

Virginia Coastal Resilience Technical Advisory Committee

Research, Data and Innovation Quarterly Subcommittee Meeting

Date: Tuesday, October 17th, 2023

Time: 01:00 pm

Location: All Virtual Meeting

Virtual Access: Register at

<https://vcu.zoom.us/meeting/register/tZYpcuCorzktGNbg3FCPjx8BsK3bB0u9RZcg>

1

Meeting Agenda

1. Call to Order, Roll Call, and Introductions
2. Adoption of Q3 Meeting Minutes
3. Subcommittee Overview
4. Old Business
 - Pluvial Modeling
 - Flood Depth Threshold
 - Land Cover Data
 - Precipitation Values
 - Fluvial Flood Hazard Data
5. New Business
 - Integrated Flood Hazard Scenarios for Planning
 - Flood Hazard Data Reporting
 - Subcommittee Members Discussion
6. Public Comment
7. Action Items, Scheduling
8. Adjourn

2

Name	Title	Organization
Evan Branosky (Chair)	Chief Stormwater Policy Advisor	Virginia Department of Environmental Quality
Dave Davis (Alternate Chair)	Manager of the Office of Wetlands and Stream Protection	
Whitney Katchmark	Principal Water Resources Engineer	Hampton Roads Planning District Commission
Ben McFarlane (A)	Chief Resilience Officer	
Norm Goulet	Director of NVRC's Environment and Resiliency Planning	Northern Virginia Regional Commission
Rebecca Murphy (A)	Coastal Zone Program Manager	
Dr. Jessica Whitehead	Director of the Institute for Coastal Adaptation and Resilience	Old Dominion University
Carol Considine (A)	Director of Applied Projects, CCRFR	
Dr. Karen McGlathery	Director of the Environmental Resilience Institute	University of Virginia
Dr. Mark Luckenbach	Associate Dean for Research and Advisory Services	Virginia Institute of Marine Science
Jamie Green	Commissioner	Virginia Marine Resources Commission
Rachael Peabody (A)	Director of Coastal Policy, Restoration and Resilience	
Randy Owen (A)	Chief of Habitat Management	
Dr. Troy Hartley	Director	Virginia Sea Grant
Dr. Robert Weiss	Director of the Center for Coastal Studies	Virginia Tech
Dr. Wendy Stout (A)	Coastal Resilience Extension Specialist	
G. Michael Fitch, Ph.D.	Acting Director	Virginia Transportation Research Council
Mary-Cason Stiff	Executive Director	Wetlands Watch
John Bateman (A)	Planning Program Director	

3

Research, Data, and Innovation Objectives

1. Inform Development of Flood Hazard Exposure Model.

Using the best available data, provide recommendations to DCR and Dewberry to select pluvial modeling approach (including climate scenarios), advise on the selection of fluvial modeling data and scenarios, and advise on approach to compound flooding joint probability analysis.

2. Inform Inputs to Flood Hazard Risk Assessment.

Based on the flood hazard exposure model developed, advise DCR and Dewberry on how to utilize the flood hazard model for conducting the flood hazard risk assessment.

3. Develop recommendations for future planning.

This includes, but is not limited to:

- Develop a data development plan to fill gaps in advance of future planning processes. Consider research and data products that can meet the state's needs.
- Advise on innovations suited to address flood risks and fill gaps in resilience action for future planning efforts. Consider R&D, public-private partnerships, collaborative research.

5

Subcommittee Actions to Date

- 2023 Q3 Subcommittee Meeting (1st Meeting)
 - Reviewed Subcommittee Objectives
 - Reviewed Pluvial Modeling Pilot Study
 - Identified and Explored Pluvial Modeling Decision Points
 - Depth Threshold
 - Land Cover Data
 - Precipitation Values
 - Discussed Fluvial Data for Virginia Flood Protection Master Plan

10/17/2023

Research, Data, and Innovation Subcommittee

6

6

CRMP Phase II - Plan Development Timeline

Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24	Jun 24	Jul 24	Aug 24	Sep 24	Oct 24	Nov 24	Dec 24
Meetings																	
	Sub	TAC		Sub	TAC		Sub	TAC		Sub	TAC		Sub	TAC		Sub	TAC
Schedule																	
Develop Flood Hazard Exposure Model Research, Data, and Innovation									Data Display (CRWE Update) Research, Data, and Innovation								
Data Collection Project Prioritization									Flood Hazard Risk Assessment Project Prioritization								
Project and Initiative Info Collection Project Prioritization									Analyze Planned Resilience Actions Project Prioritization, Funding								
												Quantify Financial Need for Flood Resilience Funding					
Ongoing Stakeholder Outreach and Engagement Outreach and Coordination																	
Develop TAC Subcommittee Recommendations All Subcommittees																	

