# Flood Resilience Advisory Committee

June 27, 2025

Photo: Virginia Department of Conservation & Recreation

| Full Name | Title | Organization |
|---|---|---|
| Matthew Wells (Chair) | Director | Virginia Department of Conservation and Recreation |
| Greg Steele (Vice-chair) | Chief Resilience Officer | Office of Commonwealth Resilience |
| Martin D. Brown | Chief Diversity Officer | Office of Diversity, Opportunity and Inclusion |
| Robbie Coates | Director, Grant Management and Recovery Division | Virginia Department of Emergency Management |
| Shawn Crumlish<br>[Peter D'Alema] | Executive Director<br>[Director of Program Management] | Virginia Resource Authority |
| Bill Curtis | Assistant Director | Virginia Department of Housing and Community Development |
| Jamie Green | Commissioner | Virginia Marine Resources Commission |
| LJ Hansen | Director of Public Works, Virginia Beach | Virginia Municipal League |
| James Hutzler | Government Relations Associate | Virginia Association of Counties |
| Fred Kirby | State Review Engineer | Virginia Department of General Services |
| Adrienne Kotula | Virginia Director | Chesapeake Bay Commission |
| Lewie Lawrence | Executive Director, MPPDC | Virginia Association of Planning District Commissions |
| John Lawson | Director | Office of Intermodal Planning and Investment |
| Alex Samms | Chief Deputy | Virginia Department of Environmental Quality |
| Chris Swanson<br>[Angel Deem] | Director, Environmental Division<br>[Chief of Policy] | Virginia Department of Transportation |

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*[Alternate Member]*

# Meeting Agenda

1) Call to Order & Roll Call
2) Adoption of the Agenda
3) Adoption of the Meeting Minutes from February 5, 2025
4) Flood Committee Charter Discussion and Vote to Adopt
5) Chief Resilience Officer Updates
6) Department of Conservation and Recreation Updates
7) Virginia Flood Protection Master Pan
    a. Statewide Flood Hazard Impact Analysis Overview
    b. Flood Resilience Strategies
    c. Next Steps
8) Committee Member Updates
9) Public Comment
10) Adjourn

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# Flood Committee Charter

Member Discussion

Vote to Adopt

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# Office of Commonwealth Resilience Updates

Greg Steele - Chief Resilience Officer

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# Department of Conservation and Recreation Updates

Matthew Wells – Director

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Virginia Department of Conservation & Recreation

# Virginia Flood Protection Master Plan

Overview

Statewide Flood Hazard Impact Analysis Overview

Flood Resilience Strategies

Next Steps

VIRGINIA FLOOD PROTECTION MASTER PLAN

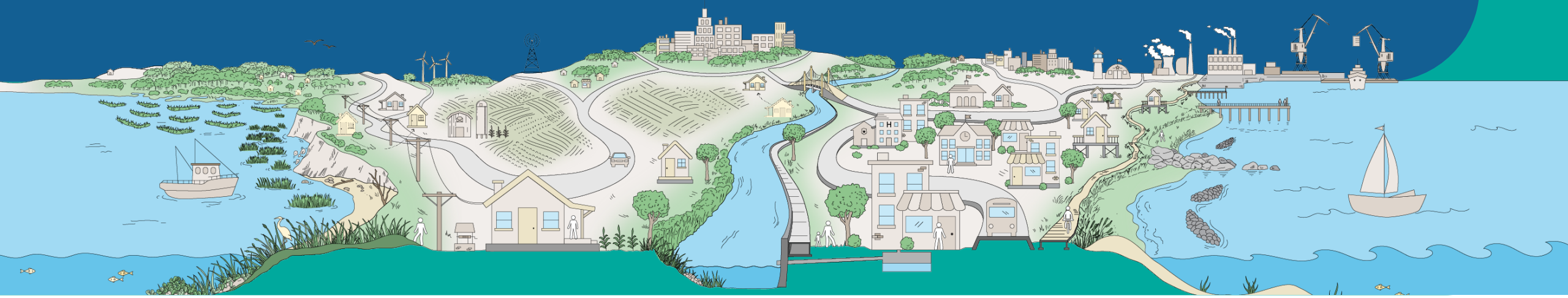
The Virginia Flood Protection Master Plan (VFPMP) will be

an actionable plan for the Commonwealth

to use in crafting policies and programs

to mitigate the impacts of flooding

on people, the economy, and the environment.



VIRGINIA FLOOD PROTECTION MASTER PLAN

# Where we are going

*Timeframe: 2025-2045*

## Vision

Long-term aspirations and desired outcomes for flood risk reduction across Virginia

## Goals

Succinct statements of what needs to be accomplished to move towards the Vision

## Objectives

Provide the basis for evaluating alternatives and measuring progress towards goals

# How we get there

*Timeframe: 2025-2030*

## Strategies

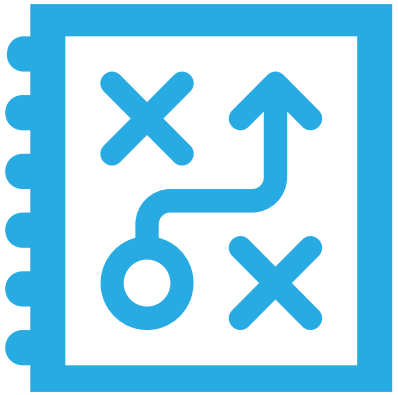
Actionable approaches to address gaps in the current state of practice and advance the plan's goals

## Implementation Roadmap

Outline the specific steps and mechanisms to implement the strategies and actions identified

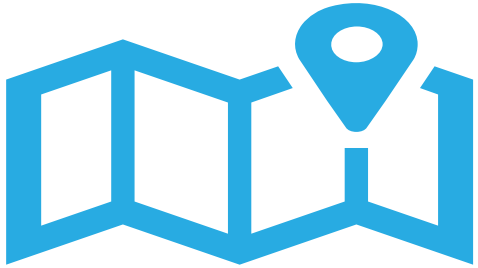
VIRGINIA FLOOD PROTECTION MASTER PLAN

# VFPMP Final Products*



The Plan

Report in Brief



Data Viewer

Status Tracker

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Key Points in Collaboratively Developing the VFPMP

**Stage Setting**

*Identify past and current flood resilience successes and challenges to inform the development of initial VFPMP goals.*

**Determine Vision, Goals & Objectives**

*Define clear desired outcomes to guide the Virginia Flood Protection Master Plan.*

**Prioritize Gaps to Address**

*Identify and prioritize data, resource, and capacity gaps in statewide flood risk management.*

**Identify Flood Resilience Strategies**

*Identify statewide actions that can be taken within the next five years to address gaps and strengthen Virginia's flood resilience.*

**Develop Implementation Roadmap**

*Outline mechanisms, responsible parties, required resources, timelines, and success metrics to guide implementation.*

# Integrated Flood Resilience Planning & Stakeholder Engagement

State-Led, Informed by Localities

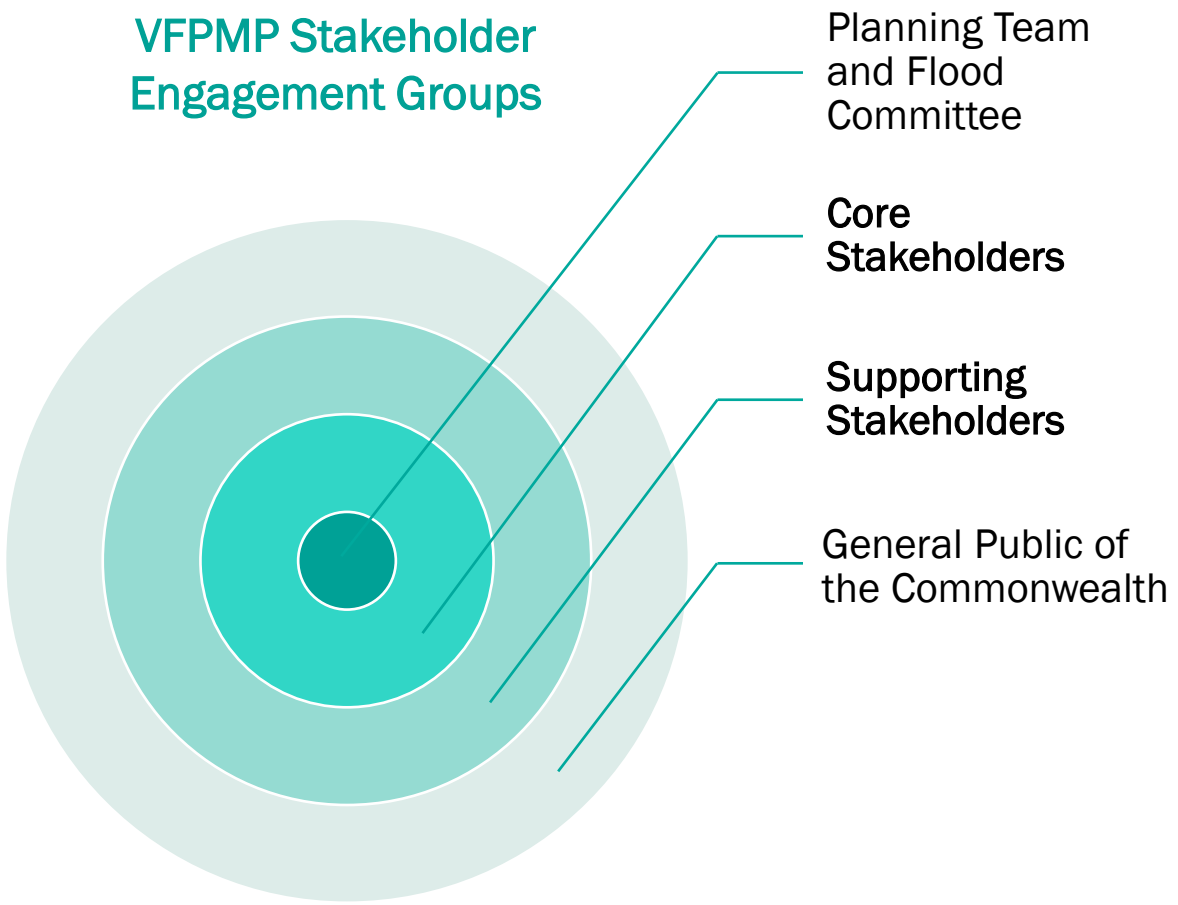
Virginia Flood Protection Master Plan
**Commonwealth**

