

# South Mountains 2020 Regional Hazard Mitigation Plan

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# SECTION 1

## INTRODUCTION

This section provides a general introduction to the South Mountains Regional Hazard Mitigation Plan. It consists of the following five subsections:

- ❖ 1.1 Background
- ❖ 1.2 Purpose
- ❖ 1.3 Scope
- ❖ 1.4 Authority
- ❖ 1.5 Summary of Plan Contents

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### 1.1 BACKGROUND

Natural hazards, such as winter storms, floods, and landslides, are a part of the world around us. Their occurrence is natural and inevitable, and there is little we can do to control their force and intensity. We must consider these hazards to be legitimate and significant threats to human life, safety, and property.

The South Mountains Region is located in the south western part of North Carolina and includes Henderson, Polk, Transylvania, and Rutherford counties and the municipal governments within those counties. This area is vulnerable to a wide range of natural hazards, most notably winter storms, thunderstorms, floods, and landslides. It is also vulnerable to human-caused hazards, such as hazardous material spills. These hazards threaten the life and safety of residents in the South Mountains Region 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 vacation in region.

While the threat from hazardous events may never be fully eliminated, there is much we can do to lessen their potential impact upon our communities and our citizens. By minimizing the impact of hazards upon our built environment, we can prevent such events from resulting in disasters. The concept and practice of reducing risks to people and property from known hazards is generally referred to as *hazard mitigation*.



#### **FEMA Definition of Hazard Mitigation:**

*"Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."*

Hazard mitigation techniques include both structural measures (such as strengthening or protecting buildings and infrastructure from the destructive forces of potential hazards) and non-structural measures (such as the adoption of sound land use policies and the creation of public awareness programs). It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive mitigation approach addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, it is essential that projected patterns of future development are

evaluated and considered in terms of how that growth will increase or decrease a community's overall hazard vulnerability.

A key component in the formulation of a comprehensive approach to hazard mitigation is to develop, adopt, and update a local hazard mitigation plan as needed. A hazard mitigation plan establishes the broad community vision and guiding principles for reducing hazard risk, and further proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

The four counties participating in the development of the South Mountains Regional Hazard Mitigation Plan first joined together in 2014 to develop the initial version of this regional plan. Prior to that, each County was operating under individual County-level hazard mitigation plans. The plan development process for the 2020 update of the plan is detailed in Section 2: Planning Process.

This regional plan draws from each of the County plans to document the region's sustained efforts to incorporate hazard mitigation principles and practices into routine government activities and functions. At its core, the Plan recommends specific actions to minimize hazard vulnerability and protect residents from losses to those hazards that pose the greatest risk. These mitigation actions go beyond simply recommending structural solutions to reduce existing vulnerability, such as elevation, retrofitting, and acquisition projects. Local policies on community growth and development, incentives for natural resource protection, and public awareness and outreach activities are examples of other actions considered to reduce the region's vulnerability to identified hazards. The Plan remains a living document, with implementation and evaluation procedures established to help achieve meaningful objectives and successful outcomes over time.

### **1.1.1 The Disaster Mitigation Act and the Flood Insurance Reform Acts**

In an effort to reduce the Nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) in order to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of DMA 2000 emphasizes the need for state, local and Tribal government entities to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local or Tribal government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation (PDM) program, both of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally-approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

Major federal flood insurance legislation was passed in 2012 under the Biggert-Waters Flood Insurance Reform Act (P.L. 112-141) and the subsequent Homeowner Flood Insurance Affordability Act (HFIAA) in 2014 which revised Biggert-Waters. HFIAA established the requirement that a FEMA-approved Hazard Mitigation Plan is now required if communities wish to be eligible for any of the FEMA mitigation programs. These acts made several changes to the way the National Flood Insurance Program is to be run, including raises in rates to reflect true flood risk and changes in how Flood Insurance Rate Map (FIRM) updates impact policyholders. These acts further emphasize Congress' focus on mitigating vulnerable structures.

