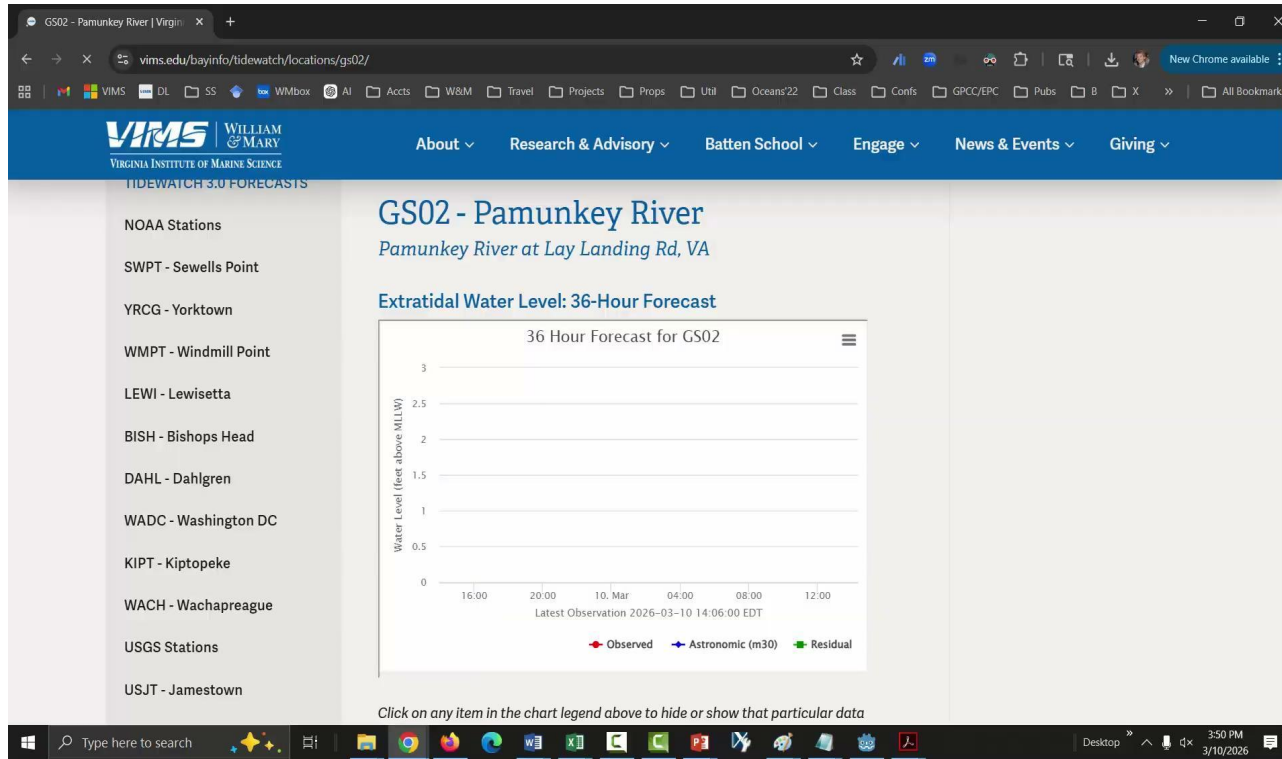
These resilience measures would have prevented 398 high tide flooding event in the past decade (if implemented in 2016)!

Exceeded only by:

- 2016 Hurricane Hermine
- 2016 Hurricane Matthew
- 2019 Hurricane Dorian, &
- 2025 Oct. King Tide+NE'



