



**Planning Commission
Agenda
Wednesday, November 12, 2025, 6:30 PM**

Work Session, 5:30 PM, Council Chambers Conference Room, City Hall, 114 North Broad Street, Salem, Virginia 24153

Regular Session, 6:30 PM, Council Chambers, City Hall, 114 North Broad Street, Salem, Virginia 24153

WORK SESSION

1. Call to Order
2. New Business

Items for the November agenda

1. 2121 Apperson Drive - Use Not Provided For Permit
2. RVAR Hazard Mitigation Plan

Items for the December agenda

1. 1000 Electric Road rezoning
2. Dalewood Cluster Housing Overlay addition
3. PC Bylaw amendment

3. Adjournment

REGULAR SESSION

1. Call to Order
 - A. **Pledge of Allegiance**
 - B. **Roll Call**
2. Consent Agenda
 - A. **Minutes**

Consider acceptance of the minutes from the October 15, 2025, work session and regular meeting.

3. Old Business
4. New Business

A. **Use Not Provided For Permit**

Hold public hearing and consider the request of Poindexter SW Florida LLC, property owner, and Salem Area Ecumenical Ministries, lessee, for a Use Not Provided for Permit to allow the relocation of Mrs. Dorsey's Clothes Closet, a ministry of Salem Area Ecumenical Ministries, that provides free clothing to local individuals and families facing a variety of challenging life circumstances, to the property located at 2121 Apperson Drive (Tax Map #281-1-2.2).

B. **Roanoke Valley-Alleghany Regional Hazard Mitigation Plan - 2025 Update**

Consider recommendation of resolution accepting the Roanoke Valley–Alleghany Regional Hazard Mitigation Plan - 2025 Update.

5. Adjournment



PLANNING COMMISSION MINUTES

Wednesday, October 15, 2025, at 6:30 PM

Work Session, 5:30 PM, Council Chambers Conference Room, City Hall,
114 North Broad Street, Salem, Virginia 24153

Regular Session, 6:30 PM, City Hall, 114 North Broad Street, Salem, Virginia 24153

WORK SESSION

1. Call to Order

A work session meeting of the Planning Commission of the City of Salem, Virginia, was held in the Council Chambers Conference Room, City Hall, 114 North Broad Street, at 5:30 p.m., on Wednesday, October 15, 2025, there being present the following members of said Commission, to wit: Denise P. King, Reid Garst, Jackson Beamer, Mark Henrickson, and Nathan Routt, constituting a legal quorum, with Chair King, presiding; together with Christopher Dorsey, City Manager and Executive Secretary ex officio member of said Commission, Charles E. Van Allman Jr., Director of Community Development; Mary Ellen Wines, Planning & Zoning Administrator, Maxwell S. Dillon, Planner, and Jim Guynn, City Attorney; and the following business was transacted:

Chair Denise King reported that this date, place, and time had been set in order for the Commission to hold a work session. The work session meeting was called to order at 5:36 p.m.

2. New Business

A discussion was held regarding the following items on this agenda:

A. 522 South Market Street rezoning from RSF to HBD

B. Energy Storage Project Siting Agreement

A discussion was held regarding the items on the November agenda.

1. Mrs. Dorsey's Clothes Closet
2. Dalewood Avenue Cluster Housing Overlay addition
3. Roanoke Valley – Alleghany Regional Hazard Mitigation Plan

3. Adjournment

Chair King adjourned at 6:20 p.m.

REGULAR SESSION

1. Call to Order

A regular meeting of the Planning Commission of the City of Salem, Virginia, was held in the Council Chambers Conference Room, City Hall, 114 North Broad Street, at 6:30 p.m., on Wednesday, October 15, 2025, there being present the following members of said Commission, to wit: Denise P. King, Reid Garst, Jackson Beamer, Mark Henrickson, and Nathan Routt, constituting a legal quorum, with Chair King, presiding; together with Christopher Dorsey, City Manager and Executive Secretary ex officio member of said Commission, Charles E. Van Allman Jr., Director of Community Development; Mary Ellen Wines, Planning & Zoning Administrator, Maxwell S. Dillon, Planner, and Jim Guynn, City Attorney; and the following business was transacted:

Chair Denise King called the October meeting of the City of Salem Planning Commission to order at 6:30 p.m. Chair King reported that this date, place, and time had been set in order for the Commission to hold a public meeting.

A. **Pledge of Allegiance**

B. **Roll call**

Mr. Routt - Here
Mr. Henrickson - Here
Mr. Beamer - Here
Mr. Garst - Here
Chair King – Here

2. Consent Agenda

A. **Minutes**

Consider acceptance of the minutes of the September 10, 2025, regular meeting.

Chair King stated that under the consent agenda, they have the minutes of the September 10, 2025, Commission work session and regular meeting. Chair King asked the Commission if anyone had any questions, additions, or comments. Hearing none the minutes will be considered accepted.

3. New Business

A. Amendment to the Zoning Ordinance

Hold a public hearing to consider the request of Pillis Enterprises Inc., property owner, to rezone the property located at 522 South Market Street (Tax Map # 160-4-2) from RSF Residential Single Family to HBD Highway Business District. Proper legal notice has been given and all adjoining property owners have been notified of said hearing.

Chair King invited the applicant on this petition to come forward to provide information regarding their petition. She instructed all speakers to state their name and address for the record.

Patrick Pillis, 1726 Amy Lane, Salem, Virginia, addressed the Commission. He explained that his father had purchased the property in the 1990s. The house on the property was in sever disrepair, and approximately 15 years ago it was demolished due to safety concerns and reports of unauthorized individuals occupying it. Following the demolition, a neighboring property owner, Mr. Everett, built a home and a fence adjacent to the lot. After being approached by a code enforcement officer Mr. Pillis contacted Ms. Wines at that time to ask if any action was required on his part. She indicated that as long as no one complained, no immediate action would be necessary, and the property remained unused for several years. During the previous summer, due to an overflow of business at Pillis Brothers Garage, Mr. Pillis parked several vehicles on the vacant lot behind the garage. He admitted that some of these vehicles were in poor condition and had to be towed. After receiving a notice of violation for parking multiple vehicles on a residential lot, Mr. Pillis consulted again with Ms. Wines, who outlined potential options for bringing the property into compliance. Based on that conversation and at the suggestion of his wife, Mr. Pillis decided to pursue rezoning the parcel.

Mr. Henrickson asked Mr. Pillis whether he needed additional space and intended to continue parking vehicles on the lot.

Mr. Pillis responded affirmatively.

Mr. Henrickson noted that another option would be to maintain the lot as green space, and asked Ms. Wines whether this was permissible.

Ms. Wines confirmed that the lot could remain undeveloped as green space.

Mr. Pillis stated that since receiving the violation notice, he had begun cleaning the lot and removing debris. He asked whether he could park there under current conditions. Ms. Wines responded that parking was not allowed for employees unless the area was paved or concreted, in accordance with code requirements

Mr. Pillis then inquired about parking as the owner of the lot. Ms. Wines clarified that the distinction becomes less clear in that scenario. If Mr. Pillis is working and parking there, he is still considered an employee under the zoning regulations. She emphasized that

the lot is zoned residential single-family, and if he wished, he could build a house on it or sell it in the future.

Robin Pillis, also of 1726 Amy Lane, stated that the request for rezoning was due to the lot's location adjacent to the garage. She clarified that the lot had only been used for parking vehicles, not for vehicle repairs. The Pillis family is considering selling the property as they get older and believe it would be more attractive if zoned for business use. Even if the lot remains green space, future buyers may appreciate the flexibility that business zoning offers.

Mr. Henrickson summarized that the property could be rezoned to highway business district (HBD) and remain unused. A future buyer could then further develop or alter its use. He reiterated that parking is not allowed under current conditions

Mr. Beamer asked Mr. Pillis if he still intended to park on the lot and expressed empathy, noting that garages often face delays due to part availability.

Mr. Pillis added that he had also considered placing a storage building on the lot.

Ms. Wines explained that depending on the type of structure and intended use, a storage building could change the zoning classification and would require a separate discussion. She also noted that paid parking differs from simply parking a vehicle owned by the business.

Chair King asked if there were any further questions or comments.

Mr. Beamer remarked for clarification that although the business can currently line the street with vehicles, it cannot park them on the empty lot. Chair King confirmed that this is due to the property's residential single-family zoning. To legally park on the lot, it must be rezoned and paved or concreted.

Mr. Pillis mentioned that there are three newly constructed houses adjacent to the garage and that he regularly parks vehicles in front of them.

Chair King asked for further questions or input from the Community Development Department. Hearing none, she opened the public hearing at 6:39 p.m. No additional speakers came forward, and the public hearing was closed at 6:39 p.m.

Chair King asked for Commission discussion. Hearing none she entertained a motion on the matter.

On motion by Mr. Henrickson, seconded by Mr. Routt, and duly carried, the Planning Commission of the City of Salem hereby recommends to City Council that the request to rezone 522 South Market Street from residential single family to highway business district be adopted as presented.

Chair King asked for a roll call vote.

Mr. Routt - Aye
Mr. Henrickson - Aye
Mr. Beamer - Aye
Mr. Garst - Aye
Chair King – Aye

- B. Hold a public hearing to consider an Energy Storage Project Siting Agreement between the City of Salem and Salem VA BESS 1 LLC proposing a 4 – megawatt battery energy storage facility within the existing electric substation located at 407 Electric Road (Tax Map # 150-2-4). The purpose of the hearing will be to receive public comments in the Planning Commission’s review, per Code of Virginia 15.2-2232, of the proposed facility to confirm it is substantially in accord with the City of Salem Comprehensive Plan. Proper legal notice has been given.

Chair King reminded the Commission of its duty to confirm compliance with the Comprehensive Plan. She noted that the city is the applicant and asked if anyone wished to speak on its behalf. Hearing none, she summarized that the Commission had already received and reviewed the Siting Agreement and the Comprehensive Plan prior to the meeting.

Chair King opened the public comment period at 6:42 p.m. No additional speakers came forward and the public hearing was closed at 6:42 p.m.

Chair King asked for Commission discussion. Hearing none she entertained a motion on the matter.

On motion made by Mr. Garst and seconded by Mr. Beamer and duly carried, the Planning Commission of the City of Salem confirms the Siting Agreement is in accordance with the City of Salem Comprehensive Plan.

Chair King asked for a roll call vote.

Mr. Routt – Aye
Mr. Henrickson – Aye
Mr. Beamer – Aye
Mr. Garst – Aye
Chair King – Aye

4. Adjournment

Chair King noted that there was no additional business for the Planning Commission and the meeting was adjourned at 6:43 p.m.



Item #: 4.A.

AT A REGULAR MEETING OF THE PLANNING COMMISSION OF THE CITY OF SALEM, VIRGINIA HELD AT CITY HALL

MEETING DATE: November 12, 2025

AGENDA ITEM: **Use Not Provided For Permit**
Hold public hearing and consider the request of Poindexter SW Florida LLC, property owner, and Salem Area Ecumenical Ministries, lessee, for a Use Not Provided for Permit to allow the relocation of Mrs. Dorsey's Clothes Closet, a ministry of Salem Area Ecumenical Ministries, that provides free clothing to local individuals and families facing a variety of challenging life circumstances, to the property located at 2121 Apperson Drive (Tax Map #281-1-2.2).

SUBMITTED BY: Maxwell Dillon, Planner

SUMMARY OF INFORMATION:

Zoning: HBD Highway Business District
Land Use Plan Designation: Commercial
Existing Use: Vacant
Proposed Use: Clothes Closet

The subject property (2121 Apperson Drive) consists of a 1.162-acre tract of land which currently sits within the HBD Highway Business District zoning designation. This parcel contains a multi-tenant building, with various retail stores and service-oriented businesses operating in those units throughout the past several years. Salem Ecumenical Ministries, lessee, and Poindexter SW Florida LLC, property owner, are seeking a Use Not Provided For Permit to allow for the operation of a clothes closet ministry.

Mrs. Dorsey's Clothes Closet, a ministry of Salem Area Ecumenical Ministries, is requesting to relocate to 2121 Apperson Drive from its current operations at 825 South Colorado Street due to lease arrangements. The ministry's operations involve providing free clothing and shoes to families and individuals facing hardship throughout Salem and the surrounding areas. The proposed location would better suit operations and client services due to HVAC capabilities and additional space allowance.

Salem Area Ecumenical Ministries has serviced the community in this fashion for over 40 years, providing great assistance to folks in times of need. Their continued operations would continue to serve the community at large, with thousands of families benefiting from their mission.

FISCAL IMPACT:

STAFF RECOMMENDATION:

Staff recommends approval of the request.

ATTACHMENTS:

1. Application
2. Affidavit



Application Data for Application Number: Z25-30060

Application Type	Zoning		
Application Sub-Type	Special Exception		
Applicant	Salem Area Ecumenical Ministries		
Location	2121 APPERSON DR SALEM VA 24153		
Applicant Address	440 High Street Salem,VA,24153	Property Owner	POINDEXTER SW FLORIDA LLC
		Owner Address	2014 ELECTRIC RD #236 ROANOKE, VA,24018
Tax Parcel	281-1-2.2		

Application Information

Section	Question	Answer
Details and Scope of Work	Please provide a detailed description of the work associated with this application.	<p>Salem Area Ecumenical Ministries is requesting a Special Exception for a "Use Not Provided." The current zoning is HBD and we are requesting to "Mercantile."</p> <p>Organized in 1997, Salem Area Ecumenical Ministries (SAEM) is a group of representatives from Salem and western Roanoke County churches and local service agencies that strives to Invite, Involve, Inspire, Educate, and Strengthen our communities by putting our faith into action. Mrs. Dorsey's Clothes Closet is a ministry of Salem Area Ecumenical Ministries and is one of the largest all-free clothing closets in southwest Virginia.</p> <p>After 7 years on S Colorado Street, SAEM will be moving to 2121 Apperson Drive in Salem. This location will allow our shoppers to have access to parking, including additional handicapped spaces, access to bus routes, more secure surroundings and increased space for clothing distribution.</p>
Existing Structure Info	Year Built	1966
	Property Description	Retail
	Number of Stories	1
	Number of Rooms	
	Number of Bedrooms	
	Number of Bathrooms	
	Type of Roof	Rubber
	Type of Exterior	Dryvit
	Type of Basement	Slab

SALEM VA



COMMUNITY DEVELOPMENT

Existing	Finished Square footage of Primary Building	8076.00
Parcel Information	Lot Size Acres	1.16
	Lot Size SQFT	50615.00
	Zoning Classification	HBD
	Legal Description	LT 2 1.1619 AC LEWIS-GALE MEDICAL CENTE
	PID	26245
Special Exception Details	Please advise Current Zoning type	
	Please advise current use	
	Please advise future use	
	Please advise designation from the future land use map	
	Is the building or parcel in a district currently designated as historic	No
	If yes, describe the proposed measures for meeting the standards of the Department of Historic Resources	
	This Special Exception/Use Not Provided For is being requested in order to?	
	Describe in detail how you plan to develop the property for the proposed use and any associated uses	
	Describe why the proposed use or exception is desirable and appropriate for the area	
	What measures will be taken to assure that the proposed use or exception will not have a negative impact on the surrounding vicinity?	
	Is the subject property located within the Floodplain District?	No
	If yes, describe the proposed measures for meeting the standards of the Floodplain Ordinance	
	Have you provided a conceptual plan of the proposed development, including general lot configurations and road locations?	No
	Are the proposed lot sizes compatible with existing parcel sizes in the area?	

**AFFIDAVIT OF MAILING PURSUANT TO S15.2-2204
CODE OF VIRGINIA**

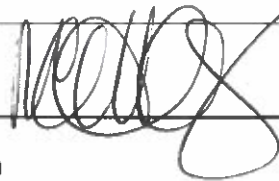
**PLANNING COMMISSION
NOVEMBER 12, 2025**

ITEM #4A

1. This is to certify that I mailed letters in reference to the request Consider the request of Poindexter SW Florida LLC, property owner, and Salem Area Ecumenical Ministries, lessee, for a Use Not Provided for Permit to allow the relocation of Mrs. Dorsey's Clothes Closet, a ministry of Salem Area Ecumenical Ministries, that provides free clothing to local individuals and families facing a variety of challenging life circumstances, to the property located at 2121 Apperson Drive (Tax Map #281-1-2.2) to the following property owners and adjacent property owners on October 24, 2025, in the 2:00 p.m. mail:

Parcel ID	Owner Name	Address 1	City	State	Zip
279-1-2-1	SBA COMMUNICATIONS INC	8051 CONGRESS AVE	BOCA RATON	FL	33487-1310
280-1-1	VIRGINIA VARSITY STORAGE-APPERSON LLC	2087 APPERSON DR	SALEM	VA	24153
281-1-2	LAYMAN REAL ESTATE HOLDINGS LLC	PO BOX 1015	SALEM	VA	24153
281-1-2.1	TWO BOYS REALTY II LLC	5010 CELL TOWER DR	ROANOKE	VA	24018
281-1-3	CAO MING HUA	1750 KALAKAUA AVE APT 3502	HONOLULU	HI	96826
282-4-1	ALINA LLC	97 DOE DR	ROANOKE	VA	24012
282-4-2	BROWN WILLIAM E JR	3767 HARBORWOOD RD	SALEM	VA	24153
281-1-2.2	POINDEXTER SW FLORIDA LLC	2014 ELECTRIC RD #236	ROANOKE	VA	24018
281-1-2.3	SMALL STEPS LEARNING ACADEMY INC	1224 PETERS CREEK RD NW	ROANOKE	VA	24017
281-1-2.4	LEWIS-GALE MEDICAL CENTER LLC	PO BOX 80610	INDIANAPOLIS	IN	46280
	MOORE PHILLIP ZONING ADMINISTRATOR CITY OF ROANOKE	215 CHURCH AVE SW ROOM 166 SOUTH	ROANOKE	VA	24011
5140208	BANDY DONALD W	PO BOX 4143	ROANOKE	VA	24015

5170101	HODGES PAUL M	4330 BRANDON AVE SW	ROANOKE	VA	24018
5170102	HODGES PAUL M	4330 BRANDON AVE SW	ROANOKE	VA	24018
5170103	BOB IT ENTERPRISES LLC	4324 BRANDON AVE	ROANOKE	VA	24015
5170111	CAI QILIN	4310 BRANDON AVE SW	ROANOKE	VA	24018
5170116	AHUERO MICHAEL M & PENNIE L	1301 BELLE AIRE LN SW	ROANOKE	VA	24018
5170117	TURNER WILLIAM G III & LINDA K	1302 BELLE AIRE LN SW	ROANOKE	VA	24018

Signed  Date 10/24/25

City of Salem
Commonwealth of Virginia

The foregoing instrument was acknowledged before me this 24th day of October, 2025 by

Tammy Dunn

Tammy Dunn
Notary Public

My commission expires: 10/31/2028





Item #: 4.B.

AT A REGULAR MEETING OF THE PLANNING COMMISSION OF THE CITY OF SALEM, VIRGINIA HELD AT CITY HALL

MEETING DATE: November 12, 2025

AGENDA ITEM: **Roanoke Valley-Alleghany Regional Hazard Mitigation Plan - 2025 Update**
Consider recommendation of resolution accepting the Roanoke Valley–Alleghany Regional Hazard Mitigation Plan - 2025 Update.

SUBMITTED BY: Mary Ellen Wines, Planning & Zoning Administrator

SUMMARY OF INFORMATION:

2025 Hazard Mitigation Plan Staff Report and Executive Summary

The Hazard Mitigation Plan fulfills the Federal requirements for the Disaster Mitigation Act of 2000. The plan identifies hazards; estimates losses; and establishes community goals, objectives and mitigation activities that are appropriate for the Roanoke Valley-Alleghany region and the various organizations which are represented in the plan. The plan was last updated and adopted in 2019. These plans must be updated every five years. The 2019 plan expired in September 2024. An adopted Hazard Mitigation Plan allows local governments to apply for disaster mitigation funds which become available following a natural disaster. In September 2024 Hurricane Helene struck Virginia and received a federal disaster declaration. Quick adoption of this plan update is important for those local governments which are applying for funds associated with the Hurricane Helene disaster.

This plan incorporates the following jurisdictions. All of these jurisdictions have been active participants in the plan.

Alleghany County	Town of Clifton Forge
Botetourt County	Town of Fincastle
Craig County	Town of Vinton
Roanoke County	Roanoke Valley-Alleghany Regional Commission
City of Covington	Roanoke Valley Resource Authority
City of Roanoke	Western Virginia Water Authority
City of Salem	
Town of Buchanan	

The plan also covers the geographic area of the Towns of New Castle and Iron Gate. While New Castle and Iron Gate did not meet the threshold of participation in this plan, their emergency services efforts operate jointly with Craig County and Alleghany County respectively.

Required Action

This plan requires adoption through resolution. To be eligible for grant requests as a result of Hurricane Helene, this resolution must be adopted by the end of the year. As FEMA and VDEM are still reviewing the plan, this resolution includes language that any update from those agencies will not require readoption by this body.

Executive Summary

Chapter 1: The Hazard Mitigation Plan

This chapter provides a summary of the planning process and outlines opportunities for improvement in future iterations of the plan. Planning efforts began in 2024 and were completed in late 2025, with adoption expected in December 2025. One round of public input was held which included a public online survey and direct stakeholder outreach.

The chapter also lays out the adoption and implementation process. Participating governments agree to an annual update of project progress which will be facilitated by the Regional Commission.

Chapter 2: The Regional Profile

This chapter describes the planning region. Key factors included in the chapter are existing infrastructure, topography, and economic factors as well as a definition of critical and vulnerable facilities.

Chapter 3: Hazard Identification

Hazards identified in this chapter include:

Earthquake

Extreme Temperature

Flooding

Hurricane and Tropical Storm

Geologic Hazards

Wildfire

Wind Event

Winter Storm

While many of these definitions are clear, some are not.

- *Extreme Temperature*: This hazard includes extreme heat and extreme cold.
- *Geologic Hazards*: This includes karst, which gives rise to sinkholes, and landslides.
- *Wind Event*: This includes straight line winds and tornadoes.

Additionally, two hazards are not assessed in the risk assessment but are outlined in this chapter. These are drought, which is addressed through state-mandated water supply plans; and pandemic. Historical events are surveyed in this chapter. High hazard potential dams are also inventoried in this chapter.

Chapter 4: Risk Assessment

This chapter contains the risk assessment model for the plan, which guides future recommendations and priorities. Outcomes from the model are included in the table below. More detail regarding each hazard and the logic for the rankings is included in the relevant subsections of the chapter. Flooding and Wind Events were the two highest ranked hazards across the region.

All Hazard Ranking Table

Table 16: All Hazards Ranking Table

Hazard Ranking Table: All Hazards

Locality	Earthquake	Extreme Temperatures	Flooding	Geologic Hazards	Wildfire	Wind Event	Winter Storm
Alleghany County	Medium	Medium	High	Medium	Medium	High	Medium
City of Covington	Medium	Low	Medium	Low	Low	High	Medium
Town of Clifton Forge	Medium	Low	High	Low	Medium	High	Medium
Town of Iron Gate	Low	Low	High	Low	Medium	High	Medium
Craig County	Low	Low	Medium	Low	Low	High	Medium
Town of New Castle	Low	Low	Medium	Low	Low	High	Medium
Botetourt County	Medium	Medium	High	Low	Low	High	Medium
Town of Buchanan	Medium	Medium	High	Low	Low	High	Medium
Town of Fincastle	Medium	Medium	High	Low	Low	High	Medium
Town of Troutville	Medium	Medium	High	Low	Low	High	Medium
Roanoke County	Medium	Medium	High	Medium	High	Medium	Medium
Town of Vinton	Medium	Medium	High	Low	Low	Medium	Medium
City of Roanoke	Medium	High	High	Low	Low	Medium	Medium
City of Salem	Low	Medium	High	Low	Low	Medium	Medium
Regional Score	Medium	Medium	High	Low	Low	High	Medium

Chapter 5: Capabilities Assessment

This chapter contains individual sections for each participating local government and details of their budgets, their staffing relevant to disaster mitigation and response, and their participation in the National Flood Insurance Program. Mutual aid agreements and other resources are also captured.

Chapter 6: Mitigation Goals and Strategies

This chapter outlines the goals and strategies for mitigation efforts in the region. In developing mitigation strategies for the region, a wide range of activities were considered in order to achieve the goals and to lessen the vulnerability of the area to the impact of natural hazards.

Chapter 7: Mitigation Action Plans

This chapter includes individual mitigation action plans for each participating jurisdiction. All identified projects are dependent upon funding availability.

Appendices

The plan contains supporting documentation in multiple appendices. Supporting documentation includes: outputs from public engagement efforts; flood modeling; critical and vulnerable facilities lists; wildfire incidence reports and modeling; dam inundation mapping and dam safety data; worksheets from steering committee members; and other documentation.

FISCAL IMPACT:

STAFF RECOMMENDATION:

Recommend approval of the Resolution.

ATTACHMENTS:

1. HMP Draft for Submission 10.10.25 with COVER

HAZARD MITIGATION PLAN

2025 UPDATE



Roanoke Valley-Alleghany
REGIONAL
commission

[blank]



Staff Contributors:

Amanda McGee, *Director of Community Development*

Jon Stanton, *Transportation Planner II*

Shira Goldman, *Regional Planner I*

Kevin Jenks, *Regional Planner I*

With special thanks to:

Cole Taggart, *VDEM*

Daniel Murray, *Botetourt County*

Terms and Definitions

Code of Federal Regulations (CFR)

The codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government.

Community Rating System (CRS)

A voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

Disaster Mitigation Act of 2000 (DMA 2000)

This act requires state and local governments to develop hazard mitigation plans as a condition for federal grant assistance.

Federal Emergency Management Agency (FEMA)

A United States government agency that helps people before, during, and after disasters. FEMA's mission is to improve the nation's ability to prepare for, respond to, and recover from all hazards.

Flood Insurance Rate Map (FIRM)

Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

National Center for Environmental Information (NCEI)

A United States government agency that manages and archives environmental data. NCEI's data includes information about the climate, oceans, coasts, and the Earth's surface.

National Oceanic and Atmospheric Administration (NOAA)

A United States government agency that studies and predicts changes in the weather, climate, oceans, and coasts. A branch of the Department of Commerce.

National Weather Service (NWS)

A United States government agency that provides weather forecasts and warnings. The NWS is part of the National Oceanic and Atmospheric Administration (NOAA), which is a branch of the Department of Commerce.

Roanoke Valley – Alleghany Regional Commission (RVARC)

One of 21 Virginia Planning District Commissions established by the General Assembly to promote regional cooperation between local governments. RVARC members include the counties of Alleghany, Botetourt, Craig, and Franklin, the cities of Covington, Roanoke, and Salem, and the towns of Clifton Forge, Vinton, and Rocky Mount.

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Chapter 1. The Hazard Mitigation Plan

1.1 Overview of the Plan

The purpose of the Roanoke Valley-Alleghany Regional Commission Hazard Mitigation Plan is to fulfill the Federal requirements for the Disaster Mitigation Act of 2000. The plan identifies hazards; estimates losses; and establishes community goals, objectives and mitigation activities that are appropriate for the Roanoke Valley-Alleghany region and the various organizations which are represented in this document.

The Disaster Mitigation Act of 2000 (DMA 2000) requires that local governments, as a condition of receiving federal disaster mitigation funds, have a mitigation plan that: describes the process for identifying hazards, risks and vulnerabilities; identifies and prioritizes mitigation actions; encourages the development of local mitigation; and provides technical support for those efforts.

The Federal Emergency Management Agency (FEMA) defines pre-disaster mitigation as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation, also known as prevention, encourages long-term reduction of hazard vulnerability. Mitigation should be cost-effective, appropriate for the community, and environmentally sound. Mitigation activities can protect critical and vulnerable community facilities, reduce exposure to liability, and minimize community disruption resulting from natural disasters. The goal of mitigation is to save lives and reduce property damage, which in turn can reduce the cost and impact of disasters across communities.

This plan incorporates the following jurisdictions. All of these jurisdictions have been active participants in the plan.

Alleghany County	Town of Clifton Forge
Botetourt County	Town of Fincastle
Craig County	Town of Vinton
Roanoke County	Roanoke Valley-Alleghany Regional Commission
City of Covington	Roanoke Valley Resource Authority
City of Roanoke	Western Virginia Water Authority
City of Salem	
Town of Buchanan	

The plan also covers the geographic area of the Towns of New Castle and Iron Gate. While New Castle and Iron Gate did not meet the threshold of participation in this plan, their emergency services efforts operate jointly with Craig County and Alleghany County respectively.

1.2 Planning Process

The Steering Committee for this effort was made up of jurisdiction representatives and state and federal agency representatives. However, consultation with numerous community stakeholders occurred during planning. Public input was also a key element of the plan. The full details of steering committee meetings, stakeholder engagement, and broader public input efforts are available in [Appendix A: Public Engagement](#) and [Appendix B: Survey Results](#).

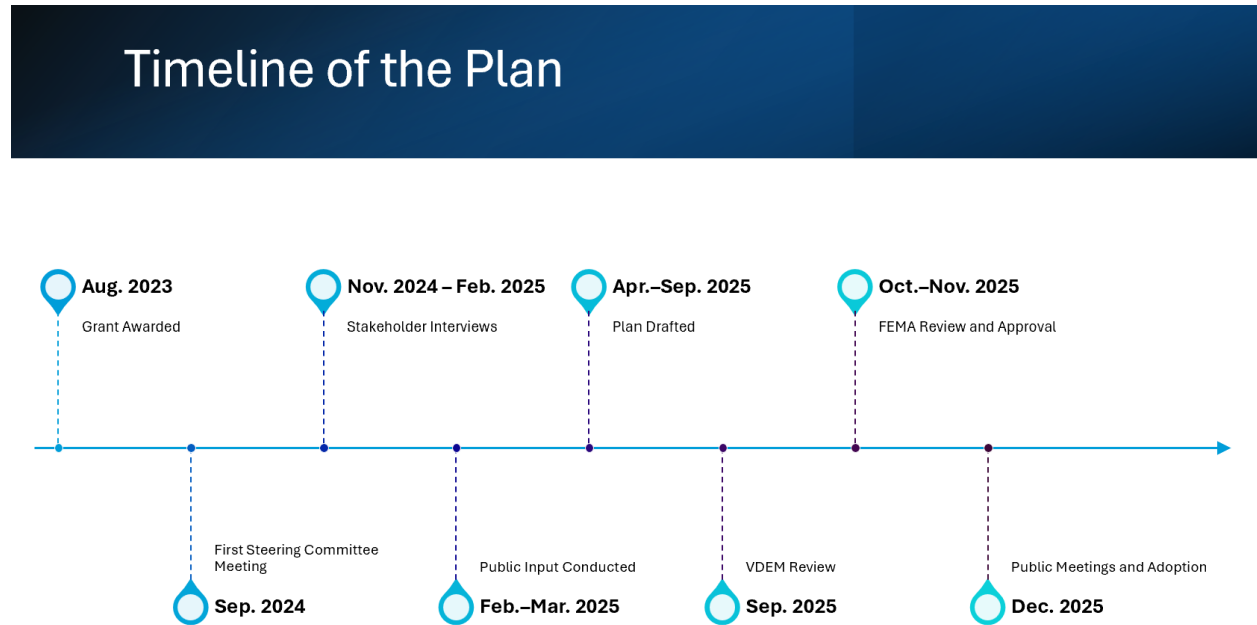


Figure 1: Timeline of the Plan

Update Priorities

Proposed timelines for this process originally began in August 2023. However, numerous staffing challenges delayed the start of work on this effort until August 2024 – one month before the expiration of the 2019 plan. Additionally, new and more rigorous federal guidelines for document development meant that large sections of this plan were developed from scratch. Additional changes in local and regional staffing continued throughout the planning process.

Additionally, in September 2024, at the same time that the first stakeholder meeting was being convened, Hurricane Helene struck Southwest Virginia. While most of the localities represented by this plan sustained minimal damage, regional stakeholders were heavily involved in disaster response efforts.

As a result of all of these challenges, the primary focus of this update is in right-sizing a new regional vision of pre-disaster hazard mitigation and rebuilding programs and relationships between jurisdictions and stakeholders.

Table 1: Steering Committee

Locality Representatives	
Locality	Representative
Alleghany County	Jonathan Fitch Melissa Munsey
City of Covington	Allen Dressler Christopher Smith
Town of Clifton Forge	Chuck Unroe Maria Saxton
Town of Iron Gate	Kawhana Persinger
Botetourt County	Daniel Murray Jason Ferguson Nicole Pendleton Matt Lewis Nick Baker
Town of Buchanan	Jon Elistad Angela Lawrence
Town of Fincastle	Melanie Young McFadyen
Town of Troutville	Michael Mansfield
Craig County	Dan Collins Darryl Humphreys
Roanoke County	Tarek Moneir David Henderson Cindy Linkenhoker Butch Workman Dustin Campbell Nickie Mills Philip Thompson Ross Hammes

City of Roanoke	Dwayne D'Ardenne Ian Shaw Laura Schmidt Leigh Anne Weitzenfeld Mckenzie Brocker Ross Campbell Trevor Shannon
City of Salem	Jeff Ceaser Mary Ellen H Wines Robert Paxton Sam Driscoll William L. Simpson, Jr
Town of Vinton	Anita McMillan Nathan McClung

Special Districts	
Organization	Representative
Western Virginia Water Authority	Roger Blankenship Tessa Okioga
Roanoke Valley Resource Authority	Jon Lanford

State/Federal Agency Representatives	
Agency	Representative
NOAA	Phil Hysell Nicholas Fillo
VDOF	Dennis McCarthy Rachel Kim
VDEM	Cole Taggart Jonathan T. Simmons Mike Guzo

Steering Committee

Between September 2024 and September 2025, the steering committee guided development of the Hazard Mitigation Plan through a series of meetings focused on timeline management, plan content, and stakeholder engagement. The process began with a kickoff meeting to discuss the plan framework, timeline, and outreach strategy. Following Hurricane Helene, FEMA and VDEM emphasized the urgency of applying for disaster mitigation funding. This prompted the committee to prioritize eligibility requirements and expand participation requirements. Meetings which occurred early in 2025 focused on public engagement and outreach while spring sessions reviewed stakeholder input, survey results, and drafts of chapters. By May 2025, the committee began to finalize chapter updates, preparing the plan for locality review and submission to VDEM and FEMA ahead of the federal funding deadline in early December. Due to staffing constraints, VDEM regional staff played a critical role in finalizing the plan, conducting final meetings with locality staff which are documented later in this section. The final steering committee meeting was held in September.

Stakeholder Engagement

In order to maximize stakeholder engagement, staff worked with various stakeholder groups already convening in the region before engaging in some individual outreach. Membership of these groups is included in [Appendix A](#).

Groups Consulted

- Southwest Virginia Public Works Academy
- Roanoke Valley Collective Response Stakeholder Group
- Roanoke Foodshed Network
- Roanoke Regional Housing Network
- Roanoke Valley Transportation Technical Committee

Individual Organizations

- Alleghany Highlands Chamber of Commerce and Tourism
- CHIP of Roanoke Valley
- Roanoke Valley Rescue Mission

Many additional stakeholders could have been consulted in this planning process. In future updates to the plan, the following stakeholders are recommended for outreach. Some of these stakeholders may be interested in participating as special districts.

- Area hospitals, especially Roanoke Memorial Hospital
- Alleghany Highlands Economic Development Corporation
- Alleghany Highlands Public Schools
- Craig-Botetourt Electric Co-op
- Local Area Office on Aging
- RVARC Committee on Economic Development Strategies
- Roanoke Regional Airport
- Soil and Water Conservation Districts
- Valley Metro

Public Input

Staff worked with the Steering Committee to design an electronic survey that was open from February through March of 2025. Full details of survey responses are available in **Appendix B**.

The survey received 251 responses, a marked improvement from the 2019 plan. Ninety-five percent of respondents identified as White. Only about 1.5 percent of respondents identified as Hispanic, Latino, or Spanish in origin. Response by household income was more varied, about 13 percent of households reporting an income of less than \$50,000. Responses were spread across zip codes, but the vast majority of responses were seen in the City of Salem (zip code 24153) with 81 responses. Only 5 respondents stated they relied on public transit. Most of the respondents owned their own home, with about 13 percent renting their home.

Flood was the greatest disaster of concern, followed by wind. This echoes results of the vulnerability assessment. Earthquake, Karst and Landslide (the latter two collectively assessed) were marked as of least concern.

Generally, respondents expressed increased concerns about natural disasters in the region compared to five years ago.

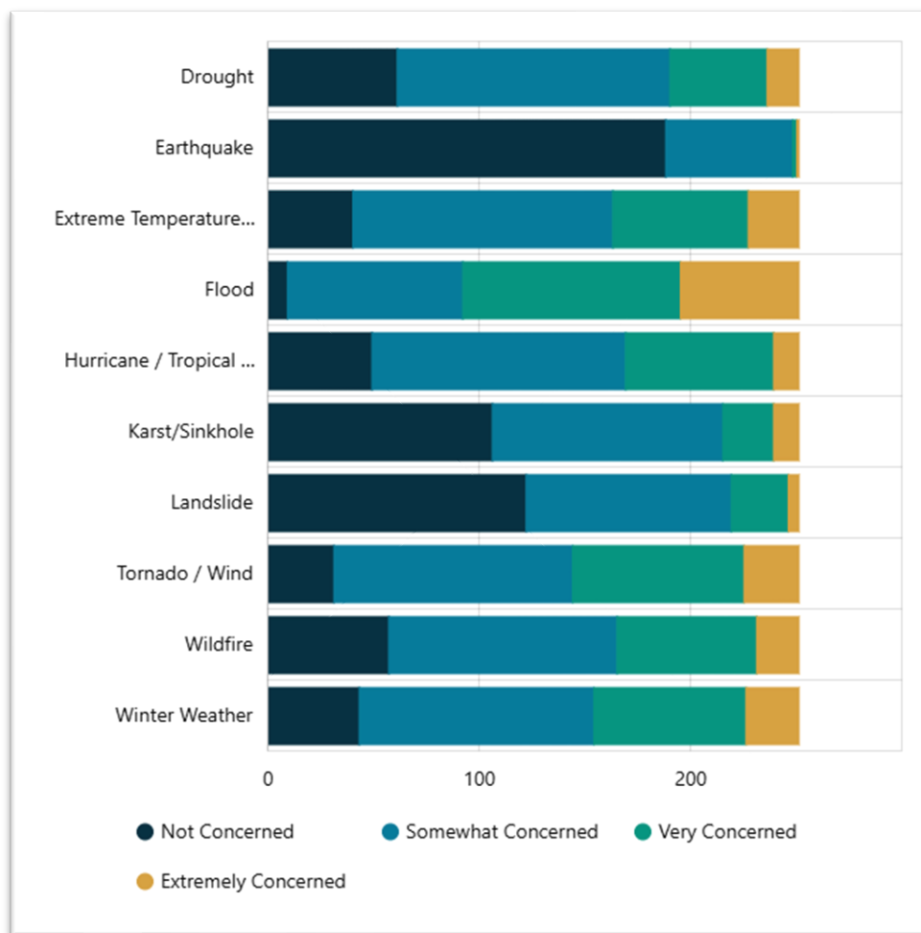


Figure 2: Concern About Future Disaster Events

1.3 Adoption of this Plan

The Virginia Department of Emergency Management (VDEM) was an active participant in development of this plan and a key funding partner. VDEM representatives have reviewed this plan and provided input on compliance with the 2025 Local Mitigation Policy Guide in the hopes of streamlining the federal approval process.

The Policy Guide Checklist with relevant page numbers for each element is included in [Appendix I](#).

The plan was submitted for federal approval on October 10, 2025. Approval documentation is included in [Appendix J](#).

Resolutions by participating jurisdictions are included in [Appendix J](#).

1.4 Future Updates

This plan will be reviewed every year for project progress and opportunities for implementation. Immediate opportunities for implementation are described in [Section 1.5](#).

Annual review will be initiated by Regional Commission staff. Project updates will be provided promptly by representatives from the respective jurisdictions incorporated into this plan.

The annual review will result in a project progress document which will be posted on a designated Regional Commission public engagement site and shared with the participating jurisdictions and the Regional Commission board. Public engagement around specific projects that reach implementation stage will be provided by request of the jurisdiction that is primary on the project.

Future five-year updates offer opportunities for planning process improvements. While many of the complications in the planning process for this update were due to staffing issues experienced at the Regional Commission, some other areas for improvement in the next plan update include:

- Expanding outreach to unreached stakeholders identified in this planning process and considering the creation of a formal stakeholder committee to inform the plan.
- Incorporating new special districts where appropriate and where interest exists.
- Increasing public input around project development and offering more consistent outreach throughout the planning process, including at least two community meetings.
- Targeting broader public engagement efforts to underrepresented populations and census tracts in innovative ways, including direct mailers and pop-ups in community spaces.
- Streamlining the project update process which can be facilitated by annual updates and reviews of this document.

In addition, some potential improvements to the vulnerability assessment have been included as projects in [Chapter 7: Mitigation Action Plans](#).

1.5 Implementation Opportunities

Many of the localities within the planning region may have capacity issues which challenge their ability to implement this plan, as discussed in **Chapter 5**. One way to address these challenges is to proactively identify projects which could benefit from technical assistance through the Regional Commission.

The Regional Commission creates an annual budget and workprogram each year to identify projects of regional significance or which are high priority for local technical assistance. Projects identified in this plan as either of regional significance or as critical to a local government's ability to address hazards should be considered on an annual basis for incorporation into that document. In the first round of project updates, the Regional Commission will work with member localities to identify candidates for the FY2028 workprogram. This list will be updated annually.

Chapter 2. The Regional Profile

2.1 The Planning Region

The Roanoke Valley-Alleghany Regional Commission service area lies in western Virginia and includes the counties of Alleghany, Botetourt, Craig, Franklin and Roanoke; the cities of Covington, Roanoke and Salem; and the towns of Boones Mill, Buchanan, Clifton Forge, Fincastle, Iron Gate, New Castle, Rocky Mount, Troutville, and Vinton. The localities of Franklin County, Boones Mill and Rocky Mount, are also served by West Piedmont Planning District Commission, and are covered by that district’s plan. All other localities within the Roanoke Valley-Alleghany service area will be covered by this document. These are the same localities that participated in the 2006 and 2013 and 2019 iterations of this plan.

Communities within the Roanoke Valley-Alleghany Region may have vastly different capacities and planning ability, which is reflected in this plan. Unincorporated areas within broader jurisdictions may be referenced where appropriate.

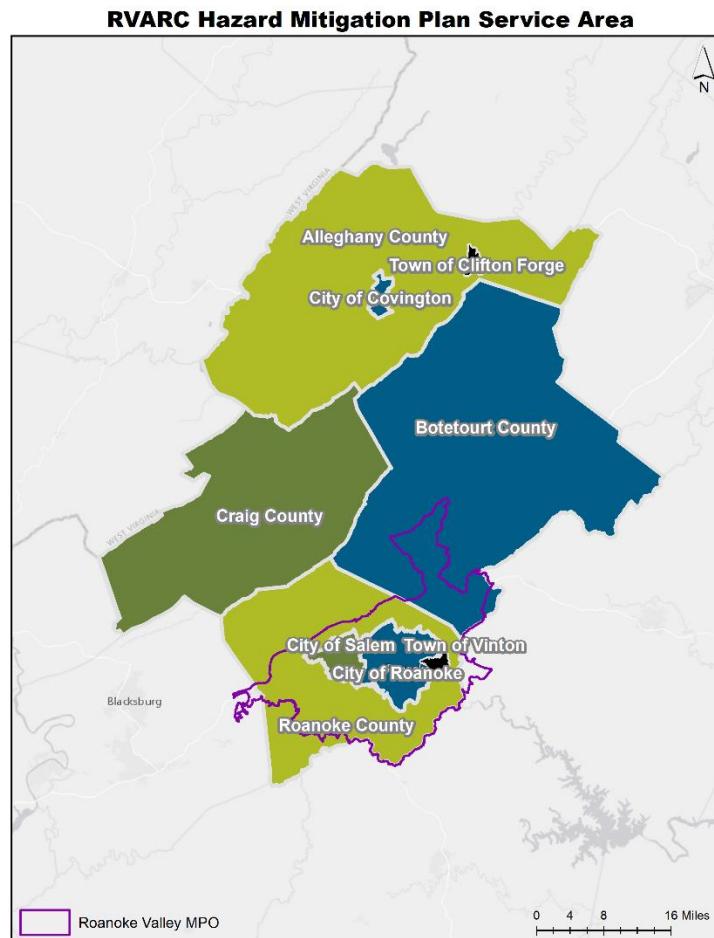


Figure 3: The Planning Region

Location and Topography

The Roanoke Valley-Alleghany Region (the region) is on the eastern border of the Appalachian Plateau and the western slope of the Blue Ridge Mountains. Two major river basins characterize the region. The James River, flowing east through Botetourt County, ultimately reaches the Chesapeake Bay and the Atlantic Ocean. The Roanoke River flows through the district in a southeasterly direction to North Carolina before reaching the Atlantic. Both river basins serve as development corridors. Although the planning area includes the Roanoke metropolitan area, much of the region is rural. Approximately 212,039 acres of federal land lies within the National Forest and Blue Ridge Parkway system.

The predominant physical characteristic of the region is the mountainous terrain. Forty-eight percent of the land area has slopes of 25 percent or greater. Within the region, mountain ridges run southwest to northeast. There are large concentrations of steep land in northern Botetourt County and Alleghany County. A broken ring of steep lands surrounds the Roanoke metropolitan area. Past development has been influenced greatly by topographic characteristics. The higher elevations have remained in open or forest use while the more moderate foothills and river valleys have been developed.

Floodplains impose considerable restraints on land development activities. In the past, heavy flooding has caused considerable property damage to existing development in floodplains. The region has several major floodplain areas along the Roanoke, James and Jackson Rivers, and the Peters, Mason, Carvin, Tinker, Glade, Mud Lick and Smith Creeks.

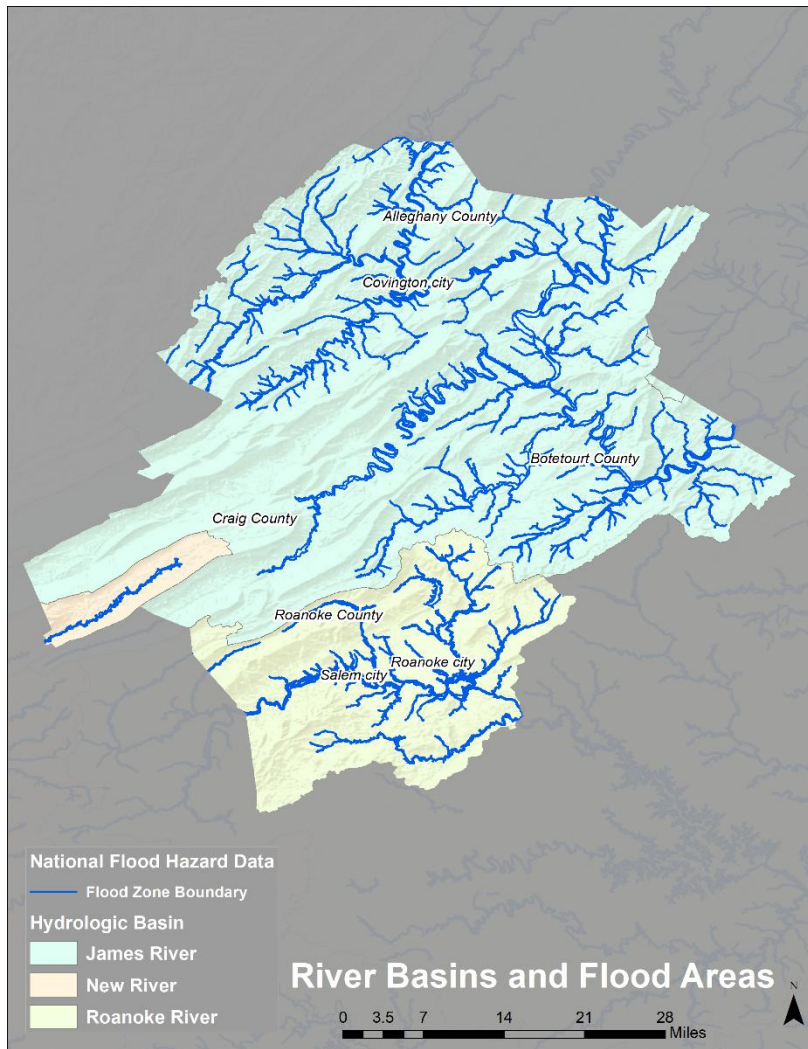


Figure 4: River Basins and Flood Areas

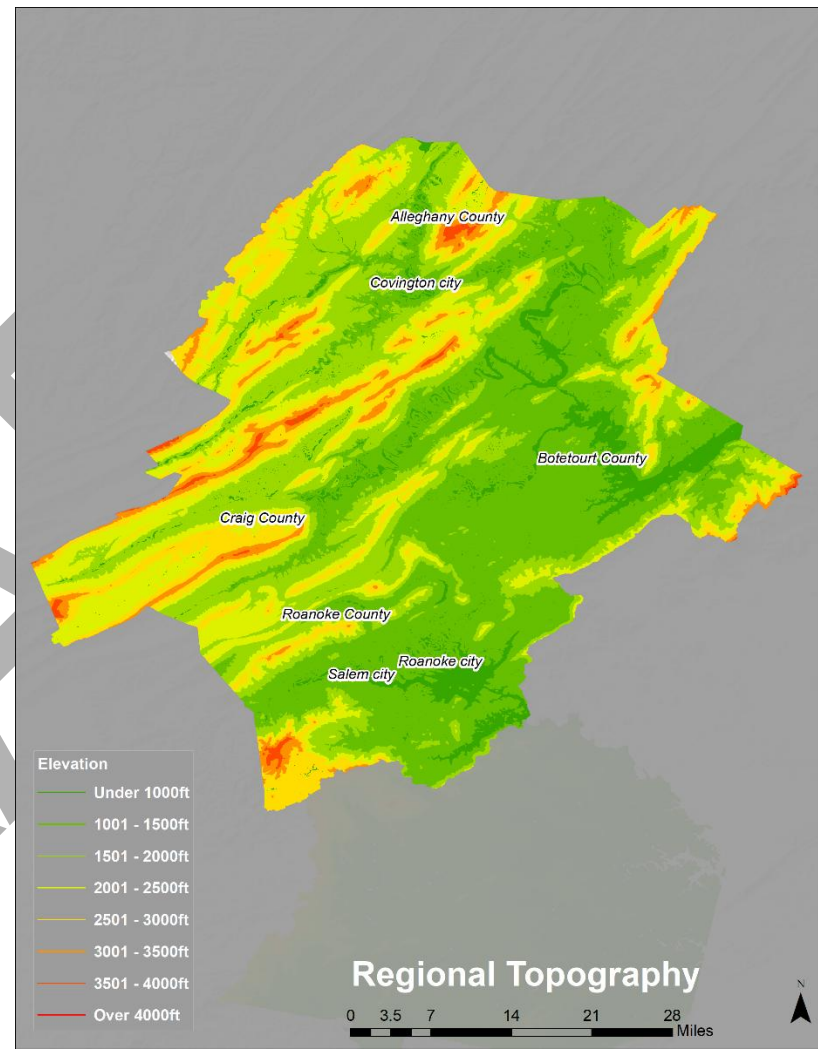


Figure 5: Regional Topography

Climate

The region is located in agricultural zones 7a and 7b and is characterized by hot, wet summers, cold winters with mild to moderate precipitation, and fluctuating shoulder seasons. Summer high temperatures average around the mid-80s across the region, with higher temperatures in the urbanized areas of the Roanoke Valley. Winter low temperatures average in the 40s in the coldest months of December and January, with colder temperatures felt in the higher elevations of the Alleghany Highlands. The area receives significant annual rainfall, with annual averages in the Roanoke Valley typically around 40 inches per year according to National Weather Service records.