Regional Flood Resilience Master Plans
**Regional**

Locality-Led, Informed by State

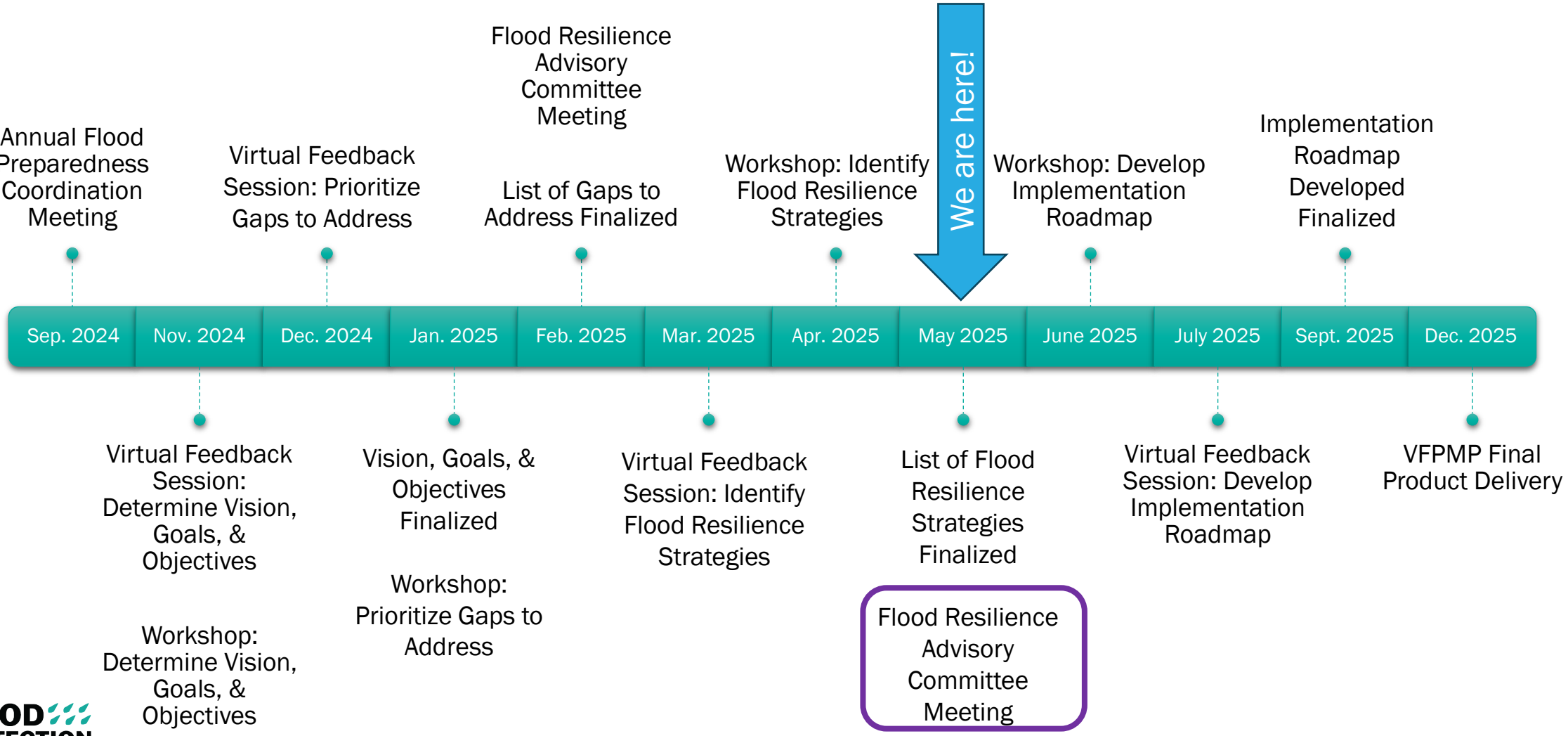
Local Flood Resilience Plans
*Regional or Local Hazard Mitigation Plans, CFPF Resilience Plans, Comprehensive Plans*

**Localities & PDCs**




VIRGINIA FLOOD PROTECTION MASTER PLAN

# Overview of VFPMP Development Schedule & Engagement Points



# Virginia Flood Protection Master Plan

Statewide Flood Hazard Impact Analysis Overview

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Introduction to VFPMP Flood Impact Study

- A Flood Impact Study was conducted as part of the Virginia Flood Protection Master Plan development process
- The analysis provides, for the first time, a baseline for flood impacts statewide using common methods, assumptions, and inputs and allowing for comparison across geographies
- The results of this analysis serve to complement and augment understanding of flood impacts from existing models at other spatial scales (e.g., those used in the Coastal Resilience Master Plan or at local scales)
- This presentation is intended to familiarize core stakeholders with the inputs, tools, and types of outputs of the Flood Impact Study.

# Inputs to Impact Methodology

| | |
|---|---|
| Hazards | Extents and depths of inland and coastal defended flood layers statewide. Includes coastal, pluvial, and fluvial flood sources. Multiple return periods and climate scenarios at ~10m resolution (1/3 arcsecond) from Fathom (2024). |
| Building Inventory | Locations and characteristics from National Structure Inventory and Lightbox SmartFabric Professional Virginia Parcels (via HIFLD Secure). |
| Population Data | Population and demographic data from 5-Year American Community Survey data at the census tract from the US Census Bureau (2020). |
| Critical & Environmental Assets | Large, multisource data set consolidating information from HIFLD Secure as well as various federal and state agencies. |
| Economic Data | Data from sources such as the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor Statistics, the U.S. Census Bureau, and the U.S. Department of Agriculture from IMPLAN (2023) |

# Initial Outputs of Impact Methodology

## Exposure Counts

Buildings
Built Infrastructure
Human Infrastructure
Natural Infrastructure
Community Resources
Population
Land Cover

## Direct Physical Damages

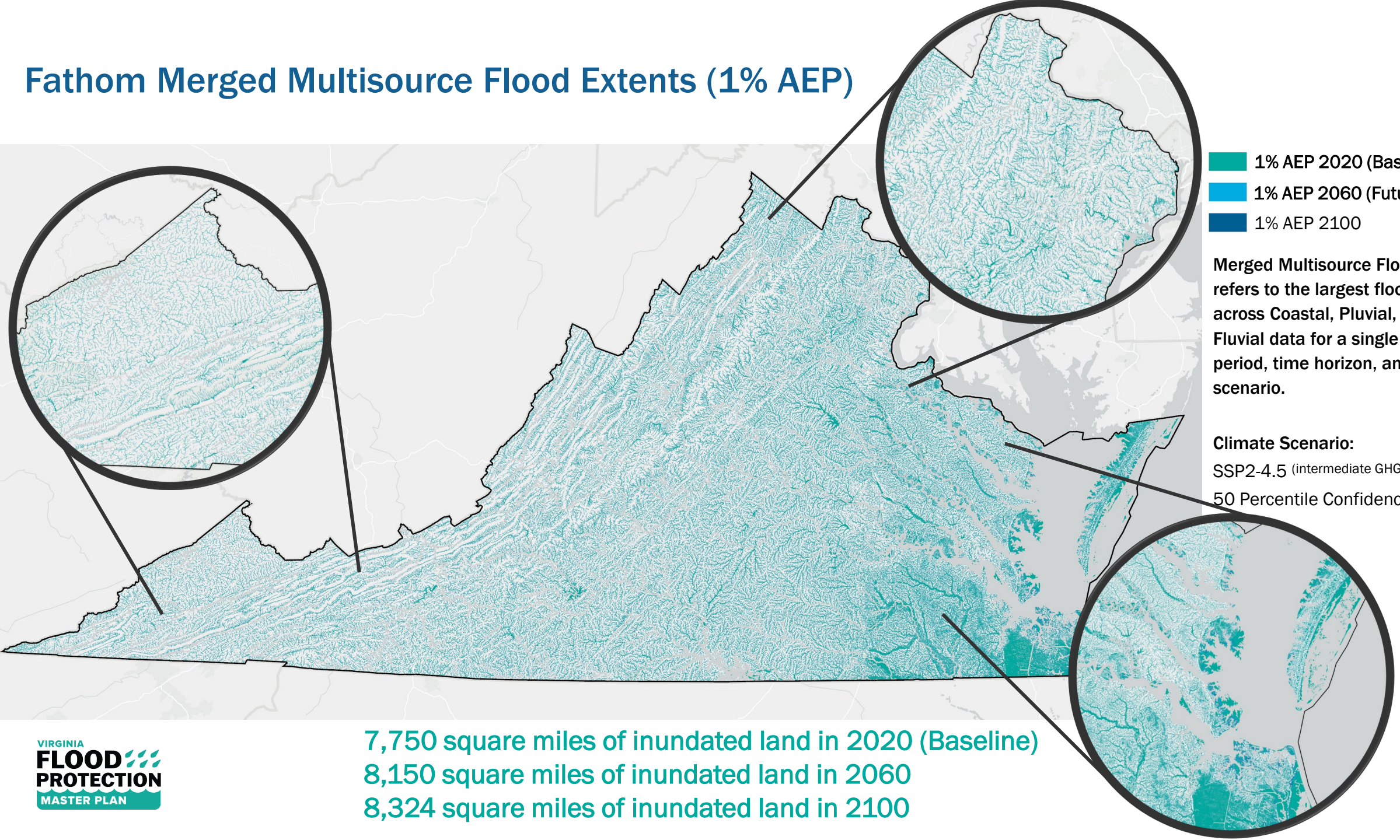
Damages to Structures
Contents and Inventory
Loss