The South Mountains Regional Hazard Mitigation Plan has been prepared in coordination with FEMA Region IV and the North Carolina Emergency Management (NCEM) to ensure that the Plan meets all applicable FEMA and state requirements for hazard mitigation plans. A *Local Mitigation Plan Review Tool*, found in Appendix C, provides a summary of federal and state minimum standards and notes the location where each requirement is met within the Plan.

## 1.2 PURPOSE

The purpose of the South Mountains Regional Hazard Mitigation Plan is to:

- ❖ Completely update the existing South Mountains Regional Hazard Mitigation Plan to demonstrate progress and reflect current conditions
- ❖ Update the plan in accordance with Community Rating System (CRS) requirements;
- ❖ Increase public awareness and education;
- ❖ Maintain grant eligibility for participating jurisdictions;
- ❖ Maintain compliance with state and federal legislative requirements for local hazard mitigation plans.

## 1.3 SCOPE

The focus of the South Mountains Regional Hazard Mitigation Plan is on those hazards determined to be “high” or “moderate” risks to the region, as determined through a detailed hazard risk assessment. Other hazards that pose a “low” or “negligible” risk will continue to be evaluated during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk. This enables the participating counties and municipalities to prioritize mitigation actions based on those hazards which are understood to present the greatest risk to lives and property.

The geographic scope (i.e., the planning area) for the Plan includes the counties of Henderson, Polk, Transylvania, and Rutherford as well as their incorporated jurisdictions. **Table 1.1** indicates the participating jurisdictions.

**TABLE 1.1: PARTICIPATING JURISDICTIONS IN THE SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLAN**

<b>Henderson County</b>	
Flat Rock	Laurel Park
Fletcher	Mills River
Hendersonville	Unincorporated Henderson County
<b>Polk County</b>	
Columbus	Tryon
Saluda	Unincorporated Polk County

Transylvania County	
Brevard	Unincorporated Transylvania County
Rosman	
Rutherford County	
Bostic	Lake Lure
Chimney Rock Village	Ruth
Ellenboro	Rutherfordton
Forest City	Spindale
Unincorporated Rutherford County	

## 1.4 AUTHORITY

The South Mountains Regional Hazard Mitigation Plan has been developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans and has been adopted by each participating county and local jurisdiction in accordance with standard local procedures. Copies of the adoption resolutions for each participating jurisdiction are provided in Appendix A. The Plan shall be routinely monitored and revised to maintain compliance with the following provisions, rules, and legislation:

- ❖ Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390);
- ❖ FEMA's Final Rule published in the Federal Register, at 44 CFR Part 201 (201.6 for local mitigation planning requirements);
- ❖ Flood Insurance Reform Act of 2004 (P.L. 108-264), Biggert-Waters Flood Insurance Reform Act of 2012 (P.L. 112-141) and the Homeowner Flood Insurance Affordability Act of 2014.

## 1.5 SUMMARY OF PLAN CONTENTS

The contents of this Plan are designed and organized to be as reader-friendly and functional as possible. While significant background information is included on the processes used and studies completed (i.e., risk assessment, capability assessment), this information is separated from the more meaningful planning outcomes or actions (i.e., mitigation strategy, mitigation action plan).

Section 2, **Planning Process**, provides a complete narrative description of the process used to prepare the Plan. This includes the identification of participants on the planning team and describes how the public and other stakeholders were involved. It also includes a detailed summary for each of the key meetings held, along with any associated outcomes.

The **Community Profile**, located in Section 3, provides a general overview of the South Mountains region, including prevalent geographic, demographic, and economic characteristics. In addition,

building characteristics and land use patterns are discussed. This baseline information provides a snapshot of the planning area and helps local officials recognize those social, environmental, and economic factors that ultimately play a role in determining the region's vulnerability to hazards.