Table 2: Average High and Low Temperatures

Daily average high and low temperatures (°F)												
High												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Roanoke	46	50	59	69	76	83	86	85	78	68	58	49
Covington	43	46	56	66	74	80	84	82	76	66	56	46
Low												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Roanoke	30	32	40	48	56	64	68	67	60	49	40	34
Covington	27	29	37	46	54	62	66	65	58	47	38	31

Data from Weatherspark.com, accessed 5/15/25.

Population

In 2023, the overall population of the region was around 280,000 people, with the majority of residents located in the City of Roanoke and Roanoke County. Key demographic factors to assess in a community's resilience to hazards include age and income. These factors can indicate vulnerability to shocks – for example, a family with children may have a harder time relocating or require more services at a public shelter; the elderly often have special medical needs; and households with low income can face inhibited options post-disaster and require more public assistance. Tables 3 through 5 show basic population data for the region.

Much of the population in Alleghany County, Botetourt County, and the Town of Clifton Forge is aging, with the median age being 48 years or older. This is ten years older than the median age across the Commonwealth. As this trend progresses over the lifetime of this planning document, it will likely have impacts on how hazard mitigation and response are carried out in these localities.

There is a projected increase in population across the region in the next 25 years. However, some localities, including Alleghany and Craig Counties, are projected to see a fall in population, likely due to aging and internal migration.

The National Risk Index displays information about social vulnerability based off the CDC Social Vulnerability Index. Highest levels of social vulnerability occur in the Cities of Roanoke and Covington.

Roanoke Valley-Alleghany National Risk Index Social Vulnerability Rating

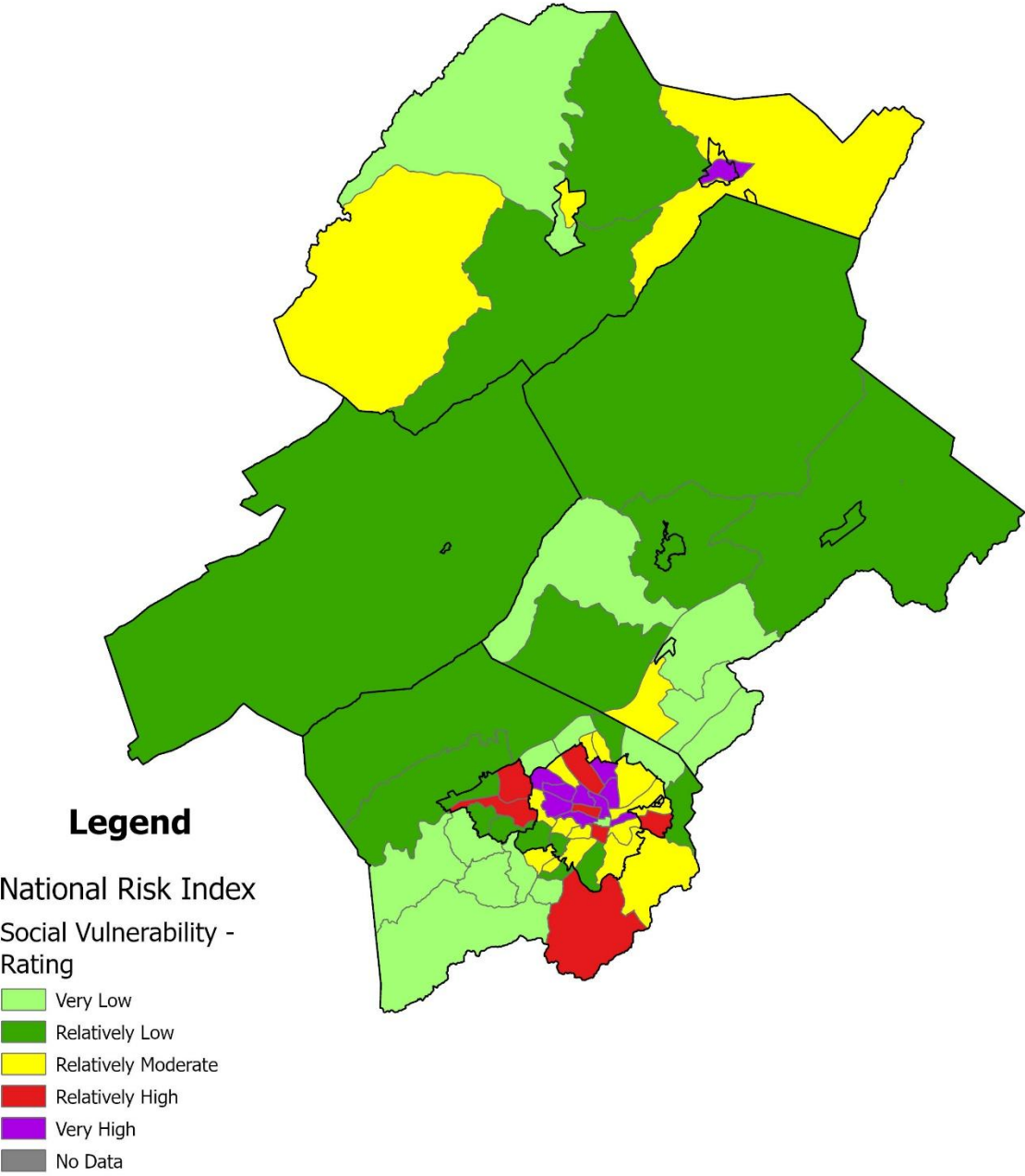


Figure 6: NRI Social Vulnerability Rating

Table 3: Population Projections by Locality, CEDS 2025

Locality	2023	2030	2040	2050
Alleghany County*	11,479	13,993	12,805	11,809
Botetourt County	33,875	33,556	34,588	36,138
Craig County	4,881	4,528	4,363	4,264
Roanoke County*	89,755	100,027	104,046	109,621
City of Covington	5,671	5,434	5,075	4,792
City of Roanoke	98,677	101,514	102,529	105,079
City of Salem	25,477	25,519	25,438	25,737
Town of Clifton Forge	3,483	-	-	-
Town of Vinton	8,038	-	-	-
RVARC Region	280,336	284,571	288,844	297,440
Virginia	8,657,499	9,129,002	9,759,371	10,535,810

*Excludes Town of Clifton Forge. Excludes Town of Vinton population.

Table 4: Population Distribution by Age, CEDS 2025

Locality	Median Age	Under 5	5 to 19	20 to 34	35 to 54	55 to 64	65 and over
Alleghany County*	48.1	603	2,268	2,420	3,211	2,338	3,801
Botetourt County	48.1	1,437	5,648	4,960	8,306	5,519	8,005
Craig County	46.1	359	999	551	1,112	921	939
Roanoke County	43.7	3,891	15,682	14,649	22,772	12,188	19,573
Covington City	41.5	332	1,238	927	1,242	829	1,103
Roanoke City	38.0	6,353	17,891	20,304	24,421	12,481	17,227
Salem City	40.3	1,039	4,958	5,093	6,047	3,375	4,965
Town of Clifton Forge	53.5	231	607	589	640	524	892
Town of Vinton	39.7	431	11,478	1,570	1,833	1,165	1,531
Virginia	38.8	495,281	1,638,640	1,737,462	2,255,522	1,120,434	1,410,160

Table 5: Median Household Income, American Community Survey

Locality	Median Household Income
Alleghany County	\$ 52,546.00
Botetourt County	\$ 77,680.00
Craig County	\$ 66,286.00
Covington City	\$ 45,737.00
Roanoke City	\$ 51,523.00
Roanoke County	\$ 80,872.00
Salem City	\$ 68,402.00

Development Trends

The region contains a significant portion of the Roanoke, Virginia Metropolitan Statistical Area, which includes the counties of Botetourt, Craig, Roanoke and Franklin, the Cities of Roanoke and Salem. This is the fourth largest MSA in Virginia and the largest in the western half of the state.

Most of the region’s largest employers are in the industries of government, healthcare, education, banking and insurance, and retail.

Table 6: 50 Largest Regional Employers

1. Roanoke Memorial Community Hospital	26. City of Salem School Board
2. HCA Virginia Health System	27. Carter Machinery Company
3. Roanoke County School Board	28. Marvin Windows
4. U.S. Department of Veterans Affairs	29. Yokohama Tire Corp.
5. Wal Mart	30. Roanoke College
6. Carilion Services	31. YMCA
7. City of Roanoke	32. Lake Region Medical
8. Roanoke City School Board	33. County of Franklin
9. Kroger	34. VDOT
10. Wells Fargo Bank NA	35. Alleghany Highlands Public Schools
11. County of Roanoke	36. Carilion Healthcare
12. Cornerstone Building Brands Service	37. Dynax America Corporation
13. U.P.S.	38. Adams Construction Company
14. Franklin County School Board	39. Davis H. Elliot Company, Inc.
15. Alliance Group Rock Tenn	40. Steel Dynamics Roanoke Bar Div
16. Altec Industries Inc	41. Coca Cola Bottling Company
17. Friendship Manor	42. Bimbo Bakeries USA INC
18. Postal Service	43. Paychecks Plus
19. Advance Auto Parts	44. Virginia Western Community College
20. Botetourt County School Board	45. Branch Highways
21. Virginia Transformer Corporation	46. County of Botetourt
22. Food Lion	47. Franklin Memorial Hospital
23. Lowes' Home Centers, Inc.	48. US Foodservice
24. Elbit Systems of America - Night Vision	49. Metalsa Roanoke
25. City of Salem	50. Mcdonald's

Source: Virginia Employment Commission, *Economic Information & Analytics, Quarterly Census of Employment and Wages (QCEW), 3rd Quarter (July, August, September) 2024*. Note: Data includes all localities within Roanoke Valley-Alleghany Regional Commission service area.

Of particular interest to this planning effort is the importance of healthcare to the regional economy. Carilion Medical Center (also known as Roanoke Memorial Hospital) is one of only six

Level I Trauma Centers in the Commonwealth. It is also one of only three Level I Pediatric Trauma Centers. Disruptions to service at Roanoke Memorial Hospital can have far-reaching effects across the Southwest Virginia region. Nearby LewisGale Medical Center in Salem is a Level II Trauma Center. Both facilities may provide critical services in disaster events to communities outside of the Roanoke Valley – Alleghany Region. Table 7 shows staffed and licensed beds for area hospitals, which can be used to assess capacity in disaster events. Nearby hospitals outside of the service area include Carilion New River Valley Medical Center, LewisGale Montgomery, Carilion Franklin Memorial, and Carilion Rockbridge Community, and, further afield, Centra General Hospital and UVA Medical Center.

Table 7: Number of Licensed and Staffed Beds in Area Hospitals, 2025

Hospital	Number of Staffed Beds	Number of Licensed Beds
Carilion Medical Center	694	752
LewisGale Salem	321	506
LewisGale Alleghany	110	205
Totals	1,125	1,463

The RVARC produces a Comprehensive Economic Development Strategy document every five years which should be referenced to better understand the economic picture of the region. Key project areas from the 2025 CEDS are included in Table 8. A full list of projects can be found in the CEDS document.

Table 8: Priority Project Categories, CEDS 2025

Priority Project Categories
1. Develop regional broadband infrastructure and increased connectivity.
2. Encourage and develop advanced manufacturing facilities
3. Focus for workforce development programs to meet needs in target industry sectors.
4. Focus on transportation infrastructure: Roanoke-Blacksburg Regional Airport, Amtrak, highways, and commuting
5. Continue success in outdoor tourism with regional and local greenway systems, Explore Park
6. Support and encourage industrial site development and upgrades.
7. Develop a wider range of homeownership and rental housing opportunities.
8. Promote and encourage attraction of biotech and life sciences clusters
9. Support local agriculture, growers, and producers.
10. Perform a gap analysis to develop regional quality of life amenities.

Local governments were asked to provide building permit data to help clarify development patterns in the region. The following overview reflects building trends including new construction, demolitions, and improved parcels from 2019 to September 2025.

Internal tracking systems vary widely among jurisdictions, and in some cases, data are incomplete or inconsistent across time periods. Some localities do not distinguish between types of structures when measuring improvements (e.g. homes vs. mobile home hookups vs. storage units). Others provided only parcel data while some reported only structures built before a certain time, current occupied housing units, or buildings which receive refuse collection. Some localities were not able to provide this data. As a result, the dataset may not capture the full extent of building activity and development across years or jurisdictions.

- **Alleghany County**
 - 7,123 buildings recorded in the 2019 refuse collection file; 6,439 in the 2025 refuse collection file.
 - 65 demolitions recorded in this period.
- **Clifton Forge**
 - There has been very little growth since 1990.
 - Residential Historic Overlay District with 730 contributing structures; Commercial Historic Overlay District with 77 contributing structures.
 - Currently 13 churches, 109 commercial buildings, and 140 vacant buildings.
- **Craig County**
 - 232 building permits from 2019-2025 (over 256 sq ft).
 - 34 units were demolished in this period.
- **Roanoke County**
 - 67,425 buildings before 2019.
 - 72,832 buildings in 2025.
 - 203 demolitions recorded in this period.
- **City of Roanoke**
 - 1,018 building permits issued for new residential and commercial structures (including accessory structures and 82 demolitions) since January 1, 2020.
- **City of Salem**
 - 10,582 parcels (9,565 improved) in 2019.
 - 10,650 parcels (9,690 improved) in 2025.
 - 20 demolitions recorded in this period.
- **Town of Vinton**
 - Steady decline in building permits since 2008.
 - As of 2022, there were 3,686 occupied housing units.

Historic and Cultural Resources

Virginia has a deep cultural history, and this portion of Virginia is no exception. The service area is located within Southwest Virginia and shares cultural ties to the wider Appalachian region. For many communities, historic and cultural resources are a catalyst for economic development and source of pride for residents. Historic properties can be located throughout a locality and the number of structures varies widely. The potentially devastating effects that flooding and other disasters can have on historic properties are not always considered in mitigation planning. More information about specific considerations of hazard mitigation on historic properties is included in [Chapter 4: Risk Assessment](#).

Local governments should work with the Virginia Department of Historic Resources, VDEM, and local preservation groups to identify historic buildings and sites in need of hazard mitigation. These efforts should follow the guidance in [Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning](#) (FEMA 386-6).

2.2 Infrastructure and Critical Facilities

Infrastructure

Several infrastructure elements contribute to a robust regional socioeconomic space. These elements affect how people get around, how they meet basic needs, and how they access employment.

Transportation

Interstate 64 bisects Alleghany County in an east-west direction while passing through the City of Covington and Town of Clifton Forge. Interstate 81 crosses Botetourt and Roanoke counties in a northeast-southwest direction and includes an urban connector I-581 that links I-81 to the central business district of the City of Roanoke. Other arterial routes in the area include US 11 in Botetourt and Roanoke counties; US 60 in Alleghany County; US 220 passing through Alleghany, Botetourt, and Roanoke counties; US 221 and 460 in Roanoke County; and State Primary Route 311 in Alleghany and Craig counties.

Air service is available at the Roanoke Regional Airport that provides nonstop service from Roanoke, Virginia to nine major cities. Rail service for freight is provided by the Buckingham Branch Railroad, CSX Transportation and Norfolk Southern Railway. Passenger train service is available from Amtrak at stations in the Town of Clifton Forge and City of Roanoke, and an additional passenger rail station is planned in Christiansburg, with rights-of-way managed by the Virginia Passenger Rail Authority. There are also several fixed-route bus lines in the region.

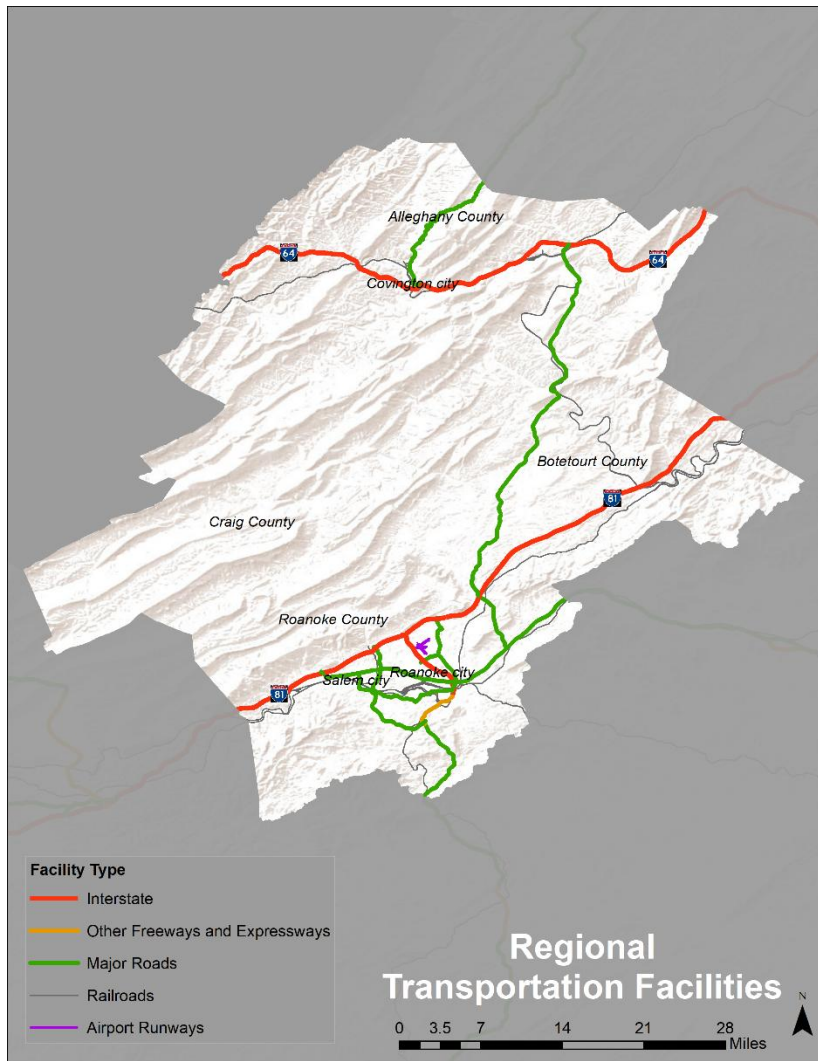


Figure 7: Regional Transportation Facilities

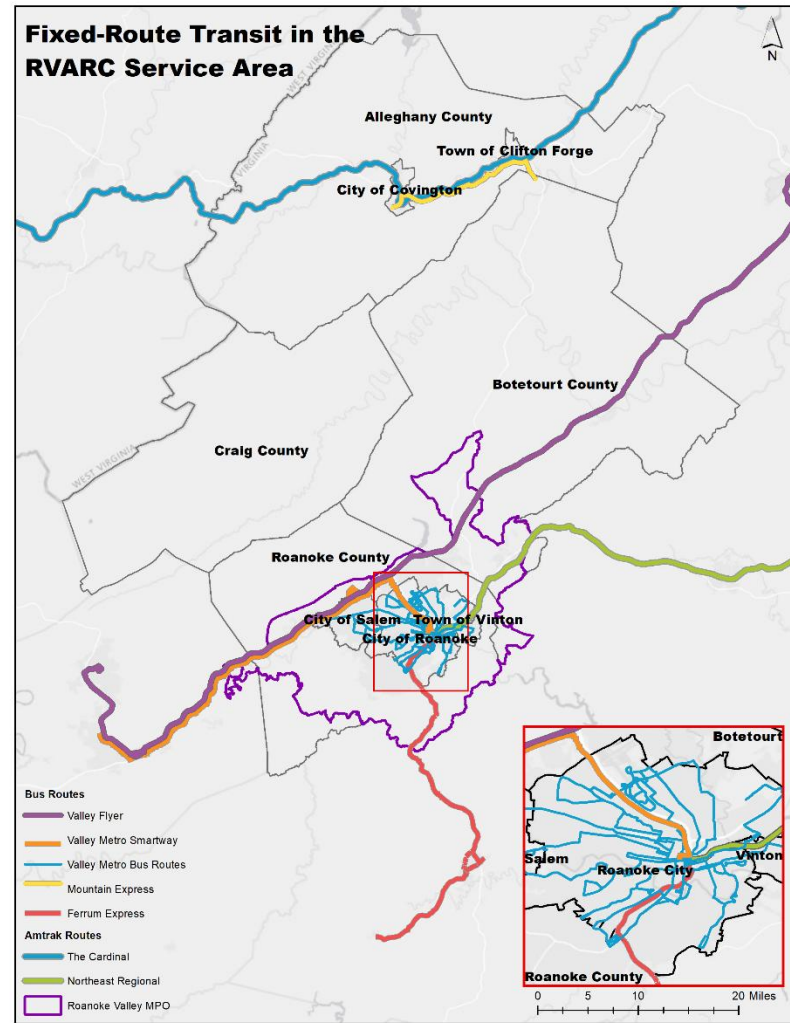


Figure 8: Regional Transit Connections

Housing

The region faces a housing shortage as the Roanoke Valley-Alleghany Regional Housing Market Study Analysis (2021). The biggest challenges to the regional housing market are identified as follows:

- The Region's population has been slowly but consistently growing over the last 50 years, with the percentage of the elderly population increasing.
- One, two, and three-person households comprise the largest share of households in the Region, but over the last five years, more growth has occurred in larger households of four or more people.
- The number of vacant units has been increasing in the Region. This, in part, has been driven by the seasonal home market, which accounts for 30% of all vacant units.
- Nearly 82% of housing units in the Region were constructed before 1980, leaving the Region with a much older housing stock than what is found in many other parts of the Commonwealth.
- Over the last five years, the median gross rent in the Region increased by 14%. The average rent for a single-family home is around \$1,000 per month, while rent in multifamily buildings averaged \$1,200 per month.
- There are significant differences in the percentage of renter of owner households classified as cost burdened across the Region. Approximately 20% of owner households are experiencing some level of cost burden compared to 41% of renters. It is typical to see a broad difference between these two groups, but it also speaks to the need for affordably priced housing for renter households.
- The number of renter households that qualify for affordable rental housing at the 30% of AMI level exceeds the number of units available at that price point. There is a projected deficit of 5,324 units, meaning many extremely low-income households are having to spend more than is recommended on housing costs. This further exacerbates housing affordability and cost burden challenges.

The CEDS offers a more updated overview of housing statistics, including annual home sales and estimated vacancy rates.

Utilities

The region contains three major electricity providers, Appalachian Power, Dominion Power, and Craig-Botetourt Electric Co-op. The City of Salem also operates a substation. Roanoke Gas and Columbia Gas are other major energy service providers in the region. This form of infrastructure relies on long, linear facilities often bracketed by substations. The location of these facilities can impact development in the region. Major energy production projects such as large-scale wind and solar are a new type of development that continues to expand in the area. Mountain Valley Pipeline is another key infrastructure project which has provided additional natural gas service to the region.

Disruptions to energy can have disproportionate impacts on vulnerable populations. Energy service provision is a key first step in post-disaster response, and future involvement of these stakeholders in hazard mitigation plans is recommended.

Clean water and sanitation are also key concerns following a disaster event. While regional water supply planning is mandated by the state, a high level overview of drought as a hazard is included in **Chapter 3: Hazard Identification**. Key players in the provision of water and sanitation include the Western Virginia Water Authority (WVWA), which provides water and sewer services to much of the service area, including the City of Roanoke, Roanoke County, Botetourt County, the Town of Fincastle, and the Town of Vinton. Additionally, the Craig-New Castle PSA, which provides water and sewer services to Craig County and the Town of New Castle, has recently entered into an administration agreement with WVWA. WVWA is a special district included in this plan. Additional water and sewer provision is provided by Alleghany County, the Cities of Covington and Salem, and the Towns of Buchanan, Clifton Forge, Iron Gate, and Troutville. Small private service providers also exist in the region.

In December of 2023 the Virginia Department of Health published a report on infrastructure needs which focuses on sewer and on-site facilities such as septic. This report estimates that \$288 million of investment are needed to maintain or improve current systems across the RVARC service area. Many sewage processing facilities are located near rivers and streams. Septic systems are also vulnerable to flooding, which can have downstream impacts on water quality and cause ripple effects for the community. These cost estimates are valuable data points in posing future projects and solutions for the region, including hazard mitigation projects.

Table 9: Regional Sewer and Septic Needs, VDH

Locality	Community Needs	Onsite Needs	Total Needs
Alleghany	\$ 9,344,076.00	\$ 18,631,769.00	\$ 27,975,845.00
Botetourt	\$ 6,857,960.00	\$ 44,805,866.00	\$ 51,663,826.00
Covington	\$ 5,605,860.00	\$ 207,632.00	\$ 5,813,492.00
Craig	\$ -	\$ 6,752,172.00	\$ 6,752,172.00
Roanoke County	\$ -	\$ 168,614,006.00	\$ 168,614,006.00
Roanoke City	\$ -	\$ 9,335,610.00	\$ 9,335,610.00
Salem	\$ 17,593,337.00	\$ 569,056.00	\$ 18,162,393.00
Total	\$ 39,401,233.00	\$ 248,916,111.00	\$ 288,317,344.00

Outdoor Recreation Facilities

Outdoor recreation is a key part of the regional economy with more than \$42 million in local tax revenue coming from visitors to the region. Greenways and trails are often located in areas particularly vulnerable to disaster events, such as on steep slopes or in floodplains. The Appalachian Trail is a key draw to the region, but other facilities of note include Carvins Cove, the Explore Park, the Roanoke Valley greenway network, the Jackson River Trail, Douthat State Park, the Blue Ridge Parkway, and the George Washington and Jefferson National Forests.

Table 10: 2023 Tax Revenues from Travel, VTC

Locality	2023 Tax Revenue
Alleghany	\$ 1,236,865.00
Botetourt	\$ 3,104,204.00
Covington	\$ 719,478.00
Craig	\$ 145,191.00
Roanoke	\$ 6,785,403.00
Roanoke City	\$ 24,463,510.00
Salem	\$ 5,746,444.00

While much of the public lands in the area are managed by federal and state partners, local governments maintain numerous parks and trails in the region, including the Explore Park, Carvins Cove, and the greenway network. Managing these facilities is a significant part of local budgets, and even relatively mild storm events can have a disproportionate impact on staff time and materials costs. In some cases, greenway and park networks serve as transportation infrastructure for those who use alternative transportation to commute.

Critical and Vulnerable Facilities

Critical Facilities are those that provide services to the public during an emergency. Examples of this include Public Safety structures, Public Assembly Sites & Shelters, Medical Structures, Utility Structures, and Transportation Structures.

Vulnerable Facilities are those that will require special attention during an emergency. Examples of this include Large Scale Housing Complexes of 50 or more total units or those with elderly or sick residents, Child / Day Care Facilities, Manufacturing Sites / Warehouses, and Tier 2 Facilities.

These definitions collectively fulfill the requirement for critical facilities listings for pre-disaster hazard mitigation planning and the community rating system program.

A full listing of Critical and Vulnerable Facilities identified in this plan is included in [Appendix G](#).

High hazard dams are also included in this plan and references to these facilities are located in [Chapter 3, Section 3.4](#); [Chapter 4, Section 4.3](#); and [Appendix H](#).

Critical Facilities	Vulnerable Facilities
<ul style="list-style-type: none"> • Public Safety: Fire & Rescue, Law Enforcement, etc. • Public Assembly & Shelters: Schools, Government Buildings, Community Centers, etc. • Medical Structures: Hospitals, Clinics, Pharmacies etc. • Utility Structures: Pumps, Wells, Water Treatment, Power Generation, etc. • Transportation Structures: Airports, Transit Hubs, Evacuations Routes, etc. 	<ul style="list-style-type: none"> • Large-Scale Housing Complexes (50 or more total units), Nursing & Assisted Living Homes, Recovery Care, etc. • Child / Day Care Facilities • Manufacturing Sites / Warehouses: Potential for dangerous Materials • Tier 2 Facilities

Chapter 3. Hazard Identification

3.1 Hazards for Assessment

The region is subject to a variety of hazard events, many of which will be assessed in this document. The following kinds of hazard events have been documented through the NCEI database maintained by NOAA.

- Debris Flow
- Drought
- Extreme Cold/Wind Chill
- Flash Flood
- Flood
- Hail
- Heavy Rain
- Heavy Snow
- High Wind
- Lightning
- Strong Wind
- Thunderstorm Wind
- Tornado
- Winter Storm
- Winter Weather

The locations and number of events for each of these hazard events is visible in [Table 1: Hazard Events and Locations](#).

The Steering Committee identified several hazards for assessment in the plan based off of this data, federal disaster declarations included in [Table 2](#), and historic hazard assessments.

- Extreme Temperature
- Flooding
- Hurricane and Tropical Storm
- Wind Event
- Winter Storm

Additional hazards which will be assessed will include:

- Earthquake
- Karst
- Landslide
- Wildfire

Hazards not assessed in this document include drought and pandemics. High hazard potential dams are assessed under flooding unless otherwise noted, with supplementary materials contained in [**Appendix H**](#).

The 2019 Plan details all historic disaster declarations and disaster events by hazard. This document will only provide details around disaster events which have occurred since the data collected in the 2019 Plan, or historic events which can provide key learning for hazard mitigation. A comprehensive record of all events since data collection began is not the aim of this chapter.

Table 11: Hazard Events and Locations

Event Types	Number of Events	Event Types	Number of Events
Debris Flow	1	Heavy Snow	2
ROANOKE CITY	1	BOTETOURT (ZONE)	1
Drought	11	ROANOKE (ZONE)	1
ALLEGHANY (ZONE)	3	High Wind	33
BOTETOURT (ZONE)	3	ALLEGHANY (ZONE)	5
CRAIG (ZONE)	3	BOTETOURT (ZONE)	5
ROANOKE (ZONE)	2	CRAIG (ZONE)	3
Extreme Cold/Wind Chill	3	ROANOKE (ZONE)	20
BOTETOURT (ZONE)	1	Lightning	4
CRAIG (ZONE)	1	ALLEGHANY CO.	1
ROANOKE (ZONE)	1	BOTETOURT CO.	1
Flash Flood	21	ROANOKE CITY	1
ALLEGHANY CO.	2	COVINGTON CITY	1
BOTETOURT CO.	7	Strong Wind	6
CRAIG CO.	1	BOTETOURT (ZONE)	2
ROANOKE CO.	4	CRAIG (ZONE)	1
ROANOKE CITY	6	ROANOKE (ZONE)	3
COVINGTON CITY	1		

Event Types	Number of Events	Event Types	Number of Events
Flood	37	Thunderstorm	168
ALLEGHANY CO.	2	Wind	21
BOTETOURT CO.	9	ALLEGHANY CO.	54
CRAIG CO.	2	BOTETOURT CO.	15
ROANOKE CO.	11	CRAIG CO.	71
ROANOKE CITY	10	ROANOKE CO.	1
SALEM CITY	3	ROANOKE CITY	4
Hail	27	SALEM CITY	2
ALLEGHANY CO.	4	COVINGTON CITY	2
BOTETOURT CO.	7	Tornado	2
CRAIG CO.	1	BOTETOURT CO.	1
ROANOKE CO.	11	SALEM CITY	1
ROANOKE CITY	2	Winter Storm	28
SALEM CITY	2	ALLEGHANY (ZONE)	6
Heavy Rain	17	BOTETOURT (ZONE)	7
ALLEGHANY CO.	1	CRAIG (ZONE)	8
BOTETOURT CO.	3	ROANOKE (ZONE)	7
CRAIG CO.	3	Winter Weather	3
ROANOKE CO.	4	ALLEGHANY (ZONE)	2
ROANOKE CITY	4	ROANOKE (ZONE)	1
SALEM CITY	1	All Hazard Events	363
COVINGTON CITY	1		

Table 12: FEMA Disaster Declarations since 2018

Declaration Date	Incident Type	Title or Name	Affected Areas
Friday, April 4, 2025	Severe Storm	SEVERE WINTER STORMS AND FLOODING	Craig (County)
Tuesday, October 1, 2024	Tropical Storm	TROPICAL STORM HELENE	Botetourt (County) Craig (County) Covington Roanoke Roanoke (County)
Sunday, September 29, 2024	Tropical Storm	POST-TROPICAL CYCLONE HELENE	Craig (County) Covington
Thursday, April 2, 2020	Biological	COVID-19 PANDEMIC	Alleghany (County) Botetourt (County) Craig (County) Roanoke (County) Covington Roanoke Salem
Friday, March 13, 2020	Biological	COVID-19	Alleghany (County) Botetourt (County) Craig (County) Roanoke (County) Covington Roanoke

3.2 Earthquake

Definition of Hazard

An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil as well as trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from falls, collapsing walls, flying glass, and falling objects. Much of the damage in earthquakes is predictable and preventable. Primary impacts from earthquakes are structural damage and loss of life.

There are two common ways of measuring earthquake intensity. The Modified Mercalli Intensity Scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is a value assigned to a specific site after an earthquake has occurred, and is assigned based on the severity of the effects of the event. The lower numbers of the intensity scale generally deal with the way the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above. In contrast, the more common Richter scale is used to scientifically measure an earthquake's magnitude, regardless of impact, based on the energy released by the event.

The Virginia Tech Seismological Observatory (VTSO) operates a digital seismic network with stations in Virginia and southern West Virginia. Along with other southeastern regional seismic networks and the U.S. National Seismic Network (USNSN), VTSO contributes to earthquake monitoring, information dissemination and seismic hazard assessment objectives in the southeastern United States. In 1991, Virginia Tech combined with other institutions in North Carolina and Tennessee to form the Southern Appalachian Cooperative Seismic Network to coordinate earthquake monitoring and data exchange.

I. Not felt except by a very few under especially favorable conditions.
II. Felt only by a few persons at rest, especially on upper floors of buildings.
III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Figure 9: Modified Mercalli Intensity Levels

Historic Event Descriptions

The southern portion of the Roanoke Valley-Alleghany Region is part of the Giles County Seismic Zone, including the Cities of Roanoke and Salem, the Counties of Craig, Roanoke, and the southern portion of Botetourt, and the Town of Vinton. Map 1 shows data collected by the Virginia Department of Emergency Management, where historical event information was used to approximate the three seismic zones across the Commonwealth.

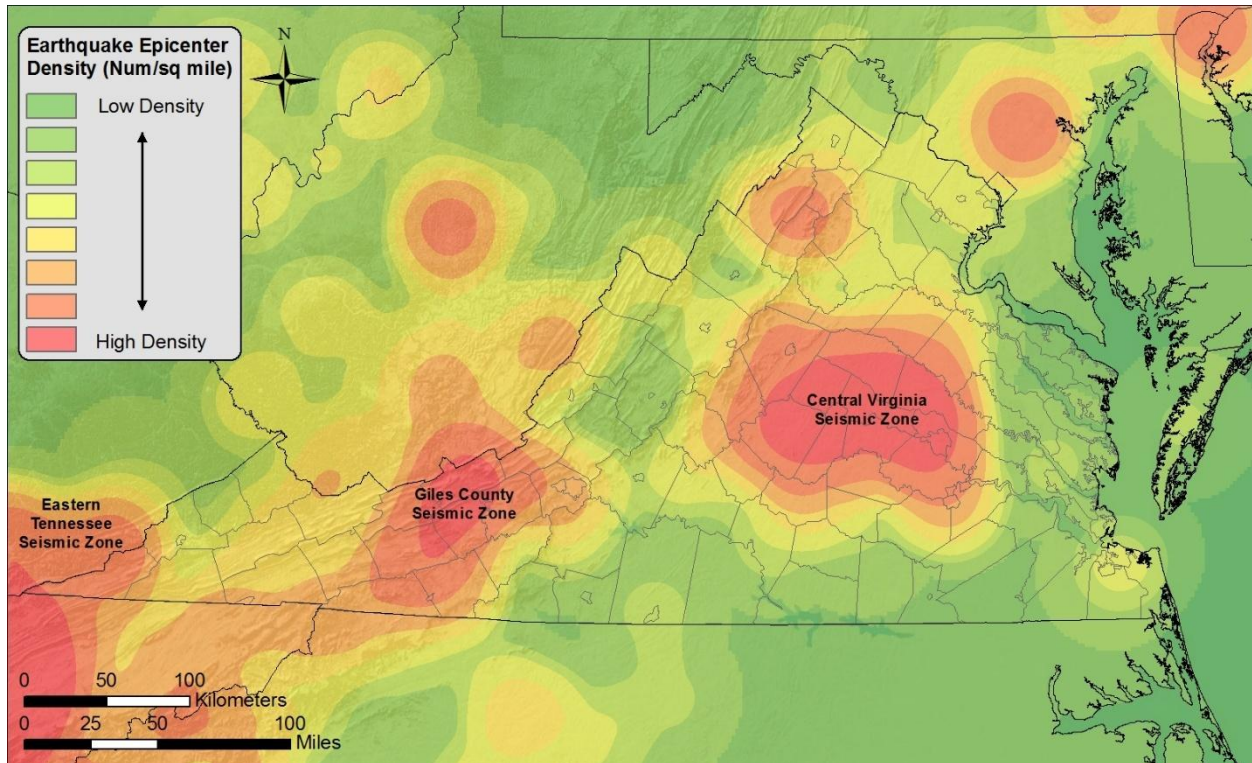


Figure 10: Virginia Seismic Zones, Virginia Department of Energy

Since 1774, the year of the earliest documented Virginia earthquake, there have been over 300 earthquakes in or near the Commonwealth. Of those, 18 earthquakes had reports of intensity VI or higher. The largest earthquake in Virginia was the 1897 Giles County shock which registered an intensity of VIII. It was felt over 11 states (approximately 280,000 square miles). The estimated magnitude for this event was 5.8, making it the third largest earthquake in the eastern United States in the last 200 years (second largest in the southeastern U.S.). On August 23, 2011, a magnitude 5.8 earthquake occurred 5 miles south-southwest of Mineral, Virginia (150 miles northeast of Roanoke). The Mineral event was Virginia's strongest earthquake in over a century. While several small quakes have occurred, no major earthquakes have occurred in Virginia since 2011.

There have only been two earthquakes with epicenters in the planning area since the last update of this plan. One occurred near New Castle at a magnitude of 2.5 in December of 2019. The second occurred near the Roanoke County and Montgomery County border at a magnitude of 2.6 in September of 2021. Neither registered as higher than III or IV on the Mercalli Intensity Scale. One earthquake affected the region with an epicenter outside of the region. On August 9,

2020 a magnitude 5.1 earthquake struck near the Virginia border of North Carolina, with effects felt throughout the study area.

There has not been a Presidential or State Disaster Declaration in the planning region for earthquakes.

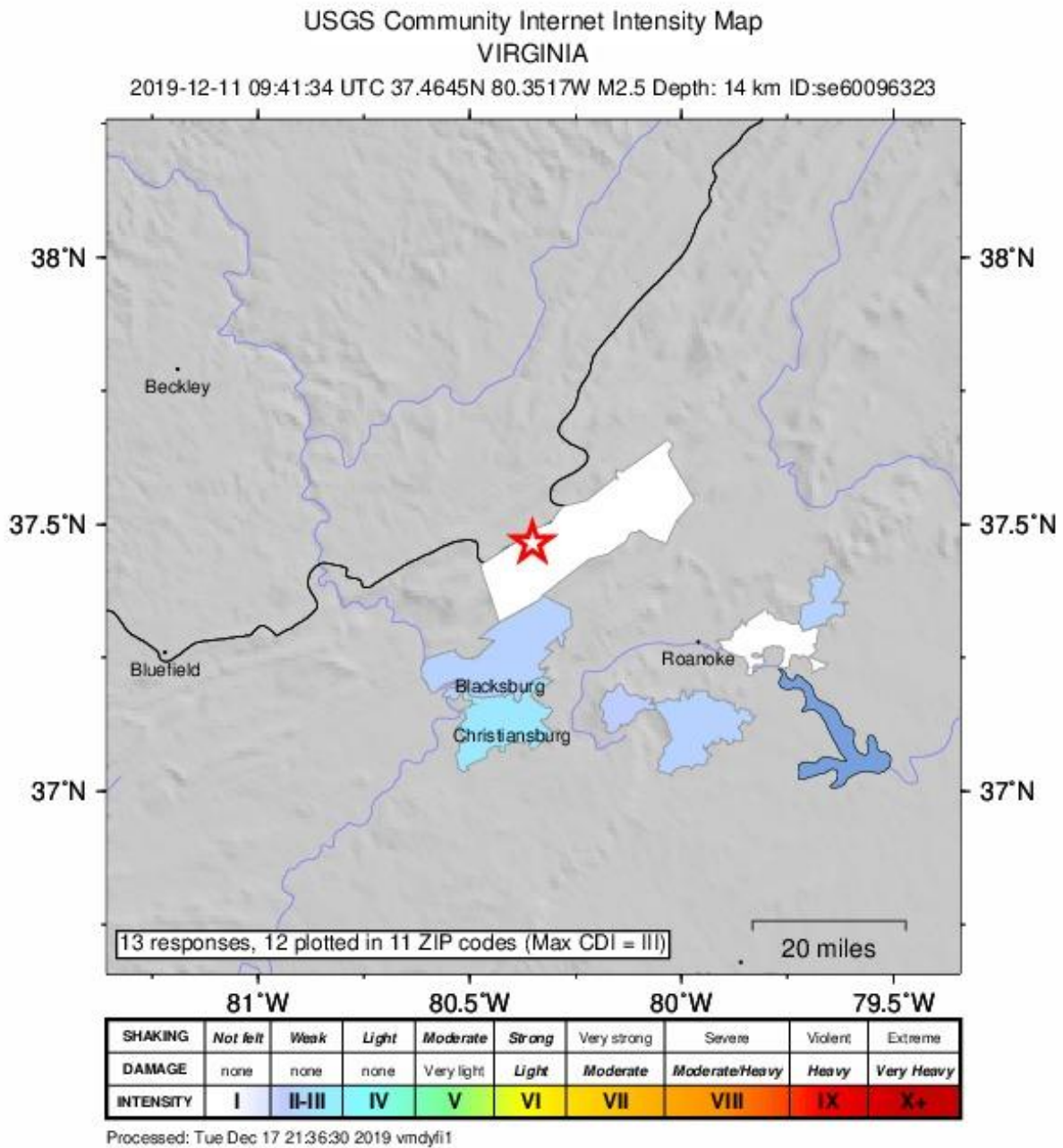


Figure 11: Community Intensity Map, New Castle Earthquake 2019

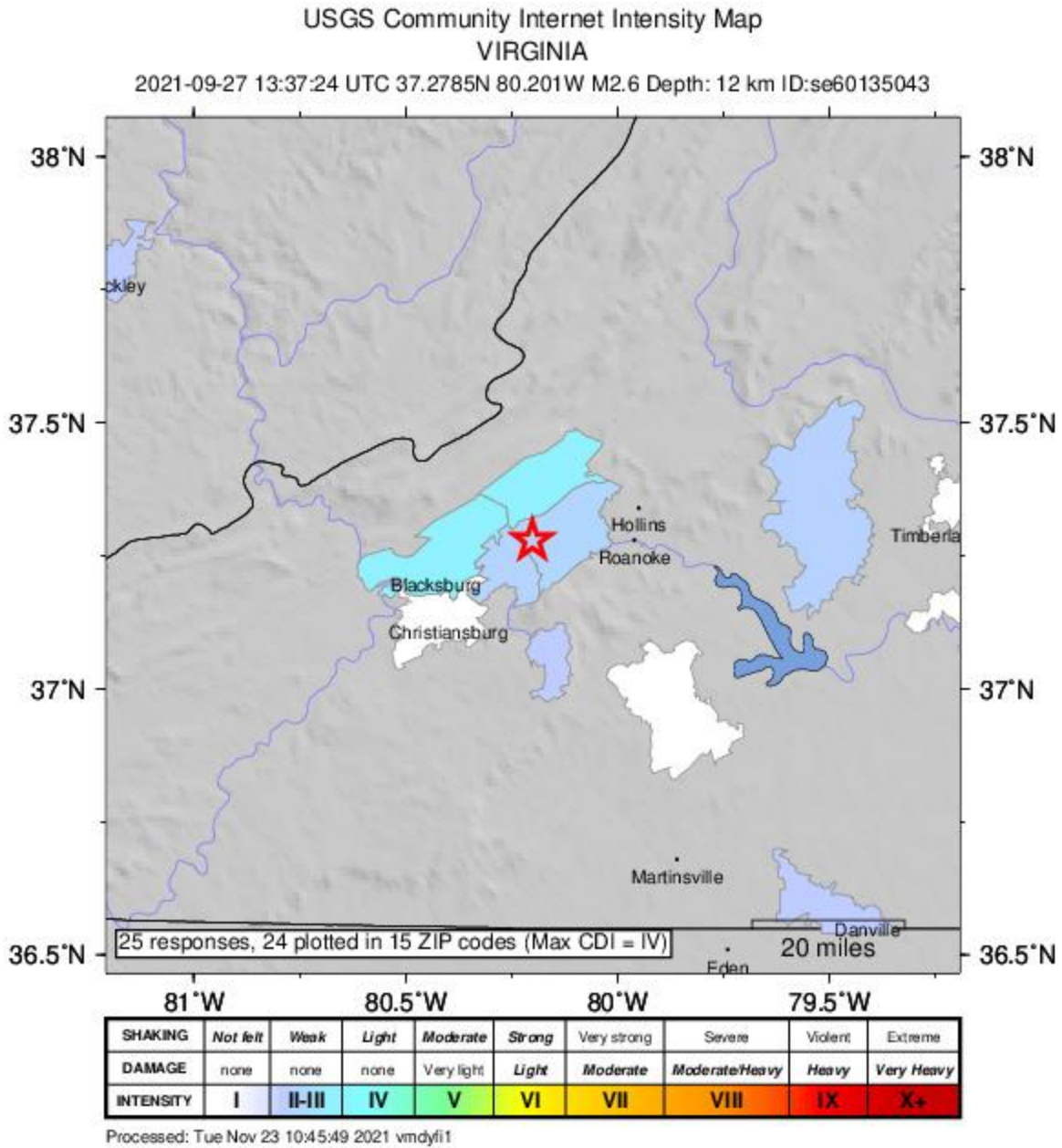
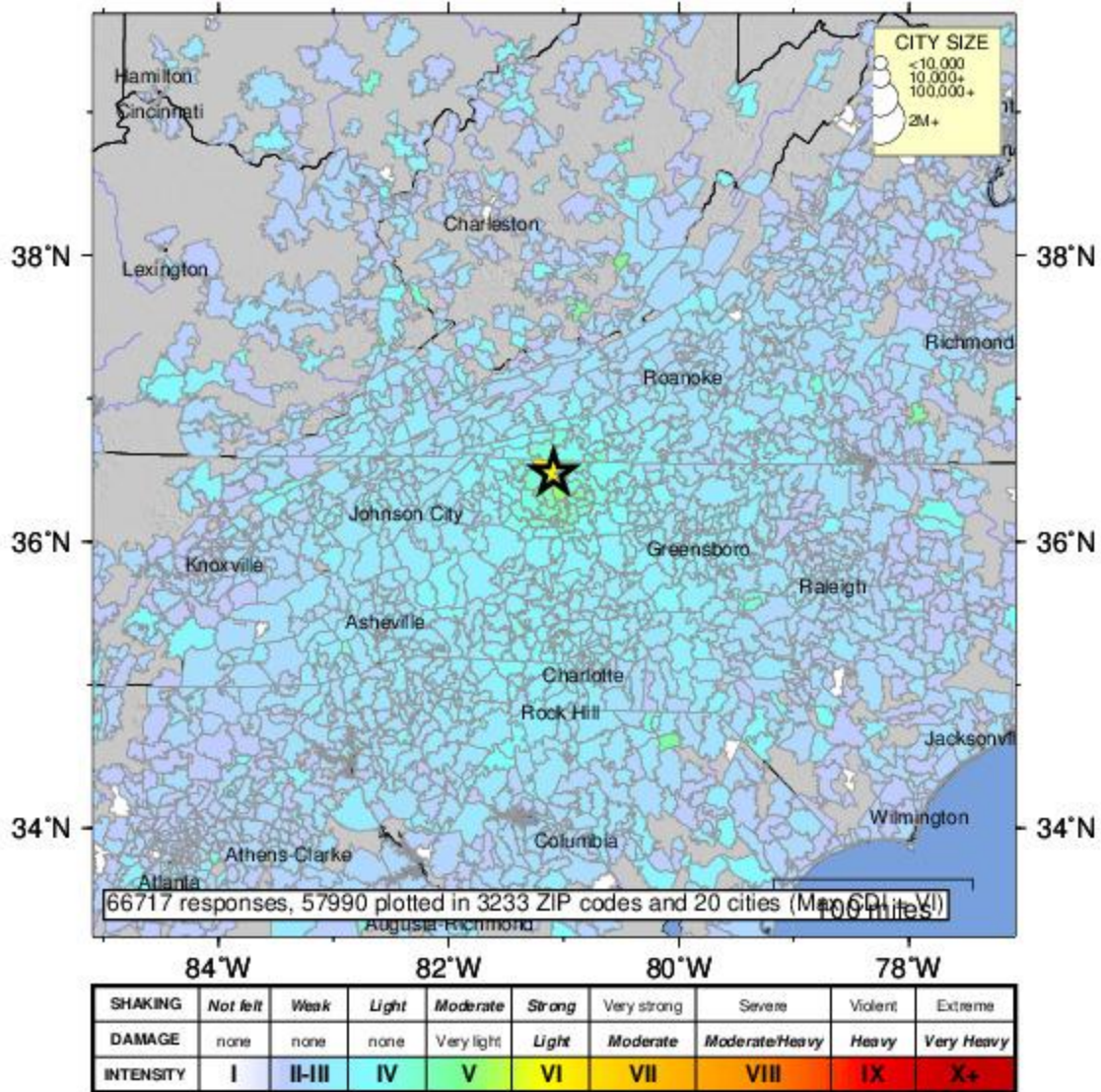


Figure 12: Community Intensity Map, Roanoke County Earthquake 2021

USGS Community Internet Intensity Map
 VIRGINIA-NORTH CAROLINA BORDER REGION

2020-08-09 12:07:37 UTC 36.4743N 81.0865W M5.1 Depth: 4 km ID:se60324281



Processed: Sun Apr 7 01:50:43 2024 vmdyfi1

Figure 13: Community Intensity Map, North Carolina Earthquake 2020

3.3 Extreme Temperature

Definition of Hazard

As described in Section 3.1, for the purposes of this plan Extreme Temperature will mean both extreme heat and extreme cold. While some strategies to address extreme heat and extreme cold may differ, the general strategies of weatherization, temperature control in the home, and emergency shelters remain consistent across these disaster events.