## Economic Impacts

Direct Output
Indirect Output
Induced Output
Federal, State, Local Taxes
Jobs

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Fathom Merged Multisource Flood Extents (1% AEP)



1% AEP 2020 (Baseline)
1% AEP 2060 (Future)
1% AEP 2100

**Merged Multisource Flood Extent refers to the largest flood extent across Coastal, Pluvial, and Fluvial data for a single return period, time horizon, and climate scenario.**

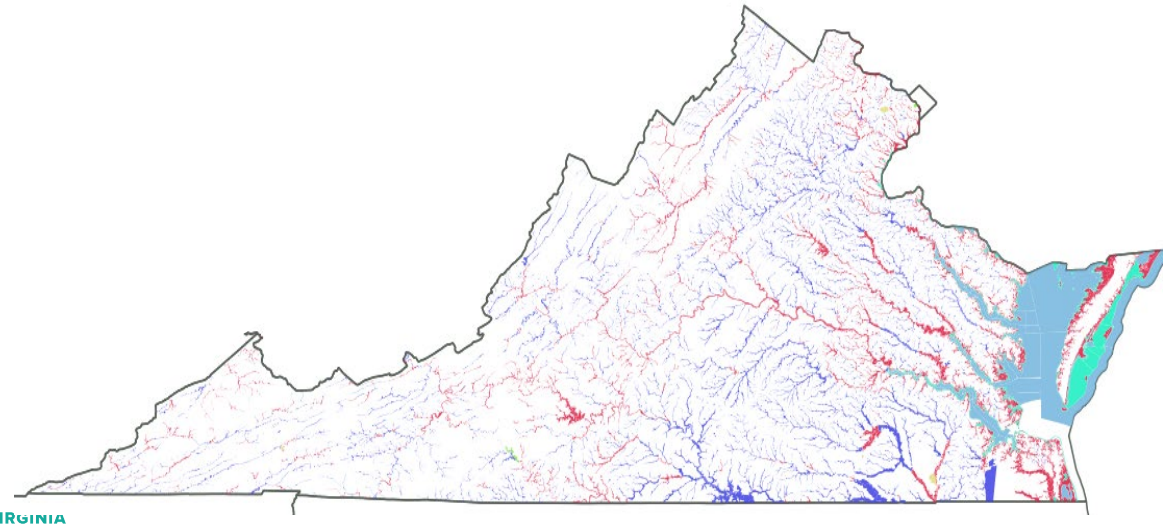
**Climate Scenario:**
SSP2-4.5 (intermediate GHG emissions)
50 Percentile Confidence Interval

7,750 square miles of inundated land in 2020 (Baseline)
8,150 square miles of inundated land in 2060
8,324 square miles of inundated land in 2100

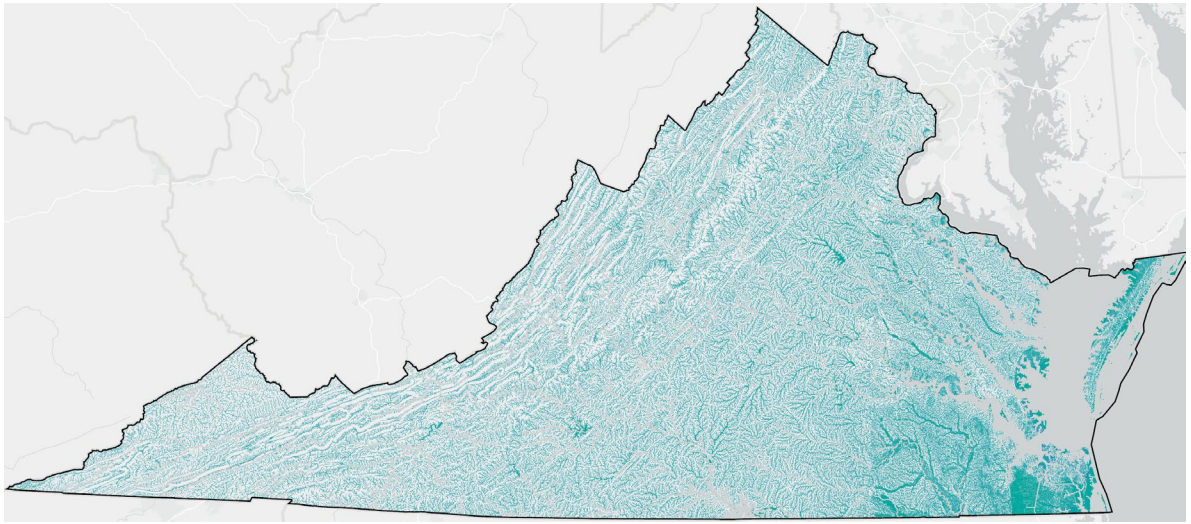
VIRGINIA FLOOD PROTECTION MASTER PLAN

# FEMA vs Fathom Flood Extents (1% AEP)

| Metric | FEMA | Fathom | Delta | % |
|---|---|---|---|---|
| Land Area [sq mi] | 2,100 | 7,800 | 5,700 | 270% |
| Structures [# buildings] | 119,000 | 260,000 | 141,000 | 120% |



FEMA Regulatory Floodplain



Fathom Non-Regulatory Floodplain

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Top 5 Communities with increased flood risk using Fathom data

No Structures

| Community Name | County | FEMA Total Exposed Structures | Fathom Total Exposed Structures | Difference |
|---|---|---|---|---|
| EXMORE, TOWN OF | Northampton | 0 | 147 | 147 |
| WAVERLY, TOWN OF | Sussex | 0 | 106 | 106 |
| NASSAWADOX, TOWN OF | Northampton | 0 | 69 | 69 |
| ONLEY, TOWN OF | Accomack | 0 | 63 | 63 |
| HALLWOOD, TOWN OF | Accomack | 0 | 50 | 50 |

% Increase

| Community Name | County | FEMA Total Exposed Structures | Fathom Total Exposed Structures | Difference (%) |
|---|---|---|---|---|
| PEARISBURG, TOWN OF | Giles | 1 | 60 | 5,900% |
| CAPE CHARLES, TOWN OF | Northampton | 8 | 370 | 4,525% |
| WAKEFIELD, TOWN OF | Sussex | 4 | 126 | 3,050% |
| ORANGE, TOWN OF | Orange | 2 | 50 | 2,400% |
| SOUTH HILL, TOWN OF | Mecklenburg | 1 | 18 | 1,700% |

Total Increase

| Community Name | County | FEMA Total Exposed Structures | Fathom Total Exposed Structures | Difference |
|---|---|---|---|---|
| VIRGINIA BEACH, CITY OF | Virginia Beach | 7,013 | 33,926 | 26,913 |
| NORFOLK, CITY OF | Norfolk | 6,593 | 19,800 | 13,207 |
| HAMPTON, CITY OF | Hampton | 10,912 | 19,702 | 8,790 |
| CHESAPEAKE, CITY OF | Chesapeake | 5,783 | 13,042 | 7,259 |
| PORTSMOUTH, CITY OF | Portsmouth | 3,548 | 9,730 | 6,182 |

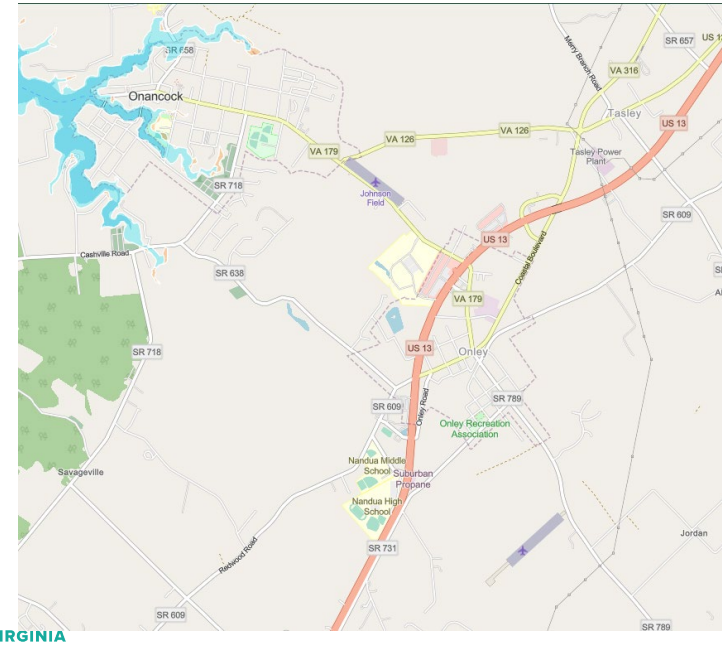
VIRGINIA FLOOD PROTECTION MASTER PLAN

# Onley, VA Flood Exposure (1% AEP)

The gap between FEMA and Fathom or CRMP data represents unaccounted and unmanaged flood risk at the individual, local, and state level.