The Risk Assessment is presented in three sections: Section 4, **Hazard Identification**; Section 5, **Hazard Profiles**; and Section 6, **Vulnerability Assessment**. Together, these sections serve to identify, analyze, and assess hazards that pose a threat to the South Mountains Region. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of the South Mountains Region.

The Risk Assessment begins by identifying hazards that threaten the region. Next, detailed profiles are established for each hazard, building on available historical data from past hazard occurrences, spatial extent, and probability of future occurrence. This section culminates in a hazard risk ranking based on conclusions regarding the frequency of occurrence, spatial extent, and potential impact highlighted in each of the hazard profiles. In the vulnerability assessment, NCEM's Risk Management section's loss estimation methodology is used to evaluate known hazard risks by their relative long-term cost in expected damages. In essence, the information generated through the risk assessment serves a critical function as the participating jurisdictions in the South Mountains Region seek to determine the most appropriate mitigation actions to pursue and implement—enabling them to prioritize and focus their efforts on those hazards of greatest concern and those structures or planning areas facing the greatest risk(s).

The **Capability Assessment**, found in Section 7, provides a comprehensive examination of the capacity of each County and municipal government in the South Mountains Region to implement meaningful mitigation strategies and identifies opportunities to increase and enhance that capacity. Specific capabilities addressed in this section include planning and regulatory capability, staff and organizational (administrative) capability, technical capability, fiscal capability, and political capability. Information was obtained through the use of a detailed survey questionnaire and an inventory and analysis of existing plans, ordinances, and relevant documents. The purpose of this assessment is to identify any existing gaps, weaknesses, or conflicts in programs or activities that may hinder mitigation efforts and to identify those activities that should be built upon in establishing a successful and sustainable local hazard mitigation program. The *Community Profile*, *Risk Assessment*, and *Capability Assessment* collectively serve as a basis for determining the goals for the South Mountains Regional Hazard Mitigation Plan, each contributing to the development, adoption, and implementation of a meaningful and manageable *Mitigation Strategy* that is based on accurate background information.

The **Mitigation Strategy**, found in Section 8, consists of broad goal statements as well as an analysis of hazard mitigation techniques for the jurisdictions participating in the South Mountains Regional Hazard Mitigation Plan to consider in reducing hazard vulnerabilities. The strategy provides the foundation for a detailed **Mitigation Action Plan**, found in Section 9, which links specific mitigation actions for each county and municipal department or agency to locally-assigned implementation mechanisms and target completion dates. Together, these sections are designed to make the Plan both strategic, through the identification of long-term goals, and functional, through the identification of immediate and short-term actions that will guide day-to-day decision-making and project implementation.

## SECTION 1: INTRODUCTION

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In addition to the identification and prioritization of possible mitigation projects, emphasis is placed on the use of program and policy alternatives to help make the communities in the South Mountains Region less vulnerable to the damaging forces of hazards while improving the economic, social, and environmental health of the community. The concept of multi-objective planning was emphasized throughout the planning process, particularly in identifying ways to link, where possible, hazard mitigation policies and programs with complimentary community goals related to disaster recovery, housing, economic development, recreational opportunities, transportation improvements, environmental quality, land development, and public health and safety.

***Plan Maintenance***, found in Section 10, includes the measures that the jurisdictions participating in the South Mountains Regional plan will take to ensure the Plan's continuous long-term implementation. The procedures also include the manner in which the Plan will be regularly evaluated and updated to remain a current and meaningful planning document.