7

7

Subcommittee Schedule

2023Q3

CRMP PII - Pluvial Modeling Pilot Study

2023Q4

CRMP PII - Flood Hazard Data Scenario Planning

CRMP PII – Flood Hazard Data Reporting

2024Q1

CRMP PII - Flood Hazard Risk Assessment Methodology

Future Plans - Recommendations

2024Q2

Future Plans - Recommendations

2024Q3

CRMP PII – Flood Hazard Assessment Review

Future Plans - Recommendations

2024Q4

Future Plans – Final Recommendations

8

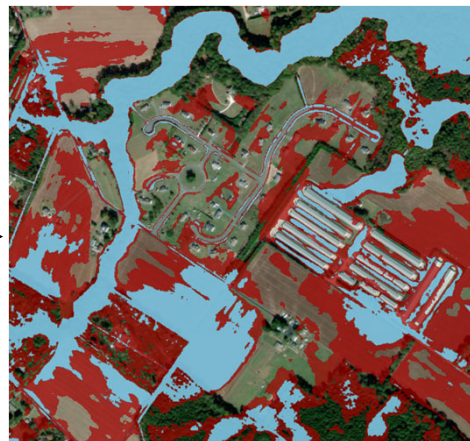
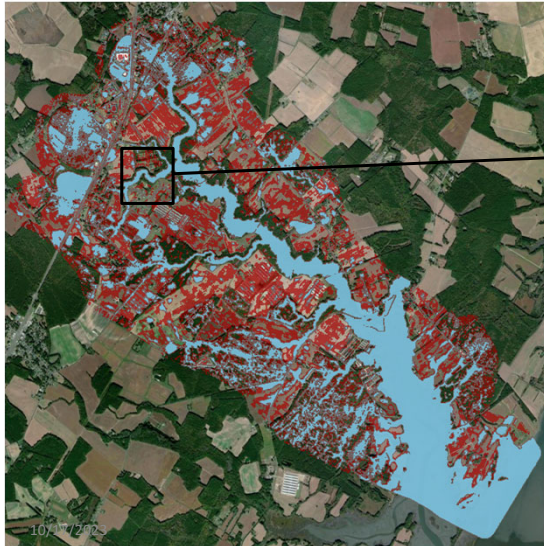
Old Business

Pluvial Modeling

Fluvial Flood Hazard

9

Pluvial Model Depth Threshold



2050-2100 100-yr 24 hour Storm	Area (mi ²)
Inundation Area	6.99
Inundation Area (filtered to 0.5')	3.61

10

10

Depth Threshold Reference

Louisiana Example

Table 1: EBR Parish 1% AEP Model Output Tolerances for Floodplain Conveyance Zones

Component Zone	Model Output Tolerance Used
Depth-based	0.5 feet
Velocity-based	0.5 feet per second (0.25 for Bayou Fountain-Bayou Manchac)
Large Depth-based	4 feet
Final Conveyance Zone	Incorporates all 3 above

(ASCE Louisiana Civil Engineer, August 2023)

FEMA Guidance

“Generally, studies do not continue past areas of minimal hazard where flood depths are less than 0.5 ft”

([FEMA 2020, Guidance for Flood Risk Analysis and Mapping](#))

11

Land Cover Data



Figure 1. VBMP imagery, 30-meter NLCD, and one-meter VSLCD.

10/17/2023

Research, Data, and Innovation Subcommittee

12

12

Land Cover Data Alternatives

Virginia Statewide Land Cover Dataset

- 2013/14 Aerial Imagery
- 1-meter resolution
- Increased infiltration = reduced flooding

Chesapeake Conservancy Land Cover Dataset

- 2017/18 Aerial Imagery
- 1-meter resolution
- Limited to localities at least partially in the Chesapeake Bay Watershed

Mosaic High-Resolution Dataset

- Chesapeake Bay Watershed = Chesapeake Conservancy Land Cover Dataset
- Beyond Chesapeake Bay Watershed = Virginia Statewide Land Cover Dataset

10/17/2023

Research, Data, and Innovation Subcommittee

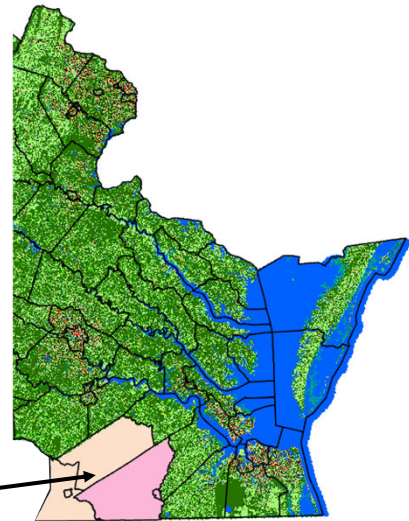
13

13

Updated DCR Recommendation

High-Resolution Mosaic Land Cover Dataset:

- Chesapeake Conservancy 2017/2018 Data
- Virginia Statewide Land Cover Data 2013/2014 Data
 - Counties: Greensville, Sussex, Southampton
 - Cities: Emporia, Franklin



Solid colored localities are not included in the Chesapeake Conservancy data coverage.