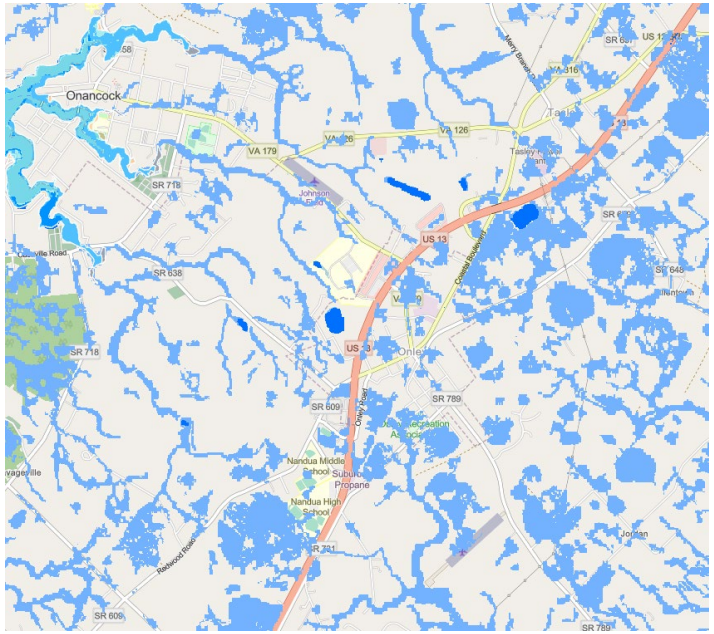
## FEMA

0 Buildings



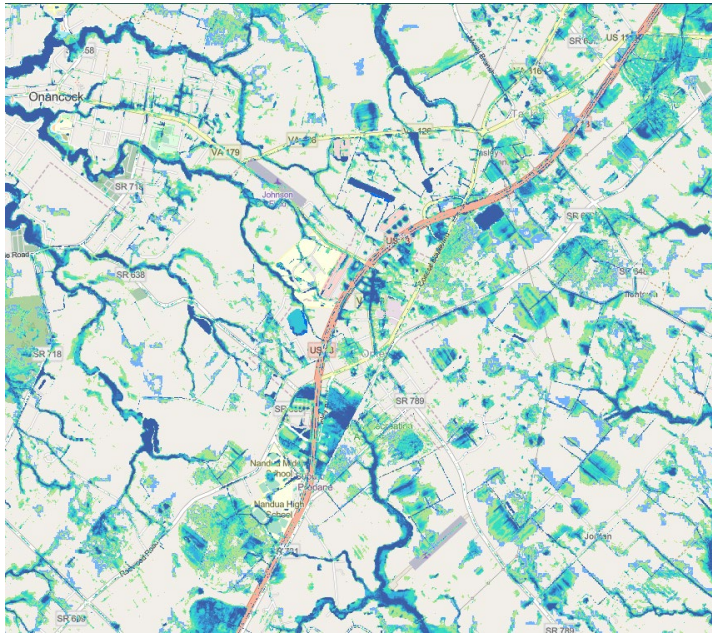

## Fathom

63 Buildings



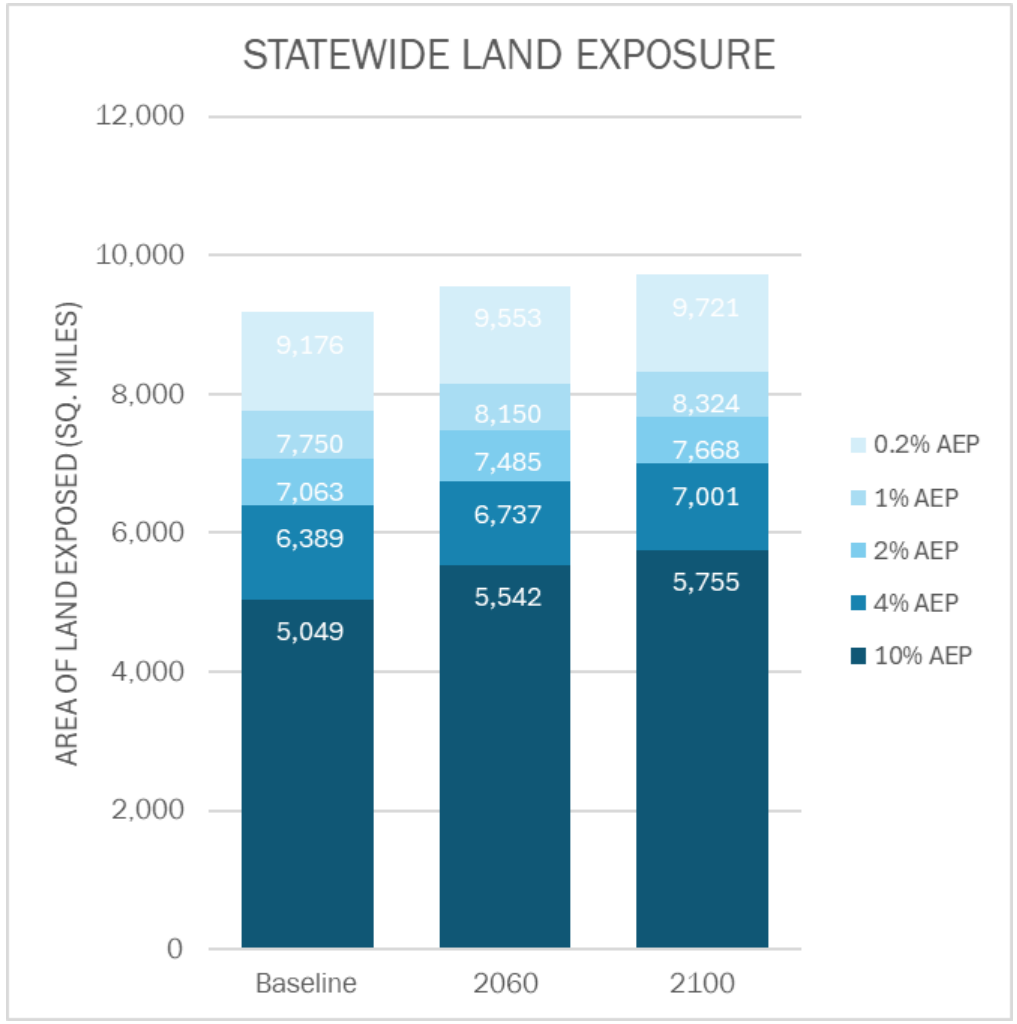

## CRMP

76 Buildings

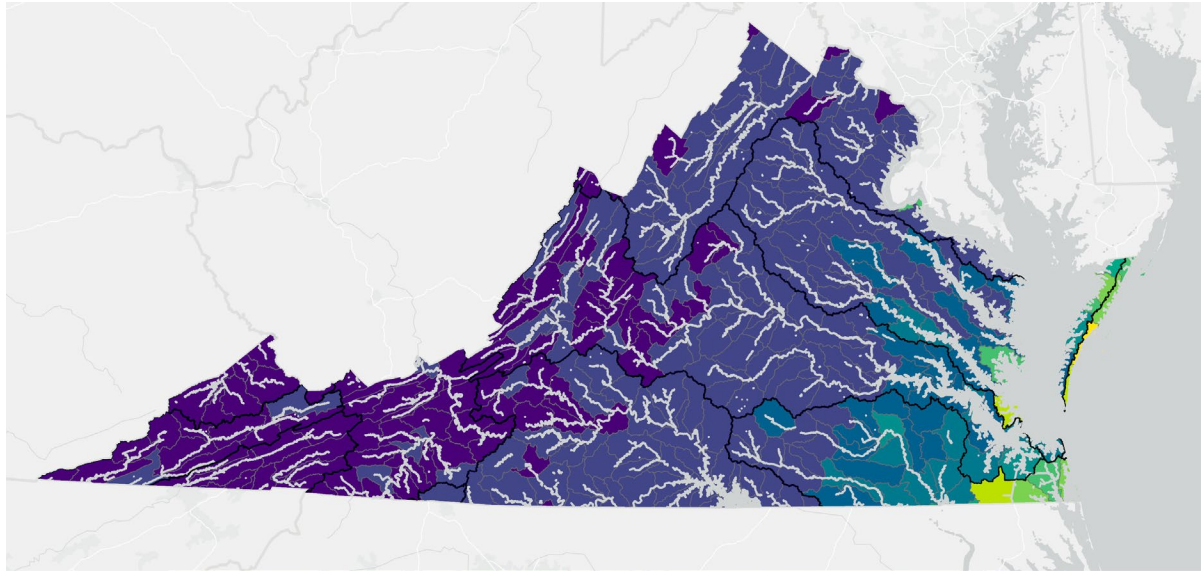



VIRGINIA FLOOD PROTECTION MASTER PLAN

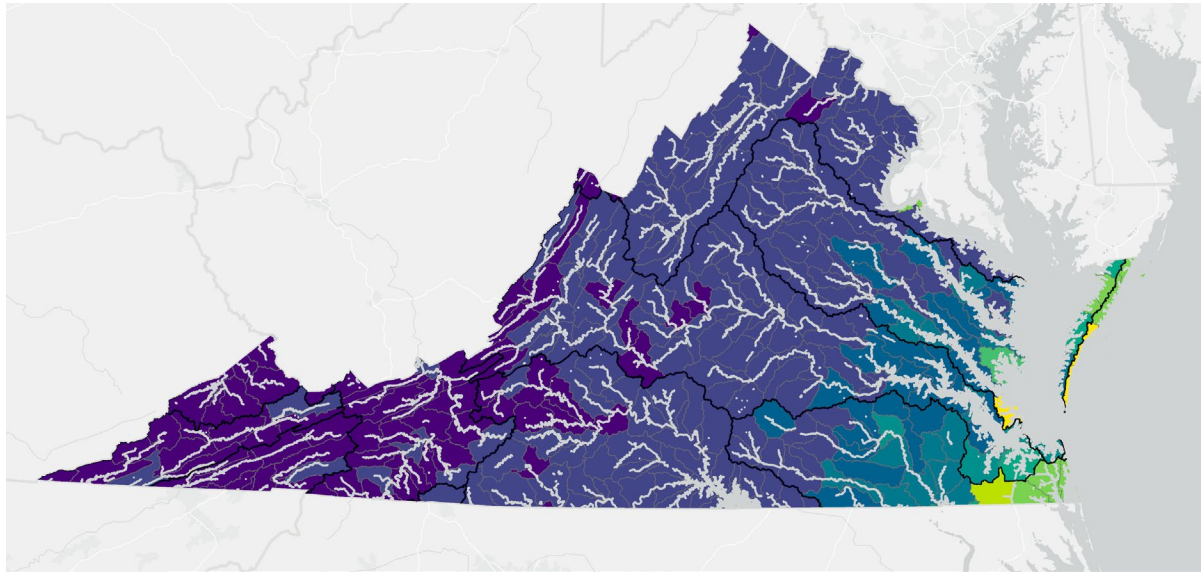
# Land Exposure (1% AEP)




HUC-6 Proportion of Flood-Exposed Land (1% AEP) - Baseline



HUC-6 Proportion of Flood-Exposed Land (1% AEP) - 2060



Pct. of land exposed

0% 80%

VIRGINIA FLOOD PROTECTION MASTER PLAN

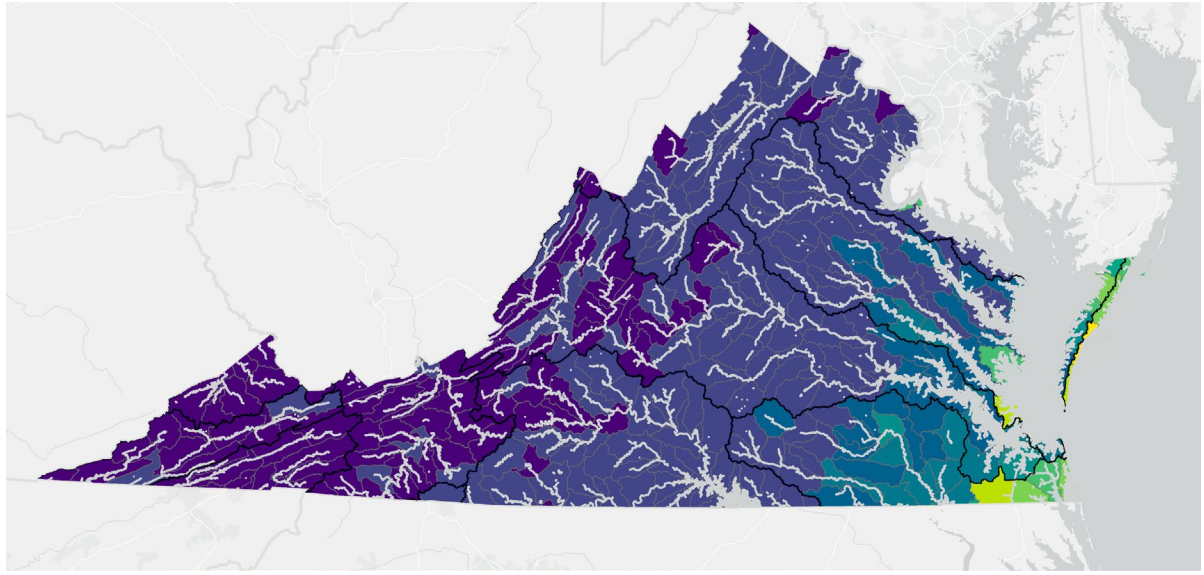
# Land Exposure (1% AEP)

| HUC6 | Total Land (Square Miles) | Baseline (2020) | | Future (2060) | |
|---|---|---|---|---|---|
| | | Exposed Land Area | Percent of Total Land Area Exposed | Exposed Land Area | Percent of Total Land Area Exposed |