# SECTION 2

## PLANNING PROCESS

This section describes the planning process undertaken to develop the 2020 update of the South Mountains Regional Hazard Mitigation Plan. Information about the development of the 2014 (and first) version of this plan can be found in that plan. Copies of the 2014 plan can be obtained by contacting each County’s Emergency Management office or NCEM’s Hazard Mitigation Planning Section. This section consists of the following nine subsections:

- ❖ 2.1 Overview of Hazard Mitigation Planning
- ❖ 2.2 History of Hazard Mitigation Planning in the South Mountains Region
- ❖ 2.3 Updating the Plan in 2020
- ❖ 2.4 The South Mountains Regional Hazard Mitigation Planning Committee
- ❖ 2.5 Community Meetings and Workshops
- ❖ 2.6 Involving the Public
- ❖ 2.7 Involving the Stakeholders
- ❖ 2.8 Documentation of Plan Progress
- ❖ 2.9 City of Brevard CRS Planning Process Documentation

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### 44 CFR Requirement

**44 CFR Part 201.6(c)(1):** The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

## 2.1 OVERVIEW OF HAZARD MITIGATION PLANNING

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process culminates in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short-term planning objectives and a long-term community vision.

To ensure the functionality of a hazard mitigation plan, responsibility is assigned for each proposed mitigation action to a specific individual, department, or agency along with a schedule or target completion date for its implementation (see Section 10: *Plan Maintenance*). Plan maintenance procedures are established for the routine monitoring of implementation progress, as well as the evaluation and enhancement of the mitigation plan itself. These plan maintenance procedures ensure that the Plan remains a current, dynamic, and effective planning document over time that becomes integrated into the routine local decision-making process. (see Section 10: *Plan Maintenance*).

Communities that participate in hazard mitigation planning have the potential to accomplish many benefits, including:

- ❖ saving lives and property,
- ❖ saving money,

- ❖ speeding recovery following disasters,
- ❖ reducing future vulnerability through wise development and post-disaster recovery and reconstruction,
- ❖ expediting the receipt of pre-disaster and post-disaster grant funding, and
- ❖ demonstrating a firm commitment to improving community health and safety.

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation 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, mitigation practices will enable local residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond solely reducing hazard vulnerability. Mitigation measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health, and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation.

## 2.2 HISTORY OF HAZARD MITIGATION PLANNING IN THE SOUTH MOUNTAINS REGION

Prior to the development of the South Mountains Regional Hazard Mitigation Plan in 2014, each of the four counties and jurisdictions participating in this Plan had a previously adopted separate county-level hazard mitigation plans. The FEMA approval dates for each of these plans, along with a list of the participating municipalities for each plan, are listed below:

- ❖ *Henderson County Multi-Jurisdictional Hazard Mitigation Plan (May 2011)*
  - ❖ City of Hendersonville
  - ❖ Town of Fletcher
  - ❖ Town of Laurel Park
  - ❖ Village of Flat Rock
- ❖ *Polk County (March 2011)*
  - ❖ Town of Columbus
  - ❖ City of Saluda
  - ❖ Town of Tryon
- ❖ *Rutherford County Hazard Mitigation Plan (June 2011)*
  - ❖ Town of Bostic
  - ❖ Chimney Rock Village
  - ❖ Town of Ellenboro
  - ❖ Town of Forest City
  - ❖ Town of Lake Lure
  - ❖ Town of Ruth
  - ❖ Town of Rutherfordton

- ❖ Town of Spindale
- ❖ *Transylvania County Hazard Mitigation Plan* (September 2011)
  - ❖ City of Brevard
  - ❖ Town of Rosman

Each of the county-level plans was developed using the multi-jurisdictional planning process recommended by the Federal Emergency Management Agency (FEMA).

For the development of the 2014 plan, all of the aforementioned jurisdictions joined to develop a regional plan. No new jurisdictions joined the process and all of the jurisdictions that participated in previous planning efforts participated in the development of the 2014 regional plan. The regional plan was developed in order to simplify planning efforts for the jurisdictions in the South Mountains Region and allowed resources to be shared amongst the participating jurisdiction to ease the administrative duties of all of the participants by combining the three existing County-level plans into one multi-jurisdictional plan. The 2014 plan was important and successful first start for regional hazard mitigation planning efforts and that success has carried over into the 2020 update of the plan.