Chesapeake Conservancy 2017/2018 Data Coverage

10/17/2023

Research, Data, and Innovation Subcommittee

14

14

Pilot Study Pluvial Flood Model Scenario Alternatives



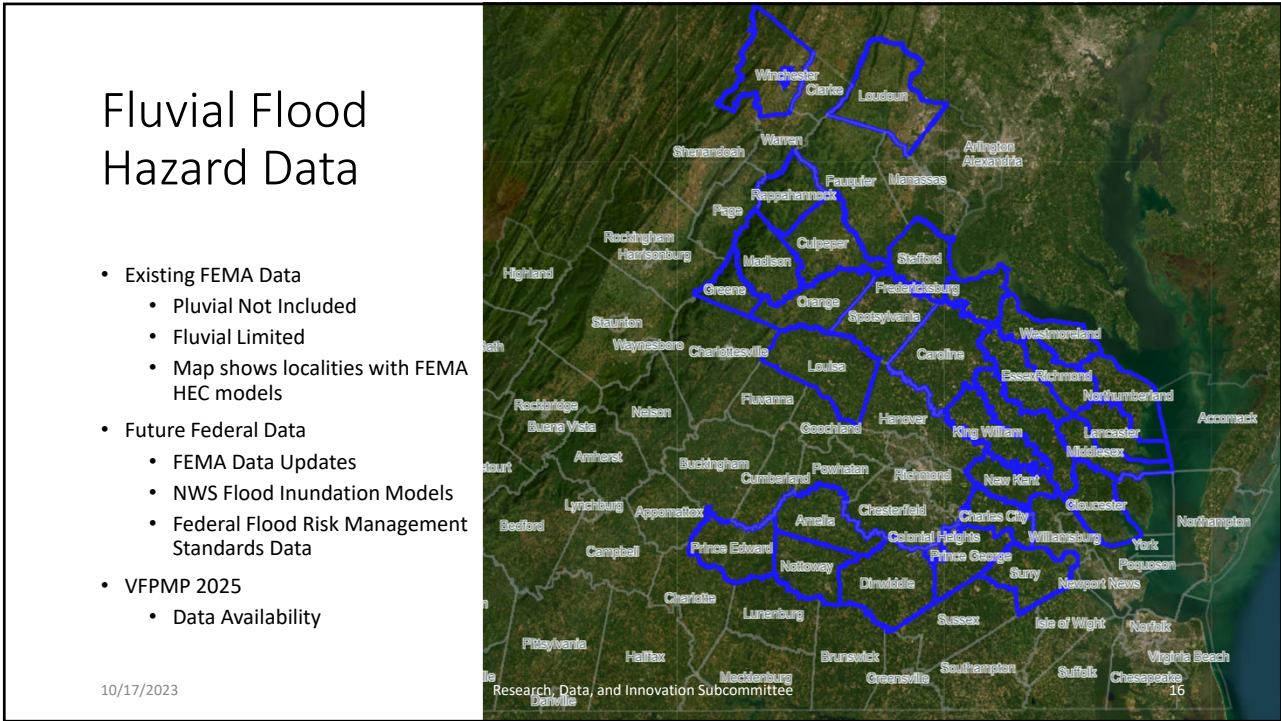
- Intensity: Intervals related to Climate Scenarios
 - 2-hr Duration
 - Range = 1.45 – 7.63 in
 - 1 – 8 in @ 0.5-in interval (15+ runs)
 - 6-hr Duration
 - Range = 1.94 – 10.71 in
 - 1 – 11 in @ 1-in interval (11+ runs)
 - 24-hr Duration
 - Range = 2.75 – 16 in
 - 2 – 16 in @ 1-in interval (15+ runs)
- Frequency
 - 2-, 5-, 10-, 25-, 50-, 100-, 500-year
- + runs needed at tidal boundary for SLR considerations

