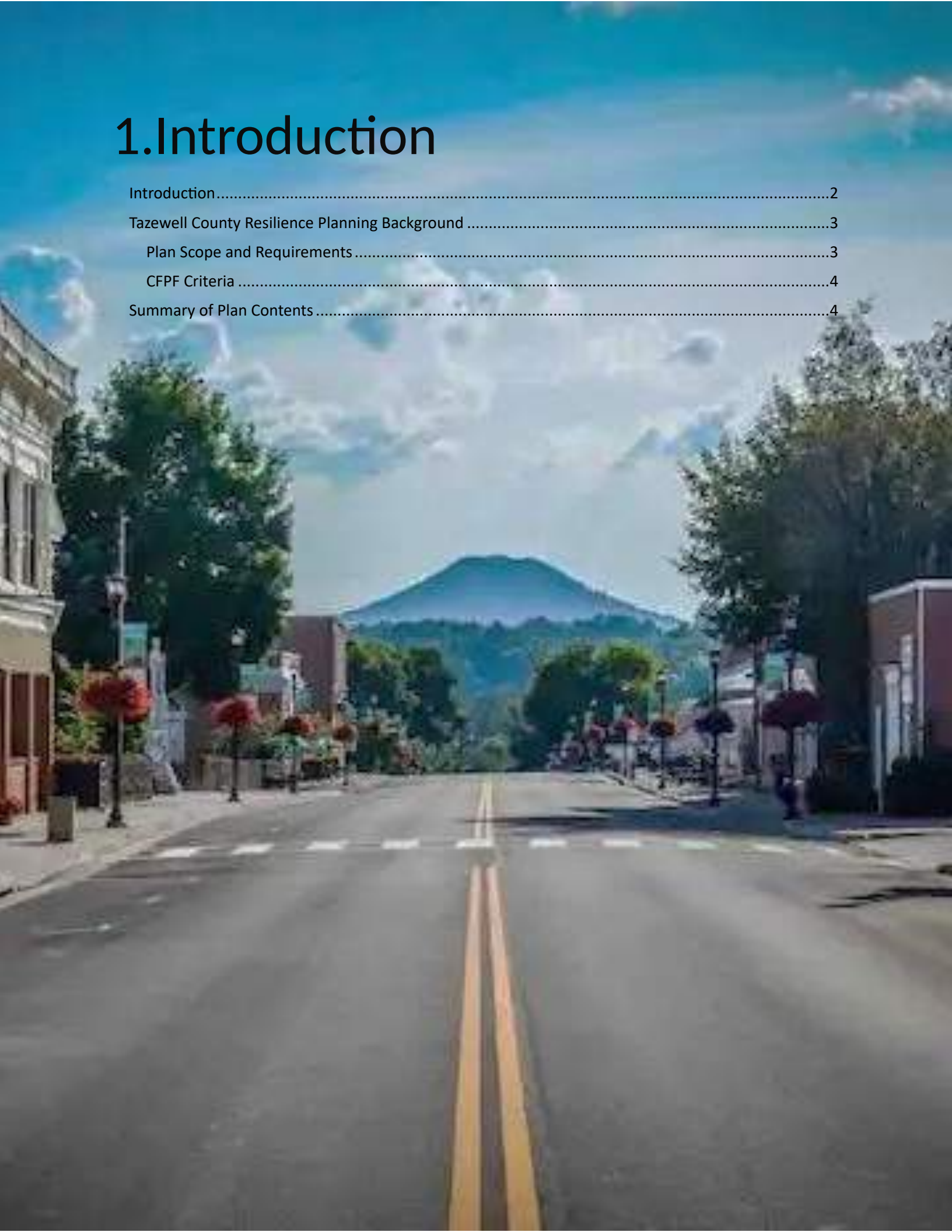


1.Introduction

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Introduction

Flood hazards occur in almost every community, but with careful planning and deliberate action, such events can be prevented from turning into devastating disasters. With the frequency and severity of flooding projected to increase in the planning area, **it is imperative that Tazewell County work toward building a more resilient community that aims to reduce the impact of flooding on people and places.** A resilient future is built on a foundation of equity and an understanding of a community's unique needs, connecting the ways we respond to disasters through community-wide investments to improve the outcomes for all residents.

Flood events threaten the life and safety of residents and have the potential to damage or destroy both public and private property, disrupt the local economy, and impact the overall quality of life of individuals who live, work, and recreate in Tazewell County. While the threat from flooding may never be fully eliminated, the goal and conscientious practice of reducing risks to people and property is a proven worthwhile effort. This practice, combined with efforts to collectively strengthen the community against shocks and stressors, is referred to as **resilience planning**.

Local resilience planning involves the process of organizing community resources, identifying critical resources and capabilities, assessing needs and vulnerabilities, and determining how to best manage, expand, or strengthen critical resources to reduce risk. This process culminates in a resilience plan that recognizes the ability to anticipate, prepare for, respond to, and recover from significant hazards and threats with minimum damage to social well-being, health, the economy, and the environment. The resilience plan will identify specific activities designed to achieve risk reduction in both the near- and long-term.

Communities that participate in resilience planning have the potential to enjoy many benefits, including:

- Equitably improving community resilience by prioritizing the most vulnerable populations;
- Preventing loss of life and property;
- Avoiding disaster related costs;
- Recovering quickly from disasters;
- Reducing future vulnerability through better development practices;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and
- Becoming eligible for resilience project funding through local, state, and federal opportunities, such as the State's Community Flood Preparedness Fund (CFPF)

Typically, communities that participate in resilience planning are described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of resilience planning is that the investments made before a hazard event will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery, and reconstruction. Furthermore, resilience practices will enable residents, businesses, and industries to re-establish themselves in the wake of a disaster. **This plan aims serve as a resilience plan for Tazewell County, specifically regarding flood resilience and flood risk reduction.**

Tazewell County Resilience Planning Background

Tazewell County's long history with destructive floods includes impacts to its community landmarks, homes, infrastructure, and businesses. However, the County has rarely possessed the resources to properly address flooding impacts and plan new approaches for the future. In 2022, Tazewell County received a grant from the Department of Conservation and Recreation's (DCR's) CFPF to build capacity and develop an actionable resilience plan. The County worked with Resource Environmental Solutions (RES) and Stantec to undertake a process to build capacity and develop an actionable resilience plan.

Plan Scope and Requirements

The Tazewell County Flood Resilience Plan was developed with funds and support from the CFPF. The CFPF was established in the Code of Virginia pursuant to Chapter 13, Title 10.1, Article 4, Section 10.1-603.24 and Section 10.1-603-25 and the provisions of § 10.1-1330. Clean Energy and Community Flood Preparedness Fund, which was passed during the 2020 session of the General Assembly. Money in the fund comes from the auction of carbon allowances through the Regional Greenhouse Gas Initiative (RGGI).

The fund was established to provide support for regions and localities across Virginia to reduce the impacts of flooding, including flooding driven by climate change. The fund will prioritize projects that are in concert with local, state and federal floodplain management standards, local resilience plans and the Virginia Coastal Resilience Master Plan. The fund empowers communities to complete vulnerability assessments and develop and implement action-oriented approaches to bolster flood preparedness and resilience.¹

The following conditions shall apply to the use of moneys allocated from the fund:

1. Localities shall use moneys in the fund primarily for the purpose of implementing flood prevention and protection projects and studies in areas that are subject to recurrent flooding as confirmed by a locality-certified floodplain manager.
2. Moneys in the fund may be used to mitigate future flood damage and to assist inland and coastal communities across the commonwealth that are subject to recurrent or repetitive flooding.
3. No less than 25% of the moneys disbursed from the fund each year shall be used for projects in low-income geographic areas.
4. Priority shall be given to projects that implement community-scale hazard mitigation activities that use nature-based solutions to reduce flood risk.

In addition to the conditions described above, the CFPF is guided by the following principles, regardless of region:

1. Acknowledge climate change and its consequences, and base decision making on the best available science.
2. Identify and address socioeconomic inequities and work to enhance equity through adaptation and protection efforts.

¹ DCR. Community Flood Preparedness Fund Grant. Retrieved from [Community Flood Preparedness Fund Grants and Loans \(virginia.gov\)](#)

3. Utilize community and regional scale planning to the maximum extent possible, seeking region-specific approaches tailored to the needs of individual communities.
4. Understand fiscal realities and focus on the most cost-effective solutions for the protection and adaptation of communities, businesses, and critical infrastructure. The solutions will, to the extent possible, prioritize effective natural solutions.
5. Recognize the importance of protecting and enhancing green infrastructure in all regions and in the coastal region, natural coastal barriers, and fish and wildlife habitat by prioritizing nature-based solutions.

Eligible activities include flood prevention and protection projects and studies, capacity building, and planning.

This plan has been developed in accordance with the guiding principles presented above.

CFPF Criteria

Tazewell County contains the type of low-income communities that the CFPF was designed to support. The median household income in the County is only 55% of the Virginia median --\$42,207 per year, versus \$76,398 per year, in 2020 dollars according to the US Census Bureau. With this household income level, Tazewell County met the CFPF definition of a low-income community. Tazewell County's case for support for the CFPF grant was also demonstrated in the Virginia Institute of Marine Sciences (VIMS) Social Vulnerability Index.² Two of the Tazewell County's 11 census tracts fall into the High Social Vulnerability category, while the remaining 9 of 11 census tracts fall into the Moderate category. Social Vulnerability is detailed in *Section 4: Existing Conditions*. Further, two of Tazewell County's census tracts, 202 and 206, are federal designated Opportunity Zones.³ Identification of the County's most vulnerable areas informed the Risk Assessment and the Risk Reduction Activities.

Summary of Plan Contents

This plan is designed to be as reader-friendly and functional as possible. It is divided into seven sections, which are detailed below.

The **Introduction, Section 1**, (this section) introduces the plan, its contents, and guiding principles.

Goals, Section 2, details goals that are intended to serve as plan outcomes.

The **Planning Process, Section 3**, describes the process used to prepare the plan. It identifies members of the Planning Team and how the public and other stakeholders were involved. It also includes a summary for each of the key meetings along with any associated outcomes.

Existing Conditions, Section 4, provides a general overview of Tazewell County, including geographic, demographic, environmental, and economic characteristics. In addition, this section discusses building characteristics and land use patterns, as well as an overview of the county's flood history and risk reduction efforts. This baseline information provides a snapshot of the planning area and helps local officials recognize those social, environmental, and economic factors that play a role in determining the county's vulnerability to flood hazards.

² Virginia Vulnerability Viewer. Retrieved from [VA SocialVulnerability \(vims.edu\)](https://vims.edu).

³ IRS. Opportunity Zones. Retrieved from [Opportunity Zones | Internal Revenue Service \(irs.gov\)](https://www.irs.gov).

The **Capability and Capacity Assessment, Section 5**, provides an inventory and analysis of existing plans, ordinances, policies, and relevant documents that support Tazewell County in flood risk reduction efforts. The purpose of this assessment is to identify any existing gaps, opportunities, or conflicts in programs or activities that may hinder flood mitigation efforts and determine activities that should be built upon to establish successful and sustainable flood risk reduction policies, actions, and practices. Specific capabilities addressed in this section include planning and regulatory capability, staff and organizational (administrative) capability, technical capability (e.g., available data), fiscal capability, and political capability. Information was obtained through the use of review of data, review of plans, stakeholder interviews, and Planning Team meetings.

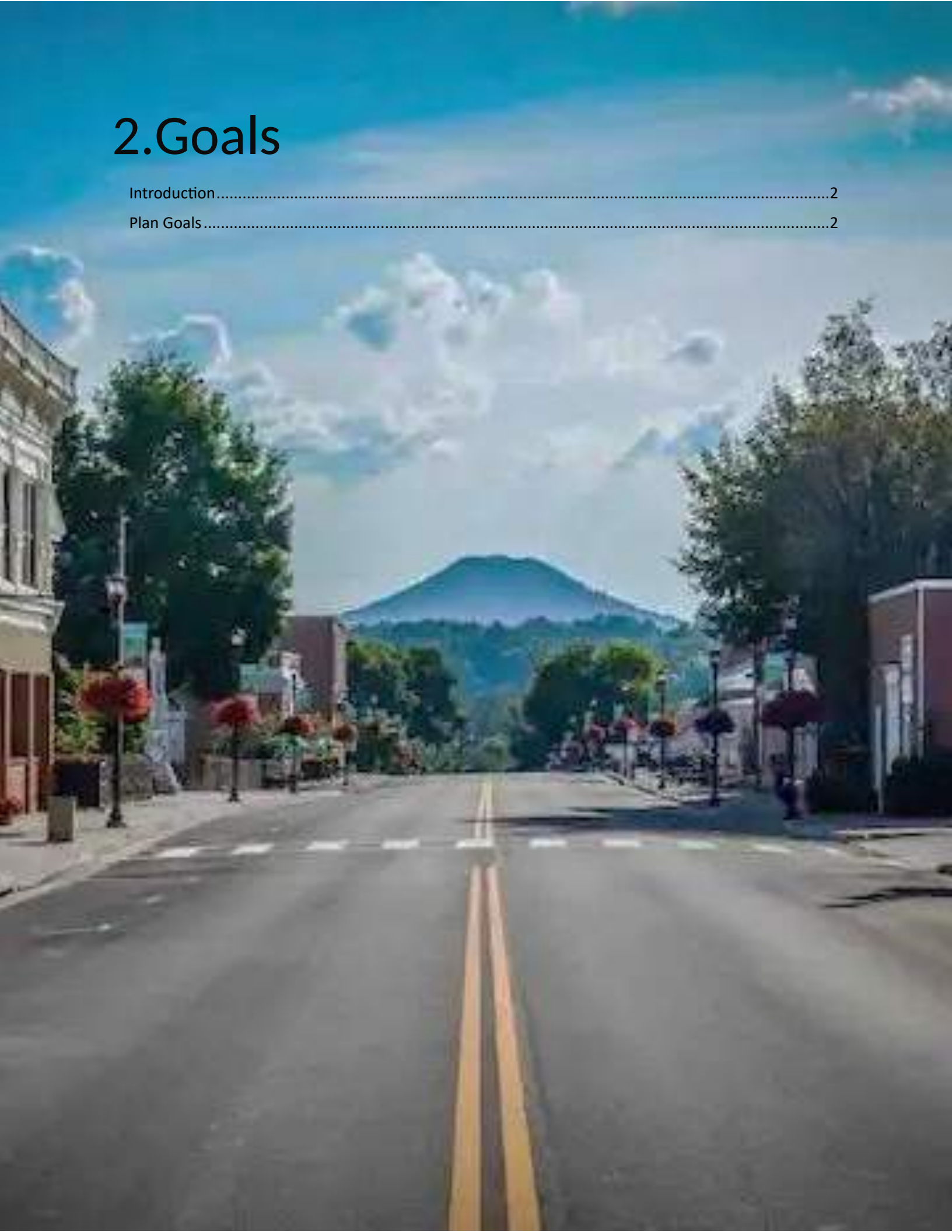
The **Risk Assessment, Section 6**, serves to identify, analyze, and assess flood hazards that threaten Tazewell County, including natural and man-made contributors to flooding within the county. A GIS structure-based risk assessment (the Flood Hazard Analysis) is provided using publicly available and county building data along with FEMA flood data. Future flood conditions are assessed in this section in terms of changes to flood frequency and severity due to climate change. The risk assessment also addresses critical facilities, vulnerable populations, and identifies areas of the county prioritized for risk reduction based on risk assessment results and community input. The risk assessment enables the County to prioritize and focus its efforts on flood hazards of greatest concern and those structures or areas facing the greatest risk.

The Existing Conditions summary, Capability and Capacity Assessment, and Risk Assessment, collectively, along with stakeholder and public outreach and input, serve as a basis for determining actions or projects for the Tazewell County Flood Resilience Plan, each contributing to the development and implementation of a meaningful and manageable Action Plan that is based on accurate background information.

The **Flood Risk Reduction Action Plan, Section 7**, identifies strategic actions that Tazewell County can implement to reduce flood risk. Overall, 18 flood risk mitigation actions were identified for Tazewell County. Each action is described in detail including a project description, project lead, action description, steps for implementation, and funding sources. As available, estimated time to complete and estimated costs were provided. Eight prioritized actions are identified. Priority actions are those identified through the planning process to have the largest potential impact on flood risk reduction in the county or are actions that are critical first steps in order to reduce risk directly or expand the County's capability to implement a range of future risk reduction actions. Priority actions were identified based on feedback from the Planning Team, comments during the Public Meetings, and the Risk Assessment results.

2.Goals

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Introduction

The primary goal of all local governments is to promote the health, safety, and welfare of its citizens. In keeping with this standard and promoting a proactive and equitable approach to disaster management and flood risk reduction, Tazewell County reviewed, revised and ultimately defined six goal statements for the flood resilience plan. These goals were developed to be reflective of current flood risk reduction priorities within the county. The goals were developed during the CFPF application process and carried through the planning process.

Plan Goals

Flood resilience goals represent broad statements that set the blueprint for the Action Plan and encourage stakeholders to envision plan outcomes. The six goals identified are presented below:

1. Understand flood risk and identification of projects for flood preparedness, control, and resilience;
2. Incorporate green, grey, and blue projects with an emphasis on nature-based solutions;
3. Integrate the whole community, regardless of socioeconomics or race;
4. Coordinate with existing and planned relevant projects, plans, and activities;
5. Leverage best available science and incorporation of current and future flood data; and
6. Develop a plan that provides a pathway to uninterrupted primary public roadway access, increased public safety, and less flooding.

3. Planning Process

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Introduction

A robust planning process is integral to the development of a resilience plan. The planning process involves identifying and convening a Planning Team, identifying and engaging stakeholders and the public, collecting data, and integrating plans, studies, and technical information.

Preparing the Resilience Plan

County staff and the consultant team designed a planning process to create the County's first flood resilience plan that met the 12-month timeframe required by the CFPF grant award. The process follows the agreed upon work plan developed as part of the CFPF application, which outlined the major tasks to be completed. Through completion of these tasks, the consultant team developed the contents for the final resilience plan. The process's major tasks are presented in **Table 31**.

Table 31: Tazewell County Flood Resilience Plan Planning Process

Resilience Planning Process	
1.	Form the Planning Team
2.	Engage Stakeholders
3.	Data Collection and Review
4.	Capacity and Capability Needs Assessment
5.	Risk and Vulnerability Assessment
6.	Priority Area Identification
7.	Prioritized Flood Risk-Reduction Actions

A necessary and important activity at the beginning of the process was to establish the Tazewell County Flood Resilience Planning Team (Planning Team) with broad representation from across the county to guide the process and plan contents. Planning Team members were chosen because of their knowledge of the County's flood history and their contributions to the County's capability to implement flood resilience projects. Together with the consultant team, the Planning Team maintained compliance with CFPF grant requirements, enabling eligibility for future CFPF funding for implementation projects.

Tazewell County Flood Resilience Planning Team

The Planning Team played an important role throughout the planning process. Members included a broad range of stakeholders vested in flood control, preparedness, and resilience, including community leaders and emergency response, building, and floodplain management officials. Regional planners from the Cumberland Plateau Planning District Commission (CPPDC), and State representatives (e.g., Virginia Department of Conservation and Recreation (DCR) and Virginia Department of Emergency Management) were engaged and invited to participate on the Planning Team. Planning Team members met regularly (approximately bi-monthly) and were responsible for providing input throughout the planning process such as understanding of existing and planned projects, plans, and data, review of draft materials, and project prioritization. Planning team members are presented in **Table 32**.

Table 32: Tazewell Flood Resilience Plan Planning Team

Name	Title/Role	Jurisdiction / Agency
Robin Boyd	Executive Director	Clinch Valley Community Action
Barry Brooks	Fire Chief, Emergency Management Coordinator, Director of Public Safety	Tazewell County
Jeff Buchanan		VDOT (Lebanon Office)
Jane Cordle	Stormwater	Tazewell County
Kenneth Dunford	Director of Engineering	Tazewell County
Brad Gibson	GIS/Mapping	Tazewell County
Gary Jackson	Building Official	Tazewell County
Charlie Perkins	Planner II	CPPDC
Shanna Plaster	Board of Supervisors	Tazewell County
Eric Young	County Administrator, Emergency Manager	Tazewell County

Involving the Public

Public participation was an important component of the planning process. Individual citizen and community-based input provides the entire Planning Team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community “buy-in” from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety and quality of life, they are more likely to gain a greater understanding of the flood hazards present in their community and take the steps necessary to reduce their impact. Public awareness is a key component of any community’s overall resilience strategy aimed at making a home, neighborhood, school, business, or entire city more prepared for flooding or other related problems.

Public involvement during the county’s development of the plan was sought using three methods: (1) three public meetings were held during the planning process, as described further in this section; (2) the plan was promoted through social media, traditional media (e.g., newspaper, radio, cable TV), and church mailers; and, (3) copies of the draft plan deliverables were made available and advertised for public review and comment online. These methods ensured the public was involved during plan development and had the opportunity to provide input on the draft plan and identified resilience actions prior to adoption and approval. A link to an electronic version of the draft plan was posted and advertised via social media and the project website from July xx to July xx, 2023. The final plan was reviewed and approved by the County Board of Supervisors on August xx, 2023 during a public meeting.

Plan Development Meetings

The preparation of this plan entailed a series of meetings, stakeholder interviews, and workshops for facilitating discussion, gaining consensus, and completing data collection efforts with local government staff and community officials. More importantly, the meetings fostered continuous input and feedback

from relevant participants throughout the planning process. The Planning Team and consultant team made considerable efforts to publicize the meetings to invite a broad range of stakeholders. The summaries below of the key meetings demonstrate how stakeholders and the public contributed directly to plan development. Meetings are summarized chronologically.

Orientation Meeting – December 14, 2022

The purpose of the Orientation Meeting was to review the scope of work, schedule, and resources with a small core team. It was a virtual meeting that served as the formal kickoff to the planning process. The meeting was facilitated by the consultant team from RES and Stantec. Following introductions, each phase of the planning process was reviewed, the proposed schedule was reviewed, and the team reviewed responsibilities of the core team members present on the call. Input on potential Planning Team members was gathered, and flooding hotspots, including previous impacts, were viewed along with past and ongoing flood mitigation projects. In the initial project documentation and CFPF grant application, several flooding hotspots were identified. Feedback on those hotspots and additional hotspots were gathered during the meeting. Key feedback is summarized in **Table 33**. Additionally, the core team discussed the need for debris clean-up and vegetation clearing along rivers and creeks. The County has discussed it, but the permitting was reported to be cost prohibitive. Participants also noted that a large number of residents potentially live in dam inundation areas.

Table 33: Tazewell Orientation Meeting Flooding Hotspot Feedback

Initial Project Documentation Hotspots Feedback	
Area	Feedback
Clinch River in Raven	<ul style="list-style-type: none"> One of the most vulnerable areas in the county because of the number of people living close to the river. The Raven Road Bridge is the only access point and could strand a large number of people. VDOT has been concerned about the bridge washing out during large events. Flooding is typically caused by the large volume of water. There are several trailer parks in this area.
Clinch River at Plant Road near Richlands	<ul style="list-style-type: none"> Water got into the compound area of the Wastewater Treatment Plant in 2020. The property to the east of the plant flooded and water covered the entire open area.
Clinch River in Richlands	<ul style="list-style-type: none"> There is reported flooding along Fourth Street, flooding along the west side of the river, and flooding of Legacy Hospice (continuing care, not residential)
Big Creek in Richlands	<ul style="list-style-type: none"> Flooding occurs mainly on the road. It is not as big of a concern as other areas.

Additional Hotspots Identified

Wastewater Treatment Plants	<ul style="list-style-type: none"> All the wastewater treatment plants in the county are in low lying areas. The Tazewell County Wastewater Treatment Plant is especially problematic with flooding on Lazy Lane.
Fourway (Town of Tazewell)	<ul style="list-style-type: none"> A car dealership was driven out of business due to flooding. Businesses flood in the area. The area has been proposed as a site for an indoor travel basketball facility.
2750 Clinch Street	<ul style="list-style-type: none"> Potential area for flood storage

Planning Team Kickoff Meeting – February 15, 2023

The Planning Team Kickoff Meeting was held in Richlands, VA on February 15, 2022. During this meeting, introductions were completed, and a project overview was given, to include the plan purpose, goals, overview of tasks, and schedule. Progress to date, such as data collection, was described, outstanding data needs were conveyed. A discussion was held to inform capabilities, capacities, identify critical facilities, identify previous flood impacts, and understand previous mitigation efforts. A summary of the feedback is shown in **Table 34**.

Table 34: Tazewell Planning Team Kickoff Meeting Feedback

Capacity Feedback	
Focus Area	Feedback
Land Use	<ul style="list-style-type: none"> • Most construction in the floodplain occurred prior to ordinances. • Floodway has been restricted by development and debris. The logging industry has added debris and cleared land from logging has altered the floodplain. Logging permits are approved immediately with no investigation. • Doran Bottom 2020 flooding was the largest flooding in memory of local residents. • Mussels prevent debris cleanup.
Plan & Policies	<ul style="list-style-type: none"> • The state enforces stormwater restrictions. • Lack of stormwater management in Tazewell leads to flooding in Richlands. • Flat land in the area is at a premium. Flooding prevents development and resale of private real estate. • Riparian buffers are not a viable option. • Flooding hotspots include Bluestone, Falls Mills, Falls Mills Lake, Tributaries surrounding Richlands, and Bandy.
Data	<ul style="list-style-type: none"> • The consulting team highlighted that high water mark records and property records can help with FEMA FIRM production. • 2020 flood data was recorded through VDEM platform. • There is a need for more stream gauges. Current stream gauges are from VDEM.
Human Component of Flooding	<ul style="list-style-type: none"> • Many citizens have lived in their homes for generations or their whole life. • The public may not strongly support buy-out programs.
Staffing	<ul style="list-style-type: none"> • No Certified Flood Manager (CFM) on staff. • Would prefer contract workers over full-time staff.
Hazard Mitigation Planning (HMP)	<ul style="list-style-type: none"> • Community not very familiar with HMP. • Tazewell is included in Cumberland Plateau Planning District Commission (CPPDC) HMP updated in September 2018.
Emergency Management	<ul style="list-style-type: none"> • The Emergency Operations Plan (EOP) is in the process of being updated. • The EOP does not include debris removal. Encouraged by VDEM to work with VDEQ for debris removal EOP. • In 2020, had “evacuations” that were really rescues. After the 2020 flood, they purchased swift boats. • Cavitt’s Lake EOP has an evacuation plan.

Public Kickoff Meeting – February 28, 2023

A public meeting was held at the Tazewell County Administration Building on February 28, 2023. The purpose of the meeting was to introduce the resilience plan and describe why creating the plan will benefit the community. The overall planning process, proposed schedules, and progress to date was described. County flooding issues were also identified, and future engagement opportunities were emphasized. A mapping exercise was held to identify flooding hot spots. Following the previous Planning Team Meeting, Tazewell County had a flood event so there was additional feedback from the recent

event. Outside of the consulting team staff, 8 participants from the public attended. Four of the participants from the public are also on the Planning Team. Feedback on over 20 flooding hotspots were identified in the meeting. Key feedback is summarized below in **Table 35** and a map of the hotspots is shown in **Figure 31**.

Table 35: Tazewell Public Kickoff Meeting Feedback

Flooding Hotspots	
Area	Feedback
Raven/Doran Area	<ul style="list-style-type: none"> • Doran Bottom Road floods frequently and has to be shut down. • Flooding on the west side prevents people from exiting the area. • Some stormwater pipes exceed capacity and have water run the wrong direction. • The bridge improvement project resulted in more water running onto adjacent properties.
Richlands	<ul style="list-style-type: none"> • The Police Station and EMS Station were not accessible during the 2020 flooding event. There have been talks about relocating the Police Station outside of the floodplain, but funding has been a constraint. • Stormwater flooding at Richlands Elementary school blocks access to the drop off/ pick up area. There are two county stormwater lines running under the school that have exceeded capacity.
Lynn Hollow Road	<ul style="list-style-type: none"> • Residents report flooding when landfill soils move to lower ponds and down the creek. Basements have been filled with water that has a strong odor.
Mill Creek Road	<ul style="list-style-type: none"> • The road runs parallel to the creek. Residents report frequent flooding of the road that extends onto their properties. • Flooding at the intersection of Nash Hill Road at Mill Creek Road blocks access to all of Mill Creek Road which is largely residential.
Other Flooding Feedback	<ul style="list-style-type: none"> • Cedar Bluff low bridge captures debris. Houses flood between the flood hazard area and the road consistently. • Blacksburg Road regularly floods with any amount of rain. • Flood insurance is cost prohibitive.

Tazewell County Flood Risk Areas

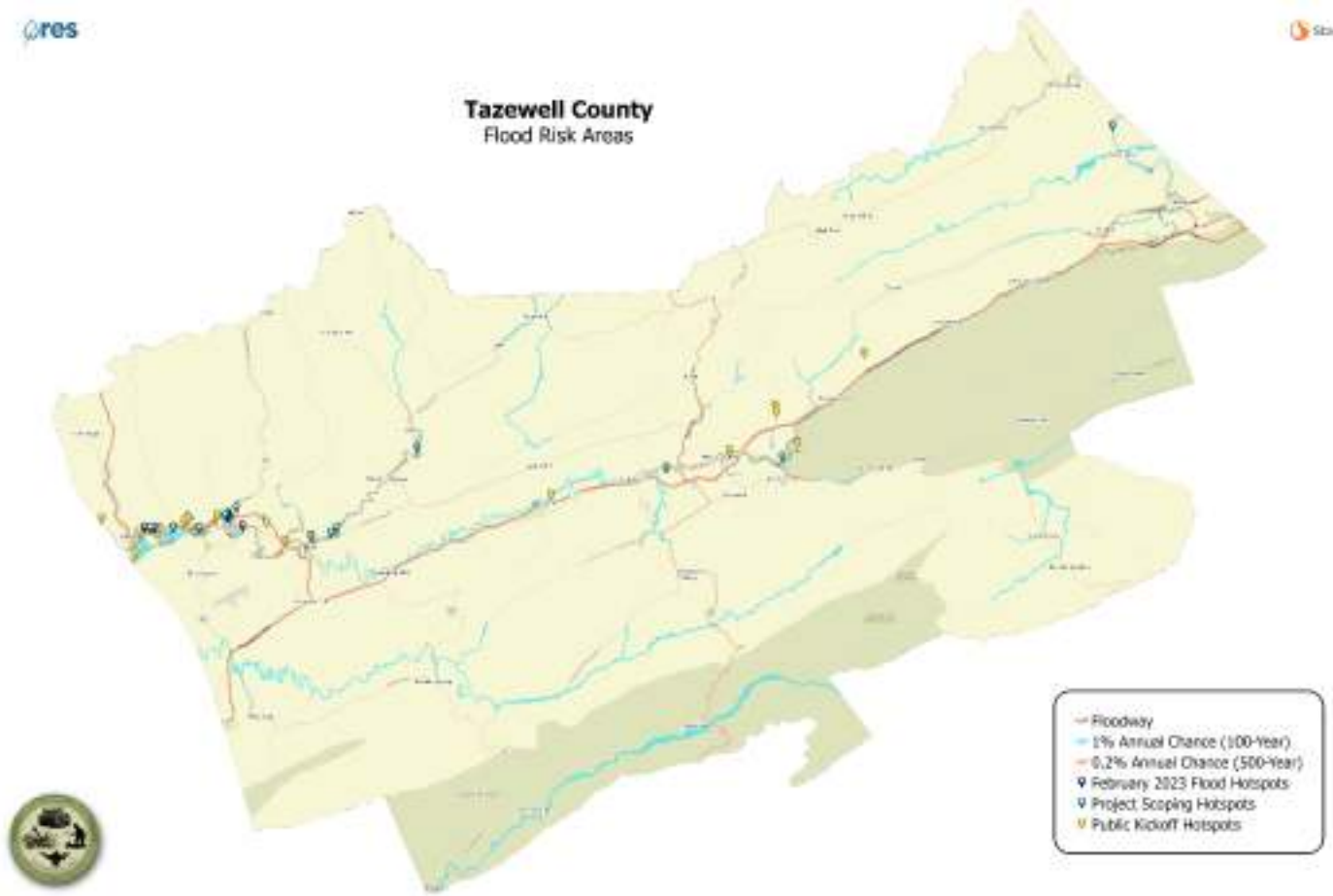


Figure 31: Identified flooding hotspots from Public Kickoff

Planning Team Risk Assessment and Priority Area Identification Meeting – March 23, 2023

On March 23, 2023, a Planning Team workshop was held in Richlands. The meeting reviewed progress to date, including preliminary results of the capability and capacity assessment. Risk assessment results were discussed, and types of flood risk reduction measures were introduced. Preliminary flood risk reduction projects based on feedback in previous meetings and the risk assessment were presented. It was reported that the February 2023 floods led to a landslide in Tannersville. A discussion was held on preliminary flood risk reduction measures and additional flood risk reduction measures.

Table 36: Tazewell Planning Team Risk Assessment Meeting Feedback

Preliminary Flood Risk Reduction Projects Feedback	
Project	Feedback
Richlands Police Headquarters and EMS	<ul style="list-style-type: none"> The buildings do not flood but the access gets flooded and closed. Washington Square Clinic in the same area also gets completely blocked.
Tazewell County Landfill	<ul style="list-style-type: none"> The County believes the flooding is not coming from the landfill but is coming from the mountain based on a study by the landfill. There is not a maintenance schedule for the ponds, but they are dredged periodically to maintain their stormwater permit. Update the project to focus on identifying where the flooding is coming from.
Property Acquisitions	<ul style="list-style-type: none"> Richlands has acquired one house before that was repurposed. The consulting team recommends trying to acquire whole neighborhoods at a time. The County has used FEMA grants to tear down homes and rebuild at a higher elevation on the same property.
Richlands Elementary School	<ul style="list-style-type: none"> Stormwater has impacted Richlands Elementary and Middle School. There have been talks of relocating the school(s).
Wastewater Treatment Plants	<ul style="list-style-type: none"> The Wastewater Treatment Plant and Water Treatment Plant in Richlands both flood. Flooding does not typically get in the plant and stop operations, but it completely blocks access.
Raven / Doran Bridge	<ul style="list-style-type: none"> The bridge was rebuilt after the 2020 flood. There are multiple flooding issues in that area that are more severe than the bridge.
Community Rating System (CRS)	<ul style="list-style-type: none"> Tazewell County participates in the National Flood Program but not in CRS.

Additional feedback was provided on a recent project being pursued in North Tazewell to build a basketball facility on the property of a former car dealership that was impacted by flooding. The area is within a flood hazard area and is mainly fill soil.

Public Meeting #2 - Risk Assessment and Priority Area Identification – March 23, 2023 (City of Tazewell)

A public meeting was held at the Tazewell County Administration Building on March 23, 2023. During this meeting, attendees were given an overview of the planning project, including scope, goals, and progress to date. A summary of risk assessment results was provided and an overview of types of flood risk reduction measures. A mapping exercise was held to identify flooding hotspots and potential mitigation actions. Outside of the consulting team staff, 6 participants from the public attended. All 6 participants were from the Blacksbury Street Community in Tazewell.

During the mapping exercise, the consulting team received public feedback on flooding issues faced by the Blacksbury Street Community. The key points are summarized below:

- Blacksbury Street is a historically black community in Tazewell. The community currently has about 10 homes. Historically, it was a much larger community with its own church.
- Flooding has been a reoccurring issue in Blacksbury but has gotten worse. They get flooding from all sides of the peninsula. At the end of the street, water comes up the road which completely blocks access. During the 2003 floods, several residents had to be rescued from the church. Flooding in the area occurs very rapidly.
- The abandoned Farm Bureau Building causes debris to build up which worsens flooding. Flooding impacts are also worsened by beaver dams, sedimentation, and debris build up. The Farm Bureau Building is shown in **Figure 32**.
- Residents report that they have not been allowed to install flood mitigation measures that have been allowed in other parts of the town. Additionally, when flooding events have occurred, they did not receive assistance after the event.
- Residents at the meeting expressed concern about not having anything to pass down to their children. Most of the remaining community members are older or renters. Many residents have built equity in their homes. If another flooding event occurs, they are worried they will “wake up in the river”, be unable to recover, and will lose their homes.
- Potential solutions discussed include removing the abandoned Farm Bureau building, stream restoration, beaver removal, and a flood wall. Feedback during the meeting was mapped in an exercise as shown in **Figure 33**.



Figure 32: Abandoned Farm Bureau Building capturing debris.



Figure 33: Mapping Exercise from Tazewell Risk Assessment Public Meeting

Public Meeting #3 - Risk Assessment and Priority Area Identification – May 2, 2023 (Bluefield)

A public meeting was held at Graham High School in Bluefield, VA on May 2, 2023. Prior to this meeting, the engagement meetings had been held in the southern portion of the county. One of the goals of the meeting was to get more feedback on the northern part of the county including Bluefield. During this meeting, attendees were given an overview of the planning project, including scope, goals, and progress to date. A summary of risk assessment results was provided and an overview of types of flood risk reduction measures. A mapping exercise was held to identify flooding hotspots and potential mitigation actions. Outside of the consulting team staff, 4 participants from the public attended including the mayor of Bluefield.

During the mapping exercise, the consulting team received feedback on flooding issues faced by Bluefield. Additionally, the mayor gave the consulting team a tour of some flooding hotspots following the public meeting. It was noted that the Town of Bluefield would like to be more involved in the plan and agreed upon to set up a follow up meeting with the Town. The key points are summarized below:

- The culvert at the crossing of College Avenue near Twin City Shopping Center gets full of sediment. During previous floods, the creek flooded the entire parking lot of the shopping center.
- The creek runs along Spring Street and alongside several businesses such as Premier Realty (shown in **Figure 34**). During floods, Spring Street floods and businesses are impacted. Business owners are worried about losing their businesses and being unable to recover.
- Beaverpond Creek near Jack Asbury Square floods and impacts the downtown area including College Avenue. FEMA previously acquired and demolished several properties in this area due to flooding. A local church is turning them into a recreation area. The flooding of College Avenue impacts fire station access to the community. The creek is shown in **Figure 35**.
- The Reynolds Avenue and Dudley Street areas frequently flood during heavy rains blocking access and impacting homes. Many residents move their cars, appliances, and electronics to higher elevations during rain events to help mitigate flooding damage. Residents report stream bank erosion and debris issues throughout the area. They also believe flooding has gotten worse from nearby development.



Figure 34: Creek running alongside Spring Street and Premier Realty



Figure 35: Beaver Pond Creek near Jack Asbury Square

Town of Bluefield Meeting – May 18, 2023

A virtual meeting was held with Town of Bluefield and Emergency Services personnel on May 18, 2023. During this meeting, attendees were given an overview of the planning project, including scope, goals, and progress to date. Most of the meeting focused on an interactive exercise to map flooding hotspots throughout Bluefield and the northern part of the county. Over twenty hotspots, were identified in Bluefield as shown in **Figure 36**. Several key areas were identified as flooding hotspots as summarized below.

- The area between Beaverpond Creek and Leatherwood Lane southeast of College Avenue frequently floods. The gas station had to raise their pumps due to the frequency of floods. The nearby parking lots frequently flood and there are beavers throughout the area.
- The culvert near Twin City Shopping Center has sedimentation issues. During floods, the parking lot floods and floodwaters get very close to College Avenue north of the culvert.
- College Avenue at Stockton Road floods at least once a year. Emergency Services must reroute traffic through a gravel road. There are debris issues in the area and a low-lying bridge.
- Beaver Creek Pond near Jack Asbury Square floods. The creek alongside Spring Street is also a hotspot and the road gets blocked from flooding. Access to the fire station gets blocked a few times a year but does not impact the building.
- The Reynolds Avenue and Dudley Street areas flood frequently. The intersection of Hockman Pike and Mobile Estates gets flooded frequently blocking access.
- There are several roads that get blocked by flooding in Falls Mills including Walton Street near Brush Fork Creek, Adams Drive at Brushfork Road, Adams Road near the railroad tracks, and Yards Road near Waterbury Road.

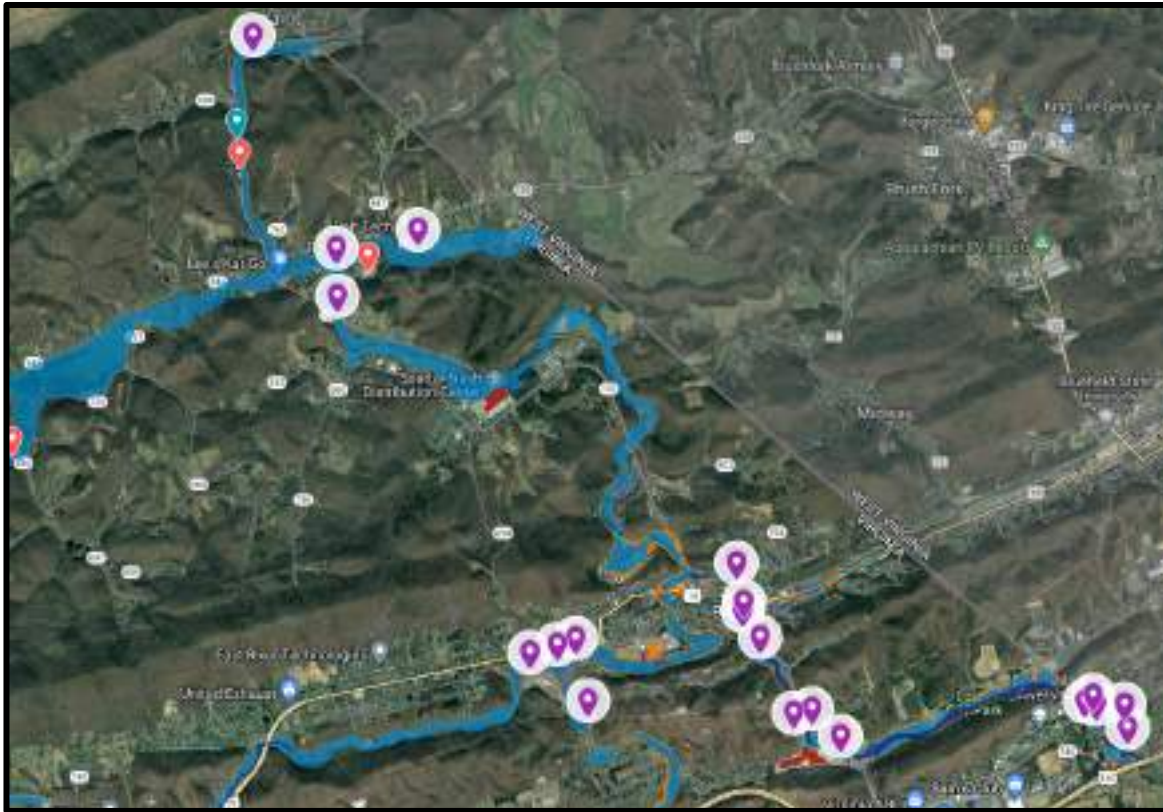


Figure 36: Identified Bluefield Flooding Hotspots

Draft Action Plan Review Meeting (June 13, 2023)

An Action Plan Review Meeting was held on June 13, 2023. This meeting was held virtually and provided an opportunity for the Planning Team to review projects included in the latest draft of Action Plan.

Flood Risk Reduction Projects Feedback

Project	Feedback
Richlands Police Headquarters and EMS	<ul style="list-style-type: none"> Community does not want to tear down the Police Headquarters and EMS Station. Would prefer to convert to a community center or public gym.
Hill Creek Area	<ul style="list-style-type: none"> One individual's yard has dropped about a foot; flood water almost reaches the house now. Flooding issues are worsening.
Lake Park Area	<ul style="list-style-type: none"> Oriole Street at Eagle Street floods consistently. This area used to have a small lake which was removed, but streets still flood.
Property Acquisitions	<ul style="list-style-type: none"> Still looking into buying out homes in the Blacksburg Street neighborhood; this would be the most cost-effective strategy. The abandoned mill building in North Tazewell would be an appropriate acquisition. Would require large amounts of funds but would reduce flooding issues in the area.

Flood Risk Reduction Projects Feedback

Richlands Schools	<ul style="list-style-type: none"> Richlands Middle School's auditorium floods frequently. This is a large issue and should be a priority because the auditorium serves as an emergency shelter. Richlands Elementary School has a blocked drain. Flooding may be due to a high water table or aquifer.
Raven/Doran Area	<ul style="list-style-type: none"> Raven/Doran area would be a great area to complete 2D BLE modeling. Some residents in Raven are open to moving. Need for an evacuation plan. Suggested the idea of a reverse 911 service to update residents when roads are flooded. Would be ideal if this included updates that were coordinated with the public school bus system.
Debris Cleanup	<ul style="list-style-type: none"> Agreement that debris removal needs to be prioritized. Need to have authority to remove debris with excavator.
Recent Flooding	<ul style="list-style-type: none"> Flooding recently occurred in Pocahontas. The County Administrator will follow up and get more information. Town of Bluefield recently experienced severe flooding. A rain gauge failed during the event and is being recalibrated.
Richlands Fire-Rescue Station 3	<ul style="list-style-type: none"> Stormwater pipes are severely undersized. Need to be updated.

Draft Plan Review Meeting (TBD)

This meeting anticipated to be virtual, with posting and comment collection through the project website and social media.

In addition to meetings with officials from Tazewell County, City of Tazewell, Richlands, and Bluefield, the consultant team attempted to contact officials from Cedar Bluff and Pocahontas to provide input during the planning process.

Incorporation of Plans, Studies, and Technical Information

Several plans and studies were leveraged during development of the Flood Resilience Plan. Specific references to other plans and studies may be found throughout the plan, primarily in *Section 5: Capability and Capacity Assessment* and *Section 6: Risk Assessment*. Examples of plans and studies incorporated into this plan include:

- Local planning documents (e.g., floodplain management ordinances, land use plans);
- Cumberland Plateau Planning District Commission Hazard Mitigation Plan;
- US Army Corps Flood Plain Management technical services and planning study for Richlands (including hydraulic modeling and FEMA Flood insurance study update);
- Local, state, federal hazard technical information (e.g., US Army Corps data, FEMA Flood Insurance Rate Maps, US Fish and Wildlife); and,
- Regional plans (e.g., economic development, environmental).

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Photo: Courtesy Donna Whittington

Introduction

Understanding a community's existing conditions lends a better understanding of overall flood risk and ability to mitigate future risk, including characteristics that influence the vulnerability of people and assets to flooding, as well as the community's ability to reduce the impact of flood events. Tazewell County has geographic, economic, and societal factors that affect the frequency and severity of flood events, as well as the community's ability to rebound from damaging floods. This section provides a summary of existing conditions in Tazewell County, including:

- Community history;
- Geography and climate;
- Population and demographics;
- Economy;
- Transportation; and,
- Flood history and characteristics.

Community History

Tazewell County is located in the Appalachian Mountains of southwestern Virginia. With 520 square miles, Tazewell County and the surrounding region are known for their agriculture, historical, resource, and cultural significance.

The initial settlers of the land were indigenous people known as the Woodland Indians. There are few known details about the early inhabitants of the area. Artifacts have been found across the county indicating they were an organized society of people and groups. The Woodland Indians were no longer in the area when the pioneers and European Settlers arrived. At that time, the Cherokee and Shawnee tribes were using the lands as hunting grounds.¹ After the first European colony was established in Jamestown, settlers including professional hunters who exported animal pelts to Europe, hunted large herds of deer, elk, buffalo, and other game in the region.²

The first permanent European settler in Tazewell County is believed to arrive in 1770.³ Most of the early settlers were of Scotch-Irish descent and arrived via the Wilderness Trail. James Burke, operating under the Woods River Company, led the first land survey of Tazewell County in 1749. The survey expedition mapped the headwaters of the Clinch River, Maiden Spring, and Dry Branch near today's Russell County.⁴ Tazewell County, chartered on December 19, 1799, was named in honor of Senator Henry Tazewell who made the motion to create the county. It was formed from Russell and Wythe Counties.

Tazewell County in its early formation and into the 19th century had a lower population than surrounding counties. The low population could be attributed to distance from the great migration road westward,

¹ Ibid.

² Ibid.

³ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](https://www.tazewellcountyva.org/2017-Comprehensive-Plan-Final.pdf)

⁴ Ibid.

hostile encounters with Native American tribes in this area, and difficulty securing clear title to land due to large-scale land speculation of the times. Historic sites, monuments, and museums reflect the community's link to pioneer and Native American ancestors throughout the region.⁵

The economic base in Tazewell County's early history was primarily agricultural uses. In the 1880s, coal started being mined commercially in Tazewell County.⁶ Coal mining rapidly expanded in the 1930s with the establishment of railroads for transporting coal. The economy in Tazewell County shifted to primarily mining and mining-related industries which peaked in 1990. As the rural Appalachia region in Southwest Virginia saw downward trends in the region's primary economic sectors of mining, manufacturing, and agriculture, the entire region collaborated in the early 2000s to develop a branding/marketing campaign under the Southwest Virginia Cultural Heritage Foundation.⁷

A recent economic revitalization study was prepared in September 2021. The Cumberland Plateau Planning District Commission Roadmap to Economic Resiliency Study charts a path forward for business and tourism resiliency in the region. Recommendations underway include making the region more attractive to a migrating workforce, eliminating blight, and advertising the community for potential relocation.⁸

Tazewell County is governed by a five-member Board of Supervisors which represent the County's five magisterial districts. Incorporated towns within Tazewell County include Bluefield, Cedar Bluff, Pocahontas, Richlands, and Tazewell.⁹ In addition, Tazewell County has approximately twenty unincorporated communities and four census-designated places.

Geography and Climate

Tazewell County is located in the north central portion of southwestern Virginia. The county lies within the valley and ridge portions of the Appalachian Mountains on the southeast with the Cumberland Plateau and Allegheny Mountains on the northeast. Tazewell County is bordered by West Virginia on the north, Buchanan County and Russell County on the west, Smyth County on the south, and Bland County on the east (Figure 4-1). It is one of four counties that comprise the Cumberland Plateau Planning District. Tazewell County is 520 square miles (the 20th largest out of 95 Counties and 39 Independent Cities in Virginia) and represents 27.5 percent of the total land area of the district.¹⁰ The county's incorporated municipalities include the Town of Bluefield, the Town of Cedar Bluff, the Town of

⁵ Ibid.

⁶ U.S. Geological Survey Bulletin. Coal Resources of Tazewell County, Virginia, 1980. Retrieved July 7, 2023, <https://pubs.usgs.gov/bul/1913/report.pdf>

⁷ Southwest Virginia Economic Analysis Report. Retrieved March 13, 2023. <https://cppdc.com/wp-content/uploads/2022/07/SWVA-Economic-Analysis-Report.pdf>

⁸ Cumberland Plateau Planning District Commission Roadmap to Economic Resiliency September 2021. Retrieved March 17, 2023. <https://cppdc.com/wp-content/uploads/2022/07/Cumberland-Plateau-PDC-Roadmap-to-Economic-Resiliency.pdf>

⁹ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](https://tazewellcountyva.org/2017-Comprehensive-Plan-Final.pdf)

¹⁰ Tazewell County Comprehensive Plan 2017. Retrieved February 13, 2023 from <http://cppdc.com/Reports/Tazewell%20Comp%20Plan%202017.pdf>

Pocahontas, the Town of Richlands, and the Town of Tazewell, which is the county seat. The incorporated towns are labeled with bold font in Figure 4-1.

Tazewell County maintains a continental climate, characterized by hot summers and cold winters. The average high is around 82 degrees in July, and the average low is 22 degrees in January. In addition, the county averages 42 inches of rain a year, 4 inches above the U.S. average of 38 inches. July is the most saturated month in Tazewell County with an average of 4.5 inches of rain, and the driest month is October with 2.5 inches.¹¹ Storms occur throughout the year in Tazewell County. In the mid-spring through early fall, Tazewell County faces more localized storms with large amounts of precipitation in a short period of time. From late fall to middle spring, Tazewell County faces slower moving storms with moderate precipitation. The climate in relation to flooding is discussed further in **Section 6: Risk Assessment**.

Since recording began in 1953, Tazewell County has experienced 21 presidential disaster declarations, including nine severe storms, five snowstorms, three hurricanes, one flood, and three other related disasters. After experiencing a hiatus in disasters from 2012 to 2017, the County has seen at least one disaster every other year. More recently, in July of 2022, the County experienced a flooding and mudslides disaster. The funding obligations for this incident accounted for approximately \$1.3 million in Public Assistance grants from the federal government.¹²

¹¹ NOAA Online Weather Data for Tazewell County, VA. Retrieved from [Climate \(weather.gov\)](#)

¹² FEMA. Disaster Declarations by State and County. Retrieved from Disaster Declarations for States and Counties | FEMA.gov.

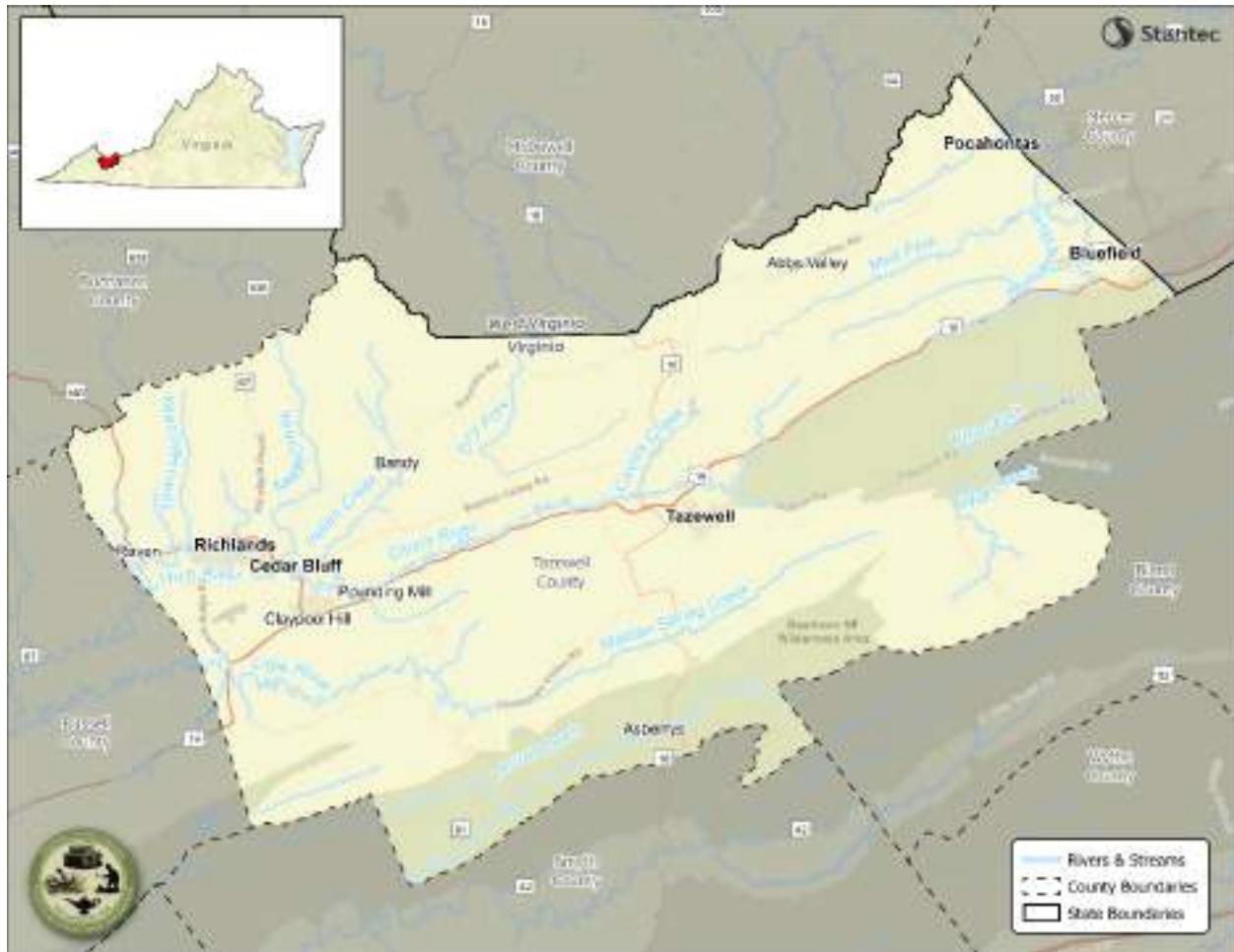


Figure 4-1: Location Map - Tazewell County, Virginia

Topography

Elevation in the valley areas of the county ranges from 1,900 feet in the western and southeastern areas to 2,763 in the east central areas.¹³ Uneven terrain is traversed by streams and sinkholes characteristic of a karst landscape. The topography ranges from sloping to hilly and steep with few areas of smooth and rolling sections across the county. The scenic mountains range from 2,500 to 4,500 feet of elevation with higher irregular peaks. While the mountains provide scenic vistas for residents and visitors, they pose a challenge to the installation of infrastructure and structural development throughout the county. Forested uplands and agriculture remain the predominant land uses for the hill and valley areas.¹⁴

Population and Demographics

As of 2020, Tazewell County had a population of approximately 40,429 residents, with a population density of 78 people per square mile. Since 2010, Tazewell County's population changed drastically with

¹³ Tazewell County Comprehensive Plan 2017. Retrieved February 13, 2023 from <http://cppdc.com/Reports/Tazewell%20Comp%20Plan%202017.pdf>

¹⁴ Tazewell County Comprehensive Plan 2017. Retrieved February 13, 2023 from <http://cppdc.com/Reports/Tazewell%20Comp%20Plan%202017.pdf>

a decline of approximately 4,600 residents. This number is a significantly larger decrease in population from prior previous decades. Table 4-1 below presents population statistics for Tazewell County and the incorporated areas within from the U.S. Census Bureau for 1990, 2000, 2010, and 2020.

Table 4-1: US Census Population Counts

	1990	2000	2010	2020	Percent Change 1990 - 2020
Town of Bluefield	5,371	5,100	5,444	5,096	-5%
Town of Cedar Bluff	1,759	1,050	1,137	1,069	-39%
Town of Pocahontas	510	453	389	268	-47%
Town of Richlands	4,506	4,206	5,823	5,261	+17%
Town of Tazewell	4,273	4,113	4,627	4,486	+5%
Tazewell County	45,968	44,598	45,078	40,429	-12%

Source: U.S. Census Bureau

Based on the 2020 Census, the median age of residents is 45 years old. Table 4-2 presents the county's racial characteristics from the 2020 Census. 92.8% of residents identify as White, 2.4% as Black, and 1.1% as Hispanic.

