



Pluvial Flood Modeling User Guide Feedback Workshop

July 2024

Facilitators



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DCR



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Computational
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Planner, Dewberry

Meeting Purpose

- We will provide an overview of the pluvial modeling and data products
- Stakeholders are encouraged to provide feedback for what to include or prioritize in the User Guide
- There will be a written survey at the end – also feel free to email us with any follow-ups
- We will incorporate feedback into the final User Guide available Fall 2024 (anticipated)



Agenda

10 minutes	Welcome and Introductions
20 minutes	Pluvial Flood Modeling Overview
15 minutes	Discussion of Potential Use Cases
15 minutes	User Guide Overview and Feedback
2 minutes	Adjourn

Participant Introductions

We invite you to unmute and share:

1. Your name and title / role
2. The organization/community you are representing
3. Why you chose to attend this Feedback Workshop



Coastal Resilience Master Plan Phase I



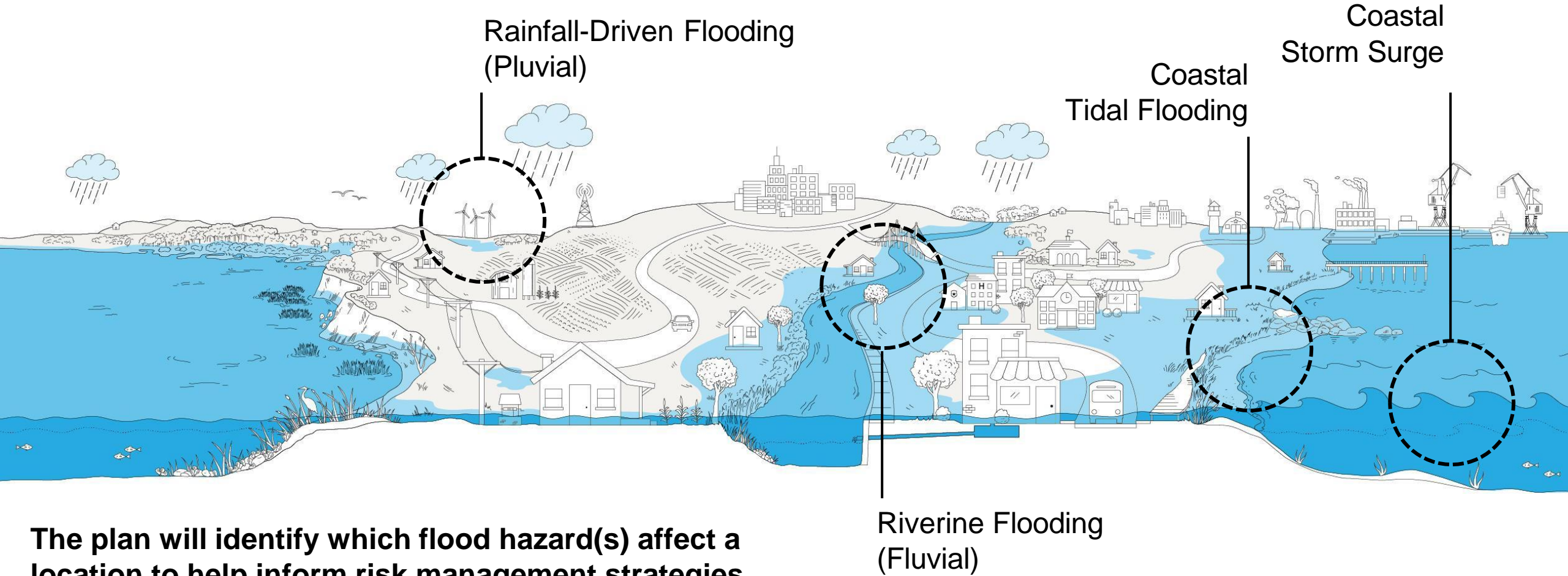
- A call to action for the Commonwealth
- Input from 2,000+ stakeholders
- Focused on impacts of tidal and storm surge coastal flooding
- Supported by the Coastal Resilience Database and Web Explorer



Office of Governor Ralph S. Northam
Commonwealth of Virginia



CRMP Phase II: Additional Sources of Flooding



CRMP Phase II: Planning Scenarios

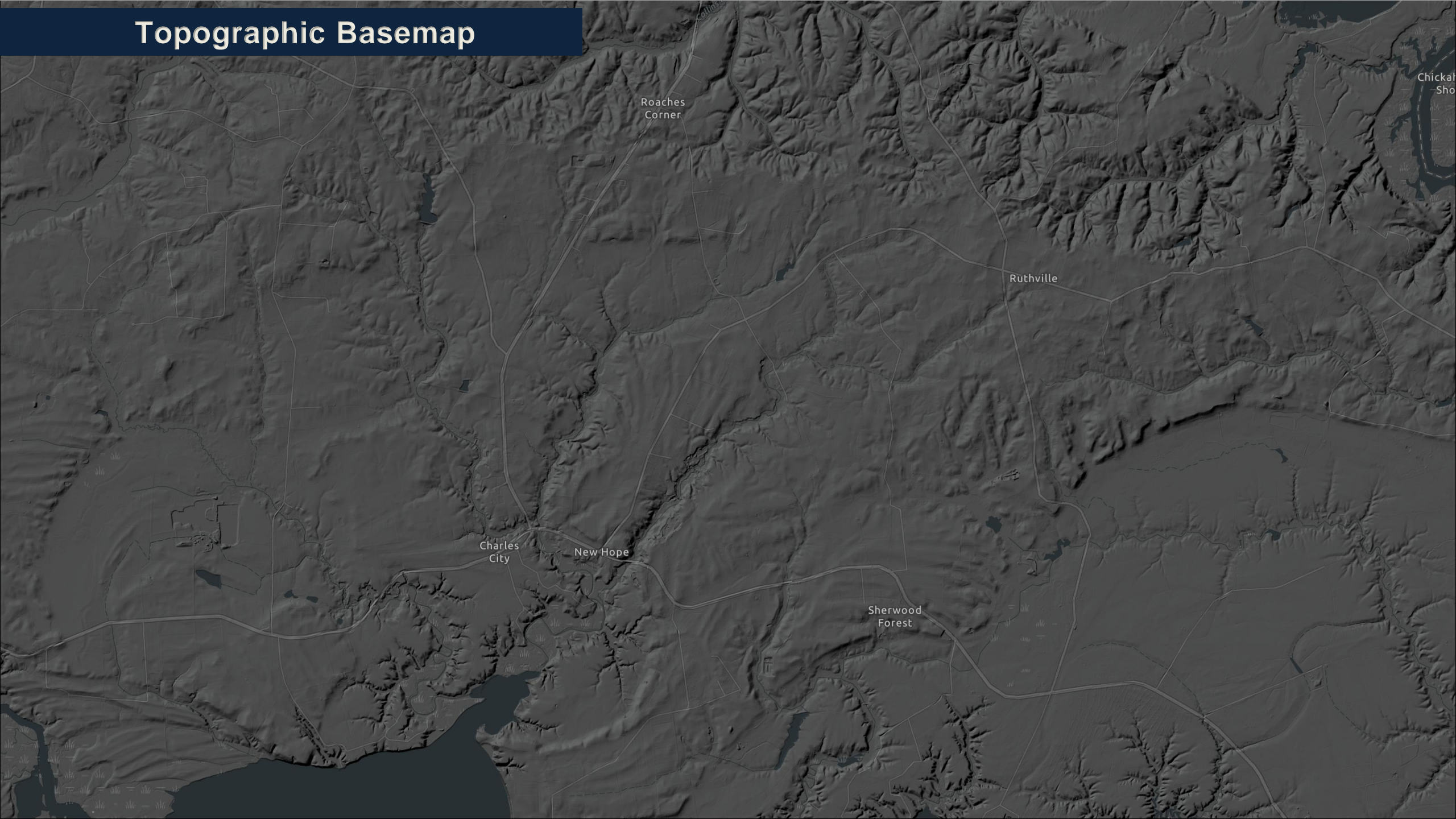
	Reference Scenario	Planning Scenarios			
Planning Horizon	2000-2020	Near Future ~2030-2060		Far Future ~2060-2100	
Risk Tolerance	-	Moderate	Low	Moderate	Low
Coastal	2020 CRMP	2040 CRMP	2060 CRMP	2060 CRMP	2080 CRMP
Pluvial	Atlas 14	2020-2070 RCP 4.5 Median	2020-2070 RCP 4.5 90 th %	2050-2100 RCP 4.5 Median	2050-2100 RCP 4.5 90 th %
Fluvial	FEMA	FEMA	FEMA	FEMA	FEMA

Notes:

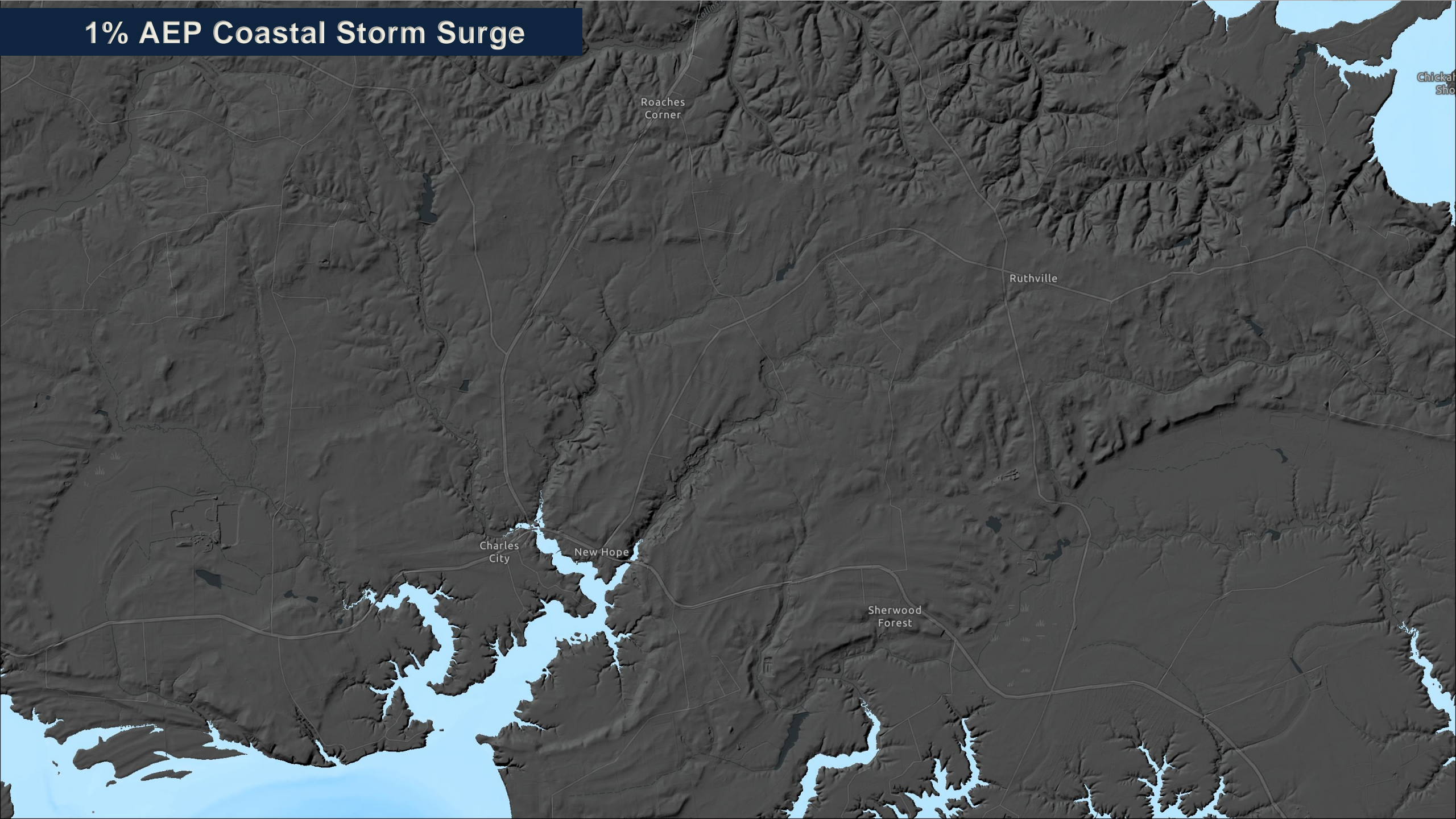
Coastal: 2020 CRMP MSL adjusted based on tidal observations. 2040, 2060, & 2080 CRMP based on NOAA 2017 Intermediate-High Relative Sea Level Rise Projection

Pluvial: Precipitation values from Atlas14 and MARISA RCP 4.5 projections will be rounded to the nearest return interval pluvial model using conventional rounding