There is no unified definition of extreme heat, and there are numerous ways to evaluate potential heat stress. The wet bulb globe temperature (WBGT) is an international standard of measurement that is often utilized by athletic programs and is best suited for those performing strenuous activity outside. This measurement factors in solar radiation, temperature, relative humidity, and wind speed. The heat index, more commonly seen in cell phone applications available to average citizens, does not factor in solar radiation or wind speed, but does factor in relative humidity. This is a more suitable temperature for assessing impacts of heat on indoor, unconditioned spaces.¹ The climate of the Roanoke Valley-Alleghany Region is subject to high levels of humidity, meaning that actual WBGT is likely higher than both the measured temperature and the heat index. Studies of heat impacts do exist in the study area and focus primarily on urban heat island effect.





Parameter	WBGT	Heat Index	
Measured in the sun	●		 temperature
Measured in the shade		●	 solar radiation
Includes temperature	●	●	 relative humidity
Includes relative humidity	●	●	
Includes wind	●		 wind speed
Includes cloud cover	●		
Includes sun angle	●		

Figure 14: WBGT vs Heat Index, Weather.gov

Per the EPA, heat is the leading cause of weather-related death in the United States.² Further methods of evaluating heat and heat impacts should be assessed. For the purposes of this plan, extreme heat will be defined as daytime high temperatures in excess of 90 degrees Fahrenheit.

Extreme heat most often affects individual health, especially of the elderly, children, homeless populations, and people with underlying health issues, but may also affect worker productivity, infrastructure such as roads and the electric grid, and cause excess energy consumption. Such impacts are further assessed in **Chapter 4**.

¹ (National Weather Service)

² (Environmental Protection Agency, 2025)

Wet Bulb Globe Temperature Risk Chart

WBGT	Flag Color	Level of Risk	Comments
<18°C (<65°F)	Green	Low	Risk low but still exists on the basis of risk factors
18°-23°C (65°-73°F)	Yellow	Moderate	Risk level increases as event progresses through the day
23°-28°C (73°-82°F)	Red	High	Everyone should be aware of injury potential; individuals at risk should not compete
>28°C (>82°F)	Black	Extreme or hazardous	Consider rescheduling or delaying the event until safer conditions prevail; if the event must take place, be on high alert. Take steps to reduce risk factors (e.g., more and longer rest breaks, reduced practice time, reduced exercise intensity, access to shade, minimal clothing and equipment, cold tubs at practice site, etc.).

The WBGT can be measured with a WBGT meter. The calculation for the determination of WBGT is: $WBGT = .7$ (Wet Bulb temperature) + $.2$ (Black Globe Temperature) + $.1$ (Dry Bulb Temperature).

This table was originally printed in Roberts WO. Medical management and administration manual for long distance road racing. In: Brown CH, Gudjonsson B, eds. IAAF Medical Manual for Athletics and Road Racing Competitions: a Practical Guide. Monaco: International Association of Athletics Federations;1998:39-75.

Figure 15: WBGT and Safety

Similar to extreme heat, there is no unified definition of extreme cold. The way heat or cold is felt likely depends on a variety of factors, including acclimatization of the individual. Factors such as wind speed and humidity can affect how cold is felt in the body the same way that they can exacerbate high temperatures. Extreme cold can have additional impacts on infrastructure beyond those experienced with extreme heat, including most commonly frozen pipes. Frozen pipes can cause a lack of access to clean, potable water, as seen in Richmond in January of 2025, and extensive property damage if not quickly identified and addressed. More information on impacts of extreme cold is available in **Chapter 4**.

For the purposes of this plan, extreme cold will be defined as daytime high temperatures of 32 degrees or less.

Collectively, extreme temperature will be defined as days when high temperatures are greater than 90 degrees or less than 32 degrees Fahrenheit. As this is the first time this hazard has been assessed in an RVARC plan, all historic instances for which there is existing data are included in this section.

Historic Event Descriptions

Historical temperature data is available from the National Oceanic and Atmospheric Administration (NOAA) going back to 1948. Since that time, the Roanoke region has experienced 1,855 days of temperatures above 90 degrees Fahrenheit and 510 days of highs at or below 32 degrees Fahrenheit. Extreme heat days average around 24 days per year over this time period. In the last ten years, extreme heat days have averaged 32 days per year. In contrast, the annual average number of extreme cold days has been only 7 days per year, with the number dropping to 5 days a year in the past ten years.

The Commonwealth has declared a state of emergency in the past due to winter weather, but no declarations in the past five years dealt solely with extreme cold. Winter weather is further analyzed later in this chapter.

Average daily lows can better reflect extreme heat in some cases, especially in urban areas. The City of Roanoke undertook a heat island mapping study which provided more insight into the effects of heat on City residents. More details of this mapping can be found on the [Urban Heat Island Effect](#) page of the City's website. Further discussion of the City's work in this area will be included in [Chapter 4: Risk Assessment](#).

DRAFT

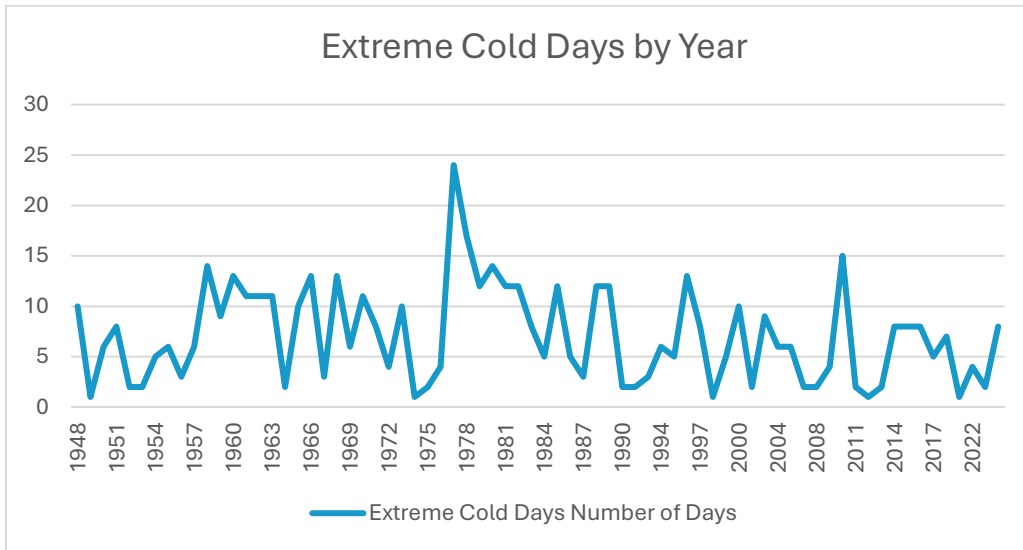


Figure 16: Extreme Cold Days by Year, Roanoke, VA

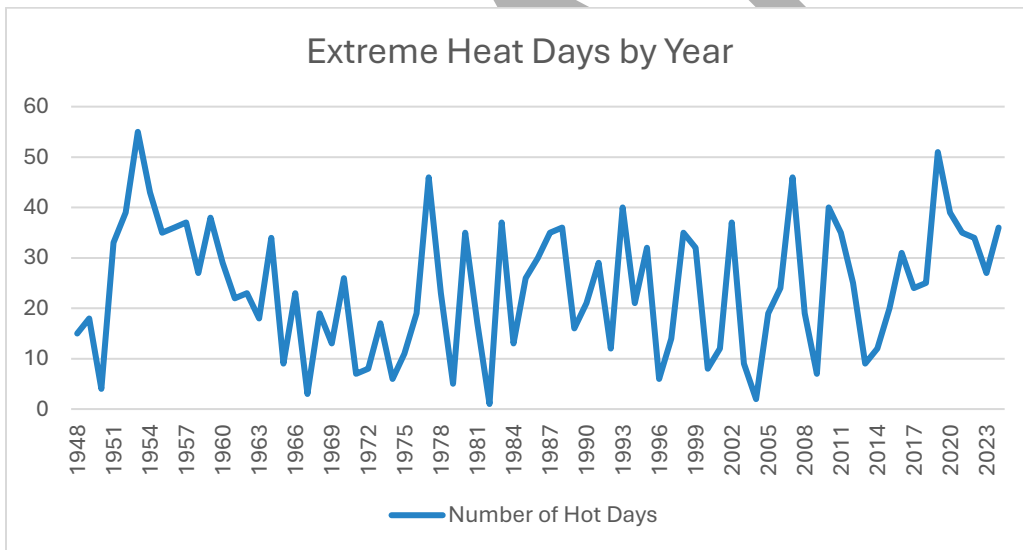


Figure 17: Extreme Heat Days by Year, Roanoke, VA

3.4 Flooding

Definition of Hazard

Widespread flooding or flash flooding impacts a large portion of the region. Watersheds in the Roanoke Valley-Alleghany region are typical of the Blue Ridge region in which smaller streams collect water which then flows through steep terrain, picking up velocity, and into the valleys and flatlands along major rivers where development has occurred. The flood plains throughout these mountainous areas are narrow, averaging less than 250 feet in most areas. These are also the only flat areas where development could take place in this mountainous region. Most flood-producing storms generally occur in the winter and spring. However, flooding due to intense local thunderstorms or tropical disturbances can occur in any season.

Flood hazard areas, along with repetitive loss clusters, dams, flood prone roads, rain gauges and other relevant spatial information for each jurisdiction participating in the plan are mapped in [Appendix D: Flood Hazard Areas](#).

Historic Event Descriptions

Alleghany County has experienced floods since its original settlement. Large floods occurred in 1877, 1913, 1936, 1969, 1972, 1973 and 1985. Hurricane Jeanne caused severe storms and flooding in October 2004. Flood damage in the area is typically concentrated in and near Covington and Clifton Forge. Because of the rural nature of the county, damages from flooding are widespread. Damage occurs to roads, bridges, and public facilities such as schools.

The Jackson River flows through the City of Covington, towns of Clifton Forge and Iron Gate and the communities of Low Moor and Selma. Gathright Dam, constructed in 1974, partially controls flooding along the Jackson River. Despite this, floods still occur. Covington experienced large floods on November 1877, March 1913, March 1936, March 1967, August 1969 (Hurricane Camille), 1972 (Tropical Storm Agnes), March and December 1973, and November 1985. Tropical Storm Agnes was the most severe of the events with as much as one-third of the city underwater. In all, one church, three public buildings, two industrial plants, 8 commercial buildings, and 490 private residences were damaged. In November 1985, a 100-year frequency rainstorm caused a reported \$17 million in damages in the City of Covington.

The US Army Corps of Engineers, 1986 report titled Flood Control Study, Jackson River, Lower Jackson Street Residential Area, Covington, provides information about the major flood that occurred in November 1985. An approximate 90-year flood event resulted in residential, commercial, and municipal damage in the lower Jackson Street / Rayon Terrace neighborhood. Residential losses included yard, basement, and first-floor damage in sixty-four (64) homes and four (4) businesses. Municipal damage included debris in the city park, a sewage pump station and damage to a storm sewer. Total residential, commercial and municipal damage were estimated at \$544,000. Structural and non-structural alternatives for this section of the city were explored in a cost-benefit analysis and found to be infeasible.

Floods used in the 1978 Federal Insurance Administration study to describe the impact on the town of Clifton Forge include the Flood of 1950 and Flood of 1969 - both of which occurred prior to construction of Gathright Dam. The 1950 flood included the flooding of basements, a lumberyard, and the armory. The town's water supply was cut off when two water mains were washed away.

Smith Creek flows north to south through the residential and commercial center of the Town of Clifton Forge. In Clifton Forge, residential, public, and commercial development are concentrated on both sides of Smith Creek. A number of large commercial buildings in the downtown area have been constructed directly over Smith Creek. Floods have inundated portions of this land in the past, and a substantially greater area is within reach of larger floods in the future. The 1969 Smith Creek flooding caused the evacuation of 40 families and caused over \$200,000 in damage to town owned property.

Numerous flood events have been recorded in the Upper James River Basin in the counties of Alleghany, Botetourt and Craig. The following water bodies in the basin have flooded: Dunlap Creek, Potts Creek, Cowpasture River, Johns Creek, Craig Creek, and Catawba Creek. Records show a history of major and frequent flooding. One of the worst floods to occur in Tinker Creek in Botetourt County was in 1940. Another large flood occurred in 1961 along Buffalo Creek in what is considered to be one of the worst storms of record. The unincorporated communities of Eagle Rock, Glen Wilton, and Gala located in Botetourt County along the James River have all experienced flooding. One of the worst floods for the James River occurred as a result of Tropical Storm Agnes in 1972. Glen Wilton was isolated in 1972 due to floodwaters covering the only road access to the community. The Botetourt Communities of Strom, Lithia, Cloverdale, and Coyner have also been victims of floodwaters. A 1940 event caused severe damage in the Tinker Creek basin. Buffalo Creek was impacted by a flood in 1961.

Historic floods in the community of Eagle Rock occurred in November 1885, November 1877, March 1913, June 1972, April 1978, March 1936, and August 1969. The November 1885 and April 1978 floods were the only two significant flood events to affect the Eagle Rock area since the completion of Gathright Dam. The community of Eagle Rock was severely flooded during the November 1885 storm causing substantial damage to the commercial district and to many residences. The 1885 storm was the storm of record with an exceedance frequency of 460 years. Seventeen commercial properties and about 16 residences were damaged during the November 1885 flood.

The Town of Troutville has been damaged by flooding from Buffalo Creek several times in the past. The flood in August 1961 was one of the worst floods in this basin, when “after two hours of intense downpour, Buffalo Creek overflowed its banks. Several homes and basements were flooded and travel on Highway 11 was hazardous due to excessive water. Also, there was about 2 feet of water around Rader Funeral Chapel in the major commercial area of the town”.³

Like other communities, the Town of Fincastle experienced extensive flooding as a result of tropical storm Agnes in 1972. Town Branch overflowed its banks and, due largely to insufficient bridge capacity at Highway 606, flooded the area between U.S. Highway 220 and Factory Street. Neither discharges nor frequencies are currently available.

The James River in Botetourt County has experienced large floods in 1877, 1913, 1936, and 1969. The remains of hurricane Camille in 1969 caused flooding that destroyed homes, roads, railroads, and bridges along the James River.

River stages and discharges on the James River at Buchanan have been recorded since 1895 by the USGS. Since 1877, the bank at full stage of 15 feet has been exceeded at least 60 times. The greatest flood known to have occurred in Buchanan was in November 1877 and measured

³ (Roanoke Times, 1961).

34.9 feet at the USGS gage. Other large floods occurred in April 1886, March 1889, March 1902, March 1913, January 1935, March 1936, March 1963, and August 1969. Tropical Storm Agnes in 1972 was the second highest storm of record. Few flood related problems have occurred on Purgatory Creek in the Town of Buchanan because of lack of development in its watershed.

The Town of Buchanan has a primary sewage treatment plant on the James River. The plant is subject to flooding and during the November 1985 flood was out of operation for 6 months. The historic flood of record in Buchanan occurred in November 1985 (after completion of Gathright Dam). The Town of Buchanan was devastated during the November 1985 storm which produced the Flood of Record with an exceedance of 600 years. The river caused water damage and structural damage to numerous buildings. Some buildings were completely washed away. The railroad station was washed off its foundation and the historic footbridge was washed downstream. People who expected their basements to be flooded had water up to their ceilings.

The history of flooding in the Roanoke Valley has been well documented since records were kept. The flood of record was the November 1985 event. The most severe flooding on the Roanoke River is usually the result of heavy rains associated with tropical storms, while tributary stream flooding is usually the result of local thunderstorms or frontal systems. Flooding along tributaries is compounded when the streams in lower elevations back-up into feeder streams.

Major floods in the area have occurred in 1940 and 1972 with discharges of 24,400 and 28,800 cfs, respectively, as measured at the USGS gage on the Roanoke River at Niagara Dam. On Tinker Creek at Dale Avenue, the August 1940 storm produced a discharge of 9,000 cfs. The flood damage from the August 1940 event was extensive and resulted in major damage to buildings, roads, bridges, and agricultural crops. The 1972 flood on the Roanoke River, which was the result of Tropical Storm Agnes, was estimated as a 50-year flood. The Roanoke River crested at 19.6 feet as measured at Walnut Avenue. Approximately 400 homes were damaged by flooding from Hurricane Agnes in the Roanoke-Salem area. On April 22, 1992, the river once again exceeded its banks and spread floodwaters in the Valley when it crested at 18.1 for the second time during the century.

The flood of record occurred in November of 1985 when rains from Hurricane Juan caused the Roanoke River to rise and crest at a level of 23.4 feet from the bottom of the River, as measured from Walnut Avenue. A total of 11 inches of rain fell between Thursday October 31 and the following Monday. The last six inches fell during the last 24 hours of that five-day period. The result of that single weather event created floodwaters in downtown Roanoke that rose over five feet inside some businesses. Ten lives were lost and damage to property cost \$520,000,000.⁴ This was estimated as a 130-year flood event. The 1985 spurred major work along the corridor, sparking the creation of the greenway system.

Since 2018, 58 flood events have occurred in the region. It should be noted that quantified damages are largely self-reported and may not reflect the full damages that occurred from a given flood event.

⁴ The Roanoke Times, November 1985.

Table 13: Flood Events per the NCEI Database, 2019-2024

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
BOTETOURT CO.	2/23/2019	Heavy Rain / Snow Melt	\$ -	The James River at Buchanan (BNNV2) reached flood stage of 17 feet on the 24th, cresting at 17.92 feet shortly thereafter. Several roads were closed including Thrasher Road and River Road due to flooding. The peak discharge of 35300 cfs at the gage was very close to a 2.33-year annual recurrence interval (0.43 annual chance of exceedance) according to USGS data. This is also close the bankfull stage.
BOTETOURT CO.	4/13/2020	Heavy Rain	\$ 33,000.00	Tinker Mill Road was closed due to high water and several other roads in the Buchanan area. Poor Farm Road near Fincastle was also reported to be underwater. There was some damage to roads in the county per VDOT.
CRAIG CO.	4/13/2020	Heavy Rain	\$ 12,000.00	Route 614 was flooded by Craig Creek with over six inches of water reported across the bridge. The IFLOWS stream gage at this location was out of service at the time, but the upstream IFLOWS gage on Craig Creek near Abbott (ABBV2) crested at 11.6 feet. This was over the flood stage of 10 feet and the 2nd highest (highest is 11.9 feet in Oct. 2018 with remains from Hurricane Michael) in a fairly short period of record (back to 2010). A water rescue was also preformed in the Abbott area, where a car drove into flood waters.
ROANOKE CITY	4/13/2020	Heavy Rain	\$ -	The Roanoke River at Roanoke crested at 11.74 feet (10,500 cfs) on the afternoon of the 13th, above the Minor flood stage of 10 feet. Several low water bridges were flooded along with the Roanoke Greenway.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	4/13/2020	Heavy Rain	\$ 25,000.00	There were several reports of flash flooding around Roanoke City including a car that was submerged in flood waters covering the intersection of Walnut Avenue and 4th Street. The intersection was closed. Social media photos showed flooding on Franklin Road at Wonju Street. A mudslide at a car dealership caused two cars to slide into the resulting sinkhole with some damage to the vehicles.
ROANOKE CO.	4/13/2020	Heavy Rain	\$ -	The Roanoke River at Glenvar (GNVV2) crested at 13.14 feet (11700 cfs) in the early afternoon of the 13th. Flood stage is 9 feet. Several roads were closed near the river including Southwest River Road. Bohon Hollow Road bridge (Route 734) about 1 mile upstream from gage was overtopped.
ROANOKE CO.	4/13/2020	Heavy Rain	\$ 5,000.00	Numerous roads were flooded and some damage reported in Roanoke County.
ROANOKE CITY	5/20/2020	Heavy Rain	\$ -	Wise Avenue was closed due to overflow from Tinker Creek. This is a low-water bridge that is inundated below flood stage on the creek. The gage height on the USGS Tinker Creek above Glade Creek gage was around 7 feet at the time of this report. The stream crested at 14.77 feet on the afternoon of the 21st.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	5/20/2020	Heavy Rain	\$ -	Tinker Creek was reported to be flooding portions of 13th Street from Eastgate Avenue to Mason Mill Road. The gage height on the USGS Tinker Creek Upper near Columbia gage was around 9 feet at the time of this report. The stream crested twice during the event, at 12.58 feet late on the 20th and 13.49 on the afternoon of the 21st. Per USGS data, the peak discharge of 3920 cfs was slightly below a 5-year flood event (0.20 annual chance of occurrence) on upper Tinker Creek.
ROANOKE CITY	5/20/2020	Heavy Rain	\$ -	A spotter reported water several inches deep on Bennington Street from the Roanoke River around 850 PM EST on May 20th. The stage at the time of the report was around 13 feet on the Roanoke River gage at Walnut Street (RONV2). Several hour later the footbridge to the Carilion Hopsital was overrun and inaccessible. Several roads around the hospital were under varying amounts of water, up to a depth of a few feet. The reading on the Roanoke River gage was around 15.7 feet at the time of this report. The river crested at 15.89 feet at 310 PM EST on the 21st. Moderate flood stage is currently 12 feet and Major flood stage is 16 feet. This was the 8th highest stage on record at this gage, with records back to 1899. According to USGS statistics it was slightly under a 10-year event (0.1 annual chance of occurrence). Social media images also showed floodwaters from the Roanoke River covering several feet of the parking lot of the Ramada Inn and water entering the hotel, although this may have been backup along Ore Branch.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
BOTETOURT CO.	5/21/2020	Heavy Rain	\$ 15,000.00	The intersection of Craig Creek Road and Roaring Run Road was closed due to high water. The gage on Craig Creek at Parr (CRGV2) was around 13.3 feet at the time of the report. Minor flood stage is 12 feet. The stream crested at a stage of 16.20 feet (16200 cfs), the highest level since September 2004 (19.87 feet) when the remains of Hurricane Jeanne plowed through the area. It was the 7th highest on record at the gage since 1925 and was slightly below a 10-year flood event (0.1 annual chance of occurrence). Moderate flood stage is 15 feet and several roads were flooded.
BOTETOURT CO.	5/21/2020	Heavy Rain	\$ 10,000.00	Tinker Mill Road was flooded and Tinker Creek reported out of its banks.
BOTETOURT CO.	5/21/2020	Heavy Rain	\$ 13,000.00	Catawba Creek Road was reported to be flooded with water of unknown depth. The USGS gage on Catawba Creek near Catawba (CTWV2) crested at 7.87 feet (3660 cfs) early on the 21st. This was the 8th highest stage on record at this gage with data back to 1954. Only Hurricane Michael in October 2018 has had a higher stage (7.98 feet) in the past 15 years, dating back to September 2004. According to USGS data this was close to a 5-year recurrence interval flood (0.2 annual chance of occurrence).
SALEM CITY	5/20/2020	Heavy Rain	\$ -	The Mill Lane low water bridge in Salem was entirely underwater and portions of W. Riverside Drive was flooded and closed along with several other roads in Salem. The nearby Salem Pump Station IFLOWS gage (SPSV2) crested at around 9.1 feet. Minor flood stage is 7 feet.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CO.	5/20/2020	Heavy Rain	\$ -	The Roanoke River at Glenvar (GNVV2) crested at 14.14 feet (13400 cfs) in the early afternoon of the 21st. Flood stage is 9 feet. It was the 9th highest stage on record but data only extends back to 1992 at this gage. Several roads were closed near the river including Southwest River Road. Bohon Hollow Road bridge (Route 734) about 1 mile upstream from gage was overtopped. According to USGS statistics it was near a 5-year flood event (0.2 annual chance of occurrence).
CRAIG CO.	5/20/2020	Heavy Rain	\$ 50,000.00	The Craig Creek at Abbott (ABBV2) IFLOWS gage crested at 10.6 feet around midday on May 21st. This was the 3rd highest crest in the fairly short (since around 2010) and erratic history at this gage site. Some roads were flooded and partially damaged Craig County according to VDOT information.
ROANOKE CITY	5/21/2020	Heavy Rain	\$ 5,000.00	Media reports showed water overtopping a portion of Spring Valley Dam in Roanoke leading to the evacuation of 13 homes due to the potential risk of a dam failure.
ROANOKE CO.	6/17/2020	Heavy Rain	\$ -	Walnut Avenue near Glade Creek was closed due to water flowing over it. Flooding also occurred along Tinker Creek where the USGS gage near the confluence of Glade Creek crested at 16.96 feet in the afternoon of the 17th. No flood stage has been set at this relatively new gaging station, but Tinker Creek overflows the low-water bridge on Wise Avenue at a stage of around 7 feet.
BOTETOURT CO.	6/17/2020	Heavy Rain	\$ -	A social media post showed the road completely flooded in front of the Cloverdale Post Office.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
BOTETOURT CO.	6/17/2020	Heavy Rain	\$ -	Flood waters were reported to have reached some mobile homes in the Wildwood Mobile Home Park. Some evacuations were conducted in the area.
ROANOKE CO.	6/17/2020	Heavy Rain	\$ -	Bonsack Road and Glade Creek Road were closed due to flooding, most likely from nearby Glade Creek.
ROANOKE CO.	6/17/2020	Heavy Rain	\$ -	A portion of 13th Street in Roanoke was closed due to urban flooding with water flowing over the road.
COVINGTON CITY	6/17/2020	Heavy Rain	\$ -	Numerous roads were flooded and closed in Covington including South Craig Avenue, South Royal Avenue and and South Highland Avenue.
ALLEGHANY CO.	6/17/2020	Heavy Rain	\$ -	Up to a foot of water was observed flowing over Valley Ridge Road at the corner of Woodland Road and Magnolia Street.
ALLEGHANY CO.	6/19/2020	Heavy Rain	\$ -	Water over six inches in depth was seen flowing over portions of Highway 159 after 1.5 inches of rain fell in a short duration. The water was not from Dunlap Creek itself which had returned to below flood stage from the previous day.
ALLEGHANY CO.	6/17/2020	Heavy Rain	\$ -	The USGS gage on Dunlap Creek (DLPV2) rose briefly above minor flood stage of 9 feet early on the 18th, cresting at 9.16 feet. Several roads very close to the creek may have been flooded.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
CRAIG CO.	6/17/2020	Heavy Rain	\$ -	The USGS gage on Johns Creek at New Castle (JCRV2) crested at 11.03 feet on the afternoon of June 17th after heavy rains the previous two days. This was the highest stage reached at this site since September 28, 2004 when it reached 12.87 feet and the 6th highest since records began in 1927. The 3-day rainfall at the nearby NWS COOP site at New Castle was 4.12 inches.
BOTETOURT CO.	6/17/2020	Heavy Rain	\$ -	The gage on Craig Creek at Parr (CRGV2) crested at a stage of 14.24 feet (12500 cfs) very early on June 18th. It was the 8th highest on record at this gaging station since 1925 and was approximately a 5-year flood event (0.2 annual chance of occurrence) according to USGS studies. A road or two was likely affected.
ROANOKE CITY	6/17/2020	Heavy Rain	\$ -	The Roanoke River at Roanoke (RONV2) crested at 11.91 feet, above the Minor flood stage of 10 feet early in the morning of June 18th. Several roads and low water bridges were flooded.
SALEM CITY	6/17/2020	Heavy Rain	\$ -	The IFLOWS stream gage at Salem Pump Station (SPSV2) crested above Minor flood stage of 7 feet early on the 18th, cresting at 7.60 feet and closing several roads in Salem, including the Mill Lane Bridge.
ROANOKE CITY	11/12/2020	Heavy Rain	\$ -	The Roanoke River at Roanoke, VA (RONV2) was above flood stage (10 feet) on November 12th, and crested at the moderate flood stage of 14.07 feet (14,000 cfs) at 12:35 PM EST on November 12th, the 13th highest crest on record for this gauge. This was between a 5- and 10-year Average Return Interval per the USGS StreamStats website.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	5/4/2021	Heavy Rain	\$ -	About 1.5 inches of rain from a thunderstorm fell during a 45 minute period. Runoff from the rainfall caused water to pond 12-18 inches deep at the intersection of Campbell Avenue and 10th Street SW, an intersection known to flood during heavy rainfall. The intersection closed by police, but was reopened after the water receded.
ROANOKE CITY	5/4/2021	Heavy Rain	\$ 2,500.00	Rain amounts between 1.5 and 1.75 inches fell from a thunderstorm within a 45 minute period across portions of the downtown area in the City of Roanoke. Runoff from this rainfall resulted in about three feet of standing water near the intersection of Salem Avenue and 1 1/2 Street. At least one car became stranded in the flood waters, though it is unknown if the occupant(s) required rescue. The road was reopened to traffic after the flood waters receded.
ROANOKE CITY	8/19/2021	Heavy Rain	\$ 25,000.00	Portions of Salem Avenue and Campbell Avenue were flooded with up to 4 feet of standing water as heavy rain overwhelmed the storm sewer system. Five water rescues were performed as cars drove into the flood waters, causing the vehicles to stall. No injuries were reported. Broadcast media reported that multiple cars parked along Salem Avenue experienced water intrusion into the vehicle passenger compartments and exhaust systems, with some of the vehicle needed to be towed.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ 20,000.00	Runoff from heavy rain caused Renick Run to flood out of its banks and flow across Indian Rock Road. The bridge crossing Renick Run was damaged and impassible by the flooding, and required repair before being eventually reopened.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ -	Runoff from heavy rain caused Purgatory Creek to flood out of its banks around one foot deep across both Greyledge and Frontage Roads. The roads reopened after flooding subsided. No damage was reported.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ 15,000.00	Runoff from heavy rain caused Jennings Creek to flood out of its banks and across Jennings Creek Road, both of which are located in the bottom of a valley with steep sides. Occupants from a vehicle caught in the flooding were able to abandon the vehicle to safety, however the vehicle was reportedly washed down the creek.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ -	Runoff from heavy rain caused Laurel Run to flood out of its banks across Pico Road, causing the road to be impassible until the flooding receded. The road was reopened afterward.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ -	Heavy rain caused ponding of water of up to a foot deep along portions of Main Street in the community of Buchanan, making the road impassible. Main Street was passable again once the flooding receded. No damage was reported.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ -	Runoff from heavy rain caused Dry Run to flow out of its banks, flooding the railway tunnel on 19th Street and across Highway 11 a few hundred feet further downstream. No damage was reported and the roads were passable again after the flooding receded.
BOTETOURT CO.	9/22/2021	Heavy Rain	\$ -	Runoff from heavy rain caused a tributary of Ellis Run to flow out of its banks, flooding across portions of Mountain Valley Road. No damage was reported and the road was passable again after the flooding receded.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CO.	8/25/2022	Heavy Rain	\$ -	The stream gauge at Tinker Creek Upper Above Columbia Street (TKRV2) recorded Tinker Creek rising more than 8 feet within 2 hours to crest at 10.67 feet, before stream levels quickly receded. This was caused by 2 to more than 4 inches of rainfall from a thunderstorm near the Botetourt County border.
ROANOKE CO.	8/25/2022	Heavy Rain	\$ -	The stream gauge at Tinker Creek Above Glade Creek recorded Tinker Creek cresting at 7.95 feet. This was caused by 2 to more than 4 inches of rainfall from a thunderstorm near the Botetourt County border.
BOTETOURT CO.	8/25/2022	Heavy Rain	\$ 15,000.00	Runoff from heavy rainfall overwhelmed an underground storm water pipe, which created a sinkhole in a portion of Highland drive near Sanderson drive.
ALLEGHANY CO.	2/17/2023	Heavy Rain / Burn Area	\$ -	The Cowpasture River near Clifton Forge, VA crested at 10.40 feet (Flood stage is 10 feet). This was a little over a 2-year event (50% AEP) per USGS Streamstats. The flooding was caused by between 1.5 and 2.75 inches of rain over a 24-25 hour period. No snow melt or frozen ground was involved, but the ground was moist from widespread rainfall on the 12th and 13th a few days prior. Minor lowland flooding was the only impact observed.
ROANOKE CITY	7/23/2023	Heavy Rain	\$ -	The intersection of Jamison Avenue and 9th Street is flooded and impassible by several inches of flowing water caused by 3 to 4 inches of rainfall, with rates as high as 6 inches per hour. No damage was reported at the intersection, and the road was reopened to traffic after the flooding receded. MRMS FLASH CREST Unit Streamflow was estimated to be between 600 and 800 cfs per mile ² , while FLASH 1-hour ARIs indicated that rainfall amounts were as high as a 100-year event in spots around the City of Roanoke during this event.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	7/23/2023	Heavy Rain	\$ -	Shafer's Crossing between 24th Street and Boulevard Street is flooded and impassible due to 2 to 3 inches of rainfall within a 90-minute period, with rainfall rates ranging from 4 to 5 inches per hour per MRMS estimates. CREST Unit Streamflow was estimated to be between 400 and 600 cfs per mile ² for this event. No damage was reported to the road, and it was reopened to traffic after the flooding receded.
ROANOKE CITY	7/23/2023	Heavy Rain	\$ -	Glade Creek was observed out of its banks and flowing across Walnut Avenue at least 6 inches deep due to between 3 and locally 5 inches of rainfall within a 2-hour period falling in the basin. Rainfall rates were observed to be as high as 5 inches per hour at times. No damage was reported to the road, and it was reopened to traffic after the flooding receded.
ROANOKE CITY	6/17/2024	Heavy Rain	\$ -	Poor drainage due to around 1.5 inches of rainfall within an hour caused standing water near within the 4800 block of Valley View Boulevard, making the road impassible for a brief period of time. The road was reopened after the flooding receded, with no damage reported.
ROANOKE CITY	6/17/2024	Heavy Rain	\$ -	Standing water due to between 1.25 and 1.5 inches of rainfall within an hour was reported at the intersection of Peters Creek Road NW and Melrose Avenue, making the intersection impassible for a brief period of time. Rainfall rates briefly reached up to 3 inches per hour in the area. The intersection was reopened after the flooding receded, with no damage reported.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	6/17/2024	Heavy Rain	\$ -	Poor drainage due to around 1.5 inches of rainfall within an hour caused standing water near the 900 block of Van Buren Street NW, making the street impassible for a brief period of time. Rainfall rates briefly were estimated to be around 3 inches per hour.
ROANOKE CITY	8/8/2024	Heavy Rain / Tropical System	\$ -	Runoff from heavy rain caused the railroad underpass along Wiley Drive to become flooded with about two feet of standing water and impassible until the water drained away. No damage was reported.
ROANOKE CITY	8/8/2024	Heavy Rain / Tropical System	\$ -	A poor drainage issue during heavy rain caused Campbell Avenue to become flooded by several inches of standing water. The road was open to traffic after the drain blockage was cleared.
ROANOKE CITY	8/8/2024	Heavy Rain / Tropical System	\$ -	The low water crossing on Wise Street at Tinker Creek became partially submerged as Tinker Creek rose to a crest of 5.85 feet, which is well within its banks. No damage to the road was reported as it is designed to begin becoming flooded at this stage.
ROANOKE CITY	8/8/2024	Heavy Rain / Tropical System	\$ -	Portions of Boulevard Street and 24th Street were flooded between three and four feet deep in spots by runoff from heavy rain. No damage was reported to the roads, which were reopened to traffic after the flooding receded.
ROANOKE CITY	8/8/2024	Heavy Rain / Tropical System	\$ -	Runoff from heavy rainfall was observed pooling several inches deep across the intersection of Walnut Avenue and 8th Street. No damage to the roadways was reported.

Jurisdiction	Beginning Date	Cause of Flood	Reported Damage	Event Description
ROANOKE CITY	9/19/2024	Heavy Rain	\$ 15,000.00	The Roanoke City Emergency Manager reported that flooding was observed at the intersection of 10th Street and Campbell Street Southwest near downtown Roanoke, an area that frequently floods during periods of heavy rain. Multiple vehicles were stranded in standing water that rose to nearly 3 feet deep as a result of poor drainage. Six individuals had to be assisted from their vehicles in the flood waters by emergency personnel. The damage estimate is the estimated damage to the vehicles due to water intrusion.
SALEM CITY	9/25/2024	Heavy Rain	\$ -	Heavy rainfall, combined with poor drainage, caused standing water around 2.5 feet deep to pool along Kessler Mill Road. No damage was reported to the road, which was open to traffic after the water receded.

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Additional flood damage has been recorded from Hurricane Helene which was not included in the NCEI data. As this was a major federal disaster, impacts from this event will be quantified further in section 3.5: Hurricane and Tropical Storm. However, it is worth noting that flooding is so frequent in the region that the NCEI data may not be comprehensive in terms of the impacts of this disaster.

CRS Communities: Special Considerations

Three communities within the region currently have a Community Flood Rating System (CRS) designation. Roanoke County entered the CRS program in October 1991 and has a rating of 8 (10% discount). The Town of Vinton entered the CRS program in October 1, 2016 and has a class 8 rating. The City of Roanoke entered the CRS program in 1996 and maintains a class 6 rating (20% discount on flood insurance premiums for parcel owners within City limits).

Several additional localities have listed this as a desired goal in their project listings, though capacity remains an inhibiting factor. Accordingly, this section specifically speaks to additive requirements for CRS planning in the region's jurisdictions.

Review of Existing Studies and Plans

The following existing studies and plans speak specifically to flooding. They are summarized and recommendations are noted where appropriate. A general overview of existing plans and studies consulted to develop project recommendations and guide planning implementation work is contained in **Chapter 5: Capabilities Assessment**. For the purposes of this section, only local government entities are listed.

Alleghany County

Flood Insurance Study, Alleghany County, Virginia and Incorporated Areas (2010): This study also includes the incorporated areas of the City of Covington, and Towns of Clifton Forge and Iron Gate.

Emergency Operations Plan (2021): This document details emergency operations procedures, including operations in a flood event.

City of Covington

City of Covington Drainage Study (2025): This document, funded through the Community Flood Preparedness Fund, includes a condition assessment of the storm sewer system and a hydraulic and hydrologic model which will feed into a forthcoming Resilience Plan.

Botetourt County

Flood Insurance Study, Botetourt County, Virginia and Incorporated Areas (2010): This study also includes the incorporated areas of Botetourt County which include Buchanan, Fincastle, and Troutville.

Botetourt County Emergency Operations Plan (2017): This document details emergency operations procedures, including operations in a flood event.

Craig County

Flood Insurance Study, Craig County, Virginia and Incorporated Areas (2009): This study also includes the incorporated area of the Town of New Castle.

Roanoke County

Flood Insurance Study, Roanoke County, Virginia and Incorporated Areas (DATE): This study also includes the incorporated areas of the Town of Vinton, City of Roanoke, City of Salem.

City of Roanoke

City of Roanoke Flood Resilience Plan (2023): This plan deals specifically with flooding and flooding impacts within the City. Several of these recommendations will be incorporated into **Chapter 6** and **Chapter 7**.

NFIP Community Rating System Repetitive Loss Area Analysis (2021): This is an update of the repetitive loss analysis for the City.

Emergency Operations Basic Plan (2020): This plan details emergency operations procedures within the City.

Peters Creek Watershed Master Plan (2019): This plan is part of a series of master plans conducted across the City each watershed. While the primary emphasis is on water quality, there are flooding applications.

Trout Run Watershed Master Plan (2017): This master plan focuses on watershed management of the Lick Run watershed through three implementation goals, which parallel those for the Trout Run Watershed Master Plan.

Lick Run Watershed Master Plan (2017): This master plan focuses on watershed management of the Lick Run watershed through three implementation goals, which parallel those for the Trout Run Watershed Master Plan.

Tinker Creek and Tributaries Watershed Master Plan (2016): This master plan focuses on watershed management of the Lick Run watershed through three implementation goals, which parallel those for the Trout Run Watershed Master Plan.

Flooding Incident Annex (2007): This Annex to the Emergency Operations Basic Plan details specific actions to take in flood situations.

Dam Safety Support Annex (2007): This Annex to the Emergency Operations Basic Plan details specific actions to take in situations where key impoundment infrastructures become a safety risk.

City of Salem

Resilience Plan (2023): This plan was prepared through funding from the Virginia Flood Preparedness Fund and deals directly with flooding impacts in the City of Salem. Several of these recommendations will be incorporated into **Chapter 6** and **Chapter 7**.

This section of the plan and other relevant sections were reviewed and discussed with the Floodplain Program Planner at DCR.

High Hazard Potential Dam Inventory and Planning

Flooding due to dam failure is considered as part of overall flood mitigation assessment and planning within this document. Within the region there are twenty-five known high hazard potential dams per DCR.

Figure 17 shows the Hazard Potential Classification for dams produced by FEMA. It is important to note that even impoundment failure that impacts a lifeline (such as a water treatment plant or key infrastructure element) does not per se result in a high hazard potential dam classification. HHPD classification is focused on the probable loss of life in an impoundment failure.

DCR’s Division of Dam Safety and Floodplain Management administers the Virginia Dam Safety Program, under the authority of the Virginia Soil and Water Conservation Board. Virginia’s Dam Safety Regulations⁵ were last updated in 2016. The owner of each regulated high, significant, or low hazard potential dam is required to apply to the board for an Operation and Maintenance Certificate. The application must include an assessment of the dam by a licensed professional, an Emergency Action Plan and the appropriate fee(s), submitted separately. An executed copy of the Emergency Action Plan or Emergency Preparedness Plan must be filed with the appropriate local emergency official and the Virginia Department of Emergency Management.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Figure 18: Dam Classifications, FEMA⁶

The City of Roanoke maintains a Dam Safety Support Annex to their Emergency Operations Plan. The Western Virginia Water Authority also maintains required Emergency Action Plans specific to operation of the dams owned by the Authority, one of which is Spring Hollow Lake Dam listed in Table 2. Inundation maps for Spring Hollow Lake Dam are included in Appendix H.

The VSWCB issues Regular Operation and Maintenance Certificates to a dam owner for a period of six years. If a dam has a deficiency but does not pose imminent danger, the board may issue a Conditional Operation and Maintenance Certificate, during which time the dam owner is to correct the deficiency. After a dam is certified by the board, annual inspections are required either by a professional engineer or the dam owner, and the Annual Inspection Report is submitted to the regional dam safety engineer.

There are no comprehensive databases of historical dam failures or flooding following a dam failure in Virginia. Dam failure can be caused by a variety of scenarios. Thirty-four percent of all dam failures are caused by overtopping, when water spills over the top of a dam. The majority of dam failure incidents are driven by flooding due to excessive precipitation. Proper maintenance of a dam structure is key to mitigating the impacts of flooding. DCR administers the Virginia Dam

⁵ (Commonwealth of Virginia, 2016)

⁶ (Federal Emergency Management Agency, 2004)

Safety, Flood Prevention, and Protection Assistance Fund. Other funding sources also exist for dam failure mitigation.

The Association of State Dam Safety Officials maintains a voluntary database of dam safety incidents, the ASDSO Dam Incident Database. Only one safety incident is recorded in this database in the region, which references overtopping of Spring Valley Lake dam. However, consultation with DCR clarifies the incident. Spring Valley Lake saw their emergency spillway activated, and a Stage 3 emergency was declared in accordance with their Emergency Action Plan in May 2020. There was no overtopping, and the dam was not in immediate danger of failure.

In the 2019 Plan, several Dam Safety Incidents and remediation efforts were documented. These have been updated with more accurate information from DCR.

Rainbow Forest Lake Dam: In May 2011, DCR ordered the Rainbow Forest Recreation Association (RFRA) in Botetourt County to reduce the pool level of Rainbow Forest Lake in order to provide extra storage capacity behind the dam until the spillway could be improved. The RFRA has been working with the state to address concerns about the structure since 1997.

Gathright Dam: In May 2009, the U.S. Army Corps of Engineers (USACE) inspected the Gathright Dam as part of Screening Portfolio Risk Analysis and routine inspections. Later in the year on September 2, the USACE assigned the dam a Safety Action Classification (DSAC) II which is defined as "Urgent (Unsafe or Potentially Unsafe)". The rating is attributed to concerns about possible increased seepage at the toe of the dam, and an undetermined flow rate at the river spring a quarter mile downstream, and potential flow channels through limestone below the spillway during pool events above 1,600 feet. Because of this rating, the USACE has implemented risk reduction measures which include increased monitoring, updating emergency operation plans and reducing the water level in the reservoir. As of early 2010, the USACE has reduced and continues to maintain the reservoir at an elevation of 1,562 ft above sea level compared to the normal level of 1,582 feet. Throughout 2010, the USACE conducted safety exercises with local/state officials, conduct a series of investigations on the dam, update inundation mapping and reevaluate the DSAC status. In November 2010, Lake Moomaw was restored to a level of 1,582 ft. and the DSAC will be reevaluated in the future.

Clifton Forge Dam: Clifton Forge Dam impounds a 12.5 square mile drainage area of Smith Creek with an 11.5-acre normal pool. The dam is classified as a High Hazard Dam by DCR and operates under a conditional 2-year, renewable, Operation and Maintenance Certificate. It has been issued an alteration permit by DCR that will be used during upgrades in 2018-19. A Dam Breach Inundation Zone Analysis was done in 2013 that showed a failure would impact 650 residential units, 1,400 people and downtown commercial, retail, public administration and infrastructure. An Emergency Action Plan was completed in 2014 and a preliminary engineering report for proposed improvements was done in 2016. Major improvements proposed include raising crest of non-overflow sections; raise concrete core wall and surrounding earthfill; seal a leaking concrete joint; remove spillway piers to expand spillway capacity; anchor the principal spillway; replace spillway bridge; and repair the deteriorated concrete face. The estimated cost for this work was approximately \$4.3 million. The town worked with its consulting engineers to develop

a funding package from USDA Rural Development in cooperation with Alleghany County. The proposed schedule anticipates construction to be complete by December 2019.

Johns Creek Watershed Dam #1 (McDaniel's Lake): Craig County Board of Supervisors and Mountain Castles Soil and Water Conservation District own and operate the Johns Creek watershed Dam #1. Four floodwater-retarding structures were built in the Johns Creek Watershed between 1966 and 1967.

The dam has a drainage area of 12,241 acres and a normal pool surface area of 28 acres. It was designed to store runoff of 50-year storm. The dam was originally designed as "Significant" hazard and later reclassified to "High" hazard due to downstream development that was allowed to occur. The dam operates under a conditional Operation and Maintenance Certificate from DCR that expired in September 2018.

A breach inundation study for the dam was done in 2009 which concluded the dam is a High Hazard Potential dam. The study found 68 occupied structures and 16 bridges within the inundation zone below the dam. An additional study by URS Group completed in 2010 found the population at risk to be 150 people.

Mountain Castles SWCD has been working jointly with Virginia's DCR and federal partners to facilitate a design to rehabilitate Johns Creek Dam #1 to increase spillway capacity for future flooding. So far, the rehabilitation team has accomplished a wetland delineation survey, riser condition survey, and a geotechnical investigation survey. A complete design is expected by spring of 2026 that involves extending the embankment through the existing auxiliary spillway, installing a new roller-compacted spillway, and installing a new concrete riser to meet the new requirements.

Niagara Dam: Niagara Dam is one of two federally regulated dams in the region. The dam was recently relicensed by the FERC in 2025. On November 4, 1985, high flows recorded at 52,300 cfs resulted in the breach of the right abutment to the dam. Repairs to the right abutment resulted in the Niagara Hydroelectric Project being taken out of service from November 4, 1985 through March 17, 1986. The average flow of the river at this location is 573 cfs. The same event affected Smith Mountain Lake dam downstream, a key infrastructure asset for the region and also federally regulated. The reservoir elevation increased from its normal operating limit of 795 NGVD to 799.5 NGVD. That elevation is 0.5 ft. below the emergency level of 800.0 NGVD allowed under the license for this structure.