| **Albemarle-Chowan** | **6,618** | **1,595** | **24%** | **1,666** | **25%** |
| Big Sandy | 1,753 | 72 | 4% | 76 | 4% |
| French Broad-Holston | 2,017 | 124 | 6% | 132 | 7% |
| James | 14,127 | 1,622 | 11% | 1,707 | 12% |
| Kanawha | 5,209 | 348 | 7% | 367 | 7% |
| **Lower Chesapeake** | **9,733** | **1,619** | **17%** | **1,725** | **18%** |
| **Mid Atlantic Coastal** | **440** | **276** | **63%** | **285** | **65%** |
| Potomac | 8,626 | 869 | 10% | 917 | 11% |
| Roanoke | 10,119 | 994 | 10% | 1,030 | 10% |
| Upper Pee Dee | 118 | 10 | 8% | 10 | 9% |
| Upper Tennessee | 3,944 | 220 | 6% | 233 | 6% |
| **Total** | **62,706** | **7,750** | **12%** | **8,150** | **13%** |

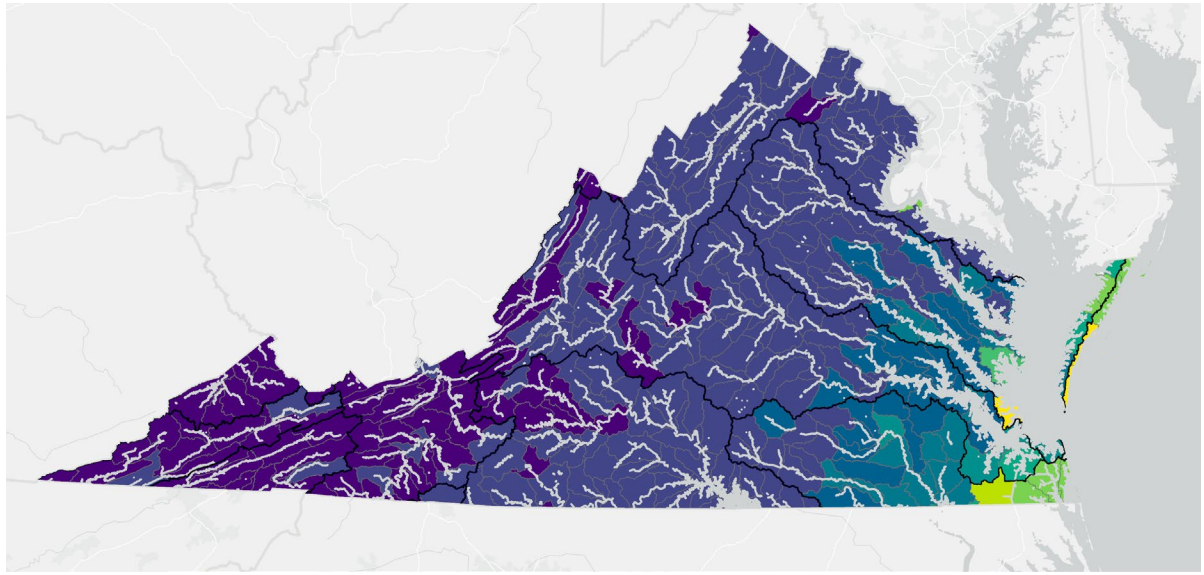
[1] Bolded rows show top three HUC6s by percent exposure