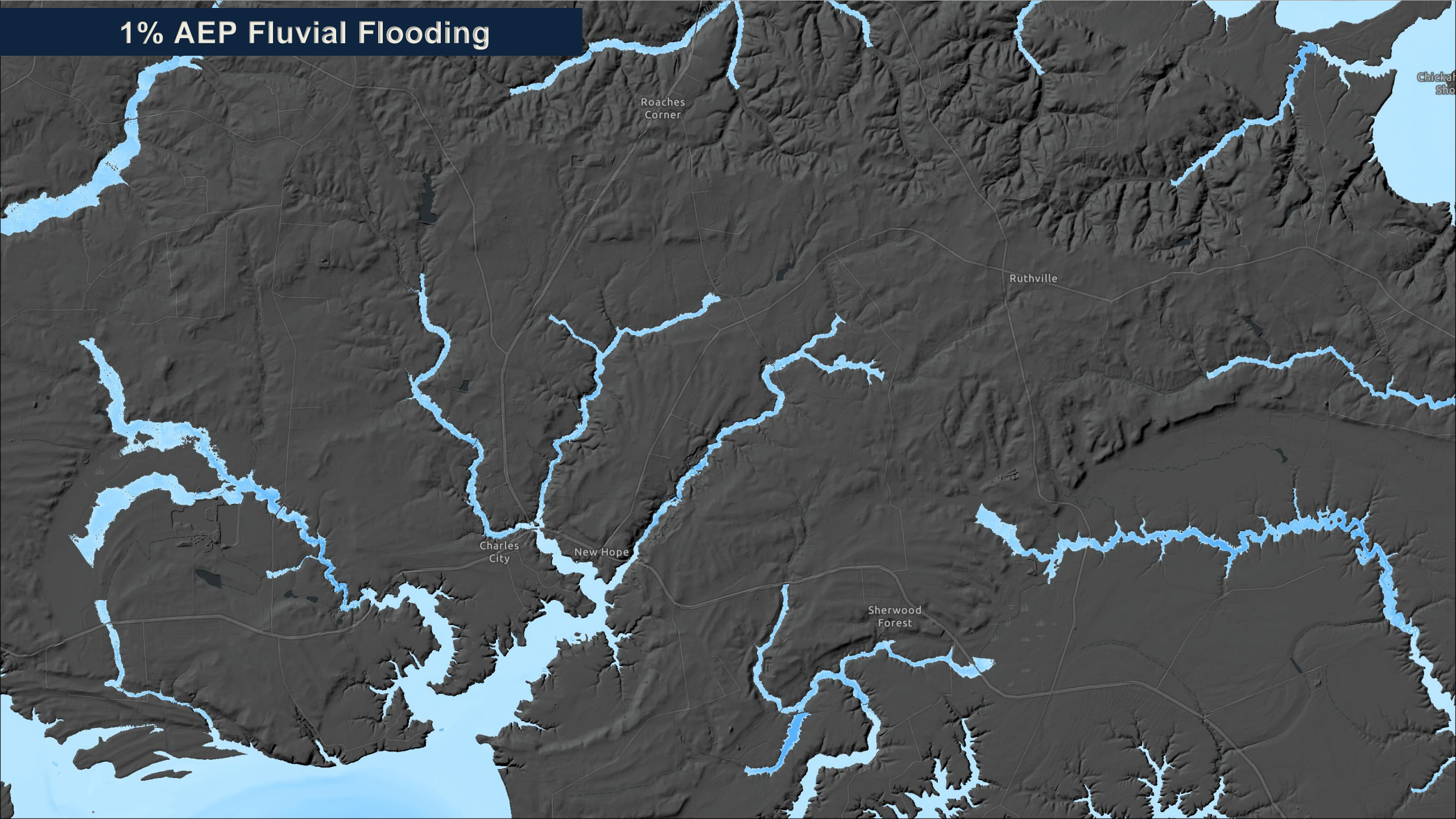
Topographic Basemap



1% AEP Coastal Storm Surge



1% AEP Fluvial Flooding



Chickasaw
Shoals

Roaches
Corner

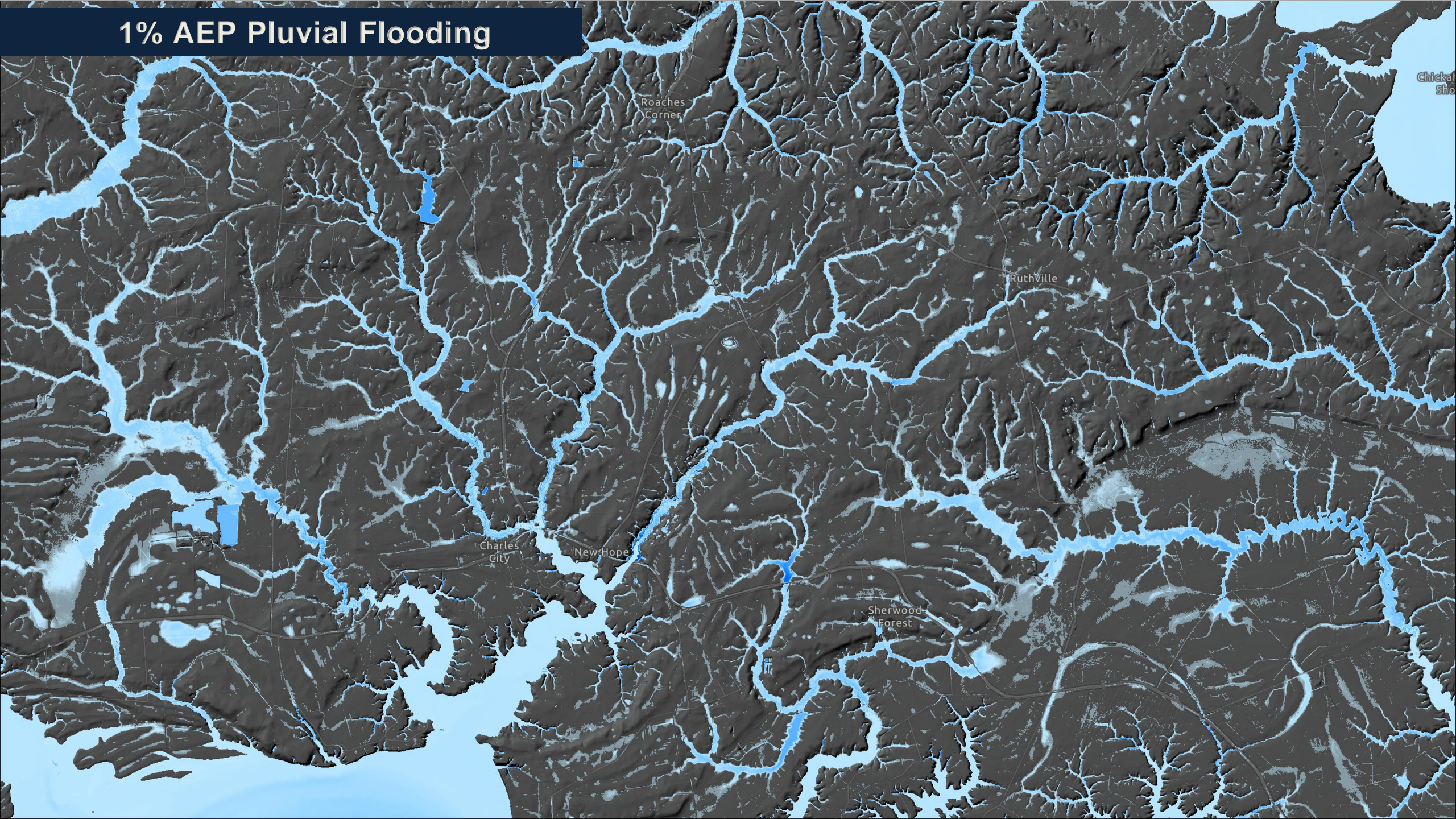
Ruthville

Charles
City

New Hope

Sherwood
Forest

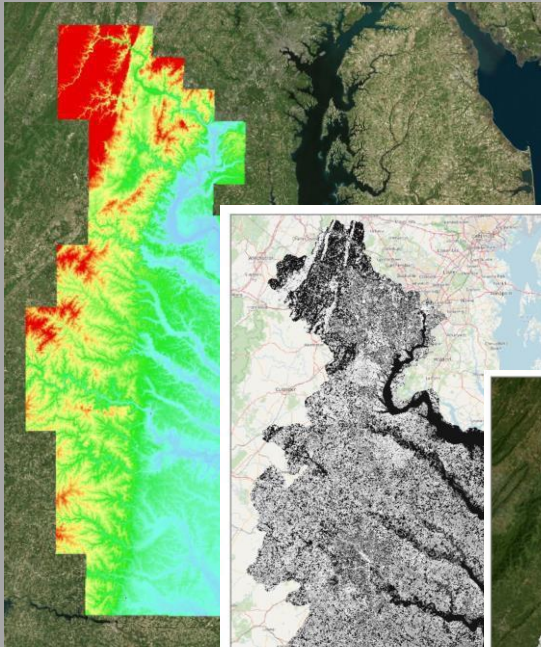
1% AEP Pluvial Flooding



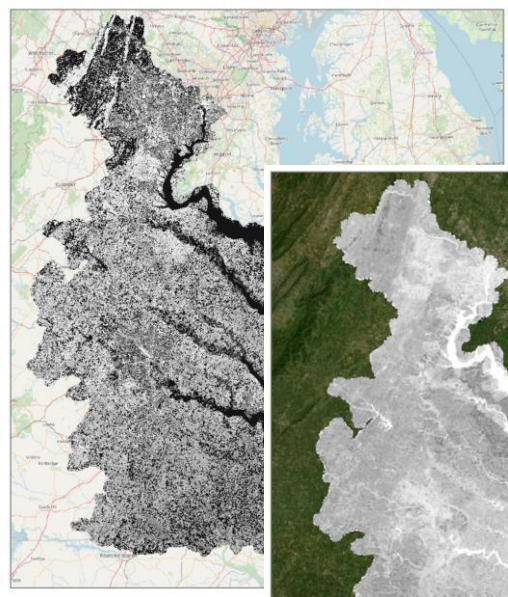
Chickaf
Sho

Pluvial Flood Modeling Overview

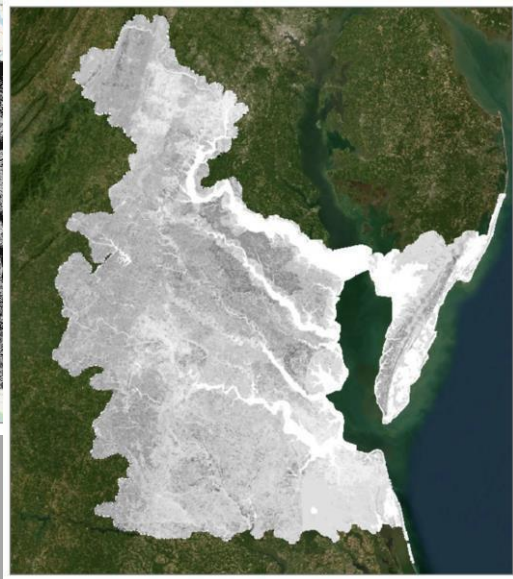
Modeling: Data Inputs



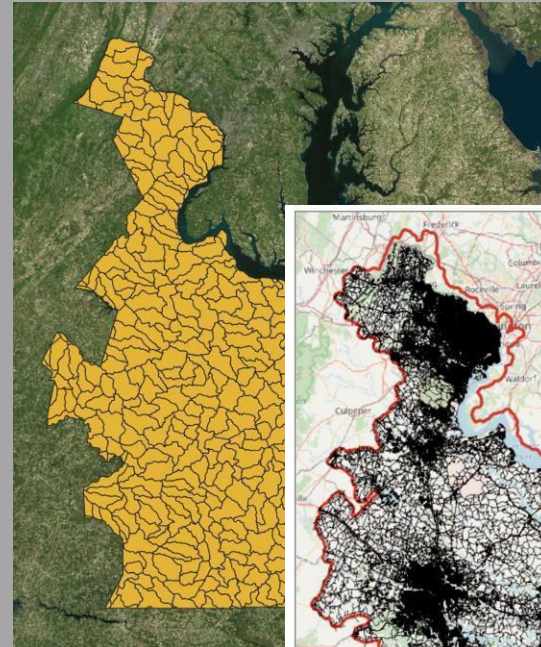
Topo



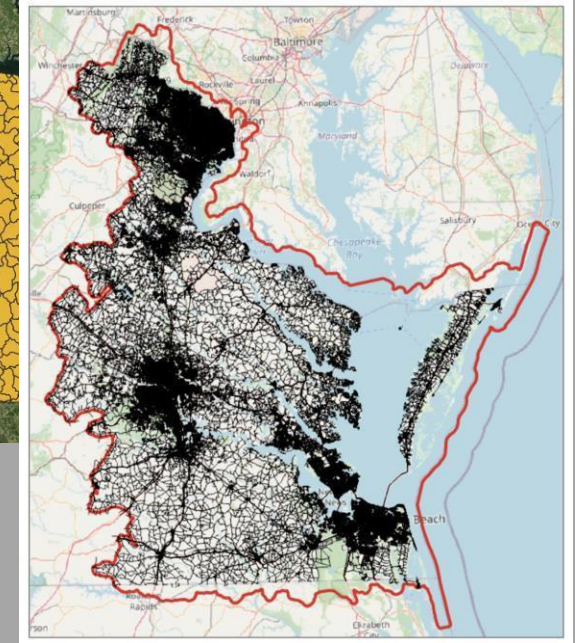
Friction



Infiltration

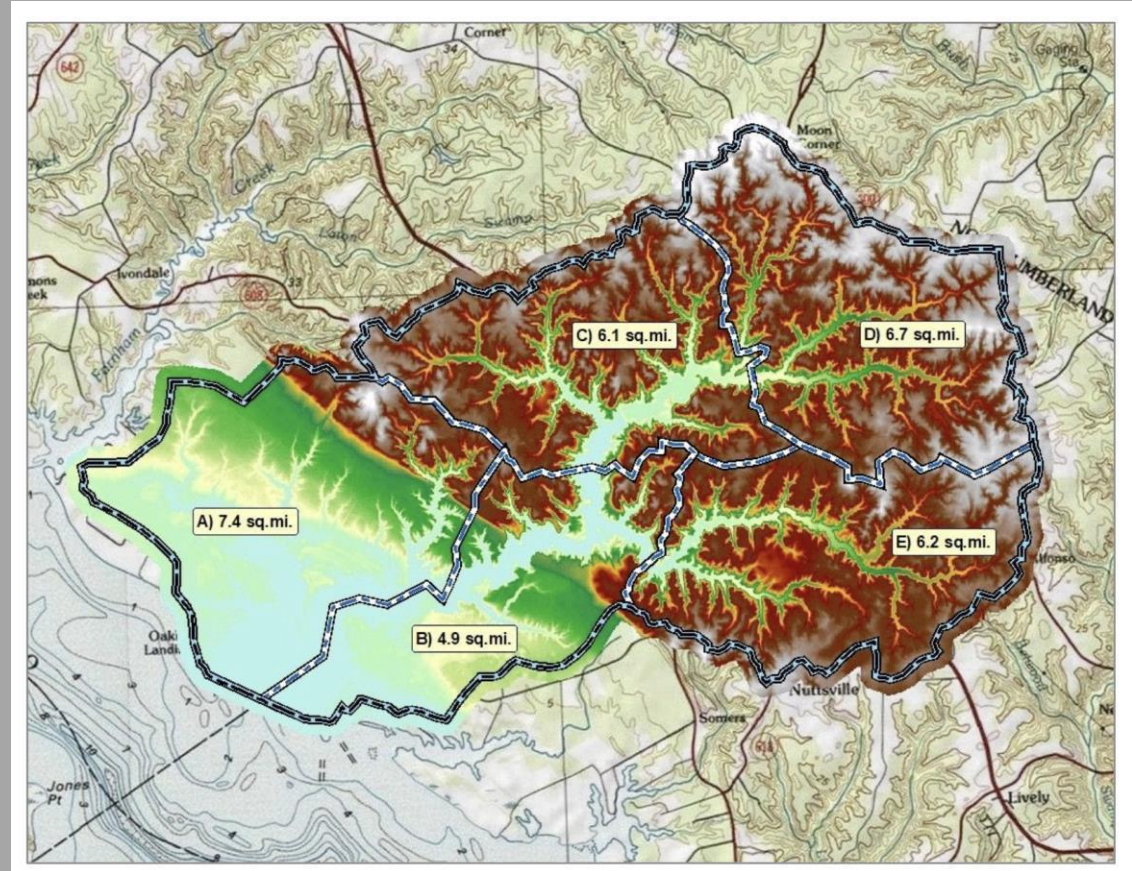
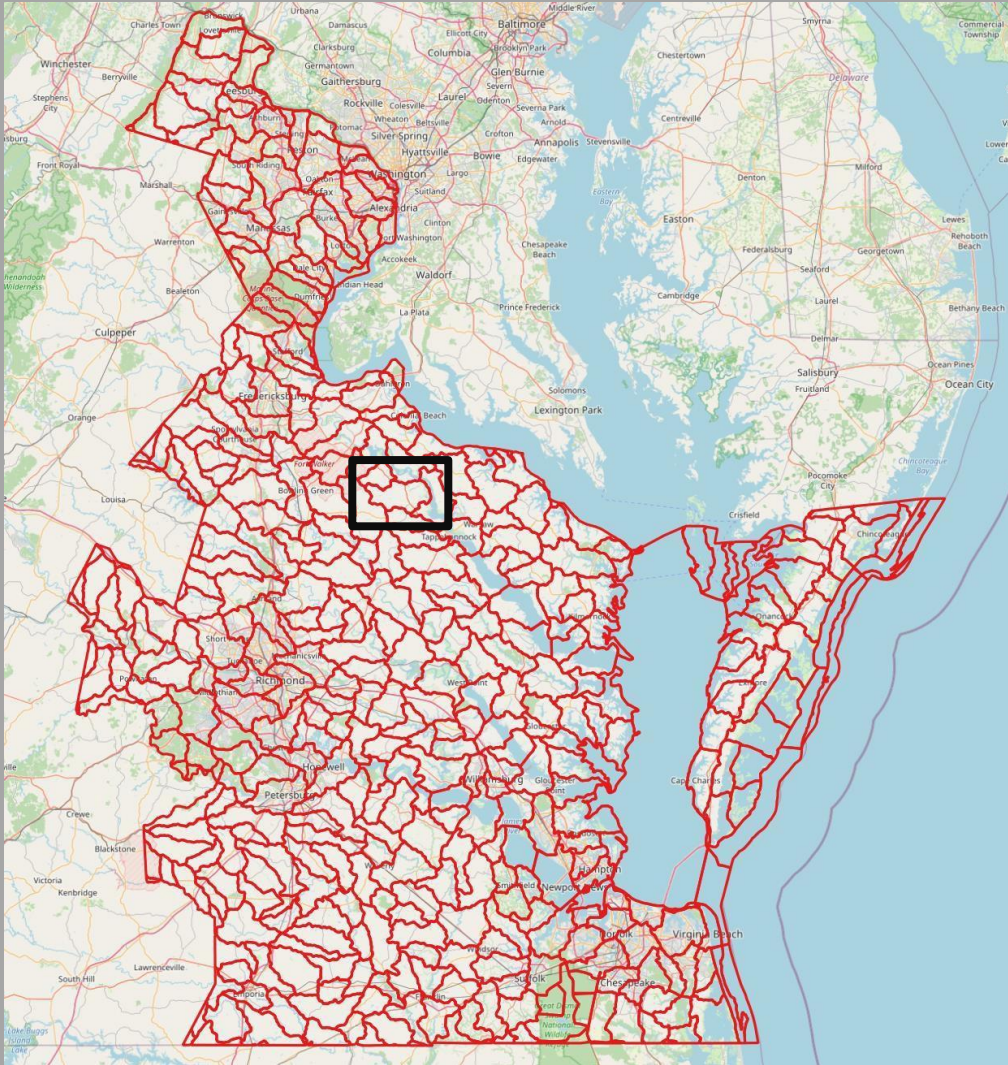