Three additional dams of interest may be high hazard dams but have not yet been classified as such. These dams are listed in DSIS as High-Preliminary, which means that there has been a preliminary study that raised concerns, but an inundation study has not been submitted by the dam owner to properly establish the hazard classification yet.

- Orchard Lake Dam – 023002
- Wilburn Dam – 023010
- Stokes Dam – 023013

This section of the plan was reviewed by the Regional Dam Safety Engineer at DCR.

Table 14: High Hazard Dams

Federal ID	Dam Name	Alternate Dam Name	Dam Type	Owner Name	Location
VA005003	Clifton Forge Dam		Gravity	Town of Clifton Forge	Alleghany
VA005004	Landfill No. 2 Dam	Westvaco #2 Flyash Lagoon	Earth	Westvaco/WestRock	Alleghany
VA005009	West Virginia Pulp Dam B		Earth	Westvaco/WestRock	Alleghany
VA005001	Gathright Dam	Lake Moomaw	Rockfill	USACE - Norfolk District	Alleghany
VA005013	Westrock #1 Embankment Dam		Earth	Westvaco/WestRock	Alleghany/Covington
VA023004	Blue Ridge Estates Dam	Emerald Lake	Earth	Lake Forest Homeowners Association	Botetourt
VA023005	Botetourt Country Club Dam		Earth	Botetourt Country Club	Botetourt
VA023010	Wilburn Dam		Earth	Vaughn E. & Anne P. Wilburn; Vaughn E. and Anne P. Wilburn	Botetourt
VA023013	Stokes Dam		Earth	Sandra J Stokes	Botetourt
VA023002	Orchard Lake Dam		Earth	Dearl & Julie Frazee	Botetourt
VA023003	Rainbow Forest Dam		Earth	Rainbow Forest Recreational Assoc Inc	Botetourt
VA023001	Carvin Cove Dam		Masonry	Western Virginia Water Authority	Botetourt/Roanoke

Federal ID	Dam Name	Alternate Dam Name	Dam Type	Owner Name	Location
VA045001	Johns Creek Dam #2		Earth	Mountain Castles Soil and Water Conservation District	Craig
VA045002	Johns Creek Dam #1	McDaniel's Lake	Earth	Mountain Castles Soil and Water Conservation District	Craig
VA045003	Johns Creek Dam #3		Earth	Mountain Castles Soil and Water Conservation District	Craig
VA045004	Johns Creek Dam #4	Dicks Creek Lake	Earth	Mountain Castles Soil and Water Conservation District	Craig
VA019010	Falling Creek Reservoir Dam		Earth	Western Virginia Water Authority	Roanoke County
VA161001	Niagara		Gravity	Appalachian Power Company	Roanoke County
VA161002	Loch Haven Lake Dam		Gravity	Bane International Company LLC	Roanoke County
VA161004	Clifford D. Craig Memorial Dam	Spring Hollow Reservoir Dam	Concrete	Western Virginia Water Authority	Roanoke County
VA161005	Woods End Dam	Hidden Valley High School Dam	Earth	Roanoke County	Roanoke County
VA161008	Darr Dam	Hudick Dam	Earth	Richard C. & Norma Lee Darr	Roanoke County

Federal ID	Dam Name	Alternate Dam Name	Dam Type	Owner Name	Location
VA161013	Roanoke College Dam		Earth	Roanoke College Trustees C/O Roanoke College	Roanoke County/City of Salem
VA770002	Spring Valley Lake Dam		Earth	Spring Valley Lake LLC; Spring Valley Lake, LLC	City of Roanoke
VA770001	Windsor Lake Dam		Earth	Windsor Lake Corporation	City of Roanoke

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3.5 Hurricane and Tropical Storm

Definition of Hazard

Hurricanes, tropical storms, and tropical depressions occasionally strike the region, causing multiple impacts, most often flooding and wind damage. While damages from these events are referred to in other sections of this document, this section looks at past storm events more holistically.

The National Weather Service offers the following definitions of these storm events:

- *Tropical Depression*: Tropical cyclone with maximum sustained surface winds of 38 mph;
- *Tropical Storm*: Maximum sustained surface winds of 39-74 mph;
- *Hurricane*: Maximum sustained surface winds of 74+ mph.

While this hazard is discussed individually in this chapter, it is important to note that the primary impacts of hurricane and tropical storm in the region are due to wind damage and riverine flooding caused by excess precipitation. In Chapter 4, this hazard is assessed as part of section **4.4 Flooding** and section **4.8 Wind Event**.

Historic Event Descriptions

Virginia has been struck by 48 hurricanes from 1900 to 2018 according to records from the National Hurricane Center. The Roanoke Valley – Alleghany region has not experienced a direct hurricane in over 100 years. The region is impacted by the remnants of the hurricanes as tropical depressions and subtropical storms bringing heavy rains and winds. The following major events have occurred in the region.

August 20, 1969, Hurricane Camille: Camille made landfall as a Category 5 hurricane smashing the Mississippi Coast with 200 mph winds on August 17. Camille was the strongest hurricane to make landfall on the U.S. this century. The hurricane maintained force for 10 hours as it moved 150 miles inland. The storm tracked northward weakening and becoming less defined. It moved toward Virginia on the 19th and was only a tropical depression. Moisture from the warm Gulf Stream waters moved northwest toward the storm and new feeder bands formed. These thunderstorms "trained" (one followed the other), into the Blue Ridge south of Charlottesville. In just 12 hours, up to 31 inches of rain fell with devastating results (153 killed, most in Nelson County). Major flooding followed as the bulge of water moved down the James River into Richmond. Waynesboro on the South River saw eight feet of water in its downtown and Buena Vista had five and one-half feet in its business section. Damage was estimated at 113 million dollars (1969 dollars). The remains of this storm caused flooding that destroyed homes, roads, railroads, and bridges along the James River in Botetourt County.

June 21, 1972, Hurricane Agnes. Agnes originated in the Gulf of Mexico and was downgraded to a tropical storm by the time it reached Virginia, yet still caused 13 deaths in the Commonwealth. The storm impacted the entire region. Tropical Storm Agnes was a severe event and resulted in as much as one-third of the City of Covington under water where one church, three public buildings, two industrial plants, 8 commercial buildings, and 490 private residences were damaged. During the event, Glen Wilton was isolated due to floodwaters covering the only road access to the community. The storm impacted communities along the James and Roanoke Rivers. Tropical Storm Agnes was the second highest storm of record along the James River in

Buchanan. The storm caused a 50-year flood. The Roanoke Valley was hit with the effects of Agnes, causing the Roanoke River to crest at 19.6 feet and approximately 400 homes were damaged by flooding in the Roanoke-Salem area.

Sept. 28, 2004, Hurricane Jeanne. The remnants of Hurricane Jeanne, in the form of a tropical depression, moved through the vicinities of Greenville, SC, Roanoke, VA and Washington, DC and finally to the New Jersey coast on Tuesday, Sept. 28. Maximum sustained wind speeds ranged from 25 mph to 30 mph near the storm's center. The primary impact on the Commonwealth was flooding, although one F1 tornado touched down in Pittsylvania County. The heaviest rainfall occurred from the New River Valley to the Southern Shenandoah Valley. Rainfall in this region ranged from 3 inches to 7 inches, with the highest amounts falling in Patrick, eastern Floyd, eastern Montgomery, Giles, Roanoke, Botetourt and Rockbridge counties.

September 14-16, 2018, Hurricane Florence. Hurricane Florence made landfall along the North Carolina coast on September 14, and after slowly tracking westward through South Carolina, the remnants of Florence did not reach western Virginia until September 16, accelerating again by that time. The track of the remnant circulation through the southern Appalachians resulted in heavy rain and flooding, and at least one landslide, over a large part of the NWS Blacksburg forecast area, with especially heavy rain along portions of the Blue Ridge due to enhanced upslope easterly flow. In addition to the heavy rain and flooding, gusty winds (although below tropical storm force) combined with saturated ground to cause numerous uprooted trees and some scattered power outages. Rainfall amounts across the area varied from less than 1 inch in Eagle Rock, 2.6 inches at the Roanoke Regional Airport to 5.6 inches on Bent Mountain. Winds were from 38 mph at the Roanoke Regional Airport to 13 mph at Springwood in Botetourt County. The Roanoke River crested at 11.14 feet (0.5 feet above flood stage) and the James River in Buchanan crested at 14.7 feet (2.3 feet below flood stage).

October 10-11, 2018, Hurricane Michael. Hurricane Michael made landfall along the Florida panhandle as Category 4 hurricane on October 10, 2018, then tracked northeastward with the northern portion of the storm circulation tracking across portions of Southside Virginia, Thursday afternoon, the 11th. As the storm circulation approached on October 11th a cold front moving in from the west and interacted with the storm and enhanced rainfall especially east of Interstate 81. Widespread rainfall amounts of 4 to 8 inches were reported, along with local amounts over 10 inches, mainly from the mountains of North Carolina up through Southside Virginia. This resulted in significant flash flooding with flash flood emergencies issued for the city of Roanoke, as well as Roanoke County. Rainfall amounts ranged from 1.97 inches at Gathright Dam, 3.3 inches at Daleville, 3.15 at the Roanoke Regional Airport to 7.16 inches in the Cave Spring area of Roanoke County. The Roanoke River at Glenvar crested at 17.1 feet (8.1 feet above flood stage) and in Roanoke at 16.4 feet (6.4 feet above flood stage).

September 27, 2024, Hurricane Helene: Helene made landfall in Florida as a powerful Category 4 hurricane late Thursday, September 26, and moved quickly northward into the southeastern states, and then turned slightly northwestward towards the southern Appalachian Mountains overnight into Friday morning, weakening as it moved over land. Helene's intensity and fast forward motion led to impacts being felt well inland, from the Florida Big Bend area into the Appalachians only 12 hours after landfall, and there was extensive damage in southwest Virginia. Widespread cellular service and power outages, some lasting for several days, occurred as high winds downed thousands of trees across the region. Winds gusted as high as 55 mph to 65 mph in southwest Virginia. There were three confirmed tornadoes associated with the remnants of

Hurricane Helene in the Piedmont region of Virginia. Flooding impacts from Hurricane Helene were extensive across the area and were exacerbated by a predecessor rainfall event that occurred a day before Helene reached the region, which brought six to eight inches of rain to the mountains prior to the arrival of the remnants of Helene. The three-day rainfall totals associated with the remnants of Hurricane Helene were highest in Grayson and Smyth Counties, where observations of 10 to locally 15 inches of rain were recorded. The Piedmont of Virginia received much less rain, between one and two inches, with a couple areas around three inches. Total economic losses for Virginia, which include Virginia's agriculture, forestry, and other industries, are expected to range between \$416 million and \$630 million per an economic analysis released by Virginia Tech researchers. Within the planning region, at least 20,000 people lost power due to downed trees in Alleghany, Botetourt, Craig, and Roanoke Counties. One woman was killed when struck by a flying chicken coop. Others, including a postal worker and a police officer, were injured by downed trees and flying debris. Total losses from agriculture damages in Craig County were estimated at \$85,000. In Troutville, twenty-one acres of sunflowers at Beaver Dam Farm were flattened by strong winds.

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3.6 Geologic Hazards

Definition of Hazard

Karst is defined as a landscape with sinkholes, springs, and streams that sink into subsurface caverns. In karst areas, the fractured limestone rock formations have been dissolved by flowing groundwater to form cavities, pipes, and conduits. Sinkholes, caves, sinking streams, and springs signal the presence of underground drainage systems in karst areas.

Sinkholes are natural depressions on the land surface that are shaped like a bowl or cone. They are common in regions of karst, where mildly acidic groundwater has dissolved rock such as limestone, dolostone, marble, or gypsum. Sinkholes are subsidence or collapse features that form at points of local instability. Their presence indicates that additional sinkholes may develop in the future. The probability for karst hazards cannot be determined as easily as other hazards due to lack of accurate mapping and historical data.

The most notable karst related event in the region was a sinkhole in Botetourt County that occurred on Route 670 in 2005. That hole eventually expanded to 50 feet deep and 75 feet wide. Several smaller sinkholes have damaged Interstate 81 to the north in Augusta, Rockbridge and Shenandoah counties and south in Washington County in the past along with damage to Route 460 in Bedford County to the east. To date, there have been no federal disaster declarations or NCEI recorded events for karst related sinkhole events. Currently, there is no comprehensive long-term record of past events in Virginia.

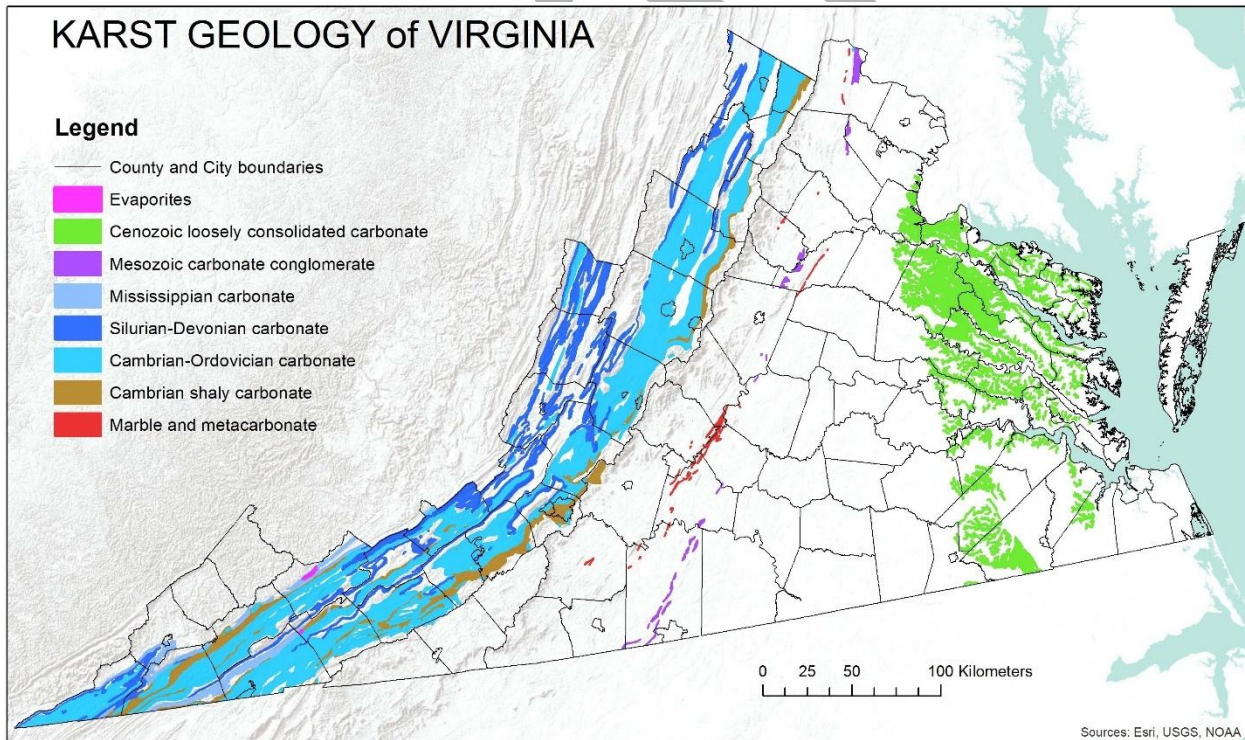


Figure 19: Karst Map, VDEQ

The term landslide describes many types of downhill earth movements, ranging from rapidly moving catastrophic rock avalanches and debris flows in mountainous regions to more slowly moving earth slides and other ground failures.

Though most landslide losses in the United States accrue from many widely distributed events, landslides can be triggered by severe storms and earthquakes, causing spectacular damage in a short time over a wide area. Some landslides move slowly and cause gradual damage, whereas others move so rapidly that they can destroy property and take lives. Debris flows are a common type of fast-moving landslide that generally occurs during intense rainfall on saturated soil. Their consistency ranges from watery mud to thick, rocky mud (like wet cement) which is dense enough to carry boulders, trees, and cars. Debris flows from many different sources can combine in channels, where their destructive power may be greatly increased.⁷

Landslides can be triggered by both natural changes in the environment and human activities. Inherent weaknesses in the rock or soil often combine with one or more triggering events, such as heavy rain, snowmelt, and changes in groundwater level, or seismic activity. Erosion may remove the toe and lateral slope support, triggering potential landslides. Human activities triggering landslides are usually associated with construction and changes in slope and surface water and groundwater levels. Changes in irrigation, runoff and drainage can increase erosion and change groundwater levels and ground saturation.

Historic Event Descriptions

Historical records tell us that destructive landslides and debris flows in the Appalachian Mountains occur when unusually heavy rain from hurricanes and intense storms soaks the ground, reducing the ability of steep slopes to resist the downslope pull of gravity. For example, during Hurricane Camille in 1969, such conditions generated debris flows in Nelson County, Virginia. The storm caused 150 deaths, mostly attributed to debris flows, and more than \$100 million in property damage. Likewise, 72 hours of storms in Virginia and West Virginia during early November 1985 caused debris flows and flooding in the Potomac and Cheat River basins that were responsible for 70 deaths and \$1.3 billion in damage to homes, businesses, roads, and farmlands.

Most localities of the RVARC region have experienced small, localized landslide events, especially areas in the valleys. The mountain slopes are characterized by the USGS as having a high susceptibility but a low incidence, indicating that few events have occurred on the higher slopes. **Chapter 2: Regional Profile** contains a topographic map of the region.

The only documented concentration of landslides in the planning region has been along Smith Creek in the Town of Clifton Forge. A State Emergency Declaration was issued in November of 1987 for the area. Heavy rain caused landslides along Smith Creek in Clifton Forge, the third occurrence in the past decade. The area is landslide prone and structures are at risk from further landslides. A study is warranted to determine scope of the problem and a method to stabilize the area.

In 2008 a rockslide occurred on Route 220 just north of the City of Covington. No property damage estimates were reported. In 2019, another event on Route 220 closed a section of the road north of Covington for a two-week period. Small landslides just outside of Eagle Rock have closed

⁷ Debris Flow Hazards in the Blue Ridge of Virginia, USGS Fact Sheet 159-96P. L. Gori and W. C. Burton, 1996.

Route 43 multiple times. Landslides on Route 220 south in the Bent Mountain area of Roanoke County have resulted in closures of that road multiple times.

In 2021 a debris flow event triggered by heavy rain was reported in the City of Roanoke with \$25,000 in damages. A car wash sustained severe structural damage when the hillside immediately behind the building gave way and smashed through the rear wall of the building. No deaths or injuries were reported.

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3.7 Wildfire

Definition of Hazard

Wildfire is a particularly pernicious natural disaster that can have wide effects across the region, affecting air quality, property, and safety. A significant portion of the region is forested and managed by public entities, including the National Park Service, National Forest Service, Virginia Department of Forestry, Virginia Department of Conservation and Recreation, and the Virginia Department of Wildlife Resources.

Several factors affect wildfires, including meteorological factors such as temperature and wind, and non-meteorological factors such as soil moisture, topography, debris accumulation of dead or dying vegetation, and forest density and age. Wildfires across the state are primarily caused by debris burning. Fire laws proscribe burning until after 4pm from February 15th to April 30th, the major fire season across the Commonwealth. Other causes include powerlines, lightning, campfires, and arson.

The Virginia Department of Forestry is the primary agency involved in wildfire education and response in Virginia; however, other entities which may engage in wildfire response include local EMS and federal entities. Data in this section comes from the VDOF unless otherwise noted.

Historic Event Descriptions

Historically, three major fire events have occurred in the region.

In 1999, Fort Lewis Mountain in the western part of Roanoke County burned out of control for a week, endangering multiple homes before it was brought under control.

In April 2012, a series of wildfires burned more than 38,000 acres in western Virginia. One of the largest fires impacting the region was in a remote area in Alleghany County 10 miles west of Covington. The U.S. Forest Service reported the Alleghany Tunnel Fire burned 11,381 acres and resulted in temporary closure of sections of routes 770 and 850. The largest fire originated in Rich Hole Wilderness area of Alleghany County. This fire spread to private lands, grew to 15,454 acres, and closed parts of Interstate 64 in both directions. 7,351 acres burned in the Barbers Creek Fire in Alleghany and Craig counties. All fires posed threats to structures on private lands. Fires also occurred in Page and Shenandoah counties.

On the first weekend of March 2018, VDOF responded to 127 wildfires spread by high winds. Across the Commonwealth. These fires burned a total of 690 acres and impacted Botetourt County and multiple other localities across the state. A month later in Roanoke County, several fires ignited along the shoulder of Virginia Highway 311 on Catawba Mountain, near the highway's intersection with the Appalachian Trail. The fires grew quickly in dry and windy conditions. Several of these fires merged into one fire which grew to 165 acres and threatened the safety of dozens of hikers who were on the trail to McAfee Knob.

Since 2018, approximately 74 fires have occurred in the region, with 38 occurring in Alleghany County, 18 occurring in Botetourt County, five occurring in Craig County, and 13 occurring in Roanoke County. Of these the largest occurred in October of 2023, when 97 acres burned near Penny Hollow and Cumberland Gap Road in Craig County. The threshold for a major fire is 100 acres. A full incident list is contained in [Appendix E: Regional Wildfire Report](#).

3.8 Wind Event







Definition of Hazard

For the purposes of this plan, wind events shall refer to straight line wind events such as derecho or thunderstorm winds as well as other wind events such as tornadoes.

Straight line wind is a term used to define any thunderstorm wind that is not associated with rotation and is used mainly to differentiate from tornadic winds. Most straight-line winds are a result of outflow generated by a thunderstorm downdraft. High winds are also associated with hurricanes, with two significant effects: widespread debris due to damaged and downed trees and building debris; and power outages. Half of all severe weather reports in the lower 48 states are due to damaging winds. Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas is at risk for experiencing straight line winds. The majority of the wind events experienced in the region are considered straight line wind events, with the vast majority of these driven by thunderstorms.

Straight line wind events can occur anywhere in the planning region and have the potential to impact all types of buildings, power and telecommunication transmission lines, and transportation services.

Figure 20: EF Ratings Definitions, Weather.gov

EF Rating	Wind Speeds	Expected Damage
EF-0	65-85 mph	<p>'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.</p> 
EF-1	86-110 mph	<p>'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.</p> 
EF-2	111-135 mph	<p>'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.</p> 
EF-3	136-165 mph	<p>'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.</p> 
EF-4	166-200 mph	<p>'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.</p> 
EF-5	> 200 mph	<p>'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.</p> 

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally April through September, although tornadoes can occur at any time of year.

In February 2007, the National Weather Service adopted the Enhanced Fujita scale to measure tornadoes. The EF scale replaces the original Fujita scale that led to inconsistent tornado ratings due to a lack of damage indicators, no account of construction quality and variability, and no definitive correlation between damage and wind speed. For example, a weak structure combined with a slow-moving storm could lead to a tornado's rating being higher than it should be. The EF scale accounts for these and other variables for a more accurate measurement.

Low-intensity tornadoes appear to occur most frequently in Virginia. Tornadoes rated EF2 or higher are very rare, although EF2, EF3, and a few EF4 storms have occurred.

Historic Event Descriptions

In total, 242 wind events have occurred in the region since the last update of the plan (see *Table 3-1*). More events were reported in Roanoke County than in any other jurisdiction. Almost all of these events resulted in some level of damages, with a total reported cost across all events of \$2,223,850. Crop damage alone was reported at \$140,000, though this number is likely underreported. The average cost per wind event was \$10,640. Sixteen events with damages estimated at greater than \$20,000 occurred in the region in this time period.

The largest scale event in the region was the derecho on June 29, 2012 that arrived with 80 mph winds and left over a million people without power and caused extensive wind damage throughout Virginia. The event was caused by a series of days with high temperatures in excess of 100 degrees created by a heat dome over the central and eastern US followed by a line of strong thunderstorms that moved quickly from the Chicago area to the east on the afternoon of June 29th. Emergency services personnel dealt with fires caused by downed powerlines, collapsed roofs, and wrecked vehicles. Many businesses in the area remained closed for an extended time and lost revenue due to the power outages while hardware stores experienced a run on generators and propane fueled grills. It took more than two weeks for utility companies to restore power to all residents in the region. Recovery, including the clean-up of hundreds of downed trees, roofs and building repairs lasted throughout July and August. A federal disaster declaration was made for this event.

Significant straight line wind events have occurred since 2019. In February 2019, a strong cold front passed over western and southwestern Virginia. In its wake, high winds intensified in the overnight hours particularly along and west of the Blue Ridge. Impacts were amplified by waterlogged soil, allowing trees to be uprooted or displaced more easily. At the peak of the event, approximately 40,000 homes in Virginia were without power.

Thunderstorms struck in May of 2019 during the afternoon and evening hours. The storms produced hail up to the size of half dollar coins and produced damaging winds that blew down numerous trees and power lines. At least 4,000 people lost power due to trees falling on to power lines, and a few structures also suffered damage. In June of the same year, multiple thunderstorms developed, some of which intensified to severe levels and produced damaging winds that knocked down numerous trees. Numerous trees and tree limbs, as well as power lines,

were blown down by straight line thunderstorm winds in eastern Roanoke and around the community of Vinton. Siding panels from the Roanoke Times Newspaper office were blown down onto the street. One tree fell onto a parked car on Underhill Avenue. Damage was most concentrated along Shelbourne Avenue in Vinton; however, damage was observed from Hardy Road to the Roanoke River, about a 3/4-mile-wide swath. Winds picked up a metal shed on Shelbourne Avenue and blew it into a telephone pole. The damage resulted in a loss of commercial power to about 2,000 customers in eastern Roanoke County.

On Halloween of 2019, a cold front brought strong winds both ahead and behind the frontal passage during the afternoon and evening hours. These winds were not associated with any thunderstorms, but they blew down trees and power lines in southwest Virginia, particularly impacting Botetourt and Alleghany County.

In July of 2020, thunderstorm winds brought two trees down on Catawba Valley Road in Roanoke County. One of the trees fell onto a home in the 3700 block. Damage values are estimated at \$50,000.

A large thunderstorm complex moved east from the Ohio and Tennessee Valleys across southwest Virginia in May of 2021. The system caused dozens of trees to be toppled across the region particularly in Botetourt County. Heavy rainfall from these storms also caused localized flooding in the City of Roanoke, where rainfall rates were in excess of 4 inches per hour at one point, between a 5-year and 10-year rainfall event per NOAA Atlas 14 Point Frequency Estimates, showing that weather events are complex and often create multiple hazards.

In June of 2022, numerous trees and power lines were downed by thunderstorm winds in Botetourt County. Near Iron Gate, one tree fell onto a garage and damaged a vehicle.

April of 2023 saw a \$60,000 estimated damage event when wind gusts resulted in many trees and power lines down in the Cities of Salem and Roanoke and portions of Roanoke County. This resulted in an estimated one to two thousand customers without power. Among the fallen trees, one fell and destroyed a raptor enclosure at the Southwest Virginia Wildlife Center which cost around \$25,000 to replace. Additionally a power pole and a telephone pole were split in two.

In May of 2024, thunderstorm cells produced a tornado (discussed later in this section). In September of 2024, Hurricane Helene caused widespread impacts across the region, with over 3,200 customers reported without power at the peak of the high winds. A peak wind speed of 68 mph was measured. There was one confirmed fatality. A woman was killed when struck by a chicken coop that was lofted by the high winds. A deputy was also injured at the scene. Total losses from agriculture damages were around \$85,000, including losses from crops and structures.

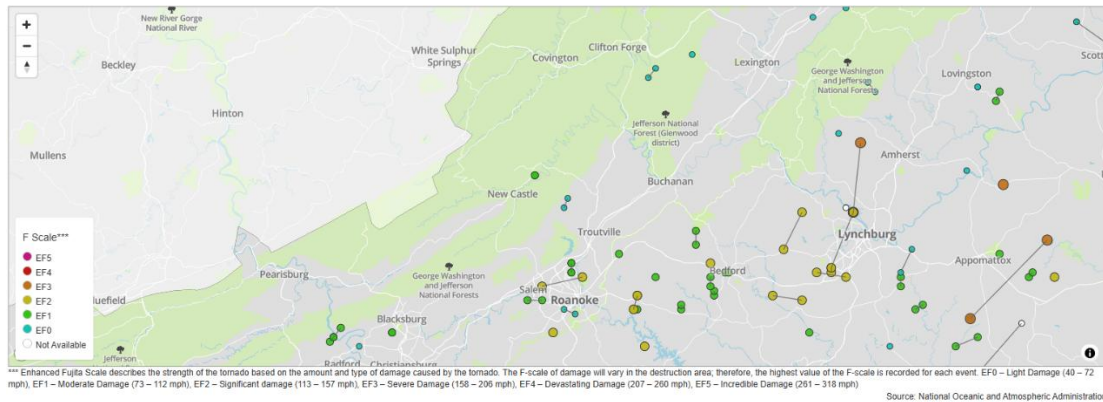


Figure 21: Tornado Paths, NOAA

Several tornadoes have touched down in the planning region. On April 24, 1896, around 4:30 pm, a tornado moved northeast from Salem into Roanoke destroying a bowling alley and several other buildings. A framed home near the bowling alley was leveled, killing three of the eight-member family in the house. The five others were injured.

In Bath and Alleghany counties, the Cowpasture Valley is at an elevation of 1,500 feet and lies between two ridges that rise 1,000 feet above the valley. On May 2, 1929, a tornado struck around 6 pm. Property losses in the communities of Coronation and Sitlington were great. At least 10 people were injured, but none were killed. There were five tornadoes reported on that day. More may have struck remote areas. Twenty-two people were killed and over 150 injured with at least half a million dollars in damage in Alleghany and Bath counties.

April 3-4, 1974 is known as the "Super Outbreak" with 148 tornadoes, 315 people killed and 5,484 injured across the United States. It was the most tornadoes ever in recorded in a 24-hour period and it was the worst tornado outbreak since February 19, 1884. In Virginia, eight tornadoes hit. One person was killed and 15 injured, all in mobile homes. Over 200 homes and barns and over 40 mobile homes and trailers were damaged or destroyed. The Saltville area and Roanoke were the hardest hit. An F3 tornado touched down on the west edge of Roanoke, near Salem around 5 a.m., and moved through the north part of Roanoke to Bonsack and into Botetourt County to the Blue Ridge area. The path was initially a mile wide, but it continued to narrow to 75 yards across near the end of its track of damage. It hit four schools (two lost portions of their roof and two had windows broken out) and two apartment complexes, Grandview Village Apartments (18 buildings damaged) and Ferncliff Apartments (lost roof). The Red Cross reported 120 homes damaged or destroyed in the Roanoke area. Trees were down on buildings and cars. Carports, garages, and porches were flattened. Roofs were partly blown off several houses in Botetourt.

A small tornado struck northern Roanoke County on August 5, 2003. The storm had winds of 110-113 miles per hour and caused damage to ITT Industries and Sunnybrook Garage on Plantation Road in addition to damaging roofs, fences and a car in the area. No injuries were reported as a result of the tornado.

A small tornado touched down in the City of Roanoke on June 4, 2008. The tornado was rated EF-0 on the Enhanced Fujita Scale of tornado intensity. The National Weather Service reported that the storm knocked down power lines and trees, including on houses along a 1.4-mile path. Appalachian Power stated that the storm knocked out power to 4,000 customers.

A tornado touched down just east of the Town of New Castle on April 15, 2018. Classified as an EF-1, estimated windspeeds reached 105 mph and had a path length of 0.5 miles. The tornado damaged 6 homes, several outbuildings and garages, and approximately 50 trees in the vicinity. Three cars and a double axel trailer were moved including one truck that was flipped over. The tornado was part of a wide regional outbreak made up of several supercells on April 15th impacting communities in Virginia and North Carolina.

On August 1, 2020 an isolated storm produced an EF0 tornado, resulting in a discontinuous path of damage with uprooted trees and small trees snapped aloft, with damages estimated at \$3,500.

An EF-1 tornado touched down near the intersection of Karen Drive and Joan Circle, on May 26, 2024. Several tree trunks were snapped. Additional trees were snapped and uprooted as the tornado moved east-northeast, with loss of roofing material noted at several homes and apartment buildings just south of the Roanoke River. The tornado lifted just east of Electric Road near the intersection of Midland and Easton Roads. The estimated peak wind speeds were 100 to 105 mph. Damage was estimated to be 1.17 million dollars. The same storm cells spawned straight line winds which resulted in an estimated \$22,000 worth of damages.

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3.9 Winter Storm

Definition of Hazard

Winter storms are events which create snow, freezing rain, or sleet. This frozen precipitation can accumulate on powerlines, trees, roofs and roads and cause damage or fatalities through car wrecks, loss of electricity, and, in extreme cases, damage to buildings. The planning region experiences a handful of winter storm events each year.

Winter storms are commonly assessed with the Northeast Snowfall Impact Scale (NESIS). Some Category 1 or 2 storms are recorded in the NESIS database which have a southern extent within the planning region over the past five years. However, the core of these storms was not localized in the planning region.

Category	NESIS Value	Description
1	1–2.499	Notable
2	2.5–3.99	Significant
3	4–5.99	Major
4	6–9.99	Crippling
5	10.0+	Extreme

Figure 22: NESIS Scale

Historic Event Descriptions

While typical snow and ice events result in low accumulations, several larger winter storms have been documented in the region.

February of 1960 found the area blanketed with 27.6 inches and March delivered 30.3 inches that same year. The March storm registered as a Category 4 storm across the northeast. In January of 1966, the area received a total of 41.2 inches of snow in a Category 3 storm. The second greatest official snow accumulation in a single 24-hour period occurred on February 11th and 12th of 1983 when 18.6 inches covered the region in another Category 3 storm. The storm resulted in snowdrifts of up to three feet in height. This was the third heaviest snowfall in over 100 years.

The "Storm of the Century" hit the valley in March 1993, the first Category 5 since the NESIS scale became commonly used to directly impact the region. With blizzard-like conditions and nearly 30 inches of snow, this was the biggest winter storm in 10 years. Localities in the region received a Presidential Declaration of Emergency and the National Guard was mobilized to help with emergency transportation needs. Shelters were open for those without electricity.

A devastating storm struck the region and surrounding jurisdictions in February 1994, with one to three inches of solid ice from freezing rain and sleet. Roads were blocked, electric and phone lines were damaged, and a large portion of the valley was without electricity.

The "Blizzard of '96," also a Category 5, dropped 22.2 inches officially in 24 hours in early January of 1996 and remains the current record 24-hour snowfall. Many areas of the region received more than 36 inches during the same period.

In March 2009 snowfall reports in the region ranged from 6 to 9 inches and were the largest snow event since 2005. The Winter of 2009-2010 brought three major winter storms to the area. On December 18th, with areas of Craig and Alleghany County reporting up to 23 inches, snow continued to fall for the next 11 days. The first week of February 2010, saw another 8-10 inches fall on top of an event in late January that had already dropped 10-12 inches causing power outages, and dangerous driving conditions. The biggest snowstorm on record for the City was December 18-19, 2009 with 17.8 inches.

The City of Roanoke's snowiest single day in December occurred in 2018 with 15.2 inches.

Since the last iteration of this plan, 31 winter storm or winter weather events have been recorded by NCEI in the planning region. These events are generally widespread and affect multiple localities, meaning that it is more truthful to say that only about 11 individual events have occurred. These events have mostly been characterized by snowfall of less than 10 inches or ice accumulation, with the most widespread impacts being power outages.

In January of 2019, a winter storm event resulted in snow and ice across much of the region, with snow accumulations of up to 4.8 inches in some places followed by slight ice accumulations from sleet and freezing rain. In February, another storm affected the region, with around 4 inches of accumulation.

The 2020-2021 winter storm season began early in December, when snow and ice accumulations of a half inch to 2.5 inches were observed across the region. Another region-wide storm struck at the end of January, with snowfall amounts of 4-7 inches recorded across the region. Two small winter weather events struck Craig and Roanoke Counties respectively in February. These episodes were brief and resulted in less than half inch accumulations of sleet. Another storm event affected the whole region later in the month, with accumulations of less than 1.5 inches.

January of 2022 saw two regional winter storm events. Accumulations in the region ranged from 1.5 to 6.5 inches in the first storm event, and from 1 to 8 inches in the second storm event.

January of 2024 saw a small episode of winter weather in Alleghany, followed by an episode of heavy snow in Botetourt and Roanoke Counties with accumulations of 4.8 and 3.5 inches respectively in higher elevations.

3.10 Hazards Not Assessed

Drought

Drought is defined by four factors: precipitation, groundwater levels, streamflow, and reservoir levels. The Virginia Department of Environmental Quality monitors drought across the state to designate drought events.

Five major droughts affected Virginia in the 20th century, during 1930-32, 1938-42, 1962-71, 1980-82, and from 1998 to 2002. Following the 2002 drought, the Local and Regional Water Supply Planning Regulation was established in Virginia, which required each locality to develop and submit a plan by 2011, either alone or in collaboration with other localities. The Virginia State Water Resources Plan (SWRP) was finalized and released to the public in October 2015. An update of the document was conducted in 2020.

There are three water supply plans which overlap the Roanoke Valley-Alleghany region included in the 2020 SWRP:

- The Upper James Water Supply Plan: this plan covers Alleghany, Bath, and Highland Counties, as well as Lexington, Buena Vista, Covington, Clifton Forge and Iron Gate and was produced in partnership with Central Shenandoah Planning District Commission.
- The Roanoke River Water Supply Plan: this plan covers Roanoke, Bedford, Botetourt, and Franklin Counties as well as the cities of Roanoke and Salem, and the Towns of Boones Mill, Buchanan, Fincastle, Rocky Mount, Troutville and Vinton.
- The Craig County – Town of New Castle Regional Water Supply Plan: this plan covers Craig County and the Town of New Castle.

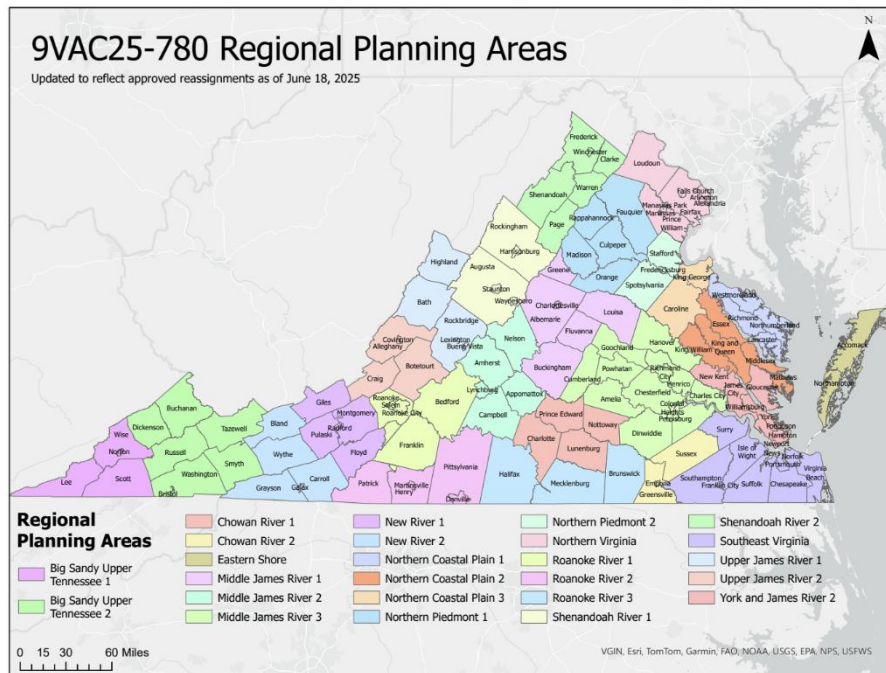


Figure 23: Water Supply Planning Areas, DEQ

The Regional Commission is currently in the process of assisting with updates to regional Water Supply plans following new watershed boundary guidance released in 2024⁸. Two plans will be completed for the Roanoke River basin and Upper James basin respectively. These will supply data and information for a future iteration of the SWRP. Water supply planning includes information concerning community water systems and self-supplied users, existing and potential sources of water supply, existing use, and anticipated future water demand.

Pandemic

A pandemic is an epidemic that has reached a global level of spread. On January 30, 2020, the World Health Organization declared a Public Health Emergency of Concern following identification of the coronavirus COVID-19, followed by a declaration of pandemic on March 11th of that year. The pandemic had harsh economic ripple effects across the Commonwealth and the country. While this document does not assess future pandemic risk, a brief summary of local impacts is included below as a learning opportunity for future disaster events.

In Virginia, a State of Emergency was declared on March 12th of 2020. On March 13th all K-12 schools in the Commonwealth were ordered closed. On March 23rd, businesses such as bowling alleys, gyms, and theaters were also ordered closed. On March 24th, restaurants were ordered to close dining rooms. On March 30th, a statewide Stay at Home order was issued. The Stay at Home order remained broadly in effect until May 15th. During Phase One reopening, people were still encouraged to maintain social distancing and mask fully in public. Social gatherings were capped at 10 people, and outdoor dining was allowed at restaurants. On May 29th, Virginians received an official order requiring all people to mask indoors. Phase Two reopening began on June 5th, which allowed an increase in social gatherings from 10 to 50 people. Limited indoor dining returned to restaurants and gyms were able to reopen. On June 8th, evictions proceedings were suspended. On July 1st, Virginia entered Phase Three reopening, which further loosened restrictions. On November 15th, new restrictions were placed limiting all indoor and outdoor gatherings to 25 people due to surging case numbers. On December 14th, a universal stay-at-home order was issued between 12 am and 5 am, along with a universal mask mandate. Social gatherings were limited to 10 people.

A vaccine was first made available in Virginia in December of 2020, but was restricted to frontline workers due to availability. As of April 2021, the vaccine was officially available to all Virginians aged 16 or older. The universal indoor mask mandate was lifted in May of 2021, along with all social distancing and venue capacity restrictions.

Economic impacts from the pandemic can be seen in a variety of data points, including unemployment rates, spending and tax revenues, and business closures.⁹

Many community stakeholders found their operations directly affected by the pandemic. While a full list of discussions can be found in **Appendix A: Public Engagement Summary**, a major takeaway was that non-governmental organizations and nonprofits serving marginalized communities found themselves quickly adapting in order to meet sharp increases in demand for services which government programs were not able to fully cover. This shows that, while NGO and nonprofit aid programs cannot replace government assistance, they are a pivotal part of the

⁸ (Virginia Department of Environmental Quality, n.d.)

⁹ (Roanoke Valley-Alleghany Regional Commission, 2025)

post-disaster response, in many cases providing immediate emergency aid while other, longer-term aid was being processed.

Hospitals were additionally a frontline for disaster response. Hospitalizations and deaths from the pandemic in the years of 2020-2021 are captured in Table 15. Data comes from Virginia’s Open Data Portal.

Table 15: Infections, Hospitalizations, and Deaths due to COVID-19, 2020-2021

Locality	Total Cases	Hospitalizations	Deaths
Alleghany	2,512	87	87
Botetourt	4,825	105	66
Craig	761	22	11
Roanoke County	14,245	281	195
Covington	818	34	19
Salem	4,396	108	83
Roanoke City	14,290	335	272
Total	41,847	972	733

The total number of deaths reported per the Virginia Department of Health and Human Services was 5,000 for the year 2020, 614 more than were observed in 2019¹⁰. The total number of deaths reported due to COVID-19 in 2020 was 560. It is safe to assume that deaths and hospitalizations due to COVID-19 represent an increased burden on hospital and health services staff. Bed capacity at area hospitals is included in **Chapter 2: Regional Profile**.¹¹

In 2025, there are 1,463 licensed beds in three area hospitals within the service area. Hospitals outside of the service area may receive patients in a diversion event. In the case of the COVID-19 pandemic, lockdown and social distancing measures reduced spread sufficiently to allow for the care of all patients. In a more acute disaster, hospital bed capacity may be a limiting factor to disaster response, causing a greater loss of life. In the case of Hurricane Helene, further discussed in **Section 3.5** in this chapter, diverted patients from Asheville, North Carolina reached Roanoke’s area hospitals in cases where specific treatments were needed for patients (e.g. in high-risk pregnancies) as reported in stakeholder interviews with CHIP. Further study of hospital capacity in disaster situations is recommended but could not be encompassed fully in this plan.

¹⁰ (Division of Health Statistics, Virginia Department of Health, n.d.)

¹¹ (Virginia Health Information, 2021)

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Chapter 4. Risk Assessment

4.1 Disaster Rankings

Hazards assessed in this chapter include all listed hazards from Chapter 3 with the exception of section [3.11 Hazards Not Assessed](#) and [3.5 Hurricane and Tropical Storm](#). While the region experiences the impacts of a few tropical storms or depressions and remnants of hurricanes, these impacts are experienced as flooding and wind events, and assessment of these two events reasonably addresses risk from Hurricane and Tropical Storm.

This section summarizes the contents of the following sections of the chapter. For more information on what data was used for individual hazard assessment, please refer to the relevant section of this chapter. Definitions of ranking methodology are included for reference.

Projected Scale of Event: Hazard events may occur on site-specific, community, or regional scales. Estimated scale of event is derived from the impacts of historic events and the projected likelihood of events to remain substantially similar in the future. Scores are defined by the approximate land area affected by a single event.

Projected Scale of Event		
Local Effects	Jurisdiction-Wide Effects	Region-Wide Effects
Effects of an event are localized to a parcel or neighborhood.	Effects of an event affect a substantial portion of the jurisdiction.	Effects of an event affect multiple jurisdictions or the region as a whole.

Projected Costs per Annum: Costs are a concrete way to estimate impact from a hazard event. Costs have been derived where possible from NRI and NCEI data, HAZUS modeling, and other sources. Costs are represented as high, medium, and low based off of thresholds defined by the individual jurisdictions. This may mean that costs that are considered high for one jurisdiction are low for another jurisdiction.

Projected Costs per Annum

	Low	Medium	High
Alleghany County	Under \$25,000	\$25,000-\$35,000	\$35,000 or higher
City of Covington	Under \$25,000	\$25,000-\$35,000	\$35,000 or higher
Town of Clifton Forge	Under \$25,000	\$25,000-\$35,000	\$35,000 or higher
Town of Iron Gate	Under \$25,000	\$25,000-\$35,000	\$35,000 or higher
Craig County	Under \$25,000	\$25,000-\$35,000	\$35,000 or higher
Town of New Castle	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher
Botetourt County	Under \$50,000	\$50,000-\$200,000	\$200,000 or higher
Town of Buchanan	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher
Town of Fincastle	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher
Town of Troutville	Under \$50,000	\$50,000-\$200,000	\$200,000 or higher
Roanoke County	Under \$200,000	\$200,00-\$1.5 million	\$1.5 million or higher
Town of Vinton	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher
City of Roanoke	Under \$200,000	\$200,00-\$1.5 million	\$1.5 million or higher
City of Salem	Under \$200,000	\$200,00-\$1.5 million	\$1.5 million or higher
Roanoke Valley Resource Authority	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher
Western Virginia Water Authority	Under \$25,000	\$25,000-\$50,000	\$50,000 or higher

Projected Frequency of Events: This takes into account the data accumulated in Chapter 3 regarding historical events. Frequent small to medium events can be just as impactful as a single large event, and more costly over the long term for communities.

Projected Frequency of Event		
Less than Annual	Annual	Multiple Times per Year
An event occurs once every two or more years.	An event occurs on average once a year.	An event occurs on average multiple times a year.

Projected Local Vulnerabilities: This is the most individual of the rankings. Projected local vulnerability to a hazard may be dependent on many factors, including the location of critical and vulnerable facilities, age of population, and other specific vulnerabilities which may be important to modeling impacts of that hazard. For example, certain hazards become more critical in areas with steeper slopes, or with increased impervious surfaces. When possible, NRI data will inform this ranking.

Projected Local Vulnerability		
Low	Medium	High
<i>Thresholds for these rankings are defined for each hazard.</i>		

Rankings are made for each locality, using a variety of data sources as appropriate or available. Rankings have then been consolidated for the region.

Sections of this chapter will specifically cite annual probability and expected annual loss provided by the National Risk Index when available and appropriate. When not available, the closest reasonable estimate will be supplied for comparison purposes.

In the case where HAZUS modeling or other improved local estimates of loss or risk exist, those numbers will be given preference. It is understood that the regional agencies that operate in the region are impacted by the hazards equivalent to the jurisdictions wherein they operate. Further discussion of regional entities included in this plan will occur in **Chapter 6: Regional Mitigation Action Plan** and **Chapter 7: Jurisdiction-Specific Mitigation Action Plans**.

Once values are assigned to each of these elements, the total score is ranked on the following scale:

- Hazard of Low Concern (4 to 6 points)
- Hazard of Medium Concern (7 to 9 points)
- Hazard of High Concern (10 to 12 points)

A regional score and a locality specific score are assigned for each hazard.

All Hazard Ranking Table

Table 16: All Hazards Ranking Table

Hazard Ranking Table: All Hazards

Locality	Earthquake	Extreme Temperatures	Flooding	Geologic Hazards	Wildfire	Wind Event	Winter Storm
Alleghany County	Medium	Medium	High	Medium	Medium	High	Medium
City of Covington	Medium	Low	Medium	Low	Low	High	Medium
Town of Clifton Forge	Medium	Low	High	Low	Medium	High	Medium
Town of Iron Gate	Low	Low	High	Low	Medium	High	Medium
Craig County	Low	Low	Medium	Low	Low	High	Medium
Town of New Castle	Low	Low	Medium	Low	Low	High	Medium
Botetourt County	Medium	Medium	High	Low	Low	High	Medium
Town of Buchanan	Medium	Medium	High	Low	Low	High	Medium
Town of Fincastle	Medium	Medium	High	Low	Low	High	Medium
Town of Troutville	Medium	Medium	High	Low	Low	High	Medium
Roanoke County	Medium	Medium	High	Medium	High	Medium	Medium
Town of Vinton	Medium	Medium	High	Low	Low	Medium	Medium
City of Roanoke	Medium	High	High	Low	Low	Medium	Medium
City of Salem	Low	Medium	High	Low	Low	Medium	Medium
Regional Score	Medium	Medium	High	Low	Low	High	Medium

High Hazard Potential Dams

High hazard potential dams are a unique structure within the region which may complicate hazard events. Key risks to dam structures include flooding, earthquake, and geologic hazards. Flooding is one of the most commonly occurring hazards in the region, and improving structures to withstand increased flooding frequency and increasingly high flood events is important in reducing risk of dam failure and downstream inundation. Further analysis is needed to assess structural vulnerability to increased rain and flood events and potential downstream impacts; however, efforts have been made to collect emergency action plans, inundation maps, and dam safety fact sheets where available.