Table 4-2: 2020 Race Demographics for Tazewell County

	White	Black	Multiracial	Asian	American Indian and Alaska Native	Hispanic Origin*
Town of Bluefield	83.9%	7.1%	5.7%	1.8%	0.2%	3.1%
Town of Cedar Bluff	95.3%	0.4%	2.9%	0.5%	0.1%	0.0%
Town of Pocahontas	92.9%	1.5%	5.2%	0.0%	0.0%	0.0%
Town of Richlands	94.9%	0.5%	3.3%	0.7%	0.2%	0.1%
Town of Tazewell	89.5%	4.7%	4.6%	0.6%	0.2%	0.2%
Tazewell County	92.8%	2.4%	3.6%	0.5%	0.1%	1.1%

*Hispanics may be of any race, so also are included in applicable race categories.

Source: U.S. Census Bureau¹⁵

Socially Vulnerable Populations

Social vulnerability refers to the potential adverse impacts on social groups including death, injury, loss, or disruption of livelihood caused by external stresses on human life.¹⁶ Several factors can contribute to increasing the vulnerability of communities to natural disasters such as flooding. Examples include age, income, employment status, or race, as well as access to day-to-day resources such as vehicles, telephones, and broadband internet. Having high social vulnerability makes it more challenging for individuals to prepare, respond, recover, and adapt to disasters. Due to the mixture of factors increasing social vulnerability, both federal and state agencies have developed indices that highlight social vulnerability at the county or census tract level.

The Center for Disease Control's (CDC's) Social Vulnerability Index (SVI) is frequently used for federal grant applications. The CDC's SVI utilizes 16 census variables to establish an index score that highlights the social vulnerability of each county or census tract within the county. The data includes poverty, lack of vehicle access, and crowded housing, among others. The 2020 SVI score, the most recent data available for Tazewell County at the statewide level is 0.69 on a 0 (lowest vulnerability) to 1 (highest vulnerability) scale. This SVI score indicates that Tazewell County has a medium to a high level of vulnerability. The score is most impacted by Tazewell's scores in socioeconomic status, household characteristics, and housing type/transportation options. When evaluating the data at the census tract level, most of the tracts are identified as areas that have "medium-high" levels of vulnerability. In addition, there are two census tracts on the western boundary of the county and abutting Buchanan and Russell County that are within the "high" level of social vulnerability (census tracts 209 and 210) and one

¹⁵ United States Census Bureau. (n.d.) QuickFacts: Tazewell County, Virginia; United States. Retrieved March 2, 2023, from U.S. [Census Bureau QuickFacts: Tazewell County, Virginia](#).

¹⁶ FEMA National Risk Index.

census tract on the eastern boundary that is a “low-medium” level of social vulnerability (census tract 211.02).¹⁷ The social vulnerability by census tract is shown in Figure 4-2.

According to the Virginia Department of Housing and Community Development (DHCD), there are two Opportunity Zones (OZ) within Tazewell County. One is located along the northeast side of the county (census tract 202) and the other is located along the southern quadrant of the county (census tract 206). OZs are a federal economic and community development tax benefit designed to encourage long-term private investment in low-income urban, suburban, and rural census tracts. OZs were nominated by each governor in the spring of 2018 and are comprised of low-income census tracts, based on 2015-16 American Community Survey data. Virginia, which had 901 eligible census tracts, was able to nominate 25% of these tracts for certification by the U.S. Department of Treasury, per the Tax and Jobs Act. The designations are permanent through December 31, 2028.¹⁸

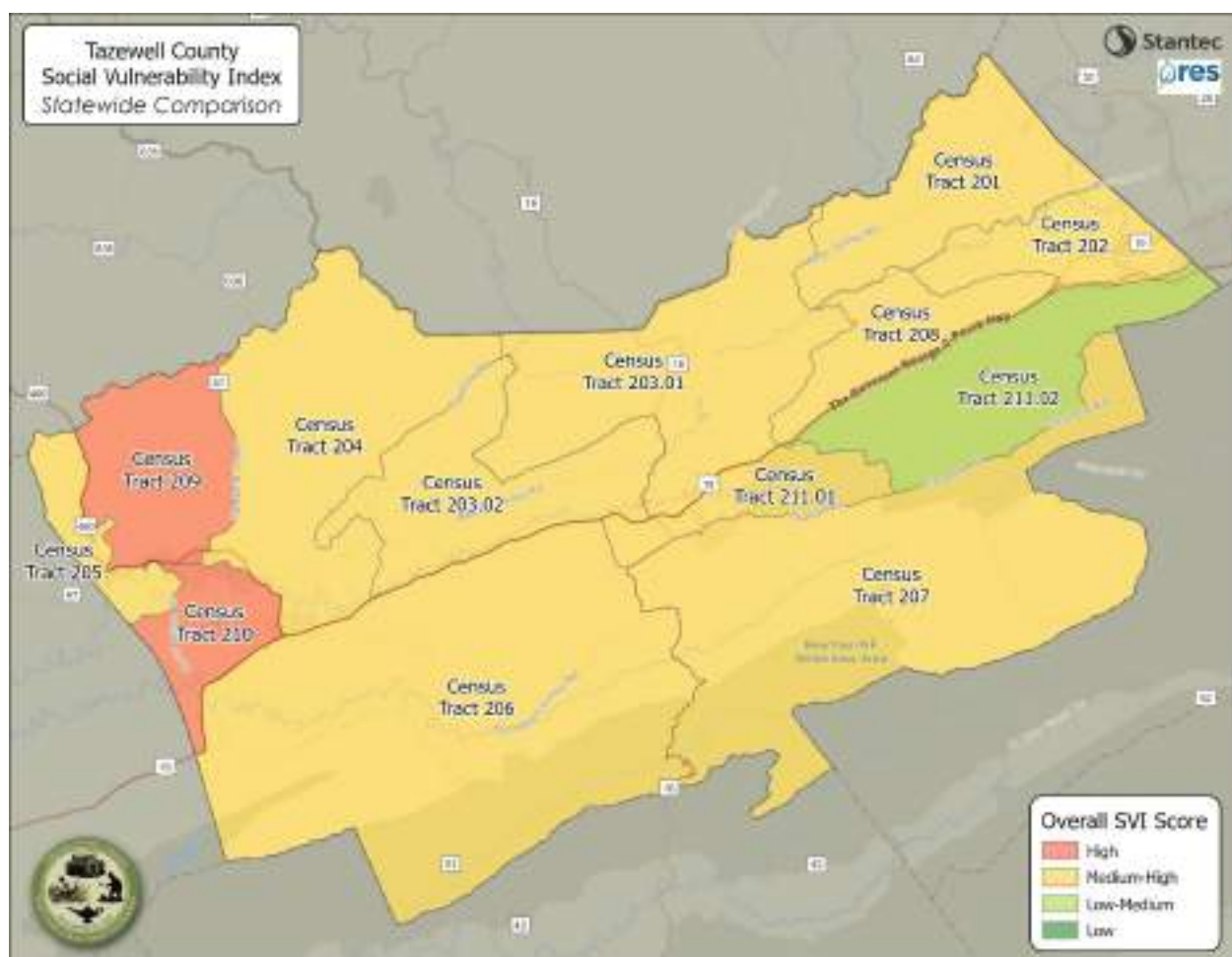


Figure 4-2: Social Vulnerability by Census Tract

¹⁷ Center of Disease Control. Retrieved from [CDC/ATSDR Social Vulnerability Index \(SVI\) | Place and Health | ATSDR](#)

¹⁸ Virginia DHCD. Opportunity Zones. Retrieved from [Opportunity Zones \(OZ\) | DHCD \(virginia.gov\)](#).

Economy and Industry

The region's abundant natural resources and economic sectors of manufacturing, mining, and agriculture have significantly declined over the last four decades. Once railroads were upgraded and expanded in the 1930s, the mining industry took off and remained very profitable until the 1960s. After a lull in production, coal resurged in southwest Virginia during the 1980s and reached peak production in 1990, when the state produced 46.5 million tons of coal. However, since then coal production has declined drastically. The number of licensed mines in Virginia in 1980 was over 800; by 2001 that number was down to 328.¹⁹ The decrease in coal production can be attributed to several factors. First, coal reserves in the area are largely depleted after years of mining. Second, the remaining coal seams in the Appalachians are relatively thin compared to mines in the western U.S. and require costly underground mining. Lastly, coal prices declined over the past 15 years, decreasing profit margins and further increasing automation.

Current regional economic growth focuses on the mission of Virginia's e-Region, promoting jobs in the electronic information technology, energy, education, and emerging specialty manufacturing industries.²⁰ In an effort to diversify the economic base of the economy and support new business and industrial facilities, basic infrastructure projects and the installation of fiber optic cabling have been underway. Additional access and availability of funding to improve infrastructure, incentivize local businesses, and market the community are necessary for continued economic growth in Tazewell County and the region.²¹

Leveraging Natural Resources

Tazewell County historically depended on natural resources such as lumber, coal, and shale as a driving force for the local economy. Even as the county incorporates additional sources of revenue, natural resources will likely continue to play a key role moving forward. Solar energy presents a potential revenue-generating source for the county. The Nature Conservancy, in partnership with Dominion Energy and Sun Tribe, is developing solar farms on six abandoned mines in Southwest Virginia.²² This creates jobs in the short term and provides cheap, renewable energy in the long term. Moreover, the CPPDC is participating in the Southwest Virginia Solar Workgroup to develop residential and utility-scale solar projects in the region.

Revitalizing agriculture in the region is another means of utilizing natural resources to support the local economy. Demand for local, hormone-free, grass-fed livestock has renewed interest in agriculture education in the region's schools and farming as an occupation.

¹⁹ Virginia Center for Coal and Energy Research. (n.d.) Virginia Coal. Virginia Polytechnic Institute and State University. Retrieved March 14, 2023 from <https://vept.energy.vt.edu/coal.html#:~:text=Virginia%27s%20peak%20production%20year%20was,declined%20to%2031%20million%20tons.>

²⁰ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](#)

²¹ Ibid.

²² Murphy, Zoeann. (2022). In Virginia, abandoned coal mines are transformed into solar farms. The Washington Post. Retrieved August 11, 2022 from <https://www.washingtonpost.com/climate-solutions/2022/03/03/coal-mines-solar-farms-climate-change-video/>

Presently, tourism and cultural heritage stimulate the local economy with the Nature Conservancy identifying the Clinch River Basin as one of twenty “Last Great Places” along with the Historic Crab Orchard Museum, the Tazewell County Old Time Bluegrass Fiddlers’ Convention, Pocahontas Exhibition Coal Mine and Museum, Burke’s Garden, and the Appalachian Trail. Burke’s Garden, visible from space and known as “God’s Thumbprint,” is a unique massive bowl formed by a mountain collapsing in on itself.²³ Outdoor recreation produces local tax dollars while maintaining the region’s natural beauty. According to the Bureau of Economic Analysis, U.S. Department of Commerce, outdoor recreation accounts for 1.6% of Virginia’s Gross Domestic Product totaling \$9.4 billion annually.

Transportation

Tazewell County, located in southwest Virginia is near the borders of West Virginia, Kentucky, and Tennessee. Major highways connecting the towns of Richlands, Tazewell, and Bluefield include US Routes 460 and 19. Connections to economic centers in Tennessee, Kentucky, West Virginia, and other parts of Virginia are made by Interstates 81 and 77 which run 30 miles south of Tazewell’s southern border.

In recent years, the Commonwealth Transportation Board has prioritized updating and repairing the bridges in Tazewell County many of which were constructed in the 1970s. In addition, repairs have been made to State Roads 696 and 747 improving the safety of those roadways. Regional improvements outside the county limits but beneficial to the county, have included I-73 and the “Coal Fields Expressway”.

The Tazewell Airport has the capacity to provide relief in the wake of natural disasters such as floods. Local police, Civil Air Patrol, and the National Guard utilize the airfield for the detection and suppression of forest fires, chemical spills, and other natural or man-made disasters. The airport has small plane capabilities, a 4,300-foot runway, and instrument landing capability for single and twin-engine general aviation uses.²⁴

Norfolk Southern Railroad and CSX Transportation provide local rail services mainly for the export of coal. The closest passenger rail service is an Amtrak station an hour away in Hinton, Virginia.²⁵

Greyhound-Trailways, Four County Transit, and Graham Transit provide bus service in the county.

Flood Overview

The steep topography of the county causes precipitation to drain quickly, and at high velocities, which can lead to rapid flooding following moderate or heavy rainfall. Quick-moving floodwaters may increase the potential for damages as the force of moving water pushes buildings off foundations and carries other large items, such as vehicles, trees, and bridges, downstream. Flooding can also occur if there is rapid snowmelt. In addition to the steep terrain, the large number of smaller tributaries feeding into the region’s larger streams and rivers creates a large influx of water during a rain event. The combination of

²³ Burke’s Garde. Virginia DWR website. Accessed March 15, 2023. <https://dwr.virginia.gov/vbwt/sites/burkes-garden/>

²⁴ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](https://tazewellcountyva.org/2017-Comprehensive-Plan-Final.pdf)

²⁵ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](https://tazewellcountyva.org/2017-Comprehensive-Plan-Final.pdf)

fast-moving runoff and the large volume of water can easily lead to flash flooding, leaving residents in the floodplains with little warning to evacuate.

The Clinch River, as it traverses through Tazewell and Russell Counties, has a drainage area of approximately 670 square miles. Multiple tributaries flow into the Clinch River including the Guest River flowing from the northwest and the Little River flowing from the east near the headwaters in Tazewell County. The mountainous terrain's steep slopes increase rapid flooding conditions following significant rainfalls or spring snowmelts.²⁶

Impervious surfaces associated with commercial and residential buildings, encroaching roadways and railways, and restricted flow from bridges all contribute to increased flood heights and increased water velocities during storm events. Most of the damage during flood events is to the contents of basements in the area, as well as the roads and railways that line the local waterways. However, in larger storm events, fast-moving water can wash out large sections of roadway, cause serious structural damage to permanent buildings, and push homes, especially mobile or modular homes, off their foundations, leading to serious injuries and loss of life.

The CPPDC's Hazard Mitigation Plan, last updated in 2018, details the flood occurrences along the Clinch River dating back to 1862. The primary data source for flood level measurements is a USGS gauge located Cleveland, Virginia. Additional USGS surface peak streamflow gauge data is available for the Bluestone River at Falls Mills, Virginia. The NOAA National Centers for Environmental Information (NCEI) Storm Events Database reported twenty-one additional flood events that caused either damage to homes or injuries/fatalities since 2002. Table 4-3 shows a full accounting of the forty-two flood events documented in the CPPDC's Hazard Mitigation Plan, the NCEI Storm Events Database, and/or presidential disaster declarations.

²⁶ Cumberland Plateau Planning District Commission Hazard Mitigation Update September 2018. Accessed March 16, 2023. <https://cppdc.com/wp-content/uploads/2022/07/Hazard-Mitigation-Plan.pdf>

Table 4-3: Previous Flood Occurrences in Tazewell County

Occurrence	Location	Source(s)
February 22, 1862	Clinch River Area	CPPDC HMP
February 22, 1867	Clinch River Area	CPPDC HMP
June 22, 1901	Entire River	CPPDC HMP
March 1, 1902	Clinch River Area	CPPDC HMP
November 20, 1906	Clinch River Area	CPPDC HMP
June 14, 1907	Clinch River Valley	CPPDC HMP
April 3, 1912	Clinch River Area	CPPDC HMP
April 1, 1913	Clinch River Area	CPPDC HMP
March 5, 1917	Lower Clinch Area	CPPDC HMP
January 29, 1918	Clinch River	CPPDC HMP
February 3, 1923	Clinch River	CPPDC HMP
June 13, 1923	Clinch River	CPPDC HMP
December 22, 1926	Clinch River Area	CPPDC HMP
August 14, 1940	Clinch River Basin	CPPDC HMP
January 30, 1957	Clinch River	CPPDC HMP
May 7, 1958	Clinch River	CPPDC HMP
March 12, 1963	Clinch River	CPPDC HMP
March 17, 1973	Clinch River Area	CPPDC HMP
January 26, 1978	Clinch River	CPPDC HMP
January 23, 2002	Wardell	NOAA/NCEI
March 18, 2002	Countywide	NOAA/NCEI
February 16, 2003	Clinch River Area	CPPDC HMP
November 19, 2003	Countywide	NOAA/NCEI
February 28, 2011	McCall Place, Bandy, Adria, Richlands	NOAA/NCEI
April 26, 2012	Richlands	NOAA/NCEI
May 22, 2012	Bluefield	NOAA/NCEI
March 4, 2015	Red Ash	NOAA/NCEI
April 23, 2017	Raven	NOAA/NCEI
June 16, 2017	Bluefield	NOAA/NCEI
February 11, 2018	Richlands	NOAA/NCEI
April 16, 2018	Cedar Bluff	NOAA/NCEI
September 10, 2018	Bluefield	NOAA/NCEI

Occurrence	Location	Source(s)
December 21, 2018	Richlands	NOAA/NCEI
February 20, 2019	Bluefield, Cedar Bluff, Pisgah, Hockman	NOAA/NCEI
February 6, 2020	Countywide	State Declared Emergency, NOAA/NCEI
April 13, 2020	Pounding Mill	NOAA/NCEI
March 1, 2021	Richlands	NOAA/NCEI
January 2, 2022	Cedar Bluff	NOAA/NCEI
May 24, 2022	Falls Mills	NOAA/NCEI
July 12, 2022	Mouth of Laurel, Jewell Ridge, and Burkes Garden	NOAA/NCEI
August 5, 2022	Richlands	NOAA/NCEI
February 17, 2023	Countywide	Local News

Note: The table does not include flash flood events.

To supplement the historical record of flooding events, County officials identified ten initial flooding hotspots within the county during project scoping. Table 4-4 presents these initial flood hotspots, which are assessed further in Section 6: Risk Assessment. Figure 4-3 shows flooding from the Clinch River at the Raven hotspot.

Table 4-4: Tazewell County Flood Hotspots

Location
Clinch River in Raven
Clinch River at Plant Road near Richlands
Clinch River near Patton Street
Clinch River in Richlands
Big Creek in Richlands
Indian Creek at Baner Bottom
Indian Creek Near Cedar Bluff
Clinch River near Tazewell Wastewater Treatment Plant
North Fork Clinch River near Freedom Avenue
Bluestone River near Falls Mills



*Figure 4-3: National Guard Rescue from Flood - February 6, 2020
Photo: Courtesy Donna Whittington*

In addition to the flooding hotspots, abandoned mines present a unique flooding hazard. Portals (entry tunnels) into the abandoned mines can flood and overflow. This can lead to a mine blowout or a landslide. Flood risks associated with abandoned mines are further addressed in Section 6: Risk Assessment.

Summary

In conclusion, this Appalachian Mountain community depends on agriculture, historic, cultural, and natural resources. The steep elevations and karst landscape provide challenges for physical growth and expansion of infrastructure. The population has steadily decreased since 1990 corresponding to the decline of the coal industry in the region. However, there are economic redevelopment efforts focused on business and tourism resiliency. Flood risk presents a challenge to these efforts, as well as maintaining life safety and quality of life within the county. There have been forty-two reported flood occurrences in Tazewell County with twenty-one occurring since 2002. The highest number of annual flood occurrences was in 2022. Flood mitigation actions are necessary to preserve and protect the residents and existing industry within Tazewell County and the incorporated areas within and make it an attractive community for future economic investment and industry.

5.Capability Assessment

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Introduction

The purpose of conducting a capability and capacity assessment is to determine the ability of a local jurisdiction to identify and implement policies, programs, or projects that reduce flood risk. As in any planning process, it is important to try to establish which actions are feasible based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability and capacity assessment helps to determine which flood risk reduction activities are practical, and likely to be implemented over time, given a local government's planning and regulatory framework, level of administrative and technical support, fiscal resources, and current political climate. Information for the capability and capacity assessment was gathered from County officials during Planning Team meetings and targeted stakeholder interviews.

A capability and capacity assessment has two components: 1) an inventory of a local jurisdiction's relevant plans, ordinances, or programs already in place and 2) an analysis of its capacity to carry them out. It includes, reviewing available flood-related data, plans, policies, and staffing capabilities, as well as providing recommendations for revisions or new policies to enhance the County's capability in floodplain management. The assessment also involves reviewing policy, including identified incentives for restoring or preserving riparian and wetland vegetation. Careful examination of local capabilities will identify existing gaps, shortfalls, or limitations with ongoing government activities that could hinder proposed flood risk reduction activities and possibly exacerbate community flood vulnerability. A capability and capacity assessment also highlights the positive measures already in place or being implemented at the local government level, which should continue to be supported and enhanced.

Recommended actions will support a long-term strategy to build capacity and capabilities. Examples include regular staff training, budget allocations to support staff in implementing the plan, and supporting a staff person in obtaining and maintaining Certified Floodplain Manager (CFM) certification. Flood risk reduction actions and projects, including those identified to maintain and enhance county capability and capacity, are presented in *Section 7: Flood Risk Reduction Action Plan*.

Data Availability

Relevant data, such as flood risk studies, maps, and gauge information, help communities understand flood risk by providing information regarding the location, severity, and likelihood of potential flood events. Further, local data, such as building and asset data, can be assessed alongside flood data to understand a community's vulnerability to flooding. Therefore, data availability is directly linked to a community's capability to understand flood risk, as well as to develop and implement strategies to effectively reduce future flood risk. As part of the planning process, flood-related data was collected from local, state, and federal sources to inform capability. This data was also used in *Section 6: Risk Assessment*, to better understand flood risk within Tazewell County. A summary of available flood data sources is provided below.

FEMA Flood Data¹

Regulatory Flood Insurance Rate Maps (FIRMs) show the location of the mapped 100-year and 500-year floodplains in Tazewell County and are used for flood insurance. The latest FIRM for Tazewell County

¹ FEMA Map Service Center. [FEMA Flood Map Service Center | Search All Products](#).

became effective in 2011. Small portions of the county's FIRM have been updated more recently, with the most recent revision being in 2021.

Flood risk products (FRPs) are non-regulatory and are used for community planning and emergency preparedness purposes. In 2014, FEMA and the US Army Corps of Engineers completed a Flood Risk Study for the Tug Fork Watershed, which includes Tazewell County. The Flood Risk Study includes depth grids and percent chance of flooding grids (annual and 30-year). The report states that flash flooding continues to be a reoccurring threat to homes, infrastructure, and public safety.²

The county would benefit from depth and velocity grids for the entire county, especially considering noted issues with houses and mobile homes being swept off their foundations and carried downstream during flood events.

Gauge Data

There is one USGS stream gauge located within Tazewell County. It is located on the Bluestone River at Falls Mills near the West Virginia border. A second stream gauge, located in Cleveland, VA in neighboring Russell County, was used to provide historical stream flow data for the Clinch River. The Clinch River originates within Tazewell County and flows through most of the County's more populated towns and cities. The measurements from these gauges are further detailed in *Section 6: Risk Assessment*. Prior gauge data for the region included IFLOW rain and stream gauges.³ This program has been temporarily suspended due to a lack of VDEM funding. It is anticipated that this system will be restored in the future.

In its current state, the network of stream and rain gauges in the county provides little benefit in terms of emergency management and warning. An expanded network of stream and rain gauges that update in real-time can provide a warning when flood stages are being approached. Further, information gathered by gauges can be used to understand the extent and severity of extreme rainfall events and can be used in floodplain mapping.

High Water Marks

High water marks, or visible lines that show the location and height of floodwaters after they have retreated, can be used to determine the extent and severity of the flooding. Unfortunately, high water mark data was not available for Tazewell County. For future planning, project, and funding purposes, it is recommended that they be collected and documented in a geospatial data format.

Without high water marks from previous flood events, future updates to flood maps may not accurately reflect the severity and extent of flooding in Tazewell County. A process for collecting high water marks after flood events and storing data in geospatial format would enhance the county's ability to plan for flood risk reduction and work with state and federal agencies to develop accurate flood risk data.

² Flood Risk Report Tug fork Water, HUC 05070201. FEMA. Retrieved April 11, 2023. [Flood Risk Report Tug Fork Watershed](#).

³ Virginia Flood Observation and Warning Network. [Virginia Flood Observation and Warning Network \(mtiv-tools.com\)](#).

Dam Data

The U.S. Army Corp of Engineers (USACE) National Inventory of Dams (NID) lists five dams within Tazewell County, and 11 dams within 10 miles of the county.⁴ USACE classifies a dam's hazard potential based on the potential of a dam to affect the safety and health of citizens and property, should the dam fail. This is separate from the condition of the dam, and only assesses the potential consequences of a dam failure. Analysis of the dam's hazard and condition are detailed in *Section 6: Risk Assessment*.

Future Conditions Data

Future conditions data helps communities understand how their flood risk may change over time. Tazewell County is expected to experience increased annual precipitation in the future, including more severe extreme rainfall events. While the county does not have future rainfall or flood data developed from downscaled climate models, national sources and tools such as the National Climate Assessment, NOAA's Climate Mapping for Resilience and Adaption, Headwaters Economics Neighborhoods at Risk, EPA's EJScreen, FEMA's National Risk Index, and USACE studies are available to understand future conditions associated with flood risk.

Future flood risk data developed specifically for Tazewell County, such as changes in the severity and frequency of extreme rainfall events, may help the county better plan to reduce future flood risk. For example, capital projects and infrastructure can be constructed to withstand projected future events rather than those of the past.

Abandoned Mine Land Data

Tazewell County has abandoned mines distributed throughout the county. Abandoned mines pose a threat due to flooding from "blowouts," when mines fill with water during extreme rainfall events and burst, resulting in large volumes of water cascading down steep slopes into valleys below. These events are difficult to predict and can also result in landslides and mudflows. While many abandoned land mines have been mapped and rehabilitated, many remain unmapped throughout the county. According to County officials, the Virginia Department of Energy (DOE), formerly the Department of Mines Minerals and Energy (DMME), located and mapped many abandoned mines in the 1970s however unlocated abandoned mines may exist throughout Tazewell County. DOE maintains an online mapping tool to show the location of known abandoned mines and associated impacts.⁵ The presence of unknown, unmapped abandoned mines makes it difficult for County officials to predict where mine blowouts may occur and makes it challenging to differentiate between flood events caused by extreme rainfall alone and those exacerbated by mine blowouts.

Tazewell County does not have a complete inventory of abandoned mines within the county. Although the DOE has made significant progress in mapping abandoned mines, a complete survey of the county for unmapped abandoned mines would allow the county to work with local, regional, and state entities to understand where flood risk may be increased due to the presence of abandoned mines and to mitigate potential effects of flooding associated with mine blowouts.

⁴ Dams of Tazewell County, Virginia. U.S. Army Corps of Engineers. Retrieved April 11, 2023. [National Inventory of Dams \(army.mil\)](https://www.army.mil/nid/)

⁵ Virginia DMME. [Virginia Abandoned Coal Mine Feature Inventory \(arcgis.com\)](https://dmme.virginia.gov/abandoned-coal-mine-feature-inventory/).

Local Data

Local building and community asset data was collected as part of the planning process to better inform risk. The County maintains geospatial data which includes building footprints, as well as parcel and value data used for tax assessment purposes. More information about how available data was used to assess flood risk is detailed in *Section 6: Risk Assessment*.

The county would benefit from an inventory of digitized building footprints that include attributes such as use, building age and material, first flood elevation, number of stories, and improvement value. This information can be used to understand building-specific vulnerability to flooding.

Local Planning and Policies

Planning and regulatory capability are based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment while maintaining the general welfare of the community. It includes emergency response and hazard mitigation planning, comprehensive land use planning, and transportation planning, as well as enforcement of ordinances and building codes, and protection of environmental, historic, and cultural resources in the community. Although conflicts can arise, these planning initiatives present significant opportunities to integrate flood risk reduction principles into the local decision-making process.

Community Plans

In Tazewell County, plans are developed by both the County and the Cumberland Plateau Planning District Commission (CPPDC). The CPPDC is a regional body that provides planning technical assistance to Buchanan, Dickenson, Russell, and Tazewell Counties. Table 5-1 provides a summary of plans for Tazewell County.

Table 5-1: Tazewell County Summary of Plans

Plan Title	Purpose
Tazewell County Comprehensive Plan	A comprehensive plan serves as a broad policy guide to assist in the decisions necessary for future development and redevelopment.
Tazewell County 2021 Emergency Operations Plan (EOP)	An EOP outlines responsibilities and how resources are deployed during and following an emergency or disaster.
CPPDC 2021 Comprehensive Economic Development Strategy (CEDS)	A CEDS contributes to effective economic development through a locally based, regionally driven economic development planning process. A CEDS is intended to implement economic development planning by engaging community leaders, leveraging the involvement of the private sector, and establishing a strategic blueprint for regional collaboration.
CPPDC Coalfields Regional Water Study	The purpose of the Virginia Coalfields Regional Water Study is to develop and evaluate, without regard to geographical or political boundaries, alternatives for regionalized water systems capable of providing water service to previously unserved areas and improving service to areas currently served.
CPPDC 2018 Hazard Mitigation Plan	A hazard mitigation plan represents a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. A community must have a current hazard mitigation plan to qualify for FEMA Hazard Mitigation Assistance (HMA) funding opportunities. Aligning risk reduction actions within this flood resilience plan with the community's hazard mitigation plan may expand funding opportunities for flood mitigation within the County.
CPPDC Southwest Virginia Regional Wastewater Study	The Southwest Virginia Regional Wastewater Study is intended to serve as a road map for the future implementation of sanitary sewer collection, treatment, and disposal projects in Southwest Virginia.
CPPDC Southwest Virginia Regional Water Supply Plan	The Southwest Virginia Regional Water Supply Plan was developed to follow the State Water Control Board's regulation 9 VAC 25-780, Local and Regional Water Supply Planning. The plan addresses water sources, water use, and natural resources in the region as well as water demand management information, and drought response and contingency planning.
CPPDC Southwest Virginia Economic Analysis Report	This report assesses economic development trends in Southwestern Virginia, including the growth of the "creative economy," general economic trends, talent and human capital, recreation, and quality of life.

In addition to plans already in place, several types of plans that have not been developed or implemented by the county or CPPDC were identified that have the potential to reduce flood risk. These present potential opportunities to enhance flood resilience within the county. These plans include:

- **Disaster Recovery Plan:** A Disaster Recovery Plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.
- **Emergency Evacuation Plan** – Evacuation Plans pre-determine safe evacuation routes for residents to relocate out of harm's way during a disaster. Having an evacuation plan before a flood event not only reduces the time needed to take action but also allows local governments to adequately prepare evacuation routes. For example, roads designated as evacuation routes may be prioritized for improvements or receive signalization preference during emergency events. Further, evacuation route plans can be socialized with a community so that residents are aware of where they should go during a disaster event. This may also help reduce the number of 911 calls received during a disaster event, which was noted as a problem in adjacent Buchanan County. The Planning Team noted that emergency evacuation route planning is needed for areas across the county.
- **Continuity of Operations Plan:** A Continuity of Operations Plan (COOP) details how an organization will remain operational and perform essential functions following any event that makes it unsafe or impossible for employees to work in the normal location. COOPs go beyond activities detailed in an emergency action plan including:
 - Delegation of transfer of authority;
 - Identification of essential functions (information technology, payroll, communications);
 - Alternate facilities for performing work;
 - Alternate transportation and remote work capabilities;
 - Access to and safeguarding of information (physical, local server, cloud); and,
 - Return to normal operations.

Ordinances and Regulations

The County has adopted and maintains several ordinances which support the ability of County officials to reduce flood risk. The ordinances are described below.

Floodplain Management

The County has an existing Floodplain Management Plan adopted as Chapter 12 of the Tazewell County Code of Ordinances.⁶ The purpose of the chapter is to prevent loss of property and life, the disruption of commerce and governmental services, the extraordinary and unnecessary expenditure of public funds for flood protection and relief, and the impairment of the tax base while creating health and safety standards. This is accomplished through regulating uses that will cause unacceptable increases in flood heights, velocities, and frequencies, restricting or prohibiting certain uses from locating within areas subject to flooding, and requiring uses that do occur in flood-prone areas to be protected and/or hardened against flooding and flood damage and protecting an individual from buying lands and structures which are unsuited for intended purposes because of flood hazards.

Soil and Erosion Control

The County has an adopted Soil and Erosion Control Ordinance as Chapter 9 of the Tazewell County Code of Ordinances.⁷ Land-disturbing permits are required and issued by the County for clearing, filling, excavating, grading, or transporting, or any combination thereof, on all lands except privately owned, occupied, or operated, agricultural, horticultural, or forestry lands.

Soil and erosion control regulations are effective when implemented, however, there is a lack of awareness among the public as to when permits are required. For example, soil and erosion control permits are often not sought for the construction and/or expansion of single-family homes even though it is a requirement. The County staff indicated challenges with effectively enforcing the soil and erosion control regulations.

Stormwater Management Plan

Tazewell County does not have a stormwater management plan. However, the soil and erosion and subdivision regulations prohibit lands from being platted for residential use if they are subject to flooding, irregular drainage conditions, and excessive drainage control and such hazards have not been corrected. A stormwater drainage plan demonstrating adequate drainage improvements is required before approval of major subdivisions.⁸

Building Codes

Tazewell County has adopted and enforces the Virginia Uniform Statewide Building Code. Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes, the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of risk faced by a community.

⁶ Tazewell County Code of Ordinances. Accessed March 17, 2023. https://library.municode.com/va/tazewell/codes/code_of_ordinances?nodeId=PTIICOOR_CH12FLDI

⁷ Tazewell County Code of Ordinances. Accessed March 17, 2023. https://library.municode.com/va/tazewell/codes/code_of_ordinances?nodeId=PTIICOOR_CH9ERSECO

⁸ Tazewell County 2017 Comprehensive Plan. Retrieved February 24, 2023. [2017-Comprehensive-Plan-Final.pdf \(tazewellcountyva.org\)](https://www.tazewellcountyva.org/2017-Comprehensive-Plan-Final.pdf)

Zoning and Subdivision Ordinances

Zoning codes and subdivision ordinances are tools used by communities to regulate land uses and building types within certain geographic areas. When used correctly, zoning and subdivision ordinances can be used to manage development in a logical, harmonious way that keeps residents safe. For instance, zoning can direct sensitive land uses out of hazard areas. Tazewell County does not currently have zoning or subdivision ordinances in place.

Limitations

While the county has implemented numerous plans and policies to help mitigate flood risk, certain planning and policy limitations were identified by the Planning Team in addition to the ones described in the above sections. These limitations are described below.

- **Floodplain management:** Homes built within the floodplain that go through the permitting process have experienced limited damage during flood events relative to pre-1997 construction, which was not subject to flood damage prevention requirements. However, enforcement to keep sheds, trucks, and other encroachments out of the floodplain is challenging. Additionally, private bridges (e.g., driveways) are common throughout the county and are not typically constructed to floodplain management standards. During flood events, bridges have the potential to constrict floodways, and washed-away bridges may contribute to jammed waterways.
- **Logging:** A lack of controls on logging may contribute to flood problems within the county due to runoff generated by logging practices. Logging is enforced by the Virginia Department of Forestry (DOF). It is unknown if the County has the authority to regulate runoff from logging. Further, the County currently lacks the staffing capacity to enforce logging runoff controls. It was noted that while DOF is responsive to soil and water notification of problems from the County, the agency does not have current initiatives to proactively enforce logging controls within the county.
- **Stormwater:** The Virginia Department of Environmental Quality (DEQ) possesses the authority to regulate stormwater. Currently, little is done with the sheet flow from roadways. Implementation and enforcement of stormwater controls would likely reduce flood risk within the county, especially for roadways and access.
- **Stream buffers:** Constraints regarding available land for development and infrastructure placement (due to topography) limit the implementation of stream buffers within the county. Vegetation along streams is often within residential yards and not subject to any stream buffer requirements. One potential avenue for implementing stream buffers is Virginia's Agricultural Cost-Share program⁹. The Agriculture Cost-Share Program established in 1984 helps farmers implement conservation practices that prevent pollution from reaching waterways. "Best management practices" funded by the program include livestock fencing near streams, planting buffers of trees and native plants along waterways, and nutrient management plans to ensure

⁹ Agricultural BMP Cost-Share Program. Virginia Department of Conservation and Recreation. Accessed March 24, 2023. <https://www.dcr.virginia.gov/soil-and-water/costshare2>

farmers utilize the correct amount of fertilizer among other stream and waterway preservation methods.¹⁰

Staffing and Training

The ability of a local government to develop and implement flood risk reduction projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. As summarized below, County staff currently has limited capacity to implement flood risk reduction. There is a need for staff to implement flood risk reduction measures and for an official to conduct reviews and enforcement of the building code and flood damage prevention ordinance.

Limitations

The Planning Team noted that most County officials serve multiple roles within the county, which impacts staff members' capacity to pursue new initiatives, such as funding opportunities or partnerships. County officials also recognize the need to have a Certified Floodplain Manager (CFM) on staff who would be able to pursue flood-risk reduction measures. County officials indicated a preference for contract work for this position over hiring more full-time staff.

In addition to the limitations described above, Tazewell County experienced significant flood events in 2020, 2021, and 2022. Because of these events, County staff has focused efforts on emergency response and recovery rather than preemptive flood risk reduction. However, the recovery process presents opportunities for reducing flood risk during rebuilding.

Additional Initiatives and Considerations

Environmental Permitting

The Clinch River boasts more endangered mussel species than any other river in North America as it flows through the far southwestern corner of the Commonwealth in Tazewell, Russell, and Scott counties before crossing into the state of Tennessee. A record 55 species of mussels once inhabited the watershed. However, pollution events, poor land use practices, loss of anadromous fish hosts, and fragmented habitat caused by dams have reduced that number to 46 species, according to recent accounts.¹¹ Within Tazewell County, there are six endangered species of mussels according to the U.S. Fish and Wildlife Services.

Limited capacity and staff expertise present a regional problem with complying with federal environmental permitting and regulations, such as the Endangered Species Act, specifically concerning stream maintenance. The presence of the mussels adds requirements for the protection of the mussels and additional complexities or directly prevents removing debris and collected sediment from clogged streams that were previously allowed – both of which are significant contributors to floods. The inability to remove debris and sediment from impacted streams was expressed as the largest barrier to reducing

¹⁰ Virginia's Agricultural Cost-Share Program. Chesapeake Bay Foundation. Accessed March 24, 2023. <https://www.cbf.org/about-cbf/locations/virginia/issues/virginias-agricultural-cost-share-program.html>

¹¹ We're Ready for Musselrama 2021! Virginia Department of Wildlife Resources. Retrieved March 23, 2023. <https://dwr.virginia.gov/blog/were-ready-for-musselrama-2021/>

flood risk, as removing debris promotes unobstructed stream flows and allows streams to store and channel greater volumes of water within their banks.

Table 5-2 below summarizes the location and status of the local endangered mussel species within Tazewell County. According to the Fish and Wildlife Service, the Cumberlandian combshell mussels, oyster mussels, purple bean, and rough rabbitsfoot mussels persist at extremely low levels in portions of the Cumberland and Tennessee River basins in Kentucky, Tennessee, and Virginia. Currently, the species and their habitats are impacted by deteriorating water quality, primarily from impactful and poor land-use practices. The species are vulnerable to toxic chemical spills.¹² The slabside pearlymussel and fluted kidneyshell are endemic to portions of the Cumberland and Tennessee River systems of Alabama, Kentucky, Mississippi, Tennessee, and Virginia. The fluted kidneyshell mussel is restricted to the Cumberland Region.¹³

Table 5-2: Critical Habitat – Mussels within Tazewell County.¹⁴

Mussel Common Name	Scientific Name	River	Status
Cumberlandian Combshell	Epioblasma brevidens	Clinch	Endangered
Oyster Mussel Freshwater Mussel	Epioblasma capsaeformis	Clinch	Endangered
Slabside Pearlymussel	Pleuronaia dolabelloides	Clinch	Endangered
Fluted Kidneyshell	Ptychobranhus subtentum	Clinch and Little River	Endangered
Rough Rabbitsfoot	Quadrula cylindrica strigillata	Clinch	Endangered
Purple Bean	Villosa perpururea	Clinch	Endangered

The endangered species of mussels are shown in Figures 5-1 to 5-6

¹² ETWP; Determination of Endangered Status for the Cumberland Elktoe, Oyster Mussel, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot. USFW. Retrieved April 11, 2023. [ETWP; Determination of Endangered Status for the Cumberland Elktoe, Oyster Mussel, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot | FWS.gov](#)

¹³ U.S. Fish & Wildlife Service. Retrieved April 11, 2023. [2013-233556](#).

¹⁴ U.S. Fish & Wildlife Service. Retrieved April 11, 2023. [Listed Species](#).

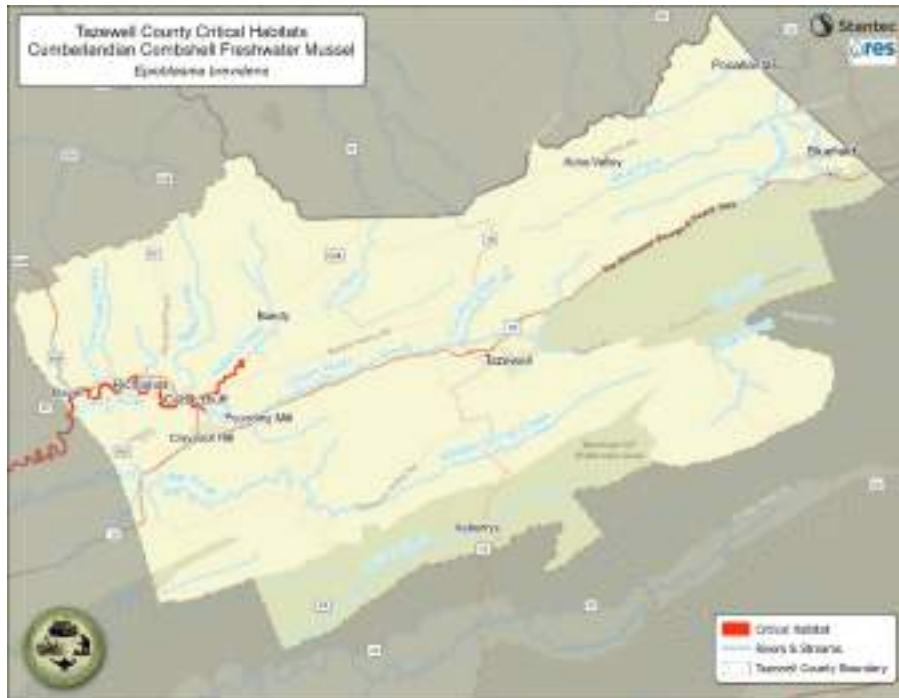


Figure 5-1 USFW Tazewell County Critical Habitat – Cumberlandian Combshell Freshwater Mussels

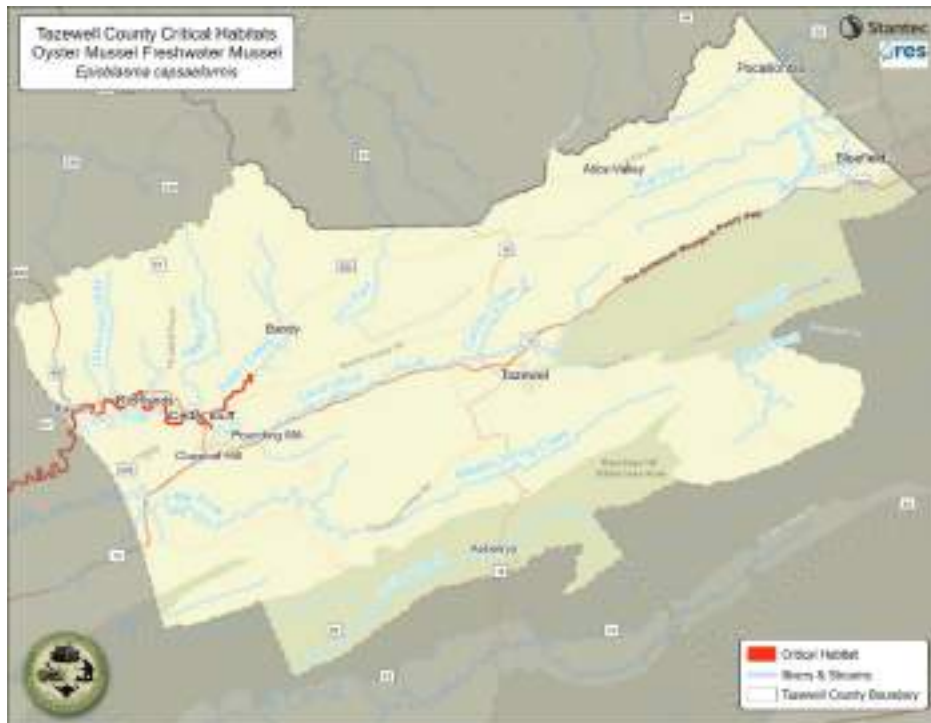


Figure 52 Tazewell County Critical Habitats - Oyster Mussel Freshwater Mussel

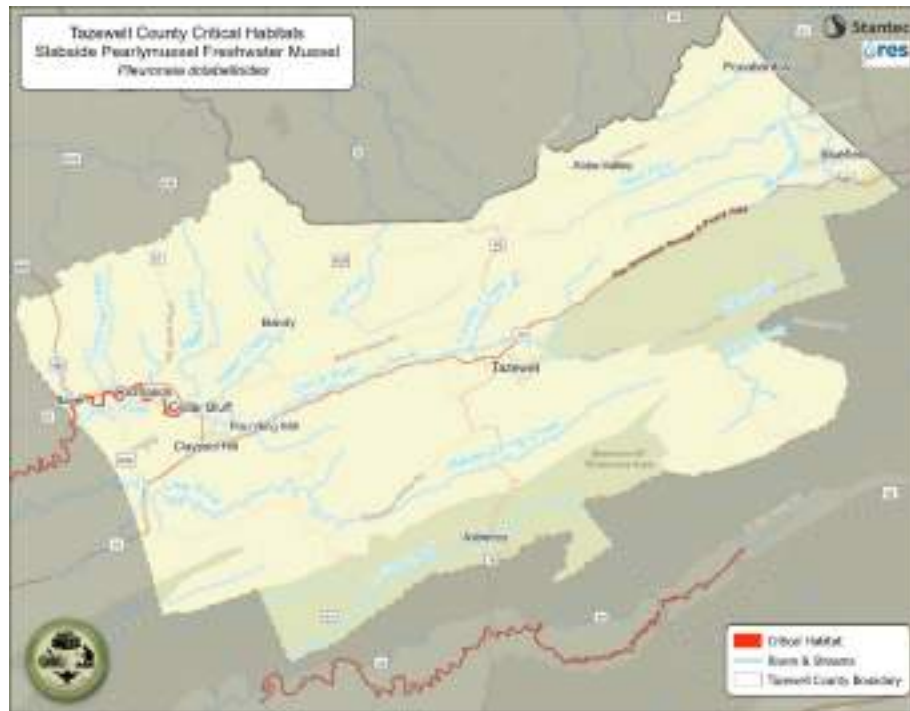


Figure 53 Tazewell County Critical Habitat - Slabside Pearlymussel Freshwater Mussel

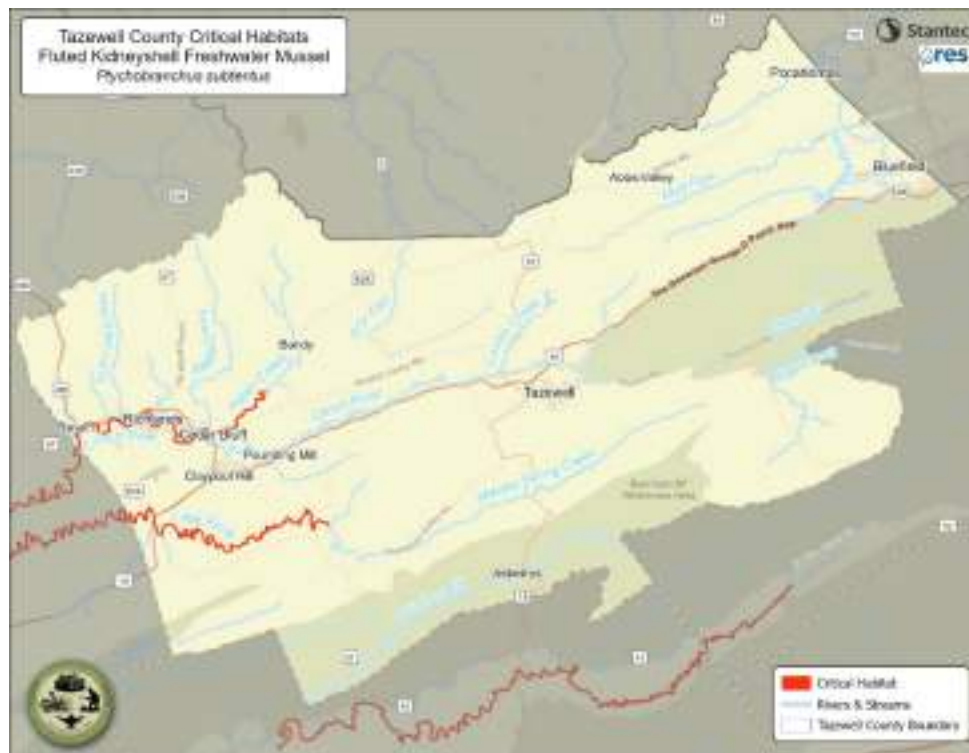


Figure 54 Tazewell County Critical Habitats - Fluted Kidneyshell Freshwater Mussel

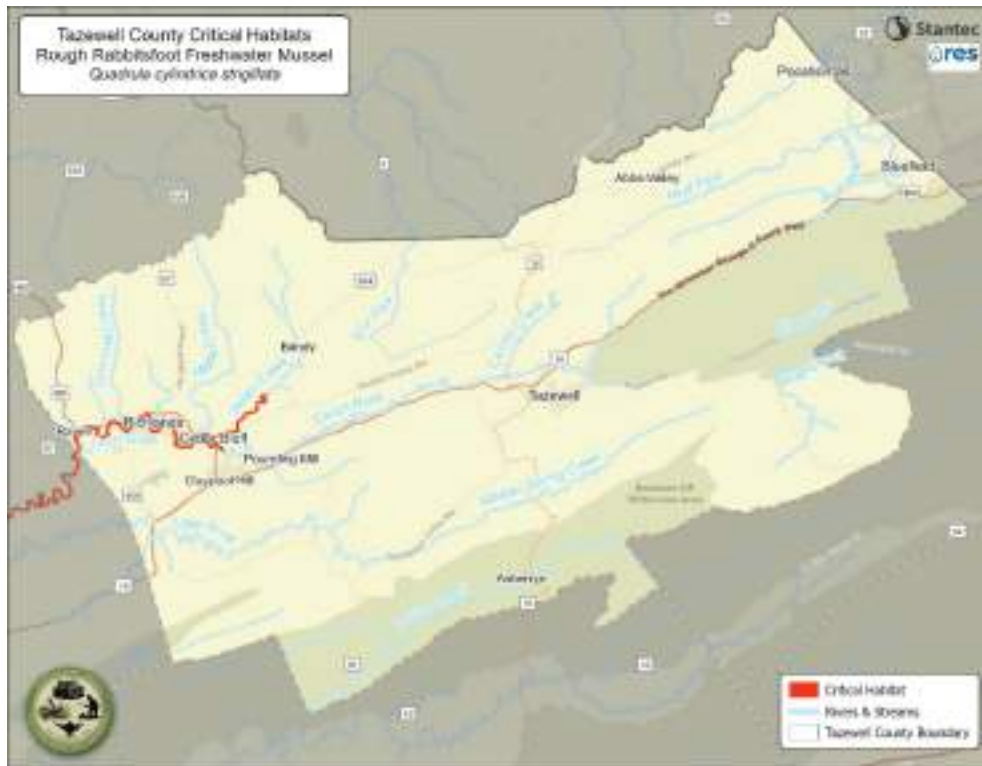


Figure 5-5 Tazewell County Critical Habitat – Rough Rabbitsfoot Freshwater Mussel

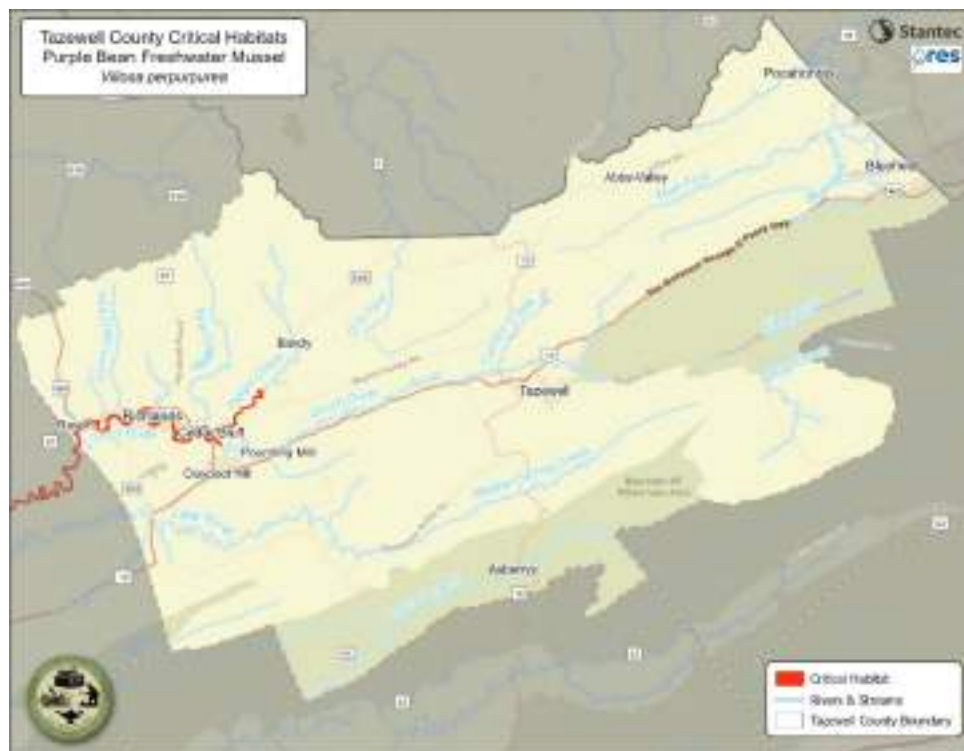


Figure 5-6 Tazewell County Critical Habitat – Purple Bean Freshwater Mussel

National Flood Insurance Program (NFIP)

Tazewell County has a total of 6 communities participating in the NFIP. As of March 30, 2023, the county has a total of 197 policies in place, with over \$36.5 million of insurance in force. The Town of Bluefield was the first community to join the regular NFIP, joining in 1978. The other 4 communities, along with the unincorporated areas of Tazewell County, joined in 1983. The communities within the county have reported 451 paid losses, totaling \$5.06 million.¹⁵ Table 5-3 below provides a breakdown of the NFIP in Tazewell County.

Table 5-3: NFIP in Tazewell County

NFIP Data for Tazewell County					
Community Name	Year of Entry	Policies in Force	Insurance in Force	Number of Paid Losses	Total Losses Paid
Town of Bluefield	1978	40	\$6,596,000	113	\$781,740
Town of Cedar Bluff	1983	19	\$2,494,000	13	\$61,027
Town of Pocahontas	1983	8	\$1,229,000	5	\$247,048
Town of Richlands	1983	46	\$8,074,200	147	\$1,346,278
Tazewell County (Unincorporated Areas)	1983	73	\$15,844,000	139	\$1,994,987
Town of Tazewell	1983	11	\$2,313,000	34	\$630,561
Totals:		197	\$36,550,200	451	\$5,061,642

The County does not currently participate in the Community Rating System (CRS) program, which is an incentive-based program that encourages counties and municipalities to undertake defined flood risk reduction activities that go beyond the minimum requirements of the NFIP. All CRS flood mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for improved CRS class ratings, which are tied to flood insurance premium reductions.

Emergency Communications

Tazewell County maintains a Reverse 911 emergency communications system. The system allows the County to send messages to residents during emergencies. The County has noted that the system is nearing replacement. The County would like to improve their capabilities with a more advanced system to allow for targeted communications and integration with sensors.

FEMA Hazard Mitigation Grant Program in Town of Bluefield

As a result of severe flood events in 2001 and as part of FEMA's Hazard Mitigation Grant program, the Town of Bluefield was awarded funds to buyout several houses along Walnut Street adjacent to Clinch River that had suffered frequent recurrent flooding and relocate the families. A local church is currently in the process of retrofitting the empty lots into recreation fields to serve the community.

¹⁵ FEMA Community Information System (CIS). Retrieved March 30, 2023.

US Army Corps of Engineers (USACE)

The northern portion of Tazewell County is included in the Huntington District while the southern end of the County is located within the Nashville District. Currently, the Nashville District USACE is preparing a Flood Plain Management Services technical services and planning study for the Richlands area of Tazewell County. The study will include the creation and updating of hydraulic modeling (Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic model) for the Clinch River to be used in the preliminary analysis of flood risk management measures for the Richlands area. Project deliverables will include a detailed report, presentation, models, data, and results. In addition, a FEMA Flood Insurance Study Update will include a submission to FEMA with updated modeling and results for FEMA FIRM and FIS mapping for the Clinch River throughout the Richlands area.

This concurrent effort provides a great opportunity for coordination and collaboration on proposed flood mitigation measures in the Richlands area. Ongoing meetings, exchange of information, and collaboration on proposed flood mitigation measures are planned with the Nashville USACE staff working on the ongoing project described above so that recommendations within this Tazewell County Flood Resilience Plan are coordinated.

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Introduction

A comprehensive understanding of flood risk throughout the county provides the foundation for sound decision-making in the context of flood risk reduction. Assessing risk and vulnerability is essential for identifying and prioritizing locations and projects for flood risk reduction. A risk assessment uses available data, both spatial and non-spatial, to analyze the risk posed to a community, including the people and assets within.