HUC's

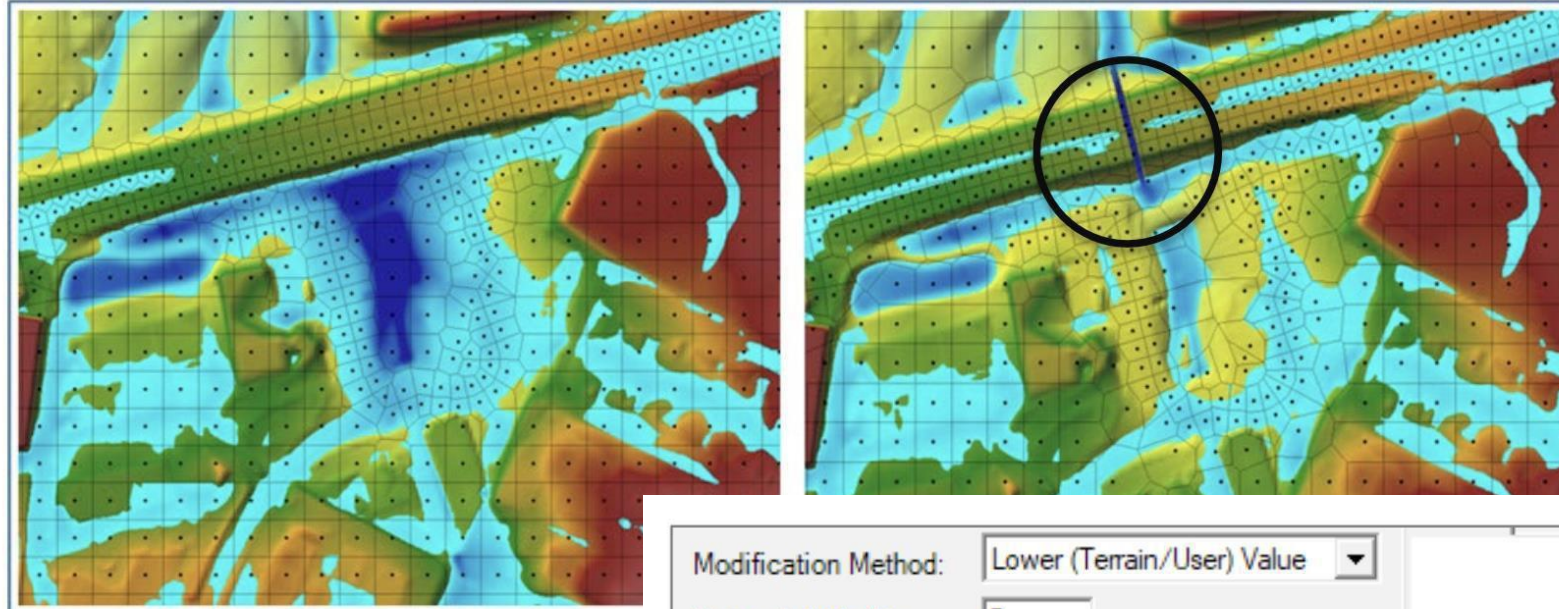


Transportation

Modeling: Basin Development



Modeling: Geometry



Modification Method: Lower (Terrain/User) Value

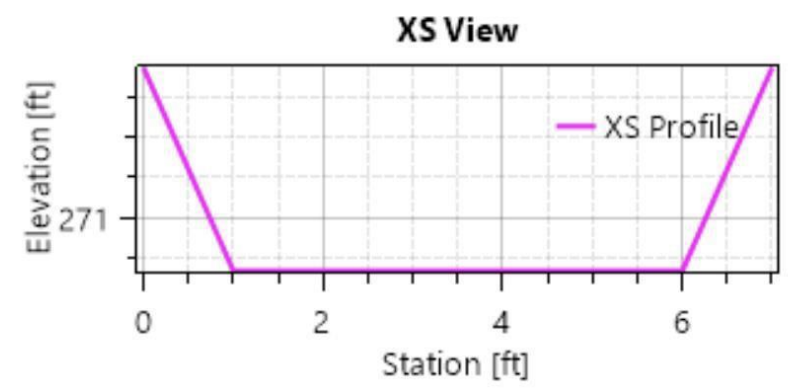
Bottom Width (ft): 5

Left Side Slope (H:V): -1

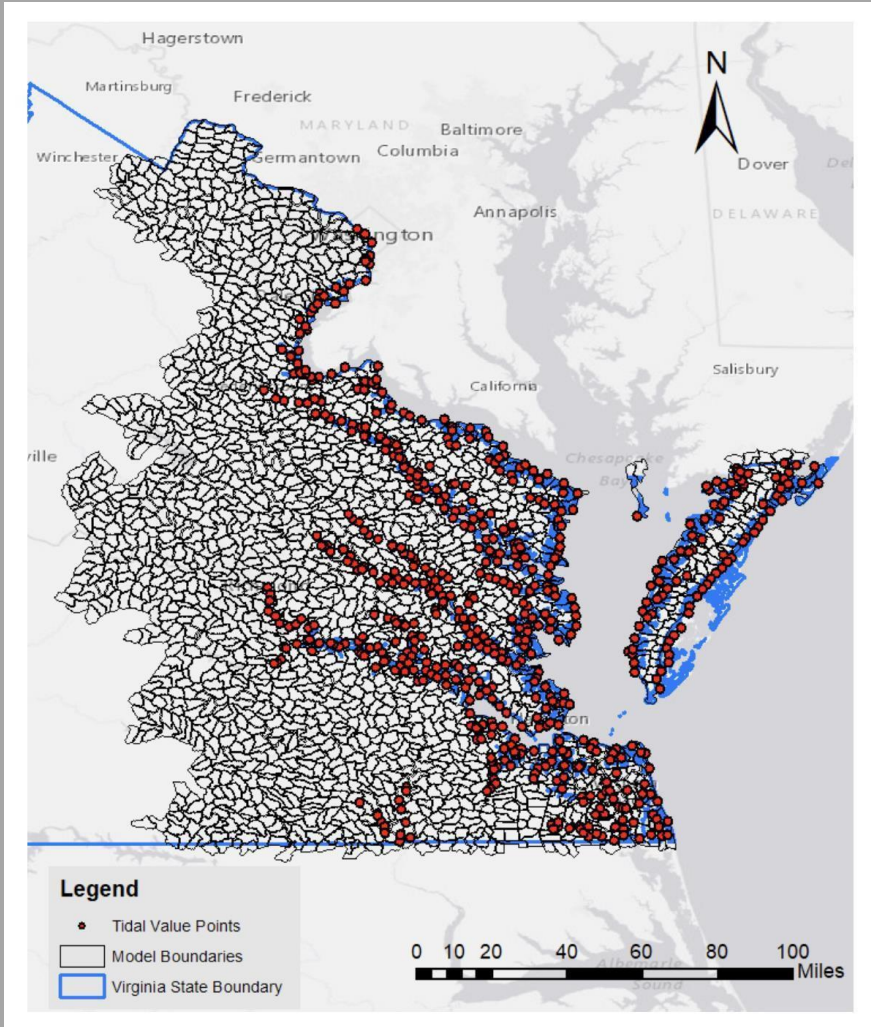
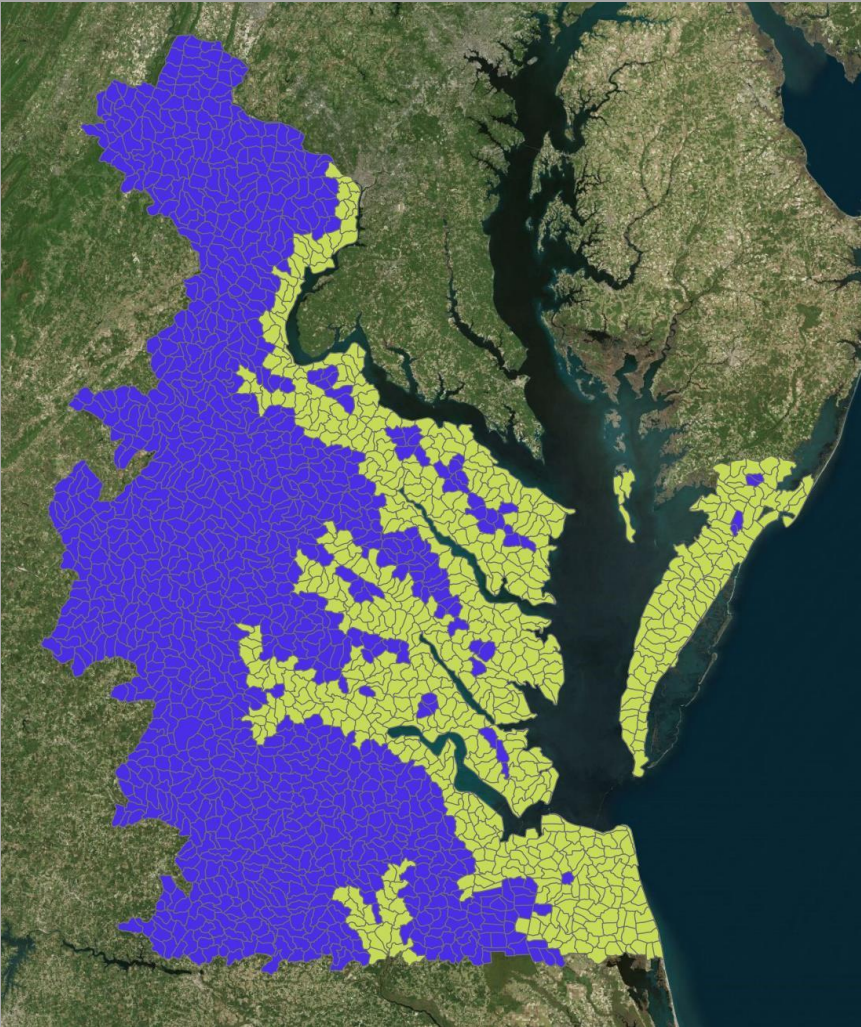
Right Side Slope (H:V): 1