10/17/2023

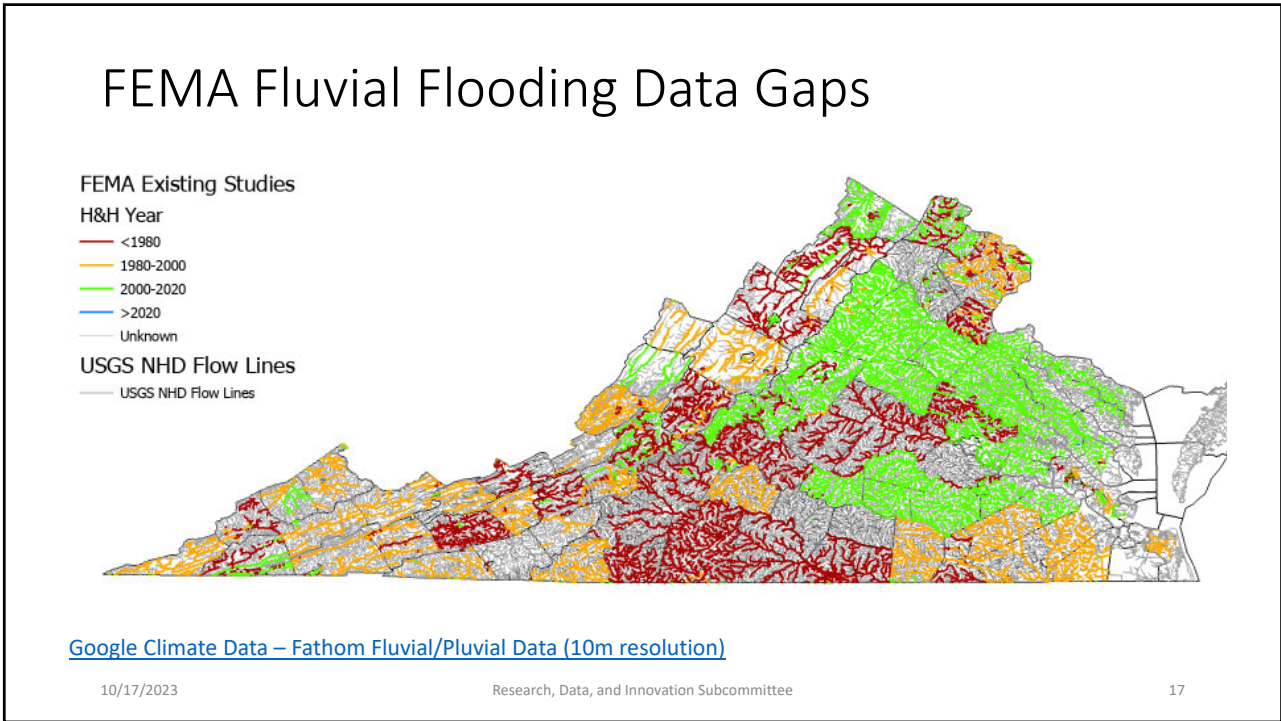
Research, Data, and Innovation Subcommittee

15

15

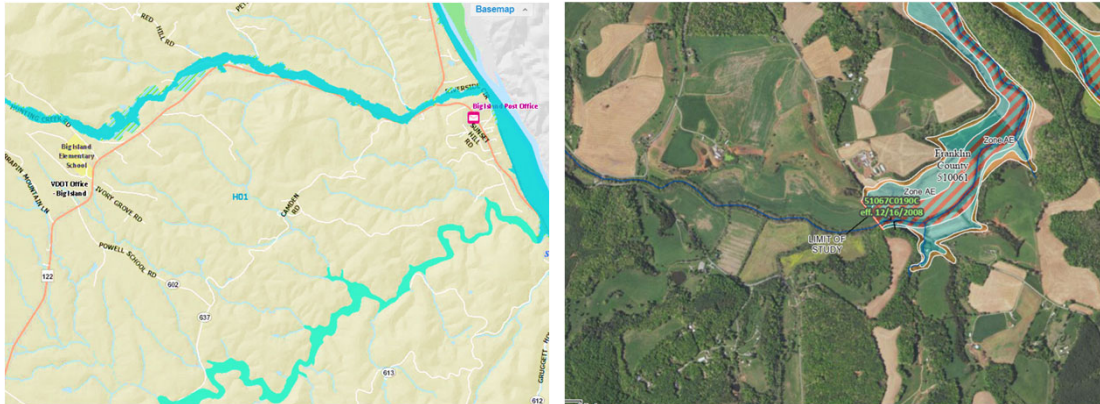


16



17

Fluvial/Pluvial Flooding Data Gaps



10/17/2023

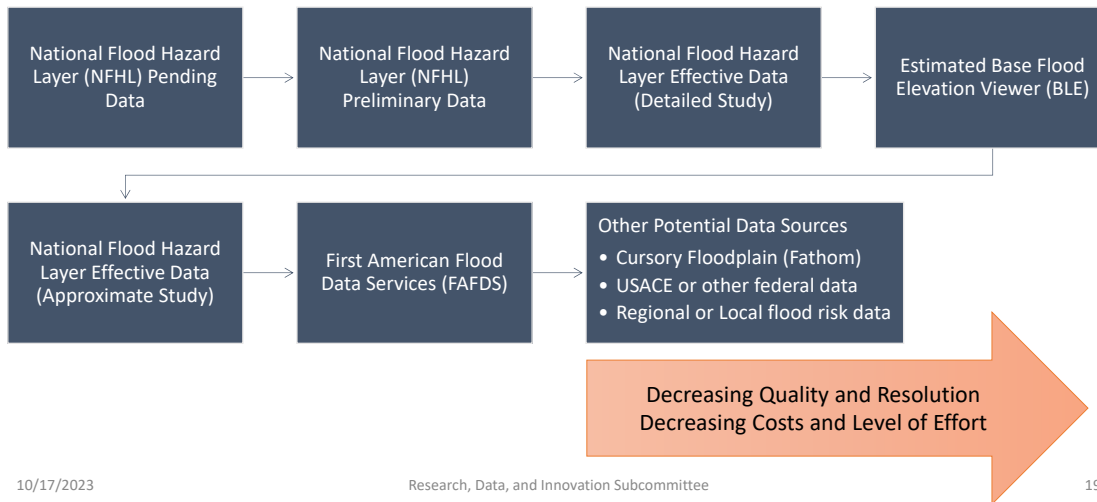
Research, Data, and Innovation Subcommittee

18

18

Texas Floodplain Data Quilt Example

There is a range of data options. Use best available data and consider options when new data is needed.