This section provides an assessment of flood-related hazards within Tazewell County, to include:

- A description of potential flood hazards, including natural and man-made contributors to current and future flood risk;
- A summary of previous flood occurrences and associated impacts;
- A qualitative assessment of potential flood impacts, including impacts to buildings and infrastructure, public health, life safety, and the economy;
- A quantitative analysis of structures considered at-risk to flood; and,
- Areas prioritized for risk reduction, based on the results of the assessment.

Description of Flood Hazards

Flooding is a frequent, dangerous, and costly hazard. In the US, flooding results in an average of 120 deaths and \$5 billion in damages annually.¹ Nearly 90% of all presidential disaster declarations result from natural events where flooding was a major component. Floods cause infrastructure damage (e.g., transportation, communication, water, and power systems), service outages, structural damage to buildings, crop loss, decreased land values, and impeded travel.

Flooding is the most common environmental hazard, due to the widespread geographical distribution of valleys and coastal areas, and the population density in these areas. The severity of a flooding event is typically determined by a combination of several major factors including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious cover. Flooding may occur when rainfall cannot drain or be absorbed fast enough (known as pluvial, or urban, flooding) or when rivers and streams exceed the capacity of their channels and water rises out of riverbanks onto surrounding lands. These types of flooding are described in depth below.

Rainfall-induced (Pluvial) Flooding and Extreme Precipitation

Rainfall-induced flooding, also called pluvial flooding, is usually caused by heavy rain over a short period of time. As land develops, or converts from fields or woodlands to roads, parking lots, and buildings, it loses its ability to absorb rainfall, increasing runoff two to six times the natural amount. Fixed drainage channels in developed areas may be unable to contain the runoff generated by relatively short, but intense, rainfall events. Since sidewalks and roads are non-absorbent, sheets of water flow down streets and into storm sewers. This high volume of water can turn parking lots into lakes, flood basements and businesses, and cause lakes to form in roads with poor or overwhelmed drainage.

¹ Flood Impact (n.d.). FEMA Preparedness Community. Retrieved from [Flood | Impact \(fema.gov\)](https://www.fema.gov/flood-impact).

Rainfall-induced flooding can also occur where floodplains have been developed. Development intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land, and occasionally, overwhelming sewer systems. Figure 61 depicts the types of rainfall-induced flooding.

In addition to development, shifts in the global climate are resulting in more frequent and more intense extreme precipitation events in certain locations, including Tazewell County, which contributes to increased flooding. Extreme precipitation events may overwhelm the design capacity of existing drainage systems and result in rainfall-induced flooding or flash flooding. Flash floods occur within a few minutes or hours of heavy amounts of rainfall and can destroy buildings, uproot trees, and scour out new drainage channels. Most flash flooding is caused by slow-moving thunderstorms, repeated thunderstorms in a local area, or by heavy rains from hurricanes, tropical storms, and their remnants. Flash flooding often occurs in mountainous areas and is also common in urban areas where much of the ground is covered by impervious surfaces. In addition to flash flooding, steep slopes that are oversaturated during extreme rainfall events may prompt slope failure, resulting in landslides, mudslides, and debris-flows.

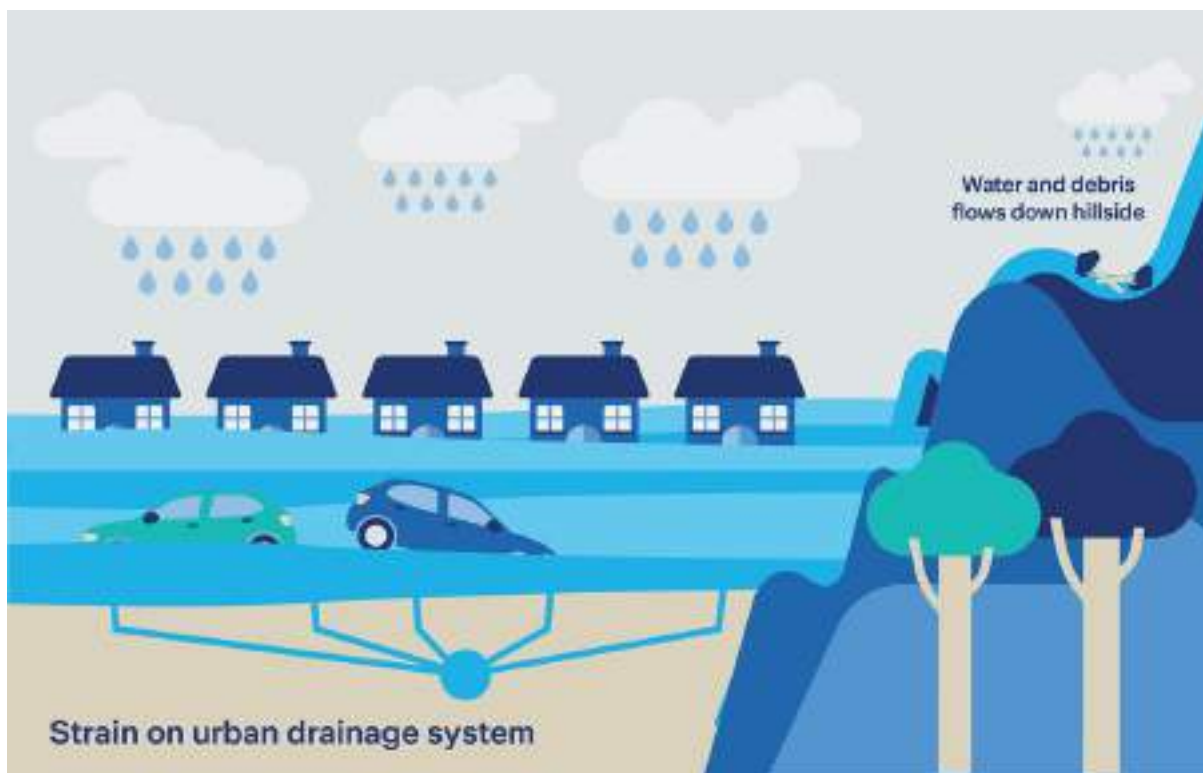


Figure 61: Rainfall-induced (Pluvial) Flooding²

² Zurich (2022). Three common types of flooding explained. Retrieved from [Three common types of flood explained | Zurich Insurance](#).

Riverine Flooding

Periodic flooding of lands adjacent to non-tidal rivers and streams (known as the floodplain) is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal waterway, some of the above-normal stream flows onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of a stream or river, as shown in Figure 62. According to USGS, the recurrence interval of a flood is defined as the probability of an event in any given year (e.g., 1% annual chance or 100-year floodplain). Higher recurrence intervals, or lower annual chances, mean larger, more wider-reaching floods.



Figure 62: Riverine Flooding³

Flooding is also governed by the size and the nature of the stream's watershed. A watershed is the geographic area of land where all runoff drains to a common point. Four major watersheds overlap Tazewell County: the Big Sandy, French Broad-Holston, Kanawha, and Upper Tennessee watersheds, shown in Figure 63. The major tributaries within Tazewell County that flow into each of these watersheds are outlined in Table 61.

³ Zurich (2022). Three common types of flooding explained. Retrieved from [Three common types of flood explained | Zurich Insurance](#).

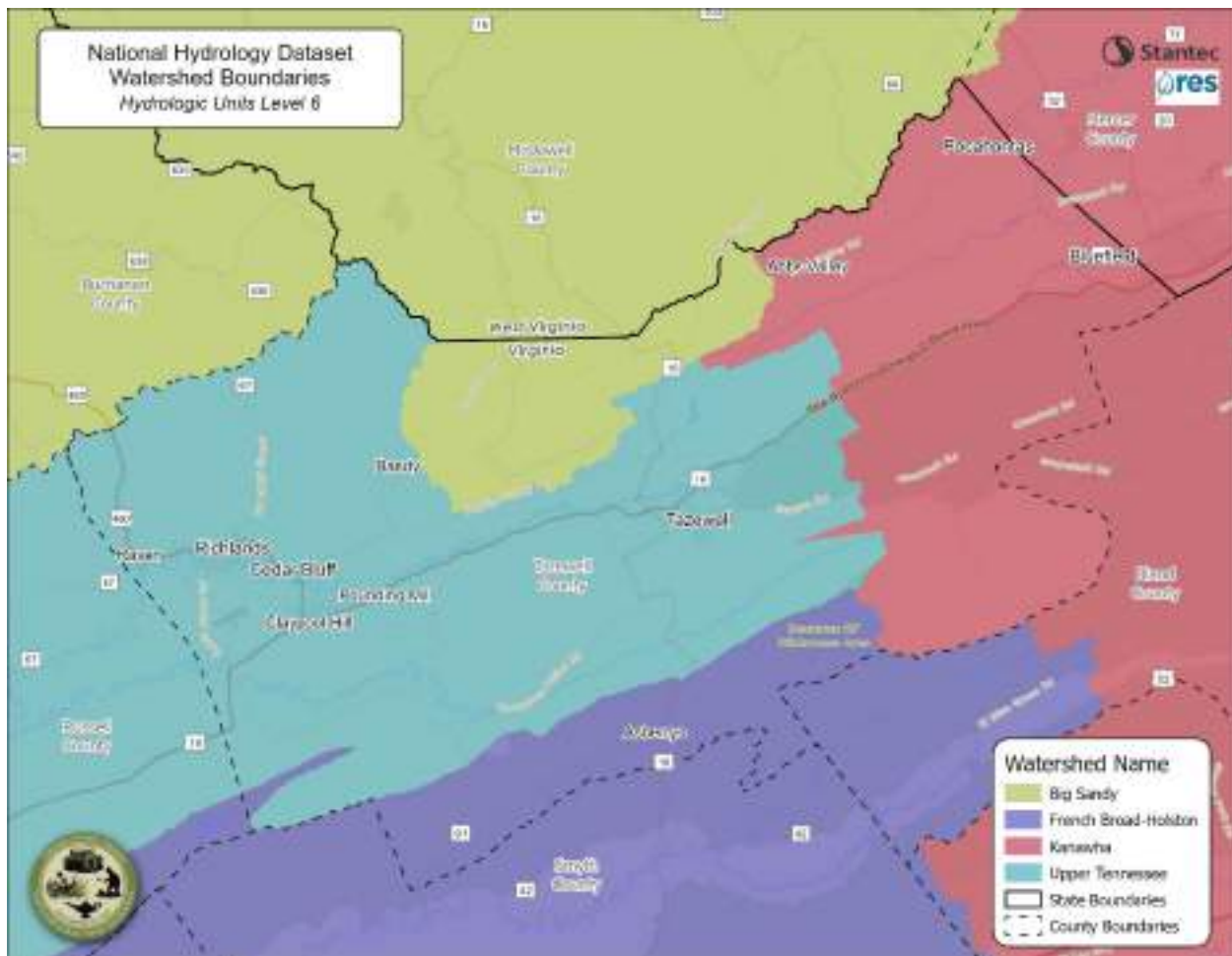


Figure 63: Tazewell County Major Watersheds

Table 61: Key Tributaries within Tazewell County

Major Watershed	Key Tributaries within Tazewell County
Big Sandy	Upper Dry Fork
French Broad - Holston	Laurel Creek
Kanawha	Bluestone River, Brush Fork, Burkes Garden Creek, Clear Fork, Laurel Fork, Mud Fork, Wolf Creek
Upper Tennessee	Cavitts Creek, Clinch River, Greasy Creek, Indian Creek, Liberty Creek, Little River, Maiden Spring Creek, Middle Creek, Pounding Mill Branch,

Floodplain Mapping

A floodplain is the land area susceptible to being inundated or flooded by water from any waterway (i.e., river, stream, lake, estuary). Floodplains are natural features of any river or stream. In many areas, FEMA has developed floodplain maps for streams that drain more than one square mile by conducting hydrologic (rainfall) and hydraulic (runoff) analysis of the watershed and stream. The mapped floodplain

areas are called the regulatory floodplain, which is also known as the 100-year floodplain, 1.0% annual chance floodplain, or the Special Flood Hazard Area. The 100-year floodplain is the land area that is subject to a 1.0% or greater chance of flooding in any given year. The term “100-year flood” is often misinterpreted. The 100-year flood does not mean that a flood will occur once every 100 years. A 100-year flood has a 1/100 (1.0%) chance of occurring in any given year. A 100-year flood could occur two times in the same year or two years in a row. It is also possible not to have a 100-year flood event over the course of 100 years or more.

The floodway, located within a floodplain, includes the main channel of the stream and adjacent land that must remain clear to convey the flood event. The floodway is the high velocity area and structures or obstructions in the floodway can increase flood heights. The floodway is regulated by the Virginia Department of Conservation and Recreation (DCR) and the county’s Flood Damage Prevention Ordinance. The flood fringe includes the remainder of the floodplain and provides flood water storage.

While the 100-year recurrence interval is most commonly used for floodplain management and regulatory purposes in the United States, the 500-year flood, also known as the 0.2% annual chance flood area, is the national standard for protecting critical facilities, such as hospitals and power plants. A 500-year flood has a 1/500 (0.2%) chance of occurring in any given year. It is generally deeper than a 100-year flood and covers a greater amount of area; however, it is less likely to occur in a given year.

FEMA offers flood insurance through the National Flood Insurance Program (NFIP). A Special Flood Hazard Area (SFHA) shown on a Flood Insurance Rate Map (FIRM) is the regulatory floodplain. FIRMs are produced by FEMA. SFHAs are delineated on the FIRMs and may be designated as Zones A, AE, AO, AH, AR V, VE, A-99. Structures located in the SFHA are highly susceptible to flooding. Structures located in the SFHA Zones are required by lenders to purchase flood insurance. Anyone in a community that participates in the NFIP, as Tazewell County does, may voluntarily purchase flood insurance. The following SFHA zones are present within Tazewell County:

- Zone A: Zone A is the flood insurance rate zone that corresponds to the 1.0% annual chance floodplains determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or depths are shown within this zone. Mandatory flood insurance purchase requirements apply for obtaining home loans.
- Zone AE: Zone AE is the flood insurance rate zone that corresponds to the 1.0% annual chance floodplains determined in the Flood Insurance Study by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply for obtaining home loans.

In addition to SFHA zones, Zone X is also present in Tazewell County. Zone X corresponds to areas outside of the 1.0% annual chance flood area, and it includes areas in the 0.2% annual chance flood boundary (500-year floodplain) and areas of minimal flood hazard.

Contributors to Flooding

Flooding can occur any time of year. The severity of flooding is determined by a combination of precipitation and weather patterns, topography and physiography, ground cover, and recent soil moisture conditions. Man-made structures and practices, such as flood control structures (i.e., dams and levees), development patterns, mining practices, and logging practices may also contribute to flooding. These natural and non-natural contributors to flooding are described throughout this section, within the context of Tazewell County.

Weather and Climate

Regional Weather Patterns

The amount of precipitation, and the frequency it occurs in a particular location is a large determinant in whether an area will experience flooding throughout the year. Precipitation quantity and frequency are governed by the weather (short-term conditions) and the climate (long-term weather trends) of that location. National and regional weather patterns are driven by large-scale forces. These include air masses, pressure systems, wind patterns, and ocean surface currents.⁴ As illustrated in Figure 64, Virginia is located in an area that is greatly influenced by interactions between dry, cool air from the north with moist, warm air from the south. This area of interaction, called the polar front, produces frontal systems that are most active in Virginia from the late fall through the middle of spring. Storms resulting from these interactions are typically slow-moving and produce moderate amounts of precipitation. This can result in flooding as rain continues over the same region for an extended period.

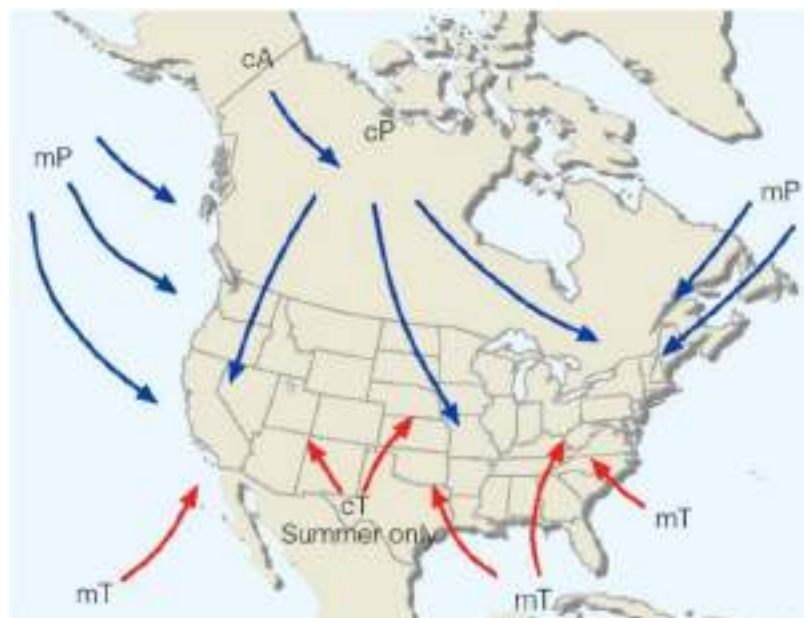


Figure 64: Air mass source regions affecting Virginia.⁵

Smaller, localized storms capable of producing more precipitation in a shorter amount of time influence the region from mid-spring through early fall but can occur at any time of the year. These storms often start as morning thunderstorms over the middle of the country and travel eastward, reaching southwest Virginia by late afternoon or evening. En route to the area, moisture is added to the storms from air flowing from the Gulf of Mexico. These storms often produce heavy rain, damaging winds, and hail.

Tazewell County is far enough inland that it is not impacted directly by hurricanes and tropical storms. However, remnants of tropical systems often pass through the area and have produced flooding in the

⁴ Science Education Resource Center. (2022). Climatology Basics. Carleton College. Retrieved April 14, 2023 from <https://serc.carleton.edu/eslabs/weather/3b.html>

⁵ Virginia Department of Conservation and Recreation. (2015). Probable Maximum Precipitation Study for Virginia. Retrieved April 8, 2023 from <https://www.dcr.virginia.gov/dam-safety-and-floodplains/document/pmp-final-report.pdf>

past, such as Hurricane Ivan in 2004 and Hurricane Laura in 2020. These storms occur from June to November, with August through October being the most active months.

Storm systems may not always act independently of each other. Frontal storms are commonly influenced by a tropical system. This commonly occurs when a frontal system, moving east into the area, is stalled by a tropical system moving north or northwest from the Gulf of Mexico or the Atlantic Ocean.⁶ This can produce an effect called training thunderstorms, where precipitation continues to form over the same area in a relatively short period of time, producing flash floods.⁷

Future Conditions

Although a location's climate is based on decades, or even centuries, of weather and atmospheric trends, it is not static. As a result of both natural and human-induced changes, the earth's climate is always evolving. Globally, increasing average annual temperatures have increased evaporation and led to higher amounts of water vapor in the air. This has led to increased precipitation in certain areas, including Virginia. Average annual precipitation in Virginia has increased at a rate of approximately 0.33 inches per decade over the last 120 years, as shown in Figure 65.

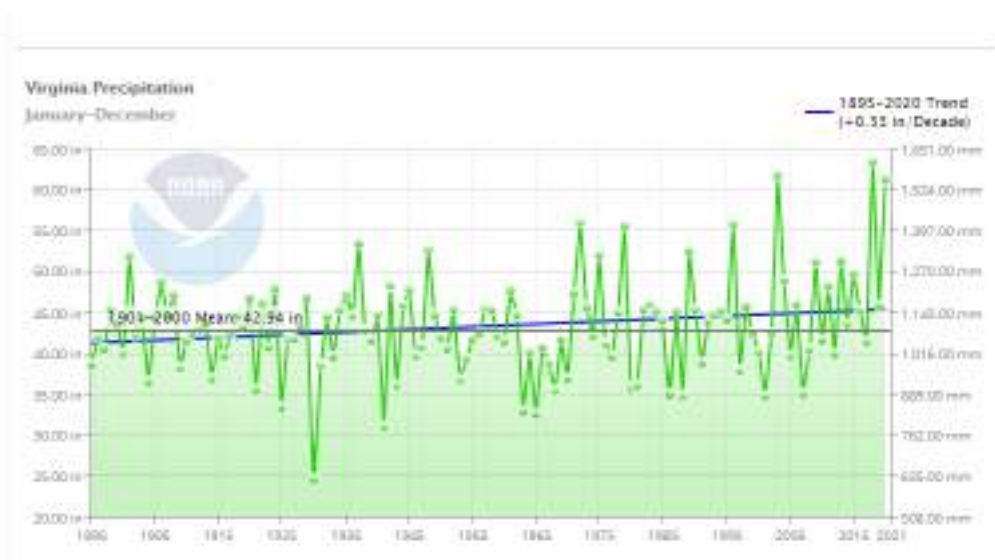


Figure 65: Virginia precipitation trend, 1895-2020.⁸

In addition to average annual rainfall, extreme precipitation events have become more frequent during the 21st century. Figure 66 illustrates observed changes in precipitation experienced over both long-term

⁶ Virginia Department of Conservation and Recreation. (2015). Probable Maximum Precipitation Study for Virginia. Retrieved November 8, 2022 from <https://www.dcr.virginia.gov/dam-safety-and-floodplains/document/pmp-final-report.pdf>

⁷ National Weather Service. (2009). Glossary. Retrieved November 11, 2022 from <https://w1.weather.gov/glossary/index.php?letter=t>

⁸ Voelsong, Sarah. (2021). Yes, Virginia, we are seeing more – and more intense – rainfall. Virginia Mercury. Retrieved April 4, 2023 from <https://www.virginiamercury.com/2021/08/20/yes-virginia-we-are-seeing-more-and-more-intense-rainfall/>

and short-term timeframes. The southeast has experienced an 18% increase in extreme precipitation events since 1901 and a 27% increase in events since 1958.⁹

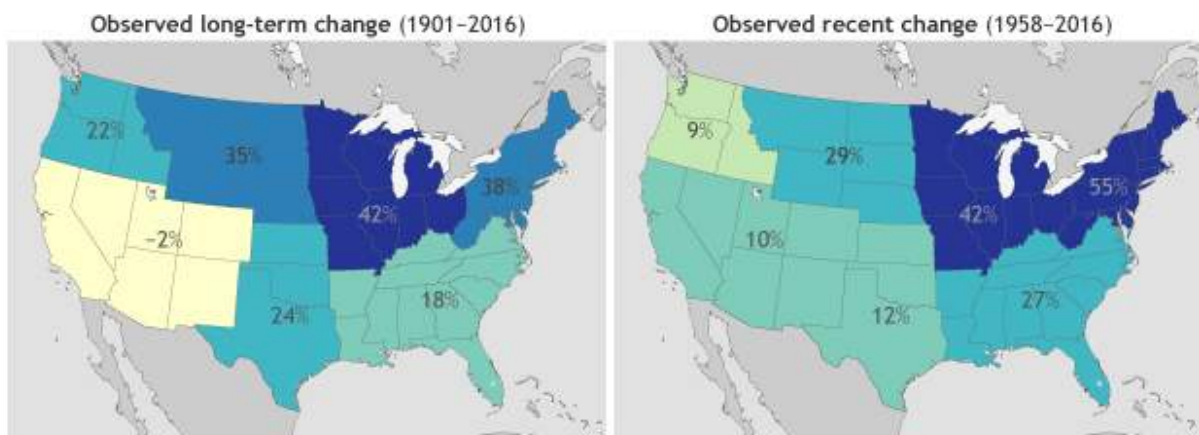
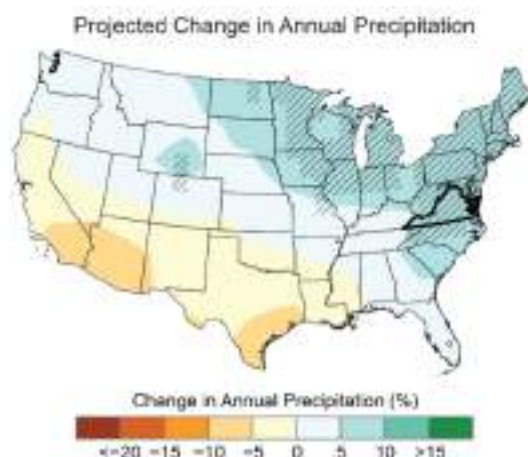


Figure 66: Change in extreme precipitation across the U.S.¹⁰

Observed increases in precipitation are expected to continue through the 21st century. Figure 67 shows projected changes in annual precipitation across the U.S. Virginia, assuming business-as-usual greenhouse gas emissions, is expected to see a 5% to 10% increase in precipitation by mid-century (2050) compared to the late 20th century.



⁹ Scott, Michon. (2019). Prepare for more downpours: Heavy rain has increased across most of the United States, and is likely to increase further. NOAA Climate.gov. Retrieved April 5, 2023 from <https://www.climate.gov/news-features/featured-images/prepare-more-downpours-heavy-rain-has-increased-across-most-united-0>

¹⁰ Easterling, D. R., Kunkel, K. E., & Arnold, J. R. (2017). Precipitation change in the United States. Retrieved April 5, 2023 from <https://doi.org/10.7930/J0H993CC>.

Figure 67: Projected changes in precipitation (%) for mid-century compared to the late 20th century (RCP8.5).^{11,12}

Precipitation projections, assuming business-as-usual greenhouse gas emissions, indicate that Tazewell County will receive an average of 48.3 inches of precipitation annually in the late 21st century. This is 3.1 more inches than the historic average (1976-2005). Further, Tazewell County is projected to experience 5.2 days per year with greater than 1 inch of precipitation by the late 21st century, which is an increase of 1.8 days from the historic average.¹³ This is paired with a projected decrease in the overall annual number of days with measurable precipitation, indicating that Tazewell County may experience increased flooding as a result of increased heavy rainfall events.

Projections for increased precipitation and heavier rainfall events align with results of joint research conducted by USACE and the Ohio River Basin Alliance. The study area of this research was the Ohio River Basin, which encompasses all of Tazewell County. The study area basin is shown in Figure 68.



Figure 68: USACE and Ohio River Basin Alliance Pilot Study - Study Area

This study saw the development of localized climate models used to predict mean annual streamflow in the early, mid-, and late 21st century for most of the Ohio River Basin. However, a localized climate model

¹¹ Projected changes are based on “business-as-usual” (RCP8.5) greenhouse gas emissions. Hatching represents areas where the majority of climate models indicate a statistically significant change.

¹² Runkle, J. et al. (n.d.). State Climate Summaries 2022 - Virginia. NOAA Technical Report NESDIS 150-VA. NOAA/NESDIS. Retrieved April 5, 2023, from <https://statesummaries.ncics.org/chapter/va/>

¹³ U.S. Global Change Research Program. (2022). Climate Mapping for Resilience and Adaptation Assessment Tool. Retrieved April 18, 2023 from <https://livingatlas.arcgis.com/assessment-tool/home>.

was not completed for the Tennessee River sub-basin (feeds into the Ohio River, outlined in red in Figure 68), which includes the south central portion of Tazewell County. However, the authors note that the results would be very similar to projections made for the Cumberland River sub-basin (noted in Figure 69) based on their adjacency. The study found that the southeastern portion of the Ohio River Basin is expected to experience some of the highest streamflow increases within the entire Ohio River Basin. The annual mean streamflow is expected to increase by 5-25% during the early and mid-21st century timeframes. By the late 21st century, the research indicates the annual mean streamflow in areas adjacent to Tazewell County will increase by 15-35%, shown in Figure 69.

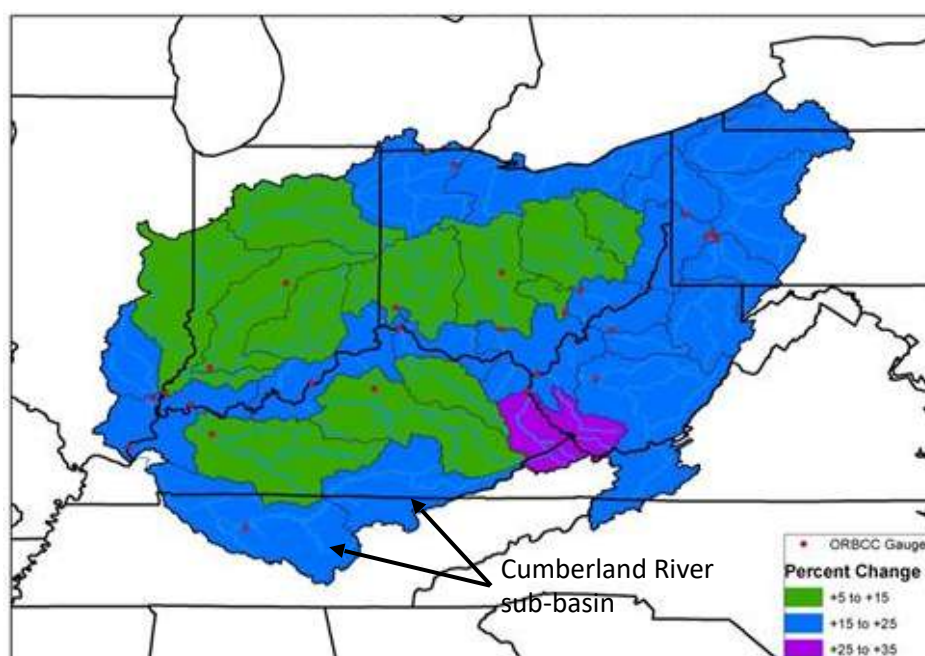


Figure 69: Forecasted annual mean percent change in streamflow (2071-2099)¹⁴

Topography

Weather systems are influenced by the terrain of the earth. Terrain at a higher elevation, like Tazewell County, has more influence on weather systems. Additionally, an area's terrain, or topography, influences the direction and speed of rainfall runoff as it travels over land and through stream channels. Orographic precipitation, shown below in Figure 610, is a phenomenon where warm, moisture-filled air is forced upwards by physical terrain features such as hills or mountains. As a result, the moist air cools rapidly and water vapor condenses and forms precipitation, which is released on the windward side of the mountain. This creates a scenario where the leeward side of the mountain is in a rain shadow region and receives significantly less precipitation than the windward side.

¹⁴ Drum, R., Noel, J., Kovatch, J., Yeghiazarian, L., Stone, H., Stark, J., & Raff, D. (2017). Ohio River Basin—Formulating Climate Change Mitigation/Adaptation Strategies through Regional Collaboration with the ORB Alliance. Retrieved April 10, 2023 from [Ohio River Basin - Formulating Climate Change Mitigation/Adaption Strategies \(army.mil\)](https://www.army.mil/ohio-river-basin-formulating-climate-change-mitigation-adaption-strategies).

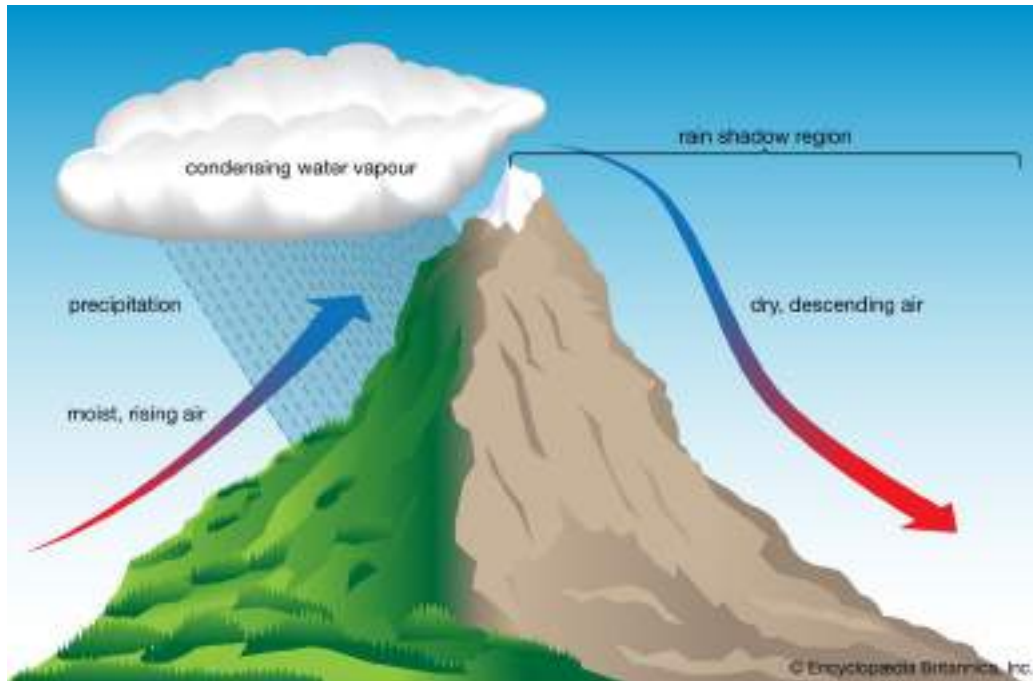


Figure 610: Orographic precipitation¹⁵

Regionally, rain shadows are evident just east and northeast of Tazewell County, in the New River Valley and the Shenandoah Valley, shown as the lighter green areas in Figure 611. These areas receive some of the lowest amounts of precipitation throughout the state. Within Tazewell County, the high ridges that travel through the center and along the southeastern border of the county may cause large amounts of precipitation to be rapidly released over these areas of the county. These areas are notably higher than the rest of the county and heavy precipitation in these areas could result in flooding at lower elevations elsewhere in the county.

¹⁵ Encyclopedia Britannica. (n.d.) Orographic Lift. Retrieved April 15, 2023 from <https://www.britannica.com/science/orographic-precipitation#/media/1/433062/140263>

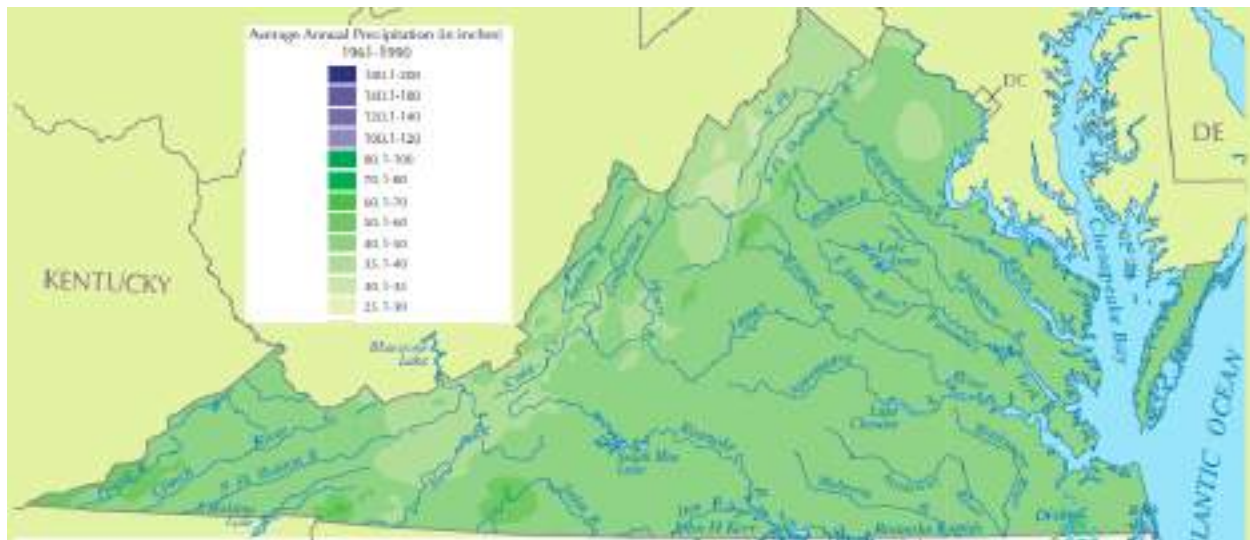


Figure 611: Average Annual Precipitation 1961-1990.¹⁶

Aside from producing orographic precipitation, the high mountain ridges throughout the county influence how weather systems travel through the area on a local scale. The ridges may restrict and slow air currents as they travel across the county.¹⁷ This may produce localized heavy rainfall events as a result of a stalled storm or front.

As mentioned above, the terrain of Tazewell County also influences the direction and speed of precipitation runoff. The steep mountains and deep valleys allow runoff to travel rapidly from high ridges to the low-lying streams and rivers. Furthermore, the steep terrain results in water moving at high velocity through tributaries. The combination of high speed and large volumes of water can result in destructive flooding along almost any of the county's waterways during a heavy rainfall event.

Man-made Influences

In addition to the natural influences described above, man-made structures and practices have the potential to increase the likelihood and/or severity of flood events. Development, which increases the amount of impervious cover, such as roads and buildings, within a watershed, can exacerbate rain-fall-induced flooding. Additionally, man-made structures within waterways, such as bridges, may restrict flows. Similarly, stored property within the floodplain, and especially the floodway, such as cars, trailers, equipment, and outbuildings, may also restrict flows when they are carried into the stream during flood events. Further, in Tazewell County, flood control structures such as dams may impact flooding, and decades of mining in parts of the county have contributed to flood risk. Mining increases flood risk in a number of ways, including increased decreased vegetation, increased sediment in waterways, alterations to the topography, and increased impervious surface. These influences are described further below.

¹⁶ Virginiaplaces.org. (n.d.) Rain Shadows – The Orographic Effect. Retrieved March 11, 2023 from <http://www.virginiaplaces.org/geology/rainshadow.html>

¹⁷ Carpenter, Michael. (2018). How Do Mountains Affect Precipitation? Sciencing by Leaf Group Ltd. Retrieved March 11, 2023 from <https://sciencing.com/do-mountains-affect-precipitation-8691099.html>

Dams and Dam Failure

A dam is an artificial barrier constructed across a stream channel or a man-made basin for the purpose of storing, controlling or diverting water. Dams typically are constructed of earth, rock, concrete or mine tailings. The area directly behind the dam where water is impounded or stored is referred to as a reservoir. Dams provide a number of vital functions to nearby communities. Often, they are a source of hydroelectric power, drinking water, flood control, and/or provide a recreational area to residents.

A dam failure is the partial or total collapse, breach or other failure of a dam that causes flooding downstream. Dam failures can result from natural events such as floods, earthquakes or landslides, human-induced events such as improper maintenance, or a combination of both. In the event of a dam failure, the people, property, and infrastructure downstream could be subject to devastating damage.

Although there is no history of dam failure in Tazewell County, a dam failure occurred in neighboring Bland County in 1957, causing over \$6 million dollars' worth of damage in the Town of Bland.¹⁸

Dam failures can result from one or more of the following:

- Prolonged periods of rainfall and flooding (the cause of most failures);
- Inadequate spillway capacity resulting in excess flow overtopping the dam;
- Internal erosion caused by embankment or foundation leakage;
- Improper maintenance (including failure to remove trees, repair internal seepage problems, maintain gates, valves, and other operational components, etc.);
- Improper design (including use of improper construction materials and practices);
- Negligent operation (including failure to remove or open gates or valves during high flow periods);
- Failure of an upstream dam on the same waterway;
- Landslides into reservoirs which cause surges that result in overtopping of the dam;
- High winds which can cause significant wave action and result in substantial erosion; and
- Earthquakes which can cause longitudinal cracks at the tops of embankments that can weaken entire structures.

The U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID) lists five dams within Tazewell County, and 11 dams within 10 miles of the county. These dams are listed in Table 64; Figure 612 provides a map of their locations.

Table 64 and Figure 612 both include the hazard potential and the condition assessment for these 16 dams. These are two rating systems tracked in the NID. USACE classifies a dam's hazard potential based on the potential of a dam to affect the safety and health of citizens and property, should the dam fail. This is separate from the condition of the dam, and only assesses the potential consequences of a dam failure. The four hazard potential ratings are outlined in Table 62.

¹⁸ Bland Messenger. (2017) Remembering the flood of '57. Retrieved on March 8, 2023 from [Bland County Historical Society \(blandcountyhistsoc.org\)](https://www.blandcountyhistsoc.org/)

Table 62: USACE Hazard Potential Ratings

Hazard Potential Rating	Description of Hazard Potential
High hazard potential	Failure will probably cause loss of human life.
Significant hazard potential	Failure will result in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can affect other concerns.
Low hazard potential	Failure will result in no probable loss of human life and low economic and/or environmental losses.
Undetermined hazard potential	The hazard potential for this dam has not been evaluated. The dam's hazard potential will be considered the same as a low hazard potential dam.

The hazard potential for all the dams in and adjacent to Tazewell County is listed as either high or undetermined. See Table 64 for the hazard rating of each dam.

USACE began providing a condition assessment of high-hazard potential dams in 2009. This rating is used to provide a rating of the steel and concrete components of a dam. The five condition ratings are outlined in Table 63.

Table 63: USACE Condition Assessment Ratings

Condition Assessment Rating	Rating Description
Satisfactory	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions.
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency.
Poor	A dam safety deficiency is recognized for loading conditions which may realistically occur. This rating is also used when there are uncertainties in critical analysis parameters. Remedial action or further investigations are necessary.
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.
Not Rated	The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

None of the dams within Tazewell County received a poor or unsatisfactory condition rating. However, according to the Associated Press the Falls Mills Dam was rated as poor as recently as 2018.¹⁹ When looking at current data, the Falls Mills Dam received a fair condition assessment and the other four dams in Tazewell County received a satisfactory condition rating or were not rated. See Table 64 for the current condition assessment ratings of all the dams in or in close proximity to Tazewell County.

Of the 16 dams in or within 10 miles of Tazewell County, only two (Amonate Slurry Impoundment and Harmon Branch Refuse Disposal Facility) are not listed as state regulated dams. Both dams are in McDowell County, WV and associated with a mining operation. Furthermore, none of the dams within 10 miles of Tazewell County (but outside of the county) present a flooding risk to residents of Tazewell County. The two dams (Bluewell Water Supply Dam No. 1 and No. 2) in Table 64 that received a Poor rating in their condition assessment do not pose a threat to Tazewell County; these dams are located downstream of Tazewell County.

It should be noted that projected increases in future streamflows within the county could produce more strain on dams in the area, increasing the likelihood of dam failure in the future.

¹⁹ Lieb, David; Casey, Michael; and Minkoff, Michelle. (2019). At least 1,680 dams across the US pose potential risk. Retrieved on March 10, 2023 from [AP: At least 1,680 dams across the US pose potential risk | AP News](https://www.apnews.com/article/at-least-1680-dams-across-the-us-are-at-risk-of-failure/1b1b1b1b-1b1b-1b1b-1b1b-1b1b1b1b1b1b)

Table 64: Dams in and adjacent to Tazewell County.²⁰

Name	River	Hazard Potential	Condition Assessment
Amonate Slurry Impoundment	Not Provided	High	Not Available
Anawalt Lake Dam	Millseat Branch	High	Satisfactory
Berwind Lake (War Creek #1)	War Creek	High	Satisfactory
Bluewell Water Supply Dam No.1	Stone Lick Branch	High	Poor
Bluewell Water Supply Dam No.2	Stone Lick Branch	High	Poor
Falls Mill Dam	Mud Fork	High	Fair
Harmon Branch Refuse Disposal Facility	Not Provided	High	Not Available
Hunting Camp Dam (Pocahontas Fuel Lake)	Hunting Camp Creek	Undetermined	Fair
Jimmy Lewis Dam (Pinnacle Rock Dam)	Bluestone River	High	Satisfactory
Kenneth Tibbs Dam	Not Provided	Undetermined	Not Rated
Laurel Bed Dam	Laurel Bed Creek	High	Fair
Mocomp Dam #1	Not Provided	Undetermined	Not Rated
New Bramwell Dam	Bluestone River	High	Poor
Sportsman Club Dam	Little Creek	Undetermined	Not Rated
Upper Clinch River Dam #8 (Lincolnshire Dam)	Lincolnshire Branch	High	Satisfactory
Upper Clinch Valley Dam #1B (Cavitt's Creek Dam)	Cavitts Creek	High	Satisfactory

²⁰ U.S. Army Corps of Engineers. (2020). National Inventory of Dams. Retrieved March 27, 2023 from <https://nid.usace.army.mil/#/>

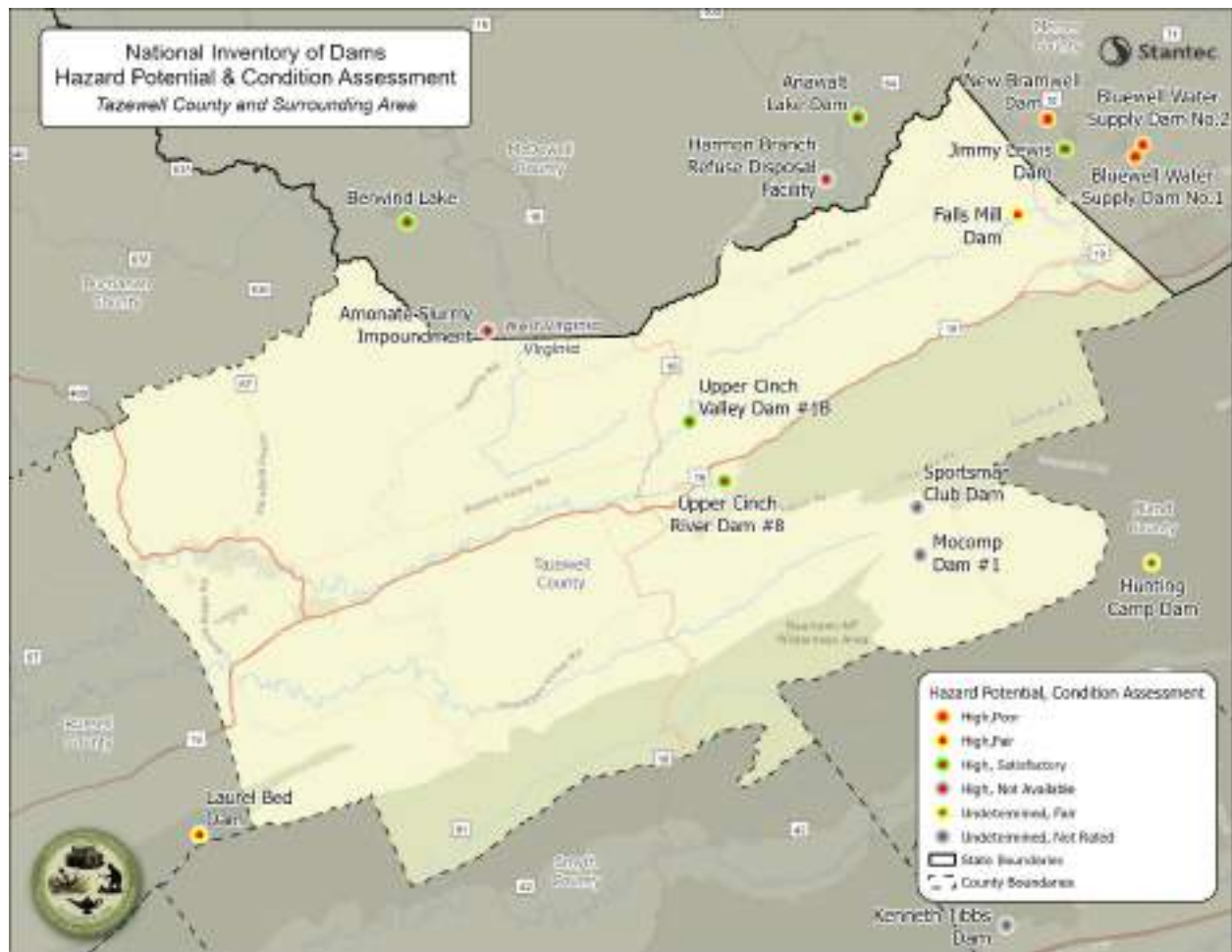


Figure 612: NID dams in and around Tazewell County.²¹

²¹ U.S. Army Corps of Engineers. (2020). National Inventory of Dams. Retrieved March 27, 2023 from <https://nid.usace.army.mil/#/>

Dam inundation areas were produced for the Upper Clinch Valley Dam #1B (Cavitt's Creek Dam) and the Upper Clinch River Dam #8 (Lincolnshire Dam) to meet the requirements of the Virginia Soil and Water Conservation Board. The inundation mapping was completed based on the probable maximum flood for each dam, based on estimated probable maximum precipitation events. In effect, the dam inundation studies show the impact a dam failure would have on communities downstream if a dam were to fail. The exact area and inundation caused by a dam failure would depend on the location (on the dam) of the dam breach and the flooding conditions that led to the dam failure. However, the dam inundation studies provide valuable insights into which areas and properties could be affected by a dam failure.

Figure 613 shows the dam inundation area for the Upper Clinch Valley Dam #1B (Cavitt's Creek Dam). Based on the dam's Emergency Action Plan, which accounts for the elevation of each building, 320 structures are at risk to flooding in the event of a dam failure at the Upper Clinch Valley Dam #1B (Cavitt's Creek Dam).

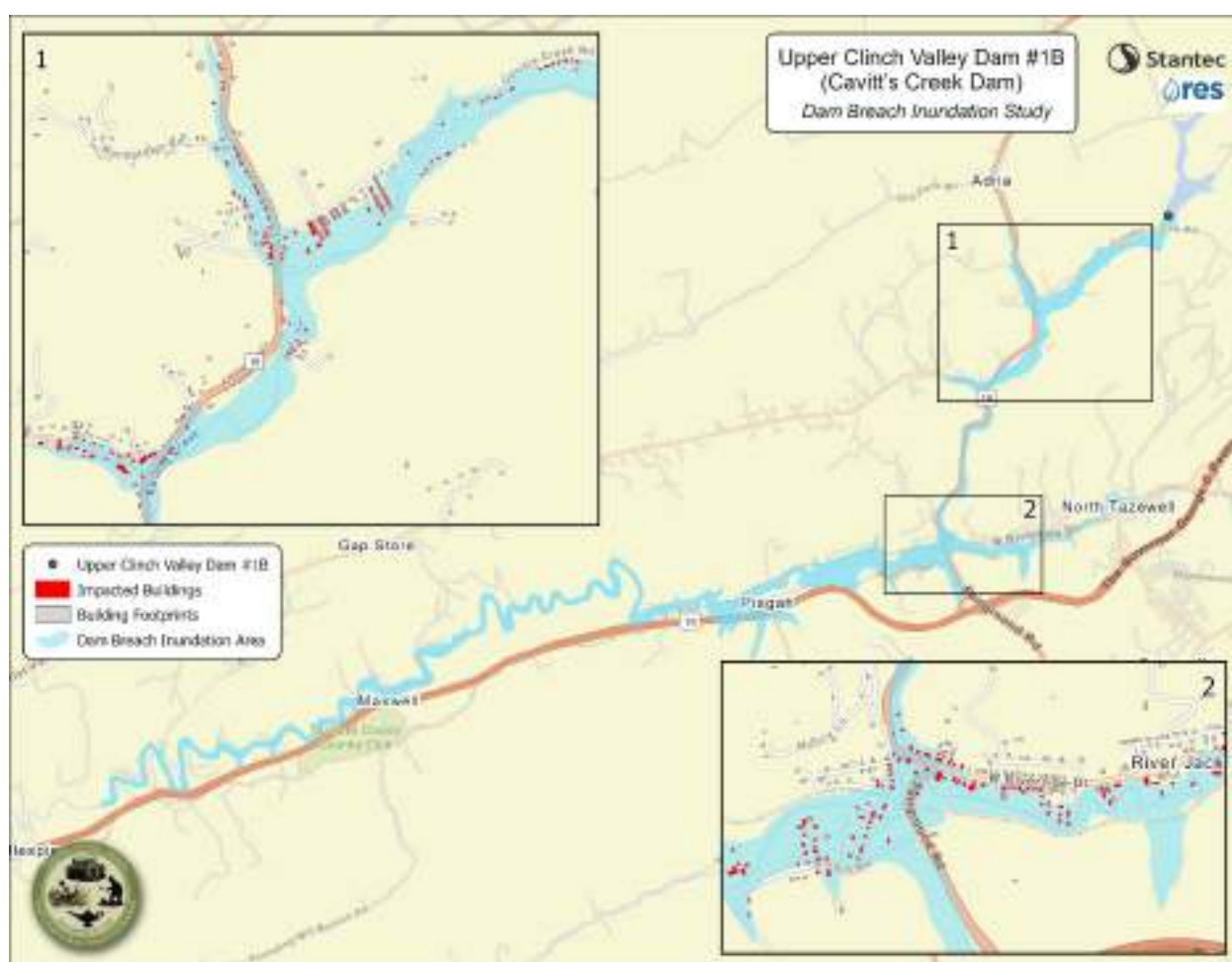


Figure 613: Dam Inundation Area for the Upper Clinch Valley Dam #1B (Cavitt's Creek Dam)

Similar to dams, levees impact the location and severity of flooding within a watershed. A levee is a man-made structure used to contain, control, or divert water to reduce flood risk. Although levees are designed to reduce flood risk, they do not eliminate the risk entirely. Levees may be overtopped or fail if a flood event exceeds the severity of its design standard (the amount of water the levee is designed to

hold). However, based on information available through the National Levee Database (NLD), there are no levees present in Tazewell County.²²

Debris and Waterway Blockages

Often during a flooding event, debris being carried by floodwaters can become stuck at a chokepoint in a waterway. Personal property located or stored within the floodplain, especially within the floodway, can contribute to this problem. Cars, tractors, outbuildings (such as sheds), mobile homes, and other items stored in flood hazard areas can be picked up during floods and jam up waterways, especially at bridges and narrow areas, to exacerbate flooding. After a flood event, this type of debris may also result in hazardous materials being released into floodwaters, potentially impacting public health and the environment. Similarly, this type of debris is more difficult to clean up and dispose of after a flood event, as it must be taken to facilities equipped to handle potentially hazardous materials.

Natural debris, such as woody vegetation and sediment from erosion, can also restrict the natural capacity of the stream (e.g., sediment building up on the streambed) and contribute to flooding. Natural debris left by a flooding in Richlands flowing a 2020 event is shown in Figure 614. When not cleared, especially after a flood event where areas pile up with debris, a hazard is created as the stream is essentially dammed and increases the likelihood that a rainfall event will become a major flood event.



Figure 614: Flood Debris from February 2020 flooding in Richlands, VA²³

During the public meetings held in Tazewell County during the development of this plan, debris from logging was brought up several times as an issue residents believe has increased the frequency and/or severity of flooding. Logging can increase the amount of natural debris found in nearby streams and

²² USACE. (2019). National Levee Database. Retrieved from [National Levee Database \(army.mil\)](https://www.army.mil/nld/).

²³ Eric DiNovo. (2020). Photo included in news article published by Bluefield Daily Telegraph. Retrieved on March 8, 2023 from [Richlands denied FEMA assistance for flood damages | News | bdtonline.com](https://www.bdtonline.com/news/richlands-denied-fema-assistance-for-flood-damages/)

rivers. Discarded logs and brush wash into waterways and logging also increases erosion in a number of ways. The large equipment disturbs the ground surface but, more importantly, the removal of tree canopies and ground cover increase the soils' exposure to direct rainfall. Stormwater flows rapidly across the surface and there are no longer root systems to hold the soil in place, increasing erosion that eventually makes its way into streams.

Forests provide many benefits to the surrounding ecosystem, especially forested land along streams and rivers. In any setting, trees and their root systems filter water and air pollution, produce oxygen, and provide habitat for many species of wildlife. Along waterways, forests can reduce flooding by stabilizing and protecting stream channels, reducing sediment load within the waterway, and by capturing and slowing the flow of precipitation during rain events.²⁴

Mining Impacts and Clogged Streams

Coal has been mined commercially in Tazewell County since the 1880's and has provided jobs and income in the area for over a century. All of the coal beds in Tazewell County are located along the western edge of the county, along the shared borders with Russell County (VA), Buchanan County (VA), McDowell County (WV), and Mercer County (WV). The coal beds are shown below in Figure 615. The most economically important coal deposits are mostly located in the Pocahontas Formation, located in the northern corner of Tazewell County.

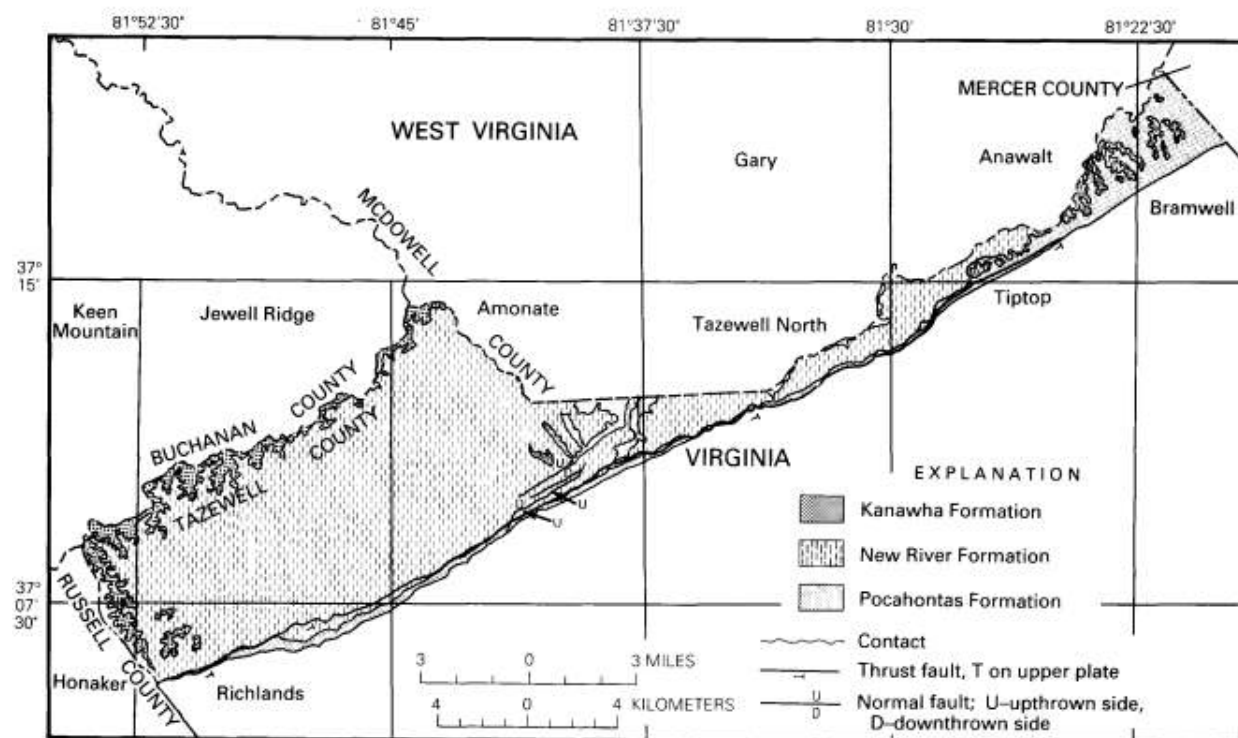


Figure 615: Map of Tazewell County Coal Fields²⁵

²⁴ Virginia Department of Forestry. (2013). Riparian Forest Buffers – Forests on the Water's Edge. Retrieved April 15, 2023 from [RFB-Forests-on-the-Waters-Edge_pub.pdf \(virginia.gov\)](#).