VIRGINIA FLOOD PROTECTION MASTER PLAN

HUC-6 Proportion of Flood-Exposed Land (1% AEP) - Baseline



HUC-6 Proportion of Flood-Exposed Land (1% AEP) - 2060



Pct. of land exposed

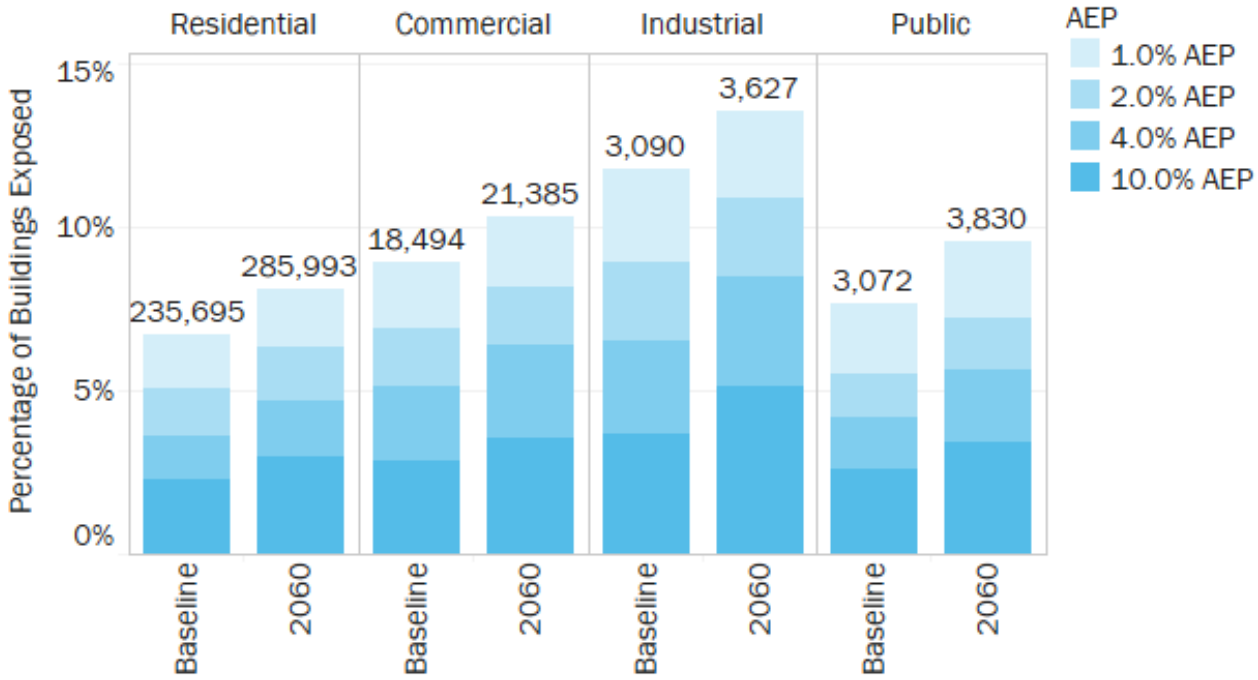
0% 80%

# Building Exposure by Reporting Category

The results show that the Baseline merged multisource flooding exposes over 260,000 buildings to flooding in the 1% AEP event. By 2060, the impacts of flooding from the 1% AEP event potentially impact over 314,000 buildings.

The reporting categories with the top percent of buildings exposed include:

1. Industrial
2. Commercial
3. Public



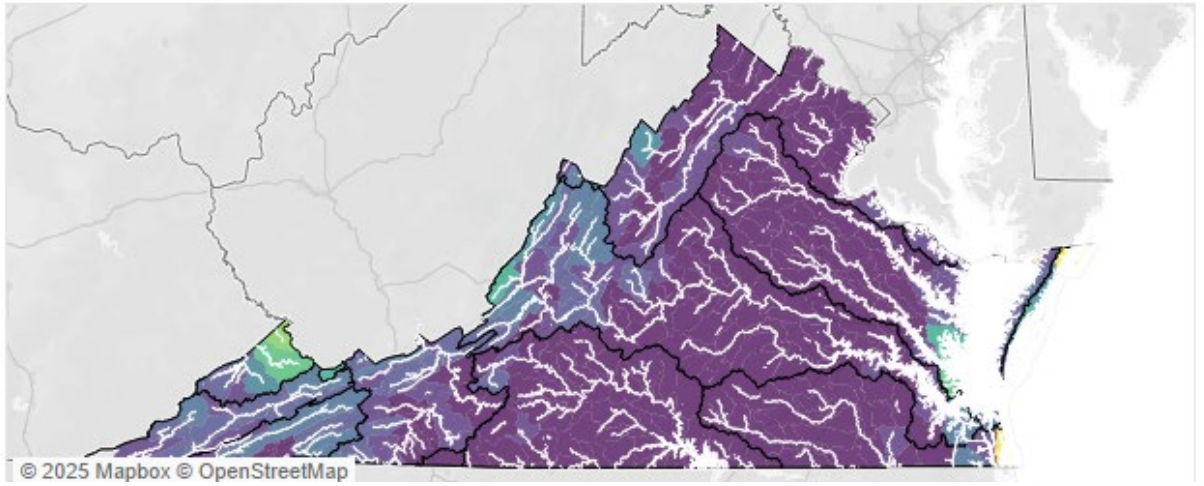

260,351 buildings exposed in Baseline Scenario (1% AEP)
314,835 buildings exposed in Future Scenario (1% AEP)

# Building Exposure (1.0% AEP)

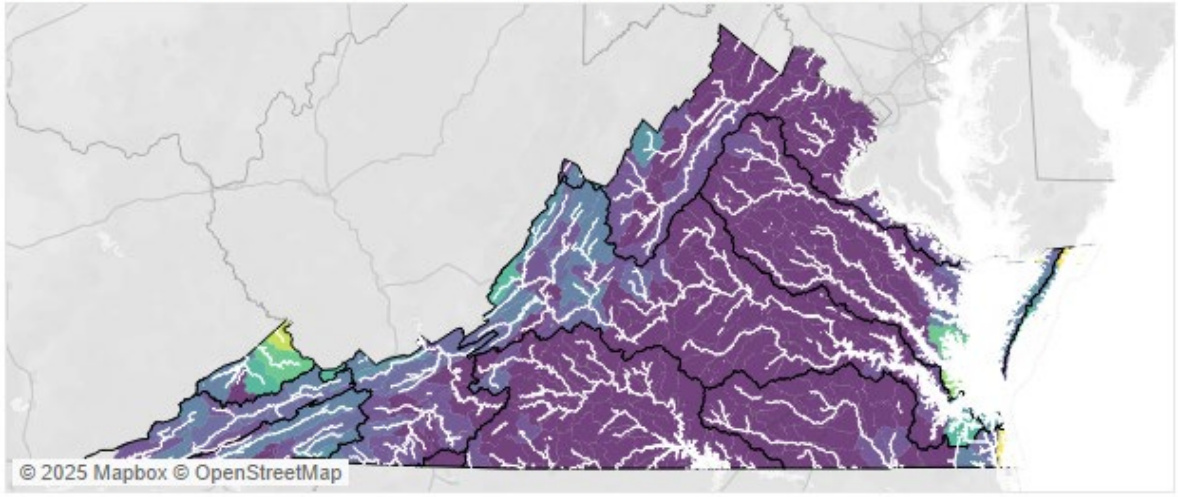
| HUC6 | Total Buildings[1] | Baseline (2020)[1] | | Future (2060)[1] | |
|---|---|---|---|---|---|
| | | Exposed Buildings | Percent of Total Buildings Exposed | Exposed Buildings | Percent of Total Buildings Exposed |
| Albemarle-Chowan | 205,980 | 21,101 | 10% | 24,846 | 12% |
| Big Sandy | 24,463 | 7,663 | 31% | 7,898 | 32% |
| French Broad-Holston | 89,651 | 10,971 | 12% | 11,626 | 13% |
| James | 1,147,505 | 75,517 | 7% | 98,973 | 9% |
| Kanawha | 163,023 | 11,806 | 7% | 12,638 | 8% |
| Lower Chesapeake | 611,936 | 65,127 | 11% | 84,344 | 14% |
| Mid Atlantic Coastal | 29,491 | 13,549 | 46% | 14,972 | 51% |
| Potomac | 970,867 | 28,883 | 3% | 32,265 | 3% |
| Roanoke | 472,844 | 13,477 | 3% | 14,291 | 3% |
| Upper Pee Dee | 8,073 | 219 | 3% | 230 | 3% |
| Upper Tennessee | 76,027 | 11,478 | 15% | 12,143 | 16% |
| **Total** | **3,804,425** | **260,351** | **7%** | **314,835** | **8%** |

[1]Total Buildings and exposure counts are based on baseline building inventory
[2] Bolded rows show top three HUC6s by percent exposure