Earthquakes may negatively impact dam structures, which can cause the loss of water supply for a community, loss of energy generation, and downstream flooding resulting in loss of life and property damage. Earthquakes may also cause landslides or trigger other geologic hazards which can negatively affect both water quality in the reservoir and impoundment structure access. In 1979, the first Federal Guidelines for Dam Safety. However, further documentation in the form of the Earthquake Analyses and Design of Dams guidance was not completed until May 2005. This indicates that dams within the region, largely built before that time, may be susceptible to earthquakes. Further analysis is needed to determine the compounding risk factors of earthquakes on high hazard potential dams in the region.

A comprehensive list of High Hazard Potential Dams in the region is located in [Chapter 3](#). Dam safety fact sheets and select inundation maps are located in [Appendix H](#).

4.2 Earthquake

Earthquake is a rare hazard in the region, but several factors make a potential occurrence concerning. The age of housing stock, social vulnerability factors, steep slopes and the lack of experience with this hazard could make a large earthquake deadly in the planning region.

Projected Scale of Event

In [Chapter 3](#), historic events were discussed. Generally, earthquakes are considered a wide-ranging event which ignore geographic boundaries. The 2020 earthquake was felt throughout most of the service area, despite originating in North Carolina, and was only measured at a V to VI at its epicenter. It is reasonable to expect that a larger earthquake anywhere across the western portion of Virginia or North Carolina could have effects in the region. A large earthquake with an epicenter in the region would likely be felt across the region even if it were a smaller event. The small 2021 earthquake which occurred on the Montgomery County border was felt through parts of Roanoke County, the City of Salem, and the City of Roanoke.

Projected Costs of Event

Expected losses for this event are difficult to quantify. No historical loss information was found to support this plan.

Table 17: Expected Annual Loss and Exposure Values for Earthquake, NRI

Locality	Expected Annual Loss	Exposure Value
Alleghany County	\$ 27,538.00	\$ 179,683,942,000.00
City of Covington	\$ 12,797.00	\$ 67,930,465,000.00
Botetourt County	\$ 58,140.00	\$ 395,469,648,000.00
Craig County	\$ 10,382.00	\$ 57,657,907,000.00
Roanoke County	\$ 293,168.00	\$ 1,141,602,462,000.00
City of Roanoke	\$ 454,632.00	\$ 1,181,643,712,000.00
City of Salem	\$ 116,212.00	\$ 300,396,037,000.00

Projected Frequency of Event

The USGS Hazard Mapping for earthquakes shows that the region has a 5-25% chance of an earthquake measuring VI or greater on the Mercalli Intensity scale in the next 100 years. This is a relatively low probability consistent with much of Virginia and the east coast. The nearest higher risk center for earthquakes is located on the far side of Kentucky and Tennessee.

NRI data indicates the following annual probability and expected annual loss for earthquakes in the region. Towns are included in counties for the purposes of this analysis.

Table 18: Annualized Frequency Values for Earthquakes, NRI

Locality	Annualized Frequency Value (%)
Alleghany County	0.03
City of Covington	0.03
Botetourt County	0.03
Craig County	0.04
Roanoke County	0.039
City of Roanoke	0.048
City of Salem	0.04

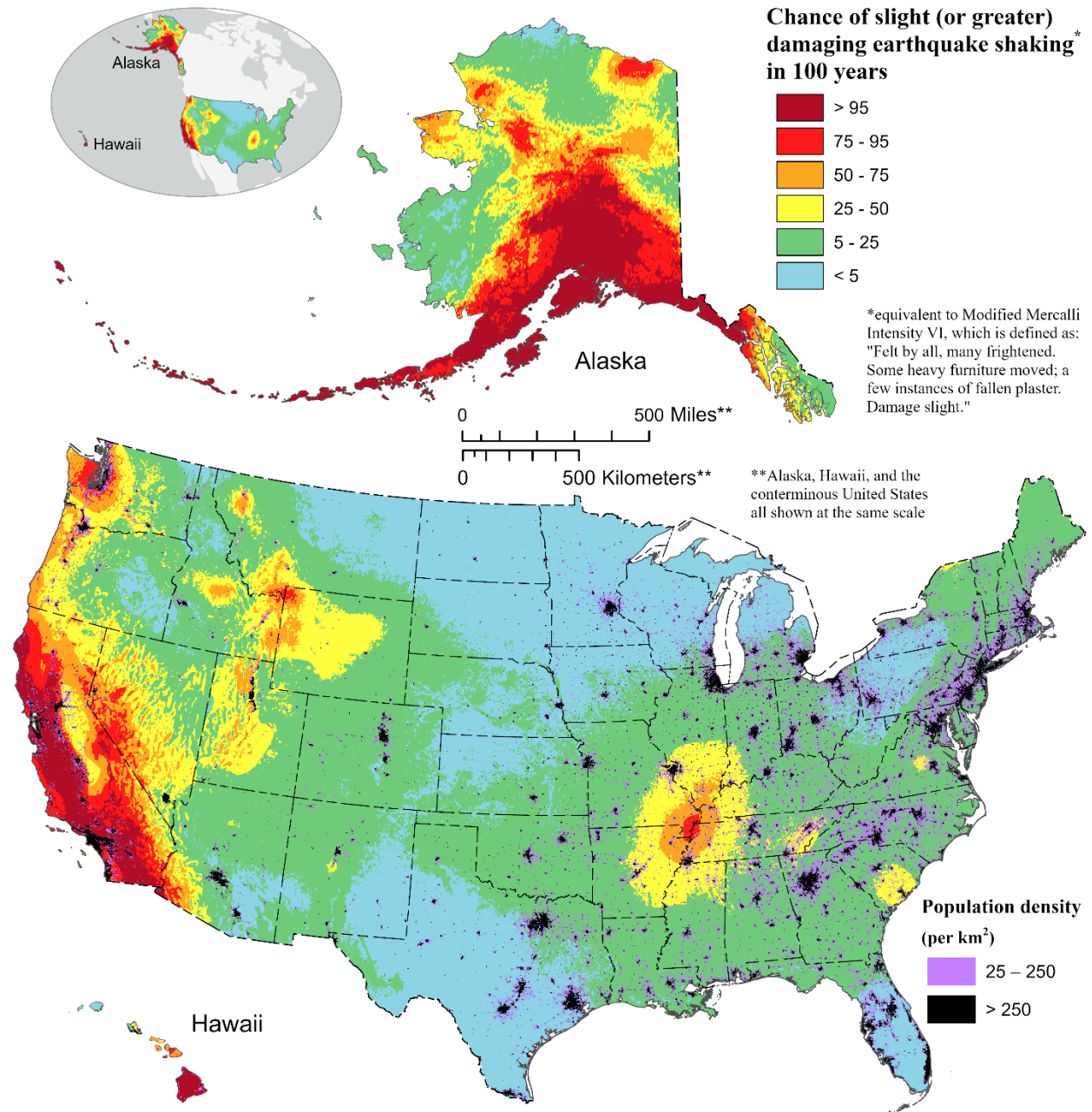


Figure 24: Earthquake Risk Mapping, USGS

Projected Local Vulnerability

Eighty percent of the housing stock in the region was built prior to 1980. These structures are likely not protected from earthquakes. Per FEMA, existing buildings are the biggest contributor to seismic risk in the United States today. Building codes prior to 1970 may not have included seismic design, which is a key factor in mitigating possible damage from earthquakes. A deeper look at the numbers shows that residences in Alleghany County, the City of Covington, and the City of Roanoke may be uniquely vulnerable to earthquakes. In the City of Covington, three out of four dwelling units are likely at risk from earthquakes.

Table 19: Homes Built Before 1970, ACS 5-Year Estimate 2023

Housing Units	Built before 1970	Percentage built before 1970
Virginia	1,080,622	30%
Alleghany County	4,082	52%
City of Covington	2,341	77%
Botetourt County	4,119	27%
Craig County	803	34%
Roanoke County	14,370	34%
City of Roanoke	31,496	64%
City of Salem	5,406	49%

The 2024 Edition of FEMA's Seismic Design Category Maps show designations for the International Building Code and the International Residential Code regarding seismic design¹². The majority of the planning region is located in category B of the International Residential Code. Other factors that are worth assessing in future plans may include soil composition, building height, and number of manufactured homes. Soil composition is directly considered in the applicability the 2024 Edition of FEMA's Seismic Design Category Maps. High risk soils must do site specific assessment.

For the local vulnerability score, designations of low, medium and high were assigned at natural thresholds of under 50 percent of aged dwellings, 50-75 percent of aged dwellings, and 75 percent or more of aged dwellings. Towns share the same score as the county in which they are located. This is not a perfect methodology and should be revisited in future iterations of the plan. Age of housing or building stock in towns may trend significantly higher than that of the enclosing county.

¹² (Federal Emergency Management Agency, 2024)

Hazard Ranking Table

Table 20: Hazard Ranking for Earthquake

Hazard Ranking		Earthquake			
Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Region-Wide Effects	Medium	Less than Annual	Medium	Medium
City of Covington	Region-Wide Effects	Low	Less than Annual	High	Medium
Town of Clifton Forge	Region-Wide Effects	Low	Less than Annual	Medium	Medium
Town of Iron Gate	Region-Wide Effects	Low	Less than Annual	Low	Low
Craig County	Region-Wide Effects	Low	Less than Annual	Low	Low
Town of New Castle	Region-Wide Effects	Low	Less than Annual	Low	Low
Botetourt County	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Buchanan	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Fincastle	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Troutville	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Roanoke County	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Vinton	Region-Wide Effects	Medium	Less than Annual	Low	Medium
City of Roanoke	Region-Wide Effects	Medium	Less than Annual	Medium	Medium
City of Salem	Region-Wide Effects	Low	Less than Annual	Low	Low
<i>Regional Score</i>	<i>Region-Wide Effects</i>	<i>Medium</i>	<i>Less than Annual</i>	<i>Low</i>	<i>Medium</i>

4.3 Extreme Temperature

Many models project an increase in extreme weather conditions in the coming years, particularly in experiences of heat waves. While the thresholds used to attempt to analyze historical events are detailed in **Chapter 3**, these measurements are not perfect comparisons to the national definitions for a cold wave and a heat wave. NRI uses these terms to describe extreme temperature.

Heat wave: a period of abnormally and uncomfortably hot and unusually humid weather typically lasting two or more days with temperatures outside the historical averages for a given area.

Cold wave: a rapid fall in temperature within 24 hours and extreme low temperatures for an extended period. The temperatures classified as a cold wave are dependent on the location and defined by the local National Weather Service (NWS) weather forecast office.

While having a national standard for temperature is important, localized conditions can create very different experiences of temperature, as discussed in the previous chapter. Additionally, changing norms in the region due to increased impervious surfaces and general trends in weather conditions can mean that heat events in particular are perceived as more critical by a given region's residents even when actual temperatures are less than in neighboring regions.

Generally, more data is needed to fully support this section. However, an initial attempt to assess impacts of extreme temperatures is included below.

Projected Scale of Event

Generally, weather-based hazards tend to be the most boundary-crossing. However, land use and elevation vary widely throughout the planning area. Temperatures in the rural and higher elevations of Craig County, northern Botetourt County, and the Alleghany Highlands trend slightly lower than temperatures in the Roanoke Valley.

Case Studies of Extreme Temperature Impacts

Two case studies of extreme heat and extreme cold incidents are worth looking at to guide this assessment: the heat dome in Seattle, Washington, and the cold wave in Richmond, Virginia. These are extreme events which show the scale of potential damage for this hazard should compounding factors occur. Both of these studies highlight impacts on critical infrastructure as being a compounding factor for extreme temperatures as well as other hazards. Specifically, power grids, healthcare facilities, and water utilities may be at risk from these events.

Richmond, Virginia Cold Wave of 2025

On January 6, 2025, residents across Richmond lost access to water during a cold wave that caused major failures to water infrastructure. Specifically, power was lost to the main water treatment plant. Backup battery power failed, the facility flooded and submerged critical electrical systems. There was a complete water treatment plant power outage for nearly 36 hours.¹³ Water production was restored on January 9th, but a boil water notification was in place until January 11th. Water losses affected area hospitals and other critical facilities.

¹³ (HNTB Corporation, 2025)

Power failure at the water treatment plant occurred during a prolonged cold wave and concurrent winter storm event which caused power loss. An article in The Richmonder on January 1st predicted around two weeks of below average temperatures driven by a polar vortex event.¹⁴

The Interstate Commission on the Potomac River Basin modeled economic and fiscal costs of a water supply disruption in the National Capital Region. Notable economic losses from water disruption begin in as little as two hours from the event, with impacts disproportionately felt by small businesses.¹⁵

Seattle, Washington Heat Wave of 2021

In the summer of 2021 Seattle, Washington experienced a heat dome event. This area of the country does not have typically hot summers – however, triple digit temperatures were recorded. The Washington Department of Health tracked 136 heat-related deaths across the state from June 26 through July 6, 2021. No planning was done for an event of that scale, because no models predicted it. Many of the care facilities in the region did not have air conditioning, making them particularly vulnerable. Power outages occurred due to the stress on the grid, and critical equipment such as imaging and laboratory equipment overheated.¹⁶

Impacts from this event were largely felt in healthcare facilities, which were already strained by COVID-19, and in the power grid. Vulnerable populations including the elderly, homeless, and those in healthcare facilities or otherwise lacking mobility to evacuate were especially impacted.

Projected Costs of Event

Costs of opening shelters, mortality costs and crop damage may all be important costs to consider when assessing the costs of extreme temperature events. For example, consistent temperatures over 90 degrees reduce or halt the growth rate of most grasses used for cattle feed in this region, increasing costs of meat production for farmers and reducing their margins. Higher temperatures result in increased energy costs for home owners, and higher demand on the grid can have complicating factors for utility service providers. These costs are hard to quantify in assessing the impacts of this hazard.

Table 21: Expected Annual Loss for Cold Wave, NRI

Locality	Expected Annual Loss	Exposure Value
Alleghany County	\$42,546	\$179,478,356,906
City of Covington	\$9,600	\$67,930,487,195
Botetourt County	\$36,708	\$394,929,053,010
Craig County	\$8,338	\$57,558,866,073
Roanoke County	\$65,026	\$1,141,152,733,759
City of Roanoke	\$100,139	\$1,181,121,995,799
City of Salem	\$25,405	\$300,396,106,588

¹⁴ (Sublette, 2025)

¹⁵ (Tonya E. Thornton, 2024)

¹⁶ (ASPR TRACIE, 2023)

This hazard is one of the main hazards for which shelters are regularly opened in the planning region. Shelters serve as heating and cooling centers when other weather events cause power outages, or simply when temperatures become extreme enough that those without reliable shelter have need. Further plan iterations should seek to quantify the cost of opening shelters for extreme heat and extreme cold to close the gap in national data, as well as the cost of illness and mortality in the housing insecure via coordination with EMS staff, local area hospitals, and local area homeless shelters.

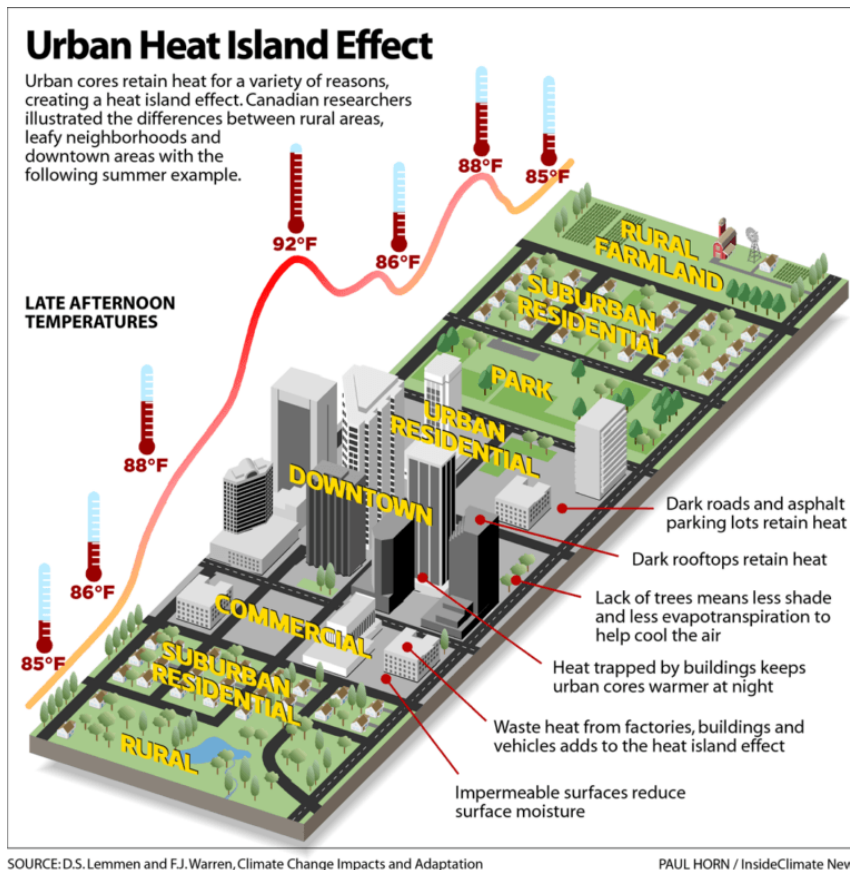


Figure 25: Urban Heat Island Effect, City of Roanoke

Projected Frequency of Event

Annual average of extreme heat and extreme cold historically are discussed in Chapter 3, with 32 extreme heat days and 5 extreme cold days by definitions used in that chapter. Annual frequency by that definition is multiple times per year. NRI data which is based off of different definitions, contests this. The annualized frequency value for cold waves remains low in the region, at between 0.1 and 0.3 events per year.

No annualized frequency data is available for heat wave in the planning region. However, heat waves occur and multiple heat advisories were issued in the region during the writing of this plan.

Table 22: Annualized Frequency of Cold Waves, NRI

Locality	Annualized Value	Frequency
Alleghany County	0.3	
City of Covington	0.3	
Botetourt County	0.1	
Craig County	0.3	
Roanoke County	0.1	
City of Roanoke	0.1	
City of Salem	0.1	

The City of Roanoke conducted urban heat island mapping to capture the risks of extreme heat within this locality. Mapping from this study recorded a variation in temperature of up to 15 degrees Fahrenheit across the City, with temperatures highest in downtown and low-income neighborhoods. Late evening temperatures of greater than 89 degrees were observed in these areas.

Projected Local Vulnerability

Factors that can increase vulnerability to extreme temperature include the weatherization rate of buildings, impervious surfaces ratios, and age of residents. For very few other hazards is social vulnerability, including factors of age, health and well-being, and poverty, such a key marker of risk. For this reason, social vulnerability numbers from the NRI are a key indicator of local vulnerability for this hazard.

Table 23: Social Vulnerability, NRI

Locality	Social Vulnerability
Alleghany County	Relatively Low
City of Covington	Very Low
Botetourt County	Very Low
Craig County	Very Low
Roanoke County	Very Low
City of Roanoke	Very High
City of Salem	Relatively Low

Hazard Ranking Table

Table 24: Hazard Ranking for Extreme Temperature

Hazard Ranking

Table: Extreme Temperatures

Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Region-Wide Effects	Medium	Less than Annual	Medium	Medium
City of Covington	Region-Wide Effects	Low	Less than Annual	Low	Low
Town of Clifton Forge	Region-Wide Effects	Low	Less than Annual	Low	Low
Town of Iron Gate	Region-Wide Effects	Low	Less than Annual	Low	Low
Craig County	Region-Wide Effects	Low	Less than Annual	Low	Low
Town of New Castle	Region-Wide Effects	Low	Less than Annual	Low	Low
Botetourt County	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Buchanan	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Fincastle	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of Troutville	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Roanoke County	Region-Wide Effects	Medium	Annual	Low	Medium
Town of Vinton	Region-Wide Effects	Medium	Annual	Low	Medium
City of Roanoke	Region-Wide Effects	Medium	Annual	High	High
City of Salem	Region-Wide Effects	Low	Annual	Medium	Medium
<i>Regional Score</i>	<i>Region-Wide Effects</i>	<i>Medium</i>	<i>Annual</i>	<i>Low</i>	<i>Medium</i>

4.4 Flooding

Flooding is one of the most impacting hazards to the region. All of the jurisdictions and special districts within this plan have to deal directly with flooding on at least an annual basis. The HAZUS model for flooding in the region includes a 100-year and 500-year model. All reports are located in **Appendix D**. Flood Hazard Areas are also mapped in **Appendix D**.

There are two types of flooding of concern in the region. Riverine flooding is most common. Most of the data in this chapter will focus on riverine flooding. Flooding due to failed infrastructure is also an issue across the planning region, specifically failure of culverts and other stormwater detention or diversion infrastructure, and failure of dams.

Stormwater infrastructure failure is an issue in some localities, most commonly in more urbanized areas including in the Cities of Covington, Roanoke, and Salem. Infrastructure typically fails when not designed to transmit the volume of water produced by a given precipitation event. Culverts, which allow stormwater to pass under roads or railways, are designed for 100-year events in most cases, though some may be designed for higher flow where safety impacts are of particular concern.¹⁷ Documenting failed or overwhelmed stormwater infrastructure, especially where it can directly impact critical facilities beyond roadways, is an important potential project for local governments. The City of Covington recently received funding from the Community Flood Preparedness Fund to complete their Drainage Study mentioned in Chapter 3. Resilience Plans from the City of Roanoke and the City of Salem also address this kind of flooding.

A flood prone roadway study was completed by the Regional Commission in 2005. The outcomes of the study were documented in the 2019 Plan. This study has not been updated.

One of the most common drivers of extreme precipitation events which produce flooding in the region is hurricanes. For this reason, hurricane hazards are considered included for assessment in this section. The history of hurricane events and hurricane-derived flooding is included in Chapter 3.

Several localities in the region are CRS communities. Other localities have indicated interest. Where appropriate information in this section will support this designation.

Projected Scale of Event

The frequency of large-scale flood events is projected via the 100-year and 500-year floodplain for given parcels. The majority of flood events are more likely to be smaller, semi-local events driven by precipitation.

Because riverine flooding specifically is tied to streams which flow through multiple localities, a flood in a specific watershed also usually affects multiple localities in the planning region. For example, a flood of the Roanoke River would affect Roanoke County, the City of Salem, the City of Roanoke, and the Town of Vinton to varying degrees. Similarly, a flood event on the James River could affect Botetourt County and the Town of Buchanan, or, if the entire Upper James watershed is impacted, the Alleghany Highlands localities. Flooding is largely driven by precipitation. Changes in precipitation patterns in the region have resulted in stronger individual precipitation events over the last several years, which increase flooding impacts.

¹⁷ (Virginia Department of Transportation, 2002)

As discussed in [Chapter 3: Hazard Identification](#), multiple high hazard dams exist in the region. Specific known structural vulnerabilities and safety incidents are documented in that chapter. Although flood inundation maps are a requirement of the current Impounding Structure Regulations, Virginia DCR does not currently have this information available in a digital form. Were these maps available, they would illustrate the probable area of flooding downstream of a dam in the event of failure.

Projected Costs of Event

For this plan, a HAZUS model was run for riverine flooding at the 100-year and 500-year thresholds. The full reports are contained in [Appendix D: Flooding HAZUS Reports](#).

Table 25: Estimated Annual Loss for Flooding, NRI

Locality	Expected Annual Loss	Exposure Value
Alleghany County	\$1,269,955	\$16,809,384,028
City of Covington	\$175,909	\$6,391,387,076
Botetourt County	\$504,537	\$16,236,678,289
Craig County	\$31,287	\$3,055,738,660
Roanoke County	\$600,519	\$26,537,346,445
City of Roanoke	\$752,345	\$38,605,696,944
City of Salem	\$621,251	\$34,391,371,524

While the estimated annual loss for flooding is already high for many localities, a 100-year flood event could have catastrophic impacts to the region. The following include possible outcomes of a 100-year flood event. An event is unlikely to occur across the entire region at the same time, as multiple watersheds are represented. However, as Hurricane Helene showed in western North Carolina, this is not an impossible scenario.

- Damage to Roanoke Memorial hospital resulting in the loss of 703 beds in the region.
- 11,401 people living in the region displaced; 1,632 people requiring temporary shelter.
- Significant damage to transportation systems across the region.
- Damage to water and wastewater systems in Alleghany County and City of Salem, and damage to wastewater systems in Botetourt, Covington, Craig, and Roanoke County and the City of Roanoke.
- Damage to public schools in Covington, Craig, and Salem.
- Damage to two emergency operations centers and two fire stations in Covington.
- Damage to one fire station in the Roanoke area.
- Damage to police stations in Alleghany, Covington, and the Roanoke area.

Mitigation of these facilities for a 100-year or greater flood event is a desirable outcome of this plan.

Roanoke Valley Resource Authority

The following vulnerabilities were identified by Roanoke Valley Resource Authority staff.

- Smith Gap Landfill: The landfill is outside of the 100-year floodplain but the initial portion of the access road located off the Exit 128 of I-81 would be impacted by the 100-year flood based on current FEMA mapping.
- Tinker Creek Transfer Station: Much of this facility is located in the 100-year floodplain, though the main operations building is located outside the floodplain.
- Salem Transfer Station: This facility is located entirely in the 100-year floodplain.

Western Virginia Water Authority

Several facilities owned and operated by the Western Virginia Water Authority are within the 100-year floodplain.

Table 26: WVWA Facilities in the Floodplain

Facility	Location	Address
Muse Spring Water Treatment Facility	Roanoke City	2135 MOUNT PLEASANT BLVD SE, Roanoke, VA, 24014
Roanoke Regional Wastewater Treatment Facility	Roanoke City	1502 Brownlee Ave, Roanoke SE, VA 24014
Eagle Rock Wastewater Treatment Facility	Botetourt Co.	14501 Church St. Eagle Rock, VA 24085
Mount Pleasant Water Pump Station	Roanoke City	2135 MOUNT PLEASANT BLVD SE, Roanoke, VA, 24014
3rd Street Sewer Pump Station	Vinton	Across from 804 3rd St, Vinton

Projected Frequency of Event

Overall frequency of flood events by locality is best assessed through the National Risk Index. A definition for the threshold of riverine flooding captured by the NRI (e.g. 2-year flood, 5-year flood, etc.) was not readily available. However, more frequent flood events do directly impact operations for many localities in the region, specifically outdoor recreation operations and roadways.

Table 27: Annualized Frequency for Flooding, NRI

Locality	Annualized Frequency Value (Events per Year)
Alleghany County	1.1
City of Covington	0.3
Botetourt County	1.7
Craig County	0.6
Roanoke County	2.1
City of Roanoke	1.6
City of Salem	0.9

Projected Local Vulnerability

One way to demonstrate specific local vulnerability is by looking at the number of repetitive loss structures in the locality. Repetitive loss structures are defined as a structure that has had two or more claims within any 10-year period since 1978 of more than \$1,000 paid by the National Flood Insurance Program (NFIP). Identifying repetitive loss structures is one of the ways to receive points in the CRS program.

As a point-to-point comparison the most effective way to assess local vulnerability would be to assess the percentage of structures that are repetitive loss structures within the locality. However, for the purposes of this plan comparison will be made between real count of structures.

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Table 28: Repetitive Loss Structures by Locality, FEMA

Locality	NFIP Repetitive Loss Structures	NFIP Serious Repetitive Loss Structures	Federal Mitigation Assistance Repetitive Loss	Federal Mitigation Assistance Serious Repetitive Loss	Primary Residences
ALLEGHANY COUNTY	27	0	1	0	13
Single Family Dwelling	22	0	1	0	12
Single Family Residential Building	3	0	0	0	1
Non Residential Building	2	0	0	0	0
BOTETOURT COUNTY	28	6	1	6	5
Single Family Dwelling	19	3	1	3	5
Non Residential Building	8	2	0	2	0
Non Residential Building B	1	1	0	1	0
COVINGTON CITY	5	0	0	1	1
Single Family Dwelling	4	0	0	1	1
Non Residential Building	1	0	0	0	0
CRAIG COUNTY	6	0	0	1	3
Single Family Dwelling	4	0	0	1	3
Non Residential Building	2	0	0	0	0
ROANOKE CITY	85	11	2	16	32
Single Family Dwelling	47	4	2	5	26
2-4 Unit Residential Building	2	0	0	0	0
Residential Building More than 4 Units	7	0	0	0	0
Non Residential Business	1	0	0	0	0
Single Family Residential Building	6	0	0	0	6
Non Residential Building	22	7	0	11	0
ROANOKE COUNTY	41	3	1	5	32
Single Family Dwelling	29	1	1	3	23
Residential Building More than 4 Units	1	0	0	0	0
Single Family Residential Building	9	1	0	1	9
Non Residential Building	1	1	0	1	0
Non Residential Building B	1	0	0	0	0

Locality	NFIP Repetitive Loss Structures	NFIP Serious Repetitive Loss Structures	Federal Mitigation Assistance Repetitive Loss	Federal Mitigation Assistance Serious Repetitive Loss	Primary Residences
SALEM CITY	90	29	5	35	50
Single Family Dwelling	56	9	4	15	41
2-4 Unit Residential Building	5	1	0	1	1
Residential Building More than 4 Units	12	12	0	12	0
Non Residential Business	2	2	0	2	0
Single Family Residential Building	8	4	1	4	7
Residential Manufactured Home	1	0	0	0	1
Non Residential Building	6	1	0	1	0
Grand Total	282	49	10	64	136

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Hazard Ranking Table

Table 29: Hazard Ranking Table for Flooding

Hazard Ranking Table: Flooding

Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Region-Wide Effects	High	Multiple Times per Year	Medium	High
City of Covington	Region-Wide Effects	High	Less than Annual	Low	Medium
Town of Clifton Forge	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Town of Iron Gate	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Craig County	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Town of New Castle	Region-Wide Effects	Medium	Less than Annual	Low	Medium
Botetourt County	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Town of Buchanan	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Town of Fincastle	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Town of Troutville	Region-Wide Effects	High	Multiple Times per Year	Medium	High
Roanoke County	Region-Wide Effects	Medium	Multiple Times per Year	Medium	High
Town of Vinton	Region-Wide Effects	Medium	Multiple Times per Year	Medium	High
City of Roanoke	Region-Wide Effects	Medium	Multiple Times per Year	High	High
City of Salem	Region-Wide Effects	Medium	Annual	High	High
<i>Regional Score</i>	<i>Region-Wide Effects</i>	<i>High</i>	<i>Multiple Times per Year</i>	<i>Medium</i>	<i>High</i>

4.5 Geologic Hazards

For the purposes of this assessment, landslide and karst have been grouped under geologic hazards. Both of these hazards include often localized sudden ground movement.

Landslide is most common in areas with high slopes, which includes much of the planning region. In Chapter 3, only one historic landslide of note was recorded in the past five years. However, the region has many characteristics which make landslides a hazard of concern.

Karst is a hazard unique to particular geologies. As such it is difficult to find national resources for assessing this hazard. Data in this section comes from the Virginia Department of Energy, Department of Conservation and Recreation, and Department of Emergency Management.

The major risk for karst areas is the development of sinkholes that directly or indirectly affect critical infrastructure. The Virginia Department of Energy began mapping karst via KarstView along the I-81 corridor following several sinkhole events that directly affected this interstate.¹⁸ However, this mapping is somewhat opaque in terms of capturing likelihood of a sinkhole or potential costs.

The second impact from karst is pollution of groundwater. In the planning region, groundwater remains a major source of water supply for several localities, including the Western Virginia Water Authority service area and the Alleghany Highlands. A full list of known wells is included in the Critical Facilities Inventory in [Appendix F](#). This hazard impact is not fully explored in this plan.

Both of these hazards show a relationship with high rain events.

Projected Scale of Event

Sinkhole events are highly localized events, usually affecting a specific facility or lot. Most landslide events are also localized, some impacting as little as one parcel. In extreme conditions, such as Hurricane Helene in Asheville, multiple landslides may occur. Sometimes landslides can build upon one another as was the case in Nelson and Albemarle Counties.

[Case Study: Past Landslides in Nelson and Albemarle Counties](#)

Nelson and Albemarle Counties share similar topographic characteristics to the region. In August 1969, an extreme rainfall event instigated by Hurricane Camille caused over 7,800 landslides, which created approximately 2,000 acres worth of impact. One hundred and twenty-five people died in Nelson County alone from impacts of this storm system, which included flooding and landslide impacts.¹⁹ This was a similar event to Hurricane Helene, which struck western North Carolina and Southwest Virginia in September of 2024.

Geology and Mineral Services received funding through VDEM and FEMA in 2017 and 2020 to complete a landslide hazard mapping study for Nelson and Albemarle Counties. This kind of local study can have greater accuracy than national models. The events in 1969 and in 2024 highlight the importance of having good information to plan emergency response to and mitigation efforts for this hazard.

¹⁸ (Virginia Department of Energy, n.d.)

¹⁹ (Landslide Hazard Mapping, n.d.)

Projected Costs of Event

Costs of sinkholes can range depending on the location of the sinkhole. A sinkhole directly affecting a major roadway is probably one of the most costly events. Costs come from direct damage to infrastructure at inception and then include stabilization efforts for the sinkholes once established. The largest of the three sinkholes which affected I-81 in Augusta County cost over \$100,000 to repair. It measured 20 feet by 11 feet and 22 feet deep.²⁰

Many sinkholes open up in fields and other open spaces, and therefore have limited and localized costs, if any.

Expected annual loss for landslide is available in the National Risk Index. Costs are generally low, but it is important to note that the cost of landslides varies widely depending on location. Because this is such a localized event, impacts can be quite targeted. The landslide recorded in 2021 included \$25,000 in damages from a single building. Widespread events in more populated areas could quickly accrue costs.

Table 30: Expected Annual Loss, NRI

Locality	Expected Annual Loss	Exposure Value
Alleghany County	\$46,739	\$140,941,177,976
City of Covington	\$21,900	\$48,638,641,691
Botetourt County	\$37,168	\$226,916,018,449
Craig County	\$21,900	\$38,621,453,915
Roanoke County	\$333,796	\$653,035,188,326
City of Roanoke	\$122,400	\$679,915,744,515
City of Salem	\$21,900	\$198,922,958,937

Projected Frequency of Event

There is no good data on the frequency of sinkholes for each separate jurisdiction. The closest comparison may be to the expected annual frequency of landslides in the area, which, despite the increased susceptibility to landslides shown in the topographic data, is relatively low.

The National Risk Index measures projected landslide frequency based off of the number of landslides recorded over a twelve-year period between 2010 and 2021. All of the localities in the region showed a projected frequency of zero landslides per year, despite some localities having events on record during that time period. The landslide noted in Chapter 3 was not captured in this dataset.

²⁰ (Virginia Department of Emergency Management, 2023)

Table 31: Events on Record 2010-2021, NRI

Locality	Events on Record (2010-2021)
Alleghany County	1
City of Covington	0
Botetourt County	1
Craig County	0
Roanoke County	5
City of Roanoke	0
City of Salem	0

Despite the NRI data, the USGS Landslide Susceptibility model shows strong landslide vulnerability in the area. Darker red indicates increased vulnerability to landslides. Steep slopes mean that most of the region is vulnerable to landslides in the right conditions, though notable the more populated areas show less vulnerability.

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Figure 26: Landslide Susceptibility Model in the Region

Projected Local Vulnerability

Local vulnerability to karst is poorly understood – it is unknown what factors may make a jurisdiction more or less vulnerable to karst. One potential factor for consideration is the number of households using unmonitored groundwater wells – this could show a locality specific vulnerability to this particular hazard. Alternatively, karst may be more prevalent in climates where long dry spells are followed by periods of intense rain. Further assessment is needed to understand the unique factors that predispose jurisdictions to karst damage.

A small portion of the planning region is located inside of a USGS recognized sinkhole hotspot, mostly in Craig and northern Roanoke Counties. Less populous portions of Alleghany and Botetourt Counties may also be at risk. A full definition of a sinkhole hotspot is not readily available on the USGS website.

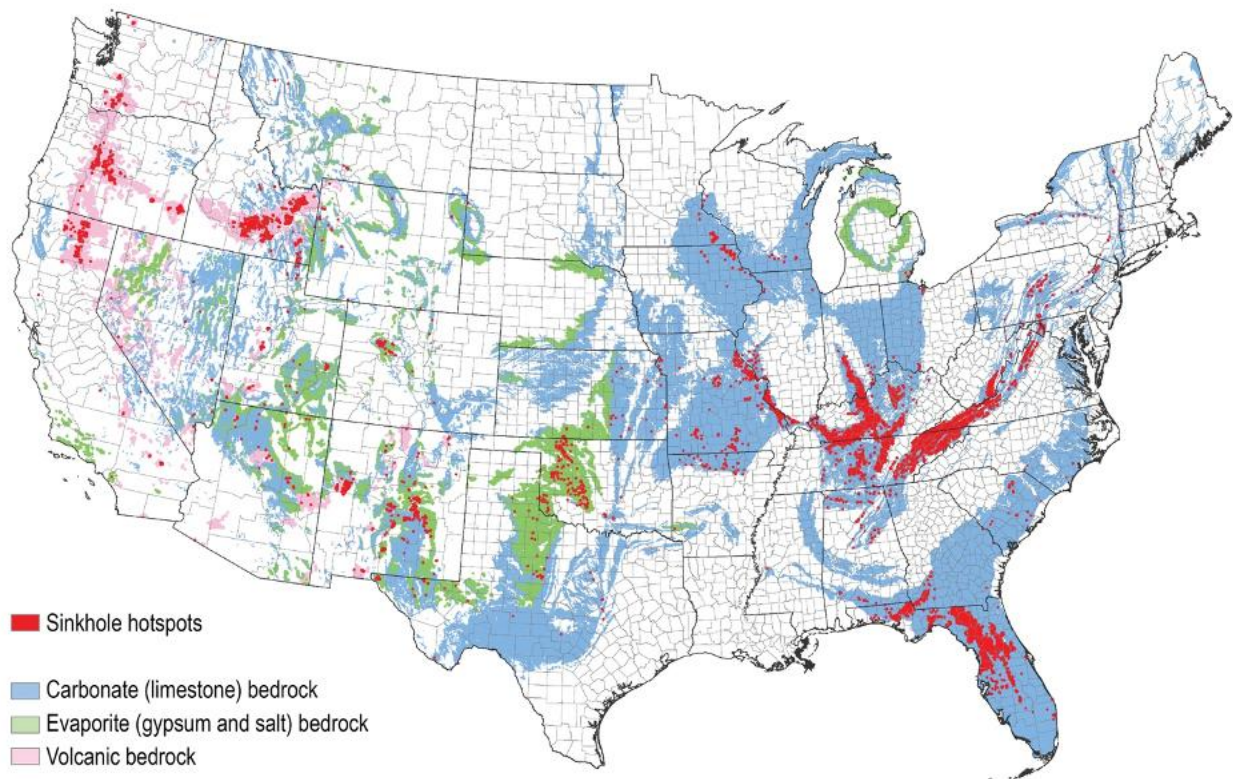


Figure 27: USGS Sinkhole Hotspots, Accessed 2025

Landslides are also difficult to quantify. During Hurricane Helene, one of the complicating factors experienced by neighboring communities in North Carolina and far Southwest Virginia was landslides caused by extreme rain.

The Virginia Department of Energy recommends identifying areas prone to future landslide hazards in order to target evacuation orders during severe rainstorm events, defined as greater than 5 inches in 24 hours.

The NOAA Atlas shows projected rainfall event frequency. Rainfall data for the City of Covington, Craig County, and the City of Roanoke show that 5 inches in 24 hours is more or less a 25-year storm in Covington and Craig, but closer to a 10-year storm in the City of Roanoke. A framework

based on rainfall frequency could be a valid way to assess potential landslide risk in future updates of this plan.

Projected Local Vulnerability for this hazard is determined by a visual assessment of the landslide and karst vulnerability map. However, future projections around this hazard should take into account more advanced analysis of vulnerability to landslides via GIS manipulation and analysis of rainfall probability as a major determinant of likelihood of landslides.

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Hazard Ranking Table

Table 32: Hazard Ranking for Geologic Hazards

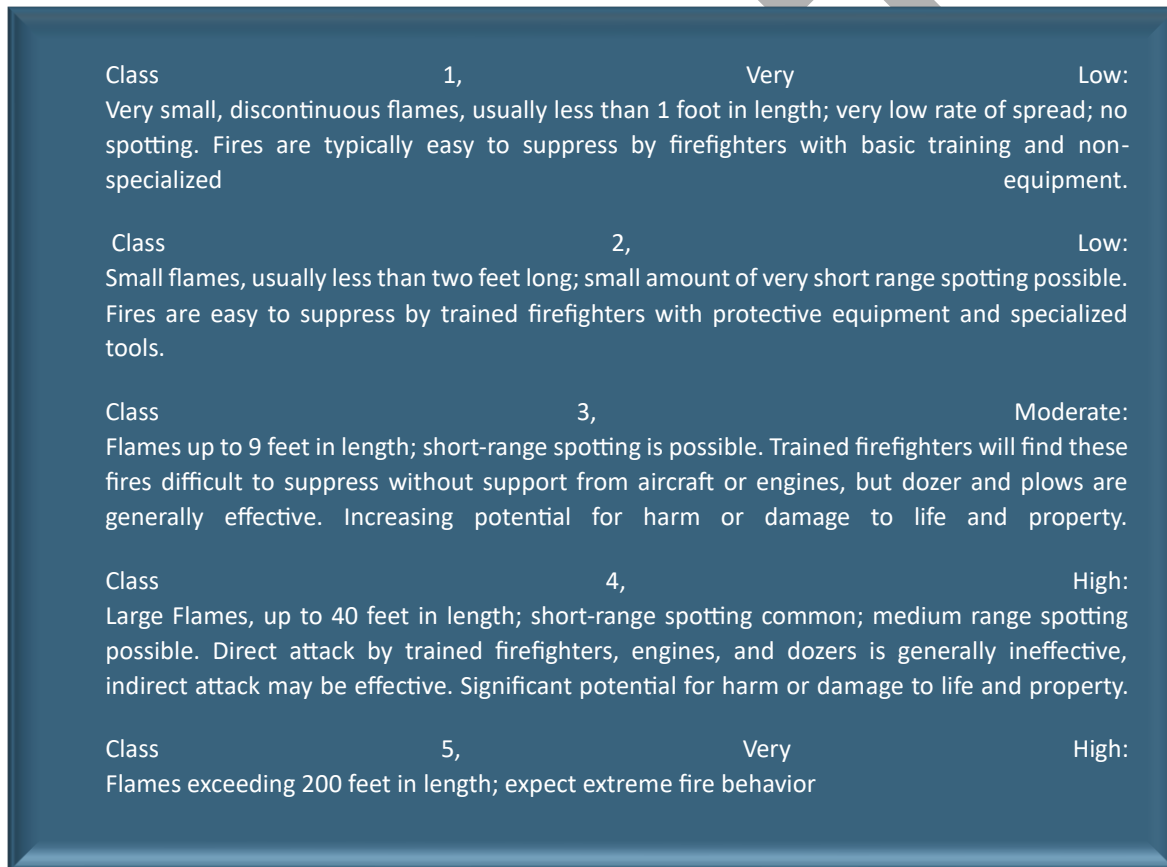
Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Local Effects	High	Less than Annual	High	Medium
City of Covington	Local Effects	Low	Less than Annual	Low	Low
Town of Clifton Forge	Local Effects	Low	Less than Annual	Low	Low
Town of Iron Gate	Local Effects	Low	Less than Annual	Low	Low
Craig County	Local Effects	Low	Less than Annual	High	Low
Town of New Castle	Local Effects	Low	Less than Annual	Medium	Low
Botetourt County	Local Effects	Low	Less than Annual	Medium	Low
Town of Buchanan	Local Effects	Low	Less than Annual	Low	Low
Town of Fincastle	Local Effects	Low	Less than Annual	Low	Low
Town of Troutville	Local Effects	Low	Less than Annual	Low	Low
Roanoke County	Local Effects	Medium	Less than Annual	High	Medium
Town of Vinton	Local Effects	Low	Less than Annual	Low	Low
City of Roanoke	Local Effects	Low	Less than Annual	Low	Low
City of Salem	Local Effects	Low	Less than Annual	Low	Low
<i>Regional Score</i>	<i>Local Effects</i>	<i>Low</i>	<i>Less than Annual</i>	<i>Low</i>	<i>Low</i>

4.6 Wildfire

Wildfire risk analysis benefits from some of the most robust data available. Data in this section comes from the National Risk Index to establish easy points of comparison for risk ranking, and from the Southern Wildfire Risk Assessment tool. Assistance was provided by VDOF staff in gathering the data for this section. The entire regional report for wildfire risk is available in [Appendix E: Wildfire Reports](#).

Projected Scale of Event

The VDOF and the Southern Wildfire Risk Assessment tool provides a Characteristic Fire Intensity Scale, which uses data on significant fuel hazards, wind, and weather conditions in a WildEST framework to provide a standard scale to measure potential wildfire intensity.



Class	1,	Very	Low:
Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.			
Class	2,		Low:
Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.			
Class	3,		Moderate:
Flames up to 9 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.			
Class	4,		High:
Large Flames, up to 40 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.			
Class	5,	Very	High:
Flames exceeding 200 feet in length; expect extreme fire behavior			

Figure 28: Characteristic Fire Intensity Scale, VDOF

This evaluation varies by locality. Data is available for Clifton Forge in this model.

Table 33: Characteristic Fire Intensity, VDOF

Scale Category	Alleghany County		City of Covington		Clifton Forge		Botetourt County	
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage
0	12,813	4%	1,887	52%	930	47%	28,661	8%
1	8,755	3%	308	8%	233	12%	10,930	3%
1.5	19,694	7%	218	6%	67	3%	35,497	10%
2	77,686	27%	422	12%	277	14%	84,988	24%
2.5	117,072	41%	480	13%	368	19%	102,757	29%
3	33,840	12%	185	5%	31	2%	65,435	19%
3.5	7,383	3%	117	3%	28	1%	11,030	3%
4	6,119	2%	12	0%	41	2%	7,634	2%
4.5	1,858	1%	2	0%	8	0%	2,433	1%
5	8	0%	0	0%	0	0%	37	0%
Greater than 5	-	0%	0	0%	0	0%	0	0%
Total Acreage	285,227		3,630		1,981		349,400	

Scale Category	Craig County		Roanoke County		City of Roanoke		City of Salem	
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage
0	8,381	4%	27,374	17%	21,475	78%	7,134	76%
1	4,872	2%	8,320	5%	2,080	8%	859	9%
1.5	10,334	5%	10,114	6%	291	1%	164	2%
2	48,606	23%	32,438	20%	1,352	5%	566	6%
2.5	90,580	43%	52,508	33%	1,363	5%	360	4%
3	34,794	16%	19,715	12%	817	3%	217	2%
3.5	6,349	3%	4,895	3%	38	0%	11	0%
4	4,759	2%	2,066	1%	33	0%	23	0%
4.5	2,778	1%	2,884	2%	15	0%	2	0%
5	144	0%	355	0%	0	0%	0	0%
Greater than 5	0	0%	0	0%	0	0%	0	0%
Total Acreage	211,596		160,668		27,464		9,337	

Projected Costs of Event

Expected Annual Loss and Exposure Value are not particularly high for this hazard. However, some context is missing from the NRI data.

Table 34: Expected Annual Loss for Wildfire, National Risk Index

Locality	Expected Annual Loss	Exposure Value
Alleghany County	\$2,536	\$3,900,729,935
City of Covington	\$194	\$1,969,158,111
Botetourt County	\$8,737	\$10,057,952,335
Craig County	\$784	\$1,237,584,666
Roanoke County	\$4,347	\$62,863,692,940
City of Roanoke	\$3,671	\$62,717,344,368
City of Salem	\$1,285	\$17,697,712,831

Roanoke County Fire & Rescue (RCFRD) has demonstrated a substantial financial commitment to wildland fire protection, ensuring the community is safeguarded against the growing risks of brush and wildland-urban interface fires. The County's Wildland Fire Team responds to approximately 80 calls for service annually, deploying 33 specially trained personnel in wildland fire suppression. This capability is supported by a dedicated fleet of eight brush trucks, one Wildland Fire Engine, and one deployable trailer equipped with specialized resources. In addition to serving local needs, Roanoke County maintains a Memorandum of Understanding (MOU) with the Federal Forestry Department, enabling the department to provide mutual aid on federal property within the County and to deploy trained personnel and assets to assist in wildfire suppression efforts in other states. This dual capability reflects both a strong local investment and a regional commitment to public safety, resource protection, and interagency cooperation.

Projected Frequency of Event

The NRI Annualized Frequency Value for this hazard is low throughout the planning region. It is important to note that while wildfires do occur frequently in the planning region, the majority of fires are small, with negligible risk and impact. The threshold for a major fire cited in **Chapter 3** is 100 acres. One major fire has occurred in Roanoke County in the past five years, which implies a 20 percent chance of a major fire in a given five-year period. More data is needed to assess, but the frequency value for Roanoke County's assessment was adjusted up in the risk assessment.

Table 35: Annualized Frequency Value for Wildfire, NRI

Locality	Annualized Frequency Value (%)
Alleghany County	0.027
City of Covington	0.001
Botetourt County	0.047
Craig County	0.008
Roanoke County	0.002
City of Roanoke	0.001
City of Salem	0.001

Projected Local Vulnerability

Housing Unit Risk represents the relative potential risk to housing units. This allows for an estimate of how many housing units are at a high risk of wildfire damage. This metric is used to estimate the acreage at a risk of 4 to 6 within each of the available localities for, and that percentage value is ranked as high, medium, or low in the vulnerability table.