²⁵ Englund, K. J., & Thomas, R. E. (1991). Coal Resources of Tazewell County, Virginia, 1980. USGS. Retrieved March 22, 2023 from [report.pdf \(usgs.gov\)](#)

The Town of Pocahontas is also home to the Pocahontas Exhibition Mine and Museum, a museum and mining exhibit, shown in Figure 616. The facility is owned and operated by the Town of Pocahontas, in partnership with Virginia Department of Energy (VA Energy). The original mine, in operation from 1882-1955, was renowned for its high-quality coal and was the chosen coal source for the U.S. Navy for decades.



Figure 616: Pocahontas Exhibition Mine & Museum

In total, over 322 million tons of coal had been extracted from Tazewell County by 1980.²⁶ Most of the mining in the past was from extensive underground mines. However, in the mid to late 20th century, strip (surface) mining methods were introduced, and are now the only mines operating in the county. As of 2021, Tazewell County was the third highest coal producing county in Virginia, behind Buchanan and Dickenson Counties.²⁷ There are four surface mines operating in Tazewell County based on the latest available data.²⁸ Existing coal mining operations and the Pocahontas Exhibition Mine and Museum are shown in Figure 617.

²⁶ Englund, K. J., & Thomas, R. E. (1991). Coal Resources of Tazewell County, Virginia, 1980. USGS. Retrieved March 22, 2023 from [report.pdf \(usgs.gov\)](https://www.usgs.gov/media/report/coal-resources-tazewell-county-virginia-1980)

²⁷ US Energy Information Administration. (2021). Coal Production and Number of Mines by State, County, and Mine Type, 2021. Retrieved March 20 2023 from [table2.pdf \(eia.gov\)](https://www.eia.gov/data/coal/production/production.php)

²⁸ The US Energy Information Administration releases an Annual Coal Report. The latest report was released on October 18, 2022. The next report will be released in October 2023.

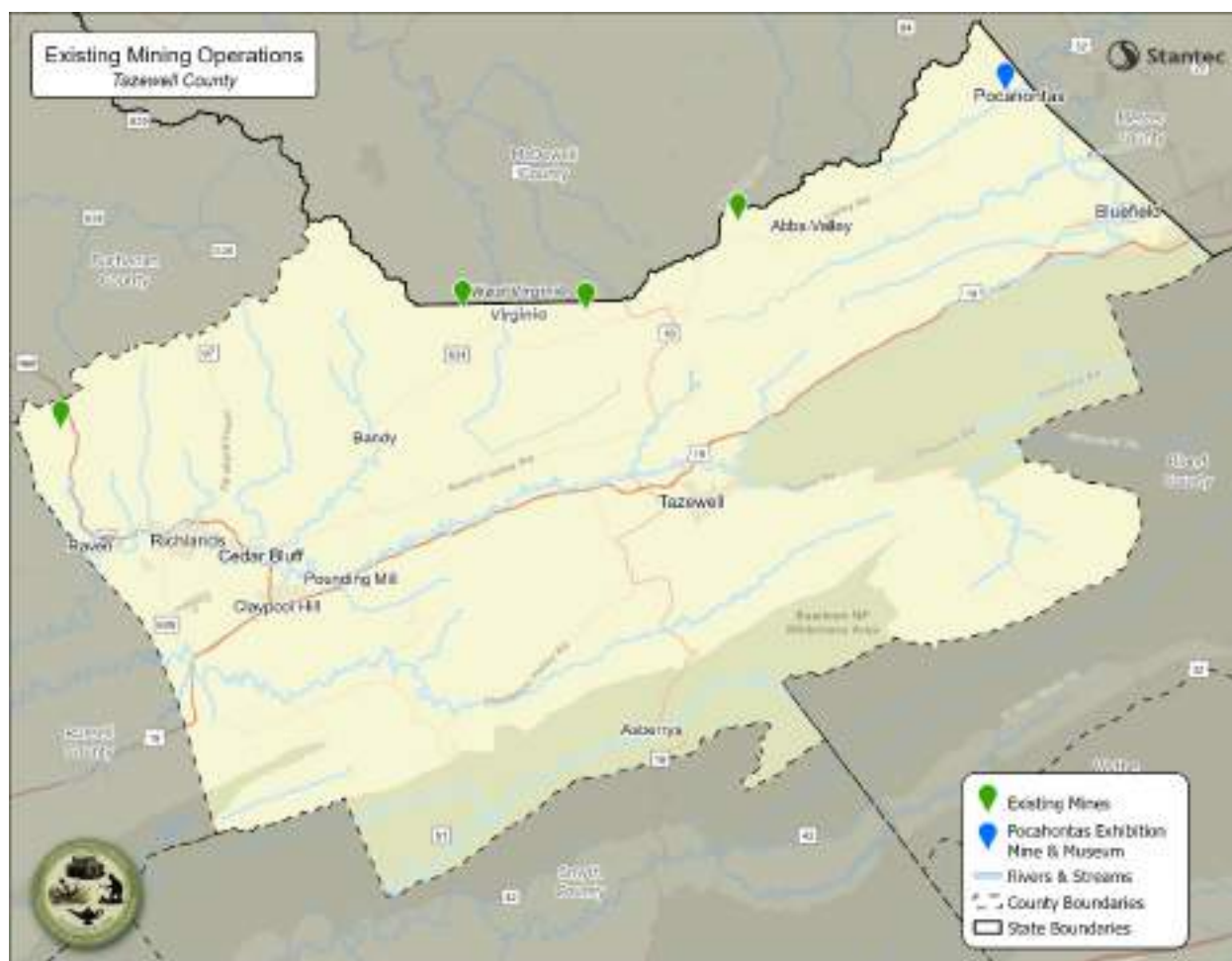


Figure 617: Existing Mining Operations in Tazewell County

The mining industry was unregulated at the federal level until 1977 and largely unregulated at a state level until 1968. Some methods and practices used in the mining industry prior to regulation resulted in unforeseen impacts on the environment and public health and safety. Some of the potential environmental impacts from mining include stream sedimentation, acid draining from tailings and waste piles, groundwater degradation, trash dumps, and landslides. Some of the potential public health and safety impacts from mining include fall hazards from highwalls, shafts and other mine openings, the unauthorized and unsupervised use of mine sites as recreational areas, and loss or degradation of drinking water.²⁹ In addition to environmental and public health and safety impacts, mining can also directly impact the severity of flooding in Tazewell County. The broad removal of vegetation in a mining area eliminates a natural buffer which normally slows runoff. Furthermore, the soil that has been removed eliminates more of this natural buffer. The end result is that precipitation flows into the local waterways much quicker and in higher volumes, picking up sediment and debris along the way.

The mining process produces waste material, or gob, as the coal is separated from the rest of the soil. In the past, and possibly more recently, gob piles have been dumped in the valleys, or hollows, in the

²⁹ Virginia Department of Energy. (2021). Abandoned Mineral Mined Lands. Retrieved March 14, 2023 from <https://energy.virginia.gov/mineral-mining/AMML.shtml>.

western portion of the county. These piles can create an impediment for runoff in the valleys and often leads to clogged streams. Data available from the VA Energy shows where confirmed gob piles and clogged streams are located, however it's likely there are more gob piles and clogged streams in the western portion of the county that have not been mapped. Figure 618 shows locations of mapped gob piles and clogged streams in the county.

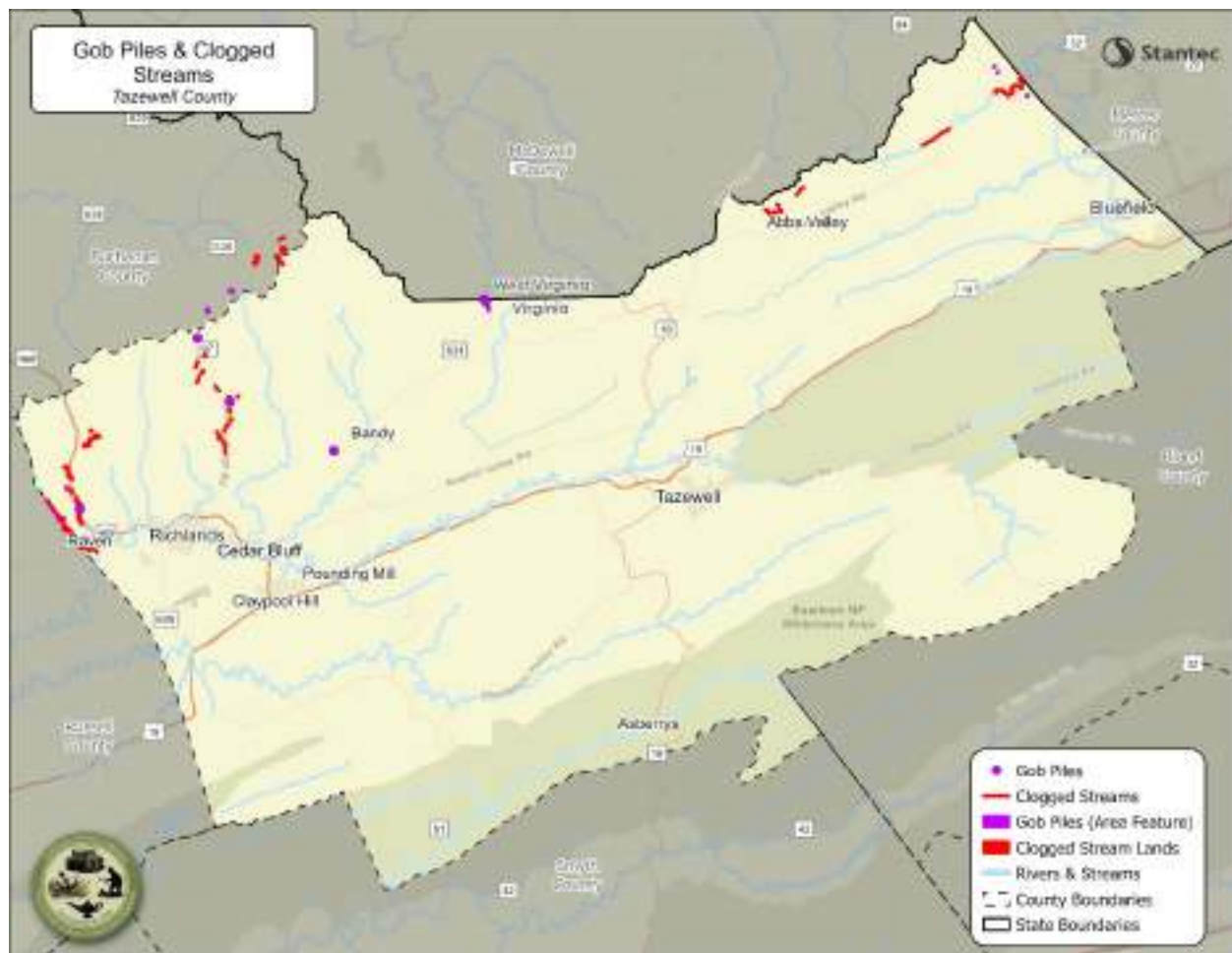


Figure 618: Tazewell County Gob Piles and Clogged Streams³⁰

Abandoned mines also create a potential flooding hazard after they fill with water or have standing water. The pressure produced by this water can cause a mine blowout, sending water rushing out of the underground cavern and down the mountain. Many abandoned mines, especially those that have been mapped, have mechanisms in place to allow water to drain as the mine fills with water; however, these mechanisms may become clogged with sediment and debris when not maintained properly, contributing to the likelihood of a blowout.

Figure 619 provides a map of various mine openings (any opening or entrance from the surface into an abandoned, underground mine) identified by VA Energy. These openings allow precipitation and runoff to enter underground mines, potentially leading to a mine blowout. It is likely that there are more mine

³⁰ Virginia Department of Energy (VA Energy). (n.d.) Abandoned Mine Land. Retrieved on April 2, 2023 from [Abandoned Mine Land \(virginia.gov\)](https://www.virginia.gov/energy/abandoned-mine-land/)

openings and portals in the western portion of the county that have not been mapped. It is worth noting that mine blowouts have not been brought up as a significant issue during meetings with the Planning Team or the public, but that does not mean they do not occur or are not possible in the county.

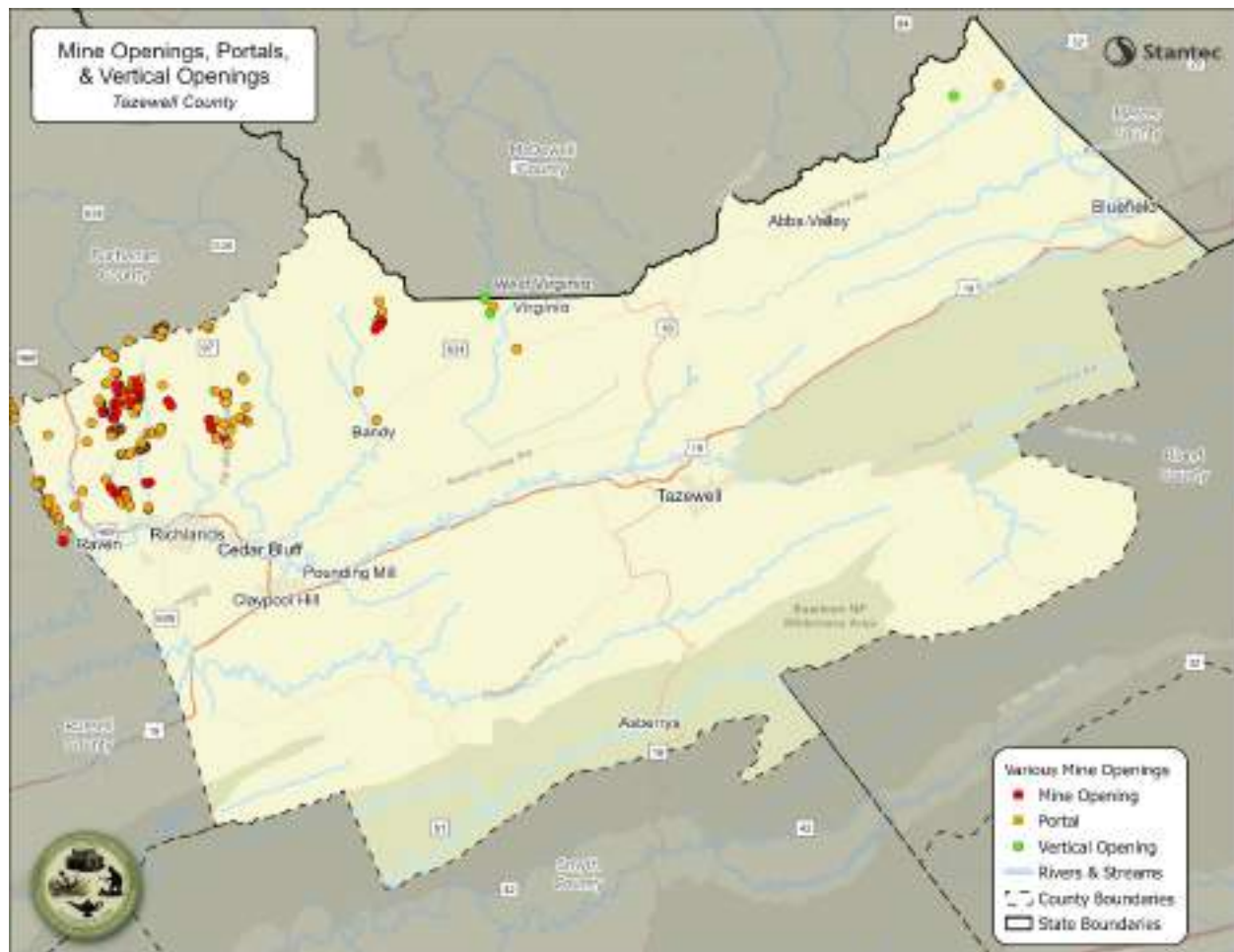


Figure 619: Mine Openings In and Adjacent to Tazewell County³¹

More recent legislation at the state and federal level has been passed in an effort to reduce these impacts through reclamation and revitalization practices. Reclamation laws enacted by the Virginia General Assembly in the 1960s and 1970s were put in place to minimize the impacts of past mining practices on the environment and public health and safety. In the 1970s, the Abandoned Mine Land (AML) Program was established to reclaim sites that were mined prior to December 15, 1981.³² VA Energy also has the Mined Land Repurposing program which applies annually for federal money to reclaim high priority AML sites. The federal program is the Abandoned Mine Land Economic Revitalization Program and has provided Virginia \$10 million every year since 2017 to develop and repurpose abandoned mines.

³¹ Virginia Department of Energy (VA Energy). (n.d.) Abandoned Mine Land. Retrieved on April 2, 2023 from [Abandoned Mine Land \(virginia.gov\)](https://energy.virginia.gov/coal/abandoned-mine-land/)

³² Virginia Department of Energy. (2021). Abandoned Mine Land. Retrieved March 14, 2023 from <https://energy.virginia.gov/coal/mined-land-repurposing/abandoned-mine-land.shtml>.

The federal government also recently approved further legislation to help fund AML revitalization projects. The Infrastructure Investment and Jobs Act, passed in 2022, appropriated \$11.293 billion for deposit into the Abandoned Mine Reclamation Fund and included provisions to extend the AML fee collections and mandatory AML Grant distributions.³³

Previous Flood Occurrences

Tazewell County's history includes many damaging floods. Several data sources were used to identify and assess past flood events in the county, such as the CPPDC Hazard Mitigation Plan, the National Centers for Environmental Information's (NCEI) Storm Events Database, and Disaster Declarations. Based on these sources, 42 damaging flood events were reported in Tazewell County in the last 161 years. These events are presented in Table 4-3 within *Section 4: Existing Conditions* of this plan. It is likely that flood events that occurred longer than several decades ago, before many reporting mechanisms began, are not well documented.

In addition to reported flood events, United States Geological Survey (USGS) stream gauges provide a historic record of peak streamflows on most waterways in the U.S. There are two USGS stream gauges located in or near Tazewell County, shown below in Figure 620. Streamflow of the Bluestone River has been recorded at Falls Mills, VA since 1981. Streamflow of the Clinch River has been recorded at the Town of Cleveland, VA (just downstream of Tazewell County, in Russell County) since 1921.

³³ Office of Surface Mining Reclamation and Enforcement. (2022). Guidance on the Bipartisan Infrastructure Law Abandoned Mine Land Grant Implementation. Retrieved March 15, 2023 from https://www.osmre.gov/sites/default/files/inline-files/BIL_AML_Guidance_7-19-22.pdf

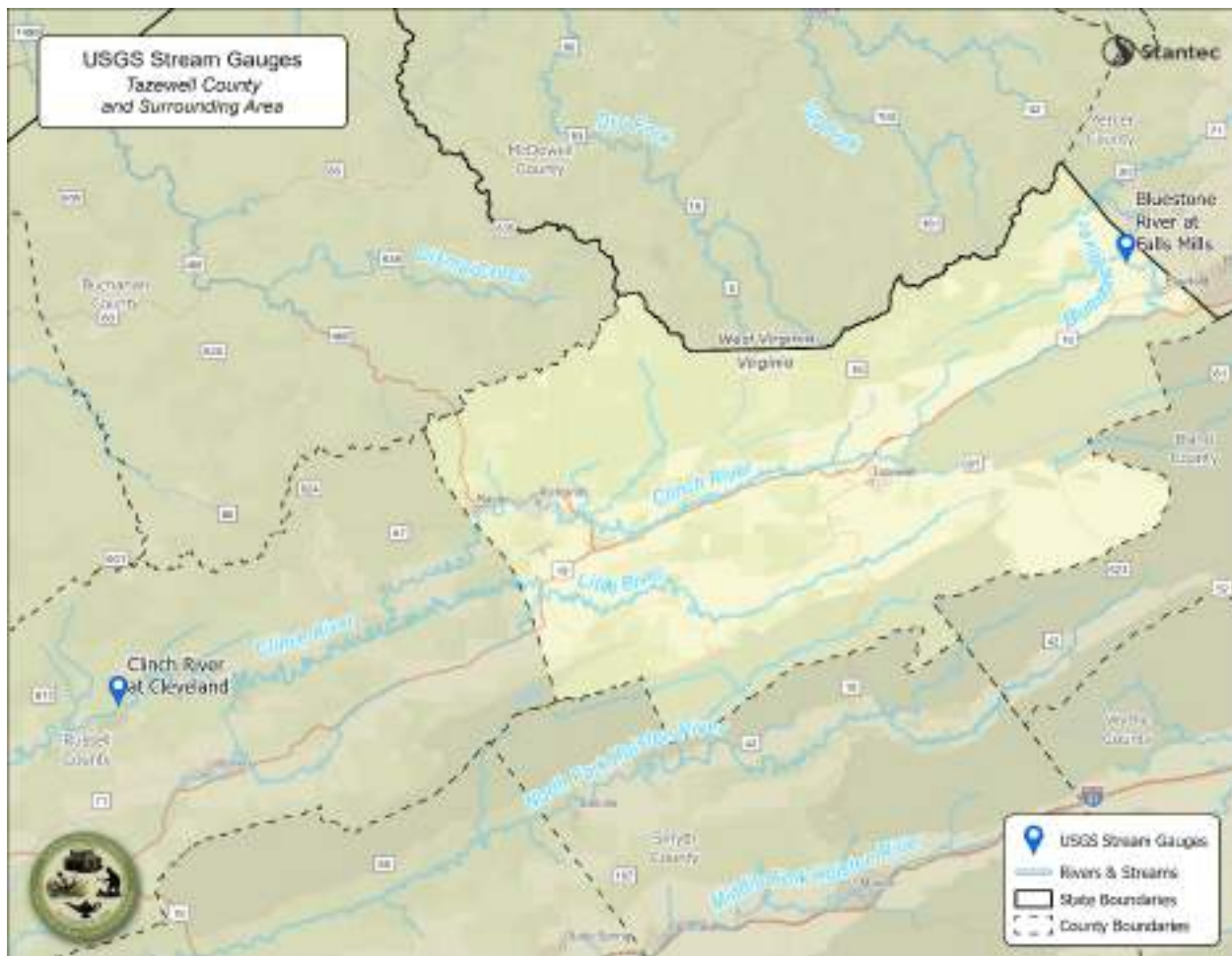


Figure 620: USGS Stream Gauges in Tazewell County and Surrounding Area

The Bluestone River's headwaters begin near Springville, VA, in north-central Tazewell County, and the river flows northeast to Bluefield, where the bends to the northwest and travels towards Falls Mills. The river then flows northeast into West Virginia. Flooding from the Bluestone River has impacted both Bluefield and Falls Mills.

The headwaters of the Clinch River begin southwest of Springville, VA and the river flows south to southwest through most of Tazewell County. The Clinch River has produced most of the significant flooding events that have impacted the more densely populated areas of Tazewell County. The river flows through North Tazewell, Tazewell, Pounding Mill, Cedar Bluff, Richlands, Doran, and Raven.

The peak streamflows of the USGS stream gauge in Cleveland, VA provides insight into when previous flooding events along the Clinch River have occurred. The annual peak streamflow has been recorded since 1921, with four additional previous peak streamflows (1862, 1902, 1907, 1918) also included in the record, dating back to 1862. The highest recording at the site was during the 1977 flood, with a height of 26.40 feet, which is considered the flood of record. Table 65 shows the 20 highest recordings at the Cleveland stream gauge. For reference, the flood stage at this location is 14 feet, moderate flood stage is 19 feet, and major flood stage is 24 feet.

Table 65: 20 highest stream height recordings at Cleveland, VA³⁴

Date	Gage Height (ft)
4/5/1977	26.40
1/30/1957	24.40
Feb. 1862	22.80♦
3/12/1963	22.70
3/18/2002	21.81
1/26/1978	20.87
8/14/1940	20.60
2/6/2020	20.43
3/1/1902	20.30
6/14/1907	20.30
12/22/1926	20.10*
3/17/1973	19.94
1/29/1918	19.90*
5/7/1984	19.46
3/30/1975	18.88
5/7/1971	18.82
3/5/2015	18.66
12/31/1969	18.63
2/11/1994	18.54
2/18/1944	17.95

♦ Day of occurrence is unknown or not exact.

*Gauge height at different site and(or) datum.

Descriptions of recent or severe flooding events that impacted the county are provided below.

May 2023 Flooding

Heavy rainfall began coming down on the night of May 28, 2023, and by the morning of May 29th, floodwaters inundated several roads in Bluefield, Virginia and the surrounding area. Residents noted that this was the most significant flooding in the Bluefield area within the last five years.³⁵ In Bluefield,

³⁴ U.S.G.S. (2023). Surface Water for USA: Peak Streamflow. Retrieved on March 7, 2023 from [USGS Surface Water for USA: Peak Streamflow](#)

³⁵ WVNS. (2023) Flooding continues to plague southern West Virginia. Retrieved on May 30, 2023 from [Flooding continues to plague south West Virginia \(wvnstv.com\)](#)

floodwaters completely blocked South College Avenue (SR-102), the main throughfare through downtown, from Tazewell Avenue to Graham Avenue. The flooding, shown in Figure 621, resulted in two to four feet of standing water along South College Avenue and Spring Street.



Figure 621: May 29, 2023 Flooding in Bluefield, Virginia

February 2023 Flooding

Local residents shared information and photographs of flooding that occurred in and around the Doran Bottom area on February 6, 2023. Figure 622 shows Route 67 (Raven Road) completely inundated with water. The next week, on February 17, 2023, the National Weather Service (NWS) issued a flood warning for most of the region through the afternoon due to heavy rain that had started the previous night and carried through the morning. Upwards of two inches of rain fell in a twelve-hour period, causing the Clinch River to rise above flood stage, shown in Figure 623.



Figure 622: Route 67/Raven Road Inundated with Floodwaters on February 6, 2023



Figure 623: February 2023 Flooding³⁶

³⁶ Photo was provided by USACE from a resident's social media post shortly after the flooding occurred.

August 2022 Flood

Afternoon thunderstorms on August 5th stalled in the Richlands area, producing prolonged heavy rainfall. Runoff from the storm resulted in small stream flooding of the Clinch River and its tributaries in the Richlands area. Little Town Hill Creek flooded across Hillcreek Road and US-460 in Doran, with the water reaching a depth of four feet on US-460. A vehicle was stranded on the highway and the occupant had to be rescued by emergency responders. Damages reported in relation to this incident were \$10,000. There was also flooding reported on Burnette Street in southwest Richlands. Flood waters did not recede for two hours.³⁷

July 2022 Flash Flooding

Severe flash flooding impacted the northwest portion of Tazewell County after several days of heavy rainfall, resulting in significant damage. According to local news reports, the area around Jewell Ridge received up to six inches of rainfall within just a few hours. At least 134 structures incurred structural damage in Buchanan and Tazewell Counties. The Bandy area of Tazewell County suffered the most significant flooding within Tazewell County, examples of which are shown in Figure 624 and Figure 625. Video captured by Tazewell County Emergency Management shows that several buildings in Bandy were flooded with anywhere between 6 inches and 2 feet of water from Indian Creek. Fourteen residents were displaced in Bandy after their homes were damaged or destroyed.³⁸ Flood waters did not recede for over eight hours. Over 2,000 power outages were reported within the area and many roadways were impassible impassable due to high water. This event resulted in the Governor of Virginia declaring a state of emergency, as well as a federally declared disaster. FEMA individual assistance was estimated at \$1.96 million and public assistance, primarily due to road and bridge damages, was estimated at \$14 million.³⁹

³⁷ National Centers for Environmental Information (NCEI). (n.d.). Storm Events Database. NOAA/NWS. Retrieved on March 9, 2023 from [Storm Events Database | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/stormevents/)

³⁸ National Weather Service. (2022). Southwest Virginia Flooding: July 2022. Retrieved on March 9, 2023 from [Southwest Virginia Flooding: July 2022 \(arcgis.com\)](https://www.weather.gov/southwest/Southwest-Virginia-Flooding-July-2022)

³⁹ FEMA-4674-DR Preliminary Damage Assessment Report. Retrieved from [FEMA-4674-DR-VA](https://www.fema.gov/4674-DR-VA).



Figure 624: Flooding in Bandy, VA in July 2022⁴⁰



Figure 625: Flooding in Bandy, VA in July 2022⁴¹

April 2020 Flood

Heavy rain began during the evening of April 12th and continued through the morning of the 13th, lasting roughly a 12-hour period. Between 1.5 and 5 inches of rain fell across Tazewell County, with isolated 5-inch amounts along the Blue Ridge Mountains. The intense rainfall rates and rapid runoff caused widespread flash flooding of small creeks and streams. The Clinch River at Richlands gauge (RLRV2)

⁴⁰ WDBJ. (2022). Flooding in Buchanan/Tazewell Counties, VA. Retrieved on March 9, 2023 from [Flooding in Buchanan/Tazewell Counties, VA \(wdbj7.com\)](https://www.wdbj7.com/news/local/flooding-in-buchanan-tazewell-counties-va/).

⁴¹ WDBJ. (2022). Flooding in Buchanan/Tazewell Counties, VA. Retrieved on March 9, 2023 from [Flooding in Buchanan/Tazewell Counties, VA \(wdbj7.com\)](https://www.wdbj7.com/news/local/flooding-in-buchanan-tazewell-counties-va/).

crested at 12.77 feet, just below “Moderate” flood stage of 13 feet. This was the 12th highest on record at this gauge, with records dating back to 1944. Several roads were closed and damaged due to the flooding. Virginia Department of Transportation (VDOT) reported very significant damage to road infrastructure across numerous counties with damage totals exceeding \$1.2 million. Some homes that were flooded in February 2020, were flooded again less than 3 months later. This event caused \$144,896 worth of property damage in the Pounding Mill and surrounding areas.⁴²

February 2020 Flood

Rainfall during a 3-day period from February 5th to February 7th produced some of the most significant flooding Tazewell County had experienced in over a decade. Numerous NWS Cooperative stations recorded one-day and two-day rainfall records. The most significant flooding within Tazewell County occurred along the Clinch River and its tributaries in the southwestern portion of the county, where a flash flood emergency was issued. However, flooding was reported throughout the county, including Burkes Garden, Raven, Richlands, and Yards.

The Richlands stream gauge (RLRV2) crested at 14.33 feet, qualifying as a “Moderate” flood stage (13 feet). This was the ninth highest record at this gauge. Flooding of low-lying areas was extensive from Cedar Bluff downstream through Richlands and into the Doran and Raven communities. News reports mentioned water up to four feet deep in parts of Richlands. There were multiple evacuations conducted and homes and businesses flooded along with roads throughout the area, some of which were damaged.

Preliminary damages for Tazewell County were estimated at over \$1.8 million by the Virginia Department of Emergency Management (VDEM). This included \$298,300 in damage to public property, \$626,100 in residential damage and \$882,900 to commercial property. An additional \$218,500 in road damage was reported by VDOT. A state of emergency was declared by the Virginia Governor for several counties in southwest Virginia due to the flooding, including Tazewell County.

⁴² National Centers for Environmental Information (NCEI). (n.d.). Storm Events Database. NOAA/NWS. Retrieved on March 9, 2023 from [Storm Events Database | National Centers for Environmental Information \(noaa.gov\)](https://www.ncei.noaa.gov/stormevents/)



Figure 626: Flooding in Richlands, February 2020

July 2015 Flooding

On July 5th slow-moving thunderstorms crossed over Tazewell County producing heavy rainfall. A flash flood warning was issued for Tazewell County by the NWS after the radar showed 1-2 inches of rain had already fallen by the early evening, with more expected. Total rainfall amounts reached 2.5-3 inches in a 3-hour period ending around 10 PM over parts of northeastern Tazewell County which produced substantial flash flooding and debris flows in several locations.

The worst flooding occurred along Laurel Fork near the Town of Pocahontas where 25 homes, 5 businesses and 2 mobile homes were damaged or destroyed. Total damage estimates reached over \$4.4 million, primarily due to a single business that was uninsured and destroyed. Multiple roads across northeast Tazewell County were closed due to flooding and mudslides.

May/June 2004 Flooding

During late May and early June excessive precipitation resulted in flooding throughout the region on a number of occasions. Severe thunderstorms in western Tazewell County dumped over 5 inches of rain within a 2-hour period beginning late in the evening of May 24th and continuing through the early morning hours of May 25th. This resulted in flooding along the Clinch River and its tributaries in Cedar Bluff and the areas downstream through Raven. Water inundated several major roads, including State Route 67 and US-460 and mudslides blocked or damaged a number of roads in the area. In total, the event resulted in over \$800,000 worth of property damage reported via NCEI. Nearly 200 private residences were destroyed or damaged, including 44 mobile homes, 79 homes with major damage, an

additional 71 homes with minor damage. Additionally, 7 businesses were destroyed or damaged and 35 vehicles received damage. Fifteen people had to be evacuated during the event.⁴³

Roughly two weeks later, severe thunderstorms passed over Tazewell County again, causing more significant flooding. Flooding occurred in eastern Tazewell County on June 12, 2004. During two hours of rain, Bluefield accumulated 2.37 inches of precipitation. Preliminary flood damage indicated that at least 20 houses and 12 businesses were impacted by the flooding. Areas affected include South College Avenue, Main Street (at intersection of Beaver Pond Creek and Whitney Branch), College Avenue, Stadium Drive and Leatherwood Lane.⁴⁴ In western Tazewell County, the community of Short Gap experienced flooding and mudslides. Flooding was also reported in the Doran area and along Town Hill Creek.

The culmination of events resulted in a federal disaster being declared (DR-1525) for flooding events that occurred between May 24th and June 26th, 2004.

November 2003

Moderate to heavy rain fell over most of Tazewell County and the region beginning the night of November 18th through the morning of November 19, 2003. The Bluefield area experienced significant flooding that damaged a number of businesses. The heavy precipitation caused the Clinch River to surpass flood stage and water continued to rise during the day on November 19th. This resulted in flooding all along the Clinch River and its tributaries throughout Tazewell County. In the Town of Tazewell a car lot flooded and there was damage to local roads. Route 637 was closed due to flooding in portions of the county and Second Street in Richlands was blocked for the first time since 1977. 26 homes were destroyed, 14 had major damage, and 5 had minor damage. One business was destroyed, 5 others had major damage, and 17 cars were flooded. In total, there was over \$10 million worth of property damage in the county. The event resulted in a federal disaster (DR-1502) being declared for several counties in the region, including Tazewell County.

March 2002

Heavy rains on March 18, 2002, produced major flash flooding across the region. In Tazewell County, numerous roads were flooded and some received damage from wash outs. Forty-two homes in the county suffered major damage and several cars were flooded. Fifty people had to be evacuated during the event. The event resulted in a federal disaster declaration for the region (DR-1406). The total estimated damage in Tazewell County was nearly \$2.8 million worth of damage.

July 2001

Severe thunderstorms impacted Tazewell County starting the morning of July 8, 2001. The storms produced damaging winds and major flash flooding across the county, with the most significant damage occurring in the Richlands area. Over 1,700 homes and business received major damage, including a large automobile dealership that received damage to the building and several vehicles. Numerous roads were closed throughout the county, and some were damaged by flooding and/or mudslides. The event

⁴³ National Centers for Environmental Information (NCEI). (n.d.). Storm Events Database. NOAA/NWS. Retrieved on March 9, 2023 from [Storm Events Database | National Centers for Environmental Information \(noaa.gov\)](https://www.noaa.gov/storm-events-database)

⁴⁴ Cumberland Plateau Planning District Commission. (2018). Hazard Mitigation Plan Update. Retrieved March 10, 2023 from <http://cppdc.org/Reports/Mitigation%20Plan%20Edit.pdf>.

caused over \$28 million worth of damage in the county, with over \$950,000 worth of property damage reported in the Richlands area alone.

April 1977

In early April of 1977, heavy rainfall across the region resulted in one of the worst flooding events ever recorded in the area. The flood serves as the flood of record on the Clinch River and all subsequent flood events are compared to this event. The flooding caused over \$11 million in damages in the area, including heavy agricultural losses. The event resulted in a federal disaster declaration (DR-530) for the region.

The event produced flooding in all low-lying areas of Tazewell County, including along the Clinch River and the Bluestone River. In Bluefield, the business district was incapacitated due to flooding. Virginia Street and College Avenue were some of the areas affected by the rain event. Traffic rerouted to the side streets, with voluntary evacuation of residents.

Flood Hazard Analysis

Location

Tazewell County falls almost entirely in the Valley and Ridge Province of the Appalachian Highlands. The Valley and Ridge Province is bounded by the Appalachian Plateau to the west and the Blue Ridge Mountains to the east, as shown in Figure 627.

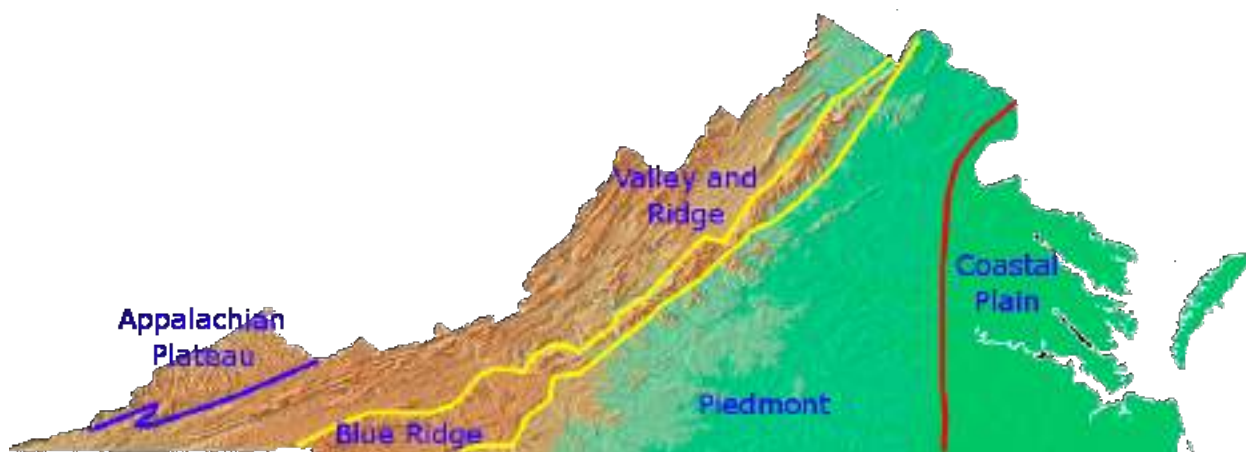


Figure 627: Virginia Physiographic Provinces⁴⁵

The county's topography is shown in Figure 628.⁴⁶ The Appalachian Plateau forms high ridges along the northwestern and northern borders of Tazewell County. Jewell Ridge, Bear Wallow, Pocahontas, and Bluefield are some of the communities found in these areas. The rest of the county is comprised of long mountain ridges that travel in a southwest to northeast direction, separated by valleys. This portion of the county is home to the headwaters for a number of rivers, including the Clinch River, the Holston

⁴⁵ Earth Science Review. (n.d.) Virginia's Physiographic Provinces. Retrieved on March 8, 2023 from [Physiographic Provinces - Earth Science Review \(weebly.com\)](https://www.weebly.com/physiographic-provinces)

⁴⁶ Virginia Geographic Information Network (VGIN). (2019). Virginia Most Recent Imagery MrSID and DEM Download. Retrieved on March 8, 2023 from [Virginia Most Recent Imagery MrSID and DEM Download \(arcgis.com\)](https://www.vgin.org/VGIN/Default.aspx?Page=1)

River (North Fork), the Dry Fork (feeds into Tug Fork in West Virginia), and the Bluestone River. Clinch Mountain, Garden Mountain, and the East River Mountain form the high ridges in the south and eastern areas of the county.

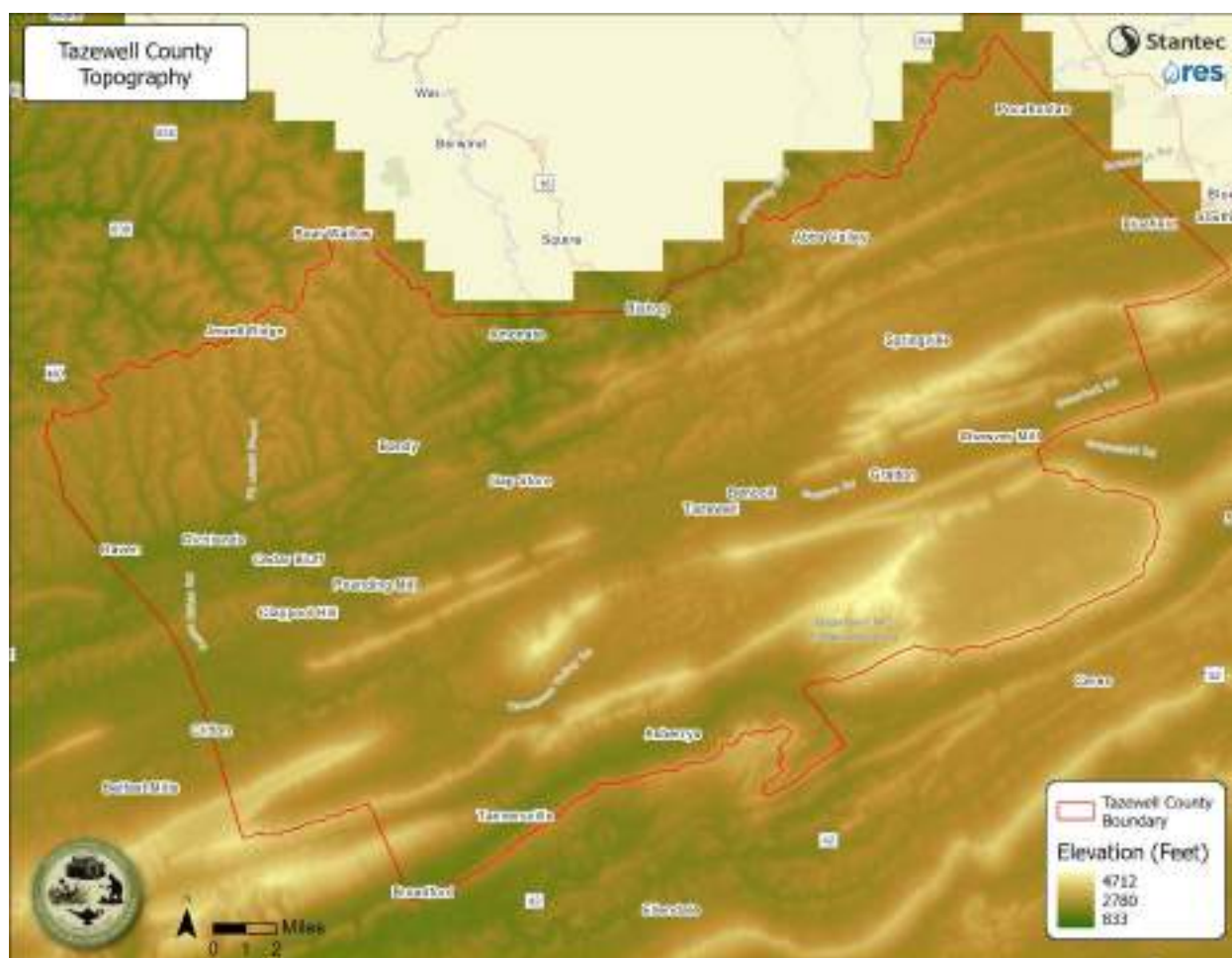


Figure 628: Tazewell County Topography

Tazewell County is characterized by high mountain ridges with steep slopes, interspersed with valleys. Throughout much of the county, the only flat land is found on valley floors. Due to the topography of the county, development typically occurs in the valleys, often along the county's rivers and streams. FEMA produces maps of special flood hazard areas based on riverine flooding. These include the areas with a 1.0% and 0.2% annual chance of flooding (the 100-year flood and 500-year flood zones, respectively). Given the county's development patterns, a substantial amount of development falls within one of these zones. Figure 629 shows the 100-year and 500-year flood zones located throughout the county.

In addition to flooding that occurs in the mapped flood hazard areas, county officials noted that flooding is possible within most low-lying areas of the county, depending on where rainfall occurs. This is also evident from recent flooding events, as well as conversations held during meetings with residents and county officials. The North Tazewell and Tazewell communities were highlighted as areas where flooding has occurred outside of the special flood hazard areas. Other communities throughout the county are likely vulnerable to similar flooding incidents, where localized heavy precipitation or clogged streams may produce flooding outside of expected areas.

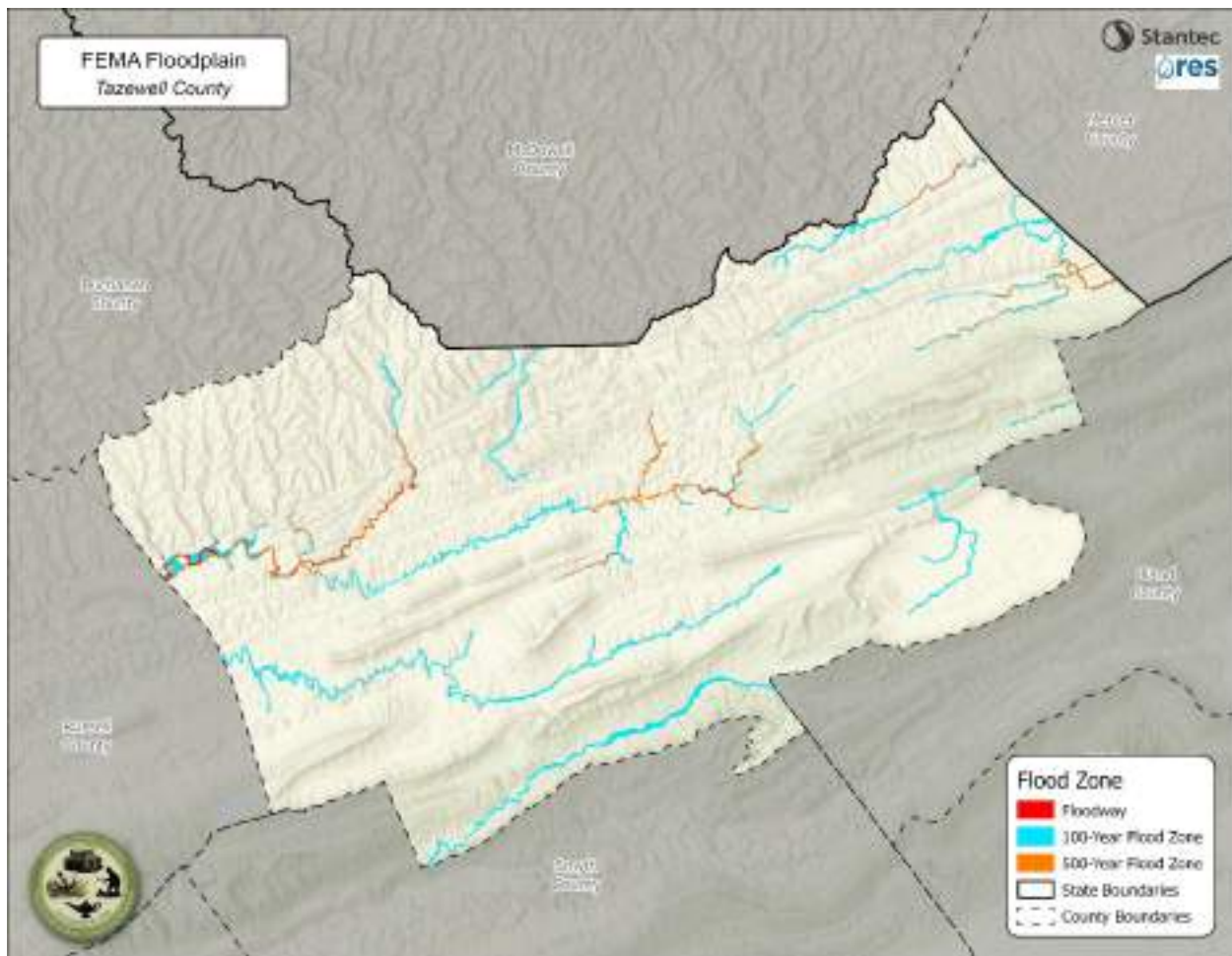


Figure 629: Tazewell County FEMA Floodplain

Building and Parcel Data

Building footprint and parcel data was provided by the Tazewell County Engineering Department for use in the flood hazard analysis. These datasets were used in unison to assess potential flood risk to structures within Tazewell County. The overall flood risk was assessed by considering the likelihood a building or parcel will flood in a given year (i.e., which flood zone the building or property falls in) alongside the improvement value of at-risk parcels. In total, there are an estimated 26,271 buildings and 32,040 parcels in Tazewell County.

Critical Facilities

Critical facilities are structures or systems that provide essential services and functions for a community. These facilities are vital to continued operations and recovery following a natural disaster or public health crisis. Table 66 provides a full list of Tazewell County's critical facilities, presented by community lifeline.⁴⁷ These facilities were identified by reviewing the CPPDC's Hazard Mitigation Plan, Tazewell County's Comprehensive Plan, and input from the Planning Team comprised of County officials.

⁴⁷ FEMA Community Lifelines. Retrieved from [Community Lifelines | FEMA.gov](https://www.fema.gov/community-lifelines).

Table 66: Tazewell County Critical Facilities

Energy	Hazardous Materials
AEP Power Substation - Near SWCC Walking Trail	Tazewell County Landfill
Food, Water, Shelter	Bluefield Wastewater Treatment Plant
Labor of Love Mission* ¹	Falls Mills Wastewater Treatment Plant
Farm Market Fresh for Seniors (SFMNP)* ²	Richlands Wastewater Treatment Plant
Clinch Valley Community Action* ¹	Tazewell Wastewater Treatment Plant
Appalachian Agency for Senior Citizens* ²	Wardell Wastewater Treatment Plant
Abbs-Valley-Boissevain Elementary School	Health and Medical
Cedar Bluff Elementary	Clinch Valley Medical Center
Dudley Primary	Carilion Tazewell Community Hospital
Graham Middle School	Tazewell County Health Department
Richlands Elementary School	Safety and Security
Richlands High School	Tazewell County Sheriff's Office
Richlands Middle School	Richlands Police Department
Tazewell High School	Pocahontas Police Department
Tazewell Intermediate School	Cedar Bluff Police Department
Tazewell Middle School	Bandy Fire Department Fire and Rescue
Tazewell Primary School	Bluefield Fire Department
Southwest Virginia Community College (SWCC)	Pocahontas Fire Department
Four Seasons YMCA	Thompson Valley Fire Department
Bluefield Water Treatment Plant	Richlands Rescue
Richlands Water Treatment Plant	Tazewell County EMS Station 1
Pocahontas Water Treatment Plant	Tazewell County EMS Station 2
Bandy Community Center	Town of Tazewell EMS
Thompson Valley Community Center	Tannersville RS
Burke's Garden Community Center	Tazewell County Emergency Management
	Tazewell County District Court
	Virginia State Police Area 28

*¹, *² – Co-located with another critical facility, indicated by a matching number.

Riverine Flood Analysis

Riverine flooding presents a risk to buildings and infrastructure (including critical facilities) as well as populations, especially when development occurs on land within the floodplain. In Tazewell County, the steep relief of the mountainous terrain led to most development occurring in valleys, often within the floodplain. Pairing FEMA special flood hazard area data with spatial data for the county's structures, critical facilities, and socially vulnerable populations, the project team conducted a spatial analysis to identify structures, facilities, and populations potentially at-risk to flood.

Buildings and Parcels

A structure's flood risk is associated with several factors, such as its location within flood hazard areas, and any implemented mitigation, such as first floor elevation, dry floodproofing, or presence of flood control structures. For example, buildings constructed to modern building codes, after the adoption of the county's Flood Damage Prevention Ordinance, may carry less risk than older structures due to how they were constructed. Table 67 presents the results of the spatial analysis of buildings within FEMA mapped flood hazard areas. This analysis does not account for building elevations or other structure-level mitigation measures. It should also be noted that flooding occurs outside of mapped floodplains.

Table 67 presents a summary of the buildings that are within FEMA flood zones and the percentage of total structures found in each flood zone. Table 68 presents a summary of the parcels located in the various FEMA flood zones within Tazewell County. Each building or parcel is only included in one of the FEMA flood zones to prevent double counting. If a building is located in more than one FEMA flood zone, it was counted in the FEMA flood zone with a higher associated risk (i.e., a building in both the 0.2% Annual Chance Flood Zone and the 1% Annual Chance Flood Zone would only be counted in the 1% Annual Chance Flood Zone.)

Table 67: Building Footprints in FEMA Flood Zones

FEMA Flood Zone	Total # of Structures	Percentage of All Structures
0.2% Annual Chance (500-year)	525	2%
1% Annual Chance (100-year)	1,996	8%
Floodway	387	1%
Total # of Structures at Risk	2,908	11%

**Each building is only included in one of the FEMA Flood Zones to prevent double counting.*

Table 68: Parcels in FEMA Flood Zones

FEMA Flood Zone	Total # of Parcels	Total Improvement Value of Parcels**	Percentage of All Parcels
0.2% Annual Chance (500-year)	435	\$ 274,915,300	1%
1% Annual Chance (100-year)	2,775	\$ 217,542,200	9%
Floodway	1,594	\$ 32,042,700	5%
Total	4,804	\$ 524,500,200	15%

*Each parcel is only included in one of the FEMA Flood Zones to prevent double counting.

**Value of improvements may exclude the value of tax-exempt improvements.

The parcels layer was used to estimate the value of property at risk to riverine flooding. These values are based on tax assessor data provided by Tazewell County and does not include the value of the land, only the improved structures on impacted parcels. It should be noted that some parcels included in the table above may be partially within a flood zone, and that the improvement (e.g., structure) on the parcel may be located outside of the flood hazard area. As noted in Table 68, the estimated total value associated with improved parcels within flood hazard areas is nearly \$525 million.

Figure 630 – Figure 639 show areas throughout the Tazewell County where there are clusters of buildings located in the FEMA flood zones.