Max Extent Width (ft): 7

Control Point Snapping Distance (ft): 50



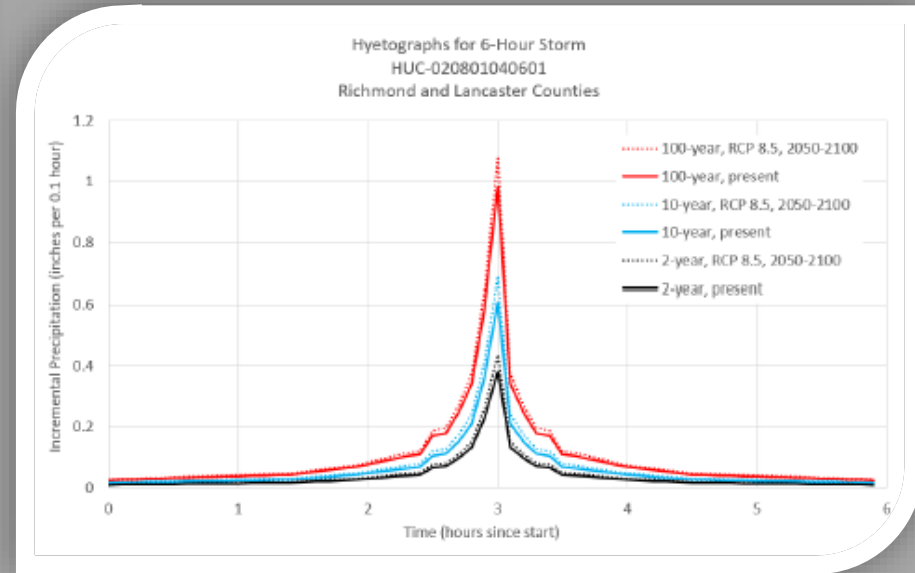
Modeling: Boundary Conditions



Modeling: Forcing

HEC-RAS Plan	Storm Duration (Hours)	Precipitation (Inches)
p01	2	1
p02	2	1.5
p03	2	2
p04	2	2.5
p05	2	3
p06	2	3.5
p07	2	4
p08	2	4.5
p09	2	5
p10	2	5.5
p11	2	6
p12	2	6.5
p13	2	7
p14	2	7.5
p15	2	8
p16	2	8.5
p17	2	9
p18	2	9.5
p19	2	10
p20	2	10.5
p21	2	11
p22	2	11.5
p23	2	12
p24	6	1
p25	6	2
p26	6	3
p27	6	4
p28	6	5
p29	6	6
p30	6	7
p31	6	8
p32	6	9
p33	6	10
p34	6	11
p35	6	12

HEC-RAS Plan	Storm Duration (Hours)	Precipitation (Inches)
p36	6	13
p37	6	14
p38	6	15
p39	6	16
p40	6	17
p41	24	2
p42	24	3
p43	24	4
p44	24	5
p45	24	6
p46	24	7
p47	24	8
p48	24	9
p49	24	10
p50	24	11
p51	24	12
p52	24	13
p53	24	14
p54	24	15
p55	24	16
p56	24	17
p57	24	18
p58	24	19
p59	24	20
p60	24	21
p61	24	22
p62	24	23
p63	24	24

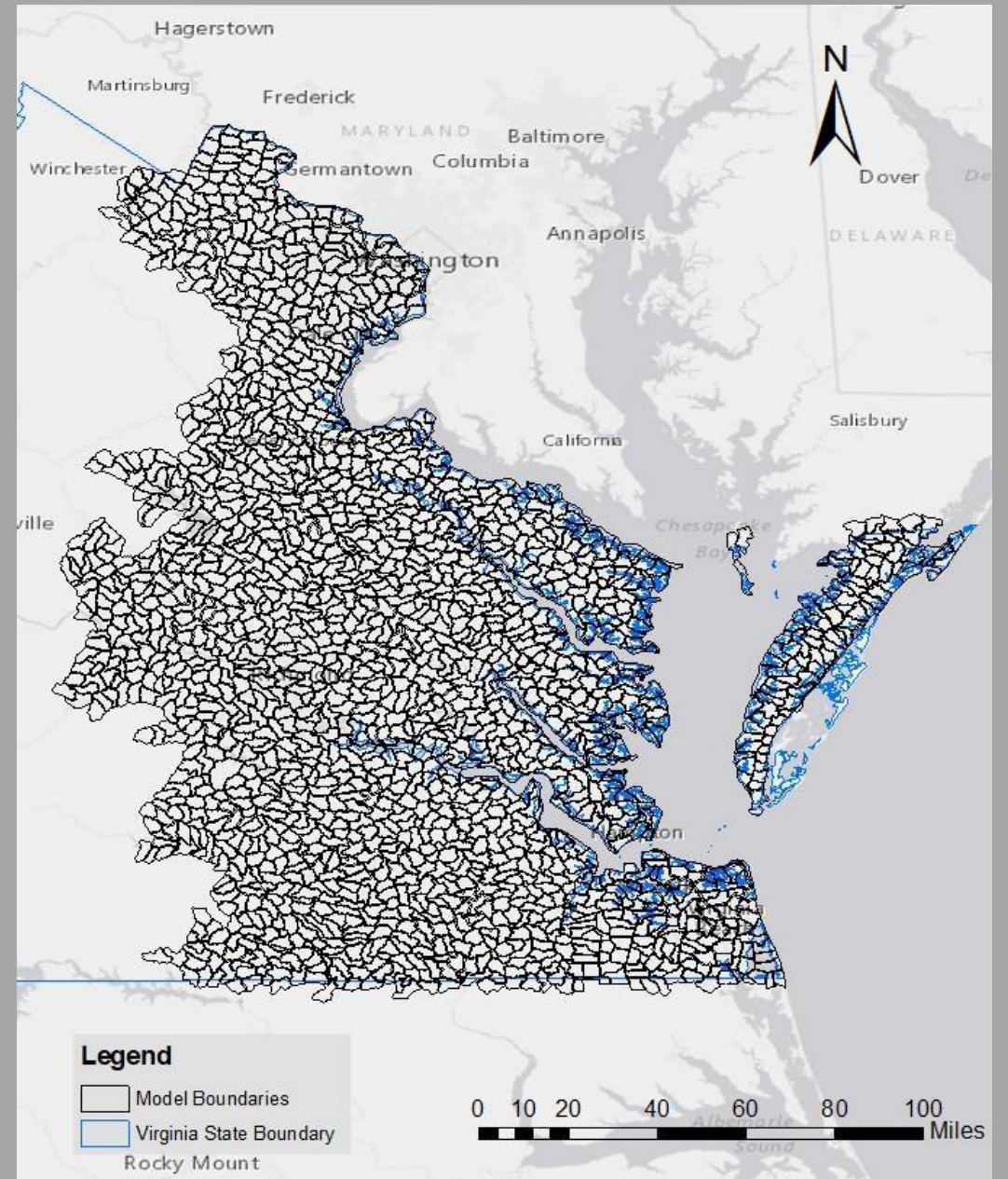


Modeling: Summary

18 Cities & 38 Counties

1,830 Models

>275,000 Simulations



Group Discussion

What questions do you have about the new modeling?

What are your initial thoughts on how this may help your community's needs?

Data Access

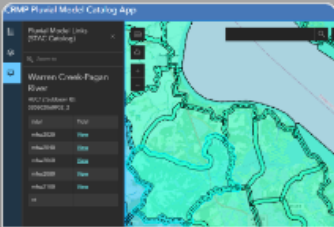
Open Data Hub

<https://crmp-vdcr.hub.arcgis.com/>

Data Preview

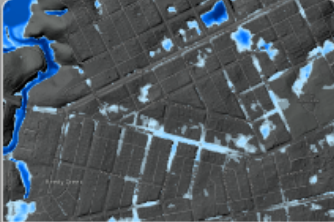


Model / Download
Access



CRMP Pluvial Model Catalog App
Catalog of pluvial flood models developed for the Virginia...

Explore




Pluvial Depth Grid 100yr (24hr Present)
Preview of Pluvial Hazard Data to be analyzed as part of the CR...

Explore



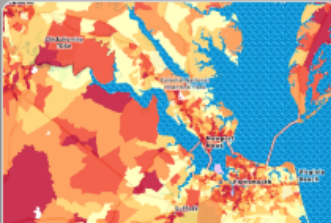
Coastal Flood Exposure and Social Vulnerability..
Analysis of areas with coastal flood hazard exposure and...

Explore



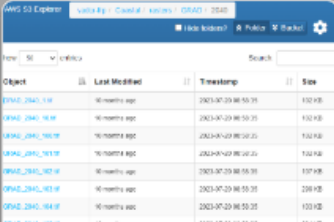
Flood Story View and Submit App
DCR invites you to share your flood story to help raise...

Explore



SVI Census Block Group Map
View and Download Social Vulnerability at Census Block...

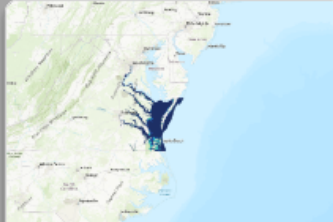
Explore



Object	Last Modified	Timestamp	Size
OPAD_2040_10M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_15M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_160M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_161M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_162M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_163M	10 months ago	2023-07-20 08:55:35	102 KB
OPAD_2040_164M	10 months ago	2023-07-20 08:55:35	102 KB

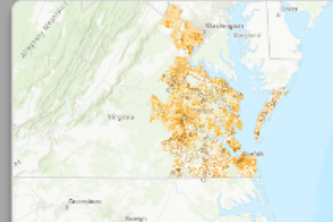
AWS Open Data Portal S3 Bucket
This link will send you to the AWS Open Data Portal where...

Explore



Coastal Flood Hazard (2020, 2040, 2060, 208...
VACRMP Coastal Flood Hazard Graduated Inundation Raster,...