10/17/2023

Research, Data, and Innovation Subcommittee

19

19

Comments + Questions

10/17/2023 Research, Data, and Innovation Subcommittee 20

20

New Business

Integrated Flood Hazard Climate Scenarios for Planning
Flood Hazard Data Reporting Structure

10/17/2023 Research, Data, and Innovation Subcommittee 21

21

Operationalizing Flood Hazard Data

Primary Audiences:

- Planning District Commissions (8)
- Localities (57)
- State Agencies/ Programs (10+)

How might they use the plan?

- Use models and findings as a starting point for additional assessment of asset and programmatic vulnerability
- Incorporate flood hazard exposure models and impacts into other long-range plans
- Leverage models and findings to aid in identifying and prioritizing resilience actions, and developing grant applications
- Identify opportunities for collaboration with other actors toward resilience
- Justify budgetary requests

10/17/2023

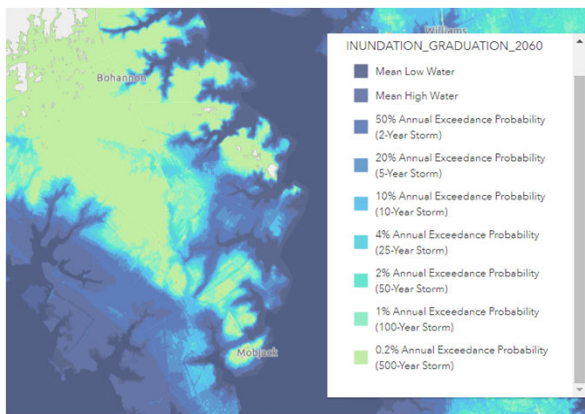
Research, Data, and Innovation Subcommittee

22

22

CRMP Phase 1 Flood Hazard Data Reporting

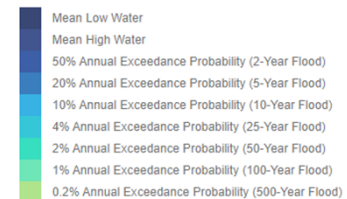
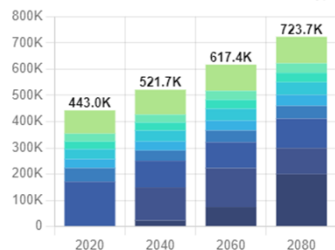
- Coastal Resilience Web Explorer



Coastal Flood Time Horizon:

2020 2040 2060 2080

Acres of Land Area Inundated Across Flood Event Type



10/17/2023

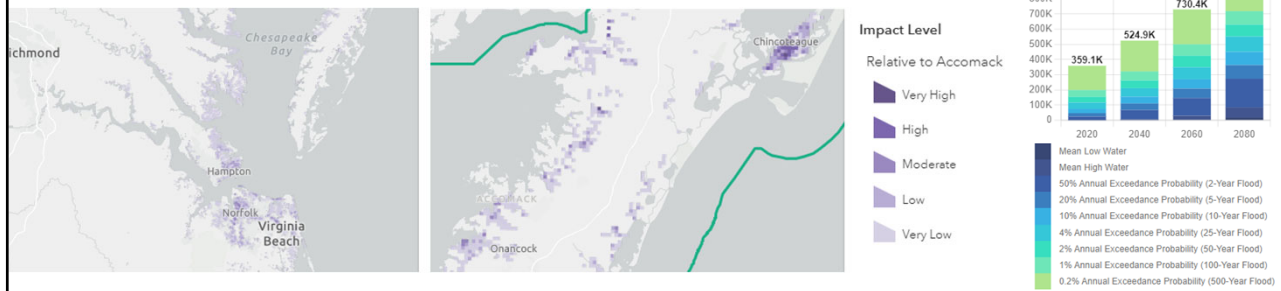
Research, Data, and Innovation Subcommittee