Figure 630: Flood Hazard Analysis – Bandy Area

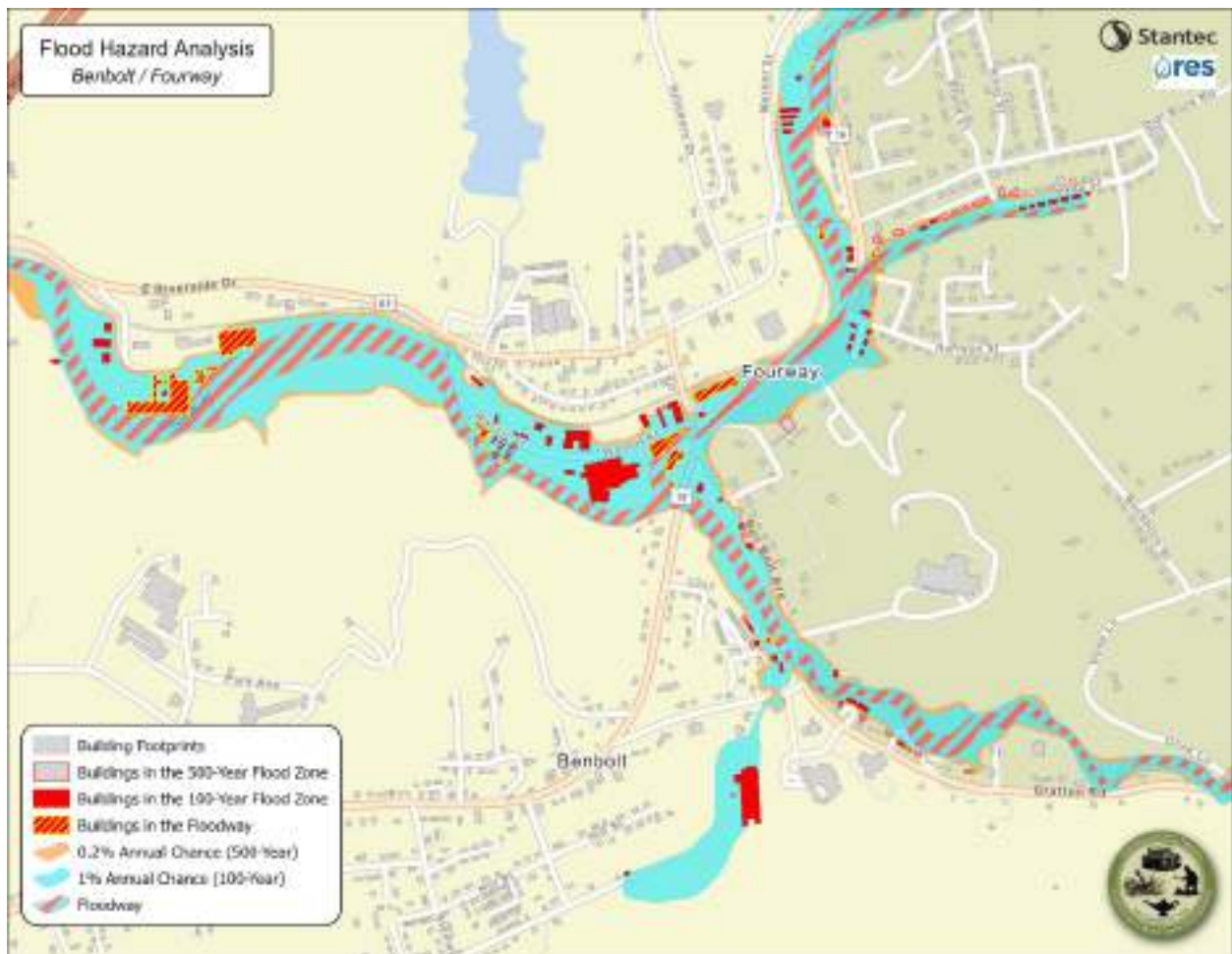


Figure 631: Flood Hazard Analysis – Benbolt/Fourway Area

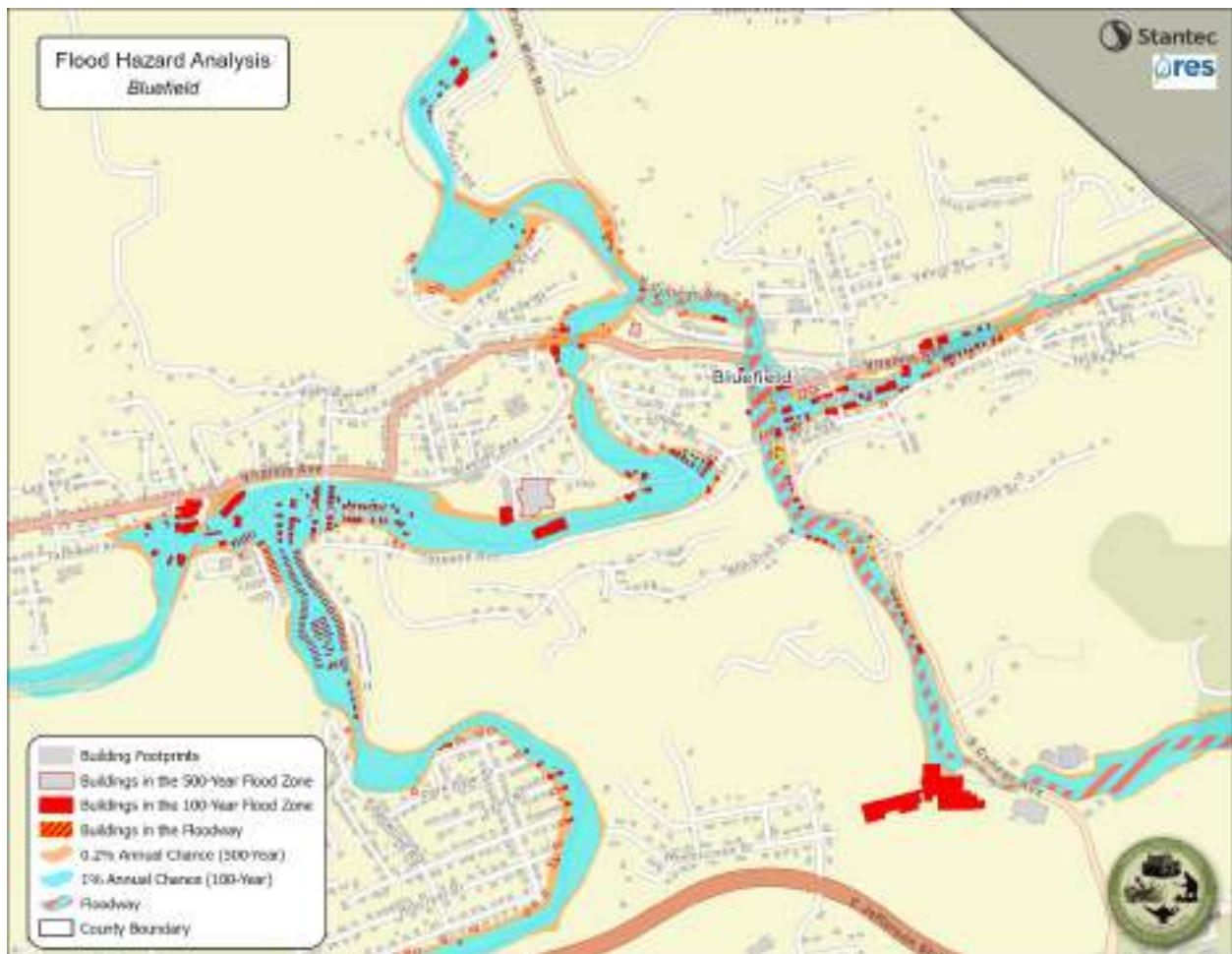
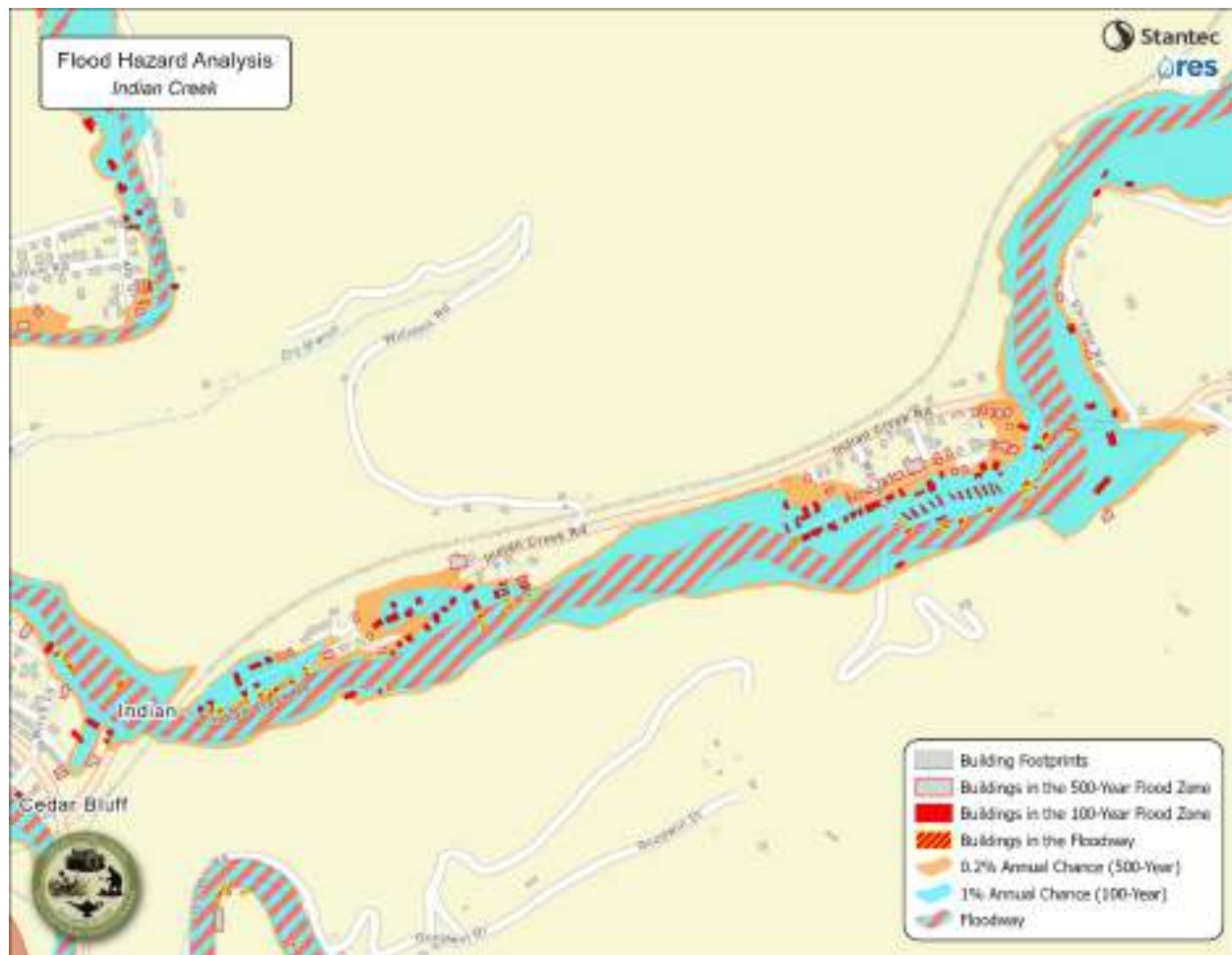


Figure 632: Flood Hazard Analysis – Bluefield Area



Figure 633: Flood Hazard Analysis – Cedar Bluff Area



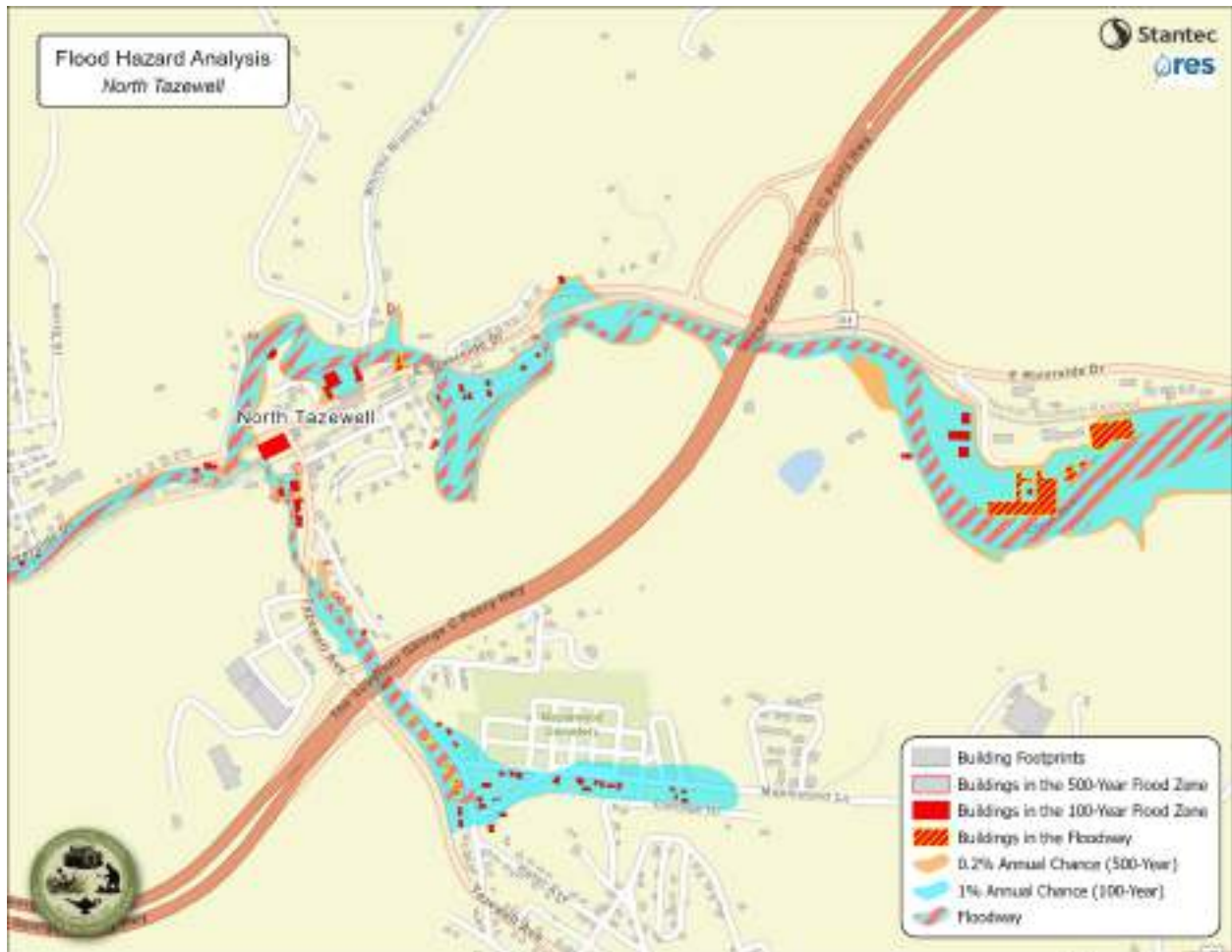
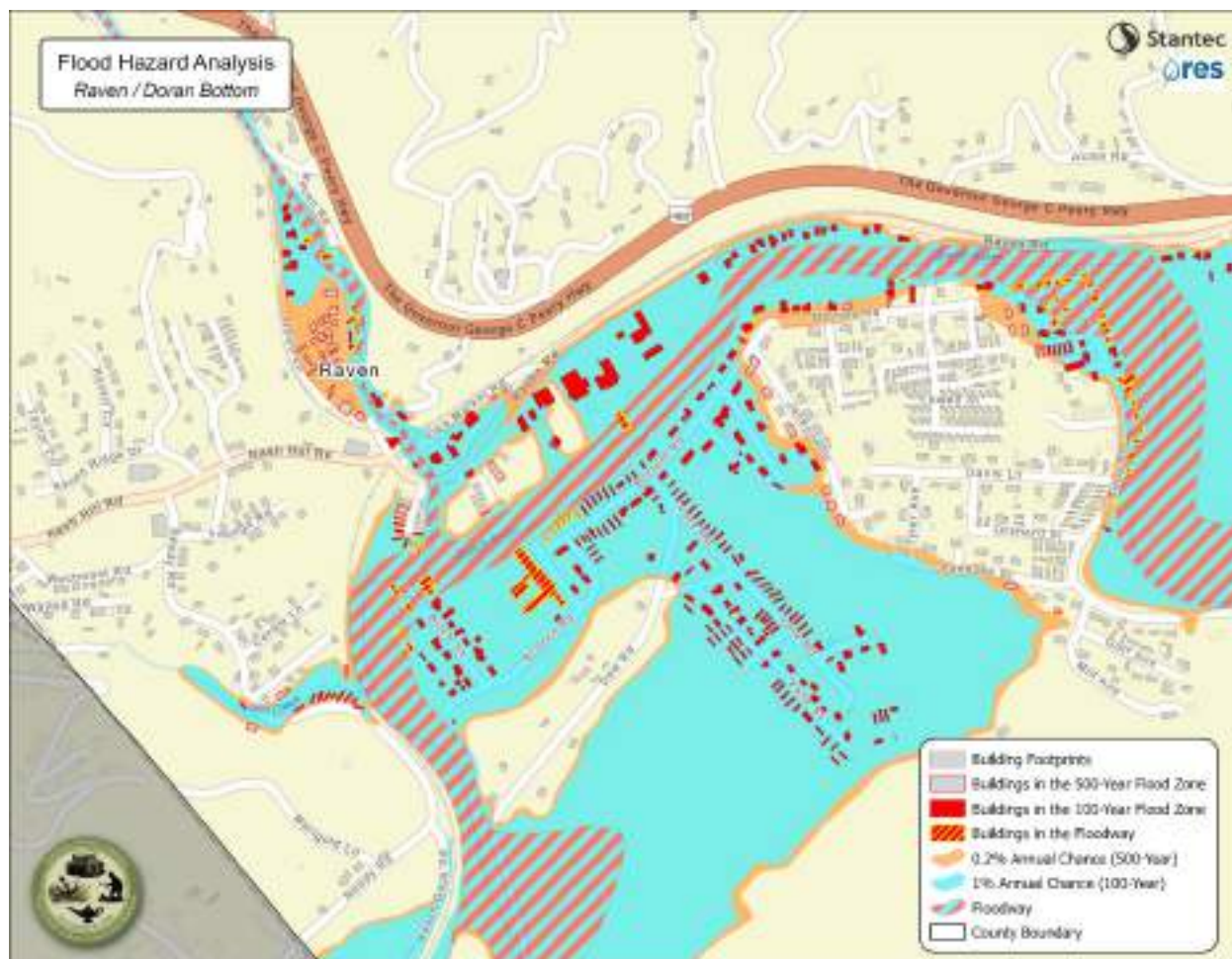


Figure 635: Flood Hazard Analysis – North Tazewell Area



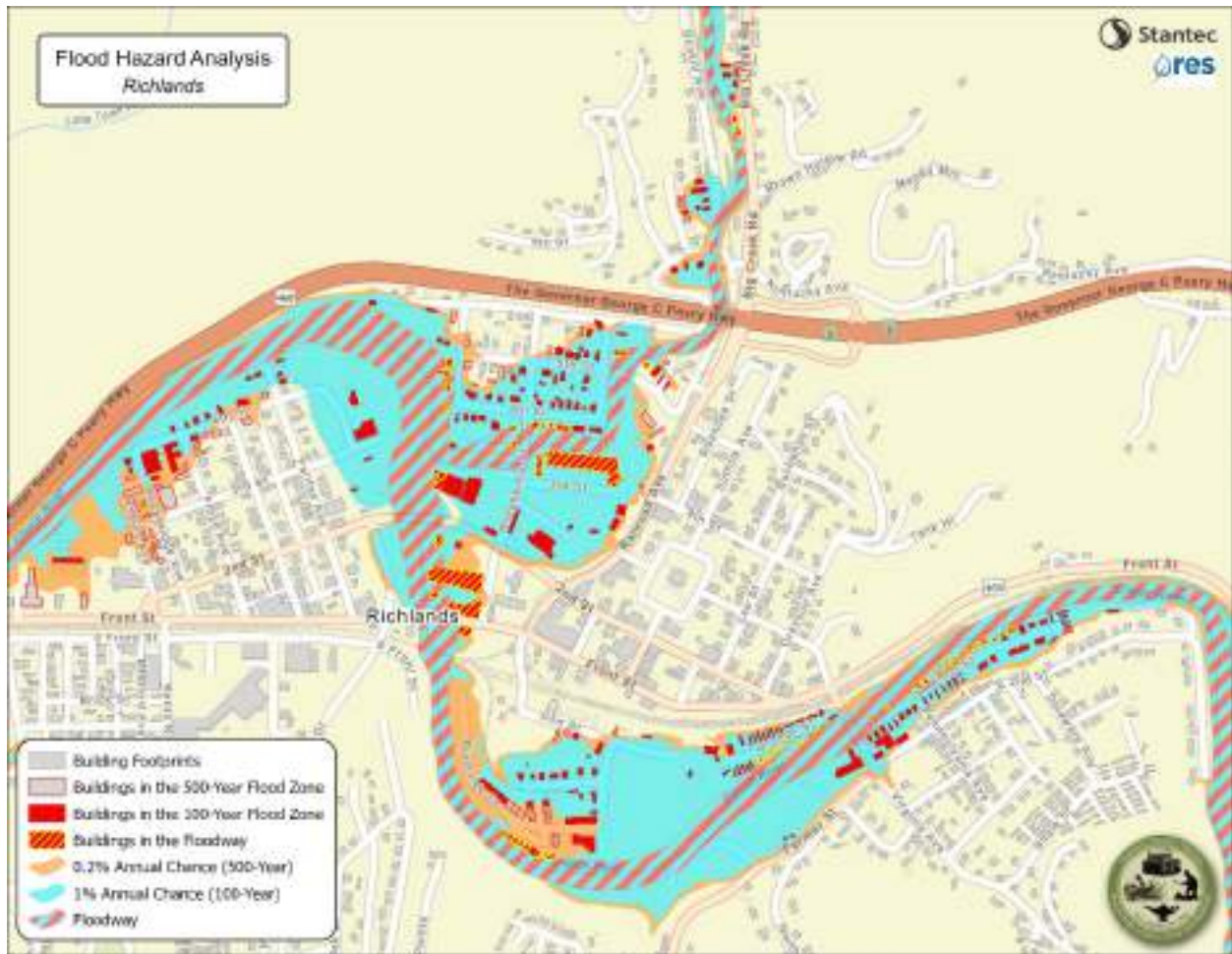


Figure 637: Flood Hazard Analysis – Richlands Area



Figure 638: Flood Hazard Analysis – St. Clair Area

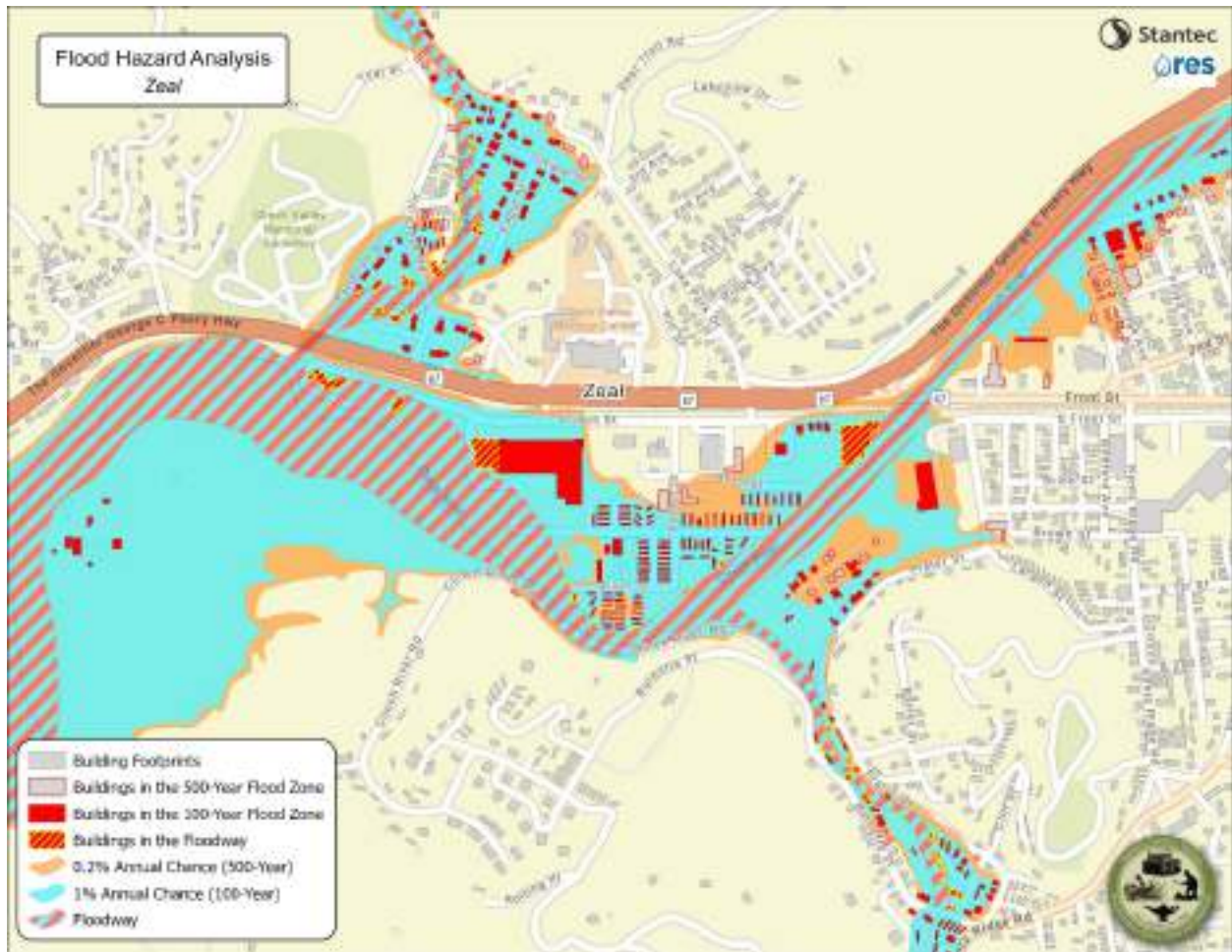


Figure 639: Flood Hazard Analysis – Zeal Area

Critical Facilities

GIS analysis was used to determine the number of critical facilities within flood hazard areas. Many of the county's critical facilities fall in special flood hazard areas or have been impacted by past flooding events.

In all, there are 12 out of 49 identified critical facilities located in FEMA flood hazard areas; all 12 identified critical facilities fell in the FEMA 1.0% annual chance (100-year) floodplain. Table 69 has the at-risk critical facilities within or partially within flood hazard areas highlighted in yellow.

Table 69: Critical Facilities Flood Risk Analysis

Energy	Hazardous Materials
AEP Power Substation	Tazewell County Landfill
Food, Water, Shelter	Bluefield Wastewater Treatment Plant
Labor of Love Mission* ¹	Falls Mills Wastewater Treatment Plant♦
Farm Market Fresh for Seniors (SFMNP) * ²	Richlands Wastewater Treatment Plant
Clinch Valley Community Action* ¹	Tazewell Wastewater Treatment Plant
Appalachian Agency for Senior Citizens* ²	Wardell Wastewater Treatment Plant
Abbs-Valley-Boissevain Elementary School	Health and Medical
Cedar Bluff Elementary	Clinch Valley Medical Center
Dudley Primary	Carilion Tazewell Community Hospital
Graham Middle School	Tazewell County Health Department
Richlands Elementary School	Safety and Security
Richlands High School	Tazewell County Sheriff's Office
Richlands Middle School	Richlands Police
Tazewell High School	Pocahontas Police Department
Tazewell Intermediate School	Cedar Bluff Police Department
Tazewell Middle School	Bandy Fire Department Fire and Rescue
Tazewell Primary School	Bluefield Fire Department
Southwest Virginia Community College	Pocahontas Fire Department♦
Four Seasons YMCA	Thompson Valley Fire Department
Bluefield Water Treatment Plant	Richlands Rescue
Richlands Water Treatment Plant	Tazewell County EMS Station 1
Pocahontas Water Treatment Plant	Tazewell County EMS Station 2
Bandy Community Center	Town of Tazewell EMS
Thompson Valley Community Center	Tannersville RS
Burke's Garden Community Center	Tazewell County Emergency Management
-	Tazewell County District Court
-	Virginia State Police Area 28

*¹, *² – Co-located with another critical facility, indicated by a matching number.

♦ – Not included in the flood hazard analysis (unknown location).

Socially Vulnerable Populations

In the U.S., low-income and minority populations are more likely to live in flood zones.⁴⁸ One way to consider exposure of socially vulnerable populations to flood risk in Tazewell County is by assessing the number of buildings at-risk to flood within census tracts with high social vulnerability. The U.S. Agency for Toxic Substances and Disease Registry (ATSDR), in conjunction with the Centers for Disease Control and Prevention (CDC), has published a social vulnerability index (SVI). The SVI uses 16 U.S. Census statistics to map socially vulnerable populations. The intent of the program is to plan support for communities that will most likely need support before, during, and after a public health emergency or a natural disaster. The statistics used include poverty, lack of vehicle access, and housing conditions, among others, which are collected at a census tract level and grouped into four themes. Each tract receives a separate ranking for each of the themes, as well as an overall ranking of social vulnerability.⁴⁹ Figure 640 shows the overall social vulnerability ranking, compared statewide across Virginia, for Tazewell County's 13 census tracts. The majority of Tazewell County's census tracts are categorized as having medium-high socially vulnerability, with two census tracts categorized as having high social vulnerability. These two tracts include the area between Jewell Ridge Road and US-460, as well as Richlands, Claypool Hill, and Wardell.

⁴⁸ Laura A. Bakkensen et al, Sorting over flood risk and implications for policy reform, *Journal of Environmental Economics and Management* (2020). DOI: [10.1016/j.jeem.2020.102362](https://doi.org/10.1016/j.jeem.2020.102362)

⁴⁹ Agency for Toxic Substance and Disease Registry. (2022). At A Glance: CDC/ATSDR Social Vulnerability Index. Retrieved April 12, 2023 from [At A Glance: CDC/ATSDR Social Vulnerability Index | Place and Health | ATSDR](#).

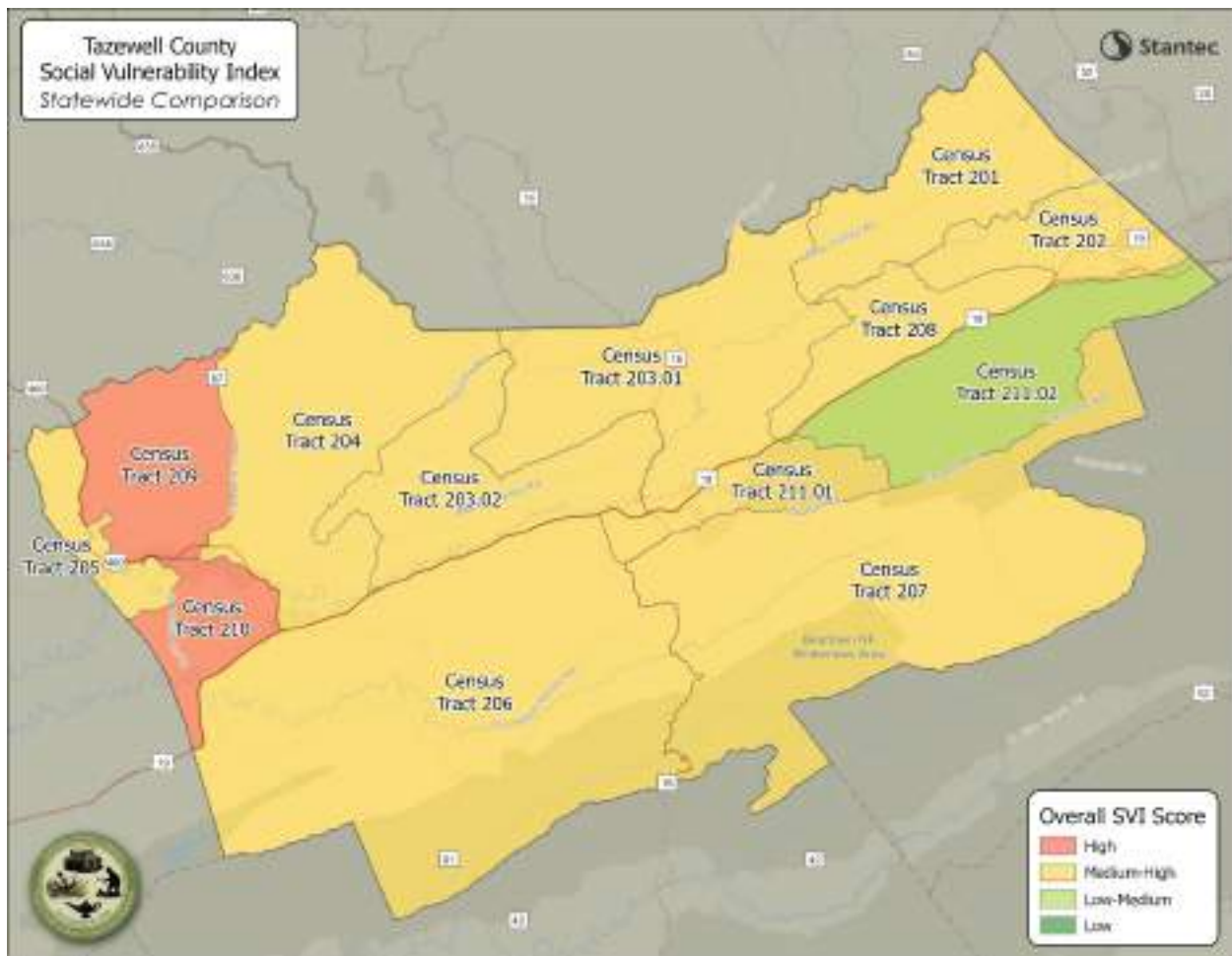


Figure 640: Tazewell County SVI⁵⁰

A GIS-based intersect analysis was performed using buildings within flood risk areas (FEMA Floodway, 1.0% annual chance, and 0.2% annual chance flood zones) and social vulnerability census tract ratings from the CDC/ATSDR. Results show that the majority of buildings in Tazewell County within flood hazard areas are located in census tracts defined as having medium-high or high social vulnerability. Of the 2,908 buildings at risk from flood, 601 (21%) are located within tracts with “high” social vulnerability and 2,236 (77%) are located within tracts with “medium-high” social vulnerability. Table 610 shows the total number and percentage of buildings within a flood hazard area separated by CDC/ATSDR social vulnerability rating. The Number of Structures At-Risk to Flooding provides the number of structures within each SVI category within FEMA’s flood hazard areas (floodway, 100-year floodplain, and 500-year floodplain). The Percent of Total Buildings At-Risk to Flooding provides a percentage of the total number of at-risk structures within Tazewell County.

⁵⁰ Agency for Toxic Substance and Disease Registry. (2022). At A Glance: CDC/ATSDR Social Vulnerability Index. Retrieved April 12, 2023 from [CDC/ATSDR Social Vulnerability Index \(SVI\)](#)

Table 610: Social Vulnerability of Buildings At-Risk to Flooding

Social Vulnerability of Buildings At-Risk to Flooding

SVI Rating	Census Tract(s)	Number of Structures At-Risk to Flooding	Percent of Total Buildings At-Risk to Flooding:
Low-Medium:	211.02	81	3%
Medium-High:	201, 202, 203.01, 203.02, 204, 205, 206, 207, 208, 211.01	2,226	77%
High:	209, 210	601	21%
Total:		2,908	100%

Table 611 and Table 612 provide even further breakdown of the at-risk buildings within the two census tracts within the county with high social vulnerability. The percentage of structures at-risk for these tracts is comparable to the overall percentages for the county.

Table 611: Breakdown of At-Risk Buildings in Census Tract 209

Census Tract 209		
FEMA Flood Zone	Total # of Structures	Percentage of All At-Risk Structures
0.2% Annual Chance (500-year)	64	2%
1% Annual Chance (100-year)	130	4%
Floodway	42	1%
Total # of Structures at Risk	236	8%

Table 612: Breakdown of At-Risk Buildings in Census Tract 210

Census Tract 210		
FEMA Flood Zone	Total # of Structures	Percentage of All At-Risk Structures
0.2% Annual Chance (500-year)	65	2%
1% Annual Chance (100-year)	235	8%
Floodway	65	2%
Total # of Structures at Risk	365	13%

In addition to looking at the CDC/ATSDR data to assess flood risk to socially vulnerable populations, Tazewell County staff and the planning team met with several members of the Blacksburg Street community in North Tazewell during a public meeting (see Section 3: Planning Process). The Blacksburg Street community is a historically Black neighborhood that is located along the Clinch River. In the past, the community was a vibrant, close-knit neighborhood; there were several small homes and a church along the roughly quarter-mile street. Community members voiced that previous and current residents share a great love for the community and are proud to be a part of the neighborhood. Unfortunately, the community is located along a low-lying point bar that has experienced significant flooding over the years. Figure 641 below shows the location of the Blacksburg Street community and highlights some causes of the flooding in the neighborhood.

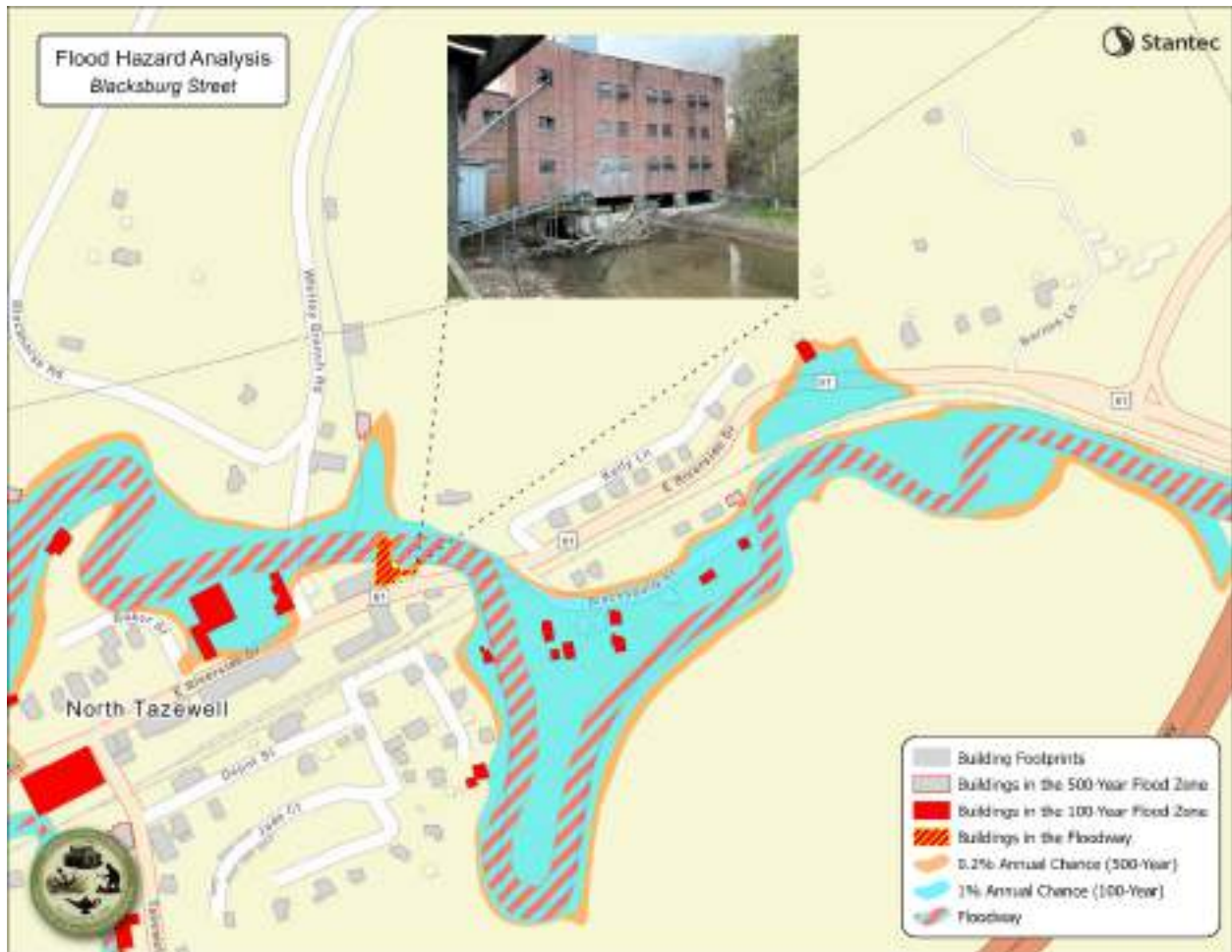


Figure 641: Flood Analysis of Blacksburg Street Neighborhood

Previous flooding events have led to a reduction in the number of homes located in the community. In total there are 12 homes currently located along Blacksburg Street. Seven of the 12 homes are located in the 100-year flood zone, and 1 additional home is located in the 500-year flood zone. In addition to being located in the FEMA flood zones, flooding intensity and/or frequency is potentially increased by the large, abandoned mill building that is located in the floodway downstream. This building, shown in Figure 641, is built in a way that greatly hinders the natural flow of the Clinch River. The water is channeled through a small concrete passageway under the building that was once used to power the mill. Furthermore, the passageway is not large enough to allow large debris to pass underneath the building. This is shown in more detail in Figure 642.



Figure 642: Debris Gathered on Upstream Side of Abandoned Mill Building in North Tazewell

During past flood events, floodwaters have overtopped the bank of the Clinch River at the east end of Blacksburg Street and travelled up the road to the west. This is a regular occurrence and is shown in Figure 643 in a photograph provided by a resident of the community. Flooding impacts all the homes located along the south side of the street. In a public meeting with Blacksburg Street residents, many community members voiced that they have to move their vehicles out of the area when heavy rainfall is predicted and most are concerned that their homes will eventually be severely damaged during a severe flooding event.



Figure 643: Floodwaters on the East End of Blacksburg Street

Flooding Impacts

Given its history of severe flood events and projected future conditions, Tazewell County is susceptible to flooding. Aware of the risk, Tazewell County has adopted a Flood Damage Prevention Ordinance, and participates in several programs aimed at reducing flood risk. These efforts are detailed in *Section 5: Capability and Capacity Assessment*. Despite these steps, Tazewell County remains vulnerable to flooding, as demonstrated through recent events and through results of the flood hazard analysis. Additionally, flooding concerns within the county's watersheds are increasing as the climate changes, as detailed in the *Weather and Climate* subsection.

Floods have a variety of impacts and effect people, structures, and infrastructure in different ways, with both immediate and long-term consequences. Flood impacts to buildings, infrastructure, the economy, public health, and life safety, including impacts on socially vulnerable populations, are described below. Cascading hazard impacts, such as flooding-induced mudflows, are also described.

Buildings

Structures exposed to flooding, including critical facilities, can be severely damaged by floodwaters. Building contents can be lost, damaged, or destroyed, and structures themselves can be compromised by floodwaters. After a flood, wooden structures may rot. Pressure from floodwater, especially as seepage through soil, can damage building foundations. Furthermore, the force of rushing floodwaters can push whole structures off their foundations. Mobile homes and manufactured homes that are not elevated or properly anchored to a permanent foundation are more susceptible to being lifted up and carried hundreds of feet during a flood event, as illustrated in Figure 644. When this occurs, not only is the structure itself damaged or destroyed, but the structure then becomes a threat to other structures, property, and residents as it travels downstream.



Figure 644: Mobile Home that was Destroyed during the July 2022 Flood Event in Bandy, VA⁵¹

Infrastructure

Infrastructure throughout the county has the potential to be impacted by flooding, including roads, railroads, bridges, dams, electrical systems, and water / wastewater systems. Potential infrastructure impacts are detailed in Table 613 below.

⁵¹ Robert Castillo via WVVA News Bluefield, WV.

Table 613: Infrastructure Flood Impacts

Infrastructure Type	Vulnerability to Flooding
Railroads	Flooding can result in the need to divert trains due to high waters, or even result in train derailments from washed-out tracks. In Tazewell County, railroads often hug streambanks within narrow valleys. No damage to railroads within the county were noted by officials from previous events.
Highways	Floods can wash out roads, causing long-lasting access issues. An example of flood damage on College Road in Bluefield, VA is shown in Figure 645. High, quick-moving floodwaters on highways can sweep up vehicles and pedestrians. Flooding on major roads can interfere with evacuations. Flooding-induced landslides and mud/debris flows can block and damage roads. County officials noted several areas within the county where roadways routinely flood, including Bottom Road, State Road 631 (Indian Creek Road), Allegheny Street, and State Road 102 (South College Avenue). Furthermore, in Tazewell County, precipitation-induced landslides, mudflows, and debris carried down steep slopes by runoff can cause damage to highways, as shown in Figure 646 and Figure 647.
Bridges	Bridges can be washed out or inundated during flood events. In Tazewell County, bridge washouts (both private bridges and state or local bridges) are common during flood events, when quick-moving water rushes through narrow channels. Washed-out bridges can be carried downstream and contribute to debris that blocks channels. Further, bridges that do not fail may be exposed to scouring and become unsafe for future use. Bridges also act as chokepoints during flood events, at which debris carried in floodwaters collects at the bridge and has a damming effect. Tazewell County also has a high number of bridges that are constructed by private property owners; these bridges are less likely to go through the permitting process or meet current design standards.
Dams	Dams are vulnerable to failure during flood events. Failed dams can result in damage to the dam itself, as well as increased flooding downstream. Further, failure at dams that impound hazardous materials, such as slurry or coal ash, may have severe environmental and public health impacts. None of the dams listed within the county are associated with mining; however, there may be small impoundment dams that are not reported.
Electric	Electric systems can be damaged during flood events, causing costly repairs and prolonged service outages. Floodwaters may damage substations and utility poles. In public meetings held near Bluefield, residents brought up concerns about a substation that was being developed in an area that was at risk for flooding. This substation may present an issue in the future.

Infrastructure Type	Vulnerability to Flooding
Water / Wastewater	<p>Water and wastewater systems and facilities have the potential to be impacted by flooding, resulting in costly damages and prolonged service outages. Treatment facilities may become inundated or inaccessible due to floodwaters. Pump stations may become damaged. When roads are washed out, or during landslides, underground watermain and sewage conveyance systems may break. During main breaks, bacteria may be introduced to drinking water systems or low pressure may cause service disruptions. Further, the Town of Richlands Wastewater Treatment Plant (WWTP) has experienced issues with stormwater infiltration and overflows. During heavy precipitation events, stormwater infiltrates the sewer lines, increasing the flow into the Richlands WWTP and leading to untreated wastewater entering the Clinch River.</p>



Figure 645: Road Damage in Bluefield, VA from Flooding in March 2023

Economy

Businesses disrupted by floods often have to close, temporarily and even permanently. They lose their inventories, customers cannot reach them, and employees are often busy protecting or cleaning up their

flooded homes. Business can be disrupted regardless of the business being located in the floodplain when customers and clients cannot reach their location, such as when roads are flooded. This is especially true in mountainous areas such as Tazewell County. Like the buildings and homes throughout the county, the county's road network is generally confined to the narrow valley floors along streambanks. Paired with a lack of alternative routes, a flooding event will isolate individuals, neighborhoods, or entire communities in the county.

Business interruption means forgone sales tax revenue for the county. As with flooded roads, public expenditures on flood preparation, response, and recovery, including sandbags, public works, emergency calls, debris clean-up, and repairs to damaged public property affect all residents of the county, not just those in the floodplain. Further, some residents may choose to leave the county after their homes have been flooded; it was noted at both public meetings that residents who relocated after being impacted by floods did not move back. Emigration of residents can impact property values, businesses, and tax revenues for the county.

Public Health Impacts

Floodwaters often contain contaminants such as bacteria and chemicals. Flooding may cause combined sewer overflows, resulting in sewage in floodwaters. Individuals traversing floodwaters or children playing in floodwaters could contract diseases, injuries, and infections.

Structures exposed to floodwaters can also present public health hazards. Damaged electrical systems and natural gas tanks present risk of fire and explosions. Structures exposed to flooding may develop mold or wood rot. People with asthma, allergies, or breathing conditions may be at a higher risk to mold.⁵²

Trains or trucks carrying hazardous materials during flood events have the potential to spill or release hazardous materials due to crashes or derailments, which could negatively impact public health. Fixed sites, such as factories or industrial facilities, can also release hazardous materials when their facilities flood.

Life Safety

The public often underestimates the dangers presented by floodwaters. Flooding is often localized to certain parts of a community (e.g., certain roads, intersections, or neighborhoods), and floodwaters can prevent normal access to buildings and facilities. This presents a danger when motorists and pedestrians attempt to traverse floodwaters. Motor vehicles and pedestrians can get swept up in flood currents, increasing the risk for drowning. Even in shallow waters, fast-moving currents can carry individuals or vehicles into deeper waters, where pressure from flowing water can prevent drivers from escaping submerged vehicles. As little as six inches of floodwater can move a vehicle, and as little as two inches can move a person. In addition, floodwaters often conceal conditions that are a danger to those on foot, including electrical wires, debris, nails, and open manholes hidden beneath the surface. In addition, roads and bridges can be weakened by flood impacts, making them unsafe for travel. Flood conditions necessitate warnings, such as flash flood warnings, road closure warnings, and flood advisories. Evacuations may be necessary, as was the case in both the 2020 and 2022 events in the county. Moving vehicles in advance of predicted heavy rainfall events was mentioned in a few of the public meetings.

⁵² The Centers for Disease Control and Prevention. (2020). Mold after a disaster. Retrieved April 11, 2023 from <https://www.cdc.gov/disasters/mold/>.

Although, this mitigates the risk of flood damage to the vehicles, it does highlight some concerns with public education and/or notification methods used to ensure residents evacuate when necessary.

Socially Vulnerable Populations

Floods have the potential to disproportionately impact socially vulnerable populations. Economically constrained households (homeowners and renters) may have trouble affording flood insurance premiums. In the event of a flood, these households have a diminished capacity to repair homes, remediate mold, and replace destroyed belongings. Further, economically constrained households may not be able to afford mitigative measures, such as structure elevation, backwater check valves or sump pumps. Individuals that do not have paid time off or are unable to work remotely (such as those in food service and hospitality) may attempt to traverse floodwaters to commute or may lose income in the event they cannot report to work due to a flood.

Certain populations may face difficulty evacuating during an extreme flood event, such as the elderly, disabled, or those who are otherwise mobility challenged. This may be particularly relevant to Tazewell County due to an aging population; approximately 22% of the county's population is 65 years or older, compared to 16% for the Commonwealth of Virginia.⁵³ Non-English speakers may also have difficulty understanding flood warnings and evacuation notices.

During public meetings, it was noted that several older individuals within the Blacksburg Street community were very concerned with the how quickly floodwaters can surround their neighborhood. Due to the location of the community and other contributing factors, the area is provided minimal warning when flooding events will occur. Some residents would require assistance from neighbors or family to safely evacuate. Many of the residents are fearful of a flooding event occurring at night and not being able to evacuate or get help evacuating before being stranded in their home.

Cascading Hazards

Flood events may lead to cascading hazards, or events where a primary hazard, such as extreme precipitation or flooding, results in subsequent hazard events. Extreme precipitation and flooding are known to trigger landslides, mudslides, and debris flows in Tazewell County. During a rainfall event, water fills the small pockets of air that naturally occur within soil, increasing the potential for a landslide. During a flooding event, flood waters can erode and, eventually, can undercut the base of the slope, carrying away a section of earth. With a portion of the slope base removed, the strength of the entire slope is now compromised, leaving it far more susceptible to a landslide.

As recently as February 2023 heavy rainfall led to a landslide event in southwestern Tazewell County. The incident, shown in Figure 646 and Figure 647, occurred near Tannersville, VA and caused State Route 91 to be reduced to one lane. The landslide caused significant damage to the roadway and no timeframe for getting the repairs completed was provided.

⁵³ United States Census Bureau. (2021). Tazewell County, Virginia. US Department of Commerce. Retrieved on March 10, from [Tazewell County, Virginia - Census Bureau Profile](#)



Figure 646: Landslide Event on Route 91, near Tannersville, VA



Figure 647: Damage from Landslide Event on Route 91

Furthermore, slopes with little or no vegetation as a result of mining operations, development, or a previous wildfire have elevated risk of landslides or mudslides.⁵⁴ Lands impacted by abandoned mines may also be more prone to slides.

Flood events may also lead to hazardous materials releases, when facilities containing hazardous materials, such as water/wastewater treatment facilities or industrial facilities, flood. This can cause

⁵⁴ Cumberland Plateau Planning District Commission. (2018). Hazard Mitigation Plan Update. Retrieved October 10, 2022 from <http://cppdc.org/Reports/Mitigation%20Plan%20Edit.pdf>.

environmental and public health emergencies, necessitating response, clean up, and/or evacuation measures.

Areas Prioritized for Risk Reduction

At the outset of this project, 12 initial flooding hotspots were identified as areas that had historically experienced severe flooding in the past. These initial hotspots guided planning team discussions and served as a starting point for the identifying problem areas throughout the county. These initial flooding hotspots are shown in Figure 648.

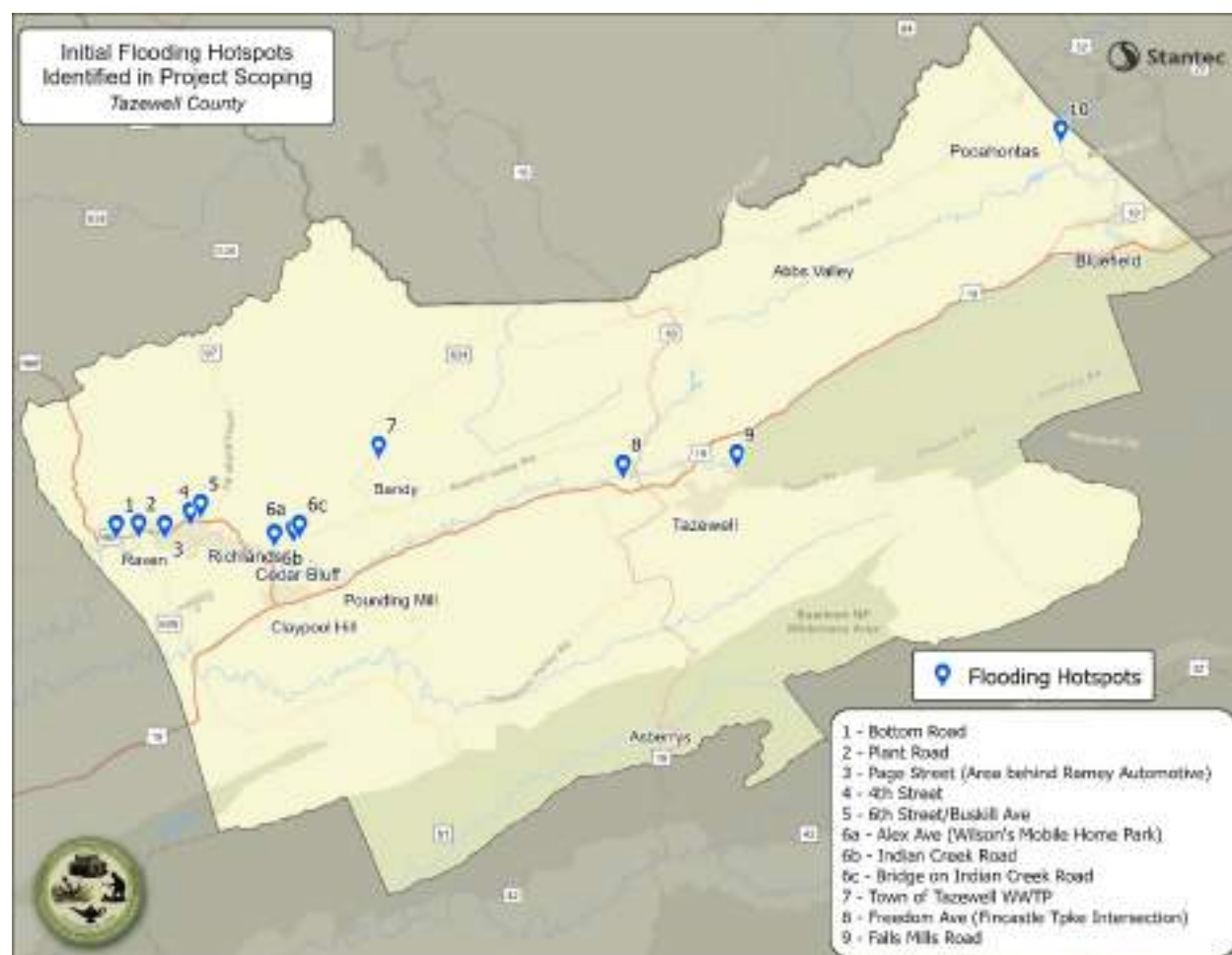


Figure 648: Initial Flooding Hotspots Identified in Project Scoping

Throughout the development of this risk assessment, the project planning team met several times to discuss flooding in locations across the county. The project planning team consisted of Tazewell County staff members from the Emergency Management and Engineering Departments and members of the Tazewell County Board of Supervisors, as well as members from municipalities throughout the county including the Town of Richlands, Town of Tazewell, and the Town of Bluefield. Project planning team members provided decades of experience and first-hand accounts flooding issues in Tazewell County.

In addition to conducting planning team meetings, 3 public meetings were held during the development of this Risk Assessment. The date and locations are listed here:

1. Town of Richlands Public Meeting, February 28, 2023
2. Town of Tazewell Public Meeting, March 23, 2023
3. Town of Bluefield Public Meeting, May 2, 2023

At each of these public meetings, the project planning team met with members of the public to discuss their concerns and collect information and data on previous flooding events. This included collecting more flooding hotspot information from members of the public, both to verify the 12 initial flooding hotspots identified but also to ensure the concerns of the public were considered when considering areas at risk and where to prioritize future risk reduction projects. In total, 86 flooding hotspots were identified throughout the development of the plan. A breakdown of each source is provided below in Table 614. The majority of these hotspots are located along the Clinch River from Raven to Cedar Bluff, near North Tazewell, in or near Bluefield, and in the Falls Mill area. The locations of the identified flooding hotspots are shown in Figure 649 – Figure 652.