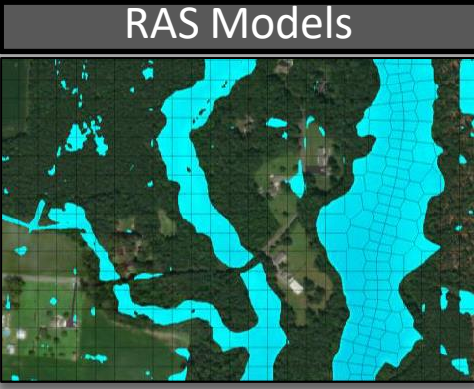
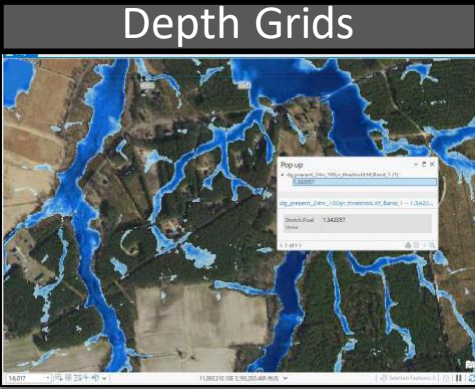
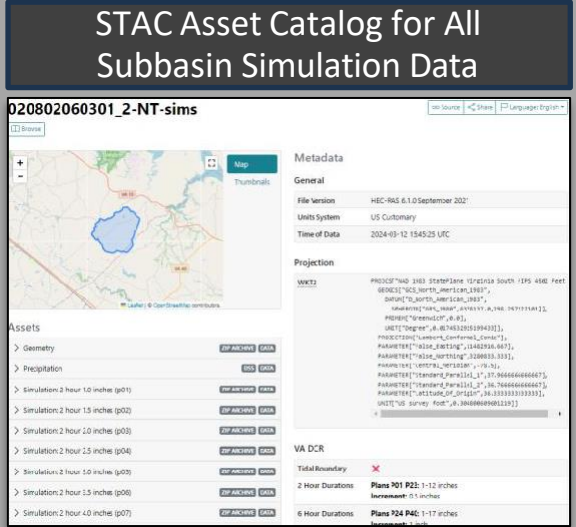
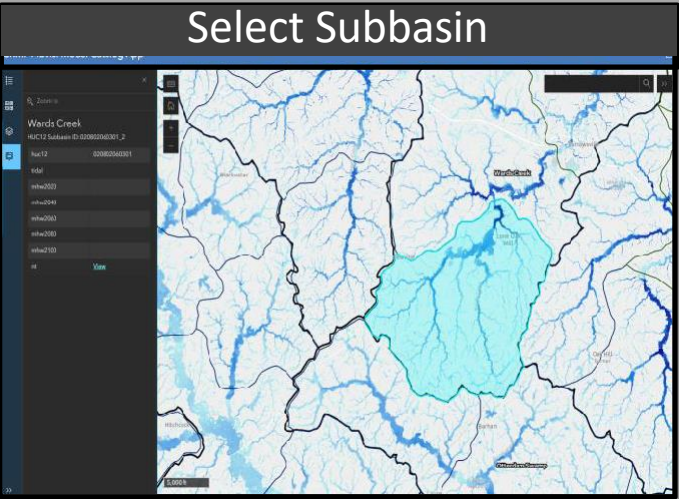
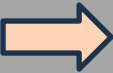
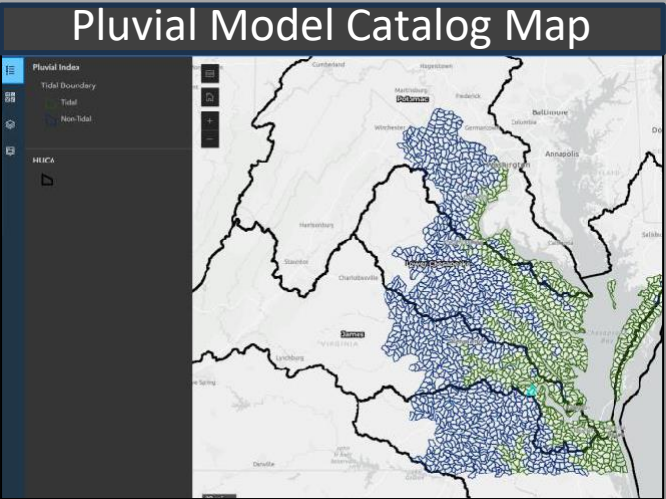
Explore



Community Context
VACRMP Community Context

Explore

Pluvial Model Catalog Navigation



Users can utilize the map to navigate or location search to access data for their area of interest

STAC Catalog

(SpatioTemporal Asset Catalog)

Granular access to download all interval simulations

Both Model files and the result depth grids files

020802060301_2-NT-sims

[Source](#)
[Share](#)
Language: English

Browse

Map

Thumbnails

Metadata

General

File Version	HEC-RAS 6.1.0 September 2021
Units System	US Customary
Time of Data	2024-03-12 15:45:25 UTC

Projection

WKT2

```
PROJCS["NAD_1983_StatePlane_Virginia_South_FIPS_450",
GEOGCS["GCS_North_American_1983",
DATUM["D_North_American_1983",
SPHEROID["GRS_1980",6378137.0,298.257222101]],
PRIMEM["Greenwich",0.0],
UNIT["Degree",0.0174532925199433]],
PROJECTION["Lambert_Conformal_Conic"],
PARAMETER["False_Easting",11482916.667],
PARAMETER["False_Northing",3280833.333],
PARAMETER["Central_Meridian",-78.5],
PARAMETER["Standard_Parallel_1",37.9666666666667],
PARAMETER["Standard_Parallel_2",36.7666666666667],
PARAMETER["Latitude_of_Origin",36.3333333333333],
UNIT["US survey foot",0.304800609601219]]
```

VA DCR

Tidal Boundary	✗
2 Hour Durations	Plans P01 P23: 1-12 inches Increment: 0.5 inches
6 Hour Durations	Plans P24 P40: 1-17 inches Increment: 1 inch
24 Hour Durations	Plans P41 P63: 2-24 inches Increment: 1 inch

Assets

- > Geometry ZIP ARCHIVE DATA
- > Precipitation DSS DATA
- > Simulation: 2 hour 1.0 inches (p01) ZIP ARCHIVE DATA
- > Simulation: 2 hour 1.5 inches (p02) ZIP ARCHIVE DATA
- > Simulation: 2 hour 2.0 inches (p03) ZIP ARCHIVE DATA
- > Simulation: 2 hour 2.5 inches (p04) ZIP ARCHIVE DATA
- > Simulation: 2 hour 3.0 inches (p05) ZIP ARCHIVE DATA
- > Simulation: 2 hour 3.5 inches (p06) ZIP ARCHIVE DATA
- > Simulation: 2 hour 4.0 inches (p07) ZIP ARCHIVE DATA
- > Simulation: 2 hour 4.5 inches (p08) ZIP ARCHIVE DATA
- > Simulation: 2 hour 5.0 inches (p09) ZIP ARCHIVE DATA
- > Simulation: 2 hour 5.5 inches (p10) ZIP ARCHIVE DATA
- > Simulation: 2 hour 6.0 inches (p11) ZIP ARCHIVE DATA

020802060301_2-nt-dgs

[Source](#)
[Share](#)
Language: English

Browse

Map

Thumbnails

Metadata

General

Description	This item includes Depth-Grid assets derived from HEC-RAS simulations (link to model data below) included in the CRMP Pluvial Flood Hazards analysis.
Time of Data	2024-04-29 1:37:13 UTC

VA DCR

Tidal Boundary	✗
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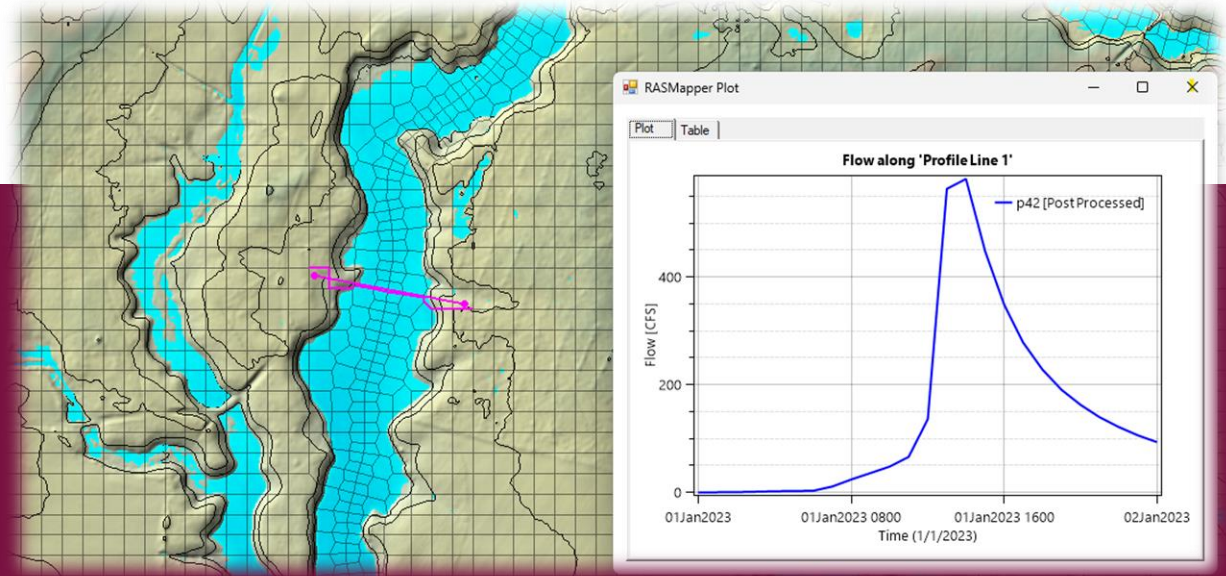
Assets

- > Simulation: 2 hour 1.0 inches (p01) SHOWN RAS-DEPTH-GRID COG
- > Simulation: 2 hour 1.5 inches (p02) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 2.0 inches (p03) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 2.5 inches (p04) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 3.0 inches (p05) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 3.5 inches (p06) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 4.0 inches (p07) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 4.5 inches (p08) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 5.0 inches (p09) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 5.5 inches (p10) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 6.0 inches (p11) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 6.5 inches (p12) RAS-DEPTH-GRID COG
- > Simulation: 2 hour 7.0 inches (p13) RAS-DEPTH-GRID COG

Product Benefits and Limitations

Product Benefits (1/3)