23

23

CRMP Phase 1 Flood Hazard Data Reporting

- Coastal Resilience Web Explorer



10/17/2023

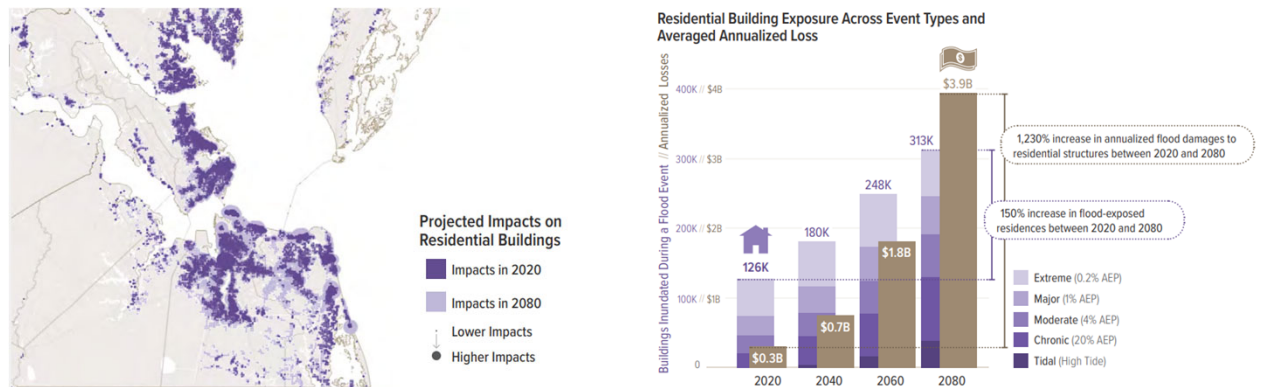
Research, Data, and Innovation Subcommittee

25

25

CRMP Phase 1 Flood Hazard Data Reporting

- PDF Plan, Impact Category Summary



10/17/2023

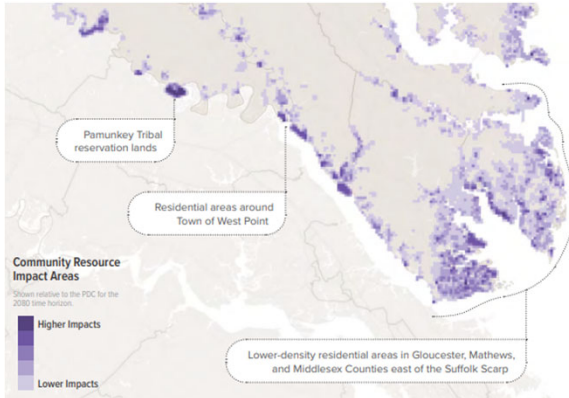
Research, Data, and Innovation Subcommittee

26

26

CRMP Phase 1 Flood Hazard Data Reporting

- PDF Plan, Region Summary



Residential Population Exposed		2020	2080	Change
Accomack-Northampton PDC	High tide	200	7,800	+ 3816%
	Extreme flood	10,900	14,600	+ 34%
Middle Peninsula PDC	High tide	170	7,600	+ 4407%
	Extreme flood	13,900	21,000	+ 51%
Northern Neck PDC	High tide	140	2,400	+ 1642%
	Extreme flood	3,800	9,900	+ 157%

Annualized Structure Losses*		2020	2080	Change
Accomack-Northampton PDC	Residential	\$20.7M	\$289M	+ 1299%
	Non-Residential	\$7.63M	\$77.0M	+ 909%
Middle Peninsula PDC	Residential	\$25.1M	\$355M	+ 1317%
	Non-Residential	\$13.1M	\$64.6M	+ 394%
Northern Neck PDC	Residential	\$11.2M	\$136M	+ 1110%
	Non-Residential	\$7.96M	\$28.2M	+ 255%

* Projected average annualized losses due to damages to structures and contents.

10/17/2023

Research, Data, and Innovation Subcommittee

27

27

CRMP Phase 2 Flood Hazard Data Planning and Reporting

How should DCR report and summarize the flood hazard data?

[Coastal Resilience Web Explorer](#)

[PDF Document](#)

Factors to summarize include:

Flood Hazard	Return Interval (years)	Time Horizon	Impacts
<ul style="list-style-type: none"> • Coastal • Pluvial • Fluvial • Total/Combined 	<ul style="list-style-type: none"> • Daily (MLW, MHW) • 2, 5, 10 • 25, 50, 100 • 500 	<ul style="list-style-type: none"> • Present and Future Conditions (Five across 2020 – 2100) 	<ul style="list-style-type: none"> • Qualitative • Exposure • Vulnerability • Risk

10/17/2023

Research, Data, and Innovation Subcommittee

28

28

Flood Hazard: Available Data Overview

Coastal Flood Hazard

- 2020, 2040, 2060, 2080, 2100
- NOAA 2017 Intermediate-High Sea Level Rise Median Values
- MLW, MHW, 1.5xMTR
- 2, 5, 10, 25, 50, 100, & 500-year Return Interval

Pluvial Flood Hazard

- Atlas 14: "Present"
- MARISA: 2020-2070, 2050-2100; RCP4.5 & RCP8.5
- 2, 6, 24-hr durations
- 2, 5, 10, 25, 50, 100, & 500-year Return Interval

Fluvial Flood Hazard

- Existing Conditions
- No Future Projections
- SFHA 100-yr Floodplain (vector data everywhere. depth-grid some locations)
- 10, 25, 50, 100, 500-yr Return Interval in very limited locations

10/17/2023

Research, Data, and Innovation Subcommittee

29

29

Return Intervals: Severe and Repetitive Flooding

How should DCR qualify and represent "severe and repetitive" flooding in reporting/summarization? Do we need further simplification in some reporting?