Table 614: Identified Flooding Hotspots by Source

Flooding Hotspot Source	Total Number of Hotspots Identified
Initial Project Documentation	12
Planning Meetings / Planning Team	28
Public Meetings	46
Total	86

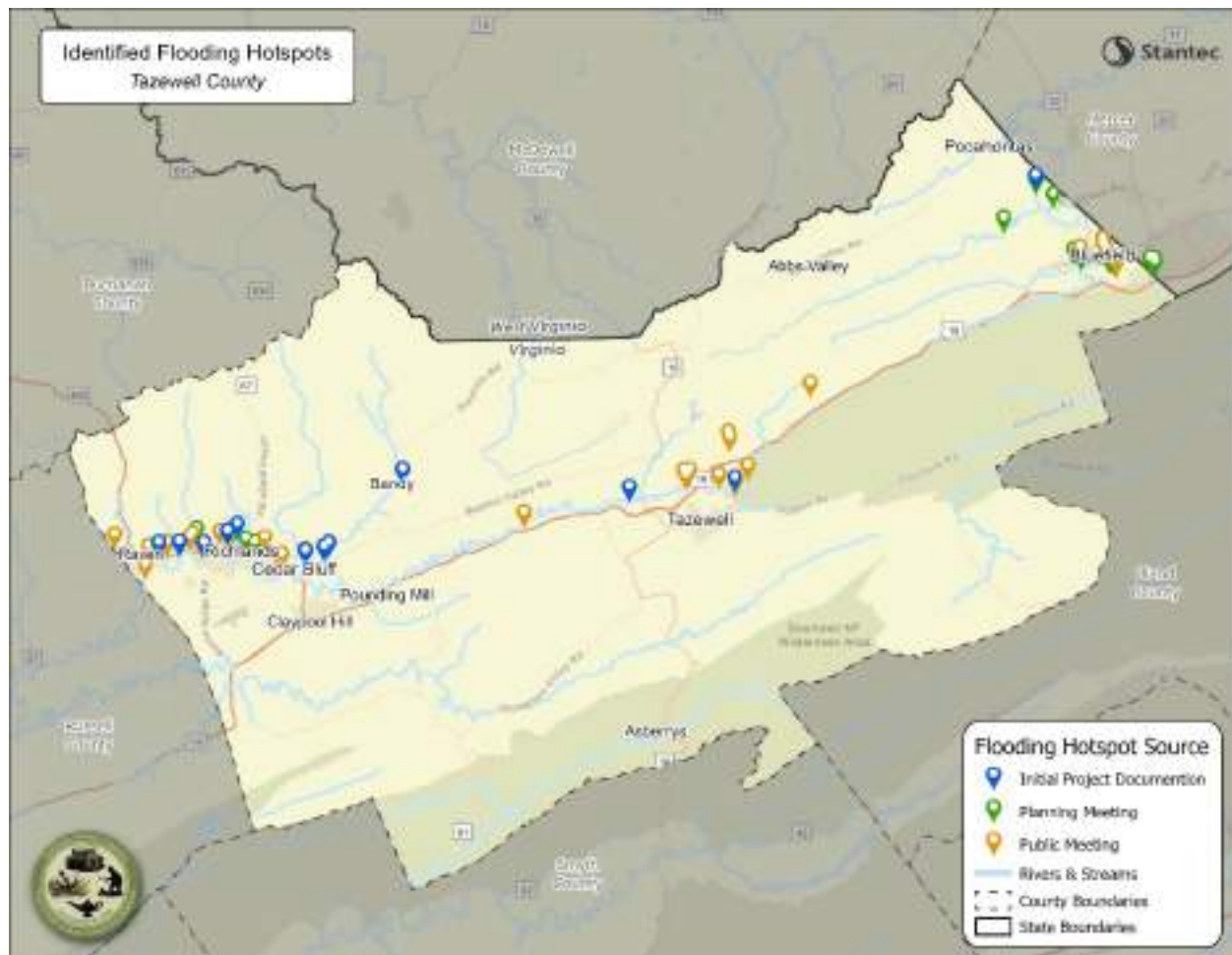


Figure 649: Identified Flooding Hotspots in Tazewell County by Source



Figure 650: Identified Flooding Hotspots - Western Tazewell County



Figure 651: Identified Flooding Hotspots - Central Tazewell County

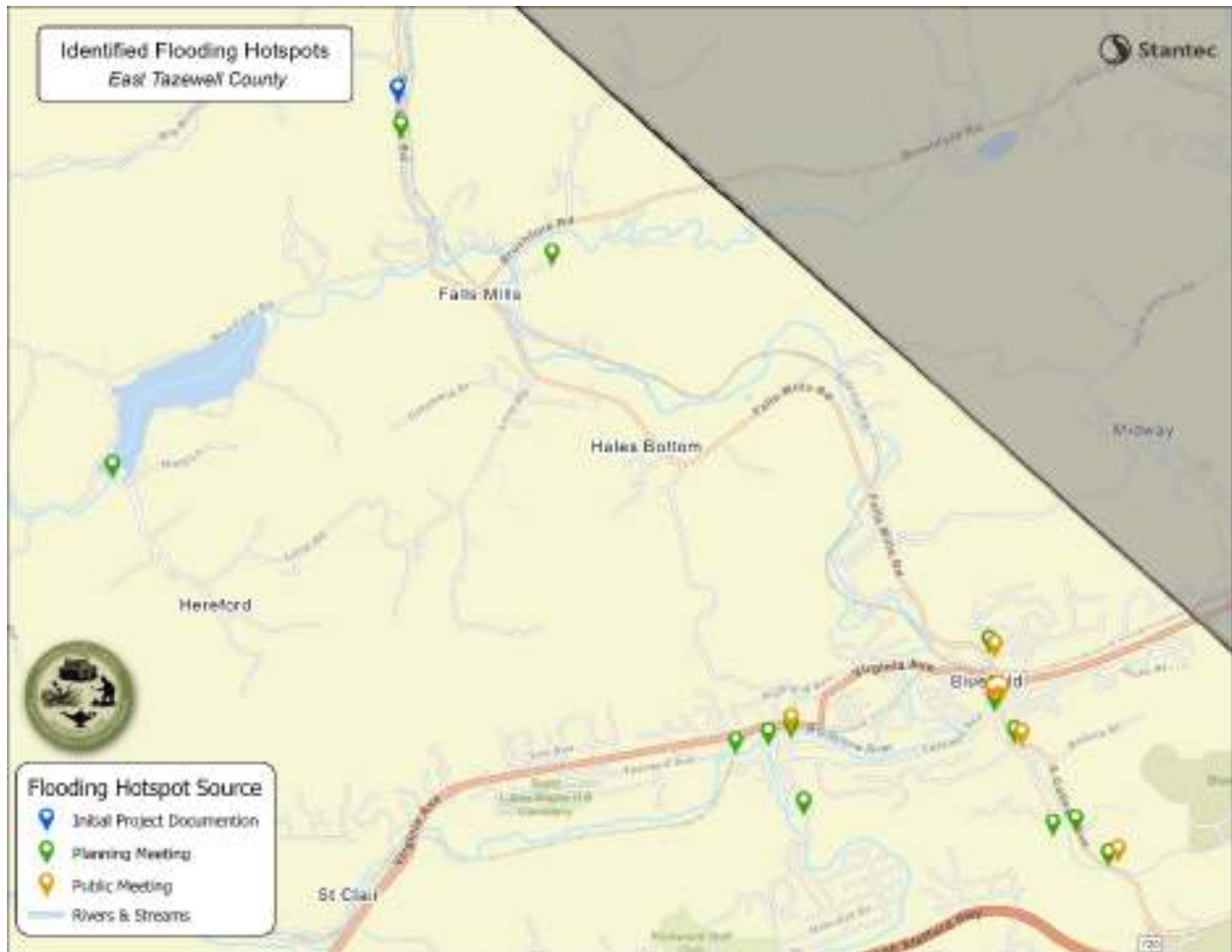


Figure 652: Identified Flooding Hotspots - Eastern Tazewell County

It is acknowledged that most developed areas of Tazewell County, especially low-lying areas adjacent to stream channels, are at risk to flooding. Areas that have not previously been impacted by a major event may be impacted in the future. However, a number of prioritized actions were identified in order to support implementation of risk reduction projects. The results of the flood hazard analysis and the impacts of flooding outlined above informed the flood risk reduction actions presented in *Section 7: Flood Risk Reduction Action Plan*. Areas prioritized for risk reduction were identified based on previous flood events, results from the flood hazard analysis, and input from the Tazewell County Planning Team and the public.

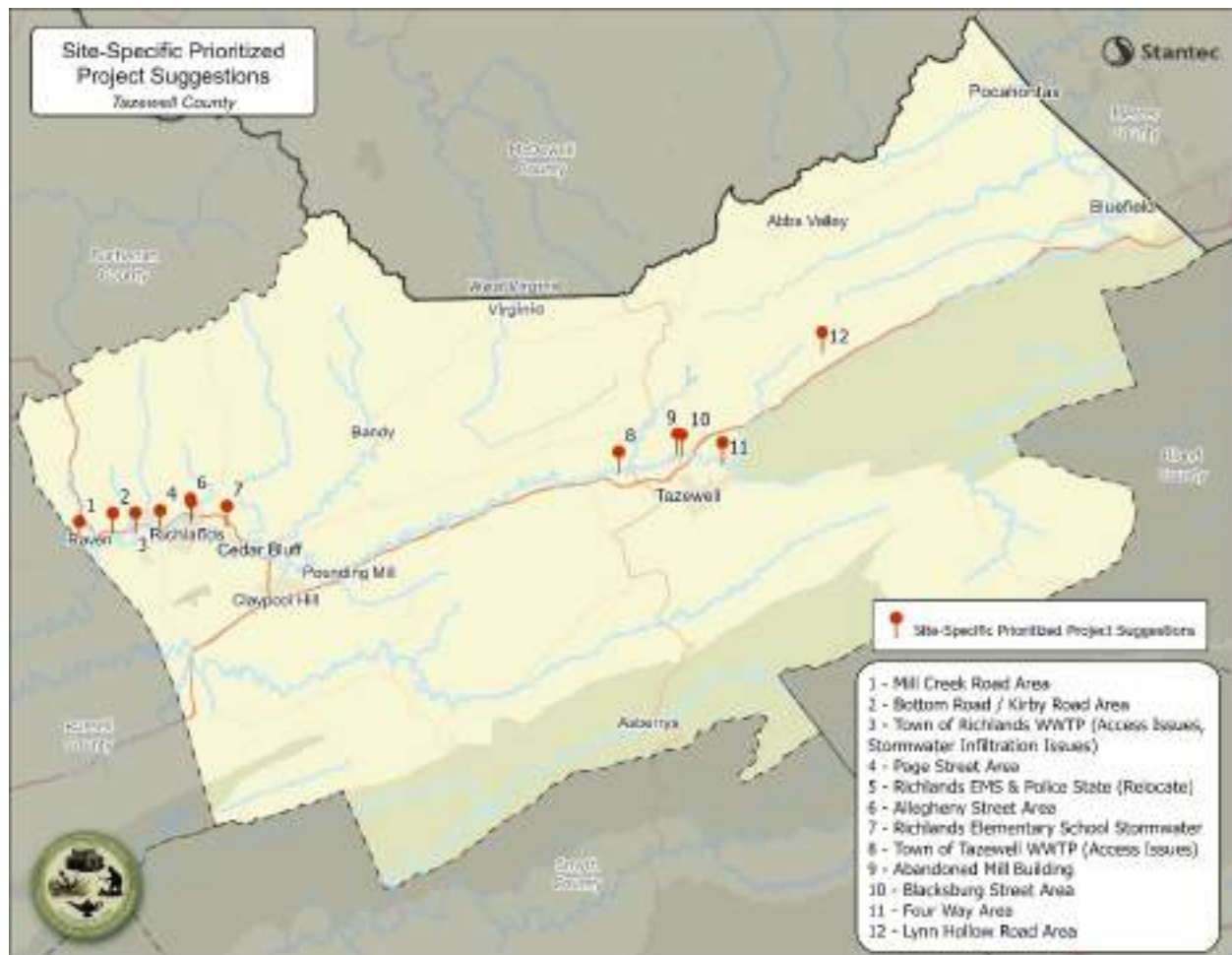


Figure 653: Site-Specific Prioritized Project Suggestions

7. Flood Risk Reduction Action Plan

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Introduction

Purpose

The Flood Risk Reduction Action Plan is a product of the input and analyses completed during the planning process. It is developed from stakeholder input, risk analysis, and capability and capacity assessment results, and is intended to guide the county in implementing actions to risk current and future flood risk. The purpose of the Flood Risk Reduction Action Plan is to provide Tazewell County with strategies to reduce the impact of flood hazards. It is designed to be targeted, strategic, and functional in nature:

- In being **targeted**, the action plan focuses on actions the County can take to reduce unique flood risks identified in the plan's risk assessment (Section 6) with consideration to the County's capabilities and capacity (Section 5) and previous or ongoing flood mitigation efforts.
- In being **strategic**, the action plan ensures that the actions are presented in a logical manner. Actions are designed to build off the capabilities gained by achieving a prior action. This structure aims to minimize potential roadblocks and improve the potential for successful implementation.
- In being **functional**, each prioritized action, when possible, is broken down into implementable steps. When available, funding sources are identified that may assist in project implementation.

Developing the Flood Risk Reduction Action Plan involves the identification, consideration, and analysis of available flood mitigation measures (i.e., activities, policies, projects, etc.) that will reduce flood risk within Tazewell County.

Action Categories

The flood risk mitigation actions represent a variety of projects that can be implemented to reduce flood risk for Tazewell County. The actions can vary including programs, infrastructure, public education, policies, emergency planning, and studies.

When implementing infrastructure projects, there is typically a project lifecycle that is followed from the identification of the problem to the implementation of the project intended to address the problem. First, the **problem is identified** in a community. Next, the **planning** phase is taken on to understand the scope of the problem, identify preliminary solutions, identify stakeholders for engagement, and start procuring funding. After the planning phase, further studies are often needed to understand the potential impacts of the proposed solutions such as flood **modeling** or further **analysis** by an engineer. This step in the lifecycle is key to understanding whether identified solutions are expected to have the desired impact, and to understand potential unintended consequences of projects aimed at reducing risk. For larger projects, a **feasibility** study may need to be completed to confirm the conditions are correct for the implementation of the solution. Often, this is when project alternatives may be studied and compared, or when a project benefit-cost analysis is performed. Once the further analysis or a feasibility study confirms a preferred solution, an engineer can **design** the solution and obtain necessary permits to implement the solution. Following the design phase, a contractor can be hired to **construct** and implement the solution. Finally, the solution will need to be **maintained** and **monitored** to ensure it

is functioning at full capacity and is solving the identified problem. The project lifecycle is shown in **Figure 71**.

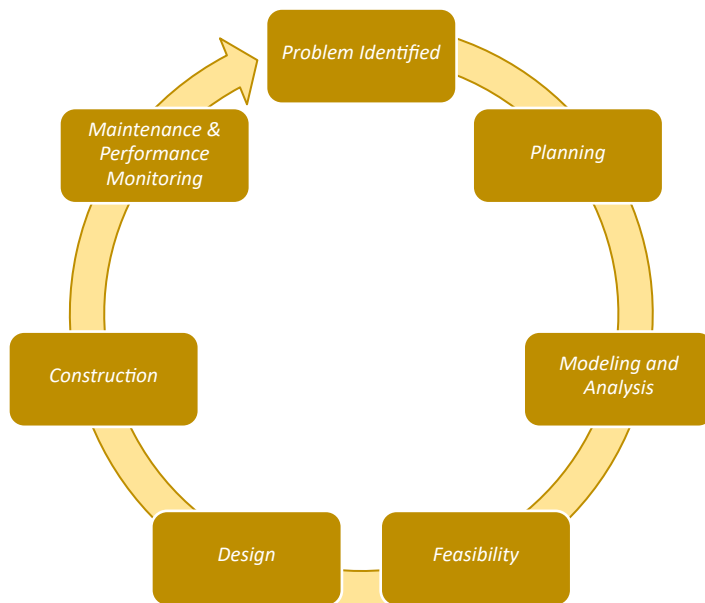


Figure 71: Infrastructure Project Lifecycle

Throughout the planning process, flood risk mitigation actions were identified to reduce flood risk in Tazewell County. The actions are broken into four categories depending on the current progression of the action through the project lifecycle. Each action is intended to go through the entire project lifecycle to reach implementation; however, some require more initial planning and modeling/analysis to better guide implementation. Planning and modeling/analysis help inform implementation by ensuring the correct problem is being solved, the solution is feasible, and the selected solution will have the anticipated benefits. Some actions are needed on an ongoing basis or at many locations throughout the County. These actions have been summarized into programmatic actions to expedite the project lifecycle for each implementation and/or provide the administrative support needed to implement flood mitigation actions. The four categories are described in **Figure 72**.

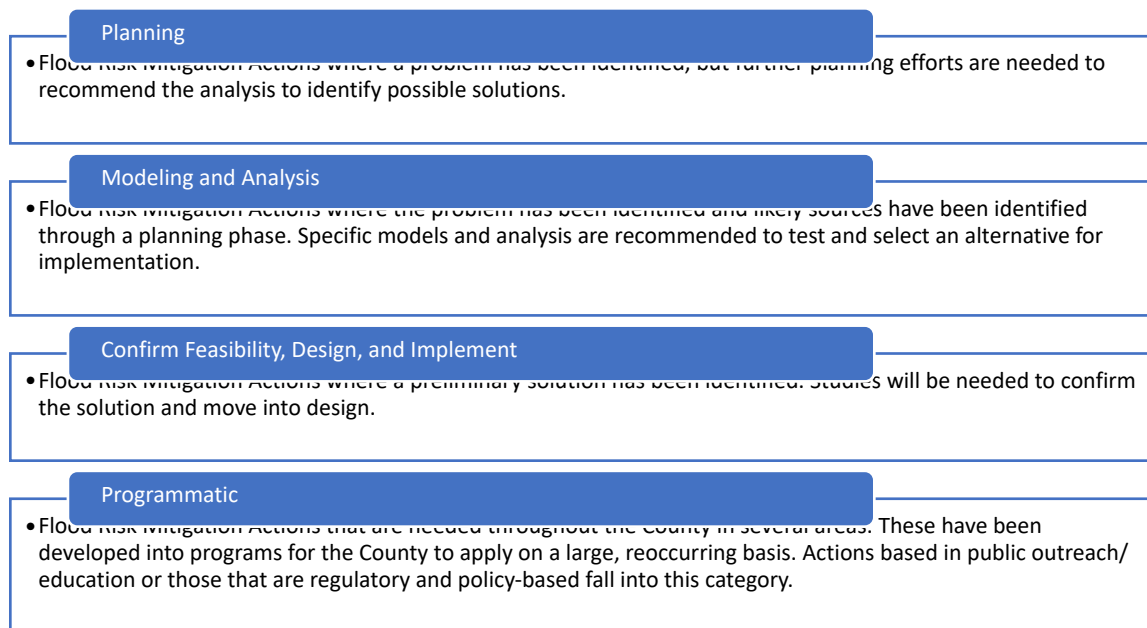


Figure 72: Flood Risk Mitigation Action Categories

Flood Risk Mitigation Actions

Overall, 16 Flood Risk Mitigation Actions were identified for Tazewell County. The actions are summarized by category in **Table 71**.

Table 71: Tazewell County Flood Risk Mitigation Actions

Category	#	Flood Mitigation Action	Priority Actions
Planning	1	Wastewater Treatment System Access Issues	-
	2	Richlands Fire-Rescue Station 3 – Claypool Hill	-
	3	Bottom Road Area Evacuation Plan	Yes
	4	Emergency Communications System	-
Modeling and Analysis	5	Intersection and Roadway Flooding	-
	6	Assess Flood Risk Reduction Options for Blacksburg Street Community	Yes
	7	Inflow and Infiltration of Stormwater into Wastewater System	-
	8	Lynn Hollow Road Flood Mitigation	-
	9	2D BLE Modeling	Yes
Confirm Feasibility, Design, and Implement	10	Removal of Abandoned Mill Building and Associated Dam	Yes
	11	Richlands EMS and Police Station Relocation	Yes
	12	Richlands Elementary School Stormwater	Yes
Programmatic Actions	13	Beaver Management Program	-
	14	Routine Debris and Sediment Removal Program	Yes
	15	Develop Emergency Debris Management Program	Yes
	16	Acquire Undeveloped Parcels	-
	17	Acquire Developed Parcels	-
	18	Participate in Community Rating System (CRS)	-

In the following sections, each action is described in detail including a:

- problem description;
- project lead;
- action description;
- steps for implementation; and,
- potential funding sources.

Several actions were designated as priority actions which should be implemented as soon as possible. Priority actions were selected based on feedback from the community, potential for risk reduction, protection of critical facilities, life safety, and equity. When possible, an estimated time to complete and estimated costs were provided. **All costs provided in this plan are high level planning**

cost estimates. Costs were estimated based on the previous experience of subject matter experts; however, costs are likely to change depending on each unique scenario. Throughout the project lifecycle, costs should be verified with an engineer to ensure proper funding is obtained. Potential funding sources are described in further detail in **Appendix A – Funding Matrix**. It should be noted that grants often change requirements, funding cycles, and processes. All grant information should be verified with the provider before pursuing the grant. Additionally, new grants are frequently announced. The County should continue to look for grants outside of the opportunities included in this plan for flood risk mitigation.

Planning

Two Flood Risk Mitigation Actions have been identified in the Planning Category. These actions have problems that have been identified but require additional planning activities to better understand the scope of the problem, community goals, and possible solutions for further study. Identified costs, estimated time to complete, and funding sources are very high level given these actions being early in the project lifecycle.

Wastewater Treatment System Access Issues

Problem Description

The access points to both the Town of Richlands Wastewater Treatment Plant (WWTP) and the Town of Tazewell WWTP are within flood hazard areas (floodway and 1% annual chance). The planning team has noted during flooding events that staff cannot reach the WWTPs. During the 2020 floods, Richlands WWTP staff used boats to access the WWTP. The road leading to the bridge to access the Tazewell WWTP also floods, preventing access. The County reports that the WWTPs do not get flooded, but access is fully blocked. The Richlands WWTP Plant has a levee surrounding the plant. The WWTPs are shown in **Figure 73** and **Figure 74**.

Figures of Problem Area

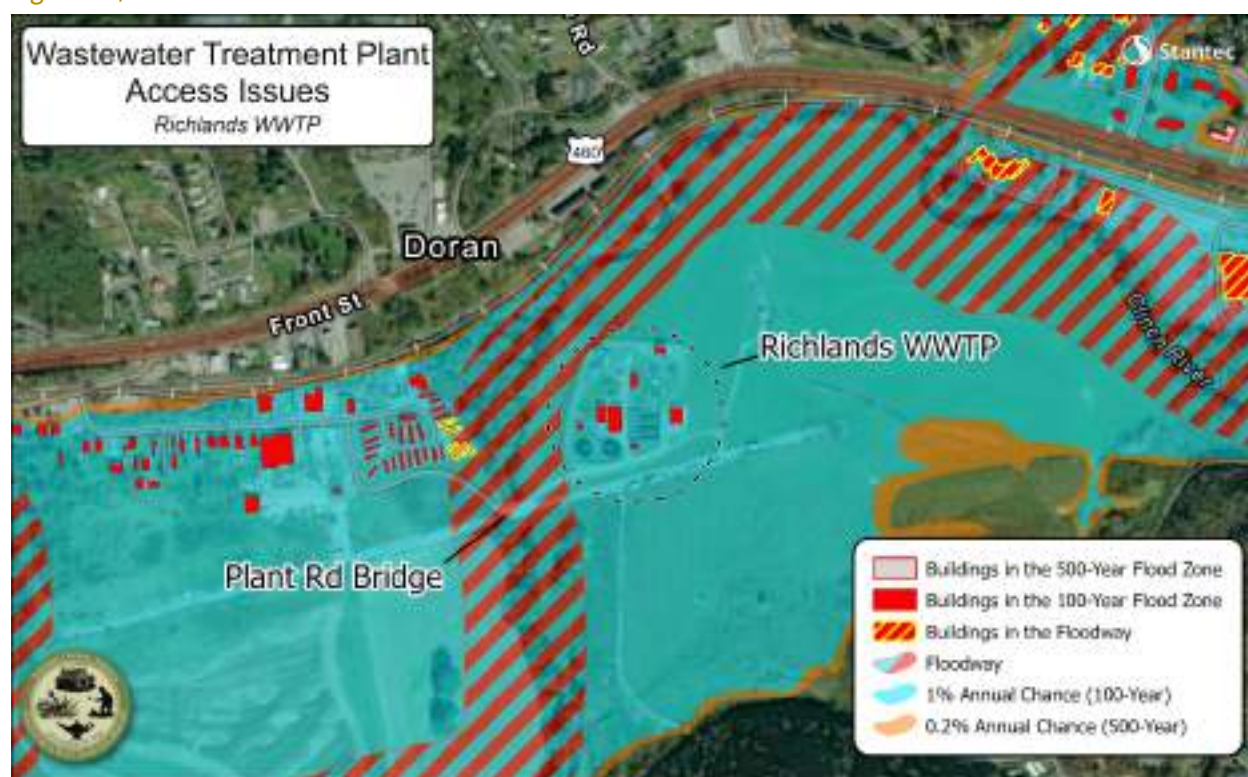


Figure 73: Richlands Wastewater Treatment Plant

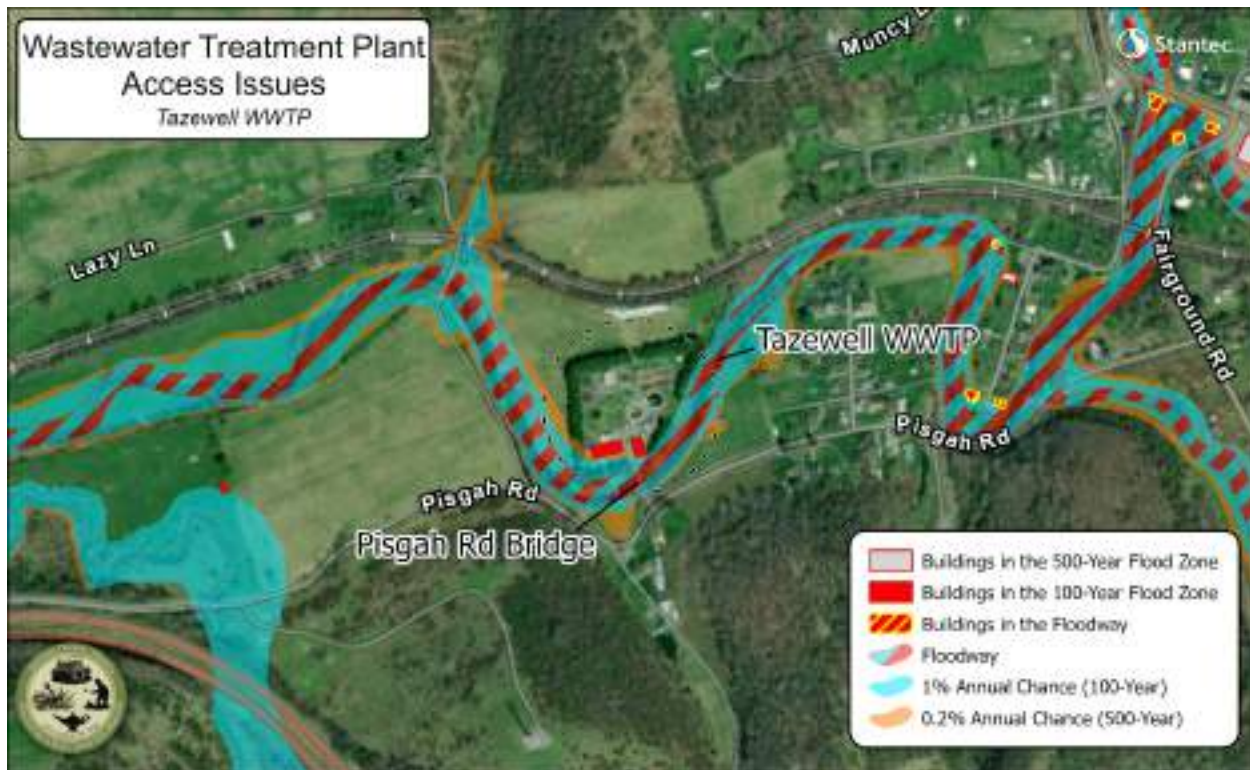


Figure 74: Tazewell Wastewater Treatment Plant

Project Type

Planning

Total Estimated Cost

Dependent on the Selected Solution

Estimated Time to Complete

5+ years

Project Lead

Town of Richlands, Town of Tazewell

Action Description

Access to the Richlands WWTP and Tazewell WWTP is a complex issue given the location of the WWTPs along the river. A series of actions will be needed to help improve access in the near term, mid-range, and long term. The U.S. Army Corps of Engineers is performing some flood modeling and surveying in Richlands. Mitigation efforts for the Richlands WWTP should utilize the modeling and survey from the U.S. Army Corps of Engineers for reference. In the near term, steps should be taken to minimize the need for personnel on site during flood events. When staff must be on site, there should be clear safety protocols.

The mid-range goal is to perform additional analysis for projects to improve access through actions such as raising roads and constructing bridges. Projects should be implemented based on the results of the analysis and a Benefit Cost Analysis (BCA) compared to relocation. A Base Level Engineering (BLE) with

2D hydrology model coupled with a stormwater infrastructure hydraulic model may be beneficial to understand the flooding and see the impacts of proposed solutions.

The long-term goal to minimize risk is to relocate the plants. While relocation may be a difficult task, when making investments in the plants and as technology progresses it should be considered. Studies may need to be performed when upgrading the plants to understand the value of investing in plants within high-risk areas or relocating the plants outside of flood hazard areas. Studies will need to be performed such as a hydraulic model to understand the implications of moving the site and a study to identify the best location for the WWTP. At their current locations, both plants are gravity-based systems. Relocating the plants will likely involve installing pumps to maintain the plants at higher elevations. These projects may be grouped together or pursued separately by each Town and/or by solution. As the long-term options are pursued, another option for project delivery is Design-Build-Operate (DBO). With DBO, there is a public-private partnership where the private entity designs, constructs, and operates the facility while the municipality retains ownership. The benefits include reduced capital and maintenance cost, more advanced equipment, shortened delivery schedules, performance guarantees, and less contracting.¹

¹ “Design-Build-Operate Gains Popularity in U.S. Market”, Water World, [Design-Build-Operate Gains Popularity in U.S. Market | WaterWorld](#)

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Study Plant Operations - In the near term , operations should be studied to improve access to both plants. Town Staff should engage WWTP operators and staff. If the Richlands WWTP plant is going to continue to use boats to access the plant during flooding, procedures should be formalized to ensure the safety of staff. Operating tools such as SCADA with backup power should be reviewed to minimize the need for staff to be at the plant during floods. Additionally, safety	0-5 years	Town Staff Time	<ul style="list-style-type: none"> Town Operating Funds CFPF
2	Access Improvements - The mid-range goal is to perform additional analysis on access improvements to both plants and implement if warranted. For the Richlands WWTP, alternatives could include a bridge across Governor George C. Peery Highway to the northside of the treatment plant or raising sections of Route 613, Plant Road, and Clinch River Road. For the Tazewell WWTP, alternatives could include raising the bridge or providing a secondary access on the northside of the plant. For both plants, the analysis should include a BCA and include considerations for railroad permitting, environmental permitting, and changing climate conditions. Throughout this process,	5-15 years	Dependent on Selected Solution	<ul style="list-style-type: none"> Area Development Program Local Access Road Program PROTECT CFPF BRIC HMGP
3	Facility Relocation - A long-term goal could explore the relocation of one or both facilities as they age out and reach the end of their lifecycles. For the Richlands WWTP, the entire facility and most of the access roads are within the 100-year floodplain. For the Tazewell WWTP, the access bridge is aging, and parts of the treatment plant lie within flood hazard areas. As flows are projected to increase, flooding will also likely increase. Over time, flood impacts to the WWTPs should be documented to aid in decision-making in terms of facility upgrades and/or potential relocation. As equipment ages towards replacement, the Town should study and consider options for relocation. BCA's can be performed to assist with the decision-making process. Studies will need to be performed such as a	15 + years		<ul style="list-style-type: none"> Area Development Program CFPF BRIC WIFIA Loan CBDG VCWRLF HMGP

Funding Sources

See Table

Figure of Action

N/A

Richlands Fire-Rescue Station 3 – Claypool Hill

Problem Description

The County reports that the Richlands Fire-Rescue Station 3 on Honey Rock Road floods frequently from stormwater. The County believes there are several causes of the flooding including landowners piping water off their properties onto the road and undersized drainage pipes in the area. The County notes that most stormwater pipes are eight to twelve inches underneath the road and that they exceed capacity. The road slopes towards the fire department, and so does the excess stormwater. In addition, Honey Rock Road sits in a valley with stormwater runoff flowing from the surrounding higher elevations. The area includes several businesses and a cemetery which increase the amount of impermeable surface. The front of the fire station is shown in **Figure 75**, its location is shown in **Figure 76**, and the surrounding terrain is shown in **Figure 77**.

Figures of Problem Area



Figure 75: Richlands Fire-Rescue Station 3



Figure 76: Fire station location

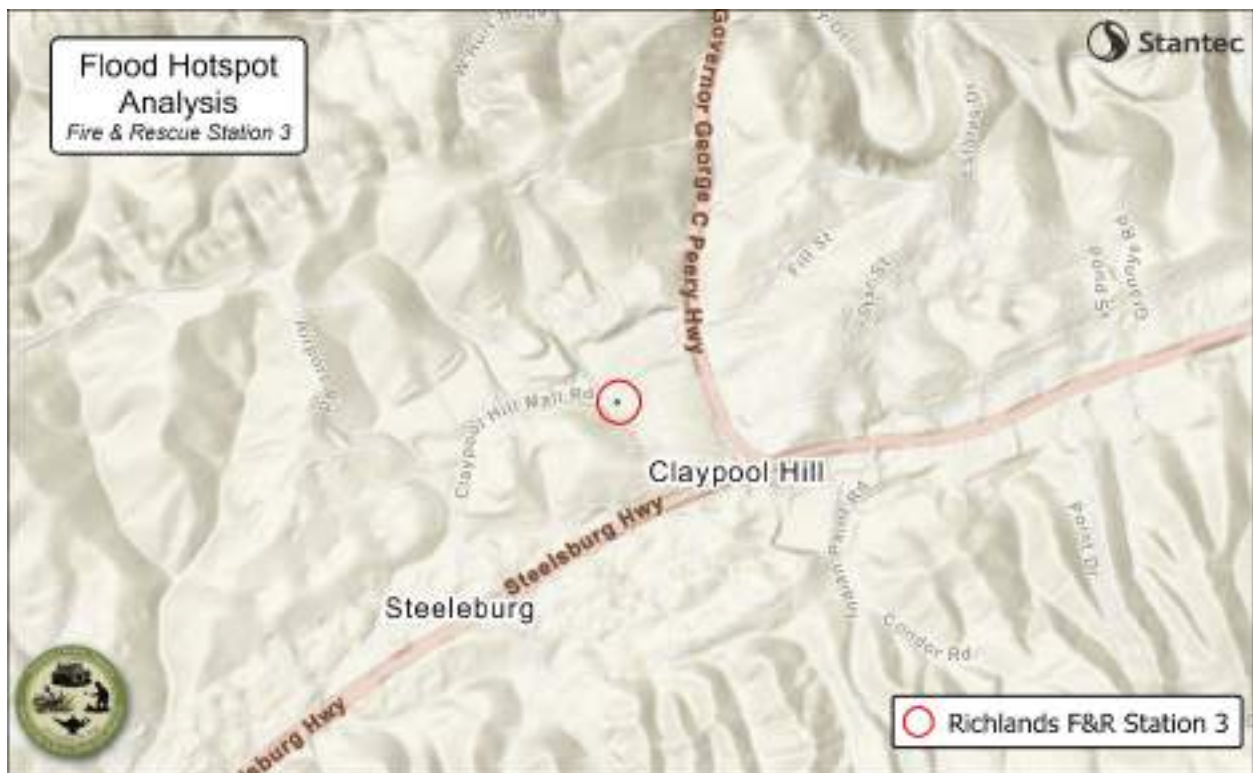


Figure 77: Terrain surrounding Honeyrock Road

Project Type

Planning

Total Estimated Cost

Dependent on Solution

Estimated Time to Complete

1 - 3 years

Project Lead

Town of Richlands

Action Description

Additional planning and preliminary engineering activities are needed to better understand the cause of the flooding issues before investing in potential solutions. Based on the results of the additional planning and preliminary engineering, the Town can select solutions to move towards implementation. Potential solutions may involve stormwater infrastructure improvements, policy changes and enforcement, acquisition, or retention. For example, stormwater being pumped from properties onto the roadway may be in violation of local ordinances. Depending on the existing stormwater infrastructure along Honeyrock Road, installing retention-based solutions or increasing capacity may be expensive due to stormwater modeling, alternative selection, design, property acquisition, and construction. The most cost-effective solution may be the relocation of the fire station.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Baseline and Initial Conditions Review –Hire a consultant engineer to perform an initial assessment of the flooding issues and provide all available information about the infrastructure in the area including: as-builts of any stormwater infrastructure, as-builts of the fire station, photos from previous events, and existing hydraulic models of the area. The engineer will review the existing data, perform a site visit to provide an initial assessment of the	2 months	Dependent on Selected Solution	County Operating Funds
2	Pursue Funding – Based on the engineer’s recommendations, the next step is for the Town to pursue funds for further study, policy development, policy enforcement, additional data collection, or relocation. If a stormwater-based solution is selected, the County should			
3	Preliminary Hydrologic Study - A stormwater engineer will perform a preliminary hydrologic study to identify a target reduction volume for the improvements. For the study, additional surveys and/or soil assessments may be	1 - 2 months		<ul style="list-style-type: none"> • SLAF • CFPF
4	Alternative Review - Based on the identified target reduction volume and flow study, a stormwater engineer will identify three alternatives to reach the target reduction volume. The engineer will assess the viability of each option and provide a comparison of the	2 months		
5	Design - After a preferred alternative is selected, the stormwater engineer will design the identified solution. Additional surveys or data may be needed to complete the design. Completed plans will allow the responsible	3-4 months		
6	Permitting – Depending on the solution selected, permits may be required to construct the stormwater improvements. These may include, but are not limited to environmental permits, land disturbance permits, and land use permits. There may be fees associated with the	6 months		
7	Construction - The selected contractor will build the selected solution based on the design.	1-2 years		

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
8	Maintenance - Depending on the selected and constructed solution, routine maintenance may be needed. A maintenance plan should be made including maintenance frequency, actions	Annually		

Funding Sources

See table

Figure of Action

N/A

Bottom Road Area Evacuation Plan

PRIORITY ACTION

Problem Description

The Bottom Road Area in Raven/Doran has been one of the areas most impacted in Tazewell County by recent floods. During the 2020 floods, both homes and infrastructure were impacted by flooding. Bottom Road is shown in **Figure 78**. The area is a peninsula surrounded by the Clinch River and is one of the more densely populated areas in the County given its flat topography. Within the area, there are a large number of residents living in proximity to the river or within the floodplain. The main access point to the area is a VDOT bridge across the Clinch River on Bottom Road that is subjected to frequent flooding. During the 2020 floods, the National Guard performed rescues in the area, as shown in **Figure 79**. Following the 2020 floods, VDOT rehabilitated the bridge due to concerns of the bridge washing out. Additionally, Raven Road flooded during 2020 which is the road used to access the bridge as shown in **Figure 710**. When the bridge is not accessible, the only other access points to the area are an unpaved road or Daw Road, which is a narrow two-lane road approximately twice the distance to Richlands. While there are flood risk mitigation actions proposed to help minimize flooding in the area, there is also a need for an evacuation plan given the number of flooding issues, high population in the area, and access issues.

Figures of Problem Area



Figure 78: Bottom Road/ Kirby Road during the February 6, 2020 flood (Source: Donna Whittington)



Figure 79: National Guard during 2020 floods (Source: Donna Whittington)



Figure 710: Raven Road during 2020 Floods (Source: Donna Whittington)

Project Type

Planning

Total Estimated Cost

\$50,000 - \$150,000

Estimated Time to Complete

0 – 1 year

Project Lead

Tazewell County

Action Description

While long-term solutions are identified in the Bottom Road Area, emergency procedures need to be in place to minimize flood risk given the large number residents isolated in the area. An evacuation plan should be developed to communicate flood risk to residents, relocate residents to a safe location, and identify potential access points during flood events. Given the history of flooding of the roads leading to the Bottom Road Area, residents should be encouraged to evacuate prior to a flooding event. **The goal**

should be to evacuate residents prior to the event rather than trying to relocate them during or post-event. There should be a clear communication plan to alert residents when to evacuate and metrics to guide the decision to evacuate. The evacuation will require the coordination of several government agencies at the state, local, and county levels such as local emergency services, State Highway Patrol, and County Emergency Management. Residents should be relocated to areas outside of the floodplain until access is restored to the area.

Accessibility must remain at the forefront during the development of the plan. For example, some residents may not own cars, do not drive, may have to transport medical equipment, may have to transport children, and need to relocate pets or animals. Additionally, residents may be concerned about leaving their property behind during the flood or being unable to actively respond to flooding of their homes. As a part of the evacuation plan, resident education materials and checklists should be developed to include items to bring when evacuating, how to minimize personal property / home damage prior to flood events, and flood risk communication. The evacuation plan should be coordinated with the *Emergency Communications System* flood risk mitigation action. The proposed area to be included in the evacuation plan is shown in **Figure 711**.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Staffing – If County or Town staff do not have the capacity or expertise, a consultant planner should be hired to prepare the evacuation plan.		Staff Time	Operating Funds
2	Review Existing Documents and Capabilities – Review existing documents and procedures for emergency operations and evacuations. When procedures are not written down, staff may need to be interviewed. Additionally, perform an	1-2 Months	\$50,000-\$150,000	<ul style="list-style-type: none"> • Homeland Security Grant Program • Emergency Management Performance Grants
3	Review Existing Transportation Conditions and Shelter Locations – Review the existing transportation network to identify potential evacuation routes, traffic control features, flooding	1-2 Months		
4	Community Engagement – The community should be engaged to understand issues with evacuating, previous access issues during floods, concerns with evacuation, and needs during evacuation. An emphasis should be placed on understanding	2-3 Months		
5	Develop Evacuation Plan – Based on the identified community needs, an evacuation plan should be developed. Throughout the process stakeholders and the community should be engaged. The contents of the plan will vary depending on identified needs but should include evacuation phases, evacuation routes, decision tree for evacuation, evacuation shelters, communication procedures, personnel roles, and reentry conditions. The plan should also include checklists and guidance for residents evacuating on items to	2-3 Months		

Funding Sources

See table

Figure of Action

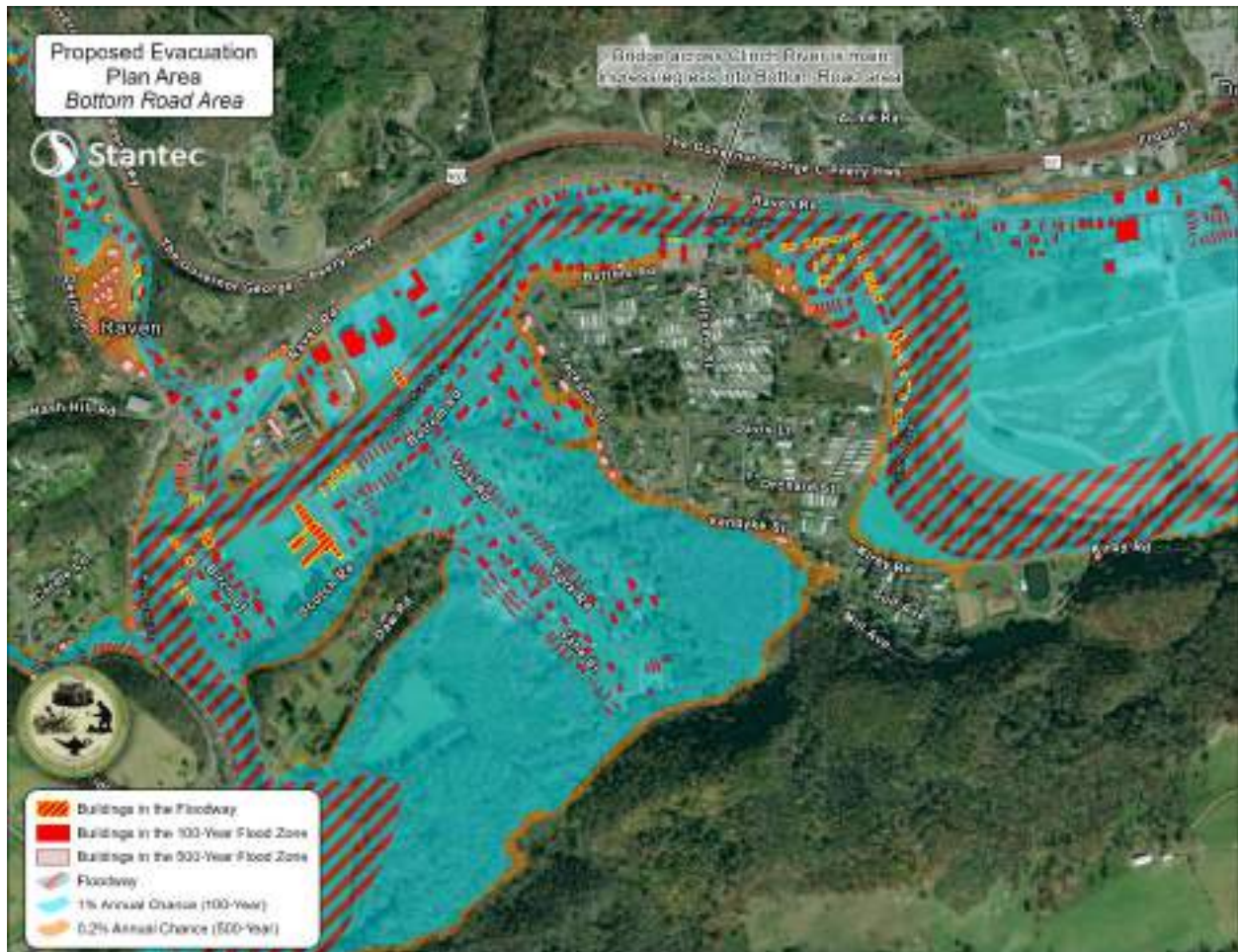


Figure 711: Proposed Evacuation Plan Area

Emergency Communications System

Problem Description

Given the frequency and severity of flooding events in Tazewell County, it is important for emergency services to be able to communicate with residents during flooding events to provide situational updates and emergency notifications. Tazewell County has a Reverse 9-1-1 system, but County staff noted the system is aging and does not allow for certain targeted communications. The County wants to be able to send geographically targeted messages in case of evacuation. Additionally, the County would like to leverage more advanced systems that connect with other technologies such as flood sensors.

The schools throughout Tazewell County must coordinate with students and parents during floods and heavy rain events. Specifically, the Richlands schools have routinely had issues with bus stops being blocked by flooding. When the bus must reroute, school staff must call each parent individually to inform

them of the new bus stop. The Planning Team would like the emergency communications system to also be able to send targeted messages to parents to coordinate during flooding events.

Figures of Problem Area

N/A

Project Type

Planning

Total Estimated Cost

Dependent on Solution

Estimated Time to Complete

1 - 3 years

Project Lead

Tazewell County

Action Description

The County should procure a new emergency communications system to improve communications during flood events. As the existing system ages and needs replacement, a new system can give the county expanded capabilities to better communicate with residents. When upgrading the equipment, the County should coordinate with the Virginia Department of Emergency Management (VDEM) as well as engage residents to understand existing limitations and the best methods to reach the community. The County may be able to leverage state capabilities such as Wireless Emergency Alerts (WEA) sent directly to cellphones.

There are numerous emergency communications vendors and systems available to purchase. The County may consider working with a consultant to help identify the best fit for the County's needs before procuring the system. For any technology procured, standard operating procedures (SOPs) should be developed to detail how the system will be utilized during an event. The communications system can be paired with technology such as flood sensors strategically placed throughout the County. The sensors can alert the system operators of water levels, notifying them to push alerts to residents. Systems can also be purchased that allow for the creation of groups which will allow the school to send alerts to parents regarding bus stop relocation. The communications system should be included in the Bottom Road Area Evacuation Plan. It is recommended to establish the communications system prior to the Evacuation Plan so it can be included in the plan.

Emergency communications systems may contain features such as:

- Sending alerts to all cell phones in the area at risk using approved WEA channels.
- Allowing for groups to be set up to send targeted messages.
- Allowing for messages to be sent to individuals in a drawn geographic zone.
- Two-way communication between officials and residents.
- Sending prerecorded messages and text messages to improve response time.
- Connecting with flood sensors to recommend when alerts should be sent.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Identify Communication Needs – Based on previous experiences, the County should identify features needed by the system. The County may request information from vendors to identify potential features of different	1 – 3 Months	\$50,000-\$75,000	<ul style="list-style-type: none">• BRIC• Homeland Security Grant Program• Emergency Management Performance Grants• Section 165 of the Water Resources Development Act of 2020
2	Stakeholder and Public Engagement – The County should meet with stakeholders such as emergency services and the public to understand needs for the communication system. The County should gain an understanding of the communication methods	6-12 Months		
3	Develop System Requirements and Use Cases – Develop and document system requirements needed by the County and potential use cases for deployment. The requirements and use			
4	System Procurement – Issue a Request for Proposals (RFP) utilizing the system requirements and use cases. Applicants should demonstrate that the system can meet the requirements and integrate with the County’s		Dependent on Selected Solution	
5	Develop SOPs – After selecting a system, the County should develop Standard Operating Procedures (SOPs) to guide the use of the system during emergencies. The SOP will describe the responsibilities of staff utilizing the system, establish procedures for implementing the system, and define cases when the system	6-12 Month	\$50,000 - \$100,000	
6	System Implementation – After developing and training staff on the SOPs, the system can be implemented. Public engagement and education will be needed to share the system and expectations with the public. For some	6-12 Months	Dependent on Selected Solution	
7	Maintenance – The system and SOPs should be tested frequently to ensure the system is ready for an emergency. Depending on the infrastructure associated with the system,	Ongoing	Dependent on Selected Solution	County Operation Funds

Funding Sources

See table

Figure of Action

N/A

Modeling and Analysis

Five Flood Risk Mitigation Actions have been identified in the Modeling and Analysis Category. These actions have problems and potential sources that have been identified but require modeling / analysis to select an alternative for implementation.

Intersection and Roadway Flooding

Problem Description

Throughout the County, there are multiple intersections and roadways that flood consistently creating unsafe access issues. In some cases, access to properties is completely blocked which creates a dangerous scenario especially when first responders are unable to access large areas. Additionally, many roads throughout the county serve as the singular ingress/egress point into large residential areas and businesses. When these roads get blocked, citizens can become stranded or may drive through unsafe road conditions. Approximately six inches of water can cause loss of control and possible stalling for most passenger cars.² A foot of water can float most vehicles and two feet of rushing water can carry away most vehicles.

Throughout the plan, the community has reported several roads and intersections that flood consistently. While some of the locations are a part of separate actions included in the plan, there were many other locations that flood frequently. The identified locations (not covered by other actions) are shown in **Table 72**.

Table 72: Intersection and roadway flooding hotspots Tazewell County

Cedar Bluff	Richlands	Bluefield
<ul style="list-style-type: none">• Daw Road• Indian Drive• Wildwood Drive• Bandy Road	<ul style="list-style-type: none">• East First Street• Allegheny Street Area (Including Fourth Street and Third Street)• Patton Street• 6th Street / Buskill Avenue• Hillcreek Road• Oriole Street at Eagle Street	<ul style="list-style-type: none">• Yards Road at Waterbury Road• Falls Mills Road• Adams Drive• Walton Street• Dudley Street / Montrose Street Area• Mobile Estates at Hockman Pike• Morton Street at Thayer Street• Spring Street at College Avenue• Stockton Street at S College Avenue• Leatherwood Lane
Tazewell	Pocahontas	North Tazewell
<ul style="list-style-type: none">• Chochran Hollow Road at Taylors Mill Road	<ul style="list-style-type: none">• Water Street• Shop Hollow Road	<ul style="list-style-type: none">• Fincastle Turnpike at Freedom Avenue (Fourway Area)• Lake Witten Road

In particular, the Town of Bluefield has reported several priority intersections and several streets in the downtown area that flood frequently. Bluefield Emergency Services has detailed several priority areas that cause routine issues and safety concerns. The priority areas are summarized in **Table 73**.

² “Turn Around, Don’t Drown!”, National Weather Service, [Turn Around Don't Drown \(weather.gov\)](https://www.weather.gov/turn-around-dont-drown)

Table 73: Priority flooding hotspots Bluefield

Location	Problem Description
Dudley Street / Montrose Street Area	The area frequently floods with heavy rain events. Residents report moving their cars to higher elevations before predicted heavy rain events. The fire department has performed swift water rescues in this area. Flooding of the Dudley Street/ Montrose Street Area is shown in Figure 712 .
Mobile Estates at Hockman Pike	The intersection gets frequently flooded. It is the only ingress/ egress into Mobile Estates. Despite putting up signage during floods, people still frequently drive through unsafe conditions because it is the sole access point.
N College Avenue at Thayer Street	The intersection and approaches flood during heavy rain events. The flooding blocks the access to the Bluefield Fire Department. Flooding has also caused some of the pavement to break away. Flooding from the May 29, 2023 flood impacting the fire station access is shown in Figure 713 and Figure 714 .
Downtown Bluefield	S College Avenue is the main road through Bluefield and runs alongside Beaverpond Creek in Downtown Bluefield. The road frequently floods blocking access to downtown Bluefield. In May 2023, College Avenue flooded which blocked the main route through town including the main route for emergency personnel. Spring Street has open channels that routinely flood and overtop the road. Many businesses are along the channel and are impacted by the flooding. Photos from the May 29, 2023 flood are shown in Figure 715 and Figure 716 .

Figures of Problem Area



Figure 712: Dudley Steet / Montrose Street area flooding



Figure 713: Flooding blocking access to the Bluefield Fire Department- May 29, 2023



Figure 714: Flooding outside of the Bluefield Fire Department- May 29, 2023



Figure 715: Flooding of College Avenue and Spring Street in Bluefield - May 29, 2023



Figure 716: Flooding of S College Avenue and Spring Street in Bluefield - May 29, 2023

Project Type

Modeling and Analysis

Total Estimated Cost

Approximately \$35,000 to \$90,000+ per study depending on the study area.

Estimated Time to Complete

0 - 1 year per site

Project Lead

Localities and Tazewell County

Action Description

Most localities within Tazewell County have roadways that routinely flood creating unsafe travel conditions for community members and emergency personnel. This mitigation action aims to present step by step instructions for how the County or Localities can address routine roadway flooding. Throughout the process, the public agency leading the actions should coordinate with VDOT for state owned infrastructure.

When an area is identified, the responsible agency should start by hiring a consulting engineer to develop Base Level Engineering (BLE) with 2D hydrology model coupled with a stormwater infrastructure hydraulic model for roadway flooding hotspots (hereafter refer to as 2D BLE hydraulic model). While typically this type of modeling is performed for larger areas, an engineer can develop a model on a micro scale to capture flooding sources impacting specific roadway sections and intersections. In these cases, the engineer will model a few intersections or roadway segments and the surrounding area that drains into it. The studies can be grouped geographically to gain efficiencies and avoid rework. As funding becomes available, the responsible agency should hire a consultant engineer to model the roadway segments and intersections grouped into geographic sections.

2D BLE hydraulic modeling has many benefits such as better integration of both overland (surface) and underground (subsurface) structures, multi-directional water flow, and velocity visualization. 2D BLE modeling also allows for more detailed understanding of the sources of the flooding such as riverine flooding or stormwater flooding. An example of 2D modeling is shown in **Figure 717**. After establishing the baseline model, the engineer can then run potential improvements through the hydraulic model to determine the optimal solution for the area that will reduce the risk of flooding. 2D BLE modeling is discussed in more detail in the *Raven / Doran 2D BLE Model Flood Risk Mitigation Action*. Potential improvements to mitigate roadway flooding could include stormwater system improvements, increased drainage capacity or retention, roadway elevation, or establishing alternative routes.

While long terms solutions are studied, the responsible department or agency should focus on communicating unsafe areas with the public and stopping drivers from driving through a flooded area.

All actions should be coordinated with VDOT and the Tazewell County Emergency Management

Department. Examples of strategies for **short term deployment** include:

- Placing temporary road closures to block access to flooded areas.
- Identifying alternative routes and procedures for emergency personnel when critical access points are blocked.
- Relocating equipment and personnel from fire, police, and EMS stations that have access frequently blocked by flooding prior to the flooding event. The Richlands Police and EMS Station, Richlands Fire-Rescue Station 3 (Claypool Hill), and Bluefield Fire Department have all been identified as having routine flooding issues.

- Placing portable variable message boards to communicate road closures, communicate flood risk, and encourage drivers to avoid flooded areas.
- Communicating road closures and unsafe areas for travel with the public. This can include:
 - Notifying local radio stations and television stations.
 - Publishing closures on local government social media accounts or websites.
 - Coordinating road closures with VDOT to include warnings on the 511 Virginia Traffic Information System.
 - Coordinating with 3rd party navigation systems such as Waze and Google Maps to display closures and flood risk areas.
- When there is warning time, take preventative measures along critical routes such as removing debris from the stormwater system and placing barriers such as sandbags prior to the flooding event.
- Placing flood sensors on bridges, roads, and culverts that flood frequently to provide flooding alerts.

Additionally, the Bipartisan Infrastructure Law (BIL) established the Promoting Resilient Operations for Transformative, Efficient, and Cost-savings Transportation (PROTECT) Grant program. The program provides funding to ensure surface transportation resilience to natural hazards by supporting planning activities, resilience improvements, community resilience, and evacuation routes. The PROTECT program provides \$1.4 billion over 5 years. More detail is provided in *Appendix A – Funding Matrix*. The next round of applications for the competitive discretionary program is due August 18, 2023. Virginia is currently in the process of preparing a statewide Resilience Improvement Plan to increase the federal cost share under PROTECT. Tazewell County should coordinate with VDOT as soon as possible to have transportation resilience actions be included in the Resilience Improvement Plan and understand the process for receiving PROTECT Funds.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time	Estimate Cost (By Step)	Potential Funding Sources (By Step)
Short Term				
1	Meet with VDOT regarding PROTECT – Plan a meeting with Tazewell County officials and VDOT as soon as possible to have transportation resilience actions, such as this one, included in the Virginia Resilience Improvement Plan and gain a better understanding of how to leverage PROTECT Funds.	2 weeks	Staff Time	<ul style="list-style-type: none">Operating Funds
2	Identify Short Term Strategies – While long term measures are being studied, review response procedures for managing roadway flooding at each jurisdiction level throughout Tazewell County. Engage with partners such as emergency personnel and VDOT to establish a streamlined short-term	2 weeks		
3	Implement Short Term Strategies – Once the strategies are identified, update procedures to implement the streamlined short-term response strategies. Strategies may include emergency planning, equipment procurement, stakeholder	1 month		
Long Term				
4	Prioritize Flooding Hotspots – As flooding hotspots are identified throughout the County; prioritize areas to focus on while tracking additional hotspots for consideration.	1 month	Staff Time	<ul style="list-style-type: none">SLAFCFPFPROTECT
5	Staffing – When a hotspot is selected to have modeling performed, hire a consultant engineer to develop a 2D BLE model for the identified area. There may be economies of scale for modeling several areas in proximity of each other at one time. The scope should include: - The area to be studied.	1 month		

Step #	Step Description	Estimated Time	Estimated Cost (By Step)	Potential Funding Sources (By Step)
6	<p>Gather Initial Data - Data will be needed to develop the 2D BLE model. More detailed data will allow the model to better represent the area. However, some data sources can be approximated if they are not available. To develop the model, high resolution lidar data is required. VDEM has lidar data available for Virginia online to download. The engineer will need to verify that the data is of sufficient resolution. Depending on the data available, the engineer may need to perform field work that may be outside of the initial scope.</p> <p>Examples of data sources that can be used to develop the model include:</p> <ul style="list-style-type: none"> - Stream gauge data - Rainfall data - Historic flood data - Photos from floods - Building footprints 	2 weeks	\$35,000 to \$90,000+	
7	Develop Baseline 2D BLE Model - The engineer will use the lidar data and initial data to develop the baseline model based on the existing conditions.	2 months		
8	Study Existing Conditions - The engineer will use the existing model to identify flooding trends, flooding hotspots, and stormwater issues. Stakeholders will be engaged to verify	2 weeks		
9	Alternatives Analysis - The engineer will identify mitigation action alternatives based on the identified problem areas. The community will select preferred alternatives to run	1 month		
10	Study Preferred Alternatives - The engineer will use the 2D BLE model to test the preferred alternatives to understand the effectiveness of each alternative. The engineer will make recommendations on which alternatives the community	1 month		
10	Communicate and Document Results - The engineer will communicate the results with the stakeholders for final feedback on the alternatives. The engineer will document the results. The results can be incorporated into grant applications by the community to pursue funding for design	1 month		

Funding Sources

- See Table

Figure of Action

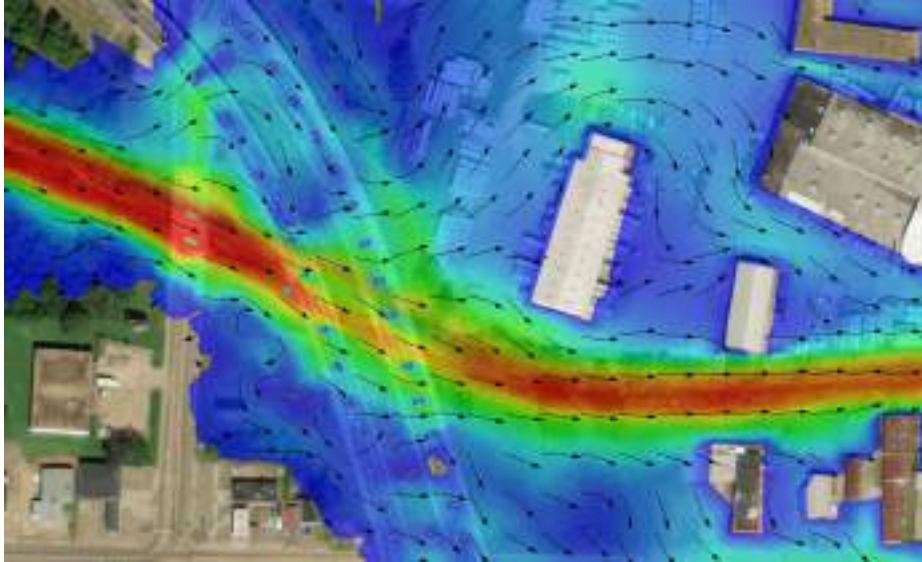


Figure 717: Example of 2D BLE Modeling³

³ “Completing the picture: The future of hydraulic modeling is two dimensional”, Stantec, [Completing the picture: The future of hydraulic modeling is two dimensional \(stantec.com\)](https://www.stantec.com/insights/articles/default.aspx?id=11111111-1111-1111-1111-111111111111)

Assess Flood Risk Reduction Options for Blacksburg Street Community

PRIORITY ACTION

Problem Description

The Blacksburg Street community is a historically black community in North Tazewell. Many long-time residents share strong ties, having raised their families in the community. The community of ten to twelve houses used to be much larger and once included its own church. The neighborhood is a mixture of long-time residents and renters. The community reports frequent flooding from multiple sides of the creek including flood waters running down Blacksburg Street completely blocking access. During the 2003 flood, several members of the community had to be rescued from the church due to flooding.