## 2.3 UPDATING THE PLAN IN 2020

FEMA requires that hazard mitigation plans be updated every five years to remain eligible for federal mitigation and public assistance funding. To prepare the 2020 *South Mountains Regional Hazard Mitigation Plan*, ESP Associates, Inc. was hired by North Carolina Emergency Management to provide professional mitigation planning services. Per the contractual scope of work, the consultant team followed the mitigation planning process recommended by FEMA (Publication Series 386 and Local Mitigation Plan Review Guide) and recommendations provided by North Carolina Emergency Management (NCEM) mitigation planning staff<sup>1</sup>. Additionally, for the 2020 update, FEMA Community Rating System (CRS) and Community Wildfire Protection Plan (CWPP) requirements were integrated into the plan update.

Tables 2.1 and 2.2 below provide an overview of how the Community Rating System and Community Wildfire Protection Plan requirements were integrated into this plan update.

**TABLE 2.1 FEMA HAZARD MITIGATION PLANNING REQUIREMENTS AND THE CRS 10-STEP PLANNING PROCESS REFERENCE TABLE**

FEMA Disaster Mitigation Act Requirement	CRS Activity 510 Planning Requirement
<b>Phase I – Planning Process</b>	
§201.6(c)(1)	Step 1: Organize to Prepare the Plan
§201.6(b)(1)	Step 2: Involve the Public
§201.6(b)(2) & (3)	Step 3: Coordinate
<b>Phase II – Risk Assessment</b>	
§201.6(c)(2)(i)	Step 4: Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5: Assess the Problem
<b>Phase III – Mitigation Strategy</b>	

<sup>1</sup> A copy of the negotiated contractual scope of work between NCEM and ESP is available through NCEM upon request.

FEMA Disaster Mitigation Act Requirement	CRS Activity 510 Planning Requirement
§201.6(c)(3)(i)	Step 6: Set Goals
§201.6(c)(3)(ii)	Step 7: Review Possible Activities
§201.6(c)(3)(iii)	Step 8: Draft an Action Plan
<b>Phase IV – Plan Maintenance</b>	
§201.6(c)(5)	Step 9: Adopt the Plan
§201.6(c)(4)	Step 10: Implement, Evaluate and Revise the Plan

**TABLE 2.2 COMMUNITY WILDFIRE PROTECTION PLAN PROCESS INTEGRATION REFERENCE TABLE**

CWPP Process	Hazard Mitigation Plan Integration Reference
Step 1: Convene Decisionmakers	Section 2: Planning Process
Step 2: Involve Federal Agencies	Section 2: Planning Process
Step 3: Engage Interested Parties	Section 2: Planning Process
Step 4: Establish a Community Base Map	Section 3: Community Profile
Step 5: Develop a Community Risk Assessment	Sections 4, 5 and 6: Hazard Identification, Hazard Profiles and Vulnerability Assessment Section 7: Capability Assessment
Step 6: Establish Community Hazard Reduction Priorities and Recommendations to Reduce Structural Ignitability	Section 8: Mitigation Strategy
Step 7: Develop an Action Plan and Assessment Strategy	Section 9: Mitigation Action Plans Section 10: Plan Maintenance
Step 8: Finalize the CWPP	Appendix A: Plan Adoption

*Source: Preparing a Community Wildfire Protection Plan – A Handbook for Wildland-Urban Interface Communities*

The Local Mitigation Plan Review Tool, found in Appendix C, provides a detailed summary of FEMA’s current minimum standards of acceptability for compliance with DMA 2000 and notes the location where each requirement is met within this Plan. These standards are based upon FEMA’s Final Rule as published in the Federal Register in Part 201 of the Code of Federal Regulations (CFR). The planning team used FEMA’s Local Mitigation Plan Review Guide (October 2011) for reference as they completed the Plan.

For the development of the 2020 plan, all of the aforementioned jurisdictions that participated in the development of the 2014 plan also participated in this plan’s development.