Reference Flood Event	Annual Exceedance Probability (AEP)	Average Return Interval (Frequency)	Example Storm/Event Type
Tidal	Mean High Water	Inundated Daily	Repetitive
Chronic	20% AEP	5 years	
Moderate	4% AEP	25 years	Severe
Major	1% AEP	100 years	
Extreme	0.2% AEP	500 years	Extreme

10/17/2023

Research, Data, and Innovation Subcommittee

30

30

Time Horizon: Resilience Planning Scenarios

Should DCR use the same 20-year time interval planning scenarios used in Phase I, or change the planning scenarios?

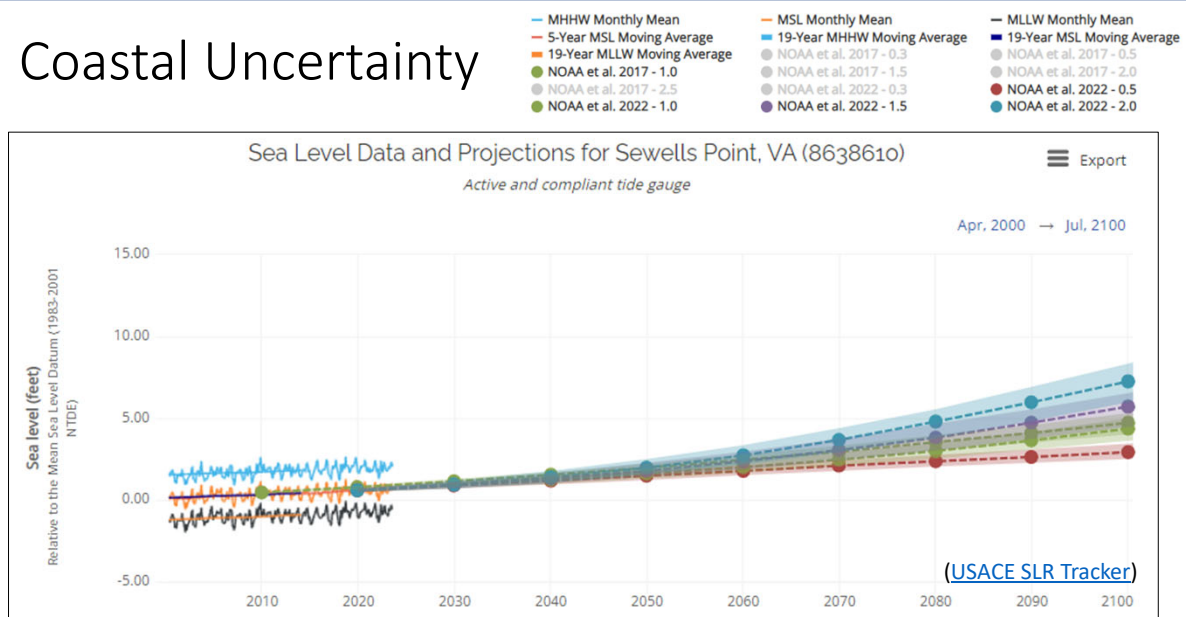
Example if using Phase I planning scenarios:

	2020	2040	2060	2080	2100
Coastal	2020 CRMP	2040 CRMP	2060 CRMP	2080 CRMP	2100 CRMP
Pluvial	Atlas14	2020-2070 RCP 4.5	2020-2070 RCP 8.5	2050-2100 RCP 4.5	2050-2100 RCP 8.5
Fluvial	FEMA	FEMA	FEMA +1.0-ft*	FEMA +2.0-ft*	FEMA +3.0-ft*

* Federal Flood Risk Management Standard Data Needed (maybe June 2024)

31

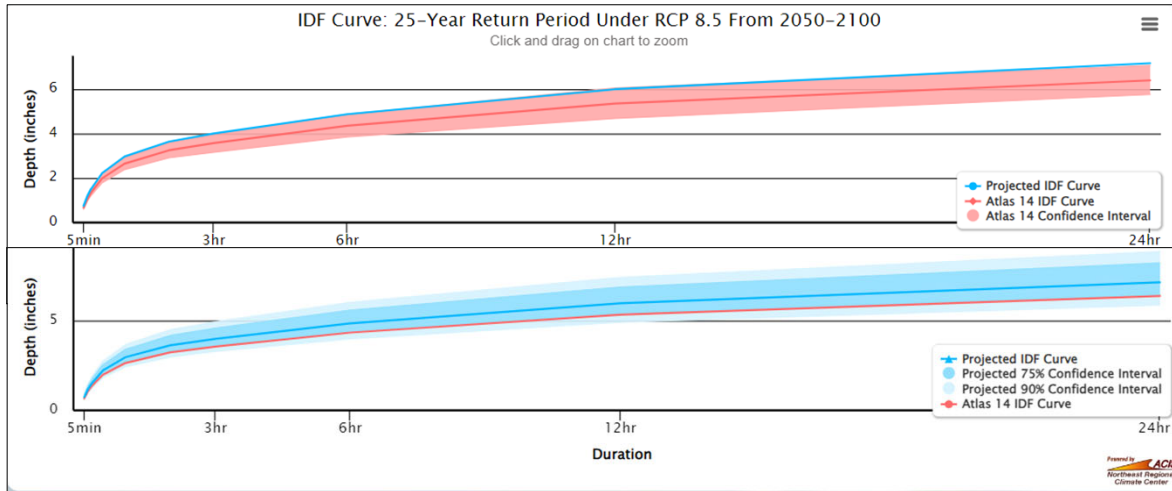
Coastal Uncertainty



32

Pluvial Uncertainty

(MARISA Predictive IDF)