Residents are distressed about minimal flood warning time, blocked access, flooding from multiple directions, and worsening flooding. Additionally, many long-time homeowners in the community are aging, and are concerned about negative equity impacts due to increased flooding. At the end of the day, residents are concerned about their ability to pass down intergenerational wealth. The community reports frequent flooding from multiple sides of the creek, which is worsened by the mill building, beaver dams, sedimentation, and debris. The flooding issues are shown in **Figure 718**. A photo of the Blacksburg Street flooding is shown in **Figure 719**. Most of the neighborhood is in the 100-year floodplain. Residents report that they have not received recovery aid following previous floods and they cleanup their properties without any assistance. Residents are growing increasingly concerned due to worsening flooding. Residents are concerned about losing their homes and the equity they have built in their homes, being unable to evacuate, and being unable to recover when they are impacted by another flood. Most residents in the neighborhood do not have flood insurance due to the high cost of flood insurance and because they own their homes free and clear and thus are not required to keep flood insurance.

Figures of Problem Area

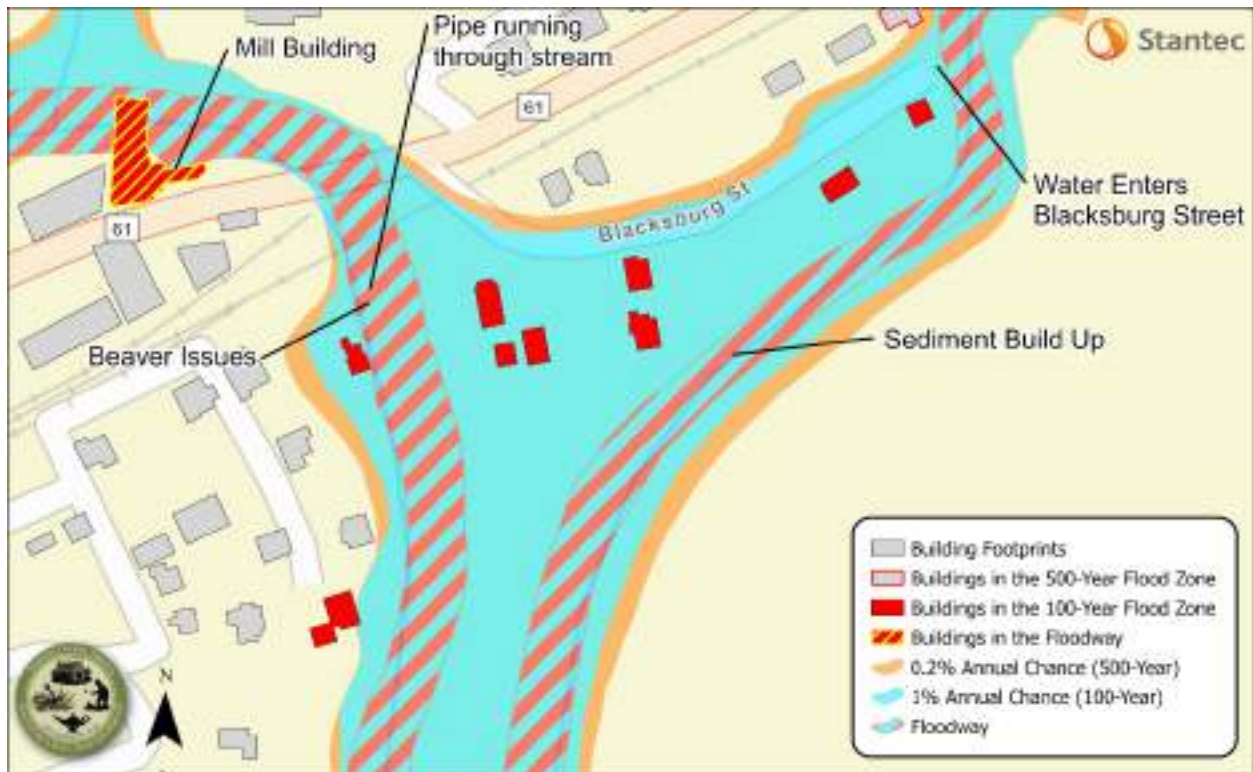


Figure 718: Blacksburg Street Flooding Issues



Figure 719: Flooding of Blacksburg Street

Project Type

Modeling and Analysis

Total Estimated Cost

\$150,000 +

Estimated Time to Complete

1 – 3 years

Project Lead

Tazewell County

Action Description

There are several actions in the mitigation plan that have the potential to help reduce flood risk for the Blacksburg Street Community such as the removal of the Abandoned Mill Building, the acquisition of undeveloped parcels for flood storage, and the acquisition of properties to return to natural areas for flood storage. **Throughout the implementation of the plan, the Blacksburg Community should be regularly engaged as it is a historically underserved community with a high level of flood risk.** As demonstrated by the residents at the second public meeting, the community wants to take action to minimize flood risk, but it needs support to help mitigate.

As the County pursues flood risk reduction, the County should assess flood risk reduction options for the Blacksburg Community through a formalized study. The community must be engaged throughout the study process with consideration given to historic context and equity. Prior to implementing other mitigation actions that could impact the Blacksburg Street Community, the County should study the benefits and impacts to the Blacksburg Street Community. Mitigation actions that could impact the Blacksburg Community include:

- The removal of the abandoned mill building and associated dam
- Acquisition of undeveloped parcels
- Acquisition of developed properties

Additional mitigation actions may be needed to minimize flood risk for the Blacksburg Street Community. The formalized study may consider other alternatives that could benefit the Blacksburg Street Community such as:

- Debris and sediment removal
- Structural flood protection solutions
- Access improvements to Blacksburg Street
- Beaver management

As mentioned previously, **the County and its consultants must actively engage the community throughout this process to understand and incorporate local priorities.** If acquisition is the preferred alternative, flood modeling would not be needed as a part of the FEMA Hazard Mitigation Assistance (HMA) funding requests since the existing Flood Insurance Study (FIS) can be leveraged or pre-calculated benefits could be used. A consultant could be hired to assist with the FEMA HMA acquisition

application, costing approximately \$10,000. A flood modeling and alternative analysis approach as proposed below would cost over \$100,000.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By	Potential Flooding Sources (By Step)
1	Desktop Study –Hire an engineer to perform a preliminary desktop study of the area. Given the extent of flooding issues faced by the Blacksburg Street Community, acquisition might be the preferred alternative. An engineer can review the existing conditions, hydrograph, and perform a quick storage calculation. This assessment will give a better	2 weeks	\$2,500	<ul style="list-style-type: none"> County Operating Funds
2	Community Engagement - Early on, the Blacksburg Community must be regularly and purposefully engaged in order to understand the goals of the residents and help prioritize mitigation alternatives. Several meetings and/or engagement methods are warranted to introduce the options, give residents time to consider, and move forward with a formalized study of preferred alternatives. The County may need to engage stakeholders individually or in smaller groups to ensure everyone is	2 months	County Staff Time	
3	Pursue Funding - Once the County and community have identified alternatives to study, the next step is for the County to pursue funding for the study. The study may be pursued as a step toward other mitigation actions such as the removal of the abandoned mill building. If the alternatives include other actions such as the removal of the abandoned	1 month	County Staff Time	<ul style="list-style-type: none"> HMGP Advanced Assistance BRIC Capability and Capacity Building CFFP
4	Alternatives Study – Hire a consulting engineer to study the flood mitigation alternatives for the Blacksburg Street Community. The study will include hydraulic modeling of the area before and after mitigation measures are applied and perform a benefit cost analysis of the mitigation measures. The scope of the study should be	3 months	150,000 +	
5	Alternative Selection – Present the results of the alternative analysis to the community for feedback. The County should work with the community to prioritize mitigation actions based on the results of the study and select	2 months		

Step #	Step Description	Estimated Time to	Estimated Cost (By	Potential Flooding Sources (By Step)
6	Pursue Funding – Once actions are selected for implementation, the County will need to pursue funding for the implementation of the selected actions. Depending on the selected actions, consulting firms would likely need to	2-3 months	County Staff Time	<ul style="list-style-type: none"> • HMGP • BRIC • CFPF • Others dependent on

Funding Sources

See table

Figure of Action

N/A

Inflow and Infiltration of Stormwater into Wastewater System

Problem Description

During extreme rainfall events, the County reports that rainwater is entering into the wastewater collection system which increases the peak flow and amount of flow into wastewater treatment plants in the county service area, known as inflow and infiltration (I&I). Inflow is surface water that enters the wastewater system. Sources of inflow include water entering the system from yards, roofs, storm drains, downspouts, and holes in manhole covers. Infiltration is groundwater that enters pipes. Sources of infiltration include holes, breaks, joint failures, connection failures, and cracks. There are multiple sources of I&I as shown in **Figure 716**.⁴

The extraneous flow into the wastewater collection system affects the capacity and operation of the wastewater treatment plants. Specifically, the Richlands Wastewater Treatment Plant and Tazewell Wastewater Treatment Plant have had significant issues during rainfall events when stormwater enters into the wastewater system. This has caused sewer overflows leading to untreated wastewater entering streams and leads to risk of sewer backup in citizen's houses. In addition to the environmental and social impacts, the wastewater treatment plants are also fined by EPA.

⁴ "What is infiltration and inflow?", King County Wastewater Services, [What is infiltration and inflow? - King County](#)

Figures of Problem Area

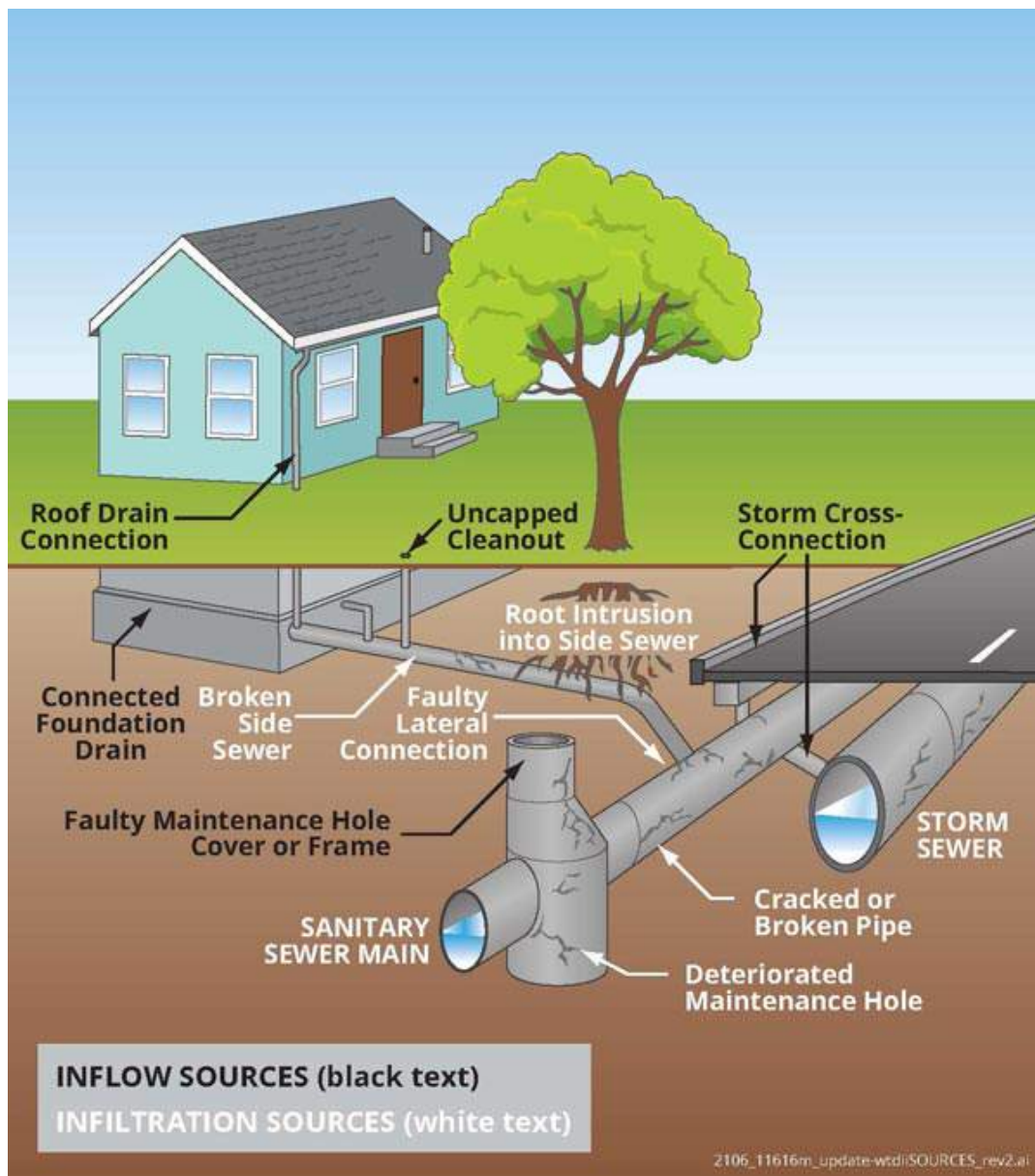


Figure 720: Sources of I&I

Project Type

Modeling and Analysis

Total Estimated Cost

Dependent on selected improvements (rehabilitation or upsizing facilities)

Estimated Time to Complete

3 – 5 years

Project Lead

Town of Richlands and Town of Tazewell

Action Description

Various studies of the wastewater system can be performed to understand the sources of I&I and key problem areas. A series of steps is proposed to understand the problem in a cost-effective manner by using available data sources to prioritize the problem areas. By first identifying problem areas, more expensive and invasive testing can be limited to focused locations. An example of testing is shown in **Figure 717**. Additionally, throughout the process, it is important to understand community goals and expected level of service. Recommendations for future projects and solutions should be selected under the advisement of an engineer. Potential solutions could include additional retention increased storage, sewer rehabilitation, maintenance, part replacement, stormwater management, coordination with the EPA, and/or operational changes.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By
1	Identify Data Sources and Data Reviews – Hire a consultant to collect and review data for preliminary desktop study. The scope should specify data sources needed to perform the desktop study and include review of the quality of the available data. Preliminary data can be utilized to help identify problem areas rather than having to perform testing throughout the system. Data could include spatial data of the wastewater system, work order history, interviews with staff, historic sewer flow data, rainfall data, monthly reports, fine history, and overflow reports. If	4 weeks	\$7,500	<ul style="list-style-type: none"> Area Development Program Section 319(h) Nonpoint Source (NPS) Implementation Program VCWRLF
2	Preliminary Desktop Study - Depending on the data available, an engineer can perform a preliminary desktop study. From reviewing the data sources, the engineer can make preliminary estimates of the source of the overflows (for example whether the source is a capacity issue or stormwater infiltration). The engineer can also review the data to gain a better understanding of the frequency of overflows, the rainfall events associated with overflows, and the history of fines. Based on the preliminary desktop study, the engineer will provide recommendations for the next steps. The engineer will also work with the Towns to understand the goal level of service for the Wastewater Treatment Plant which may involve	4 weeks	\$15,000	
3	I&I Study - If I&I is confirmed as the likely cause of the overflows, a consultant can be hired to perform a detailed I&I study. The I&I study should be conducted to isolate and prioritize problem areas in smaller sub-basins. System-wide flow monitoring should be conducted as the first phase in the I&I study. An I&I analysis should be conducted utilizing the sewer flow monitoring data. The deliverable of the I&I study will be a technical memo summarizing the key problem areas, and the amount of inflow/infiltration that enters the wastewater system. The scope of the study should be developed under the advisement of an engineer and be reviewed in comparison with	4-6 months	\$50,000 - \$75,000+	
4	Model Development and Calibration – This step will be conducted if I&I study (Step 3) determines that there is significant I&I enters wastewater system. Using the flow monitoring and GIS data, a simplified H&H model will be built to support capacity assessment and improvement alternatives evaluation.	2 months	\$50,000	

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
5	Capacity Assessment & Alternatives Evaluation – Using the H&H model developed under Step 4, an engineer can determine the existing level of service and wastewater system performance under different storm conditions. The engineer will identify potential solutions to reduce/eliminate overflow. Solutions may include I&I source reduction (rehabilitation), additional storage, or sewer replacement. The practicality of I&I removal needed to meet the overflow reduction goal	1 month	\$35,000	
6	Alternative Selection - With input from the community and under the advisement of an engineer, a preferred alternative or alternatives should be selected. Opinions of potential construction costs for each alternative will be estimated to support decision	1 month	\$15,000	
7	Sanitary Sewer Evaluation Survey (SSES) Investigations – This step will be conducted only if I&I removal / reduction is part of the selected alternative under Step 6. The I&I study will prioritize the problem areas into high, medium, and low for the severity with recommendations for additional field investigations SSES to narrow down the source of I&I. Various SSES techniques exist, and typically the first step is to	6-12 months	\$100,000 +	<ul style="list-style-type: none"> Operating Funds VCWRLF
8	Design & Permitting - After a preferred alternative is selected, a consultant engineer may need to be hired to design the identified solution. Additional surveys or data may be needed to complete this assessment. Permits will need to be acquired depending on the selected alternative. Some activities may be covered under the existing collection system permit while others may require permits for construction. Completed plans will allow the responsible party to hire or issue a request for bids for a contractor.	12 months	Based on the solution. 10% of the construction fee.	<ul style="list-style-type: none"> Area Development Program Section 319(h) Nonpoint Source (NPS) Implementation

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By
9	Construction - The selected contractor will build the selected solution based on the design.	Dependent on solutions	Dependent on solutions	<ul style="list-style-type: none"> • Area Development Program • CBDG • Section 319(h) Nonpoint Source (NPS) Implementation Program • USDA Water &
10	Maintenance - Depending on the selected solution, routine maintenance may be needed. A maintenance plan should be made including maintenance	Annually	Dependent on solutions	<ul style="list-style-type: none"> • Operating Funds

Funding Sources

Included in Steps Table

Figure of Action

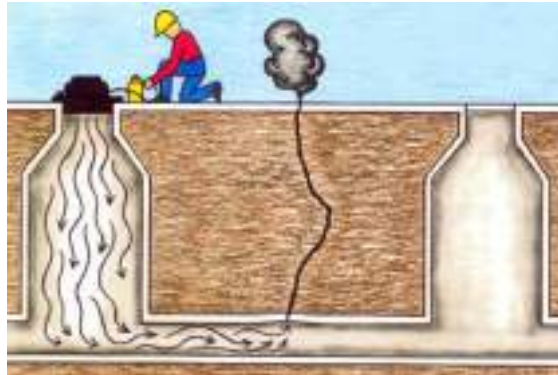


Figure 721: Smoke testing for I/I⁵

⁵ “Wastewater Smoke Testing”, Iowa Sioux Center, [Wastewater Smoke Testing | Sioux Center, IA - Official Website](https://www.siouxcountry.org/2018/05/01/wastewater-smoke-testing/)

Lynn Hollow Road Flood Mitigation

Problem Description

Residents along Lynn Hollow Road report that water and sediment flood their homes during heavy rainfall events. They report that their basements are frequently flooded with water containing a strong foul odor, and their driveways are filled with debris. Residents indicate the water and sediment originates from the Tazewell County landfill when the lower ponds overflow during heavy rainfall events. The creek is shown in **Figure 718**.

The County reports the water is coming down the mountain into resident's yards and not from the landfill as demonstrated by a prior landfill study. The ponds do not have a regular maintenance schedule which the County recognizes could be beneficial for short and long-term pond maintenance. The ponds are dredged as needed to maintain the active stormwater permit.

The project team also noted there are several agricultural uses upstream of the homes with flooding issues. Several of the properties have fences for animal pastures that extend across the stream. From an initial site observation, the stream appears unstable which could be a source of sediment. A map of the area is shown in **Figure 719**.

Figures of Problem Area



Figure 722: Creek along Lynn Hollow Road



Figure 723: Lynn Hollow Road Area

Project Type

Modeling and Analysis

Total Estimated Cost

\$250,000 - \$650,000 depending on selected solution

Estimated Time to Complete

1 – 3 years

Project Lead

Tazewell County

Action Description

Perform a comprehensive Watershed Study to understand the source of the flooding. Once the problem is better understood, the engineer will be able to recommend potential solutions. Potential solutions could include retrofit of existing stormwater features, new structural stormwater projects, procedural changes, routine maintenance of the landfill ponds, agriculture community engagement, and stream channel stabilization & widening.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Preliminary Site Visit - Hire a consultant water resource engineer to perform a preliminary site visit to inspect the area. The engineer should review the ponds for signs of breaching and overtopping. The engineer should inspect the creek along Lynn Hollow Road for signs of stormwater and sediment bypassing the retention pond, stream stability, and agriculture	1-2 months	\$8,000	<ul style="list-style-type: none"> • CFPF • SLAF • VCWRLF
2	Perform a Watershed Study - From the direction of the engineer, it is anticipated that a Watershed Study will be recommended. Potential recommendations could include contributing watershed hydrologic calculations, 1D HECRAS model of the	2-6 months	\$40,000	
3	Identify Alternatives - Based on the identified flooding sources, the engineer can make recommendations for specific mitigation actions. If the landfill is identified as a flooding source, the engineer may need to perform additional studies of the landfill infrastructure and operating procedures. The engineer will identify solution alternatives and prepare conceptual schematics for review. Solutions could include retrofit of existing features, new structural projects, or procedural changes. Examples of alternatives are stream bed erosion	2-6 months	\$30,000	
4	Alternative Selection - With input from the community and under the advisement of an engineer, a preferred alternative or alternatives should be selected. Funding should be identified for design and construction to move the project toward	1-2 months	\$10,000	
5	Design - After a preferred alternative is selected, an engineer may need to be hired to design the identified solution. Additional surveys or data may be needed to complete this assessment. Completed plans will allow the responsible party to hire or issue a request for bids for a	6-12 months	\$50,000+	<ul style="list-style-type: none"> • CFPF • Five Star and Urban Waters Restoration • Section 319(h)

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
6	Permitting – Depending on the solution selected, permits may be required to construct the selected alternative. These may include, but are not limited to environmental permits, land disturbance permits, and land use permits. The engineer should work with the community to obtain the proper permits. There may be costs associated with obtaining each	4-12 months	\$15,000+	Nonpoint Source (NPS) Implementation Program <ul style="list-style-type: none"> • SLAF • Virginia Clean Water Revolving Loan Fund (VCWRLF) • Virginia Pooled Financing Program
7	Construction - The selected contractor will build the selected solution based on the design. The cost will vary based on the	2-6 months	\$100,000 - \$500,000	
8	Maintenance - Depending on the selected solution, routine maintenance may be needed. A maintenance plan should be made including maintenance frequency,	Annually	Dependent on Solution	<ul style="list-style-type: none"> • County Funds

2D BLE Modeling

PRIORITY ACTION

Problem Description

There are several priority areas in Tazewell County that have suffered the greatest impacts from recent floods. Many of these areas contain large residential areas or critical infrastructure in proximity to the river or within the floodplain. Additionally, many of these areas are only accessible by a singular access point that frequently floods. Multiple factors are reported to contribute or worsen the flooding in these areas. The priority areas are summarized below.

The **Bottom Road Area** is one of the most impacted areas in the County from recent flooding. Within the area, there are a large number of residents living in proximity to the river or within the floodplain. During the 2020 floods, the National Guard performed rescues in this area. The area is shown in **Figure 724** and **Figure 725**. There are multiple factors contributing to or worsening the flooding impacts in this area including:

- Many homes are within the floodplain and were constructed prior to the flood ordinance.
- Many of the homes are mobile homes and are more vulnerable to flooding.
- The VDOT bridge along Bottom Road is the main access point to the large residential area in the floodplain and frequently overtops.
- Residents reported increased flooding following the bridge upgrades.
- Residents reported water running up stormwater pipes during flooding events.
- Raven Road is also used to access the area and frequently floods.

The **Mill Creek Road Area** is a residential area along 5 miles of Mill Creek Road which runs parallel to Mill Creek. There is no floodplain mapping along Mill Creek. There are multiple factors contributing to or worsening the flooding problems in this area including:

- Residents report flooding along Mill Creek Road where Mill Creek runs parallel to the road.
- There are many privately owned driveways crossing Mill Creek which capture debris. Debris build up in the creek minimizes stream capacities and worsens flooding.
- Residents report access to Mill Creek Road (approximately 5-mile residential area) is blocked by flooding at the intersection with Nash Hill Road near Plaster's Discount Furniture. The area is shown in **Figure 726** and **Figure 727**.

Downtown Bluefield has a history of flooding issues due to its location along Beaverpond Creek. While some mitigation actions were taken previously, flooding is still a problem as experienced during the flood on May 29, 2023. The flooding is shown in **Figure 728**. The main flooding issues include:

- S. College Avenue is the main road through Bluefield and runs alongside Beaverpond Creek. It floods throughout the downtown area.
- Beaverpond Creek splits into an open channel that runs alongside Spring Street and several businesses. These channels have been a hotspot for flooding by overtopping Spring Street and impacting the businesses along the channel.

- The main access of the Bluefield Fire Station is blocked by flooding along College Avenue at Thayer Street.

The **Richlands School Area** contains Richlands Elementary School, Richlands Middle School, Richlands High School, a shopping center, and several businesses. The area has frequent stormwater flooding issues. In addition, the schools are used for shelters for the community during emergencies. The main flooding issues include:

- Stormwater blocks the main entrance to the schools at the intersection of Cedar Valley Road at Learning Lane.
- Stormwater infrastructure along Cedar Valley Road exceeds capacity and drains are frequently blocked.
- The area is surrounded by several mountain peaks and contains a large amount of development with impervious surface.
- There is minimal stormwater infrastructure or retention in the area.
- The elementary school parking lot floods from stormwater lines exceeding capacity as discussed in the *Richlands Elementary School Stormwater* flood risk mitigation action.
- The County reports that engineers previously studied the area and found that most of the area sits above an aquifer.
- The middle school auditorium floods frequently. The County believes the source is groundwater and water running down the slope behind the school.

Figures of Problem Area



Figure 724: Bottom Road/ Kirby Road during the February 6, 2020 flood (Source: Donna Whittington)



Figure 725: Clinch River along the Bottom Road area during the February 6, 2020 flood



Figure 726: Plasters Discount Furniture alongside Mill Creek during regular conditions



Figure 727: Culvert crossing Mill Creek



Figure 728: Downtown Bluefield flooding – May 29, 2023

Project Type

Modeling and Analysis

Total Estimated Cost

Approximately \$80,000 for 600 acres and study of 4 alternatives.

Proposed Study Areas	Area (acres)
Bottom Road Area	930
Mill Creek Road Area	600
Downtown Bluefield	40
Richlands School Area	150

Estimated Time to Complete

1 – 3 years per area

Project Lead

Tazewell County

Funding Sources

- Virginia DEQ Stormwater Local Assistance Fund (SLAF)
- CFPF Grants

Action Description

Develop a Base Level Engineering (BLE) with 2D hydrology model coupled with a stormwater infrastructure hydraulic model for the identified areas in Tazewell County (hereafter refer to as 2D BLE hydraulic model). It is recommended to include the Bottom Road Area, Mill Creek Road Area, Downtown Bluefield and Richlands School Area. The studies can be pursued individually or together. Projects grouped geographically such as the Bottom Road Area and Mill Creek Area may result in some savings compared to completing them separately.

2D Base Level Engineering (BLE) hydraulic modeling is an emerging type of modeling that has many benefits. Traditional floodplain mapping (1D) is tied to streams and is developed for flood insurance requirements. It also has limitations to tie to underground stormwater sewers. Traditional models stop at a set boundary surrounding a stream and are developed as cross sections. The areas between cross sections are interpolated which can limit accuracy. Traditional modeling is also limited to showing one direction of water flow, has limited integration of structures, and has limited velocity visualization. An example of 1D modeling is shown in **Figure 729**.



Figure 729: Traditional 1D Modeling

2D BLE models are developed using lidar data to visualize the entire area. The use of lidar data allows for better integration of both overland and underground structures, multi-directional water flow, and velocity visualization. 2D BLE models show the interaction of the modeled area with both riverine flooding and stormwater flooding. For areas with complicated flooding issues, 2D BLE models allow for a more detailed understanding of the flooding occurring and the factors influencing it. An example of 2D modeling is shown in **Figure 730**. The U.S. Army Corps of Engineers is performing some flood modeling and surveying in Richlands. Results from that study may supplement the 2D model.

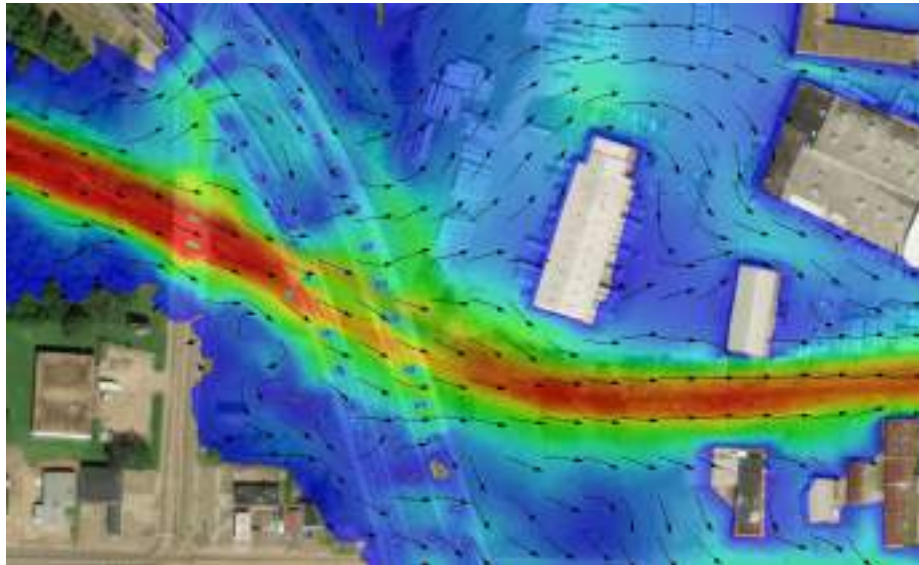


Figure 730: Example of 2D Modeling⁶

The 2D BLE model will allow engineers to better understand the existing flooding and then test proposed solutions. Engineers can run the proposed solutions in the model to gain an understanding of the flood risk reduction for each solution. Based on the model, engineers can also make recommendations for acquisition for properties with the highest flood risk.

The proposed study areas with some identified flooding hotspots are shown in **Figure 732 – Figure 734**. The proposed study areas are recommended due to reported flooding issues. The actual model boundaries will depend on the drainage, topography, and watersheds in each area. The model extents should be developed under the advisement of an engineer.

6 “Completing the picture: The future of hydraulic modeling is two dimensional”, Stantec, [Completing the picture: The future of hydraulic modeling is two dimensional \(stantec.com\)](https://www.stantec.com/insights/articles/2017/06/20/completing-the-picture-the-future-of-hydraulic-modeling-is-two-dimensional)



Figure 731: Mill Creek Flooding Hotspots and Proposed Modeling Area

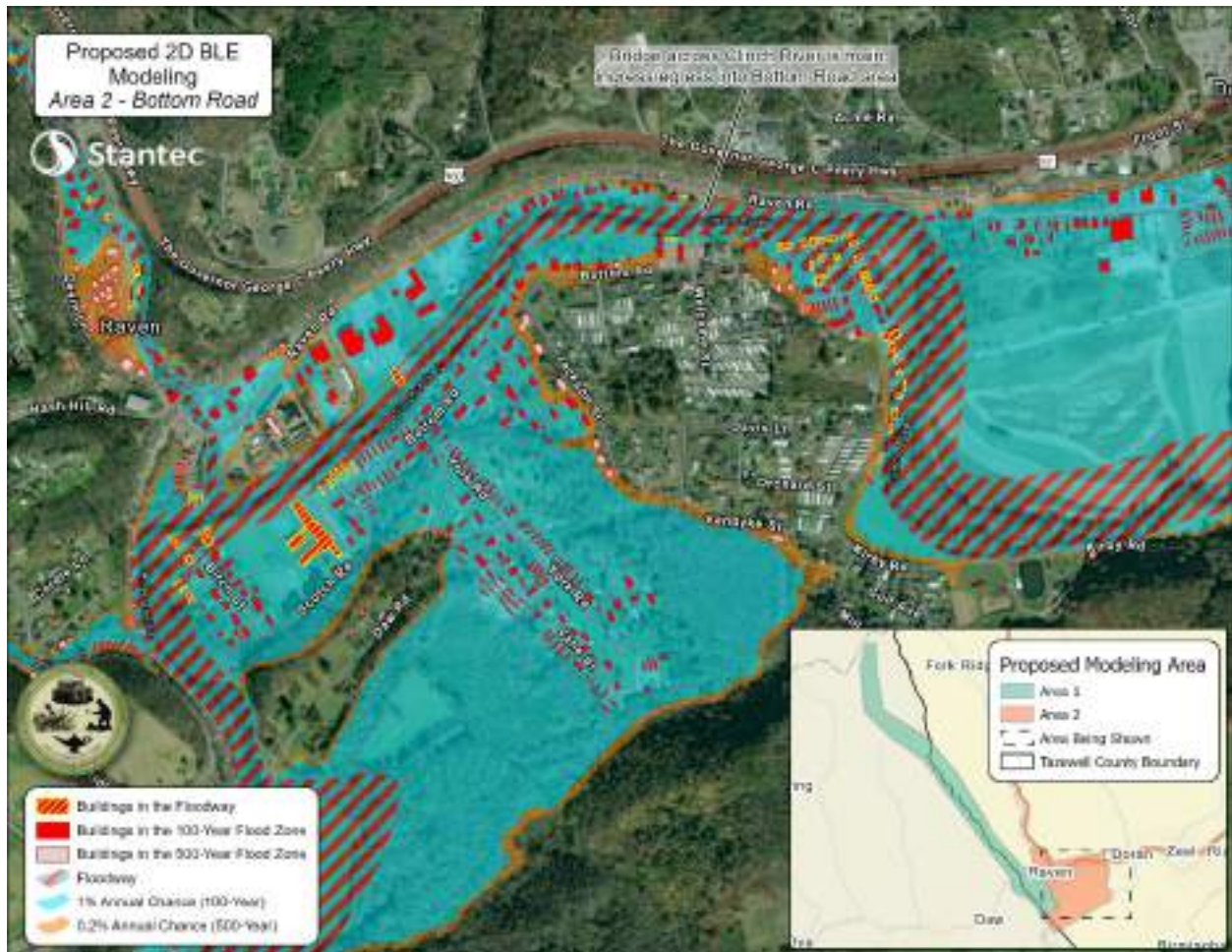


Figure 732: Bottom Road Flooding Hotspots and Proposed Modeling Area

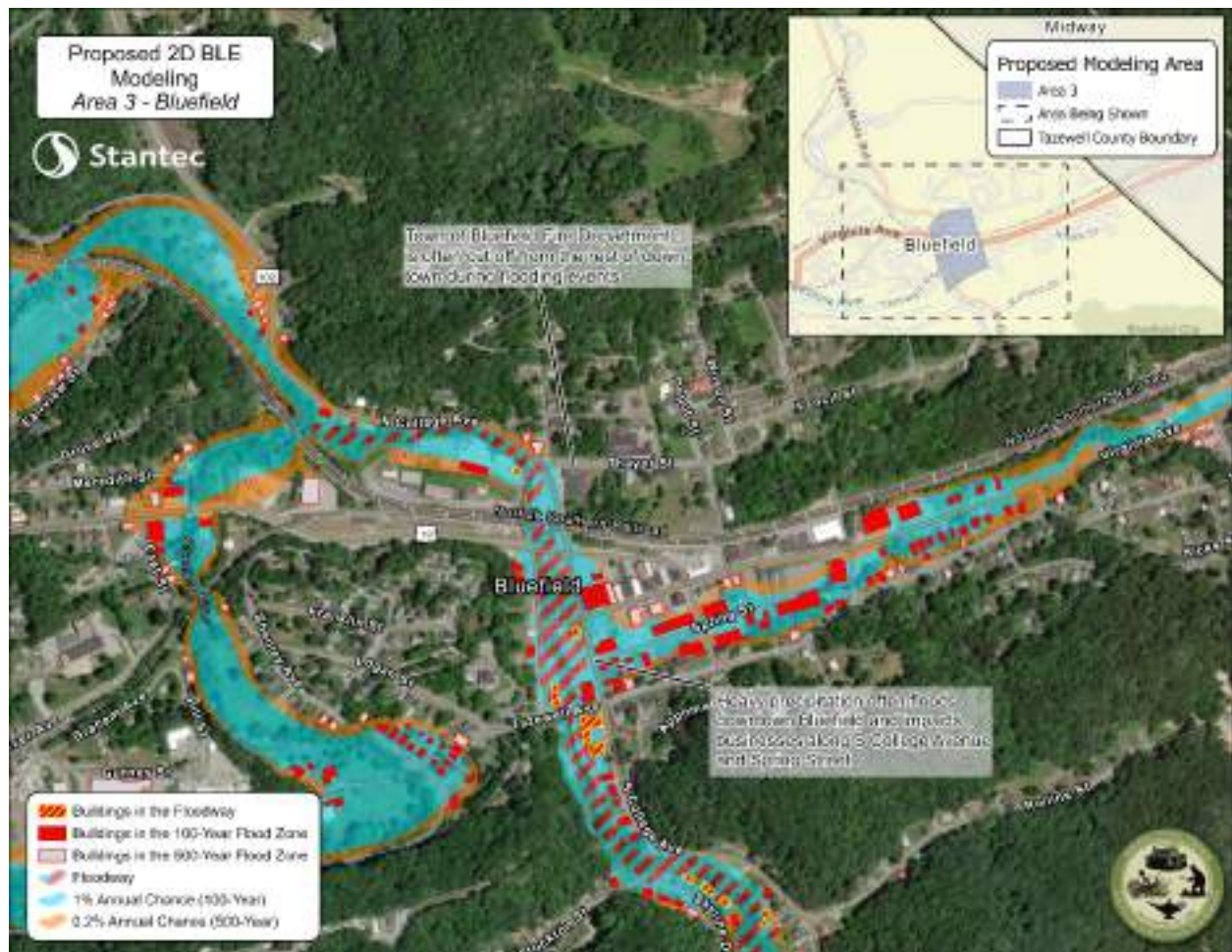


Figure 733: Bluefield Flooding Hotspots and Proposed Modeling Area

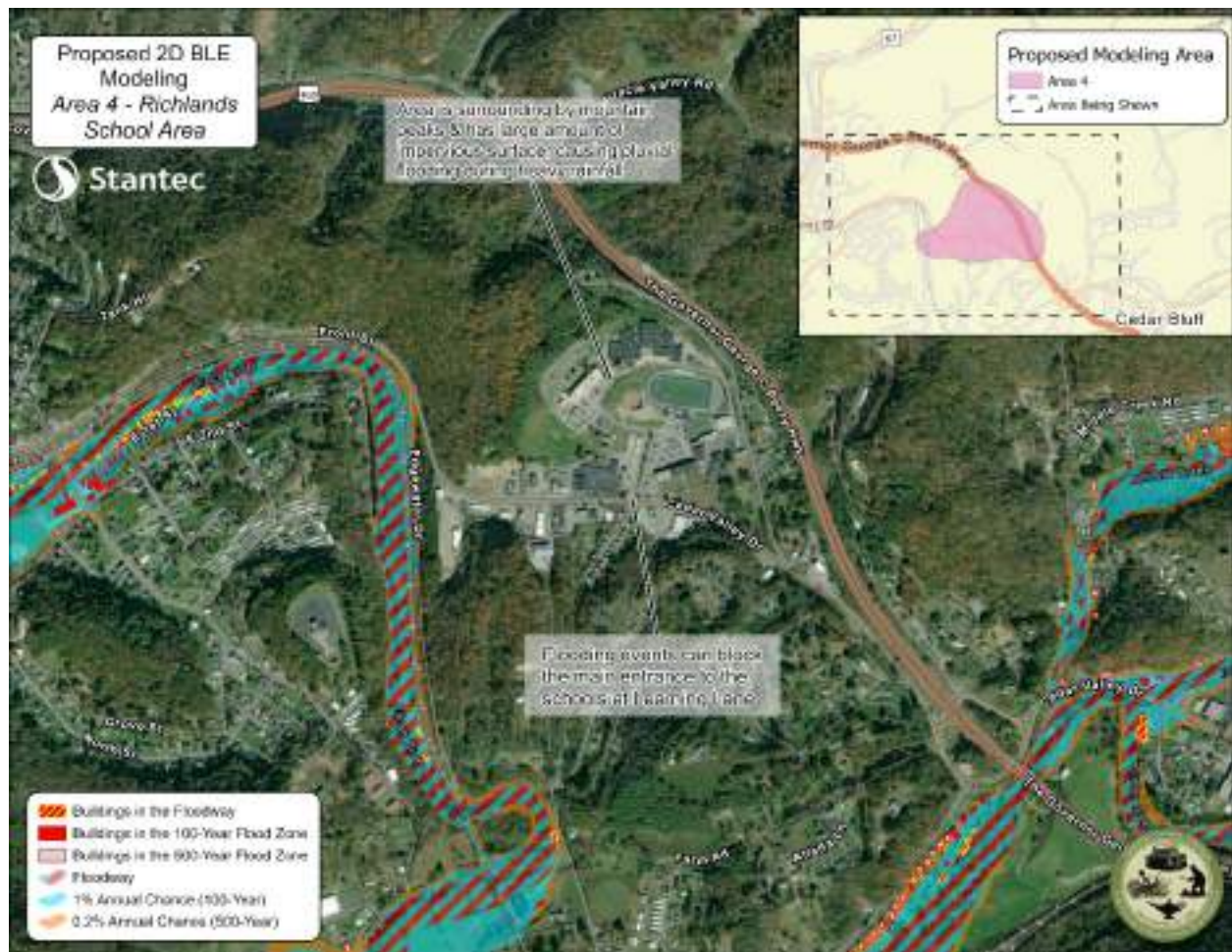


Figure 734: Richlands School Area Flooding Hotspots and Proposed Modeling Area

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time	Estimated Cost (By Step) *	Potential Funding Sources (By Step)
1	Staffing - Hire a consultant engineer to develop a 2D BLE model for a designated area. The area could be one of the priority areas or multiple depending on available funding. The scope should include: - The area to be studied. - Checkpoints for community and stakeholder engagement. - The number of mitigation actions to be studied in the		County Staff Time	<ul style="list-style-type: none"> Virginia DEQ Stormwater Local Assistance Fund (SLAF) CFPF Grants
2	Gather Initial Data - Data will be needed from the County to develop the 2D BLE model. More detailed data will allow the model to better represent the area. However, some data sources can be approximated if they are not available. To develop the model, high resolution lidar data is required. VDEM has lidar data available for Virginia online to download. The engineer will need to verify that the data is of sufficient resolution. Depending on the data available from the County and other sources, the engineer may need to perform field work that may be outside of the initial scope. Examples of data sources that can be used to develop the model include: - Stream gauge data - Rainfall data - Historic flood data - Photos from floods		\$5,000	
3	Develop Baseline 2D BLE Model - The engineer will use the lidar data and initial data to develop the baseline model, reflecting existing conditions.		\$35,000	
4	Study Existing Conditions - The engineer will use the existing model to identify flooding trends, flooding hotspots, and stormwater issues. The County will engage the community		\$8,000	
5	Select Preferred Alternatives - The engineer will identify mitigation action alternatives based on the identified problem areas. The community will select preferred alternatives to run through the model under the advisement		\$8,000	
6	Study Preferred Alternatives - The engineer will use the 2D BLE model to test the preferred alternatives to understand the effectiveness of each alternative. The engineer will make recommendations on which alternatives the community		\$16,000	

Step #	Step Description	Estimated Time	Estimated Cost (By Step) *	Potential Funding Sources (By Step)
7	Communicate and Document Results - The engineer will communicate the results with the community for final feedback on the alternatives. The engineer will document the results. The results can be incorporated into grant applications by the community to pursue funding for design.		\$8,000	

*Cost Estimate is assuming approximately 600 acres in the study area

Funding Sources

See Table

Figure of Action

N/A

7. Action Plan (continued)

Confirm Feasibility, Design, and Implement

Three Flood Risk Mitigation Actions have been identified in the Confirm Feasibility, Design, and Implement category. These actions have preliminary solutions that have been identified for implementation. Prior to implementation a feasibility study should be performed to confirm the benefits of the identified solution and possible barriers to implementation. Feasibility needs to be confirmed to avoid paying for solutions without confirming they have the proper benefit. Identified costs, estimated time to complete, and funding sources are provided at a high planning level and should be confirmed during the feasibility study.

Removal of Abandoned Mill Building and Associated Dam

PRIORITY ACTION

Problem Description

The abandoned mill building, and associated dam (formerly Farm Bureau) obstruct the creek, as shown in **Figure 71**. The dam and building block the natural flow of the creek as well as capture significant debris. Residents have noted the mill building contributes to the flooding of the community on Blacksburg Street by causing water to build up. The community reports frequent flooding from multiple sides of the creek, which is likely worsened by the mill building, beavers, sedimentation, and debris. The location of the dam and its relation to the Blacksburg Street Building is shown in **Figure 72**.

Figures of Problem Area



Figure 71: Mill Building March 2023 capturing debris

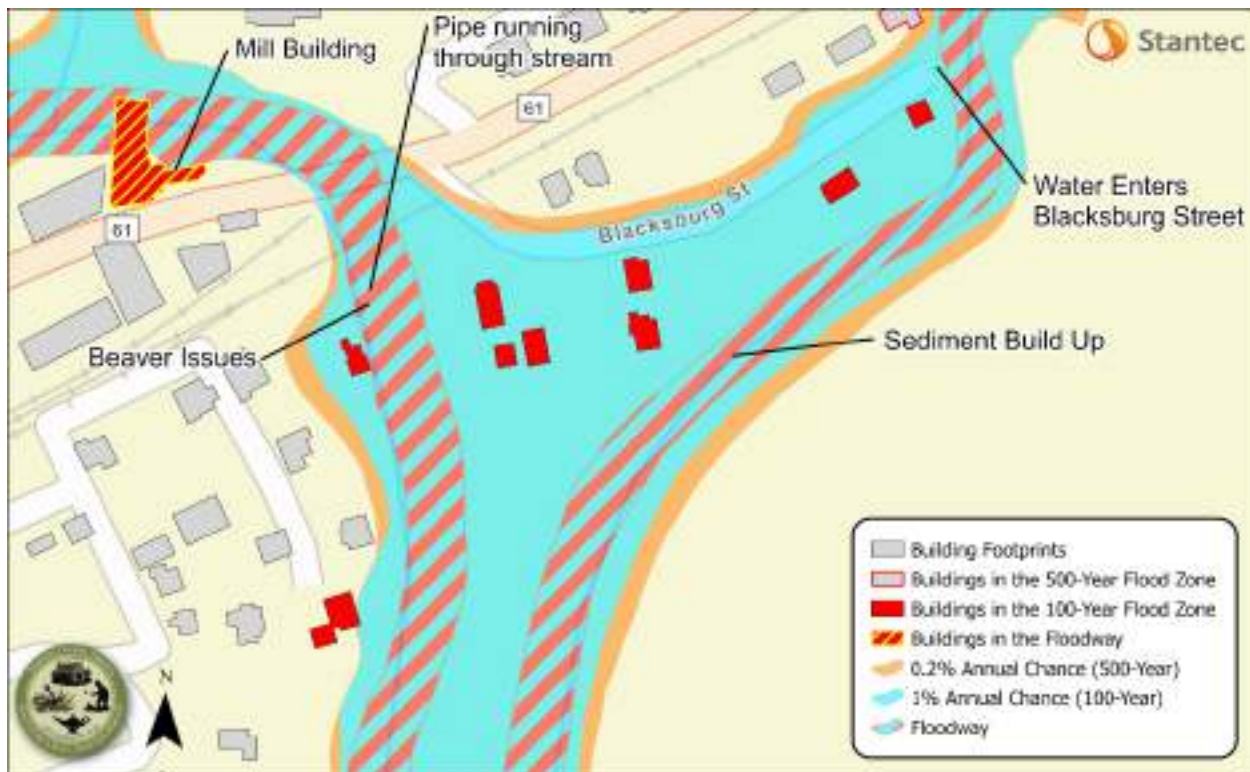


Figure 72: Mill building location

Project Type

Confirm Feasibility, Design, and Implement

Total Estimated Cost

\$3.4 - \$4.5 million

Estimated Time to Complete

5 + years

Project Lead

Town of Tazewell

Action Description

Pursue the removal of the mill building and dam to restore the natural flow of the creek, limit the accumulation of debris, and reduce flooding of the Blacksburg Street Community. **The property owner and community should be engaged early and often throughout the process.** Given the presence of several endangered species of mussel in the Clinch River, U.S. Fish and Wildlife Services should be engaged throughout the project to ensure all environmental regulations are met. In order to meet environmental regulations, actions may need to be taken throughout the project to protect mussels such as mussel surveys and mussel relocation. This action should be pursued in conjunction with other actions to mitigate flooding of the Blacksburg community such as:

- Acquisition of undeveloped parcels for flood storage
- Acquisition of properties to return to natural recreation areas.

- Assess flood risk reduction options for Blacksburg Street Community

Given the high projected cost, the Town may need to hire a consultant to assist with grant preparation and benefit cost analysis. The Town should consider grants that cover planning, design, and construction as this is a large multiphase project. Separate funding sources will likely need to be pursued throughout the project to cover the phases. Consultants can be hired to assist with the preparation of grant applications especially to be competitive for large federal grants. For example, consultants are frequently hired to assist with BRIC grants and the required benefit cost analysis. A BRIC application prepared by a consultant typically costs at least \$50,000.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Project Scoping and Development – The removal of the structure will be a high-cost project that has the possibility for multiple phases. To start pursuing implementation, it is recommended that the Town engage the community, engage the property owner, and pursue larger grant opportunities. Recommend engaging the property owner early and often to verify that the property owner is open to selling. Additionally, the community should be engaged to receive feedback and help develop plans for the site once the structure is removed. When pursuing grants such as HMGP or BRIC, the Town may need to hire a consultant to assist	3-4 months	\$50,000 + (BRIC application prepared by a consultant)	<ul style="list-style-type: none">• HMGP Advanced Assistance• BRIC Capability and Capacity Building• CFPF• Fish Passage Technical and Planning Assistance
2	Gap Analysis and Document Review – Recommend a consultant engineer be hired to assess and design the removal of the structure from the river and floodplain. The first step is to review and collect existing data such as as-builts, endangered species presence, and existing hydraulic information. The engineer can then determine data needed to complete the	2 weeks	\$350,000 - 400,000	
3	Topological and Geomorphic Survey – The engineer will have a topological and geomorphic survey performed to gain a better understanding of stream stability	1 month		
4	Hydrologic and Hydraulic Modeling (H&H) Modeling – A study will need to be performed to understand the impact of the structure removal on the river and surrounding areas. This study may be performed as a part of the Assess Flood Risk Reduction Options for the Blacksburg Street Community Mitigation Action. The study will give a better understanding of the impact to downstream properties from the	2 months		

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
5	Alternatives Study – Based on the results of the H&H Modeling, the engineer may need to review alternative approaches for removing the structure. This could include possible grade control structures, floodplain storage, and stream stabilization. The engineer can then provide a recommendation to the County for removal. The alternative study is recommended to include cost estimates for each alternative.	2 months		
6	Design & Permitting – Once the preferred alternative is selected, an engineer can lead the design and permitting process. Given the complex nature of the project, the engineer may need to perform additional steps such as survey collection, biological studies, and federal agency coordination. The engineer should	4+ months		<ul style="list-style-type: none"> • Community Challenge • BRIC • Five Star and Urban Waters Restoration • Outdoor Recreation Legacy Partnership (ORLP) Land and Water Conservation Fund
7	Structure Removal – Hire a contractor to remove the structure from the stream while minimizing environmental impacts. The contractor should obtain and follow all proper	1+ years		<ul style="list-style-type: none"> • CFPF • Recreational Trails Program • Virginia Land Conservation Fund
8	Stream Restoration – Following the removal of the structure, restore the surrounding area and stream to natural areas. The area may serve as public amenities such as a public park, walking trails, or kayak launch. Development rights should be maintained to avoid future development on the property.	1-2 years	\$3,000,000 - \$4,000,000	<ul style="list-style-type: none"> • Section 319(h) Nonpoint Source (NPS) Implementation Program • SLAF • Get Outdoors (GO) • Preservation Trust Fund

Funding Sources

- See Table

Figure of Action

N/A

Richlands EMS and Police Station Relocation

PRIORITY ACTION

Problem Description

The Richlands EMS and Police Station are both located in the 1% Annual Chance Floodplain as shown in **Figure 73**. They are in separate buildings located on the same property and utilize the same access points. The County reports frequent flooding of the access points along Allegheny Street, preventing ingress/egress. During the 2020 floods, the access points were inundated, which impeded response, as shown in **Figure 74**.¹ The National Guard brought in boats to assist with the emergency response efforts. The access was also blocked during the February 2023 floods. The Town has not reported flooding impacts to the buildings. The Town previously considered relocating the police station; however, funding was not secured.

¹ “More flooding out of Richlands, Virginia in Tazewell County”, Billy Bowling, WOAT TV, [More flooding out of Richlands, Virginia in Tazewell County. Video provided by Billy Bowling. - YouTube](#)

Figures of Problem Area

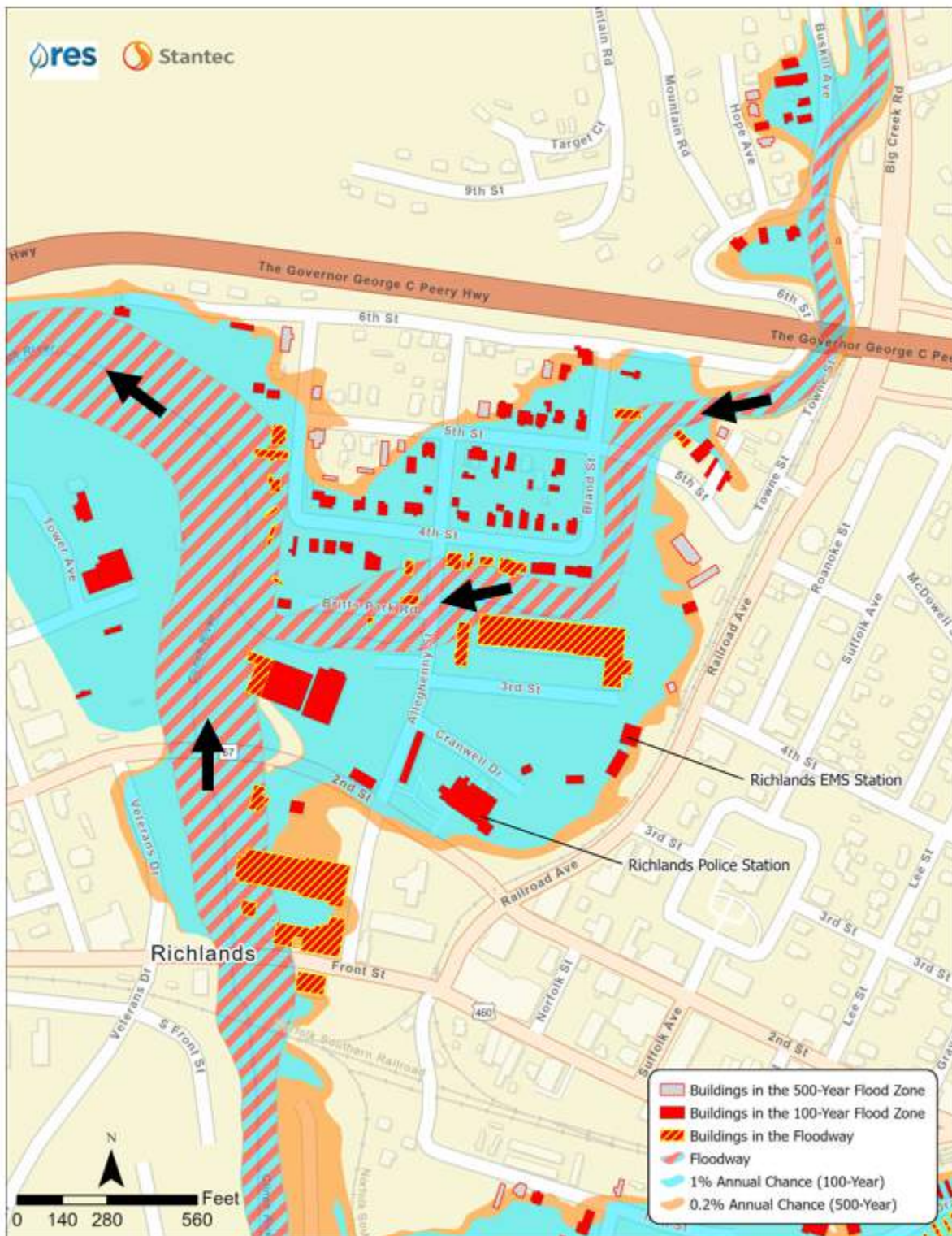


Figure 73: Richlands EMS Station and Police Station Location



Figure 74: Richlands EMS and Police Station during the February 2020 Floods

Project Type

Confirm Feasibility, Design, and Implement

Total Estimated Cost

\$ 6 million +

Estimated Time to Complete

5 + years

Project Lead

Town of Richlands

Action Description

Relocate the EMS Station and Police Station outside of the floodplain. The EMS Station can be acquired and demolished to utilize as natural flood storage or a public amenity such as a playground. The Planning Team has expressed a desire to maintain the police station building to supplement the recreation facilities on the property. The building was previously a school, so it has a gym and spaces for gathering. To best meet the community's needs, two routes can be pursued to minimize flood risk to the police station. With both routes, the police station (personnel, property, and equipment) will be relocated outside of the flood plan. The two options are shown below:

1. **Relocate and Repurpose** – Relocate the police station outside of the floodplain to minimize flood risk to the critical facility. Elevate or floodproof the structure to utilize as a community center to enhance the open space utilization on the property. The center will not house any critical services.