HUC-6 Proportion of Flood-Exposed Buildings (1.0% AEP) - Baseline




HUC-6 Proportion of Flood-Exposed Buildings (1.0% AEP) - 2060

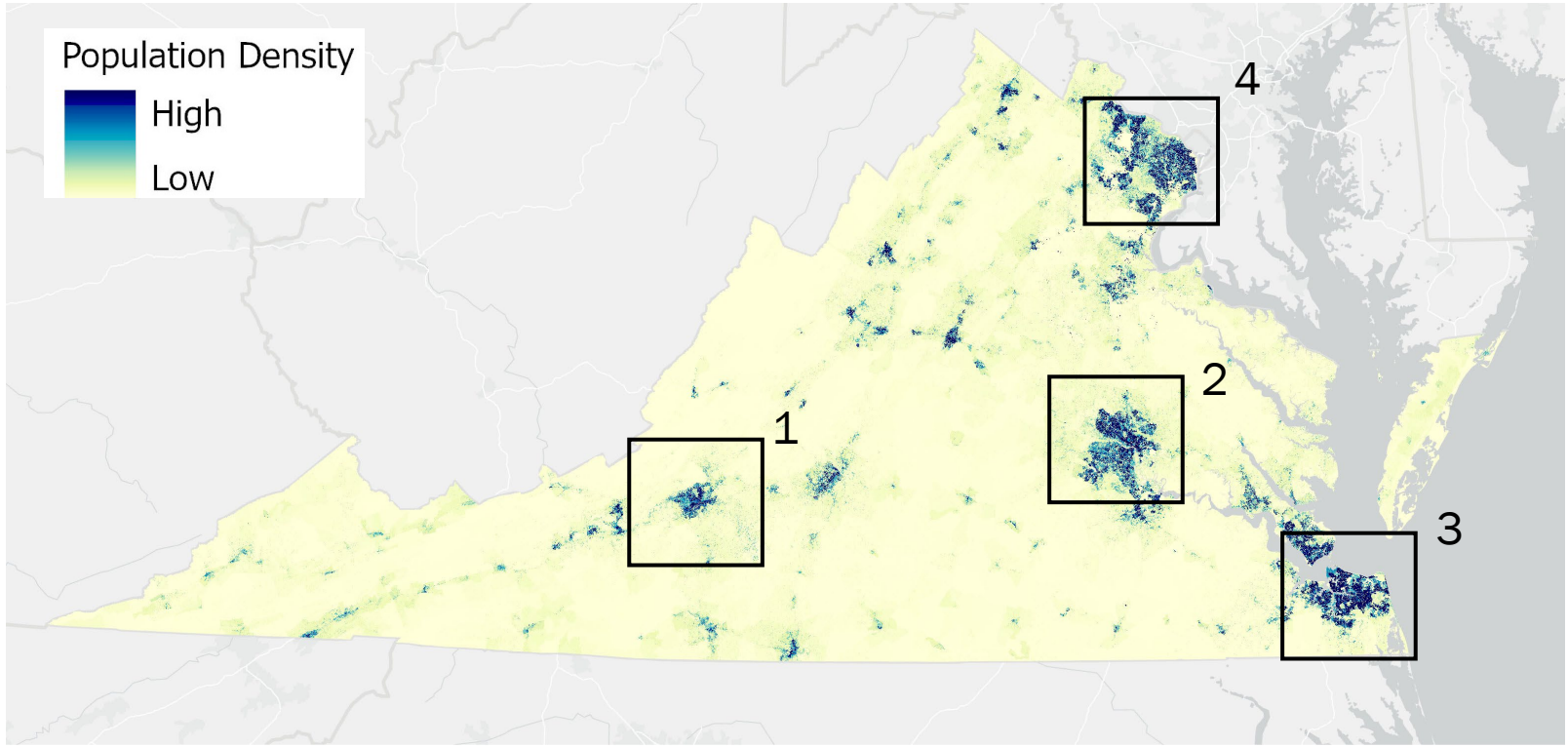


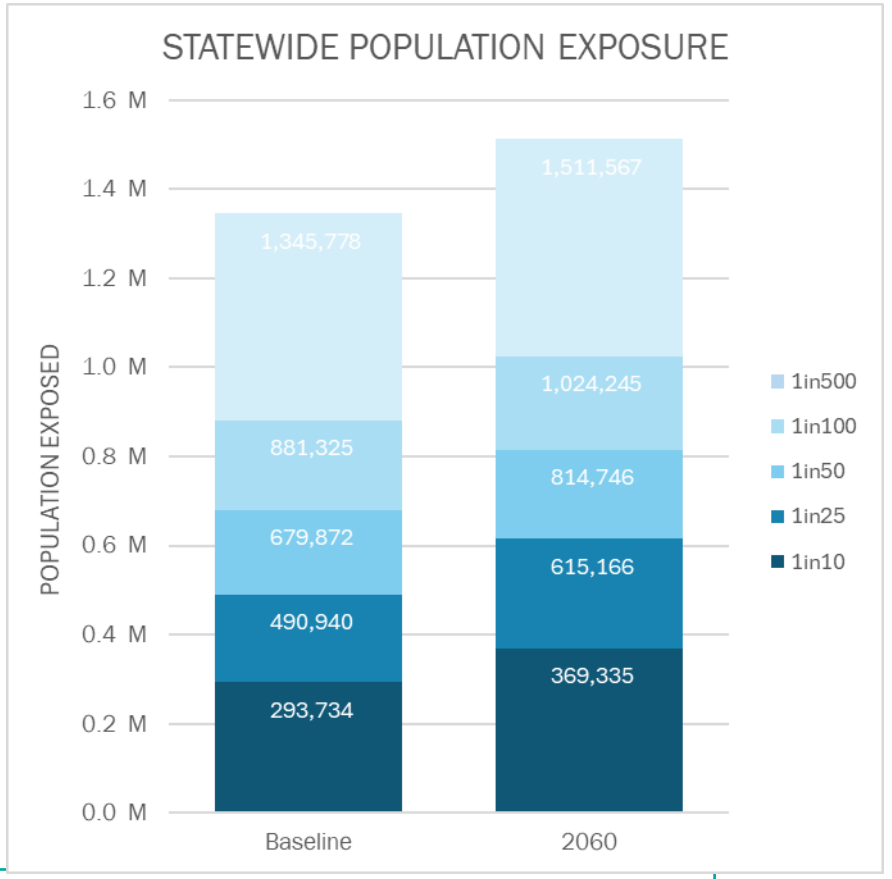

Pct. of buildings exposed

0% 60%

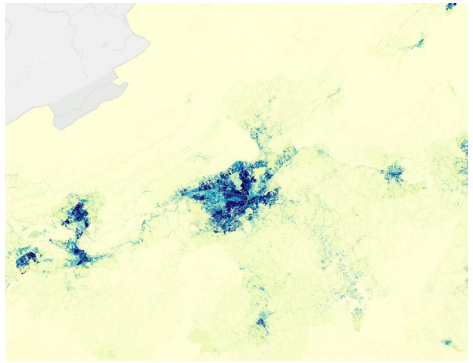
VIRGINIA FLOOD PROTECTION MASTER PLAN

# Population Exposure (1% AEP)

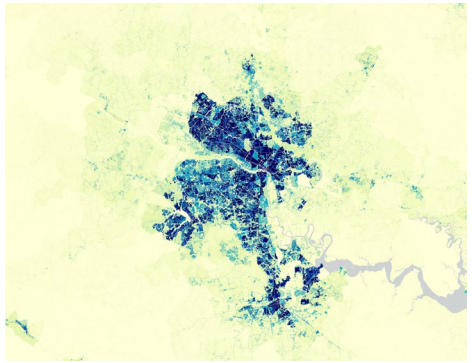


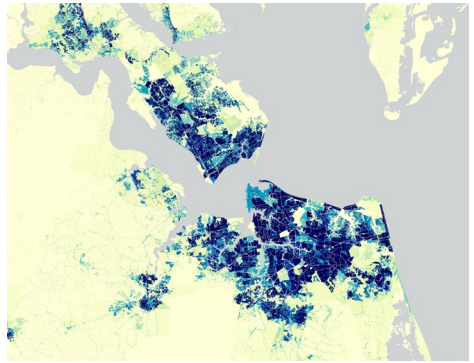

Baseline Dasymetric Mapping Inset Maps:



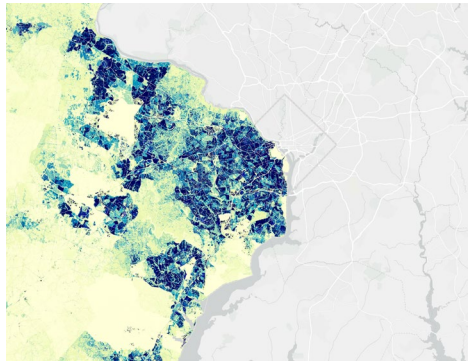
1 - City of Roanoke



2 - City of Richmond



3 - Hampton Roads



4 - City of Alexandria

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Key Takeaways

- FEMA flood hazard data that does not include rainfall driven flooding underrepresents flood risks across the Commonwealth resulting in unaccounted and unmanaged risk.

- Expanding coastal flooding represents the largest increase in flood risk to the Commonwealth.

- Flood risk is most prevalent in low lying coastal areas and in the mountains where development occurs near the Commonwealth's water resources.

- Extreme events (>100-year return period) have the most potential to cause widespread losses.