- Pre-developed base models ready for use
- Combines both hydrologic and hydraulic processes into one model
- Simulates complex surface runoff and flow dynamics that are not captured in a 1D or hydrologic modeling approach

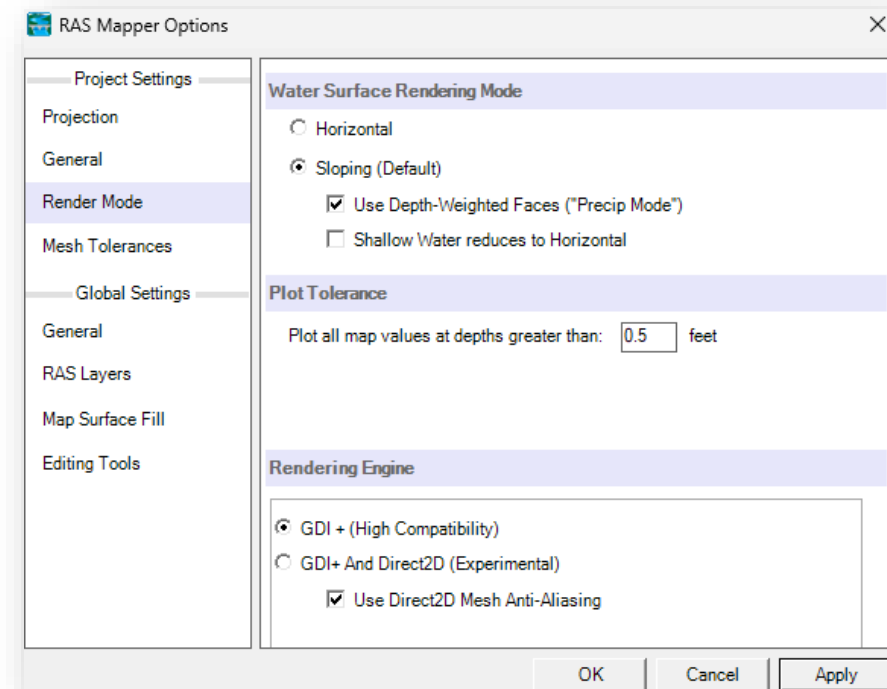


Product Benefits (2/3)

- Results for extreme events can be compared and used for high-level planning
- Rainfall used in models covers almost all return period storms including frequent events
- Models can be refined for a very small portion of the watershed and rerun without making refinements to the entire model

Product Benefits (3/3)

- Terrain modifications can be added
- Tidal inundation mapping can be generated from the models by adjusting the model's tailwater boundary condition
- Model results can be exported and brought into GIS for maps and figures
- The model results can all be shown graphically in ways that people unfamiliar with flood models can grasp



Product Limitations

- Cells size in context of other potential applications and resolving flow pathways
- Pipe networks and many culverts are not modeled. Results for small storm events carried by pipe networks may show flooding issues where there is none
- Models are Rain-on-Grid only and do not contain 1D river reaches or cross sections
- Results cannot be compared directly with FEMA 1D HEC-RAS model results

Use Cases

Floodplain Management

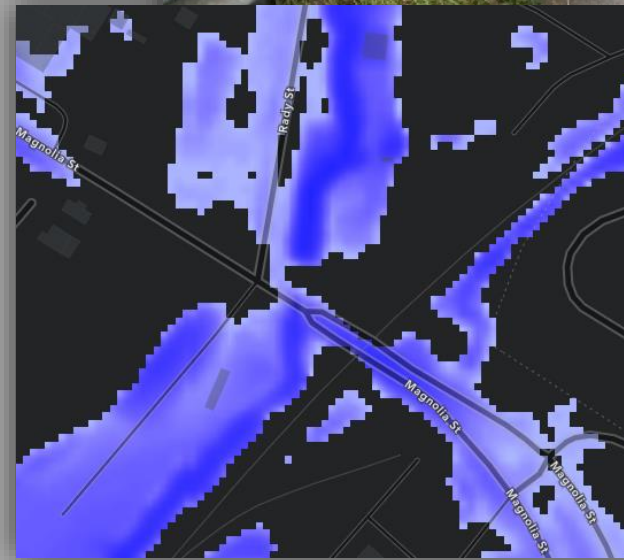


- Approximate (non-regulatory) floodplain extents
- Land cover change (pre- and post-development)
- Overland flow relief
- Tailwater elevations for hydraulic grade line computations
- Extracting profiles and cross-sections
- 1-ft or zero rise analysis

Homes that have experienced flooding, but were mapped outside 2014 effective SFHA

Public Works

- Baseline flood hazard data for H&H
- Baseline flood hazard data for design standards
- Roadway overtopping analysis
- Extract Tailwater Elevations for Hydraulic Grade Line Computations
- Approximate size of culvert or bridge openings
- Compound flood modeling



Parks and Environmental Management

- Conservation planning
- Agricultural land planning, BMP siting
- Restoration and conservation priorities
- Property acquisition
- Public access planning
- Data Input for Habitat Suitability Analysis



Planning and Zoning

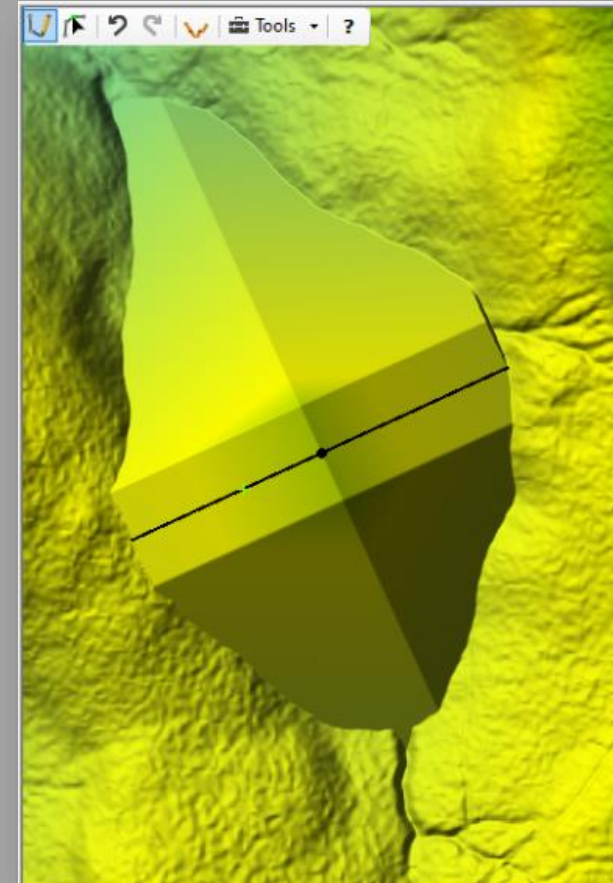
- Community awareness and vulnerability assessments
- Evacuation route planning



Model Modifications

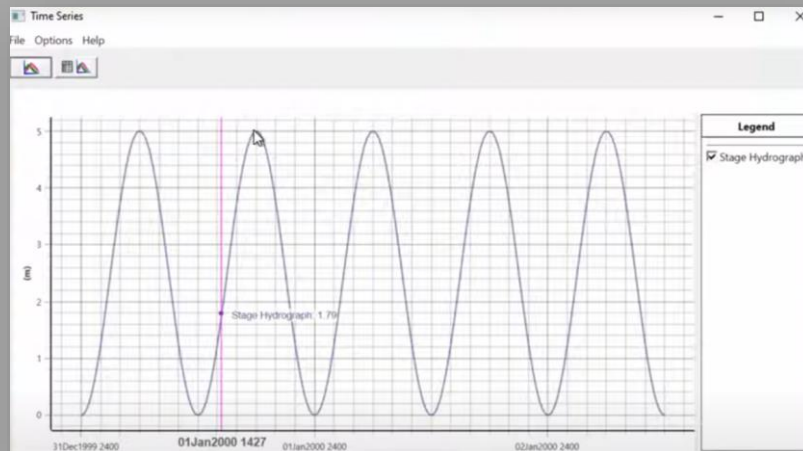
Terrain Modifications

- Represent channels, digging lakes, etc. for HEC- RAS and other applications
- Assess dam and levee impacts to upstream and downstream properties
- Terrain modifications in GIS (e.g., add roadway embankment, calculate fill volume)
- Represent projects for CLOMRs