Tide Gauge Locations: VIMS



Siting new automated StormSense tide gauges & Tidewatch 36-hr. Forecasts

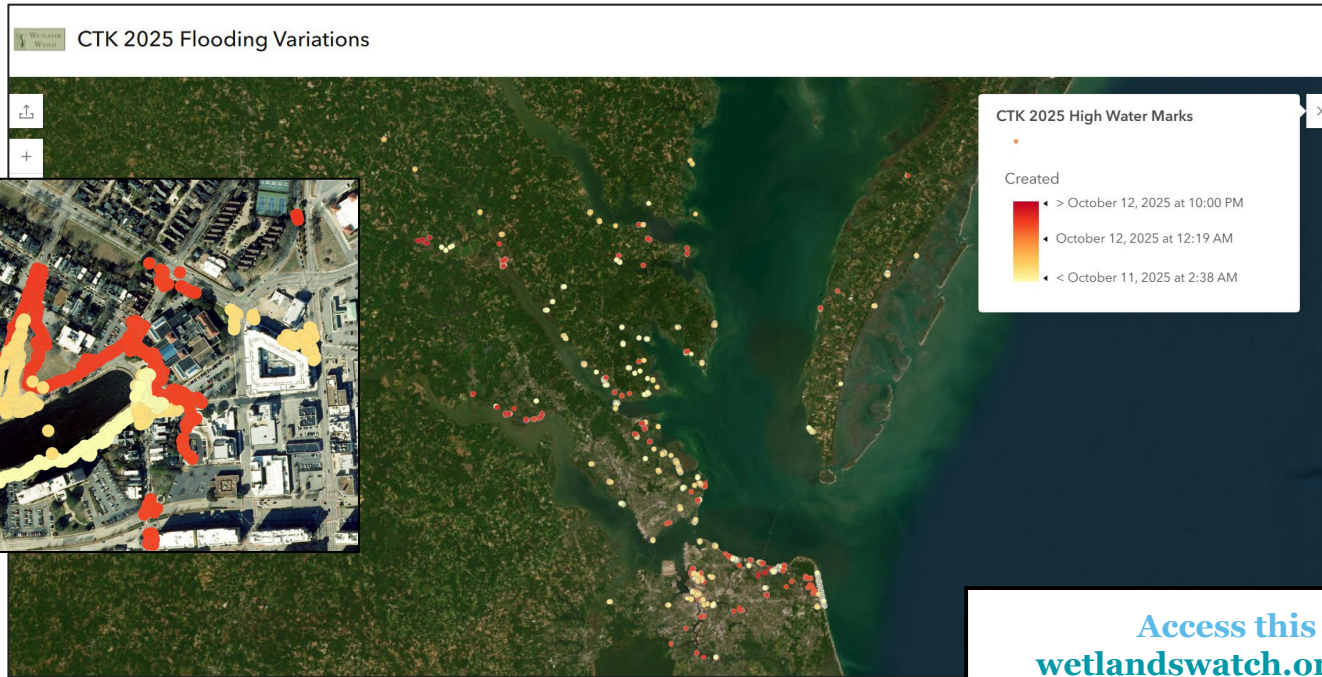


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Flood Sensor Location Validation: HRPDC



2025 Flooding Variations



Access this map at
wetlandswatch.org/ctk-results

In 2026...

- Continuing partnership with Old Dominion University's Measure the Muck project (sample collection in Sept and Oct).
- Expanded collaborations: ERP, LRNow (litter clean ups!), York River Steward, VA Sea Grant, WHRO
- 4 mapping opportunities - with goal of MOST during Oct 9-11

Scan this QR code to
sign up for 2026!



Catch the King 2026

A World Record-Holding Community Science Program
mapping tides and flooding during Virginia's fall king
tide season using our **Sea Level Rise phone app**

Volunteers Needed October 9-11, 2026

in areas that flood near you



Scan the QR code or visit to
sign up for both events:

wetlandswatch.org/catchtheking

*The Sea Level Rise app currently requires
cellular service or Wi-Fi for mapping.



The Blocker Foundation



Bartlett School of Coastal & Marine Sciences



SCAN
TO CONNECT



wetlandswatch.org

Thank You!

Stephanie Letourneau

Community Science & Outreach Staff

Catch The King Coordinator

s.letourneau@wetlandswatch.org

catchtheking@wetlandswatch.org

Support Our Mission:



HISTORICAL SEA LEVEL CHANGES