Another factor that may affect local vulnerability is the percentage of federal forest land and the topography. Rural areas of Roanoke County, Craig County, and Alleghany County are federally managed. Local vulnerability has been adjusted to account for that factor.

Table 36: Housing Unit Risk, Virginia Department of Forestry

Risk Ranking	Alleghany County		City of Covington		Clifton Forge		Botetourt County	
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage
1	2	0%	0	0%	0	0%	6	0%
2	180	0%	21	1%	4	0%	312	0%
3	11,411	4%	430	12%	149	7%	30,108	9%
4	33,308	12%	1,617	45%	832	42%	75,424	22%
5	5,820	2%	761	21%	683	34%	7,258	2%
6	-	0%	0	0%	12	1%	0	0%
Total Acreage	285,227		3,630		1,981		349,400	
No Risk	234,506	82%	801	22%	301	15%	236,293	68%
Risk Greater than 4	39,128	14%	2,378	34%	1527	77%	82,682	24%

Risk Ranking	Craig County		Roanoke County		City of Roanoke		City of Salem	
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage
1	0	0%	42	0%	322	1%	116	1%
2	5	0%	495	0%	857	3%	498	5%
3	16,588	8%	15,771	10%	5,165	19%	2,592	28%
4	23,711	11%	59,729	37%	7,527	27%	4,543	49%
5	686	0%	9,941	6%	1,794	7%	595	6%
6	0	0%	17	0%	1	0%	0	0%
Total Acreage	211,596		160,668		27,464		9,337	
No Risk	170,607	81%	74,673	46%	11,798	43%	993	11%
Risk Greater than 4	24,397	12%	69,687	43%	9,322	34%	5,138	55%

Hazard Ranking Table

Table 37: Hazard Ranking Table for Wildfire

Hazard Ranking Table:	Wildfire				
Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Jurisdiction-Wide Effects	Low	Less than Annual	High	Medium
City of Covington	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Town of Clifton Forge	Jurisdiction-Wide Effects	Low	Less than Annual	High	Medium
Town of Iron Gate	Jurisdiction-Wide Effects	Low	Less than Annual	High	Medium
Craig County	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Town of New Castle	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Botetourt County	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Town of Buchanan	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Town of Fincastle	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Town of Troutville	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
Roanoke County	Jurisdiction-Wide Effects	High	Annual	High	High
Town of Vinton	Jurisdiction-Wide Effects	Low	Less than Annual	Medium	Low
City of Roanoke	Local Effects	Low	Less than Annual	Medium	Low
City of Salem	Local Effects	Low	Less than Annual	Medium	Low
<i>Regional Score</i>	<i>Jurisdiction-Wide Effects</i>	<i>Low</i>	<i>Less than Annual</i>	<i>Medium</i>	<i>Low</i>

4.7 Wind Event

Wind events are one of the most frequent hazards in the planning region. They can also be costly. This section looks at data from the National Risk Index, National Centers for Environmental Information, and other sources to evaluate risk of wind events including straight line winds and tornados.

One major cause of extreme wind in the region is hurricanes. Effects from hurricanes generally spawn straight line winds, but may occasionally spawn tornado winds.

Projected Scale of Event

Generally, the majority of events experience in the region are straight line winds. Wind events often spawn from bands of storm cells which cut across the region. Most wind events are multi-jurisdictional within a given 24-hour period, though individual impacts are usually most localized.

Projected Costs of Event

Costs for wind events can vary greatly. In Chapter 3, one of the most expensive wind events documented, an F1 tornado which damaged a local business, resulted in over a million dollars of damages. However, the majority of wind event records in the past five years do not contain damage estimates. In fact only eight percent of the records in the NCEI database for the planning region contained damage estimates. The average cost across events with recorded damages was \$112,906, but the average across all wind events was only \$10,640. This makes it difficult to estimate the probable economic impact of a given event for the region.

The National Risk Index tracks two wind event categories relevant to this hazard (excluding hurricanes, which also spawn wind damages). The Expected Annual Loss for Strong Wind and Tornado are included in the table below.

Table 38: Expected Annual Loss for Wind Events, NRI

Locality	Expected Annual Loss - Strong Wind	Expected Annual Loss - Tornado
Alleghany County	\$ 172,445.00	\$ 45,378.00
City of Covington	\$ 110,402.00	\$ 20,258.00
Botetourt County	\$ 361,702.00	\$ 106,201.00
Craig County	\$ 84,036.00	\$ 14,927.00
Roanoke County	\$ 1,018,060.00	\$ 352,206.00
City of Roanoke	\$ 1,043,952.00	\$ 409,594.00
City of Salem	\$ 344,362.00	\$ 114,772.00

Projected Frequency of Event

Wind events occur more than annually around the region. The highest number of occurrences are projected in the Roanoke Valley, which includes the City of Roanoke, City of Salem, Roanoke County, and the Town of Vinton.

Table 39: Annualized Frequency Value for Wind Events, NRI

Locality	Events per Year	
	Annualized Frequency Value - Strong Wind	Annualized Frequency Value - Tornado
Alleghany County	2.3	0.1
City of Covington	2.5	0
Botetourt County	2.7	0.1
Craig County	2.6	0
Roanoke County	3.4	0
City of Roanoke	3.4	0
City of Salem	3.4	0

Projected Local Vulnerability

Wind events can compound other hazards, including winter weather and extreme cold. Wind is often a primary factor in power loss following storm events, as strong winds blow down trees and impact powerlines. Power lines are generally privately owned and maintained. Strong winds can also negatively affect RVs and other outdoor recreation users, who can be particularly vulnerable in an event. Further analysis is needed to develop specific nuance in local vulnerability. One potential factor for further development is topography.

Hazard Ranking Table

Table 40: Hazard Ranking for Wind Events

Hazard Ranking

Table: Wind Event

Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
City of Covington	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of Clifton Forge	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of Iron Gate	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Craig County	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of New Castle	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Botetourt County	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of Buchanan	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of Fincastle	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Town of Troutville	Jurisdiction-Wide Effects	High	Multiple Times per Year	To be developed	High
Roanoke County	Jurisdiction-Wide Effects	Medium	Multiple Times per Year	To be developed	High
Town of Vinton	Jurisdiction-Wide Effects	Medium	Multiple Times per Year	To be developed	High
City of Roanoke	Jurisdiction-Wide Effects	Medium	Multiple Times per Year	To be developed	High
City of Salem	Jurisdiction-Wide Effects	Medium	Multiple Times per Year	To be developed	High
<i>Regional Score</i>	<i>Jurisdiction-Wide Effects</i>	<i>High</i>	<i>Multiple Times per Year</i>	<i>To be developed</i>	<i>High</i>

4.8 Winter Storm

Winter storm is another frequent hazard in the area. Localities and the Virginia Department of Transportation spend money every winter preparing the transportation network for winter storm events and ice and snow accumulation. These events also impact powerlines and the electrical grid, similar to wind events and extreme cold. The National Risk Index includes two event types of relevance: ice storm, a freezing rain event with significant ice accumulations of .25 inches or greater; and winter weather, which includes winter storm events in which the main types of precipitation are snow, sleet, or freezing rain.

Projected Scale of Event

As discussed in Chapter 3, events are generally wide-spread and affect multiple jurisdictions. While effects may vary across the jurisdictions, winter storms are generally a region-wide event.

Projected Costs of Event

Generally, expected annual loss is higher for winter weather generally than for ice storms specifically, which makes sense given the relative frequency of these events. However, NRI numbers for Craig County are reversed. This may reflect an inaccuracy in the national database. The higher value will be used in ranking this element of the hazard impact.

Table 41: Costs of a Winter Weather Event

Locality	Expected Annual Loss - Winter Weather	Expected Annual Loss - Ice Storm
Alleghany County	\$ 11,190.00	\$ 1,819.00
City of Covington	\$ 6,372.00	\$ 3,081.00
Botetourt County	\$ 19,959.00	\$ 6,391.00
Craig County	\$ 3,092.00	\$ 20,097.00
Roanoke County	\$ 103,699.00	\$ 2,120.00
City of Roanoke	\$ 135,292.00	\$ 20,524.00
City of Salem	\$ 37,482.00	\$ 6,921.00

Projected Frequency of Event

Winter storms occur frequently, several times a year. Ice storms with greater than .25 inches of accumulation are less frequent but still occur at least every other year across the planning region, more frequently than many other hazards.

Locality	Annualized Frequency Value - Winter Weather	Annualized Frequency Value - Ice Storm
Alleghany County	3.8	0.5
City of Covington	3.8	0.5
Botetourt County	3.5	0.6
Craig County	3.3	0.5
Roanoke County	3.4	0.6
City of Roanoke	3.4	0.6
City of Salem	2.4	0.6

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Projected Local Vulnerability

Some localities specifically maintain their roads and winter storm response vehicles. Others are dependent on the Virginia Department of Transportation. Extensive roadway mileage in rural areas combined with topography challenges mean that rural localities are much more sensitive to winter storm events. Accumulations are generally higher, and roadways are generally impacted longer, especially non-arterial feeder roads.

For the purposes of this assessment, the factor assessed will be limited to roadway mileage. However, alternative factors for evaluation to include in future plans may include average precipitation accumulation per event, cost of transit interruptions, or cost of roadway maintenance. Data for mileage was taken from the 2024 VDOT Mileage Table Book. Localities with an asterisk maintain their own roads in whole or in part.

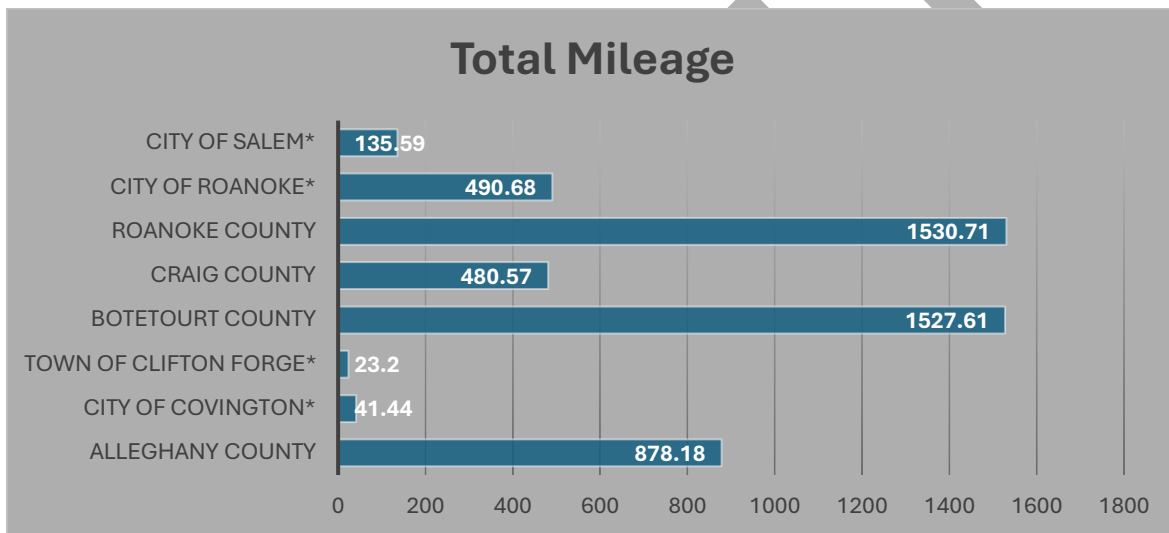


Figure 29: Total Mileage by Locality in 2024, VDOT²¹

²¹ (Virginia Department of Transportation, 2024)

Hazard Ranking Table

Table 42: Hazard Ranking for Winter Storm

Hazard Ranking

Table: Winter Storm

Locality	Scale of Event	Costs per Annum	Frequency of Event	Local Vulnerability Score	Overall Score
Alleghany County	Jurisdiction-Wide Effects	Low	Multiple Times per Year	High	Medium
City of Covington	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Town of Clifton Forge	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Town of Iron Gate	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Craig County	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Medium	Medium
Town of New Castle	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Botetourt County	Jurisdiction-Wide Effects	Low	Multiple Times per Year	High	Medium
Town of Buchanan	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Town of Fincastle	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Town of Troutville	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
Roanoke County	Jurisdiction-Wide Effects	Low	Multiple Times per Year	High	Medium
Town of Vinton	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
City of Roanoke	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Medium	Medium
City of Salem	Jurisdiction-Wide Effects	Low	Multiple Times per Year	Low	Medium
<i>Regional Score</i>	<i>Jurisdiction-Wide Effects</i>	<i>Low</i>	<i>Multiple Times per Year</i>	<i>Low</i>	<i>Medium</i>

Chapter 5. Capabilities Assessment

5.1 Capability Assessment Framework

While [Chapter 2: Regional Profile](#) contains a general picture of the region, including of the local jurisdictions served by this document, this chapter will build on that baseline information. The following sections contain a more detailed analysis of the capacity of each of the jurisdictions in this planning effort.

Each section will include the following elements:

- A general assessment of budget and resources, including staffing.
- A list of plans the jurisdiction has or maintains, when they were last updated if that information is available, and which of these plans address hazards.
- A list of ordinances and policy mechanisms which can be used to assist with implementation of the Hazard Mitigation Plan, and any barriers that may exist to their use.
- Additional NFIP compliance documentation.
- Other factors that may help with mitigation efforts.

Plans and documents previously discussed in **Chapter 3: Hazard Identification** to meet the goals of the CRS program are marked with an asterisk. Responses to worksheets provided by the localities, which contain more in-depth information about their capabilities and their NFIP programs, are included in [Appendix G: Jurisdiction Capability Assessment Surveys](#).

The table below explores one of the best points of comparison between the localities in the region by showing overall revenues and revenues per capita. This clearly illustrates capacity to operate key government services, including mitigation services and disaster response. Data in this chapter comes from a variety of sources. Where possible, data is provided by the Auditor of Public Accounts to the Commonwealth of Virginia. This data reflects real budgets in the years 2024 if available and 2023 if 2024 data was not available. Where neither dataset is available, 2025 or 2026 adopted budgets have been referenced. These budgets are adopted based off of best available information regarding revenues and expenses.

In [Section 4.3: Extreme Temperature](#), the NRI Social Vulnerability Index for larger localities within the region was examined. The City of Roanoke was the only locality which ranked Very High in terms of social vulnerability. All other localities ranked Relatively Low or Very Low.

Population numbers may vary in this chapter. These were taken from two separate sources, one provided by the Commonwealth's Auditor of Public Accounts, one provided by the CEDS. Sources are noted as appropriate.

Table 43: Comparison of Revenue Across RVARC Member Local Governments

Locality	Population ^a	Total Revenue	Total Revenue per Capita
Alleghany County*	14,898	\$81,004,953.00	\$5,437.30
City of Covington	5,567	\$32,225,593.00	\$5,788.68
Town of Clifton Forge**	3,483	\$5,613,161.00	\$1,611.59
Botetourt County	33,466	\$139,116,476.00	\$4,156.95
Craig County	4,855	\$18,953,496.00	\$3,903.91
Roanoke County	96,519	\$441,121,263.00	\$4,570.30
City of Roanoke*	99,634	\$603,957,800.00	\$6,061.76
City of Salem	24,985	\$164,155,327.00	\$6,570.16
Town of Vinton**	8,038	\$15,756,600.00	\$1,960.26
* Data comes from the 2023 Comparative Report			
** Data comes from the website or adopted budget			
^a Data comes from the 2023 and 2024 Comparative Report where available. Where unavailable data comes from the 2025 CEDS.			



5.2 Alleghany County

Alleghany County is the northernmost county in the service area, characterized by largely rural development patterns. Approximately half of the locality is federal forest land, and state-owned lands are also present. The population of the County was 11,479 in 2023 excluding the Town of Clifton Forge and is projected to be 13,993 in 2030. The median age is high for the region, at 48.1 years. Median household income is low at \$52,546. One small rural hospital provides the majority of medical emergency capacity for the locality.

Budget and Staffing Characteristics

The Comparative Report of Local Government Revenues and Expenditures shows the following general information about Alleghany County’s real budget for the year 2023. Alleghany County staffs a Chief Building Official and an Emergency Manager. The Zoning Administrator serves as a combined Community Planner, Floodplain Manager, and GIS coordinator.

Federal share of revenue in the 2023 budget was over 14 percent. Revenue from the Commonwealth was close to 50 percent, showing a significantly high vulnerability to outside funding sources.

Table 44: Alleghany County Budget 2023, Commonwealth of Virginia

Alleghany County Budget 2023	
Population	14,898
Local Revenue	\$ 29,205,904.00
<i>Per Capita</i>	<i>\$ 1,960.39</i>
<i>Percent of Revenue</i>	<i>36.05%</i>
From the Commonwealth	\$ 40,281,474.00
<i>Per Capita</i>	<i>\$ 2,703.82</i>
<i>Percent of Revenue</i>	<i>49.73%</i>
Federal Pass-thru	\$ 10,729,017.00
<i>Per Capita</i>	<i>\$ 720.16</i>
<i>Percent of Revenue</i>	<i>13.24%</i>
Direct Federal Aid	\$ 788,558.00
<i>Per Capita</i>	<i>\$ 52.93</i>
<i>Percent of Revenue</i>	<i>0.97%</i>
Total Federal Vulnerability	\$ 11,517,575.00
<i>Percent of Revenue</i>	<i>14.22%</i>
Total Revenue	\$ 81,004,953.00
Non-Revenue Receipts	\$ 77,240.00
Transfers from Other Funds	-
Total Sources Available	\$ 81,082,193.00

Plans and Planning Schedules

Alleghany County currently has two plans in place which specifically address hazard mitigation. These are the Comprehensive Plan, currently being updated and last updated in 2019, and the Emergency Operations Plan, the new version of which is expected to be adopted in November

2025. Additional plans in place which could incorporate hazard mitigation in the future include the Capital Improvement Plan.

Ordinances and Policy Mechanisms

Alleghany County maintains a County code, several sections of which provide some opportunity for hazard mitigation. Large amendments to the code are possible but may be constrained by funding and staff capacity.

Chapter 30 of the County Code contains Erosion and Sediment Control regulations. These provisions mirror Code of Virginia, § 10.1-563(C). Chapter 34 – Fire Prevention and Protection adopts pertinent sections of the Code of Virginia, § 27-1 et seq. to do with fire management, and additionally describes rules around the sale, possession, and use of fireworks. Chapter 47 of the Code addresses Public Safety.

Chapter 52 of the County Code contains the Stormwater Ordinance. This was last adopted in 2014. It integrates the County's stormwater management requirements with its erosion and sediment control, flood insurance, and floodplain management requirements into a unified stormwater program. This facilitates the submission and approval of plans, issuance of permits, payment of fees, and coordination of inspection and enforcement activities in a more convenient and efficient manner.

Alleghany County adopted its most recent Floodplain District in December 2010 that requires new residential buildings to be elevated to or above the base flood elevation. The floodplain district is an overlay that applies to all other zoning districts. Additional requirements prevent the obstruction of the floodway. In addition to Federal Regulations, the County has established guidelines for development within flood hazard areas. They can be found in Chapter 66-Zoning, of the Code of the County of Alleghany, Virginia. No construction or development, including fill, can be done in a designated floodway. Development can occur in the 100-year floodplain, however the first-floor elevation of a structure must be at least one foot above the designated flood elevations shown on the Flood Insurance Rate Maps. Also, structures in the 100-year floodplain must be in compliance with building code requirements for structures in flood hazard areas. Development can occur in the 500-year floodplain with compliance of building code requirements for structures in flood hazard areas.

Chapter 66 - Zoning Ordinance, contains, among other things, the established flood hazard areas and guidelines for development therein. Chapter 66 and Chapter 54 - Subdivision Ordinance both contain key regulatory authority over land use in the county.

One factor in all localities, including Alleghany, is that many structures may have been built prior to the adoption of these ordinances. Pre-existing structures built in flood prone areas are often only mitigated directly if mitigation is triggered by improvements on the property.

NFIP Compliance

Community Development is the responsible department for NFIP compliance in Alleghany County. The NFIP coordinator is not a Certified Floodplain Manager. NFIP services include permit review, inspections, review of floodplain mapping for zoning and rezoning, and a GIS layer; however, staff capacity is a barrier to running an effective NFIP program. Alleghany County entered the NFIP in

1987. The Indian Draft community within the County is vulnerable to flooding but has limited NFIP policy coverage. The total amount of paid claims in the community is \$2,867,632 for 172 claims.

Dam Safety

There are four dams in Alleghany County. These are the Clifton Forge Dam (owned and maintained by the Town of Clifton Forge), Gathright Dam (owned and maintained by US Army Corps of Engineers), Pond Lick Branch Dam (privately owned) and WestRock #2 Flyash Lagoon Dam (owned and maintained by WestRock). Alleghany County staff review plans annually with Smurfit WestRock, US ACE, and DCR.

Town of Iron Gate

The Town of Iron Gate is a small town on the border of Alleghany and Botetourt Counties, which shares a strong cultural identity with the Alleghany Highlands. The Town engages in water and sewer service provision. They are not an active jurisdiction in this plan but participate through Alleghany County. The Town Code deals mainly with solid waste management and water and sewer service provision.

The Town of Iron Gate has very limited capacity for mitigation, but some utility lines and structures may be vulnerable to hazards. The Town adopted Alleghany County's floodplain ordinance to maintain good standing with NFIP.

Other Factors

The County has also entered into a number of mutual aid agreements in relation to Statewide Aid for Emergency Management, radio communications with neighboring localities and fire and rescue departments, and emergency services. They commonly collaborate with Covington and Clifton Forge, and also with Bath County outside the region. Alleghany County provides support for floodplain management in the Town of Iron Gate.

Alleghany County does maintain a Planning Commission and is a member government of the Roanoke Valley-Alleghany Regional Commission.

5.3 City of Covington

The City of Covington is a small city located in the Allegheny Highlands. The City shares strong cultural connections and some infrastructure with Allegheny County and the Town of Clifton Forge. Population in the City of Covington was 5,671 in 2023 and is expected to fall to 5,434 in 2030. The median age is 41.5. Median household income is low at \$45,737. The City provides water and sewer to residents.

Budget and Staffing Characteristics

The statewide Comparative Report of Local Government Revenues and Expenditures shows the following general information about the City of Covington’s real budget for the year 2024. The City of Covington has a small staff. The Director of Development Services serves as a Building Official, Community Planner, and Zoning Administrator. The Director of Public Safety also serves as Chief of Police and primary Emergency Management response. Covington is a small locality, whose employees generally wear many hats.

Funding is a large barrier to the City in expending mitigation efforts. Hazard mitigation grants were uplifted as a main source of funding for mitigation activities. Additional funding sources for mitigation activities include CIP allocations, utility fees, a stormwater utility fee, and other state funding programs. Federal funding, either direct funding or pass-through from the state government, is about 13 percent of the City’s revenue.

Table 45: City of Covington Budget 2024

City of Covington Budget 2024	
Population	5,567
Local Revenue	\$ 21,666,135.00
<i>Per Capita</i>	\$ 3,891.89
<i>Percent of Revenue</i>	67.23%
From the Commonwealth	\$ 6,405,092.00
<i>Per Capita</i>	\$ 1,150.55
<i>Percent of Revenue</i>	19.88%
Federal Pass-thru	\$ 1,170,444.00
<i>Per Capita</i>	\$ 210.25
<i>Percent of Revenue</i>	3.63%
Direct Federal Aid	\$ 2,983,922.00
<i>Per Capita</i>	\$ 536.00
<i>Percent of Revenue</i>	9.26%
Total Federal Vulnerability	\$ 4,154,366.00
<i>Percent of Revenue</i>	12.89%
Total Revenue	\$ 32,225,593.00
Non-Revenue Receipts	\$ 2,233,967.00
Transfers from Other Funds	-
Total Sources Available	\$ 34,459,560.00

Plans and Planning Schedules

The City of Covington maintains a Capital Improvements Plan, a Continuity of Operations and Local Emergency Operations Plan, a Stormwater Management Plan and an Economic Development Plan.

The Emergency Operations Plan was updated in November 2023. The Stormwater Management Plan was updated in March 2025. A Resilience Plan is in development which will directly affect flooding and flood response in the City.

Ordinances and Policy Mechanisms

Chapter 18 – Environment of the City Code addresses Erosion and Sediment Control in compliance with Code of Virginia § 10.1-560 et seq.

Chapter 19 – Stormwater Management, adopted pursuant to Code of Virginia, § 62.1-44.15:24 et seq., addresses specific stormwater management regulations.

Chapter 20 – Fire Prevention and Protection; Emergency Medical Services designates the city fire department and emergency medical services departments as integral to the safety program of the city and additionally establishes open-air fire restrictions and regulations.

Appendix A addresses Subdivision regulations and Appendix B addresses Zoning. Article XIII-A of Appendix B specifically establishes Floodplain Districts for the City, adopting the FIRM provided by FEMA.

NFIP Compliance

The NFIP program within the City of Covington is maintained by Development Services. The Development Services Director is the primary NFIP administrator. He was formerly certified, but his certification has lapsed. The Development Services Director also serves as the building administrator and zoning administrator, as discussed earlier in this section. Besides staff capacity, one of the barriers to running an effective NFIP program within this jurisdiction is community interest.

The City of Covington entered the NFIP in 1979. Since that time they have paid out 179 claims at \$1,904,162. There are five known repetitive or severe repetitive loss structures in the community.

Dam Safety

There are three dams in that could impact the City of Covington. These are the Gathwright Dam (owned and maintained by US Army Corps of Engineers), Pond Lick Branch Dam (privately owned) and Mead Westvaco #2 Fly Ash Lagoon Dam (owned and maintained by Mead Westvaco). These dams are not located within the City boundary.

Other Factors

The City of Covington engages in mutual aid agreements and joint planning and service provision efforts with Alleghany County. The City utilizes open source precipitation and water level gauges through water.gov, as well as a staff gauge posted at the Main St. Park.

The City does maintain a Planning Commission and is a member government of the Roanoke Valley-Alleghany Regional Commission.

5.4 Town of Clifton Forge

The Town of Clifton Forge, formerly the City of Clifton Forge, is an incorporated town within the boundaries of Allegheny County. The population of the Town was 3,483 in 2023. Population projections are not available in the data collected for this plan. The median age is the highest in data available for the planning region at 53.5 years. No separate median household income is available. The Town engages in utility service provision of water and sewer.

Budget and Staffing Characteristics

No budget information was available in the statewide Comparative Report. However, the approved 2025 budget provides some context for Clifton Forge's revenues and resources. Numbers provided may lack some of the nuance available in the state audit document.

Clifton Forge staffs a Community Planner and an Emergency Manager.

Table 46: Adopted Budget Town of Clifton Forge, 2025

Town of Clifton Forge Budget 2025 Projected	
Population	3,483
Local Revenue	\$ 2,672,548.00
Per Capita	\$ 767.31
Percent of Revenue	47.61%
From the Commonwealth	\$ 2,340,613.00
Per Capita	\$ 672.01
Percent of Revenue	41.70%
Direct Federal Aid	\$ 600,000.00
Per Capita	\$ 172.27
Percent of Revenue	10.69%
Total Revenue	\$ 5,613,161.00

Plans and Planning Schedules

Clifton Forge maintains a Comprehensive Plan, a Land Use Plan, and a Local Emergency Operations Plan. The Emergency Operations Plan is the most relevant to hazard mitigation, and was last updated in 2023.

Ordinances and Policy Mechanisms

Chapter 50 – Fire Prevention and Protection establishes rules around open burning and the acquisition and use of explosives and fireworks.

Appendix A – Subdivision Ordinance and Appendix B- Zoning contain information guiding new development in the town. Article 5 of Appendix B, Floodplain Overlay District, formally adopts floodplain regulations and the FIRM.

NFIP Compliance

An NFIP worksheet was not developed for the Town, so further details of the NFIP program could not be provided.

Dam Safety

There are three dams in that could impact the Town of Clifton Forge. These are the Smith Creek Dam, Gathright Dam, and Douthat Lake Dam. The Smith Creek dam, along with the associated Smith Creek Reservoir is owned and maintained by the Town of Clifton Forge and serves as the water supply for the Town of Clifton Forge, portions of Alleghany County, and the Town of Iron Gate. The Town of Clifton Forge is responsible for the maintenance of the Smith Creek Dam. After the dam was transferred to the Town, repairs were made and completed in early 2021. The dam and reservoir are routinely maintained and inspected by our water plant staff as well as being inspected annually per dam safety regulations.

Other Factors

The Town of Clifton Forge engages in collective operations with Alleghany County and Covington regarding regional branding, tourism, and economic development. The Town also provides water to portions of Alleghany County.

The Town does maintain a planning commission and is a member government of the Roanoke Valley-Alleghany Regional Commission.

5.5 Botetourt County

Botetourt County has been one of the fastest growing localities in the region over the last decade. The southern half of the locality has experienced significant development pressure in this time. The northern half of the locality is still largely rural, with strong cultural ties to the Alleghany Highlands. The population in 2023 was 33,875 and is projected to fall to 33,556 by 2030. Median age is 48.1 and median household income is the second highest in the region at \$77,680. Botetourt County does not maintain an MS4 permit. Utility service provision for water and sewer is handled by the Western Virginia Water Authority or private community providers.

Budget and Staffing Characteristics

State data is available regarding Botetourt’s revenue in 2024. Botetourt is one of the least vulnerable to federal funding fluctuations, with only a little under 11 percent of revenue from federal sources. The majority of Botetourt’s revenue is generated locally, at 54.5 percent.

Botetourt staffs a Certified Building Official, Community Planner, Emergency Manager, and Floodplain Administrator. The Community Development Department contains multiple staff positions, including several planners, building inspectors, a code enforcement officer, a combined Erosion and Sediment Control and Stormwater Management Inspector and a separate Administrator, and others. Botetourt’s emergency management response is supplemented by a robust volunteer fire and EMS organization.

Table 47: Botetourt County Budget, 2024

Botetourt County Budget 2024	
Population	33,466
Local Revenue	\$ 75,818,720.00
<i>Per Capita</i>	<i>\$ 2,265.54</i>
<i>Percent of Revenue</i>	<i>54.50%</i>
From the Commonwealth	\$ 48,166,729.00
<i>Per Capita</i>	<i>\$ 1,439.27</i>
<i>Percent of Revenue</i>	<i>34.62%</i>
Federal Pass-thru	\$ 10,085,282.00
<i>Per Capita</i>	<i>\$ 301.36</i>
<i>Percent of Revenue</i>	<i>7.25%</i>
Direct Federal Aid	\$ 5,045,745.00
<i>Per Capita</i>	<i>\$ 150.77</i>
<i>Percent of Revenue</i>	<i>3.63%</i>
Total Federal Vulnerability	\$ 15,131,027.00
<i>Percent of Revenue</i>	<i>10.88%</i>
Total Revenue	\$ 139,116,476.00
Non-Revenue Receipts	
Transfers from Other Funds	-
Total Sources Available	\$ 139,116,476.00

Plans and Planning Schedules

Botetourt maintains a Capital Improvements Plan and a Comprehensive Plan. A Local Emergency Operations Plan directly addresses hazards and was last updated in 2017.

Ordinances and Policy Mechanisms

Multiple sections of Botetourt's code may affect mitigation activities and disaster response.

Chapter 8.5 – Drainage and Flood Control creates rules for impounding structures that control runoff on a site.

Chapter 10 – Erosion and Sediment Control; Stormwater Management allows for local compliance with the Erosion and Sediment Control Law of the Code of Virginia. The County adopted its most current E&S ordinance in 2024. The towns of Buchanan, Fincastle and Troutville utilize Botetourt County's E&S staff for erosion and sediment control monitoring.

Chapter 11 – Fire Prevention and Protection addresses the coordinated fire and EMS system and brush burning.

Chapter 21 – Subdivisions establishes subdivision regulations.

Chapter 25 – Zoning addresses various zoning rules for the County, including establishing a Flood Hazard Overlay District based on the FIRM to bring the county in compliance with the NFIP.

NFIP Compliance

The Director of Community Development is the primary administrator of the NFIP in Botetourt County, and is a Certified Floodplain Manager. The county also maintains a retainer contract with an organization to assist in administrative functions. Like all rural, growing communities, the County has difficulty maintaining budget and staff. Their success in NFIP is due to the dedication of existing staff performing multiple auxiliary functions.

Botetourt County entered the NFIP in 1978. Since that time, 182 claims have been paid out in the County, totaling \$3,563,445. There are 1,752 structures exposed to flood risk in the community. Twenty-eight are repetitive loss and six are severe repetitive loss. The community does not participate in CRS. There were 137 NFIP policies in force in the County (including the towns of Buchanan, Fincastle and Troutville) as of July 2025.

Dam Safety

Botetourt County adopted a Drainage and Flood Control Ordinance in 1987. Division 2 Dam Safety, in Sec. 8.5-31 addresses issues concerning impoundment construction, inspection and maintenance stating "No one shall have a right to build or maintain an impoundment structure which unreasonably threatens the life or property of another. The [county] administrator shall cause safety inspections to be made of impounding structures on such schedule, as he deems appropriate. The time of the initial inspection and the frequency of reinspection shall be established depending on such factors as the condition of the structure and its size, type, location and downstream hazard potential. The owners of impounding structures found to have deficiencies which could threaten life or property if uncorrected, shall take the corrective actions needed to remove such deficiencies within the time limits established by this article, or if no time limit is established, within a reasonable time."

There are five dams of significance in Botetourt County. These are the Blue Ridge Estates Dam on Laymantown Creek, Carvin Cove Dam on Carvin Creek, Orchard Lake Dam on Glade Creek, Rainbow Forest Dam on Laymantown Creek and Greenfield dam on an unnamed creek.

Gathright Dam, located on the Jackson River in Alleghany County, was completed in 1979 and is operated for flood control of the Jackson and James Rivers. The facility is managed by the Army Corps of Engineers. The dam controls the runoff from a 345 square mile drainage area and reduces the effects of flooding along the Jackson and James Rivers. The Corps of Engineers estimates that the project has prevented more than \$70 million in flood damages. The James River passes through the northern part of Botetourt County and impacts the communities of Eagle Rock and Glen Wilton and the Town of Buchanan.

Other Factors

Botetourt contains several Towns, which are further discussed in the following sections, and works collaboratively with them to support their development when possible. Botetourt County is a member government of the Roanoke Valley-Alleghany Regional Commission and the Roanoke Valley Transportation Planning Organization. They are one of only two attainment counties in the Appalachian Regional Commission service area.

Botetourt County has experienced some turnover challenges in the past few years, which is fairly consistent with other governments in the area. The County does maintain a planning commission, as well as a public relations position on staff.

5.6 Town of Buchanan

The Town of Buchanan is a small, incorporated town within Botetourt County located on the James River. Buchanan is an important tourist hub for Botetourt County. The Town provides water and sewer service to residents.

Budget and Staffing Characteristics

The Town maintains four staff positions currently. The Town Manager is the most likely to participate directly in mitigation planning.

The Town is too small to participate in the statewide audit document, but a proposed budget for FY2025 is available on the website²². The General Fund shows a balance of \$903,351. \$65,610 comes from the Commonwealth. Total revenues including water and sewer service fees are a little over \$2 million.

Plans and Planning Schedules

The Town maintains a Comprehensive Plan which is in the process of being updated.

Ordinances and Policy Mechanisms

Article II of Appendix A of the Code of the Town addresses Zoning, with Sec. 201 establishing a Flood Hazard Overlay District to maintain participation in the NFIP.

Chapter 7 – Erosion & Sediment and Chapter 20 – Subdivisions establish additional restrictions on development.

NFIP Compliance

Botetourt County has adopted a Flood Hazard Overlay District as part of its Zoning Ordinance (2002). The boundaries of the floodplain district are established as shown on the flood boundary and floodway and/or Flood Insurance Rate Maps. The Town of Buchanan has adopted a Floodplain Management Ordinance that requires new residential buildings to be elevated to or above the base flood elevation.

The Town participates in the NFIP as a consumer of flood insurance for local government infrastructure and is in good standing with the County.

The Town of Buchanan uses Botetourt County's E&S staff for erosion and sediment control monitoring.

Other Factors

The Town of Buchanan collaborates with Botetourt County on some planning efforts. They are not an official member of the Roanoke Valley-Alleghany Regional Commission due to their size, but RVARC does some support work for the Town at the County's request.

The Town does maintain a planning commission.

²² Invalid source specified.

5.7 Town of Fincastle

The Town of Fincastle is a small town centrally located within Botetourt County and the county seat. While administrative offices for Botetourt County have largely moved out of the Town, it maintains a central position in Botetourt County's identity. The Town has historically provided water and sewer services; however, those services are now operated by the Western Virginia Water Authority.

Budget and Staffing Characteristics

The Town of Fincastle maintains a very small staff, including a part-time Town Manager who is charged with the majority of planning activities. While they are too small to be included in the Comparative Report, a budget for FY2024 is available on the town's website which details a General Fund of \$173,000 and total revenues of \$537,700.

Plans and Planning Schedules

The Town does maintain a Comprehensive Plan, which was last updated in 2021.

Ordinances and Policy Mechanisms

The Town's Zoning Ordinance is available online, with Sec. 201 establishing a Flood Hazard District to maintain participation in the NFIP.

NFIP Compliance

Botetourt County has adopted a Flood Hazard Overlay District as part of its Zoning Ordinance (2002). The boundaries of the floodplain district are established as shown on the flood boundary and floodway and/or Flood Insurance Rate Maps. The Town of Fincastle has adopted a Floodplain Management Ordinance that requires new residential buildings to be elevated to or above the base flood elevation.

The Town participates in the NFIP as a consumer of flood insurance for local government infrastructure and is in good standing with the County.

The Town of Fincastle uses Botetourt County's E&S staff for erosion and sediment control monitoring.

Other Factors

The Town of Fincastle holds several critical facilities for Botetourt County, including the courthouse, Fire/EMS administrative offices, and the jail. They are not an official member of the Roanoke Valley-Alleghany Regional Commission due to their size, but RVARC does some support work for the Town at the County's request.

The Town maintains a planning commission of seven members, including a Zoning Administrator.

5.8 Town of Troutville

The Town of Troutville is a small town within Botetourt County. It is located on the southern end of the county, where development pressures are higher, and is an Appalachian Trail community. Town limits are just under one square mile with boundaries including Interstate 81 and the Norfolk Southern Railroad right of way. Troutville provides domestic water via pumped storage system including areas outside of town boundaries. Town population is 468 people.

Budget and Staffing Characteristics

The Town maintains limited staff, including a volunteer Zoning Administrator, Utility Operator, and Clerk as well as a Facilities and Equipment Manager and Town Attorney.

The FY26 Town budget for general fund is \$187,000.00.

Plans and Planning Schedules

No plans or planning documents were available on the Town website. The last comprehensive plan was completed in 2010.

Ordinances and Policy Mechanisms

The Town does maintain a Zoning Code and Erosion and Sediment Control regulations. Article XIV of the Zoning Code details the Floodplain Overlay District.

NFIP Compliance

Botetourt County has adopted a Flood Hazard Overlay District as part of its Zoning Ordinance (2002). The boundaries of the floodplain district are established as shown on the flood boundary and floodway and/or Flood Insurance Rate Maps. The Town of Troutville has adopted a Floodplain Management Ordinance that requires new residential buildings to be elevated to or above the base flood elevation.

The Town participates in the NFIP as a consumer of flood insurance for local government infrastructure, and is in good standing with the County.

The Town of Troutville uses Botetourt County's E&S staff for erosion and sediment control monitoring.

Other Factors

The Town does maintain a planning commission. They are not an official member of the Roanoke Valley-Alleghany Regional Commission due to their size, but RVARC does some support work for the Town at the County's request.

5.9 Craig County

Craig County is one of the most rural localities in the service area, with a population in 2023 of 4,881 and a projected population of 4,528 by 2030. The median age is 46.1 and the median household income is \$66,286. Nearly two thirds of the county is national forest or state parks.

Budget and Staffing Characteristics

Craig County budget information is available from the statewide Comparative Report for 2024. About 46 percent of revenues received by the County come from the Commonwealth, and 15 percent is direct federal money or federal pass-thru dollars.

Craig maintains minimal staffing, with a part time County Administrator serving also as the Zoning Administrator, a Building Official, and an Emergency Management Coordinator.

Table 48: Craig County Budget 2024

Craig County Budget 2024	
Population	4,855
Local Revenue	\$ 7,394,865.00
<i>Per Capita</i>	\$ 1,523.14
<i>Percent of Revenue</i>	39.02%
From the Commonwealth	\$ 8,701,440.00
<i>Per Capita</i>	\$ 1,792.26
<i>Percent of Revenue</i>	45.91%
Federal Pass-thru	\$ 2,410,413.00
<i>Per Capita</i>	\$ 496.48
<i>Percent of Revenue</i>	12.72%
Direct Federal Aid	\$ 446,778.00
<i>Per Capita</i>	\$ 92.02
<i>Percent of Revenue</i>	2.36%
Total Federal Vulnerability	\$ 2,857,191.00
<i>Percent of Revenue</i>	15.07%
Total Revenue	\$ 18,953,496.00
Non-Revenue Receipts	\$ -
Transfers from Other Funds	\$ -
Total Sources Available	\$ 18,953,496.00

Plans and Planning Schedules

The County maintains a Capital Improvements Plan, a Comprehensive Plan which addresses land use, an Emergency Operations Plan and Continuity of Operations Plan. The Emergency Operations Plan specifically addresses hazards and was last updated in 2025.

Ordinances and Policy Mechanisms

Chapter 26 – Fire Prevention and Protection establishes the volunteer fire service and establishes rules for open burning.

Chapter 46 – Erosion and Sediment Control regulates land disturbing activities. The Town of New Castle utilizes the E&S Control services of Craig County.

Chapter 47 – Stormwater Management addresses required stormwater management plans.

Chapter 50 – Floods addresses flood hazard reduction and required elements for the NFIP.

Chapter 54 – Subdivisions and Chapter 58 – Zoning address new development in the County and general land use.

NFIP Compliance

The Building Official is the floodplain administrator in Craig County, and is not certified. Staffing challenges and financial restrictions combined with a low volume of required service are the barriers to running an effective NFIP program. Since 1990, 71 claims have been paid out in the community at \$1,271,108. Two hundred and two structures are at flood risk in the community, with six being repetitive loss structures. The community does not participate in CRS. There were 41 NFIP policies in force in the County and two in the Town of New Castle as of July 2025.

Dam Safety

There are four dams in Craig County. The Mountain Castles Soil and Water Conservation District has responsibility for the operation and maintenance of these dams. The dams are located on Johns Creek, Little Oregon Creek, Mudlick Branch, and Dicks Creek. The dams were constructed during the period of 1966 to 1968 for the purpose of flood control in the Johns Creek watershed. Future work will be occurring to rehabilitate several of these dams. Johns Creek Volunteer Fire Department has observers for each dam when there are high water issues.

Town of New Castle

The Town of New Castle is included in this capabilities assessment despite not having met the criteria for participation in the planning effort. Craig County serves as the planning authority for the Town in hazard mitigation planning. The Town of New Castle is the county seat of Craig County. They are not an active jurisdiction in this plan, but participate through Craig County. The town has one staff person who functions as Town Clerk, Treasurer to the Town Council, and Zoning Administrator. Limited information is available on the Craig County website regarding the Town's government. No budget information is available.

Other Factors

The County has participated in the VDEM Flood Intelligence Unit's flood gauge program. Three water level gauges and two precipitation gauges have been installed in key locations throughout the County. The County receives support from RVARC as a member government and is within the service area for the Appalachian Regional Commission.

5.10 Roanoke County

Roanoke County is one of the largest localities by population, with 89,755 residents in 2023 and 100,027 projected in 2030, excluding the population of the Town of Vinton. The development patterns of the County are largely suburban and rural, with some more densely developed areas. The median age is lower than many other localities in the region at 43.7. The median household income is the highest in the region at \$80,872. The County encircles the Cities of Roanoke and Salem. The Town of Vinton is located within the County. The County additionally owns and operates the Explore Park, a major regional outdoor recreation facility which is bifurcated by the Roanoke River, other parks potentially impacted by flooding such as Green Hill Park and Wayside, and several miles of the Roanoke River Greenway which are largely in the floodplain.

Budget and Staffing Characteristics

Data for the county is available in the statewide Comparative Report. Local revenue is over 56 percent of the revenue for the county in 2024. The percentage of federal revenue is low, at less than 9 percent.

The County maintains numerous staff, including several community planners, stormwater management staff and engineers, GIS staff, and emergency manager. They are a CRS community.

Table 49: Roanoke County Revenues, 2024

Roanoke County Budget 2024	
Population	96,519
Local Revenue	\$ 248,040,326.00
<i>Per Capita</i>	<i>\$ 2,569.86</i>
<i>Percent of Revenue</i>	<i>56.23%</i>
From the Commonwealth	\$ 154,421,775.00
<i>Per Capita</i>	<i>\$ 1,599.91</i>
<i>Percent of Revenue</i>	<i>35.01%</i>
Federal Pass-thru	\$ 30,897,590.00
<i>Per Capita</i>	<i>\$ 320.12</i>
<i>Percent of Revenue</i>	<i>7.00%</i>
Direct Federal Aid	\$ 7,761,572.00
<i>Per Capita</i>	<i>\$ 80.41</i>
<i>Percent of Revenue</i>	<i>1.76%</i>
Total Federal Vulnerability	\$ 38,659,162.00
<i>Percent of Revenue</i>	<i>8.76%</i>
Total Revenue	\$ 441,121,263.00
Non-Revenue Receipts	
Transfers from Other Funds	\$ 1,405,682.00
Total Sources Available	\$ 442,526,945.00

Plans and Planning Schedules

The County maintains numerous plans, including a Capital Improvements Plan, a Comprehensive Plan last updated in 2024 which addresses future land use, an Emergency Operations Plan, an Economic Development Plan, an annual update of the Regional Stormwater Management Plan, and other plans and planning documents.

Ordinances and Policy Mechanisms

The County has engaged in a variety of mechanisms to address hazards, including land acquisition, maintaining an up to date building code, adopting the FIRM and a floodplain overlay, a subdivision ordinance, and a zoning ordinance, all of which are tools that have been used to address hazards.

Roanoke County has adopted an Erosion & Stormwater Management Ordinance (2025) and Design Manual (2008) that require new residential buildings to be elevated two feet and new commercial buildings one foot above the 100-year base flood elevation. The Stormwater Management Design Manual that specifies acceptable methodologies, design events for a wide variety of facilities, and administrative requirements such as submittal checklists. Appendices provide a wide variety of charts and tables to be used in applying the approved methodologies.

The County has a floodplain overlay district, corresponding to areas identified on Flood Insurance Rate Maps (FIRM) prepared by FEMA. Roanoke County also has up to date DFIRMS of all FEMA studied streams. Additionally, the County has adopted regulations for development in areas that contain more than 100 acres of drainage area that require flood studies for elevations of additions or new construction.

Roanoke County has adopted a Roanoke River Corridor Conservation and Overlay District. Although primarily designed to protect water quality, it also helps reduce siltation, which in turn protects the channel that is carrying floodwaters. In this overlay district, smaller sites (2,500 square feet in lieu of standard 10,000 square feet minimum) must meet erosion and sediment controls standards. Roanoke County has completed over one mile of stream restoration. Project goals were aimed at reducing streambank erosion, improving channel stability during high flow events, storing flood waters, and supporting aquatic and other life.

NFIP Compliance

Roanoke County primarily staffs the NFIP program through the twin roles of a Project Engineer and a Floodplain Administrator. Floodplain management is a primary function for staff. They are also a CRS community. Major barriers to running an effective NFIP program include challenges with staffing following disasters to complete tasks in a timely manner. Limited knowledge beyond primary staff member requires that individual to be present or involved with all mitigation activities and disaster response. More training is sought, however, staff time in the face of additional duties remains a challenge.

Roanoke County entered the NFIP in 1978. To date 797 claims have been paid out in the community with a total amount of \$18,582,734. There were 288 NFIP policies in force in the County as of July 2025.

Participating in the Community Rating System is an important program for Roanoke County. The County maintains an established permit process, requires and tracks elevation certificates, and provides public outreach and education. The County is challenged by the investment of financial and staff resources to improve the class in this plan cycle.

Dam Safety

There are eight regulated dams that could impact properties in Roanoke County: Privately owned Loch Haven Lake Dam located on a tributary of Deer Branch Creek; Appalachian Electric Power owned Niagara Dam located on the Roanoke River; privately owned Orchard Dam on a tributary of Glade Creek; Carvin Cove Reservoir Dam, located on a tributary of the Carvin Creek and owned by the Western Virginia Water Authority, Spring Hollow Reservoir Dam located on a tributary of the Roanoke River and owned by the Western Virginia Water Authority, Montclair Dam and North lakes Dam in the Peters Creek watershed managed by Roanoke City, and Hidden Valley Dam in southwest county managed by Roanoke County.

The County sees an opportunity for regional collaboration around high hazard potential dams, and a need for dam breach inundation mapping for dams which could impact their community.

Other Factors and Activities

Roanoke County was first designated as a “StormReady” community in 2019 and has successfully maintained this designation through the National Weather Service. The county’s next recertification is scheduled for 2027.

The County has strategically deployed three (3) Department of Homeland Security (DHS) stream flood sensors and three (3) locally monitored rain gauges to enhance real-time monitoring capabilities. In addition, the County utilizes resources from the National Oceanic and Atmospheric Administration (NOAA), including the Water Prediction Center’s forecasts and mapping tools (water.noaa.gov/va) and the NOAA rainfall monitoring system (weather.gov/rainfall).