10/17/2023

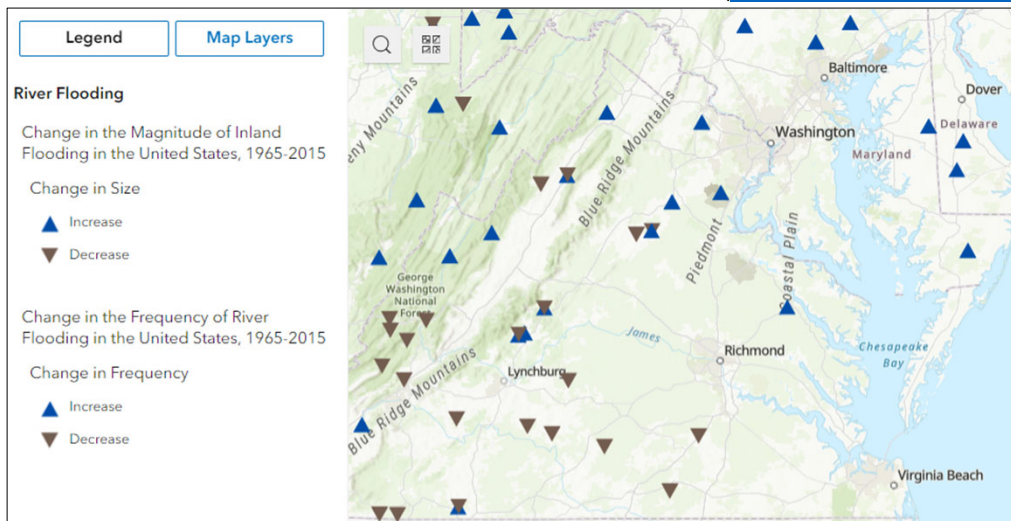
Research, Data, and Innovation Subcommittee

33

33

Fluvial Uncertainty

(EPA Climate Change Indicator)



10/17/2023

Research, Data, and Innovation Subcommittee

34

34

Phase 2 Flood Resilience Planning Scenarios

Should DCR update the Phase 1 Planning Scenarios?

Existing Conditions
(~2020-2025)

Near Future
(~2030 – 2060)

- Upper Bound
- Lower Bound

Far Future
(~2050 – 2100)

- Upper Bound
- Lower Bound

10/17/2023
Research, Data, and Innovation Subcommittee
35

35

Phase 2 Flood Resilience Planning Scenarios?

Existing Conditions ~2020-2025		Near Future ~2030-2060		Far Future ~2050-2100	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
Coastal	2020 CRMP	2040 CRMP	2060 CRMP	2060 CRMP	2100 CRMP
Pluvial	Atlas14	2020-2070 RCP 4.5	2020-2070 RCP 8.5	2050-2100 RCP 4.5	2050-2100 RCP 8.5
Fluvial	FEMA	FEMA	FEMA +1.0-ft*	FEMA	FEMA + 2.0-ft*

Coastal Flood Hazard Values: NOAA 2017 Sea Level Rise Intermediate-High Median Values
 Pluvial Flood Hazard Values: [Median Values at different RCPs, Upper and Lower Bounds of a Single RCP,...?](#)
 *Fluvial Flood Hazard Values: Federal Flood Risk Management Standard Data Needed (maybe June 2024)

10/17/2023
Research, Data, and Innovation Subcommittee
36

36

CRMP Phase 2 Data Reporting Needs

- Planning Scenario
 - Changes from Phase 1?
- Web Explorer Data Reporting
 - Changes from Phase 1?
- PDF Data Reporting
 - Changes from Phase 1?
- Plan Delivery
 - Data Download for Custom Reporting?
- Post-Plan Technical Support
 - DCR Support for Custom Reporting?

10/17/2023

Research, Data, and Innovation Subcommittee

37

37

Comments + Questions

10/17/2023

Research, Data, and Innovation Subcommittee

38

38

Subcommittee Members Discussion

10/17/2023

Research, Data, and Innovation Subcommittee

39

39

Public Comment

If you would like to provide public comment, please let us know using the Chat window.

10/17/2023

Research, Data, and Innovation Subcommittee

40

40

Action Items, Scheduling

- Action Item Review
- 2024Q1 Meeting
 - Date/Time
 - Location
 - Agenda Items
 - CRMP PII - Flood Hazard Risk Assessment Methodology
 - Future Plans - Recommendations

10/17/2023

Research, Data, and Innovation Subcommittee

41