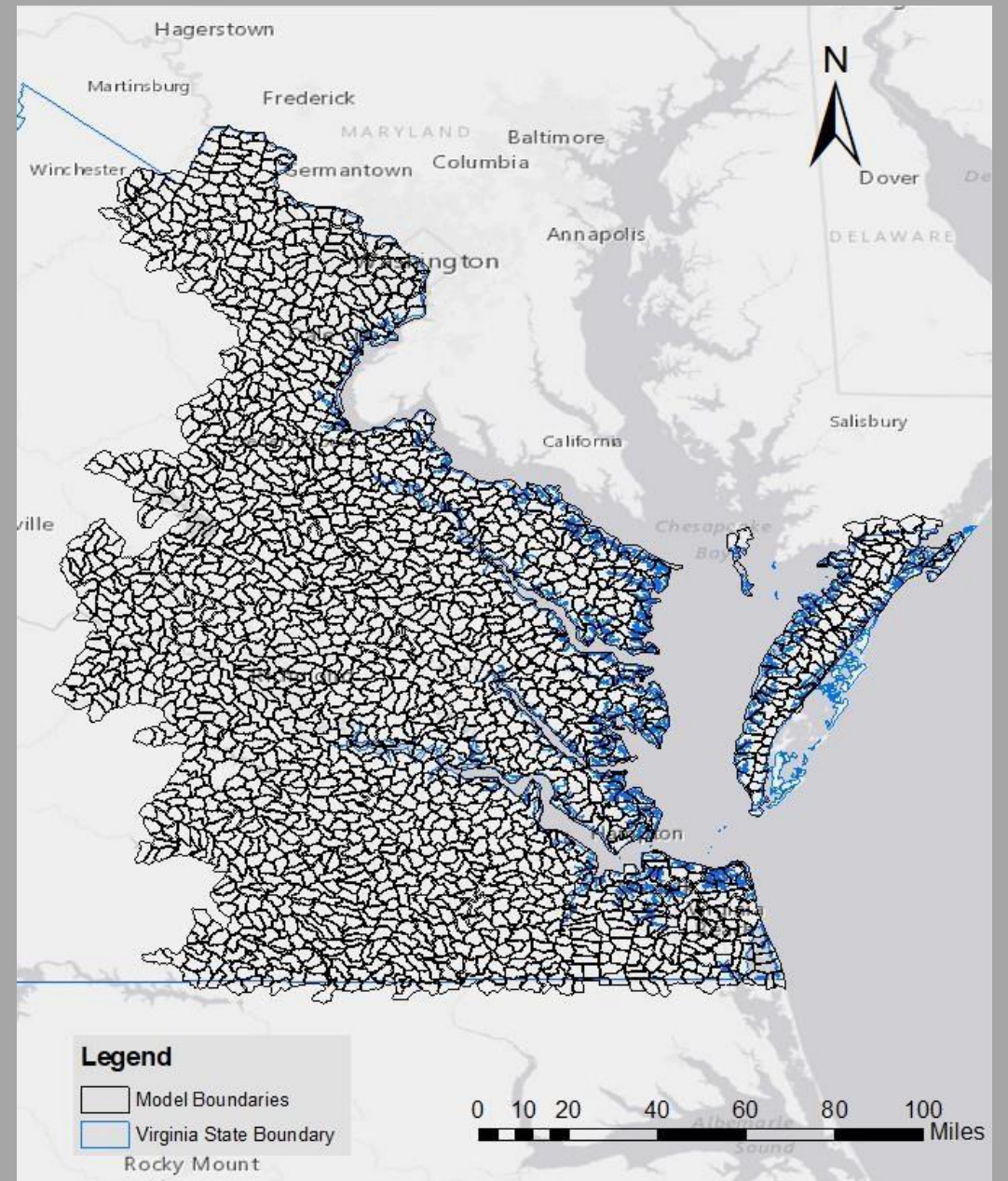
Model Inputs

- **Land Cover Changes:** Analyze impacts and affects of changes to land cover conditions by creating new infiltration and friction rasters
- **Tidal Boundary Conditions:** Tidal inundation mapping can be generated from the models (e.g., add a tidal stage hydrograph BC)



Group Discussion

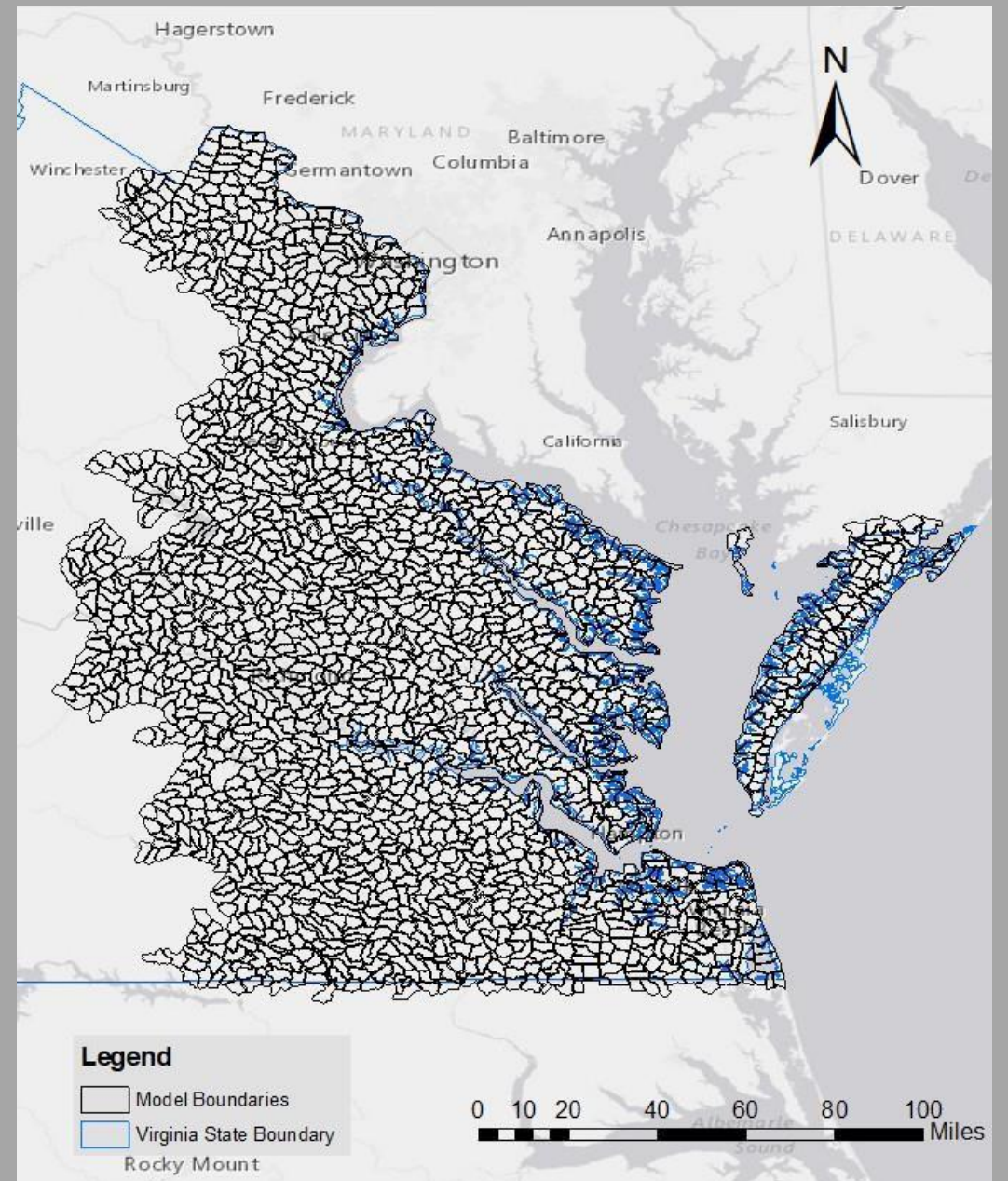
How might your organization/community use the new pluvial flood modeling?



Draft User Guide

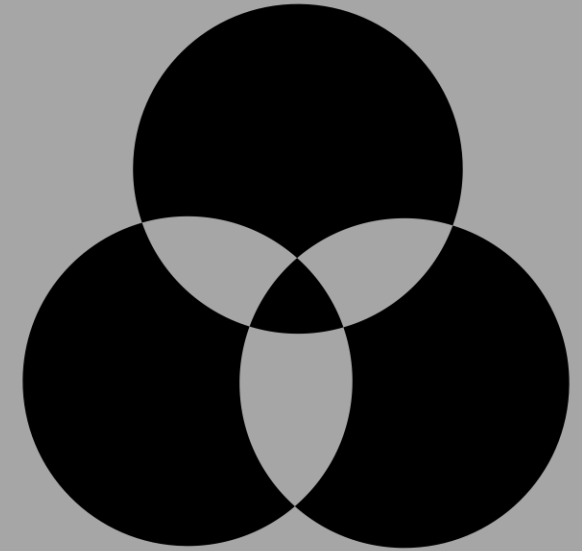
Group Discussion

What other use cases would you recommend DCR consider when developing a *User Guide*?



Who is the Audience?

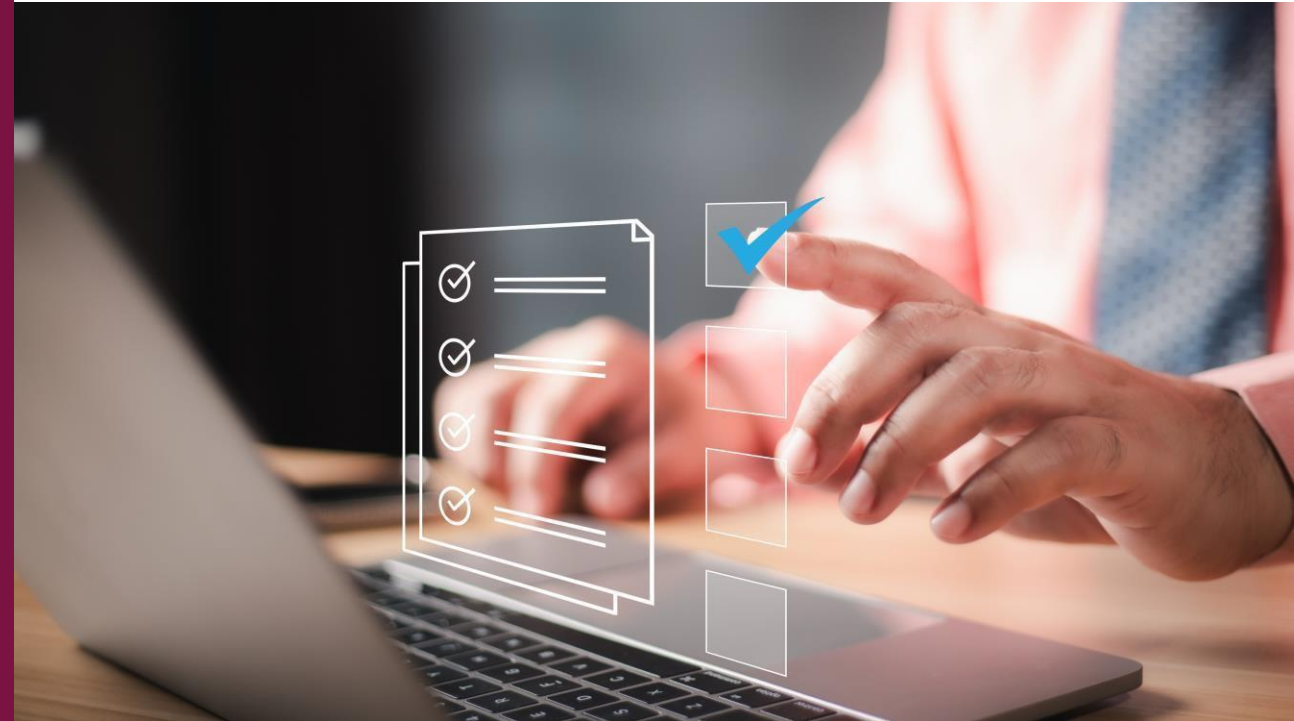
- **Primary Audience (Managers)**
 - Local, regional, and state government staff who influence or scope flood resilience policy, plans, and/or projects.
 - i.e. state agency program managers, public utility managers, floodplain administrators.
- **Secondary Audience (Modelers)**
 - Practitioners with knowledge of operating HEC-RAS who wants to modify for potential applications.
 - i.e public and private-sector engineers, planners, consultants, university researchers/students.



Created by Mister Pixel
from Noun Project

Polling Questions

1. 7 questions to collect further feedback
2. Your answers are not anonymous
3. We will share the results live with the group for discussion



Group Discussion

What other suggestions do you have about how we can improve the *User Guide*?



Next Steps

Thank you!

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Seth Lawler
Computational Scientist, Dewberry
slawler@dewberry.com