2. **Acquire, Relocate, and Restore** – The rights to the property will be acquired to limit future development. The police station will be relocated outside of the floodplain to minimize flood risk to the critical facility. The existing structure will be demolished and restored to natural space or a public amenity such as a park.

The preference of the Planning Team is to pursue relocation and repurpose. However, both routes are listed as grant funding may be more streamlined for restoration-based projects. When pursuing grant funds, the EMS Station and Police Station projects may be grouped together or separately as funding becomes available.

If the critical facilities are damaged by a declared disaster, relocation of the facilities may be eligible for FEMA's Public Assistance (PA) program. PA funds could be used for activities such as relocating the police and fire services personnel and equipment to a new location. In most instances, FEMA grant applications require the preparation of Benefit Cost Analysis (BCA). When flooding events occur, the Town should start tracking all impacts to the Police and EMS Stations and any overtime hours. Under PA they can seek reimbursement for emergency protective measures undertaken and these costs can help support and justify the relocation of the facilities. Direct damages to the EMS or Police Station would likely be required in order to relocate utilizing FEMA funds.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Identify Funding Source – As this is a larger project with multiple phases, the Town may need to pursue grant funding to assist with project scoping, studies, and larger grant applications. For pursuing larger grant opportunities such as HMGP or BRIC, a consultant or disaster recovery services coordinator may be beneficial to prepare the application. HMGP Advanced Assistance or BRIC Capability and Capacity Building grants may be pursued to assist with planning and scoping to	1 month	Staff Time	<ul style="list-style-type: none"> • HMGP Advanced Assistance • BRIC Capability and Capacity Building
2	Identify New Location Outside of the Floodplain – A new location must be identified for the facilities. A study may be needed to decide on the best location for the facilities. Considerations for the study include proximity to the floodplain, proximity to the service area, and the roads providing access to and from the service area. The Town may also consider existing facilities outside of the floodplain that may be converted to house the Police Station and/or EMS Station. The Town should consider grants when selecting the site for the new facilities. Some grants may	3-6 months	\$100,000 +	
3	Pursue Funding Source – Once the Town has identified the new location and goals for each site, pursue grant funds for design, construction, demolition, and restoration as applicable. HMGP Advanced Assistance or BRIC Capability and Capacity Building grants may be pursued to assist	3 months	\$50,000 + for BRIC application prepared by a consultant	

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
4	Design New Facilities - Once a site has been selected, hire an architect to design the facilities. The architect will lead coordination with other professionals as needed for the design of the building. The buildings may be new construction or retrofits to existing facilities.	6 months	\$6 million +	<ul style="list-style-type: none"> Community Challenge BRIC Community Flood Preparedness Fund (CFPF) FMA (Requires Flood Insurance) Virginia Pooled Financing Program
5	Permitting – Depending on the solution selected, permits may be required for construction. These may include, but are not limited to environmental permits, land disturbance permits, and land use permits. Permits may include additional fees.	6 months		<ul style="list-style-type: none"> Community Challenge BRIC Community Flood Preparedness Fund (CFPF)
6	Construct New Facilities – Hire a contractor to construct the new facilities according to the plan.	1-2 years		<ul style="list-style-type: none"> FMA (Requires Flood Insurance)
7	Relocate Operations – Develop a plan to smoothly transition operations from the existing facilities to the new locations. The plan will need to incorporate the transition while continuing the current operations.	3 months		<ul style="list-style-type: none"> Virginia Pooled Financing Program
8a	Demolish Existing Facilities and Restrict Future Development – As applicable, demolish the existing structures to restore the locations to natural space. Restrict future development on the site. An engineer may need to be hired to design plans for the safe demolition of the buildings.	2-3 months		<ul style="list-style-type: none"> HMGP PA

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
8b	Restore Natural Areas – As applicable, restore the sites to natural areas to allow for flood storage. The natural areas may include public amenities such as a park or green space that are able to flood. Given the history of floods of the area and location in the floodplain, consider integrating the restoration with other buyouts in the future. For example, the commercial shopping centers along Big Creek. Some of the grants for restoration may also be leveraged for design of the restoration, natural areas, and public amenities.	2-3 months	\$6 million + Dependent on Solution	<ul style="list-style-type: none"> • Five Star and Urban Waters Restoration • Outdoor Recreation Legacy Partnership (ORLP) Land and Water Conservation Fund • Rivers, Trails, and Conservation Assistance (RTCA) • Transportation Alternatives Program (TAP) • Recreational Trails Program • Virginia Land Conservation Fund • Section 319(h) Nonpoint
8c	Floodproofing – If the Police Station building is retained to supplement the recreation facilities as a community center, the building will need floodproofing to help mitigate potential damages. Flooding proofing could include elevation, wet floodproofing, or dry floodproofing. Examples include installing openings to allow the entry / exiting of floodwaters and reduce hydrostatic pressure, raising critical mechanical and electrical	Dependent on Solution		<ul style="list-style-type: none"> • HMGP • BRIC • PA <p>Section 165 of the Water Resources Development Act of 2020</p>

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
9	Maintenance - Depending on the selected and constructed solution, routine maintenance may be needed. A maintenance plan should be made including maintenance frequency, actions needed, associated costs, and funding.	Dependent on Solution	Dependent on Solution	<ul style="list-style-type: none"> Town Operating Funds

Total Estimated Cost

\$450,000 +

Estimated Time to Complete

2 – 5 years

Project Lead

Tazewell County and Tazewell County Public Schools

Action Description

An engineer can perform a hydraulic study to confirm that excess stormwater is the source of the flooding. Once the source is confirmed, the engineer will calculate the target reduction volume and study potential solutions. It is anticipated that a gray infrastructure and/or a nature-based solutions will be needed to improve stormwater retention and reroute the flooding from the parking lot. Tazewell County has areas at risk to karst which may require more detailed soil surveys to design retention-based solutions. Additionally, previous studies have identified an aquifer underneath the school property which may require more data collection.

Steps (step #, step description, timeline, estimated cost)

	Step Description	Estimated Time to Complete	Estimated Cost/LOE (By Step)	Funding Sources (By Step)
Step #				
1	Baseline and Initial Conditions Review - A stormwater engineer will review existing information provided by the County and perform a preliminary site visit. This review will allow the engineer to gain a basic understanding of the problem and data availability/needs.	1 month	\$3,000	<ul style="list-style-type: none"> • SL • AF • CF • PF
2	Preliminary Hydrologic Study - A stormwater engineer will perform a preliminary hydrologic study to identify a target reduction volume for the improvements. For the study, additional surveys and/or soil assessments may be needed. Tazewell County has access rights to land which	3-6 months	\$3,000	
3	Alternative Review - Based on the identified target reduction volume and flow study, a stormwater engineer will identify three alternatives to reach the target reduction volume. The engineer will assess the viability of each option and provide a comparison of the alternatives to assist with selection. The stormwater engineer will	6-12 months	\$7,000	
4	Design - After a preferred alternative is selected, the stormwater engineer will design the identified solution. Additional surveys or data may be needed to complete the design. Completed plans will allow the responsible	6-12 months	\$40,000	
5	Permitting – Depending on the solution selected, permits may be required to construct the stormwater improvements. These may include, but are not limited to environmental permits, land disturbance permits, and	8-12 months	\$15,000	
6	Construction - The selected contractor will build the selected solution based on the design.	1-3 months	\$350,000 (dependent on solution)	
7	Maintenance - Depending on the selected and constructed solution, routine maintenance may be needed. A maintenance plan should be made including maintenance frequency, actions needed, associated costs,	Annually	Dependent on solution (\$1,500 / yr.)	

Funding Sources

- See table

Figure of Action

N/A

Programmatic

Six Flood Risk Mitigation Actions have been identified in the Programmatic category. These actions represent those that are needed at a large scale in multiple areas throughout the County or those that are policy-based. They have been developed into programs so the County can address these problems on an ongoing basis often with the assistance of contractors to supplement county staff.

Beaver Management Program

Problem Description

Beavers are the largest rodent in North America and can be found across the United States. County staff and the community have reported beaver presence worsening flooding in areas throughout the County. Beavers and beaver dams have many ecological benefits such as providing habitat for other species, slowing water velocity, changing water temperatures, and improving water quality.² However, as reported in Tazewell County, beavers can also cause significant damage. Most damage caused by beavers is the result of dam building and associated flooding, bank burrowing, and tree cutting. Beaver damage in Virginia is estimated to cause losses from \$3 million to \$5 million annually.³ Beaver dams can impede stream flow leading to worsening flooding and standing water often in areas that would not otherwise flood frequently. Beavers can also increase debris in streams. Beavers build two types of dens. Lodges are free standing dens built similarly to dams in slower moving ponds. The second type is known as a bank den. Bank dens and associated access tunnels can collapse and damage property and infrastructure.

Figures of Problem Area

N/A

Project Type

Programmatic

Total Estimated Cost

Dependent on the number of sites per year

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

While beavers have many ecological benefits, there are times when it becomes necessary to control beavers in an area to protect property and infrastructure. Therefore, it is recommended that Tazewell County establish a Beaver Management Program. An effective Beaver Management Program should include identification of potential and existing beaver-related activity that could impact county infrastructure and/or personal property. In areas where there is the potential for beaver activity, there are several non-lethal activities that can be implemented to deter beaver use of an area. These include

² "Environmental Benefits of Beavers", King County, [Environmental Benefits of Beavers - King County](#)

³ "Beaver Removal", Virginia Professional Wildlife Removal Services, [Beaver Removal - How To Get Rid Of Beavers | VA Pro Wildlife Removal \(virginiaprofessionalwildliferemovalservices.com\)](#)

exclusion (fencing, barriers to prevent beavers from accessing an area), repellents (sprays, devices to deter beavers) and habitat modification (removing vegetation near the water's edge).⁴ Given the environmental importance and protections surrounding the Clinch River, any treatment methods should consider permitting requirements and environmental impact.

Areas with existing beaver activity should be similarly evaluated to determine if there is a threat to infrastructure or personal property. In Virginia, live trapping and relocating beavers to another area is not permitted. Therefore, problem beavers will need to be removed using lethal methods and proper disposal. There are many non-lethal measures such as bypassing flow or fencing that may be more appropriate and cost effective when compared to lethal trapping. However, there are some scenarios where lethal measures may be necessary, as described below.

Some situations that may warrant lethal measures could include:

- Flooding from beaver dams impacting public infrastructure causing safety concerns such as worsening flooding of primary ingress/egress routes.
- Flooding from beaver dams threatening structures and infrastructure upstream of the dam.
- A large beaver colony forming which is likely to cause future issues.

As part of the Beaver Management Program the County should explore options for contracting with one or more Wildlife Management and Control Contractors. The selected contractor(s) should have the appropriate training, safety program, insurance, and Commercial Nuisance Permits. The County should work with the contractor to understand the best treatment method for each unique case.

The County may also explore the use of local trappers in the area. By allowing them access to trap and keep the fur, the County may save money and help control beavers. This option would only apply during the appropriate trapping season in the County.

When a beaver is trapped, the beaver dam should be immediately removed to mitigate the flooding issues. The beaver dam should be disposed of outside of the floodplain extents to minimize debris entering the stream. Following the removal of the beaver and the dam, other treatment measures should be considered to prevent other beavers from relocating to the same spot. Examples could include fencing, barriers, and repellants.

Several initial priority areas have been identified during stakeholder engagement for beaver control including:

- Blacksburg Street Area in North Tazewell
- Springville Area
- Leatherwood Lane / College Drive area in Bluefield

Additionally, any treatments that impact the Clinch River may require environmental permits. **The environmental permitting process may need to be included in the Habitat Conservation Plan developed in the Routine Debris Removal action.** The hired contractor should be licensed and

⁴ "Beaver Removal", Virginia Professional Wildlife Removal Services, [Beaver Removal - How To Get Rid Of Beavers | VA Pro Wildlife Removal \(virginiaprofessionalwildliferemovalservices.com\)](https://virginiaprofessionalwildliferemovalservices.com)

knowledgeable about permitting requirements. Depending on the contractors' abilities, it may be possible to hire the same contractor for debris removal service.

The County should draft and issue an RFP for contractors for the Beaver Management Program. The contract should include a yearly retainer and set pricing for routine beaver removal activities such as site investigations, non-lethal beaver deterrents, and trapping for a set length of time. The contract should also include procedures for communication, expected time between notification and treatment, and procedures for working on private property. The County should work with the contractor to gain permission before entering or implementing beaver control on private property.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Establish Program – Identify County staff to manage the beaver control program. Staff will be responsible for identifying priority areas, managing funding, hiring a contractor, and	0 - 2 years	Staff Time	County Operating Funds
2	Identify Priority Areas – Recommend the County supplement the priority areas in this plan by identifying additional hot spots for beaver control. These hotspots could be identified through engagement methods such as staff interviews or public surveys. The County			
3	Identify Funding Source – Identify an annual funding source for the program as funding will most likely come from County Operating Funds.			
4	Hire On-Call Contractor – Recommend the County hire on-call contractors for beaver control. The contract should include the processes to be followed by the contractor and County once a site has been identified. Additionally, the contract should include set costs for routine control activities. The contractor should maintain a Virginia Commercial Nuisance Animal Permit and be			
5	Maintain Program – Recommend the County actively work to maintain the program. When sites are identified for beaver control, the County should notify the contractor. The contractor should visit the site and provide the County with treatment recommendations. After approval by the County, the contractor should	Annual Basis	Dependent on treatment	

Funding Sources

- See table

Figure of Action

N/A

Routine Debris and Sediment Removal Program

PRIORITY ACTION

Problem Description

Throughout the planning process, public and planning team input has included issues with debris build up that reduces stream capacities and worsens flooding. Residents report increasing issues with debris and sediment associated with growth in logging in the area and minimal debris removal from the previous floods.

Woody debris in rivers is an important component of the structural and functional elements of riverine ecosystems. Wood in rivers may provide grade control, retain dissolved and particulate organic matter, provide a food source for aquatic invertebrates, and cover for fish. Rivers may recruit wood through a variety of mechanisms including bank erosion, windthrow, landslides, tree mortality, and/or flood pulses (periodic inundation of the floodplain). However, debris and sediment may accumulate at dams, culverts, and low-lying bridges, leading to infrastructure damage. Debris jams have been observed throughout Tazewell County by residents and County staff as shown in **Figure 75**.

The Clinch River is a globally significant river. The Clinch River is home to more species of mussels than any other river in the world.⁵ The river is home to 48 imperiled and vulnerable species of mussels and fish.⁶ In addition, the river is home to rare plants, mammals, and birds. The Clinch River has been identified as the number-one hotspot in the United States for imperiled aquatic species. Due to the presence of endangered species, federal actions that adversely impact the endangered species, such as debris and sediment removal, must complete consultation under Section 7 of the Endangered Species Act (ESA). Prior to the protections by the ESA, residents reported more frequent cleaning and removal of debris and sediment from the river. While the importance of protecting endangered species is acknowledged, the associated restrictions and regulatory processes are a burden to resource-limited County staff and is believed to be an underlying reason for less active debris management programs. Understanding which debris-removal actions are allowed under the ESA and how to obtain permissions to take such actions requires time and expertise not currently had by county staff.

Debris within waterways is also a problem after a major flood, as fast-moving floodwaters pick up and carry not only woody debris and sediments, but structures, infrastructure, cars, and other personal property. This type of debris requires additional considerations as it may contain hazardous materials. In addition, separate regulations and funding opportunities exist around debris removal after an emergency event. Therefore, Emergency Debris Removal is considered as a separate action within the plan.

⁵ "Clinch River", Virginia Department of Wildlife Resources, [Clinch River | Virginia DWR](#)

⁶ "Clinch River", The Natural Conservancy, [Clinch River \(nature.org\)](#)

Figures of Problem Area



Figure 76: Example of debris captured on dam in North Tazewell

Project Type

Programmatic

Total Estimated Cost

Unavailable

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

*The County needs a mechanism in place to routinely remove debris and sediment while maintaining compliance with ESA and other environmental requirements, as there are streams in the County designated as critical habitat for endangered species. If needed, the County should hire contractors to increase staff capacity for debris removal. Contractors could include program administration, crews for debris removal, or environmental permitting experts. The mechanism for *emergency debris removal* will vary and is broken out into a separate action.*

The routine debris and sediment removal program should have short-term and long-term goals. In the short-term, the focus should be on understanding the mechanisms needed to remove debris and sediment. The County should focus on clearing debris that is captured on infrastructure and removing sediment that is blocking the flow of the stream. For example, many culverts throughout the County are filled with sediment which worsens flooding by limiting the capacity of the culvert. Prior to removing debris, the location should also be evaluated for long-term solutions. While debris removal is necessary in some parts of the County from years of buildup on infrastructure, repeated routine debris removal from the same locations is expensive and damaging to the environment. The County should focus on

solving the long-term problem by resizing infrastructure to accommodate seasonal flow and debris delivery. The long-term focus should be reducing the sources of unnatural debris and sediment through actions such as studies to identify sources of debris and sediment, strengthening sediment and erosion control ordinances, increasing staff capacity to support enforcement, and resizing infrastructure to accommodate seasonal flow and debris delivery.

There are several mechanisms that can be utilized to obtain proper environmental permits to remove debris and sediment. Additionally, the best process may be determined by owner of the infrastructure. For example, VDOT may already have routine procedures and permitting to remove debris from VDOT structures utilizing a Nationwide Permit and/or Programmatic Agreements. The proposed steps outline the recommended approach for the Routine Debris and Sediment Removal Program. However, the U.S. Fish and Wildlife Service (FWS), U.S. Army Corps of Engineers (USACE), and Virginia Department of Transportation (VDOT) should be engaged throughout this process to identify the most streamlined process.

For removal of debris and sediment, it is recommended that the County develop a *Habitat Conservation Plan (HCP)* including procedures for debris and sediment removal under *Section 10 of the Endangered Species Act*. An HCP is a planning document designed to accommodate economic development to the extent possible by authorizing the limited and unintentional take of listed species when it occurs incidental to otherwise lawful activities.⁷ The plan is designed help landowners and communities while providing long-term benefits to species and their habitats. HCPs describe the anticipated effects of the proposed taking, how those impacts will be minimized or mitigated, and how the conservation measures included in the plan will be funded.

If the FWS finds an HCP meets the specified criteria, it issues an incidental take permit. This allows the permit holder to proceed with an activity that could otherwise result in the unlawful take of a listed species. The benefits of the HCP include creating set procedures for actions within the river to balance conservation with flood risk reduction, available grant funding, agency coordination, and provisions for routine and emergency debris removal. In addition, the procedures within the HCP are set for the life of the HCP even if some ESA requirements change. HCPs may cover both listed and unlisted species. For example, if the regulatory status of an unlisted species changes during the term of the HCP, the obligations of the applicant do not.

⁷ "Habitat Conservation Plans", U.S. Fish & Wildlife Service, [Habitat Conservation Plans | U.S. Fish & Wildlife Service \(fws.gov\)](https://www.fws.gov/habitat-conservation-plans)

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources
Short-term Goals				
1	Identify Staffing – Recommend the County identify staff to manage and champion the Routine Debris and Sediment Removal Program. If staff does not have the capacity, the County should hire a consultant to lead the effort. The consultant could fill multiple roles identified through the	0-1 years	County Staff Time	
2	Identify Priority Areas – Recommend the County identify priority areas for debris and sediment removal throughout the County. The Community should be engaged throughout the process to provide input. By identifying priority areas, the County can develop goals for each year of the program	0-1 years	County Staff Time	
3	Agency Coordination – There are several potential paths to obtain permits for removing debris and sediment within Tazewell County. The County should set up an initial engagement meeting with VDOT staff to understand Nationwide Permits held by VDOT. For structures owned by VDOT, there may already be a process in place for debris removal. If VDOT does not hold permits, the County may need to pursue a Nationwide Permit which will include notification of FWS with each action. The County should set up initial engagement meetings with FWS to present the proposed approach before moving forward with developing a Habitat Conservation Plan (HCP)	1-3 months		
4	Secure Funding for an HCP – The County should pursue funding to develop the HCP. FWS has funds to help communities establish HCP through its Cooperative			
5	Develop HCP – The County should hire a consultant to prepare the HCP. Throughout the plan, the County should coordinate with FWS to ensure all Section 10 requirements of the ESA are met. Once the plan is completed, FWS will evaluate the plan to ensure it meets NEPA and HCP requirements to issue an incidental take permit.	1-2 years	\$50,000 - \$200,000	Cooperative Endangered Species Conservation Fund – Conservation Planning

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources
6	Remove Debris and Sediment following HCP – Once FWS issues an incidental take permit, the County can begin work in accordance with the HCP and permit requirements. The County should hire a contractor to remove debris and sediment in accordance with the HCP and incidental take permit. It is important to note, violating the terms of the incidental take permit may constitute unlawful take under ESA. When removing the debris, the County should also evaluate sites that routinely capture debris. Removing	As Needed	Dependent on flood event	Section 165 of the Water Resources Development Act of 2020
7	Maintain Program – The program should be run on an ongoing basis including activities such as identifying priority areas, coordinating with FWS, removing debris and sediment, and resizing infrastructure as funding is available. Additionally, the HCP and incidental take permit will have	Ongoing		
Long-Term Goals				
8	Field Review – The County should hire a geomorphologist to perform a preliminary field visit. The geomorphologist should spend a few days reviewing hotspots for sedimentation provided by the County. Based on the field observations, the geomorphologist should make	3-6 months		
9	Study Source of Sedimentation – Based on the recommendations of the geomorphologist, the County should have a study of the sedimentation sources prepared. The study should consider sedimentation sources such as streambank erosion, logging, agriculture, and others as recommended by the geomorphologist. The study should identify sources of sediment and make recommendations for limiting sedimentation if there is unnatural or increased sedimentation identified. Recommendation may include	1-2 years		
10	Strengthen Sediment and Erosion Control Ordinances – Based on feedback from the community, it is believed that human activities are causing increased sedimentation. As recommended by the proposed study in Step 9, the County should work to strengthen the Sediment and Erosion Control Ordinance (e.g., requirements that go beyond	6-12 months	County staff time	
11	Increase Staffing Capacity for Enforcement and Review - As recommended by the proposed study in Step 9, the County should increase staffing capacity to better enforce the Sediment and Erosion Control Ordinance. This could include hiring consultants to perform permit review or hiring inspectors for enforcement. The staff should also	Ongoing		

Funding Sources

- See Table

Figure of Action

- N/A

Develop Emergency Debris Management Program

PRIORITY ACTION

Problem Description

Floods create a significant amount of natural and man-made debris within the stream such as trees, cars, unsecured property, and pieces of buildings and infrastructure. In the last 161 years, there have been 42 damaging flood events in Tazewell County. Since 2020, there have been seven floods within Tazewell County as discussed in *Section 4 – Existing Conditions Summary* and *Section 6 - Risk Assessment*. Residents have reported issues with debris build up that reduces flow capacities within streams and worsens flooding. Debris can also damage infrastructure and property. Residents reported that there used to be more frequent cleaning up of debris and sediment in the river following flood events. Residents reported receiving minimal assistance with removing debris. Additionally, compounding debris in streams from previous flood events worsens future flooding.

As discussed throughout the plan, the Clinch River is home to many endangered species. Due to the presence of endangered species, actions that potentially impact the species such as debris and sediment removal must meet the specifications of the Endangered Species Act (ESA). Prior to the protections by the ESA, residents reported more frequent routine cleaning up of debris and sediment in the river. County staff has limited capacity and has not been able to implement procedures to meet the ESA requirements to allow for debris and sediment removal. Special conditions/procedures may apply after an emergency flood event to allow for expedited removal of debris with respect to ESA compliance. Flood events exhaust staff capacity which limits the ability of staff to focus on debris removal after flood events. Additionally, when there is a Presidential disaster declaration, there are more sources of funding and assistance for debris removal, such as funding available through FEMA Public Assistance. Currently, staff does not have capacity to fully leverage available assistance.

Figures of Problem Area

N/A

Project Type

Programmatic

Total Estimated Cost

Unavailable

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

Debris build-up is an ongoing issue in Tazewell County that worsens flooding. Additionally, to remove debris the County must navigate the proper approvals due to the presence of protected species. This action includes the creation of an Emergency Debris Management Program by establishing set procedures and permits for debris removal in streams, hiring a disaster recovery services contractor to supplement county staff, and updating the Tazewell County Emergency Operations Plans Debris Management Support Annex. A disaster recovery services contractor can assist in the acquisition and administration of grants. A disaster recovery services contractor can also assist with the procurement and management of services such as debris removal.

One of the largest disaster recovery federal programs is the Federal Emergency Management Agency (FEMA) Public Assistance (PA) Program, as authorized by section 406 of the Stafford Act. All FEMA PA funds come with an additional 5% for management costs (Category Z), which most local governments use to pay the disaster recovery services contractor. FEMA also provides additional funding as part of the PA program for hazard mitigation, so that recovery projects using PA funds are more sustainable and resilient in the face of future, similar disasters. Finally, once FEMA PA funds are totaled, a percentage of those funds may be added and given to the state to manage and fund other types of hazard mitigation projects as part of the Hazard Mitigation Grant Program (HMGP) as authorized by section 404 of the Stafford Act. It should be noted that communities that have an Emergency Debris Management Plan in place typically have higher reimbursement rates through the FEMA PA program. Hiring a disaster recovery services contractor can help Tazewell County clear debris following flood events and leverage available federal funding for recovery. This action should be pursued in conjunction with the *Routine Debris and Sediment Removal Program*. All these proposed steps should be performed in advance of flood events to help the County be prepared to actively respond.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to Complete	Estimated Cost	Potential Funding Sources (By Source)
1	<p>Hire a Disaster Recovery Services Contractor – Throughout the plan, there have been several actions that could include support from the Disaster Recovery Services Contractor. The County should identify the specific roles and expectations for the Disaster Recovery Services Contractor and hire a firm to fill the role. The County should reach out to the VA SHMO to see if any PA funds are still available to support initial tasks for the Disaster Recovery Services Contractor.</p> <p>The Disaster Recovery Services Contractor can assist the County by:</p> <ul style="list-style-type: none"> • Managing Public Assistance and other recovery grant applications and administration. • Guiding the County in submitting applications to fund debris removal (or for reimbursements), pump station repairs, road and culvert repairs and other recovery projects. Recovery contractors may be paid with a portion of the 5% administration costs that accompany FEMA grants. • Meeting with FEMA Program Delivery Manager (PDMG) and establish what meetings (Recovery Scoping Meeting) have occurred and deadlines for project submittal. Discussing options for debris removal and stream restoration, including the Natural Resources Conservation Service (NRCS) and United States Army Corps of Engineers (USACE) management of debris removal projects and stream restoration. • Completing the Damage Inventory (DI), including a detailed inventory of debris associated with the 			<ul style="list-style-type: none"> • County operating funds • PA Management Costs • NRCS Emergency Watershed Protection (EWP) funds • USACE Direct Federal Assistance (DFA) • Federal Operations Support (FOS) • Mission Assignments
2	<p>Agency Coordination - There are several potential paths to obtain permits for emergency debris removal. The County should set up an initial engagement meeting with VDOT staff to understand Nationwide Permits held by VDOT through USACE. For structures owned by VDOT, there may already be a process in place for debris removal. If VDOT does not hold permits, the County may need to pursue a Nationwide Permit which will include notification of FWS with each action. When a presidential disaster is declared, the USACE should be immediately requested to set up emergency debris removal utilizing Nationwide Permits.</p>			

Step #	Step Description	Estimated Time to Complete	Estimated Cost	Potential Funding Sources (By FY)
3	<p>Acquire Nationwide 401 Permit for debris removal from non-VDOT owned infrastructure in the waterways – The USACE issues Nationwide Permits that allow agencies to maintain their assets. Through coordination with VDOT, it should be confirmed that VDOT has and can utilize a Nationwide Permit to clear debris and sediment from VDOT assets post event.</p> <p>Tazewell County should obtain a Nationwide 404 permit to clear debris from assets not covered by VDOT debris removal. Due to the protected species in the Clinch River, Tazewell County should obtain a Nationwide 404 permit to clear debris from assets not covered by VDOT debris removal.</p>			
4	<p>Include Emergency Debris Removal in Habitat Conservation Plan (HCP) – As discussed in the <i>Routine Debris and Sediment Removal Program</i>, Tazewell County should include programmatic actions for emergency debris removal in the HCP. The plan should clearly outline actions to be taken with the Nationwide Permit and debris removal outside of infrastructure assets. By having clear approved procedures in advance of flood events, the County can expedite the acquisition of permits to remove debris post</p>			

Step #	Step Description	Estimated Time to Complete	Estimated Cost	Potential Funding Sources (By FY)
5	<p>Amend Debris Management Support Annex (Tazewell County Emergency Operations Plan) - The Tazewell County Emergency Operations Plan includes a Debris Management Support Annex to facilitate and coordinate the removal, collection, and disposal of debris following a disaster in order to mitigate against any potential threat to the health, safety, and welfare of the impacted citizens, expedite recovery efforts in the impacted area, and address any threat of significant damage to improved public or private property.</p> <p>Currently, the annex does not include specific provisions for debris removal from waterways after a flood event. The annex should include guidance for emergency removal of debris from waterways including:</p> <ul style="list-style-type: none"> • Roles of County staff and Disaster Recovery Services Coordinator • The request process for debris assistance from USACE following a presidential disaster declaration. The County EM can request a USACE field assignment to remove debris when a Presidential Disaster Declaration has been made. • FEMA Trainings for County Staff assisting with Debris Management including IS-632.a (Introduction to Debris Operations) and IS-633 (Debris Management Plan Development) • Private contractors for debris removal • Resources needed for debris removal (e.g., equipment, personnel, etc.) 			

Funding Sources

- See Table

Figure of Action

N/A

Acquire Undeveloped Parcels

Problem Description

As discussed in the *Risk Assessment*, large portions of Tazewell County are at risk of flooding. Additionally, most of the development is near water features due to the flat topography along the valley bottoms. Development intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land, and, occasionally, overwhelming sewer systems. Residents report rapid flooding with minimal warning time and high velocity floodwaters.

Figures of Problem Area

N/A

Project Type

Programmatic

Total Estimated Cost

Dependent on number of parcels identified and current market value.

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

The County has expressed interest in acquiring parcels of undeveloped land within the floodplain to reduce and mitigate the impact of flooding by limiting future development in the floodplain and implementing flood storage areas. Parcels should be selected upstream of high-risk flood areas to capture, store, and slow the velocity of the channel flow. To serve as flood storage, the parcels may require minor grading, wetland restoration, stream restoration, the construction of nature-based solutions or the construction of flood storage basins. While serving as natural flood storage, the parcels can also serve as public amenities such as natural areas or parks with recreation facilities, hiking trails, or canoe access points. When acquired for flood storage, sites may need additional studies to evaluate storage capacities, flood risk reductions, and needs for nature-based solutions or restoration. Sites identified for public amenities, nature-based solutions, or storage basins may require additional planning, design, and construction.

At a minimum, the following actions should be taken at each site:

- Acquisition of property and development rights
- Restriction of future development
- Long-term maintenance plan development

In addition, the following actions should be considered for each site:

- Investigative or planning level studies
- Required permitting needs
- Stream and or wetland restoration
- Nature Based Solution installation for flood storage
- Flood storage basins
- Conversion to a public amenity (walking trails, natural areas, recreation facilities, etc.)
- Mitigation banking
- Long-term stewardship

Throughout the engagement process, several areas were identified as potential sites to be acquired for flood storage.

Areas identified for potential flood storage include:

- Parcels upstream of North Tazewell
- Parcels near the Four Way Area in Tazewell
- Parcels upstream of Richlands

When identifying funding sources for acquisition, restoration, and construction the County should pursue several opportunities. There are a wide variety of grants available for activities such as stream restoration, wetland restoration, and public recreation amenities. Sites with hard infrastructure solutions such as retention basins may not be eligible for grants focused on mitigation through nature-based solutions and restoration. The County should also consider public /private partnerships through options such as mitigation banks. Additionally, FWS provides Habitat Conservation Plan Land Acquisition Grants through the Cooperative Endangered Species Conservation Fund Grants. These funds can be utilized to acquire land to complement mitigation in areas with approved Habitat Conservation Plans. These funds could be leveraged upon the completion of the Habitat Conservation Plan as recommended in the *Routine Debris and Sediment Removal Program*.

Undeveloped parcels in flood hazard areas for North Tazewell and Richlands are shown in **Figure 76** and **Figure 77**. The total government owned undeveloped areas within flood hazard areas are summarized in **Table 71**.

Table 71: Government Owned Undeveloped Parcels within Flood Hazard Areas

Flood Hazard Area	Undeveloped Area (Acres)
Floodway	127
100-Year Flood Zone	3318
500-Year Flood Zone	32

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Property Identification – Recommend the County develop a priority matrix that identifies priority acquisition properties based on selection criteria. Depending on the goals of the County, a study may need to be determined to understand which parcels would best reduce flood risk by serving as flood storage. The County should also identify the actions to be implemented at each site. For example, in some sites the goal may just be to acquire the site and restrict future development. Other sites may be used for flood storage		County Staff or Consultant Time	<ul style="list-style-type: none"> BRIC Capability and Capacity Building
2	Pursue Funding – Once the County has identified priority sites and the actions to implement at each site, the County should pursue funding for the actions. Depending on the funding sources, actions may be taken one site at a time or through groupings of sites. When pursuing BRIC funds, the County should pursue larger flood mitigation actions including the			
3	Acquisition – Recommend the County acquire the prioritized sites and development rights to the sites. The County should restrict future development on the sites.			<ul style="list-style-type: none"> BRIC CFPF Cooperative Endangered Species Conservation
4	Design & Permitting – Depending on the site, further design and permitting may be needed for flood storage, nature-based solutions, stream restoration, and public amenities. The County should hire qualified consultants as needed for design			<ul style="list-style-type: none"> Community Challenge BRIC Five Star and Urban Waters Restoration

Step #	Step Description	Estimated Time to	Estimated Cost (By Step)	Potential Funding Sources (By Step)
5	Implementation – Once the design is complete, the project may be bid, and a qualified contractor selected to implement the action at each site.			<ul style="list-style-type: none"> • Outdoor Recreation Legacy Partnership (ORLP) Land and Water Conservation Fund • Rivers, Trails, and Conservation Assistance (RTCA) • Transportation Alternatives Program (TAP) • Community Flood Preparedness Fund (CFPF) • Recreational Trails Program • Virginia Land Conservation Fund • Section 319(h) Nonpoint Source (NPS) Implementation Program • Stormwater Local
6	Maintenance – Depending on the selected solution, routine maintenance may be needed. A plan for maintenance should be made including maintenance frequency,			<ul style="list-style-type: none"> • County Operating Funds

Funding Sources

- See Table

Figure of Action

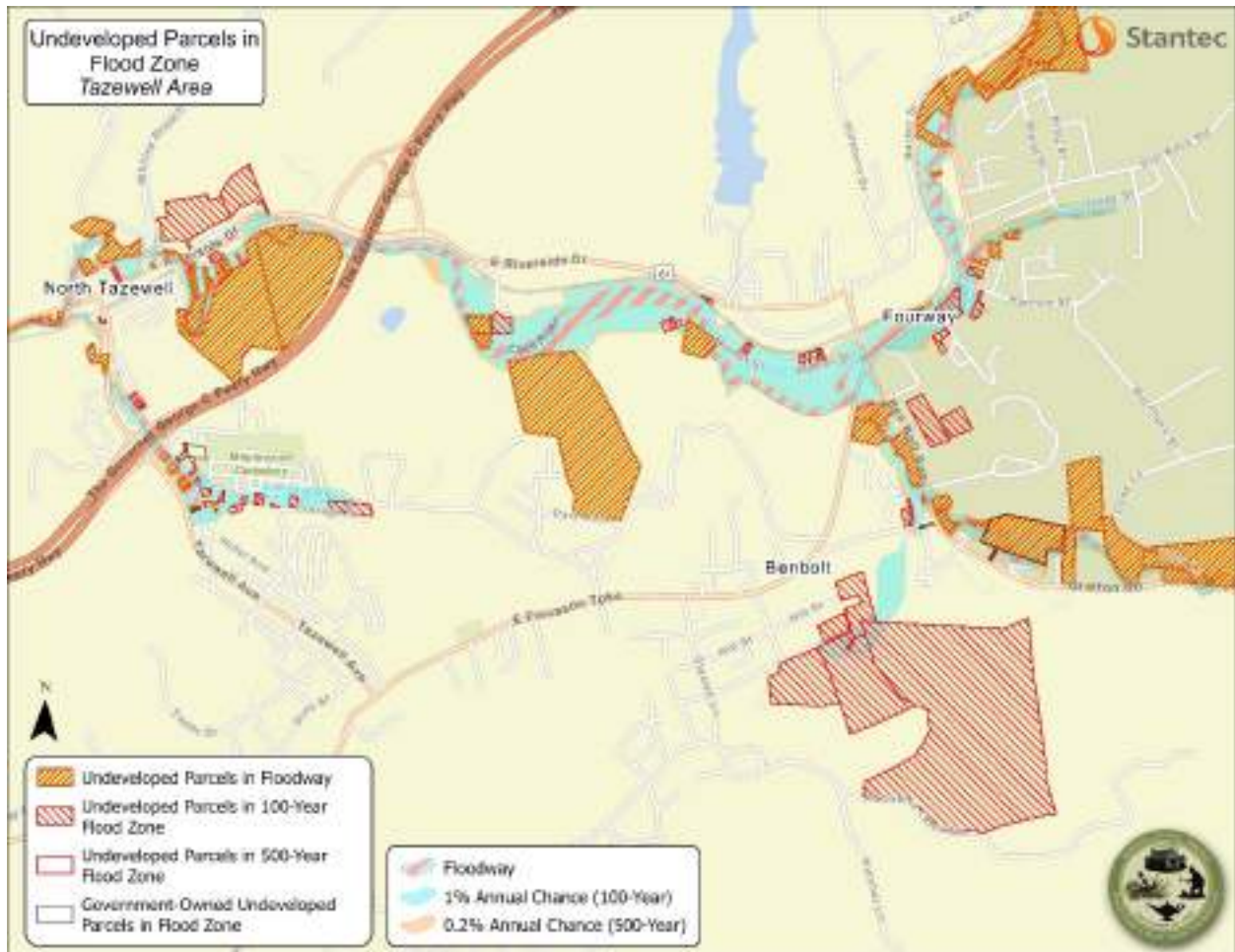


Figure 77 Undeveloped Parcels in Flood Hazard Areas in Tazewell

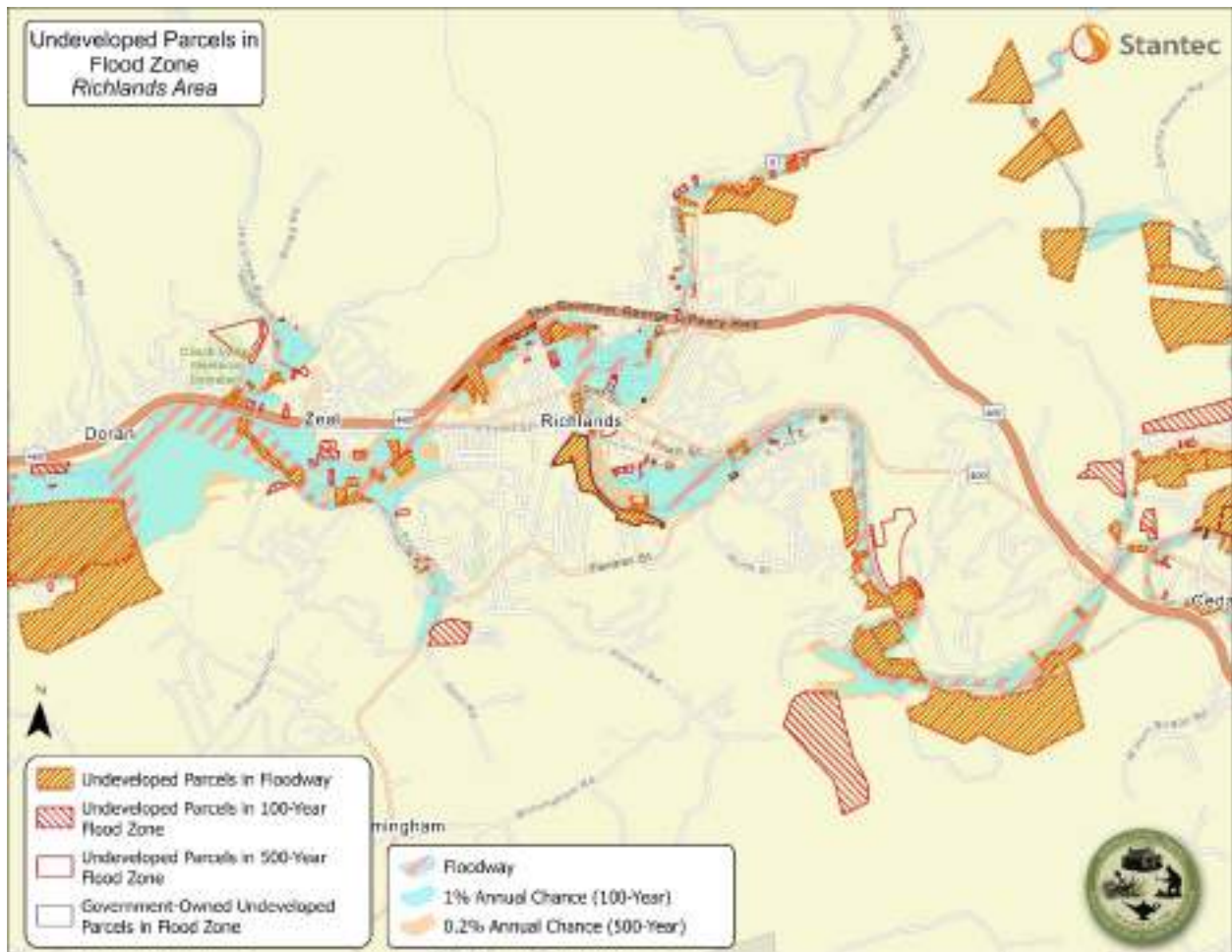


Figure 78: Undeveloped Parcels in Flood Hazard Areas in Richlands

Acquire Developed Properties

Problem Description

Tazewell County has a large number of structures located within the floodplain, as described in the *Risk Assessment*. Many of these structures were built prior to floodplain management ordinances. Development intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land, and, occasionally, overwhelming sewer systems. Development within the floodplain puts people, property, and infrastructure at higher risk of negative impacts from flooding as shown in **Figure 78** and **Figure 79**. Additionally, many of the structures located within the floodplain are mobile homes that have higher vulnerability to flooding. Residents with high social vulnerability or without flood insurance may be unable to afford repairs to their homes and are more likely to continue to live in their homes. Tazewell County also has several residential areas that are only accessible by a single access point which strands a large number of residents and cuts-off emergency services when flooded.

Figures of Problem Area



Figure 79: Bottom Road Area during February 2020 floods (Source: Donna Whittington)



Figure 710: Allegheny Street Area during February 2020 floods (Source: WOAY TV)

Project Type

Programmatic

Total Estimated Cost

Dependent on the number of properties acquired and current market value.

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

Tazewell County should develop a program to acquire properties based on prioritization located within the floodway and high hazard areas of the mapped FEMA floodplain to return to natural areas. **Priority should be given to severe / repetitive loss properties, mobile homes, abandoned buildings, properties in the floodplain or 100-year floodplain, and areas cut-off from emergency services during flooding events.** While acquisition may be pursued one property at a time, a focus should be placed on buying out multiple properties where applicable to minimize flood risk. The acquisition of property will minimize flood risk by providing opportunities within the floodway or floodplain for incorporation of flood storage (including natural or nature-based solutions) and limiting future development.

Once acquired, structures on the property should be demolished and the site should be restored to natural area. Natural areas may also be utilized for public recreation. To serve as flood storage, the parcels may require minor grading, wetland restoration, stream restoration, and or the construction of nature-based solutions. While serving as natural flood storage, the parcels can also serve as public amenities such as natural areas and parks with recreation facilities, hiking trails, and or canoe access points. When acquired for flood storage, sites may need additional studies to evaluate storage capacities, flood risk reductions, and needs for nature-based solutions or restoration. Sites identified for public amenities or nature-based solutions may require additional planning, design, and construction. Sites

with hard infrastructure solutions such as retention basins may not be eligible for grants focused on mitigation through nature-based solutions and restoration.

At a minimum, the following actions should be taken at each site:

- Acquisition of property and development rights
- Demolition of existing structures
- Restriction of future development
- Long-term maintenance plan development

In addition, the following actions should be considered for each site:

- Investigative or planning level studies.
- Required permitting needs
- Stream or wetland restoration
- Conversion to a public amenity (walking trails, natural areas, recreation facilities, etc.)
- Nature Based Solution installation for flood storage.
- Mitigation banking
- Long-term stewardship

When pursuing acquisition, the program should consider community engagement, equity, and affordable housing. Residents should be engaged throughout the process to understand their options, rights, and risk. Some property owners may require additional assistance to relocate beyond the value they are given for their home or as renters. The County should consider additional funding sources and support to ensure residents are relocated outside of the floodplain and flood risk areas. Additional support may include moving assistance, site development for relocated communities, and housing assistance. For communities that want to remain together, the County may need to provide assistance to help residents relocate to an area together.

Priority areas identified throughout this plan include:

- Blacksbury Street, North Tazewell
- Bottom Road/ Kirby Road Area, Raven
- Allegheny Street Area, Richlands
- Page Street Area, Richlands
- Four Way Area, North Tazewell
- Reynolds Avenue Area, Bluefield including Dudley Street and Mobile Estates/ Magnolia Lane

These areas were identified throughout the planning process which included public engagement and a desktop risk assessment. Other areas should be considered if they meet the program goals. Additional studies may need to be performed to acquire grant funding for property acquisition, demolition and restoration. This program should remain ongoing until the number of structures within flood hazard

areas is reduced to zero and as funding and opportunities become available. Examples of acquisition and demolition properties being turned into a public park are shown in **Figure 711** and **Figure 712**.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
1	Establish Program – Recommend the County identify staff to lead the program and champion the effort. The County should work to acquire properties on an ongoing basis as funding becomes available. Staff should be trained on funding sources for acquisition, demolition, and restoration. If existing staff does not have the capacity, the County may			
2	Community Engagement – Recommend the County hold public meetings with the identified priority communities to receive feedback on potential acquisition projects		County Staff Time	<ul style="list-style-type: none"> • HMGP Advanced Assistance • BRIC Project Scoping
3	Property Identification – Recommend the County identify priority properties to acquire and demolish through a prioritization matrix based on selected criteria. Depending on the goals of the County, a study may be needed to understand which parcels would best reduce flood risk by serving as flood storage (natural flood storage or nature-based infrastructure). The County should identify the actions to be implemented at each site. The County should			
4	Pursue Funding – Once the County has identified priority sites and the actions to implement at each site, recommend the County pursue funding for the actions. Depending on the funding sources, actions may be taken one site at a time or through groupings of sites. For pursuing larger grant opportunities such as HMGP or BRIC, a consultant or disaster recovery services coordinator may be beneficial to prepare the		\$50,000 + for BRIC application prepared by a consultant	
5	Acquisition / Demolition – Recommend the County acquire the prioritized sites and development rights to the sites. The County should restrict future development on the sites. The County should coordinate with residents to ensure a streamlined process and		County Staff Time, funding for acquisition	<ul style="list-style-type: none"> • BRIC • CFPF • FMA • CBDG (housing development) • HMGP

Step #	Step Description	Estimated Time to Complete	Estimated Cost (By Step)	Potential Funding Sources (By Step)
6	Design & Permitting – Depending on the actions selected for the sites, further design and permitting may be needed for flood storage, nature-based solutions, stream restoration, and public amenities. The County should hire consultants as needed for design and permitting on the acquired properties. Most grants are focused on stream restoration for natural flood storage. If the County decided to pursue hard infrastructure solutions for			<ul style="list-style-type: none"> • Community Challenge • BRIC • Five Star and Urban Waters Restoration • Outdoor Recreation Legacy Partnership (ORLP) Land and Water Conservation Fund
7	Implementation – Once the design is complete, a contractor can be hired to implement the action at each site.			<ul style="list-style-type: none"> • Rivers, Trails and Conservation Assistance (RTCA) • CFPF • Recreational Trails Program • Virginia Land Conservation Fund • FMA • Section 319(h) Nonpoint Source (NPS) Implementation
8	Maintenance – Depending on the selected solution, routine maintenance may be needed. A plan for maintenance should be made including maintenance frequency, actions			<ul style="list-style-type: none"> • County operating Funds

Funding Sources

- See Table

Figure of Action



Figure 711: Example of open space post property acquisition/demolition due to flooding (California Neighborhood Louisville, Kentucky).



Figure 712: Example of a park being developed on previously acquired properties from flooding in the California Neighborhood, Louisville, Kentucky⁸

⁸ "Alberta O. Jones Park", Parks Alliance of Louisville, [Alberta O. Jones Park | Parks Alliance of Louisville \(parksalliancelou.org\)](https://parksalliancelou.org)

Participate in Community Rating System (CRS)

Problem Description

Within Tazewell County, there are a large number of structures location in Flood Hazard Areas as discussed in *Section 6 - Risk Assessment*. There are 387 structures in the Floodway, 1,996 in the 1% Annual Chance Flood Hazard Area, and 525 in the 0.2% Annual Chance Flood Hazard Area. While Tazewell County participates in National Floodplain Insurance Program (NFIP), many residents report that flood insurance premiums are cost prohibitive. Without flood insurance, residents may be fully responsible for flood-related damage to their property. Flood damage can be extremely expensive. One inch of floodwater can cause up to \$25,000 in damage.⁹

Figures of Problem Area

N/A

Project Type

Programmatic

Total Estimated Cost

Staff time. Additional costs associated with developing flood management planning (e.g., hiring a consultant to develop a plan, write an ordinance, or verify CRS prerequisites are met) may apply.

Estimated Time to Complete

Ongoing Program

Project Lead

Tazewell County

Action Description

Under the Community Rating System (CRS), communities are rewarded for exceeding the minimum national standards for floodplain management. Under the CRS, the flood insurance premiums of a community's residents and businesses can be discounted to reflect the community's work to reduce flood damage to existing buildings, manage development in areas not mapped by the NFIP, protect new buildings beyond the minimum NFIP protection level, preserve and /or restore natural functions of floodplains, help insurance agencies obtain flood data, and help people obtain flood insurance. Participating communities achieve certain classes that are associated with a specific discount on residents' premiums. The discounts by CRS class are shown in **Figure 713**.¹⁰

⁹ "Flood Insurance", FEMA, [Flood Insurance | FEMA.gov](https://www.fema.gov/flood-insurance)

¹⁰ "National Flood Insurance Program Community Rating System Coordinator's Manual", FEMA, 2017, [CRS Coordinator's Manual \(fema.gov\)](https://www.fema.gov/national-flood-insurance-program-community-rating-system-coordinator-manual)

CRS classes, credit points, and premium discounts			
CRS Class	Credit Points (cT)	Premium Reduction	
		In SFHA	Outside SFHA
1	4,500+	45%	10%
2	4,000–4,499	40%	10%
3	3,500–3,999	35%	10%
4	3,000–3,499	30%	10%
5	2,500–2,999	25%	10%
6	2,000–2,499	20%	10%
7	1,500–1,999	15%	5%
8	1,000–1,499	10%	5%
9	500–999	5%	5%
10	0–499	0	0

SFHA: Zones A, AE, A1–A30, V, V1–V30, AO, and AH
Outside the SFHA: Zones X, B, C, A99, AR, and D
Preferred Risk Policies are not eligible for CRS premium discounts because they already have premiums lower than other policies. Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage.
Some minus-rated policies may not be eligible for CRS premium discounts.
Premium discounts are subject to change.

Figure 713: CRS classes, credit points, and premium discounts

To help lower the cost of flood insurance in Tazewell County, the goal of this action is to start participating in CRS. While communities can continue to earn more credits, an initial goal is to achieve CRS Class 9 which would result in a 5% insurance premium discount. The process to join the CRS is described in the [Coordinator's Manual](#) and summarized below. The steps reference the 2017 Coordinator's Manual, however, when applying the community should reference the latest manual as they are updated every few years.

Flood Risk Mitigation Actions from this plan including the activities performed for the completion of this plan may be leveraged for CRS Credit. For example, increased flood modeling actions may be leveraged under Activity 410 – Flood Hazard Mapping. Additionally, the Tazewell County Flood Resilience Plan may be leveraged for Activity 510 – Floodplain Management Planning with the addition of a few components. As the community pursues and implements the Flood Risk Mitigation Actions in the Tazewell County Flood Resilience Plan, the community should check if the activities meet any CRS credits.

Steps (step #, step description, timeline, estimated cost)

Step #	Step Description	Estimated Cost	Potential Funding
	Initial Classification		
1	<p>Meet Prerequisites - To become and continue to be a Class 9 or better, a community must demonstrate that it has enough points to warrant the class AND meet the following six prerequisites. Below the prerequisites are summarized. The community should verify that the Class 9 prerequisites are met as defined in the Coordinator's Manual.</p> <ol style="list-style-type: none"> 1. The community must have been in the Regular Phase of the NFIP for at least one year. 2. The community must be in full compliance with the minimum requirements of the NFIP. This must be verified by the FEMA Regional Office within 6 months of the initial CRS verification visit. 3. The community must maintain FEMA Elevation Certificates on all new buildings and substantial improvements constructed in the Special Flood Hazard Area (SFHA) after the community applies for CRS credit. 4. If there are one or more repetitive loss properties in the community, the community must take certain actions. These include reviewing and updating the list of repetitive loss properties, mapping repetitive loss areas, describing the causes of the losses, and sending an outreach project to those areas each year. A community with 50 or more repetitive loss properties must take additional actions. 5. The community must maintain all flood insurance policies that it has been required to carry on properties owned by the 		
2	<p>Submit Letter of Interest - The community will submit a letter of interest to the FEMA Regional Office and copies will be sent to the State NFIP Coordinator and Insurance Services Office, Inc. (ISO). The contents required are shown in the Coordinator's Manual. The community will also include documentation showing that the community is implementing activities to warrant at least a CRS Class 9.</p>		
3	<p>Submittal Review - If the community's submittal is complete and shows that Class 9 is likely, the ISO Specialist will contact the FEMA Regional Office for approval to conduct an initial verification visit with the community.</p> <p>The Regional FEMA Office must approve the submittal to ensure that the community is in full compliance with the minimum floodplain</p>		

Step #	Step Description	Estimated Cost	Potential Funding
4	Prepare for Community Visit - The ISO Specialist will contact the community to schedule the community verification. During the visit, the ISO/CRS Specialist will review all the communities' activities that may deserve credit. Prior to the visit, community staff will prepare		
5	Community Visit - ISO will perform the verification visit and submit a verification report to FEMA. The review period may take several months. FEMA will make the final decision on the community's credit and		
6	Credit Set - FEMA sets the CRS credit to be granted and notifies the community, the state, insurance companies, and other appropriate		
7	Official Classification - The classification becomes effective on May 1 or October 1, whichever comes first, after the community's activities are		
	Recertification (Each Year)		
1	<p>Staffing - Designate a community CRS coordinator and maintain the position. The CRS coordinator should be responsible for recertification each year. The CRS coordinator should also be responsible for applying for additional credits as Tazewell County completes flood mitigation activities to gain further insurance premium discounts. The process for applying for additional credits is detailed in the Coordinators Manual. For example, the Class 6 prerequisites are summarized below, which would result in a 20% premium reduction for properties in Special Flood Hazard Areas. The Coordinator's Manual should be referenced for the full criteria.</p> <ol style="list-style-type: none"> 1. The community must meet all the Class 9 prerequisites. 2. The community must have received and continue to maintain a classification of 5/5 or better under the Building Code Effectiveness Grading Schedule (BCEGS). 		
2	Recertification Packet - ISO/CRS will send the community a list of credited activities. The community must respond by the deadline provided with the annual recertification package certifying whether it is still implementing each item on the list. The community will submit the package to the ISO / CRS Specialist. Some activities will require the		

Funding Sources

- See Table

Figure of Action

N/A

Plan Implementation and Maintenance

The actions included in this section are intended to provide a near-term roadmap for Tazewell County to implement flood risk reduction measures. Ongoing monitoring to evaluate flood mitigation actions that have been successfully implemented is recommended. Going forward, it is recommended that the Planning Team meet annually (at a minimum) to review progress on the flood mitigation measures and discuss flood mitigation implementation actions to be taken in the following year.

Further, while not required, it is recommended that the County update the Flood Resilience Plan every 5-10 years in order to reassess capability and capacity and flood risk and vulnerability, as well as understand the progress made toward implementation of actions identified during this planning process, and to identify new actions for flood risk reduction.