Project Impact Roanoke Valley was a partnership of FEMA, Roanoke County, the cities of Roanoke and Salem and the Town of Vinton to reduce destruction to life and property during disasters through planning and mitigation. The Project Impact Roanoke Valley Steering Committee and its work groups evaluated hazard mitigation needs from 1998 to 2001. The four work groups were: Hazard Mitigation, Public Information and Community Education, Stormwater Management and Partnership and Resource group. The Stormwater Management group was responsible for the preparation of over 1,500 floodplain elevation certificates in the participating localities. The Public Information and Community Education and Partnership and Resource groups met with community organizations, civic groups, businesses and the general public to promote hazard mitigation activities. The Land Use group focused on the how local plans and ordinances relate to hazard mitigation and published Hazard Mitigation through Land Use Planning in 2001. The Hazard Mitigation group addressed flooding, wildfire, meteorological events, and hazardous materials incidents in its report Hazard Analysis.

The County provides annual updates on the Roanoke Valley Regional Stormwater Management Plan, which is further discussed in [Section 5.14](#).

Roanoke County provides capacity to the Town of Vinton around stormwater issues. The County is a member government of the Roanoke Valley-Alleghany Regional Commission and the Roanoke Valley Transportation Planning Organization. Water and sewer is provided by the Western Virginia Water Authority. The County is a member of the Roanoke Valley Resource Authority. Valley Metro serves this locality and they are a member of the Greenway Commission. They have a robust public outreach program and are a member of Roanoke Valley Television.

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5.11 City of Roanoke

The City of Roanoke has the highest population in the region, with a 2023 population of 98,677 and a projected 2030 population of 101,514 per the regional CEDS. The median age is 38, the lowest in the region. The median household income is \$51,523, the second to lowest in the region. The City owns and maintains Carvins Cove, a large park which surrounds a key reservoir for water in the Roanoke Valley. The region’s only level 1 trauma center is located within the City. The City is encircled by Roanoke County and adjoined by the City of Salem and Town of Vinton, meaning that many environmental issues are shared between these localities.

Budget and Staffing Characteristics

Budget information for the City is available most recently in the 2023 publication of the statewide Comparative Report. A little over 46 percent of the City’s revenue is local, with slightly less than 17 percent of the revenue being federal or federal pass-thru dollars.

The City maintains a robust stormwater management department, multiple planning staff, and several emergency response professionals, as well as dedicated GIS staff. They are a CRS community in good standing. The City sees an opportunity for increased emergency response training amongst their staff.

Table 50: City of Roanoke Revenues 2023

City of Roanoke Budget 2023	
Population	99,634
Local Revenue	\$ 280,458,617.00
<i>Per Capita</i>	<i>\$ 2,814.89</i>
<i>Percent of Revenue</i>	<i>46.44%</i>
From the Commonwealth	\$ 221,242,528.00
<i>Per Capita</i>	<i>\$ 2,220.55</i>
<i>Percent of Revenue</i>	<i>36.63%</i>
Federal Pass-thru	\$ 86,449,186.00
<i>Per Capita</i>	<i>\$ 867.67</i>
<i>Percent of Revenue</i>	<i>14.31%</i>
Direct Federal Aid	\$ 15,807,469.00
<i>Per Capita</i>	<i>\$ 158.66</i>
<i>Percent of Revenue</i>	<i>2.62%</i>
Total Federal Vulnerability	\$ 102,256,655.00
<i>Percent of Revenue</i>	<i>16.93%</i>
Total Revenue	\$ 603,957,800.00
Non-Revenue Receipts	\$ 713,029.00
Transfers from Other Funds	\$ 1,961,500.00
Total Sources Available	\$ 606,632,329.00

Plans and Planning Schedules

The City maintains a variety of plans and planning documents. Many of these are listed in Section 3.4: Flooding.

- Comprehensive Plan
- Downtown Roanoke Plan (2017)
- Urban Forestry Plan
- Parks and Recreation Plan
- Climate Action Plan
- CIP
- NFIP Community Rating System Repetitive Loss Area Analysis (2021)*
- City of Roanoke Flood Resilience Plan (2023)*
- Emergency Operations Basic Plan (2020)*
- Peters Creek Watershed Master Plan (2019)*
- Tinker Creek and Tributaries Watershed Master Plan (2016)*
- Trout Run Watershed Master Plan (2017)*

Additionally, they have conducted research into the urban heat island effect, mapping critical hotspots within the City and working with the local Roanoke Memorial Hospital on improving health outcomes for City residents and educating residents on the impacts of heat.

Key amongst these plans, the Flood Resilience Plan could be updated to include additional flood mitigation actions.

The City is working on a collaborative plan to mitigate wildland fire in multiple park areas throughout the City. The current Substantial Damage Management procedures are being consolidated into an effective plan. They are also in the process of revising the Emergency Operations Plan, which will provide opportunities to include mitigation language. The Debris Management Annex will be revised during the next update to our EOP to include a more circular economy framework.

Ordinances and Policy Mechanisms

The City has a robust ordinance, including most mechanisms allowed in the Commonwealth. The FIRM is adopted in the Floodplain Overlay District (Chapter 36.2 Zoning). Additionally, a River and Creek Corridors Overlay District seeks to manage water quality of the numerous streams running through the City.

The City has adopted the River and Creek Corridors Overlay District (RCC) to recognize the Roanoke River and its tributaries as valuable water resources in the City and to designate certain areas along their banks as being critical to their protection in order to ensure that such streams and adjacent lands will fulfill their natural functions. Streams have the primary natural functions of conveying storm and ground water, storing floodwater, and supporting aquatic and other life. Vegetated lands adjacent to the stream channel in the drainage basin serve as a buffer to protect the stream system's ability to fulfill its' natural functions. Primary natural functions of the buffer include protection of water quality by filtering pollutants, provision of storage for floodwaters, and provision of suitable habitats for wildlife. Within the River and Creek Overlay District, riparian buffers shall be established and shall consist of all land adjacent to, and fifty (50) feet landward from, the top of the banks of the Roanoke River or the applicable tributary. Further, riparian buffers shall be retained and maintained if present, and where it does not exist, shall be established and maintained upon any land disturbing activity. To retain ecological functional value, native vegetation shall be preserved to the maximum extent possible.

Other sections of the ordinance relevant to this effort include Chapter 11.3: Stormwater Discharge Requirements, Chapter 11.5 Stormwater Utility, Chapter 11.6 Stormwater Management, Chapter 11.7 Erosion and Sediment Control, and Chapter 12 Fire Prevention and Protection. Building regulations, subdivision regulations, and general land use are also provided for in the ordinance.

Current zoning standards restrict floodway development to specific permitted uses including agricultural operations, recreational use, botanical gardens, and accessory residential use. Other acceptable floodway uses must be granted by special exception. All floodway development must meet “no-rise” qualifications and all new floodplain development or substantially improved structures must meet the freeboard requirements for elevation or flood-proofing and be within NFIP compliance. After reviewing, the City finds its current zoning and floodplain management ordinance adequate and does not plan to assert stricter permitted uses in the floodway or other flood zones.

Enforcing stricter building codes within flood zones can further reduce flood risk by requiring more strict elevation, or floodproofing requirements in the floodplain. The City currently requires 2 feet of freeboard within the regulatory floodplain but otherwise follows the Virginia Uniform Statewide Building Code. Current City standards are in line with City’s goals and will update alongside any state level changes.

Subdivision ordinance language help to ensure that the threat of flooding is considered and addressed in the planning process. The City’s ordinance language requires that subdivision layouts be consistent with minimizing flood damage and ensuring there are clear and safe evacuation routes during a flood event. It also requires adequate subdivision drainage and locating utilities and facilities in areas subject to minimal flood damage. After review, there are no areas of the subdivision ordinance in regard to floodplains that have been deemed in need of change.

Stormwater management regulations, specifically those addressing water quantity, reduce the severity of flooding when applied across the community. These regulations ensure development impacts on stormwater runoff are offset by solutions such as green infrastructure best management practices. The city code follows the Virginia Stormwater Management Program (VSMP) to address both stormwater quality and quantity, and also employs a stormwater credits program that encourages both residential and commercial properties to employ stormwater best management practices that assists the city in managing stormwater issues. There are no current plans to revise the stormwater management ordinance beyond the state standards.

The City of Roanoke has adopted more stringent regulations, references, guidelines, standards and specifications than promulgated by the Virginia Soil and Water Conservation Board (and any local handbook or publication of the board) for the effective control of soil erosion and sediment deposition to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources.

Notable amongst the other localities, the City has designated a Stormwater Utility Fee in 2014 which is used to fund water quality improvements in the region and encourage alternative

development practices. These activities have co-benefits to reduce flooding in many cases. Project examples include:

- Planning, design, engineering, construction, and debt retirement for new facilities and enlargement or improvement of existing facilities, including the enlargement or improvement of dams, levees, and floodwalls, that serve to control stormwater;
- Water Quality Projects including stream restorations and other green infrastructure to reduce pollutants and erosion and to enhance runoff infiltration;
- Facility operation and maintenance, including the maintenance of publicly owned stormwater and flood mitigation infrastructure;
- Monitoring of stormwater control devices and ambient water quality monitoring; and
- Other activities consistent with the state or federal regulations or permits governing stormwater management, including, but not limited to, public education, watershed planning, inspection and enforcement activities, and pollution prevention planning and implementation.
- Creation of a Stormwater Utility Flood Mitigation Program as a supplement to nationally competitive FEMA grants.
- Outreach and Education on water quality, stream health, floodplain natural functions, flood insurance and substantial damage and substantial improvement requirements.

NFIP Compliance

The City participates in, and is in good standing with, the National Flood Insurance Program (NFIP) by enforcing floodplain management regulations that meet federal requirements. This program allows property owners to purchase flood insurance from NFIP. As of 2025, there are 385 NFIP policies in force in the City.

The Zoning Administrator is the primary responsible staff person for floodplain management, but is not a certified floodplain manager. The City entered the NFIP in 1981. In that time there have been 797 claims at \$18,852,734 total. There are 85 repetitive loss properties and 11 severe repetitive loss properties in the City.

The City identified land use demands in an urban environment as a primary inhibiting factor for running an effective NFIP program, as well as staff expertise continuity and maintenance.

The City of Roanoke entered the CRS program in 1996 and maintains a class 6 rating (20% discount on flood insurance premiums for parcel owners within City limits).

Dam Safety

Spring Hollow Reservoir Dam, located on a tributary of the Roanoke River and owned by the Western Virginia Water Authority, could impact properties in the City of Roanoke if it failed. Carvins Cove Reservoir Dam, located on a tributary of the Carvins Creek and owned by the Western Virginia Water Authority, could impact properties in the City if it failed. Two other smaller private lakes in the City are designated high hazard by the DCR; Windsor Lake and Spring Lake, both have conducted significant spillway improvements, and owners closely coordinate with the City. The City works work directly with them during storm events and potential flooding impacts that would or could potentially see impacts in on dam structures.

Windsor Lake and Spring Valley Lake dams are privately-owned dams located within the City of Roanoke. The emergency communication protocol for both includes notification to City of Roanoke Emergency Management.

Windsor Lake Corporation reaches out to Emergency Management annually for communication tests and every three years for a tabletop exercise and revision of their Emergency Action Plan. They have shared a copy of their 2025 plan with us, as well as GIS shapefiles of inundation extents.

Spring Valley Lake LLC is due for a revision of their Emergency Action Plan. The last revision of the plan is dated 2013. They conducted a joint evaluation with City of Roanoke Emergency Management after a 2020 emergency event.

Other Mitigation Implementation Activities

The City continues to maintain open space as recreational areas as well as seeking to expand the open space in the floodplain through acquisition and demolition of highly flood prone structures, then maintaining them as deed restricted parcels. Acquisition, demolition, and open space preservation has been and will continue to be one of the City's strategies to reduce community flood risk. The City participates in State and Federal grant funding programs to be able to fund these projects.

Stream restorations have been a significantly beneficial strategy for flood loss prevention. Stream restorations allow for channel design and streambank stabilization that protects surrounding infrastructure, with the added benefit of renaturalizing the surrounding floodplain. This not only provides flood storage and property protection benefits, but also improves water quality and local habitat. The City plans to continue to seek high priority stream segments and apply for grant funding for projects in those areas.

Star City Alerts allows for direct alerting to citizen devices which helps save lives and property by shortening warning times and informing the public during flood events. The City has plans to leverage local stream gauge data to trigger automatic communications through this alerting system. Currently the system has a manual communication chain during flood events. Grant funding is being sought to establish the gauges and software necessary to make this connection happen.

The City has a large backlog of Capital Improvement Projects (CIP) to improve stormwater drainage throughout problem areas in the City. The CIP project prioritization system now allows the best use of Stormwater Utility funds and awarded grants to upgrade and repair the stormwater drainage system.

The City has successfully maintained a consistent flooding outreach program that involves a brochure that goes to all floodplain properties, a flood safety website, social media posts, repetitive loss letters, and hosting a Prepareathon (an event focused on emergency preparedness including flooding preparedness). New projects are always being considered to ensure flood hazard and mitigation information is reaching the community. Outreach projects are typically funded through the City general fund and the Stormwater Utility fund.

The City of Roanoke was designated a Storm Ready community in February 2010 by the National Weather Service. The City was certified based on its level of emergency preparedness including: a 24-hour warning point and emergency operations center; development of at least four methods by which weather warnings can be received and disseminated; creation of a system to monitor local weather conditions; conducting community seminars to promote disaster readiness; and development of a formal hazardous weather plan, including spotter training and emergency exercises. An additional benefit of the designation to the residents and business owners in the City is reduced rate for flood insurance.

The Stream Hydrology And Rainfall Knowledge System (SHARKS) is a platform that integrates USGS precipitation gauge data as well as stream sensors across the City of Roanoke to show real time stream height and rain data. This facilitates staff understanding and analysis of flooding in real-time events as well as past flood data. The SHARKS system helps inform flood planning, emergency responders, road closures and stormwater projects.

The City partners with the U.S. Geological Survey (USGS) to monitor and study local waterways to better understand local water quality dynamics and inform management decisions. Monitoring objectives include: continual stream levels, water temperature, pH, conductivity, dissolved oxygen, and turbidity. Statistical relationships between sediment and turbidity have been developed at each station in order to estimate sediment loading with the goal of effective management of suspended sediment. In addition, the monitoring data are being used with aquatic insect data to better understand the relationship between hydrology, water quality and aquatic insect health in the City. These monitoring and science efforts support the City's science-informed watershed management strategy; more information is available at the USGS' Roanoke Project Site.

The City has also partnered with the USGS to install precipitation monitoring gauges in a selected spatial distribution pattern to optimize data capture. This robust precipitation monitoring network can provide many benefits to a variety of stakeholders within the city, including stormwater and other utilities, first responders, educational programs, and others. The monitoring network can provide critical data to aid the management and modeling of the stormwater infrastructure and first responders could utilize the real-time monitoring to better allocate resources during extreme precipitation events. The network could also be used as an outreach tool to educate residents and students about precipitation and potential risks of precipitation and flooding.

Project Impact Roanoke Valley was a partnership of FEMA, Roanoke County, the cities of Roanoke and Salem and the Town of Vinton to reduce destruction to life and property during disasters through planning and mitigation. The Project Impact Roanoke Valley Steering Committee and its work groups evaluated hazard mitigation needs from 1998 to 2001. The four work groups were: Hazard Mitigation, Public Information and Community Education, Stormwater Management and Partnership and Resource group. The Stormwater Management group that originated with the Project Impact Roanoke Valley initiative was responsible for the preparation of over 1,500 floodplain elevation certificates. The Public Information and Community Education and Partnership and Resource groups met with community organization, civic groups, businesses and the general public to promote hazard mitigation activities.

Other Factors

The City identified several factors as potentially inhibiting mitigation activities. State ordinance and national building codes may offer some limitations. Funding for acquiring land may be limited. The loss of multiple federal funding sources will severely impact mitigation efforts. Potential losses include BRIC grants, funding from the Inflation Reduction Act, Community Bloc Grants, and funding from the Bipartisan Infrastructure Law. These have all been key sources of mitigation funding in the past.

The City is a member of the Roanoke Valley-Alleghany Regional Commission, the Roanoke Valley Resource Authority, the Greenway Commission, the Western Virginia Water Authority, Valley Metro, and the Roanoke Valley Transportation Planning Organization. They maintain a planning commission and a board of zoning appeals. They have a robust public outreach program and are a member of Roanoke Valley Television. Mitigation-related programming is common in their public outreach.

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5.12 City of Salem

The City of Salem is a small city adjoining the City of Roanoke and encircled by Roanoke County. Route 11, a key transportation corridor, bisects the City and LewisGale hospital, the region’s other major hospital, is located within its boundaries. The City had a population of 25,477 in 2023 with a projected population of 25,519 in 2030. The median age is 40.3, and the median household income is \$68,402.

Budget and Staffing Characteristics

The City staffs several positions, including all relevant positions to mitigation planning. A floodplain administrator, a GIS coordinator, emergency management personnel, building officials and civil engineers, as well as a community planner, are all covered by staff. The Comparative Report shows a low 7 percent federal funding ratio, and local revenue makes up a hearty 61 percent of revenues for the locality.

Table 51: City of Salem Revenues 2024

City of Salem Budget 2024	
Population	24,985
Local Revenue	\$ 100,577,836.00
<i>Per Capita</i>	<i>\$ 4,025.53</i>
<i>Percent of Revenue</i>	<i>61.27%</i>
From the Commonwealth	\$ 52,065,597.00
<i>Per Capita</i>	<i>\$ 2,083.87</i>
<i>Percent of Revenue</i>	<i>31.72%</i>
Federal Pass-thru	\$ 5,508,189.00
<i>Per Capita</i>	<i>\$ 220.46</i>
<i>Percent of Revenue</i>	<i>3.36%</i>
Direct Federal Aid	\$ 6,003,705.00
<i>Per Capita</i>	<i>\$ 240.29</i>
<i>Percent of Revenue</i>	<i>3.66%</i>
Total Federal Vulnerability	\$ 11,511,894.00
<i>Percent of Revenue</i>	<i>7.01%</i>
Total Revenue	\$ 164,155,327.00
Non-Revenue Receipts	\$ 720,018.00
Transfers from Other Funds	\$ 3,305,679.00
Total Sources Available	\$ 168,181,024.00

Plans and Planning Schedules

The City of Salem maintains numerous plans, many of which are listed in section 3.4: Flooding. The Resilience Plan and the Emergency Operations Plan are perhaps most relevant to this effort. The Comprehensive Plan was recently updated in 2025.

Ordinances and Policy Mechanisms

Chapter 30. – Environment of the City ordinance contains several sections relevant to mitigation planning and emergency response, including Article III. Erosion and Sediment Control and Article IV. Stormwater Management. Chapter 34 – Fire Prevention and Protection deals with hazardous materials, bonfires, and creates the role of a fire marshal.

The City of Salem has adopted the regulations, references, guidelines, standards and specifications promulgated by the Virginia Soil and Water Conservation Board (and any local handbook or publication of the board) for the effective control of soil erosion and sediment deposition to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources. Salem's ordinance, in addition to referencing the Virginia Erosion and Sediment Control Handbook, states in Section 30-117 that the erosion and sediment control plan must consider "Peak runoff from a ten year or 100-year frequency storm, based on present and future developed conditions ..." and "If the watershed is greater than one square mile in area, a peak runoff study of the 100-year frequency storm shall be prepared."

The City of Salem adopted a Floodplain Management Ordinance in 1993 (revised in 2007) that requires new residential buildings to be elevated to a minimum of one foot (1') above the base flood elevation. The City has a floodplain overlay district corresponding to areas identified on Flood Insurance Rate Maps prepared by FEMA.

The City has a Stormwater Management Ordinance that is part of the City Code. It was developed to bring the City into compliance with state laws on stormwater management and is consistent with the statewide Stormwater Management Model Ordinance.

Chapter 106 establishes the zoning code, which includes the floodplain overlay district in accordance with the NFIP. An urban forest overlay is also designated as a method to combat urban heat island effect.

NFIP Compliance

The Director of Community Development is the program administrator for the NFIP. He is floodplain manager certified. There were 252 policies in the community in 2025. Since Salem joined the NFIP in 1978, 592 claims have been paid out in the community at \$18,080,710. Flood risk is high in the community, with 2,592 structures at risk. Ninety are repetitive loss structures, with 29 being severe repetitive loss structures. Staff note that the program is understaffed and underfunded – staffing constraints remain a repetitive issue for localities across the region in running an effective NFIP program.

Dam Safety

Spring Hollow Reservoir Dam, located on a tributary of the Roanoke River and owned by the Western Virginia Water Authority, could impact properties in the City of Salem if it failed. The WVWA is a recognized jurisdiction in this plan. Further information about potential impacts from this dam is available in [Appendix H](#).

Other Factors

The City stated a desire to improve public awareness around hazards. They stated that their approach to mitigation is proactive and adaptive.

The City maintains many of their own utility systems, including their own water and sewer system and some electrical infrastructure. They are a member of the Roanoke Valley-Alleghany Regional Commission, the Roanoke Valley Transportation Planning Organization, and the Greenway Commission. The locality does maintain a planning commission. Valley Metro serves this locality.

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5.13 Town of Vinton

The Town of Vinton is one of the largest towns in the Commonwealth with a 2023 population of 8,038 per the CEDS. Located within Roanoke County, the town also borders the City of Roanoke. The median age is 39.7 making this the second youngest locality in the region.

Budget and Staffing Characteristics

No budget information is available in the statewide Comparative Report for the past two years. However, the adopted FY2025 budget is available on the Town website.²³ The document states FY2023 actual revenues in the General Fund, Capital Fund and Stormwater Fund were \$15,756,600. Combined revenue from non-categorical aid, state sales tax, and categorical aid in that year were about 23 percent of the revenues received.

Vinton uses this money to, among other things, staff several positions, including several community planners, a code enforcement officer, floodplain manager, and a capital projects manager. Some of these may be collected in one position. Vinton has a relatively small staff compared to some other localities in the region.

Plans and Planning Schedules

The Town maintains a Capital Improvement Plan (updated annually), Comprehensive Plan last updated in 2025 which also serves as a land use plan, and an Emergency Operations Plan and Continuity of Operations Plan updated in 2022. All of these plans include mitigation actions.

They also maintain a transportation plans and an economic development plan.

Ordinances and Policy Mechanisms

Chapter 79 – Stormwater Management establishes stormwater and erosion and sediment control regulations. Appendix B contains the zoning ordinance, including establishing a Floodplain Overlay District.

The Town of Vinton floodplain management regulations were originally adopted in 1982. These regulations are designed as an overlay district and adopted as part of the 1995 Zoning Ordinance. The regulations have been amended subsequently in 2007 and 2014 and comply with the Federal Emergency Management Agency (FEMA) floodplain regulations. The Floodplain Overlay District applies to properties that have been identified on a Flood Insurance Rate Map (FIRM) as being in a Special Flood Hazard Area (SFHA). The land area covered by the floodwaters of the base flood is the SFHA.

There are two (2) flood zones in the Town:

1. Floodway – The land immediately adjoining the watercourse channel that is the natural conduit for floodwaters; and
2. Special Flood Hazard Area – Any area of land that is susceptible to a one percent (1%) chance of flooding annually. The most recent FIRM for the Town of Vinton was completed in 2007.

²³ <https://www.vintonva.gov/100/Budgets-Reports>

The Town's floodplain management regulations ordinance requires that new residential structures be at least two (2) feet above base flood elevation, and that new non-residential structures be at least one (1) foot above flood elevation.

The Town follows Roanoke County's Combined Erosion & Stormwater Management Ordinance that is part of the County Code. It was developed to bring the County into compliance with state laws on stormwater management and erosion and sedimentation control. In addition to using the Virginia Erosion and Sediment Control Handbook, Roanoke County publishes a separate Stormwater Management Design Manual that specifies acceptable methodologies, design events for a wide variety of facilities, and administrative requirements such as submittal checklists. Appendices provide a wide variety of charts and tables to be used in applying the approved methodologies.

Roanoke County administers the Town of Vinton Erosion and Sediment Control program under the adopted regulations, references, guidelines, standards and specifications promulgated by the Virginia Soil and Water Conservation Board (and any local handbook or publication of the board) for the effective control of soil erosion and sediment deposition to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources. Such regulations, references, guidelines, standards and specifications for erosion and sediment control are included in, but not limited to, the Virginia Erosion and Sediment Control Regulations and the Virginia Erosion and Sediment Control Handbook, as amended from time to time. In 2025, Erosion and Sediment Control standards, specifications and regulations were adopted under a new joint combined Erosion & Stormwater Management Ordinance

Vinton staff note that a complication of implementation of these ordinances is equity. The enforcement of these ordinances inadvertently impact lower-income populations and neighborhoods

NFIP Compliance

The Town participates in, and is in good standing with, the National Flood Insurance Program (NFIP) by enforcing floodplain management regulations that meet federal requirements. This program allows property owners to purchase flood insurance from NFIP. There are currently 27 NFIP policies in force in the Town.

The Assistant Planning and Zoning Director is responsible for floodplain management in this community and is a Certified Floodplain Manager. One hundred and sixty structures are exposed to flood risk in the community. Three of these are repetitive loss structures. The Midway Community has limited policy coverage but is at risk of flooding.

As of October 1, 2016, the Town is one of the few communities in Virginia that have been accepted into the Community Rating System (CRS) program. Due to the continuing efforts of Town administration, every Town of Vinton property owner – residential or commercial – whose property is located within the Special Hazard Flood Area (SHFA), may be eligible for a 10% discount on their annual flood insurance premium due to the Town's CRS Classification of 8.

Relative to CRS requirements, Vinton undertakes the following CRS specific activities, among many others.

- *Higher Regulatory Standards:* Credit is provided for enforcing regulations that require freeboard for new construction and substantial improvement, and local drainage protection. Credit is also provided for the enforcement of building codes, a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 4/3, and regulations administration.
- *Open Space Preservation:* Credit is provided for preserving approximately 20 percent of the Special Flood Hazard Area (SFHA) as open space and protecting open space land with deed restrictions.

Dam Safety

Carvins Cove Reservoir Dam, located on a tributary of the Carvin Creek and owned by the Western Virginia Water Authority (WVWA) could impact the western side of the Town of Vinton. Inundation maps for this dam are included in [Appendix H](#).

Other Mitigation Activities

The Town obtained two FEMA Hazard Mitigation Grant Program (HMGP) grant funding in April 1998 and July 2004. Through these two grant programs, 19 properties that were either developed with residential structures or vacant lots located in the SFHA were acquired. Eleven structures that were located in the floodway were demolished and the occupants and/or tenants were relocated from the SFHA and the properties were rezoned to public/open space district. The Town purchased a mobile home park in 2024 using local funds which involved the relocation or demolition of nine manufactured home units that were in the floodway. Additionally, the Town purchased and demolished a single-family residence located in the floodway in March 2025 using local funds. The Town has an overarching goal of continuing to purchase flood prone properties throughout its jurisdiction using a piecemeal strategy by working with current or future homeowners and vacant landholders.

In January 2010, the Town of Vinton and Roanoke County entered a Memorandum of Understanding (MOU) for Operations, Oversight, and Management of the Merged Emergency Communications Center. By the agreement, the Roanoke County Emergency Communications Center shall provide emergency and non-emergency dispatch services for the Town of Vinton, including the Vinton Police Department and the Vinton Public Works Department. Services delivery procedures will be documented in General Orders (GO) Standard Operating Procedures (SOPs), and Directives, with input provided by the Inter-Agency Operational Team, and the Advisory Board.

In partnership with the City of Roanoke, the Town purchased a flood warning system in 2022.

Other Factors

Increased assistance with grants administration is an opportunity for regional support to Vinton; especially in regards to hazard mitigation grant programs provided by VDEM and DCR. Additionally, less regulations and requirements on federal grants would be helpful in administering the projects that are awarded. Additional grant assistance (especially from State agencies) is the Town's biggest need in terms of addressing capacity constraints.

The Town receives support on stormwater work and some other services through Roanoke County. The Town of Vinton is a member of the Roanoke Valley – Alleghany Regional Commission and the Roanoke Valley Transportation Planning Organization. Valley Metro serves this locality and they are a member of the Greenway Commission. The Town is a member of the Roanoke Valley Resource Authority and the Western Virginia Water Authority. They have a robust public outreach program and are a member of Roanoke Valley Television.

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5.14 Roanoke Valley-Alleghany Regional Commission

The Roanoke Valley-Alleghany Regional Commission is the regional planning district commission and the holder of this planning document. The Regional Commission also staffs the Roanoke Valley Transportation Planning Organization, which, while not a direct adopter to this plan, is nonetheless a critical organization in providing transportation planning and funding to the region. The Commission engages in planning across a wide variety of planning areas, including rural transportation, alternative transportation and transportation demand management, public health and opioid abatement, housing, water quality and stormwater management, and general technical assistance including comprehensive plan and zoning assistance.

Budget and Staffing Characteristics

A breakdown of the Regional Commission budget is included below. The Commission does not own public land or levy taxes upon citizens. All revenue comes from organizational dues, individual contracts with locality or regional partners, state appropriations, state grant programs, or federal grant programs and pass-thru dollars. In fact, more than a quarter of the revenue for the Commission is federal or federal pass-thru.

The annual workprogram and budget of the Commission and TPO guide the work of the Commission from year-to-year. The Strategic Plan guides the work of the Commission over a five-year period.

Table 52: RVARC Budget FY2026

Roanoke Valley Alleghany Regional Commission Budget Comparison FY2026		Final Budget 2026 Revenues
Revenues:		
Localities Per Capita Regional Commission	\$	400,274
Localities Per Capita TPO	\$	35,882
Blueway Funding From Localities	\$	11,491
Franklin County for Micro Transit Study	\$	35,000
Department of Housing & Community Development	\$	114,971
Federal Highway Administration - PL	\$	726,273
Virginia Department of Transportation - PL	\$	90,784
Federal Highway Administration - SPR	\$	58,000
Federal STBG VDOT Glade Creek Funding	\$	268,892
Virginia Department Rail & Public Transit, FTA Federal	\$	184,682
Virginia Department Rail & Public Transit, FTA State	\$	23,085
VA Dept. Rail & Public Transit, RideSolutions (Roanoke)	\$	187,696
VA Department Rail & Public Transit Franklin County Micro Transit	\$	60,000
City of Roanoke Better Bus Stops	\$	79,667
Federal Economic Development Administration	\$	80,420
Virginia Department of Forestry	\$	8,000
Virginia Department of Environmental Quaility	\$	107,754
Virginia Environmental Endowment	\$	20,798
Virginia Department of Emergency Management	\$	38,619
Appalachian Regional Commission	\$	67,614
Appalachian Regional Commission Ready LDD Grant	\$	47,000
Mountain Castle Water Conservation District	\$	7,000
Southeast Crescent	\$	15,000
City of Roanoke Bike Coordination	\$	12,000
ARP ACT City of Roanoke Carryover	\$	68,327
Department of Health & Human Services-Peer Recovery	\$	495,496
City of Roanoke Virginia Opioid Abatement Authority Funds	\$	425,000
Western Virginia Regional Industrial Facility Authority	\$	25,000
Virginia Housing	\$	931,569
SERDI Website Administration Contract	\$	1,538
RVARC Interest Income	\$	40,000
Miscellaneous Income	\$	2,500
Sponsorships	\$	2,000
Blueway Carryover	\$	28,000
Regional Bike Carryover	\$	7,412
Total Revenues	\$	4,707,744

Plans and Planning Schedules

The Regional Commission maintains a variety of regional plans mandated by the federal and state governments, as well as several regional studies and documents which have been generated by local interest. The Commission also staffs the TPO, whose documents will be included in this section. Most relevant to the goals of this plan are the Long Range Transportation Plan (LRTP), the Transportation Improvement Plan (TIP), the Rural Long Range Transportation Plan (Rural LRTP), and the Comprehensive Economic Development Strategy document (CEDS). Together these four documents, in conjunction with this plan, guide significant investment across the region.

Schedule of Updates:

- CEDS: The CEDS receives an annual review and demographics update, with a full update and revision every 5 years. The last 5-year update was conducted in 2024.
- LRTP: The LRTP was last approved in 2023. The next update will begin in 2026.
- Rural LRTP: The Rural LRTP was last updated in 2011, and an update is planned to conclude in 2026.
- TIP: The TIP is approved every four years. The current TIP covers FFY24-27. Updates will begin on the next TIP in 2026.

The Regional Commission has also historically contributed to stormwater collaboration and water quality activities throughout the region which can have direct impact on flood resilience. Specifically, the Regional Commission is currently involved in Chesapeake Bay Watershed Improvement Plan implementation work in partnership with the Virginia Department of Environmental Quality. The Commission also coordinates a regional stormwater advisory group which allows local governments and other entities operating under an MS4 permit to meet and share information and ideas.

Roanoke Valley Regional Stormwater Management Plan (1997)

All four Roanoke Valley jurisdictions (Roanoke County, Cities of Roanoke and Salem, Town of Vinton) participated in the development of a stormwater management plan that was coordinated through the efforts of the Fifth Planning District Commission (Roanoke Valley-Alleghany Regional Commission). It offers alternative solutions for both flooding and flash flooding problems. These alternatives include clearing stream channels, enlarging drainage openings, constructing regional detention facilities, and flood proofing individual structures. The plan presents a total of 138 individual projects to address flooding in the 16 watersheds. These are ranked in order of priority within each watershed but no overall ranking within the valley is presented. Cost estimates are presented for each project, but neither individual project benefits, nor cumulative benefits are discussed. It would be essential to analyze the benefits of these projects before the plan can be used as a guideline for specific activities. The identified projects would cost a total of \$66 million in 2001 dollars, not including land acquisition or efforts to flood proof or move over 2,200 buildings. A formal quantification of the corresponding benefits would go a long way toward justifying this cost, which can initially seem overwhelming to both citizens and community officials. For example, the 1997 plan reports that between 1972 and 1992, floods caused over \$200 million in damages in the valley, and resulted in 10 deaths. The plan's Financing Options Report recommends creation of a regional stormwater utility as a means of funding the identified work.

Other Factors

The Regional Commission is the primary holder of this plan and issues with capacity or staffing directly affect the ability to update or maintain the document. Historically, the Commission has also been a key partner for small localities in applying for mitigation grant funding, either by providing assistance with the application process or by administering grants. The Commission also serves as an incubator for regional initiatives.

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5.15 Roanoke Valley Resource Authority

The Roanoke Valley Resource Authority is a solid waste management organization serving the Roanoke Valley. Member communities include the City of Roanoke, Roanoke County, City of Salem, and Town of Vinton.

Budget and Staffing Characteristics

The annual revenue for the RVRA totals at \$19,116,734 per the adopted FY2026 budget²⁴. They maintain seven administrative staff positions, including a Director of Community Engagement, a Director of Operations, and an Operations Manager.

Plans and Planning Schedules

The RVRA maintains an annual budget, a Master Plan that functions as the Capital Improvements Plan, a Comprehensive Plan, and a Stormwater Management Plan. The plan was last updated in 2025. Any ordinances that cover solid waste are enacted by localities. RVRA does not have regulatory authority.

Other Factors

The RVRA is primarily a support agency for response to disasters. They operate critical facilities within the Roanoke Valley. RVRA sees the primary need for mitigation efforts to be better cross-agency engagement.

²⁴ <https://www.rvra.net/135/Annual-Budget>

5.16 Western Virginia Water Authority

The Western Virginia Water Authority provides critical water and sewer services and maintains and operates infrastructure for many of the communities within this plan, including the counties of Roanoke, Botetourt, and Craig, the City of Roanoke, and the Towns of New Castle, Fincastle, and Vinton.

Budget and Staffing Characteristics

The WVWA staffs 309 full-time employees across multiple divisions within the organization. All of the divisions might be directly or indirectly impacted by mitigation work or disaster events. Staff members include those with skills in engineering, emergency management, and GIS. The WVWA revenue in FY2025 was projected at \$50.5 million.²⁵

Plans and Planning Schedules

The WVWA maintains a Master Plan, a Capital Improvements Plan, Emergency Response Plans for their various treatment facilities, and Emergency Actions Plans for High Hazard Potential Dams under their ownership. They are all updated annually, and all include mitigation activities. Ordinances which may impact the operations of the WVWA are controlled by the localities in which they operate.

Dam Safety

The WVWA operates several dams within the region. Inundation mapping for WVWA-owned dams is available in [Appendix H](#).

Other Factors

The WVWA is primarily a support agency for response to disasters, but the Authority is the primary maintenance agency for two high hazard potential dams in the region. They operate critical facilities within the region.

²⁵ <https://www.westernvawater.org/about-us/financial-documents-reports/annual-budget>

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Chapter 6. Mitigation Goals and Strategies

Goals and strategies are guiding elements which help shape the action plans of the jurisdictions participating in this planning process. Goals and strategies are housed regionally, emphasizing a regional approach highlighting partnership and intentional strategy, representative of all participants.

6.1 Identified Goals

Three goals were identified in the planning process. Goals are broad statements allowing for establishment of tailored, focused strategy. These are aspirational, vision statements that guide implementation efforts.



Goal 1

Minimize the loss of life, structures and critical infrastructure during a disaster, as well as reduce risk to the built environment and natural resources.

Goal 2

Minimize the economic impact to communities and the region in the wake of disaster

Goal 3

Minimize impacts to social systems and community resources following disaster.

6.2 Regional Strategies

Strategies are conceptual statements wherein projects can be developed, detailed and executed. In applying mitigation strategies to the region and participants, a wide range of activities were considered in order to achieve the goals and to lessen the vulnerability of the area to the impact of natural hazards. Goals are pursued regardless of financial resources. However, advancement of identified strategies is largely contingent upon meaningful, sustainable projects relying on availability and timeliness of non-local funding from a variety of partners and sources.

Strategies are generally organized conceptually around five areas of work, which are:

1. Local Plans and Regulations
2. Structure and Infrastructure Projects
3. Natural Systems Protection and Nature-Based Solutions
4. Education and Awareness Programs
5. Community Safety and Partner Efforts

Strategies were developed by jurisdictions in partnership with VDEM staff.

6.3 All Hazards

Local Plans and Regulations

1. Support local development codes that promote disaster resiliency.
2. Support robust, deliberate emergency operations planning.
3. Pursue opportunities to study, research and plan to build resiliency throughout communities based on hazard data, new research and concepts. This could include risk and vulnerability assessments, operational assessments among others.

Structure and Infrastructure Projects

4. Equip and maintain critical facilities and resources with redundant power resources, such as generators, hookups/quick connects, and battery/solar backups.
5. Assess and develop where practical, loan, grant, or similar programs to support increased resilience of privately owned facilities, structures and property.
6. Seek opportunities to build resiliency within utilities to reduce impact from all-hazards.
7. Develop redundancy in water sources and water distribution systems.
8. Establish, sustain and develop dam maintenance and replacement programs to ensure dam safety, access to water sources and sustainment of natural recreation areas.

Natural Systems Protection and Nature-based Solutions

9. Integrate regional environmental and natural resources preservation efforts with hazard mitigation planning.

Education and Awareness Programs

10. Pursue educational programs and outreach activities that promote individual, family and business safety and resiliency
11. Provide planning resources tailored to business continuity.

12. Make home safety and individual preparedness resources available to community members
13. Participate in special outreach/awareness programs and activities.
14. Seek opportunities to communicate effectively across multiple methods with the public well in advance of disaster to communicate forecast and preliminary action steps, including the use of social media and non-emergency alert systems. Ensure capability to speak with vulnerable communities including non-English speaking community members and individuals with access and function needs.

Community Safety and Partner Efforts

15. Participate, seek or maintain certification as a “Storm Ready” Community with the National Weather Service.
16. Improve region-wide interoperability across radio systems.
17. Improve citizen access to emergency reporting mechanisms including but not limited to 911 and post disaster recovery tools.
18. Pursue, sustain and develop emergency alerting tools that allow emergency services to alert members of the community through a variety of methods, to impending emergency, particularly mass notifications systems.
19. Develop, resource and sustain locations, physical and virtual, where whole of government and community partners may coordinate to respond to the impacts of hazards.
20. Conduct resiliency assessments of public facilities with an emphasis on critical infrastructure and utilities.
21. Undertake deliberate research, planning and effort to develop comprehensive, compliant and innovative debris management programs following all hazards disasters that generate manageable debris.
22. Support the development of weather reading and monitoring equipment to increase situational awareness, alert and warning.
23. Support the development and sustainment of Community Emergency Response Teams (CERT) within localities.
24. Support the maintenance and expansion of locality sheltering locations and resources.
25. Develop, sustain and support capabilities to shelter pets during disaster.
26. Resource capabilities related to assisting special needs and vulnerable populations.
27. Develop, sustain and support capabilities to conduct family reunification and assistance.
28. Engage partners to share capability and situation information, pre, during and post disaster.
29. Develop capabilities to conduct multi-jurisdiction sheltering when applicable.
30. Regularly train first responders, coordinate with regional partners, and ensure clear post-disaster communication and recovery.

6.4 Earthquake

Education and Awareness Programs

1. Conduct public information activities such as the “Great Shakeout” to provide individuals with tactics to take when earthquakes strike.

Community Safety and Partner Efforts

2. Engage with subject matter experts to understand the scope and risk to facilities and life as a result of an earthquake.
3. Develop “critical area” maps based on geotechnical information to identify locations where damage potential could be high.
4. Engage partners to share capability information.

6.5 Extreme Temperature

Local Plans and Regulations

1. Plan to develop adaptation features to build individual, community and infrastructure resilience.

Structure and Infrastructure Projects

2. Identify vulnerable structures and implement infrastructure retrofit projects to include measures that reduce risk to existing utility systems.
3. Consider use of reflective roof coatings, radiant barriers and other tactics to mitigate heat interaction with structures.

Natural Systems Protection and Nature-based Solutions

4. Increase urban tree cover to mitigate heat island effect.

Education and Awareness Programs

5. Inform community members of the danger of extreme temperature and provide resources through multiple methods, such as NWS HeatRisk.

Community Safety and Partner Efforts

6. Identify locations and partnerships that create opportunity for community members to seek reprieve from extreme temperatures.

6.6 Flooding

Local Plans and Regulations

1. Encourage a comprehensive approach to floodplain management
2. Support programs that update FEMA's Flood Insurance Rate Maps (FIRM). Consider participation in FEMA's Cooperating Technical Partners (CTP) program that establishes partners with local jurisdictions to develop and maintain up-to-date flood maps.
3. Participate in FEMA's Digital Flood Insurance Rate Maps (DFIRM) program.
4. Support FIRM remapping projects that address flood prone areas in the region
5. Maintain an accurate database and map of repetitive loss properties
 - a. Localities will work with RVARC, VDEM and FEMA to update list of repetitive loss properties annually.
 - b. Localities will obtain updated list of repetitive loss properties annually from VDEM/FEMA.
 - c. Localities will review property addresses for accuracy and make necessary corrections.
 - d. Localities will determine if and by what means each property has been mitigated.
 - e. Localities will map properties to show general site locations (not parcel specific in order to maintain anonymity of the property owners).
 - f. Localities will determine if properties have been mitigated and inform FEMA/VDEM through submission of an updated list/database and mapping.
6. Participate in, and remain in good standing with the NFIP, in accordance with NFIP regulatory requirements including:
 - a. Adoption of the NFIP minimum floodplain management criteria via local regulation;
 - b. Adoption of the latest effective Flood Insurance Rate Map (FIRM), when applicable;
 - c. Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs;
 - d. Appointment of a designee or organization to implement the commitments and requirements of the NFIP;
 - e. Implementation of the substantial improvement/damage provisions of their floodplain management regulations after an event, as applicable.
7. Strengthen and support the insurance aspects of the NFIP through participation in relevant programs, such as the Community Rating System.
8. Work to reduce flood damage to insurable property.
9. Develop, support and sustain Stormwater Management Plans, such as the Roanoke Valley Regional Stormwater Master Plan.
 - a. Explore the number of watersheds studied in the Roanoke Valley Regional Stormwater Master Plan, consider expanding the number of inclusions as appropriate and develop watershed plans for each.

Structure and Infrastructure Projects

10. In cooperation with local governments, utilize GIS tools to inventory at risk infrastructure and public and private structures within flood prone areas.

11. Support local and state transportation projects that call for improved ditching, replacement of inadequate and undersized culverts, enlargements of bridge openings, drainage piping and other physical work needed to minimize flooding.
12. Pursue the acquisition of residential and commercial property in floodplains with an emphasis on repetitive loss properties.
13. Support structural elevation projects where buildings can be safely elevated to avoid loss or damage during flood events.
14. Seek opportunities to floodproof structures.
15. Pursue acquisition of elevation certificates for flood prone properties.

Natural Systems Protection and Nature-based Solutions

16. Consider seeking funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems.
17. Consider increasing conveyance standard to handle more intense precipitation, while avoiding streambank erosion.
18. Pursue opportunities to utilize pervious hard surfaces when possible.
19. Pursue opportunities to stabilize soil along river, creek and stream banks to prevent undercutting roads and other facilities.
20. Promote green infrastructure to prevent flooding, manage excess runoff and increase filtration.
21. Promote the use of green roofs and rainwater harvesting systems
22. Restore and protect riparian areas.
23. Restore waterways that have been covered or buried due to natural conditions.
24. Protect and restore wetlands, forests, and other natural buffers to reduce storm surge and flooding impacts.

Education and Awareness Programs

25. Enhance pre-disaster community situational awareness of flood hazards and hazard prone locations, by cooperating with all relevant partners to support a comprehensive public information and education program on all aspects of preparedness related to flooding. Tools such as the FloodView App (2025) provide information and resources supporting this strategy.

Community Safety and Partner Efforts

26. Provide early flood warning
 - a. Identify target areas for monitoring, including flood prone areas, streams and rivers to provide advance warning for downstream impacts.
 - b. Identify, acquire and maintain equipment that will perform required monitoring for specific locations and needs. Ensure equipment is appropriately supported and networked to enhance data coordination and empower early warning.
 - c. Configure systems and tools that monitor water levels and flooding conditions to support data and early warning interoperability with organizations that have responsibility to provide alerts, store, and monitor data. Ensure sustainment of these systems and data interoperability.

6.7 Geologic Hazards

Local Plans and Regulations

1. Develop, sustain and enforce, as appropriate, steep slope ordinances/guidelines for development in steep slope/marginal soils areas.

Education and Awareness Programs

2. Develop an education and awareness program for home, land and business owners, to inform life and property safety measures on an individual basis, as well as financial considerations associated with geologic hazards.

Community Safety and Partner Efforts

3. Encourage the delineation of karst areas and areas susceptible to sinkholes through a cooperative effort with the Virginia Karst Mapping Project, Virginia Speleological Survey, and Virginia Department of Conservation and Recreation (Virginia Cave Board).
4. Encourage the delineation of susceptible areas and different types of landslide hazards at a scale useful for planning and decision-making, led by USGS and State geological surveys.
5. Work with state and Federal agencies to develop data that will assist in reducing and eliminating impacts from landslides.

6.8 Wind

Local Plans and Regulations

1. Promote building codes and retrofitting practices that enhance wind resistance for homes, utilities, and critical facilities.

Structure and Infrastructure Projects

2. Identify vulnerable structures and implement infrastructure retrofit projects to include measures that reduce risk to existing utility systems.
3. Identify, maintain, and publicize designated tornado shelters, and encourage safe room installation in schools, public buildings, and homes.

Natural Systems Protection and Nature-based Solutions

4. Research and install landscape mitigation for strategic planting of trees and hedge rows.
5. Conduct pre-storm tree assessments and pruning to help minimize wind born debris and protect infrastructure.

Education and Awareness Programs

6. In cooperation with Federal and State governments, support a comprehensive public information and education program on wind hazards, including straight line winds, tornados and thunderstorm winds. This can be accomplished through regional workshops and educational materials for citizens, business, local staff, and elected officials.

7. Strengthen community access to NOAA Weather Radio, mobile alerts, and local emergency notifications to ensure residents receive timely tornado warnings.
8. Support school level preparedness activities including tornado drills.

Community Safety and Partner Efforts

9. Strengthen operational coordination relationships with utility providers to coordinate and collaboratively support the community following disaster related impacts.

6.9 Wildfire

Structure and Infrastructure Projects

1. Encourage residents and developers to use NFPA Firewise USA TM building design, siting, and materials for construction.
2. Continue to support domestic water line infrastructure into communities who currently operate off well water.

Natural Systems Protection and Nature-based Solutions

3. Create Defensible Space – implement perimeters around homes, structures, and critical facilities through the removal or reduction of flammable vegetation.
4. Continue to utilize the Va. Dept. of Forestry “Dry-Hydrant” program to support access to private water sources

Community Safety and Partner Efforts

5. Identify buildings or locations vital to the emergency response effort and buildings or locations that, if damaged, would create secondary disasters in forested areas.
6. Encourage VDOF to continue its Community Wildfire Assessments.

6.10 Winter Storm

Structure and Infrastructure Projects

1. Implement pavement temperature sensors to increase real-time planning, execution and public information efforts.

Chapter 7. Mitigation Action Plans

7.1 Project Development and Prioritization

This section contains the mitigation action plans of each participating jurisdiction within the plan. In developing mitigation strategies for the region, a wide range of activities were considered in order to achieve the goals and to lessen the vulnerability of the area to the impact of natural hazards. All goals, strategies, and projects are dependent on the availability and timeliness of nonlocal funding.

Prioritization of projects was based on the benefit-to-cost criteria and the strategy's potential to mitigate the impact from natural hazards in line with long term planning efforts. For example, if a project is already clearly scoped in an existing plan, that project is given higher priority. Consideration was also given to availability of funding, the department or agency responsible for implementation, and the ability of the locality to implement the project. Under each identified project, applicable participant departments will be the lead in making sure that each project or action will be implemented in a timely manner by coordinating with other departments, other participant representatives and/or other regional agencies.

The anticipated level of cost effectiveness of each measure was a primary consideration when developing the list of proposed projects. Projects were categorized as high, medium or low benefit to cost based on the available information for each proposed project. Reduced damages over the lifespan of the projects, the benefits, are likely to be greater than the project cost in all cases. Although detailed cost and benefit analysis was not conducted during the mitigation action development process, these factors were of primary concern when prioritizing and selecting the proposed projects.

For more information about each locality, including active mitigation programs and ordinances, please see [Chapter 5: Capabilities Assessment](#).