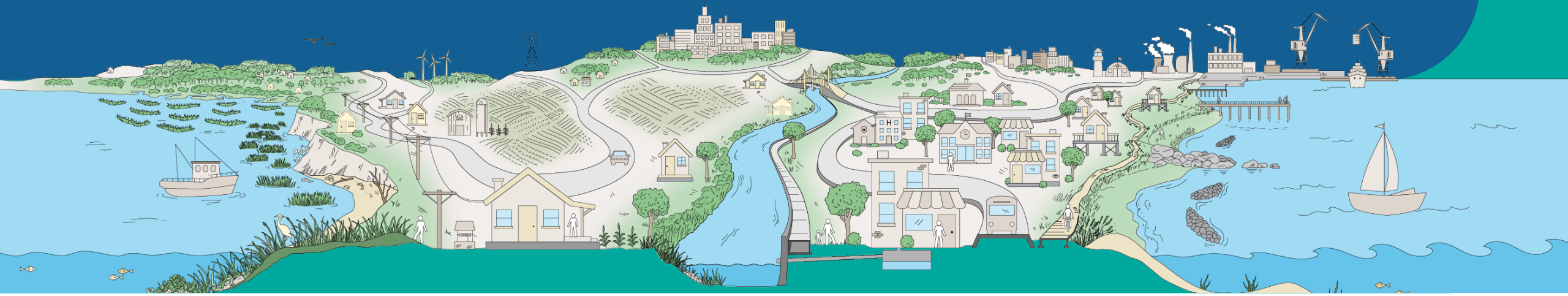
# Virginia Flood Protection Master Plan

Flood Resilience Strategies

VIRGINIA FLOOD PROTECTION MASTER PLAN

# STRATEGIES MUST HELP ACHIEVE PLAN VISION

A thriving Commonwealth
proactively addressing flood risks to further strengthen
the resilience of communities, the economy, and the environment
now and into the future.



VIRGINIA FLOOD PROTECTION MASTER PLAN

# STRATEGIES MUST ALIGN WITH PLAN GOALS AND OBJECTIVES

## *A. Mitigate current and future flood risks statewide.*

A1. Reduce negative effects on human health from flooding.

A2. Reduce negative impacts to vulnerable populations from flooding.

A3. Reduce flood damage to buildings and infrastructure.

A4. Reduce economic disruptions and losses from flooding.

A5. Reduce negative effects to natural and cultural resources from flooding.

## *B. Advance lasting and unified strategies to address flood risk.*

B1. Increase understanding of current and potential future flood risks.

B2. Strengthen the ability to prepare for and manage flood risks.

B3. Increase the adaptability and effectiveness of flood resilience strategies to potential future conditions and regional interests.

B4. Increase the return on public investments in flood resilience.

B5. Increase the accessibility of flood resilience resources, opportunities, and information for all Virginians.

## *C. Capture additional benefits through flood resilience.*

C1. Improve health and quality of life through flood resilience.

C2. Boost the economy through flood resilience.

C3. Enhance the natural environment through flood resilience.

# STRATEGIES MUST HELP ADDRESS PRIORITY GAPS

| Prioritized Gaps | |
|---|---|
| P1. Coordination among state agencies to streamline flood resilience strategies and reduce redundancies. | S1. Staff capacity and data management resources for coordination between federal, state, and local agencies during events to ensure targeted event response. |
| P2. Funding resources for long term resilience planning that supports a wide breadth of needs at both the state and local government levels. | S2. Staff capacity and funding resources for additional grant application and management support to local governments. |
| P3. Access to up-to-date data resources that support long-term flood resilience planning and resource allocation decisions. | S3. Funding resources for asset maintenance. |
| P4. Community knowledge and capacity to take proactive steps to reduce vulnerability to flooding. | S4. Reliance on non-permanent federal funding posing challenges in sustaining flood resilience programs. |
| P5. Staff capacity hindering collaboration, technical assistance provision, and funding outreach efforts. | S5. Staff capacity and resources to coordinate technical assistance for funding and program initiatives to address long-term flood resilience goals. |
| P6. Robust decision-making frameworks and capacities to facilitate long-term planning efforts and resource allocation decisions. | S6. Staff capacity for integration of flood resilience tools. |
| P7. Staff capacity and resources for interdepartmental data aggregation and coordination for comprehensive flood risk assessments, including those for state-owned assets. | S7. Staff capacity to address and assist with federal and state regulations. |

# Plan Flood Resilience Strategies

# DRAFT STRATEGIES v. POSSIBLE ACTIONS

## Strategies

**Higher-level policy/program Strategies** that build flood resilience and meet plan Objectives.

**Timeframe:** next **five years**, with longer-term relevance as the plan is updated over the next 20 years.

Room for **flexibility in how implemented**, to accommodate changing administrations and allow for alignment with agency-specific plans.

**Characteristics:**

- Broad and overarching.
- Focused on "what".
- Aimed at aligning resources and initiatives toward goals and objectives.
- Sets the foundation for decision-making and prioritization.

## Possible Actions

Illustrative examples of the kinds **of more detailed recommended actions** that can support the implementation of strategies in the near term.

This content will be **revised and refined with stakeholder input** as part of what will be included in the Implementation Roadmap.

**Timeframe:** next **two years**, with ability to be updated during implementation to advance the plan over the next five years.

**Characteristics:**

- Specific and focused on execution.
- Can be targeted at and customized by agencies.
- Focused on "how" to achieve the strategy.
- Often short- to medium-term in nature and measurable.
- Can be one of many actions supporting the broader strategy.

# STRATEGIES ARE ORGANIZED BY STAKEHOLDER-IDENTIFIED THEMES

## Meaningful Coordination

We are actively increasing awareness and understanding of flood resilience efforts across state agencies and programs, leveraging existing networks to improve flood resilience outcomes.

## Enhanced Capacity

We are actively integrating comprehensive staff training and development opportunities with strategic workforce planning to effectively manage and expand flood resilience efforts.

## Resilience Funding

We are actively enhancing flood resilience through strategic financial management of existing and potential funding.

## Reliable Data Systems

We are actively acquiring, managing, and sharing flood resilience-related data across agencies to inform decision-making and guide policy and program administration.

## Proactive Adaptation

We are actively implementing flood resilience solutions to enhance financial outcomes, adaptively manage both planning and standards, and prioritize Nature-Based Solutions where appropriate.

## Supported Local Governments

We are actively enhancing partnerships with local, regional, and tribal governments to preserve assets, expand engagement, provide technical assistance, and develop flood resilience resources and guidance.

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Meaningful Coordination

**DRAFT Strategies:**

- Coordinate among applicable personnel across state agencies to increase their awareness and responsiveness to flood resilience.
- Leverage coordination bodies and relationships with nongovernmental entities and the private sector to advance flood resilience.

# Enhanced Capacity

**DRAFT Strategies:**

- Expand the flood resilience knowledge of state agencies.
- Routinely assess and adapt state agency roles and responsibilities in flood resilience.

# Resilience Funding

**DRAFT Strategies:**

- Optimize existing flood resilience funding resources to accomplish flood resilience goals.
- Explore new financial mechanisms to advance implementation.

# Reliable Data Systems

**DRAFT Strategies:**

- Establish a state-wide comprehensive flood data management program.
- Establish data-informed decision-making frameworks for prioritizing flood resilience actions.

# Proactive Adaptation

**DRAFT Strategies:**

- Invest in effective and innovative flood resilience solutions to improve the Commonwealth's economic wellbeing.
- Support the deployment and maintenance of Nature-Based Solutions, where appropriate.
- Encourage the incorporation of flood resilience best practices during revisions of plans, policies, regulations, codes, and standards.

# Supported Local Governments

**DRAFT Strategies:**

- Expand engagement with local, regional, and tribal governments to promote increased understanding of effective flood resilience.
- Provide technical assistance for local, regional and tribal governments on flood resilience.
- Explore state agency pathways for supporting communities in managed retreat and voluntary relocation.

# Virginia Flood Protection Master Plan

Next Steps

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Key Points in Collaboratively Developing the VFPMP


*Identify past and current flood resilience successes and challenges to inform the development of initial VFPMP goals.*

*Define clear desired outcomes to guide the Virginia Flood Protection Master Plan.*

*Identify and prioritize data, resource, and capacity gaps in statewide flood risk management.*

*Identify statewide actions that can be taken within the next five years to address gaps and strengthen Virginia's flood resilience.*

*Outline mechanisms, responsible parties, required resources, timelines, and success metrics to guide implementation.*

VIRGINIA FLOOD PROTECTION MASTER PLAN

# DRAFT STRATEGIES v. POSSIBLE ACTIONS

## Strategies

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# Discussion Questions

- Which of these strategies do you see as the most challenging to implement? Why?
- What would make it easier for your organization to implement these strategies?
- Who else needs to be a part of implementing these strategies?
- What questions do you have about implementing actions to support these strategies?
- What level of success metrics can best support monitoring and adapting?

# Member Updates

VIRGINIA FLOOD PROTECTION MASTER PLAN

# Public Comment

DCR
Virginia Department of Conservation & Recreation

# Contact and Additional Information

Virginia Department of Conservation & Recreation

**Flood Committee FOIA Officer – Lisa McGee:**
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**Flood Committee Website:**
https://www.dcr.virginia.gov/dam-safety-and-floodplains/flood-resilience-advisory-committee