7.2 Allegheny County

The mitigation actions contained in this section also cover mitigation actions for the Town of Iron Gate.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Acquisition of flood prone properties	Flooding	Removal of households from flood hazard areas; reduce repetitive loss; reduce loss of life and property	Unknown	High	High	FEMA, VDEM, Local government	Local government, Engineering & Building Inspections	COMPLETE	2018-2023
Communication equipment interoperability	All hazards	Improved coordination among jurisdictions; improved response times	\$7,000,000	High	High	FEMA, Local government	Local government	COMPLETE	Current / Ongoing
Identify areas with recurring flood problems and request additional stream/rain gauges	Flooding	Improved early warning of flooding; ensure that these areas are adequately covered and monitored	\$12,500	High	Medium	FEMA, VDEM	RVARC	In progress	2025-2026
Identify areas that warrant site-specific hydrologic and hydraulic studies emphasizing chronic and repetitive flooding problems	Flooding	Possible determination of solutions to repetitive loss properties.	Cost Pending Scoping	Medium	Medium	County, Grantor with an appropriate grant program	Community Development	Not started; lack of scoping and staff	Unknown

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Identify buildings or locations vital to the emergency response effort and buildings or locations that, if damaged, would create secondary disasters in forested areas	Wildfire	Available inventory of structures that need additional or unique protection from wildfires.	\$10,000	Low	Medium	VA Dept. of Forestry, US Forest Service, Local governments	Co Public Safety	Not started; lack of funding	Unknown
Evaluate critical facilities and public utilities for flood-proofing	Flooding	Evaluation of county owned critical facilities and public utilities for retrofitting or flood-proofing to prevent failure during disasters	\$250,000	Medium	Medium	FEMA, Local government	Public Works/General Services	Not Started pending scoping	6MOs from Funding
Hazardous Materials Risk Assessment and Education Program	All Hazards that result in Hazardous Materials Release	Evaluate risk and community safety information for Hazardous Materials Release	\$25,000	Medium	High	County, Grantor with an appropriate grant program	Public Safety	Not started pending scoping	Pending Scoping
Install Generators at: -CSB -AHS -Pump Stations	All hazards generating power outage	Ensure that emergency facilities can be operational during hazard events	\$75,000(ea)	High	Medium	County, CSB, Schools, VDEM Shelter Upgrade Grant, Grantor with an appropriate grant program	Public Safety, Public Works, General Services	Pending Grant Award	6MOs from grant award

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Local codes review	All hazards	Review of development codes to evaluate need for changes that would improve disaster mitigation	\$10,000	Medium	Medium	FEMA, Local government		Not started; lack of funding	Unknown
Community wildfire assessments	Wildfire	Reduction of loss to wildfire, through collaborative assessments and tailored mitigation action	\$25,000	Medium	Medium	VDOF, USFS, Public Safety	Public Safety	In progress	Ongoing

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7.3 City of Covington

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Add / Replace Generators at Fire Station City Hall Emergency Shelter Locations	All Hazards generating power outage Extreme Temperature	Evaluate the facilities and install appropriate generating equipment and controls to allow them to be better utilized during disasters and severe events	~\$220,000+	High	High	City/ Grantor with an appropriate grant program	Development Services/Public Works/ Emergency Management	Not started pending scoping	1YR from funding
Add flow monitoring equipment to locality water system	Flooding	Provide better, more timely information to public works to identify system anomalies	~\$100,000	High	High	City, I&I Grant	Public Works	In Progress	DEC 2026
Elevation of Structures - City Pool and Playground	Flooding	Reduced damages and repair costs	\$100,000	Medium	Medium	City & Local Foundation Grant	Local Government	Complete	2016
Drainage Improvements – Craig Avenue and Royal Avenue	Flooding	Reduced damages and repair costs	\$500,000	High	High	VDEM / FEMA / LOCAL GOVT	Local Government	Engineering/ design underway COMPLETE	2020-22

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
The upgrading of the present weather terminal at the Covington EOC	All Weather Hazards	Better and more timely weather information will allow first responders to make better decision about actions to take, evacuations, and the possibility of flooding and other severe weather	\$10,000	High	High	City, Grantor with an appropriate grant	Emergency Management	Not started; lack of funding	TBD
Mobile Generator Acquisition with Quick Connects on Pump Stations	All Hazards generating power outage	Continue to operate wastewater pump stations during power outage	\$100,000	High	High	City	Development Services/Public Works	Pending Delivery	Within 1MO of Delivery
Drainage Improvements: Chestnut & Monroe ST	Flooding	Reduced Damage and repair costs; access and response between areas of the City during moderate or greater rainfall	\$7,000,000	High	High	City, Post Helene Mitigation	Development Services/Public Works/ Emergency Management	Pending Grant Award	~1YR from Funding
Study potential of Landslide on 220 at Town Hill	Geologic Hazards	Prevent impact of landslide into 220	\$100,000	Low	High	City, VDOT, Grantor with an Appropriate Grant Program	Public Works	Not Started pending scope	TBD
Study former water line work	Geologic Hazards	Mitigate flow in the area that could be the cause of sink hole	\$50,000	Low	Low	City, Grantor with an appropriate grant program	Public Works	Not Started pending scope	TBD

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Joint Communications Center with Allegheny Co	All Hazards	Improved coordination between responders and response records between both jurisdictions	~\$10,000,000	High	High	City, County, VDEM(NGS)	City PD/Allegheny Public Safety/Allegheny Sheriff's Office	Multi-phase process, back end technical work underway, Scoping move/construction	3-5YRS

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7.4 Town of Clifton Forge

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Update and Develop Town Specific GIS Layer	All-Hazards	Create situational awareness related to assets, problem areas and spacial functions of the town.	\$15,000-\$25,000	High	High	Local Government, Virginia Tech	Local Government, Community Planning	In Progress	1YR to Completion
Identify buildings or locations vital to the emergency response effort and buildings or locations that, if damaged, would create secondary disasters in forested areas	Wildfire	Available inventory of structures that need additional or unique protection from wildfires.	\$10,000	Medium	Medium	VA Dept. of Forestry, US Forest Service, Local governments	Local government, VDOF, USFS	Not started; lack of scoping	1YR from scoping
Communication equipment interoperability	All hazards	Improved coordination among jurisdictions; improved response times	\$1,000,000	High	High	FEMA, Local government	Local government, Police Department	COMPLETE	Current / Ongoing
Determine the need for generators at public emergency facilities	All hazards	Ensure that emergency facilities can be operational during hazard events	\$250,000	High	Medium	FEMA, Local government	Local government, Public Works	COMPLETE	2013

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Local codes review	All hazards	Review of development codes to evaluate need for changes that would improve disaster mitigation	\$10,000	N/A	Medium	Town	Local government, Community Development, Building Official	In-Progress	Unknown
Local Flood Profile	Flood	Identify Hazards associated with Dam Safety	\$100,000	High	High	USDA	VA Soil and Water Conservation Board	COMPLETE	2014-15
Stream Bed Survey	Flood	Identify Repairs Required	\$25,000	Medium	Medium	RWA, Local Government	Local Government Public Works	Not started; lack of funding	Unknown
Conduct a town-wide study Identify Geologic Hazard Areas, and appropriate mitigation actions	Earthquake, Geologic Hazards	Increased situational awareness and planning capability	\$75,000	Medium	Medium	Local Government	FEMA, Local Government, Community Development	Not started; lack of funding	1YR from grant award
Communications Plan	All Hazards	Improved Communication and Response	\$5,000	Medium	High	Local Government	FEMA, Local Government, Police Department	COMPLETE	Ongoing
Water Reservoir Hazard Plan	All Hazards	Protection of Town Water Supply	\$125,000	High	High	VA Dept of Health, FEMA	Local Government, VA Department of Health	Not started; lack of funding	12 months

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Hazardous Materials Planning	All Hazards resulting in HAZMAT release	Increased awareness and planning capability to decrease loss of life, property and enhance response resources.	\$15,000-\$25,000	High	High	Town, Grantor with an appropriate grant program	Emergency Services, Railroads, VDOT	Not started; Lack of funding/scoping	2Yrs from funding

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7.5 Botetourt County

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Participate in the "StormReady" program	All Hazards	Community is better prepared through planning and education	\$1,000	High	Medium	FEMA, VDEM, NWS, Local governments	Local government	COMPLETE	Accepted to program in 2011. County is a participant in good standing
Obtain more up-to-date and comprehensive GIS system	All hazards	Increased information for better incident response	\$350,000	High	High	Local Government	Local Government	COMPLETE	Complete due to transition to ArcGIS, external funding sources not needed.
Community notification system	All hazards	Reduced loss through improved warning system	\$55,000	High	Low	FEMA, VDEM, ODP, Local Government	Local government, ESC, Sheriff Dept.	COMPLETE	
Evaluate critical facilities and public utilities for flood-proofing	Flooding	Evaluation of critical facilities and public utilities for retrofitting or flood-proofing to prevent failure during disasters, particularly emergency services facilities located in flood hazard areas.	\$50,000	Medium	Medium	FEMA, Local government	Local government	In progress: Evaluation ongoing, funding sources are being sought	2026

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Communication equipment interoperability	All hazards	Improved coordination among jurisdictions; improved response times	\$250,000	High	High	FEMA, Local government	Local government, ESC, Sheriff Dept.	In progress: Still on-going, procurement for new radio system underway	Fall 2027
Identification and tracking of special needs populations	All hazards	Preparation for assisting special needs populations to prevent loss of life and property	\$25,000	Medium	Medium	Local government	Local government	In progress: GIS efforts underway	Ongoing
Identification and installation of generator quick-connect locations for critical public service facilities, shelter facilities, and other critical infrastructure	All Hazards resulting in power outage	Continuity of critical services during disasters	\$200,000	High	High	FEMA, VDEM, Local	Local government	In progress: project underway, grant funding is pending FEMA review, expense has increased	2025
Obtain portable generators to be used on various infrastructure components as needed during incidents	All Hazards resulting in power outage, including wildfire	Would allow deployment of generator to critical infrastructure when power fails to certain facilities, to include mountain tower sites	\$180,000	High	Medium	Local Government	Local Government	In progress, grant in FEMA review	2026

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Construct an Emergency Operations Center for use during disasters to support response and recovery efforts	All hazards	Allow for central location to coordinate all response and recovery resources during and after an event.	\$1,000,000	High	Medium	Local Government	Local Government	Not Started; Lack of Funding: In progress, Capital Improvement Project for new Fire Station/Dispatch Center	2026
Installation and Maintenance of River and Precipitation Gauges	Flood	Development of a water and flooding common operating picture supporting early warning and situational awareness	\$70,000	High	High	Local Government, HMGP: Helene	Botetourt County Emergency Management	In progress, Funding has been sourced for initial installation, addition funding is being sourced for maintenance and expansion	2026
Development of Sheltering Resource Cache	All-Hazards	Expand capability to operate shelters within the County	\$50,000	High	High	SHSP, Other emergency management grant sources as available	Botetourt County Emergency Management	Not Started, previously submitted grants have not been approved, continuing to seek funding	6 Mos upon funding

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Landslide and Geologic Hazards Training for land disturbance inspectors	Geological Hazards	Due to increased consequential development in the community and land disturbance, inspectors will have increased perspective and consideration for these types of hazards	\$5,000	Low	Low	County, Grantor with an appropriate grant program	Community Development	Not Started, Pending development	2027

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7.6 Town of Buchanan

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Evaluate public utilities for floodproofing	Flooding	Evaluation of public utilities for retrofitting or floodproofing to prevent failure during disasters	\$10,000	Low	High	FEMA, Local government	Local government, Public Works Dept	COMPLETE	Ongoing
Acquire and demolish derelict property in the floodplain through local program	Flooding	Reduction of derelict structures within the flood plain	Unsure	Medium	Low	Town, and Grantor with an appropriate grant program	Town Manager	Not started; lack of funding	TBD
Elevation of the Water St Pump Station, Pump replacement, movement of sewer line under the river	Flooding	Continuation of sewer service during disasters	\$1,800,000	High	High	DEQ, Town	Town Water System Operator	In progress	3 Yrs from Engineering
Flood Wall to protect Lowe Street and Main Street	Flooding	Elimination of street, business and residential flooding downtown	unknown	High	High	FEMA, VDEM, Local	Local government	Not started; lack of funding	2026
Elevate Parkway Dr from Main St to Quarry	Flooding	Elevate Parkway Dr.	\$1,000,000	Medium	Medium	Town, County, Grantor with an appropriate grant program	Town Manager	Not Started, pending scoping	TBD

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Study residential and agricultural property existing in steep slope areas to identify mitigation solutions	Geologic Hazards, Wildfire	Study landslide, karst and wildfire risk associated with residential and agricultural property existing in steep slope areas to identify mitigation solutions	\$50,000	Medium	Medium	Town, Grantor with an appropriate grant program	Town Manager	Not started pending scoping	1YR from scoping
Plan Buchanan Library and elementary school as a backup area shelter and POD.	Extreme Temperature, Wind, Winter	Development of a redundant location for local emergency sheltering	\$5,000	Medium	Medium	Town, County	County Emergency Manager	In Progress	TBD
Identification and installation of generator quick-connect locations for critical public service facilities, shelter facilities, and other critical infrastructure	All Hazards resulting in power outage	Continuity of critical services during disasters	\$200,000	High	High	FEMA, Local, VDEM,	Botetourt Co Emergency Management	In progress: project underway, grant funding is pending FEMA review, expense has increased	2025

7.7 Town of Fincastle

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Evaluate public utilities for floodproofing	Flooding	Study public utilities for retrofitting or floodproofing to prevent failure during disasters	\$10,000	Medium	High	Town, County, Available Grantors with appropriate grant programs, when scope of work is developed	Town Council	Not started; lack of funding	4-6 Months from Funding
Study vulnerability of the Wastewater Treatment plant	All Hazards generating power outage, Flooding, Geologic Hazards, Wildfire, Earthquake	Study to determine flood risk, power failure and resiliency, slope stability, road access, defensible space and security measures at WWTP	\$50,000	Medium	Medium	Town, County, Available Grantors with appropriate grant programs, when scope of work is developed	Town Council	Not Started pending scope of work	To be determined by scope
Procure Trailer Drawn Generator and Install Quick Connects	All Hazards generating Power Outage, i.e. Flood, Wind, Winter, Extreme Temperature	Have a portable generator to support 2 town wells and the WWTP, upon which quick connects will be installed. Available resource for the Ventilator Dependent Skilled Nursing Facility located within the town, in the event of extreme temperatures.	\$210,000	High	High	Town, County, VDEM Hazard Mitigation, FEMA Post Disaster Mitigation Grant (Helene)	Town Manager, County Emergency Manager	Not Started pending grant approval	6 Months from Funding (order time of generator)

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Study: Stream Bank Restoration- Town Branch	Flooding	Determine course of action and cost to restore the banks of Town Branch to minimize flooding in the low lying area of Roanoke Rd	\$50,000	Low	Low	Town, County, VDOT, Available Grantors with appropriate grant programs, when scope of work is developed	Town Council	Not Started pending scope of work	To be determined by scope

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7.8 Town of Troutville

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Conduct study for public utilities floodproofing	Flooding	Evaluation of public utilities for retrofitting or floodproofing to prevent failure during disasters	\$10,000	Medium	Medium	Town, County, Grantor with an appropriate grant program	Town Water Department	Not started; lack of scoping	1YR from scoping
Local Code Review	All Hazards	Review of development codes to evaluate need for changes that would improve disaster mitigation	\$10,000	Medium	High	Town, County, Grantor with an appropriate grant program	Town Council	Not started; lack of funding	1YR from funding
Stream Restoration in the Park	Flooding	Safe community park area and preservation of stream banks	\$100,000	Medium	Medium	Town, County, Grantor with an appropriate grant program	Town Council	Not Started pending scoping	2Yrs from scoping
Identify Water Distribution Infrastructure vulnerable to hazardous environmental concerns including extreme cold and karst	Extreme temperature and Geologic Hazards	Identify and prioritize vulnerable infrastructure to prevent customer/system outage	\$50,000	High	High	Town, County, Grantor with an appropriate grant program	Town Water Department	Not Started pending scoping	1YR from scoping
Transfer Switch and Generator Upgrade for town Buildings	All Hazards generating power outage	Redundant power for Town Hall, Fire Department, Water Tower, Pump Station, Training Center (Back-up Co 911)	\$30,000	High	High	Town, County, Grantor with an appropriate grant program	Town Water Department	Not Started pending funding	8MOs from funding

7.9 Craig County

The mitigation actions located in this section also cover mitigation actions for the Town of New Castle.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Reverse 911 (Mass Notification)	All hazards	Reduced loss through improved warning system	\$38,000	High	High	FEMA, VDEM, Local Government	Local government, ESC, Sheriff Dept.	Complete	2020-22
Develop and maintain an inventory of flood prone critical facilities	Flooding	Available inventory of critical structures that need additional or unique protection from flooding.	\$1,000	Medium	Medium	FEMA, VDEM	Local government	Complete	
Communication equipment interoperability	All hazards, enhanced capability for Wildfire	Improved coordination among jurisdictions; improved response times	\$4,700,000+	High	High	Local Government, US Congress, General Assembly	Local government, ESC, Sheriff Dept.	In Progress	Spring '27
Install generators at communications towers	All hazards resulting in power outage	Redundant power for public safety communications, part of overall radio project.	\$100,000	High	High	Local Government, US Congress, General Assembly	ESC	In Progress	Spring '27
Install Generator at Shelter-Simmonsville Fire Dept	All Hazards requiring shelter/warming/cooling	Resilient shelter and community location in rural area of the county	TBD	High	High	VDEM Shelter Upgrade Grant	ESC	In Progress	6MOs from funding award

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Support Virginia Department of Transportation projects that minimize flooding	Flooding	Clear debris and repair banks along roads to prevent backup, erosion and flooding of existing drainage systems	\$700,000	N/A	Medium	FEMA, VDEM, VDOT	VDOT	PER VDOT	
Add additional stream and precipitation gauges	Flooding	Provide better, more timely information to allow faster, more accurate warnings to be issued to the public	TBD	High	Medium	VDEM / FEMA / VDOT	Local EM	Not started; lack of funding	
Seek funding and support programs that update FEMA's Flood Insurance Rate Maps	Flooding	Updated flood hazard mapping	TBD	NA	High	FEMA	Building Inspector	Not started; lack of funding	
Identify projects that would mitigate repetitive flooding at properties along Craig's Creek	Flooding	Reduction of property and community impacts from flooding along Craig's Creek	unknown	Unknown	High	Grantors with appropriate grant programs	Local EM	Not started; lack of funding	

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Safety improvements to Johns Creek dams #1, #2, #3, and #4	Flooding	Protection of life and property downstream from the dams.	Unknown	Unknown	High	FEMA, DCR, USDA, SWCD	Mountain Castle SWCD	Design in progress	2030
Downtown New Castle Flooding	Flooding	Work with VDOT to address downtown stormwater drainage problems	\$400,000	High	High	FEMA, VDOT, VA DHCD	County Administrator and VDOT	Planning and design underway. Project paused due to lack of funding	

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7.10 Roanoke County

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Publish Public Safety Announcements (PSA) using Multi – Media Outlets with emergency information on earthquakes.	Earthquake	Increased level of knowledge and awareness in citizens	\$2,500	High	Low	FEMA, VDEM	Local government Roanoke Co Public Information Office & Emergency Management	Ongoing	
Research and consider participating in the National Weather Service “Storm Ready” program	All Weather Hazards	Community will be better prepared through planning and education about hazards	\$2,000	Medium	Medium	NWS	Local government Roanoke Co Emergency Management	Complete	Complete
Publish Public Safety Announcements (PSA) using Multi-Media Outlets and utilizing practice drills to increase knowledge and impacts risks associated with high winds in business and schools.	Wind	Public informed about how to protect yourself during a tornado in case you are at home, in a car, at the office, or outside	\$5,000	High	Medium	Local government	Local government Roanoke Co Emergency Management and Participating Departments	Ongoing	

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Participate in, and remain in good standing with, the National Flood Insurance Program (NFIP)	Flooding	Reduction of future flood damage through enforcement of floodplain ordinances and availability of discounted flood insurance for property owners	Unknown	N/a	High	FEMA	Local government	Ongoing	Ongoing
Maintain an accurate database and map of repetitive loss properties. Request Data from FEMA.	Flooding	Identification of repetitive loss properties that should be mitigated	Unknown	N/A	High	FEMA, VDEM	Local government Roanoke Co Development Services	Ongoing	Ongoing, continuous effort
Develop and maintain an inventory of flood prone roadways	Flooding	Inventory of flood prone roadways for planning purposes (road improvements, limitation of development)	\$25,000	Medium	Medium	FEMA, VDEM, RVARC, VDOT, Local government	RVARC, Roanoke Co Development Services	In progress	Ongoing, continuous effort
Support Virginia Department of Transportation projects that minimize flooding	Flooding	Clear debris and repair banks along roads to prevent backup, erosion and flooding of existing drainage systems.	Cost varies annually, due to work performed	N/A	Medium	FEMA, VDEM, VDOT	Roanoke Co Development Services & VDOT	Ongoing	Ongoing, continuous effort throughout the year

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems	Flooding	Possible determination of solutions to repetitive loss properties.	\$100,000	High	Medium	Local governments	Roanoke Co Development Services	Continuous effort based on volume of projects ongoing	Ongoing, continuous effort throughout the year
Identify locations for additional rain, river and stream monitoring.	Flooding	Provide better, more timely information to allow faster, more accurate warnings to be issued to the public	\$25,000	High	Medium	VDEM / FEMA / LOCAL GOVT	Local Government	Not started; lack of funding	TBD
Develop and maintain an inventory of flood prone critical facilities	Flooding	Available inventory of critical structures that need additional or unique protection from flooding.	\$1,000	Medium	Medium	FEMA, VDEM	Local government Roanoke Co General Services and Development Services	COMPLETE	Ongoing
Maintain an inventory of flood prone residential properties and repetitive loss properties.	Flooding	Available inventory of repetitive loss properties that could be used for planning purposes		N/A		No external funding	Roanoke Co Development Services	Ongoing, continuous effort	

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Repetitive Loss Property Acquisition and Demolition of a Property located in North County	Flooding	Mitigation of repetitive loss property	~\$1,000,000	High	High	FEMA, VDEM	Roanoke Co Development Services	Pending Funding	6MOs from received funding
Revise stormwater management and floodplain management ordinances	Flooding	Up to date hazard related ordinances to provide guidance for planning and development	Unknown	High	High	Local government, DCR	Local government	Complete 2025	
Citizen Warning and Alert	All hazards	Reduced loss through improved warning system	\$20,000 annually	High	Medium	FEMA, VDEM, Local Government	Roanoke Co Emergency Management	Ongoing annual recurring cost	Annual
Additional hazard related GIS layers/data	All hazards	Increased accuracy of hazard mitigation planning	\$100,000	High	High	USGS, NOAA, FEMA, VDEM, VDOT, VDOF	Roanoke Co Development Services and GIS/IT	Complete	Continuous improvement effort
Public education	All hazards	Inform public about hazards and mitigation options	\$50,000	High	High	FEMA, VDEM, Local government	Local government, Emergency Management	In progress	Ongoing

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Participate in special statewide outreach/awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc	All Hazards	Inform public about hazards and mitigation options	\$10,000	High	High	VDEM, FEMA, NWS	Roanoke Co Emergency Management	In progress	Ongoing events
Upgrade/repairs to stormwater system	Flooding	Reduce frequency and impact of flooding	\$10,000,000	High	High	FEMA, VDEM, VDOT	Roanoke Co Development Services	Ongoing	Continuous effort
Drainage system maintenance	Flooding	Clear debris and repair banks to prevent backup, erosion and flooding of existing drainage systems	\$1,000,000 annually	High	High	FEMA, VDEM, VDOT	Roanoke Co Development Services	Ongoing	Continuous Effort
Identify buildings or locations vital to the emergency response effort and buildings or locations that, if damaged, would add complexity to a response. Apply community wildfire assessments as appropriate.	Wildfire	Available inventory of structures that need additional or unique protection from wildfires. Support property owners in taking mitigation actions such as defensible space, building and siting materials	\$80,000	Medium	Medium	VA Dept. of Forestry, US Forest Service, Local governments	Local government, VDOF, USFS, and Roanoke County Fire & Rescue Dept.	Ongoing	Perpetual

Project		Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Dixie Landfill System	Cavern Leachate	Flooding	Replace aging system to prevent discharge	\$1,000,000	Medium	Medium	Funding Partners with Mitigation Grants; other relevant development grants	Roanoke Co Development Services	Pending Study	

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7.11 City of Roanoke

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule	Additional Notes
Star City Alerts (Rave Mobile Safety)	All Hazards	Reduced loss of life and property through improved warning system.	\$25,000	High	High	Local Government	Local Government, Emergency Management	Online registration portal available. Text, email, and voice message opt-in available.	Ongoing. Star City Alerts replaced the previous alert system known as "Reverse 911".	Continuing to utilize hazard response operations.
Structure acquisition	Flooding	Removal of structures from flood hazard areas; reduce repetitive loss; reduce loss of life and property.	\$200,000 per year	High	High	FEMA, VDEM, Local Government	Local government, Stormwater Utility	Ongoing, To date \$13M has been spent to mitigate 139 homes/structures thereby returning 58 acres to natural floodplain open space. Two of the four PDM grants from 2020 have been fully completed. The two remaining grants are currently at 95% completion and 65% design phase.	Ongoing	Continuing to achieve property protection measures. Created City of Roanoke Flooding Mitigation Program in 2019.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementati on/ Lead Agency	Status	Proposed Schedule	Additional Notes
Acquisition of flood prone properties	Flooding	Removal of households from flood hazard areas; reduce repetitive loss; reduce loss of life and property.	\$50,000	High	High	FEMA, VDEM, Local government	Local government, Stormwater Utility	Ongoing, To date \$13M has been spent to mitigate 139 homes/structures thereby returning 58 acres to natural floodplain open space. Two of the four PDM grants from 2020 have been fully completed. The two remaining grants are currently at 95% completion and 65% design phase	Ongoing	Continuing to achieve property protection measures. Created City of Roanoke Flooding Mitigation Program in 2019.
Public Education	All Hazards	Inform public about hazards and mitigation options and NFIP.	\$50,000	Medium	Medium	FEMA, VDEM, Local Government	Local government, Stormwater Utility, Emergency Management	Ongoing – Direct mailer sent each year and Flooding Brochure inserted in Roanoke Times each year or included with direct mailer. Roanoke Remembers the Flood of 85 Event 2025 for education on local flood history	Ongoing	Advise property owners, potential property owners, and visitors about hazards.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule	Additional Notes
Flood Hazard mapping update / modernization	Flooding	Increased accuracy of flood maps and more effective regulation and enforcement of regulations.	\$212,800	High	High	FEMA, VDEM	Local government , Stormwater Utility, Planning Division	Ongoing; Flood prone roads and critical facilities have been mapped. Roanoke River Flood Reduction Project LOMR approved and adopted in December 2023. FEMA Remapping in progress	Ongoing,	Work with organizations to improve flood hazard mapping. Look to develop flood models.
Additional Hazard related GIS layers/data	All Hazards	Increased accuracy of hazard mitigation planning	\$100,000	High	Medium	USGS, NOAA, FEMA, VDEM, VDOT	Local Government, Stormwater Utility, Department of Technology, Emergency Management	Ongoing	Ongoing	Update City of Roanoke Real Estate GIS to reflect flood zones on FEMA Map Center
Participate in CRS	Flooding	Reduction in flood insurance rates; reduction in flood loss.	\$10,000	High	High	VDEM	Local government; Stormwater Utility	Participating Community – Currently Class 6 Working toward Class 5	Ongoing; Class 5 projected by 2030	Continue to work with departments in the City of Roanoke to achieve CRS credit.
Develop and maintain an inventory of flood prone critical facilities	Flooding	Available inventory of critical structures that need additional or unique protection from flooding.	\$10,000	Medium	Medium	FEMA, VDEM	Local government, Stormwater Utility, Emergency Management	Completed	Ongoing; updates as needed	Plan for emergency services. Advise emergency response, citizens, and visitors.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementati on/ Lead Agency	Status	Proposed Schedule	Additional Notes
Continue participation in FEMA's DFIRM program	Flooding	Updated flood hazard mapping.	\$15,000	High	High	FEMA, local government	Local government	In progress	Ongoing	Property protection.
Develop Family Assistance Center Plan, Standard Operating Guidelines for Family Assistance Center deployment, and identify staffing needs	All Hazards	Supporting government and private employers in Roanoke by developing SOGs to implement Family Assistance Center.	\$0	High	Medium	City & private partner agencies	City of Roanoke Emergency Management, City Schools	Developed	Ongoing	Plan for emergency response and protection to public safety.
Secure grants to purchase and maintain Volunteer Management and Reception capabilities	All Hazards	Supporting spontaneous volunteers in a disaster.	\$25,000 (100% grant funded)	High	Medium	City/FEMA	Roanoke Valley governments	Implemented	Ongoing	Plan for emergency response and protection to public safety.
Standard Operating Guidelines for Volunteer Reception deployment	All Hazards	Supporting spontaneous volunteers in a disaster.	\$0	High	Medium	City Emergency Management	City EM, Police Department, Animal Wardens	Developed	Ongoing. Activated September 21, 2022.	Plan for emergency response and protection to public safety.
Develop Disaster Pet Sheltering capabilities	All Hazards	Supporting Pets in Disaster by developing Community Animal Response Team.	\$25,000 (100% grant funded)	High	Medium	City Emergency Management	City EM & Police Department	Developed	Ongoing. Exercised and utilized in 2022.	Plan for emergency response and protection to public safety.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule	Additional Notes
Upgrade / repairs to storm water system	Flooding	Reduce frequency and impact of flooding.	\$140,000,000	High	High	FEMA, VDEM, Local government	Local government	Ongoing	Ongoing	Preventative maintenance.
Drainage System Maintenance	Flooding	Clear debris and repair banks to prevent backup, erosion and flooding of existing drainage systems.	\$500,000	High	High	FEMA, VDEM, Local government	Local government	Ongoing	Annually	Preventative maintenance.
Stream Restorations	Flooding	Improved stream flow and sediment transport, reduction of stream bank erosion, increase in water quality benefits.	Variable \$300,000 to \$2 million	High	High	VADEQ, potentially FEMA	Local government	Ongoing based on Watershed Master Plans. Two restoration projects completed Glade Creek and W. Fork Carvins. Garnand stream restoration is now in design.	Ongoing	Natural Resource Protection
Study on power resiliency	All hazards generating power outage	Solutioning long term, multi disaster power resiliency	\$100,000	Medium	Medium	City, Grantor with an appropriate grant program	Sustainability, Emergency Management	Not started, pending scoping	Pending scoping	
Pavement Temperature Sensors	Winter, extreme temperature	Operational efficiency generating safer travel methods	\$150,000	Medium	Medium	City, USGS, Grantor with an appropriate grant program	Transportation Division	Not started, pending scoping		

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementati on/ Lead Agency	Status	Proposed Schedule	Additional Notes
Develop Heat Resilience Plan	Extreme Temperature	Develop adaptation features to build resiliency	\$150,000	Medium	High	City, Grantor with an appropriate grant program	Sustainability	Not Started, pending funding	1YR from funding	
Sponsor Community Resilience Hub	All Hazards	Support community efforts to develop resilience hub, by supporting funding pursuit	TBD	Low	Medium	Partner identification underway with USDN	Sustainability and Emergency Management	Scoping on going		
Develop Crisis Communications Plan	All Hazards	Increased planning to establish coordinated public information and warning throughout the incident continuum	TBD	High	High	City, Grantor with an appropriate grant program	Emergency Management, Communications	Ongoing scoping	1 Yr from completed project scoping	
Develop Continuity of Government Plan	All Hazards	Increased decision making and coordination resiliency	TBD	High	High	City, Grantor with an appropriate grant program	Emergency Management, City Manager	Not started, pending scoping		
Participate in, and remain in good standing with, the National Flood Insurance Program (NFIP)	Flooding	Reduction of future flood damage through enforcement of floodplain ordinances and availability of discounted flood insurance for property owners.	\$0	High	High	FEMA	Local government, Stormwater Utility	Ongoing	Ongoing	Reflect City Codes to match NFIP Standards.

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit to- Cost	Priority	Funding Partners	Implementati on/ Lead Agency	Status	Proposed Schedule	Additional Notes
Elevation Certificate Updates	Flooding	Once the LOMR is updated as a result of the Roanoke River Flood Reduction Project, new elevation certificates along the river corridor may be needed.	Unknown	Med	Med	Silver Jackets, VDEM, FEMA	Local government, Stormwater Utility	Completed	Waiting completion of LOMR as part of ESP contract.	Revised Elevation Certificates with updated Base Flood Elevations
Inundation Mapping	Flooding	City will be able to understand what flooding depths will be based on RR stream gauge heights.	Unknown	High	High	Silver Jackets, local governments	Stormwater Utility	Completed		Ability to provide road closures and needed evacuation zones at certain gauges levels of the Roanoke River.
Maintain an accurate database and map of repetitive loss properties	Flooding	Identification of repetitive loss properties that should be mitigated.	Unknown	High	High	FEMA, VDEM	Stormwater Utility, VDEM	Ongoing - Obtained ISAA with FEMA to better track Rep. Loss structures and areas	Ongoing: annual updates	Continue to update Repetitive Loss list.
Watershed Master Planning	Flooding	Assess and plan Stormwater needs on a watershed per watershed basis with comprehensive modeling and identification of priority projects	\$700,000 per watershed	High	High	Local Government, DCR	Stormwater Utility	In progress	Funding Stream identified (CFPF)	

7.12 City of Salem

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation / Lead Agency	Status	Proposed Schedule
Communication equipment interoperability	All hazards	Improved coordination among jurisdictions; improved response times; citizen alerts	\$1,000,000 to 3,000,000	N/A	High	FEMA, Local government	Local government, Fire & Emergency Services, Police, IT	COMPLETE	2018-2019
Mass notification System	All hazards	Reduced loss through improved warning system	N/A	N/A	N/A	FEMA, VDEM, Local Government	Local government, Fire & Emergency Services, Police, IT	Complete	N/A
Flood hazard mapping update/modernization / Additional hazard related GIS layers/data	All hazards/ flooding	Increased accuracy of flood maps and increased accuracy of hazard mitigation planning	N/A	High	Medium	FEMA, VDEM	Community Dev	Ongoing	Ongoing
Soil Stabilization	All hazards/ flooding	Continue headwall and riverbank stabilization to reduce road undercutting in multiple areas as scoping determines.	\$500,000	High	Medium	FEMA, VDEM, Local government CFPF, grantor with app grant program	Community Dev	Ongoing	2025-2030

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation / Lead Agency	Status	Proposed Schedule
Public education	All hazards	Develop web application(s) for informing public about hazards and mitigation options Utilize ArcGIS to allow real-time citizen input regarding occurring hazards.	N/A	High	Low	FEMA, VDEM, Local government	GIS	Ongoing	Ongoing
Participate in FEMA Hazard Mitigation Programs such as FMA, PDM, and HMGP for acquisition of flood prone properties or flood-proofing projects	Flooding	Possible sources of funding for acquisition/demolition projects, structure elevation, mitigation reconstruction project, flood-proofing critical facilities, flood-proofing commercial structure, infrastructure upgrades, and technology upgrades	\$500,000	High	High	FEMA, VDEM, Local government, grantor with an appropriate grant program	Community Development	Not started; pending scoping	n/a
Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems	Flooding	Possible determination of solutions to repetitive loss properties.	\$15,000	Medium	Medium	FEMA, VDEM, City, grantor with app grant program	Community Development	Not started; lack of scoping	N/A

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation / Lead Agency	Status	Proposed Schedule
Open Drainage system maintenance;	Flooding	Improved stream flow and mitigation of flooding; Clear debris and repair banks to prevent backup, erosion and flooding of existing drainage systems	\$100,000	Medium	Medium	FEMA, VDEM, City, grantor with app grant program	Community Development, Street Department	Ongoing, preventative maintenance	Ongoing
Closed Stormwater system construction, upgrades or repairs	Flooding	Reduce frequency and impact of flooding	\$1,000,000	Medium	Medium	FEMA, VDEM, City, grantor with app grant program	Community Development.	Ongoing, preventative maintenance	N/A
Additional hazard field data	Flooding	Elevation certificates for residential, business and critical facilities; increased accuracy of hazard mitigation planning	\$25,000	Medium	Medium	FEMA, VDEM, Local government	Local government, Community Development.	As needed per project	Ongoing
Use HEC-GeoRAS, HEC-GeoHMS, or HAZUS software to model potential flood scenarios and identify high-hazard areas	Flooding	Use software to model potential flood areas and identify high risk areas to help mitigate flooding	\$10,000	Medium	Low	FEMA, VDEM, Local government	Community Development	Not started; lack of scoping	Within 6 months of scoping
Participate in CRS	Flooding	Reduction in flood insurance rates; reduction in flood loss	\$20,000	Medium	Low	VDEM, City, grantor with an appropriate grant program	Community Development	Not started; lack of funding	N/A

Project	Hazard Mitigated	Benefit	Cost	Benefit-to-Cost	Priority	Funding Partners	Implementation / Lead Agency	Status	Proposed Schedule
Revision of floodplain ordinance	All Hazards	Up to date floodplain and zoning ordinance to provide guidance for development	\$150,000	N/A	Medium	City, grantor with an appropriate grant program	Local government, Community Development	Not started; pending scoping	2025-2029
Defensible Space	Wildfire	Partner with the Virginia Department of Forestry to mitigate wildfire risk by focusing on fire prevention and creating defensible space.	TBD by project	High	Low	DOF, Local government	Local government, Community Development, Fire & Emergency Services, Streets and General Maintenance	Ongoing	2025-2030
Identify and equip a community resource center	Extreme temps, winds, earthquake, winter	Provide community space for warming/ cooling and power needs in a disaster	\$200,000	Medium	Medium	FEMA, VDEM, City, grantor with an appropriate grant program	Fire and EMS	Not started; lack of scoping	2026-2028

7.13 Town of Vinton

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Implement Mass Notification System	All Hazards	Public made aware of impending danger. Encourage voluntary use of the National Weather Service or private warning mechanisms, such as The Weather Channel NOTIFY! and the Specific Area Message Encoding (SAME)	\$100,000	High	High	RVARC Localities	RVARC and Local government	COMPLETE	
Provide an informational brochure or handout on Flood Safety in Vinton	All Hazards	Public better informed about Flood Safety.	Unknown	Medium	Medium	VDEM FEMA, RVARC Localities	Town of Vinton	COMPLETE	
Determine the need for generators at public infrastructure facilities, emergency shelters, and public buildings	All hazards	Ensure that water and sewer service can be operational during hazard events. Needed services can be provided during emergency events.	\$20,000	High	High	FEMA, Local government	Town of Vinton Public Works and Police Departments	COMPLETE	
Local codes review	All hazards	Review development codes to evaluate need for changes that would improve disaster mitigation	\$100,000	Medium	High	FEMA, Roanoke County and Town of Vinton	Town of Vinton Planning and Zoning Department	COMPLETE	

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems	Flooding	Study Gish Mill redevelopment area and Tinker Creek Tributary to determine effective solutions	Unknown	High	Medium	FEMA, VDEM, and RVARC Localities	Local governments	COMPLETE	
Flood hazard mapping update/modernization	Flooding	Increased accuracy of flood maps and more effective regulation and enforcement of regulations	\$50,000	Medium	High	FEMA, VDEM	RVARC, County of Roanoke, and Town of Vinton	COMPLETE	
Transportation corridor debris removal and bank stabilization.	Flooding	Clear debris and repair banks along roads to prevent backup, erosion and flooding of existing drainage systems. Hardy Rd, Walnut Ave, Virginia Ave, as well as, other roadways as determined by Town, VDOT, Roanoke City staff.	\$2,000,000	Medium	Medium	Town, VDOT, Roanoke City, Roanoke Co	Town Planning and Zoning	Not started; lack of funding	As funding becomes available
Maintain an inventory of flood prone residential properties and repetitive loss properties	Flooding	Available inventory of repetitive loss properties that could be used for planning purposes	Unknown	Unknown	Unknown	VDEM, RVARC	RVARC, Roanoke County and Town of Vinton	COMPLETE	
Property acquisition – single-family and commercial structures	Flooding	Removal of households and other structures from flood hazard areas; reduce repetitive loss; reduce loss of life and property	\$10,000,000	Medium	High	FEMA, VDEM, Town of Vinton	Town of Vinton Planning and Zoning Department	Ongoing	2020-2024, as funding becomes available

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Town-wide Stormwater facilities retrofit	Flooding	Reduce frequency and impact of flooding	\$20,000,000	Medium	High	Town of Vinton, Grantor with Appropriate Grant Program	Town of Vinton Planning and Zoning Department	Not Started pending scope of work and funding	2025-2050
Evaluate public utilities for floodproofing	Flooding	Evaluation of public utilities for retrofitting or floodproofing to prevent failure during disasters	\$50,000	High	Medium	FEMA, VDEM, Town of Vinton	Town of Vinton Public Works Department	COMPLETE	Additional projects as funding becomes available.
Obtain CRS Classification Rating	Flooding	Reduction in flood insurance rates; reduction in flood loss	\$10,000, Annually	Medium	High	FEMA, RVARC Localities, Town of Vinton	Town of Vinton Planning and Zoning Department	COMPLETE	2016
Identify locations for additional stream gauges	Flooding / Heavy Rains	Provide better, more timely information to allow faster, more accurate warnings to be issued to the public	\$25,000	Medium	Medium	Town, Roanoke City, Roanoke County, Grantor with an appropriate grant program	Town of Vinton Planning and Zoning	Ongoing	As funding becomes available
Community Wildfire assessments	Wildfire	Reduction of loss to wildfire	\$50,000	Medium	Medium	VA DOF, RVARC Localities	Roanoke County and Town of Vinton	Ongoing	As funding becomes available
Retrofit and Floodproof Gish Mill Historical Structure	Flooding	Protect structure and tenants from flooding, improve economic community value	\$400,000	High	High	Town, Private Developers, Helene Post Disaster Mitigation	Town Planning and Zoning Department	Ongoing	2027
Charles R. Hill Community Center Shelter Retrofit	All Hazards	Retrofit building with generator and supplies to serve as shelter while War Memorial is upgraded	\$200,000	Medium	Medium	Town, Roanoke Co, Grantor with appropriate grant program	Town Emergency Management	Not Started	N/A

7.14 Roanoke Valley-Alleghany Regional Commission

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Identify areas with recurring flood problems and prepare funding scope for additional stream/rain gauges	Flooding	Improved early warning of flooding; ensure that these areas are adequately covered and monitored	\$5,000	High	High	DHCD, Localities	RVARC	In progress	2025-2026
Request additional stream/rain gauges on behalf of interested local governments.	Flooding	Improved early warning of flooding; ensure these areas are adequately covered and monitored.	\$120,000	Medium	Medium	FEMA, VDEM	RVARC	Not started	2026-2028
Update the 2005 Flood Prone Roadway Study	Flooding	Improved and updated information about roadway flooding in the region	\$10,000-\$30,000	Medium	High	TPO	RVARC	Not started	2026-2027
Critical and Vulnerable Facilities Flood Vulnerability Study and action plan	Flooding	Improved and updated information on the regional impacts to critical facilities	\$30,000-\$60,000	Medium	Medium	TPO, other	RVARC	Not started	2027-2029
Train staff in hazard mitigation, specifically in wind-related hazards	Wind	Increased staff capacity for 2030 plan update	\$10,000-\$15,000	High	High		RVARC	In progress	2025-2027

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/Lead Agency	Status	Proposed Schedule
Maintain an active regional database of repetitive loss properties	Flooding	Improved information around repetitive loss	\$5,000-\$10,000	High	High	FEMA, VDEM	RVARC	Needs to be reinstated	2025
Develop or update the Regional Stormwater Management Plan	Flooding	New and updated action items for stormwater management	\$100,000-\$150,000	Medium	Medium	To be identified	RVARC	Not started	TBD
Regional Transit Impact Study	Flooding, Winter Storm	Improved information around transit impacts in hazard events	\$40,000 - \$80,000	Medium	Low	TPO	RVARC	Not started	TBD
Expand assessment of wildfire risk to incorporate new data regarding air quality mortality in partnership with regional health advocates	Wildfire	Improved data around wildfire risk and public health	TBD	Medium	Low	Regional health partners, VDH	RVARC	Not started	TBD
Expand extreme temperature data collection in partnership with interested localities	Extreme Temperature	Improved data around extreme temperature impacts	TBD	Low	Low	VDOF, VDH, other	RVARC, local governments	Not started	TBD
Annual updates on Regional and Local project progress and plan documentation	All Hazards	Improved implementation tracking and public engagement	\$5,000-\$10,000	High	High	Localities	RVARC, localities	Ongoing	Annual

7.15 Roanoke Valley Resource Authority

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Implement 2 trailer drawn emergency generators to support 2 pump stations primarily, with flexibility to support others	All Hazards that result in power outage: Wind, Winter, Flood, etc	Keep pump stations operational during power outage: protection of illicit discharge to VA waters. Trailer mounted set-up provides flexibility for other internal and external use.	\$300,000	High	High	Sourcing FEMA Post Disaster Mitigation Funds	RVRA- Dir. Of Operations/ Operations Management	Pending Funding, Applications and plans are finished	190 Days from Funding
Leachate Bypass Pump Station and Tank Cleaning	Flooding	Maximize storage capacity, protection of pumps, improved pump out capacity through efficiency gains. Builds resiliency and prevents system from being overrun in a storm event.	\$322,400	High	High	Sourcing FEMA Post Disaster Mitigation Funds Connected to the generator project	RVRA- Dir of Operations/ Operations Management	Pending Funding, Applications and plans are finished	Less than 1YR from Funding
Haul Road Study	Flooding, Geologic Hazards, Earthquake	Authority owns a critical access road, along with several state roads leading to the area. This area experiences routine short term and occasional long term flooding. The area is at risk for karst events and runs alongside a sheer cut hillside. A study could yield meaningful solutions to the issue.	Unknown, pending development of a scope of work	Low	Medium	Seeking grant funding that would be applicable. This could be from any source.	RVRA Executive Director	Not Started	No Available Timeline

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Increase relationships with service area jurisdictions	All-Hazards	RVRA has significant relationships across the operational region, both contractually and organizationally and seeks to share resource information, capability and contribute to regional public safety efforts	\$0	High	Low	All localities and partners within service district on a case by case basis	RVRA Executive Director	On-Going	Continuous

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7.16 Western Virginia Water Authority

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Water Pollution Control Plant Flood Protection-Ferrum	Flooding	Study and execute a solution to prevent flooding within the water pollution control plant.	\$4,000,000	High	High	FEMA Post Disaster Mitigation	WVWA Water Quality	Not Started pending grant award	Study: 6MOs from grant award
Water Pollution Control Plant Flood Protection-Boones Mill	Flooding	Construction of stormwater conveyance system to prevent flooding within the water pollution control plant.	\$228,000	High	High	FEMA Post Disaster Mitigation	WVWA Water Quality	Not Started pending grant award	~1YR from grant award
Carvins Cove Forestry Management Study	Wildfire, Geologic Hazards	Prevent and mitigate wildfire, to create resiliency in water quality from source to tap, including reservoir and WTP.	TBD	Medium	High	WVWA, City of Roanoke, Grantor with an appropriate grant program	WVWA Water Quality	Phase 1 complete, sourcing funds for phase 2	2Yrs from funding development
Identify critical facilities within WVWA Network to install generators	All Hazards resulting in power outage	Promote resiliency of water distribution system during power outages	\$5,000,000	Medium	High	WVWA, Grantor with an appropriate grant program	WVWA Water Quality	Not Started pending funding	2Yrs from funding development

Project	Hazard Mitigated	Benefit	Cost Estimate	Benefit-to-Cost	Priority	Funding Partners	Implementation/ Lead Agency	Status	Proposed Schedule
Identify distribution infrastructure vulnerable to hazardous environmental concerns including extreme cold and geologic hazards	Extreme Temperature, Geologic Hazards	Identify and prioritize vulnerable infrastructure to prevent customer/system water outage.	Routine effort. Cost by project	High	High	WVWA, Grantor with an appropriate grant program	WVWA Engineering Services	On-going constant maintenance effort, exacerbated by natural hazards	On-going multiple projects per year
Study WVWA Dams and establish a replacement program	Flooding, Geologic Hazards, Earthquake	Long term planning to evaluate dam lifecycle.	TBD	Medium	Low-Med	WVWA, Grantor with an appropriate grant program	WVWA Water Quality	Not Started pending internal scoping	TBD
Distribution System Redundancy	All-Hazards	Promote resiliency of water distribution and collection systems.	TBD	Medium	Medium	WVWA, Grantor with an appropriate grant program	WVWA Engineering Services	Not Started pending internal scoping	On-Going

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Appendices

Appendix A: Public Engagement Summary and Documentation

Appendix B: Hazard Mitigation Survey Results

Public Input Survey Report

Stakeholder Form Responses

Appendix C: Flood Hazard Areas

Appendix D: Flooding HAZUS Reports

100 Year Flood Model

500 Year Flood Model

Appendix E: Wildfire Incident Reports and Regional Wildfire Report

Wildfire Incident Reports

Regional Wildfire Risk Model Report

Appendix F: Critical and Vulnerable Facilities Inventory

Appendix G: Jurisdiction Capability Assessment Worksheets

Appendix H: High Hazard Dam Supplemental Information

Dam Safety Fact Sheets

Inundation Maps Beaverdam Creek

Inundation Maps Carvin Cove

Inundation Maps Falling Creek

Inundation Maps Johns Creek 1

Inundation Maps Johns Creek 2

Inundation Maps Johns Creek 3

Inundation Maps Johns Creek 4

Inundation Maps Spring Hollow

Appendix I: Policy Guide Checklist

Appendix J: Resolutions and Adoption

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