The process used to prepare this Plan included twelve major steps that were completed over the course of approximately nine months beginning in October 2018. Each of these planning steps (illustrated in **Figure 2.1**) resulted in critical work products and outcomes that collectively make up the Plan. Specific plan sections are further described in Section 1: *Introduction*.

FIGURE 2.1: MITIGATION PLANNING PROCESS FOR THE SOUTH MOUNTAINS REGION



## 2.4 THE SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLANNING COMMITTEE

In order to guide the initial development of this Plan and this subsequent update, the participating jurisdictions created the South Mountains Regional Hazard Mitigation Planning Committee. The Regional Hazard Mitigation Planning Committee represents a community-based planning team made up of representatives from various county departments, municipalities, and other key stakeholders identified to serve as critical partners in the planning process.

Beginning in October 2018, the Regional Hazard Mitigation Planning Committee members engaged in regular discussions as well as local meetings and planning workshops to discuss and complete tasks associated with preparing the Plan. This working group coordinated on all aspects of plan preparation and provided valuable input to the process. In addition to regular meetings, committee members routinely communicated and were kept informed through an e-mail distribution list.

Specifically, the tasks assigned to the Regional Hazard Mitigation Planning Committee members included:

- ❖ participate in Regional Hazard Mitigation Planning Committee meetings and workshops
- ❖ provide best available data as required for the risk assessment portion of the Plan
- ❖ help update the Capability Assessment section of the plan and provide copies of any mitigation or hazard-related documents for review and incorporation into the Plan
- ❖ support the update of the Mitigation Strategy, including the review, update and adoption

- ❖ of regional goal statements.
- ❖ help update existing mitigation actions and design and propose any appropriate new mitigation actions for their department/agency for incorporation into the Mitigation Action Plan
- ❖ review and provide timely comments on all study findings and draft plan deliverables
- ❖ support the adoption of the 2020 *South Mountains Regional Hazard Mitigation Plan*

**Table 2.3** lists the members of the Regional Hazard Mitigation Planning Committee who were responsible for participating in the development of the Plan.

**TABLE 2.1: MEMBERS OF THE SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLANNING COMMITTEE**

NAME	DEPARTMENT/AGENCY
Arledge, Bobby	Polk County Emergency Management
Biberdorf, Mark	Town of Fletcher (Town Manager)
Brissie, James	Henderson County Emergency Management
Cannon, Jonathan	City of Saluda (City Manager/Zoning Administrator)
Christie, Patricia	Village of Flat Rock Village and Zoning Administrator
Conner, James	City of Saluda Police Department
Cooper, Bobby	City of Brevard Fire Chief*
Davidson, Jamie	Citizen
Ferguson, Chris	NCEM (Hazard Mitigation Planner)
Fraday, Susan	City of Hendersonville, Development Assistance
Greenway, John	Rutherford County Emergency Management
Heymann, Daniel	City of Hendersonville, Development Assistance
Hamrick, Frankie	Rutherford County Emergency Management
McFalls, Tim	Henderson County Emergency Management
Owen, Emory	City of Brevard Wastewater Director*
Richardson, Dennis	City of Brevard Water Treatment Director*
Ruth, Cathy	Polk County Planning
Shook, Kevin	Transylvania County Emergency Management
Vindigni, Joseph	City of Hendersonville, Fire Department
Waldrup, Kevin	Henderson County Emergency Services

\*City of Brevard staff attended the project kickoff meeting but forgot to sign the meeting sign-in sheet. Their attendance was confirmed by Transylvania County EM Director by email. This email confirmation is included in Appendix D.

**Table 2.4** lists the points of contact for several of the jurisdictions who elected to designate their respective county officials to represent their jurisdiction on the planning team, generally because they did not have the time or staff to be able to attend on their own. Although these members designated county officials to represent them at in-person meetings, each was still contacted throughout the planning process and participated by providing suggestions and comments on the Plan, updates to mitigation actions and the Capability Assessment via email and phone conversations. These members are listed in alphabetical order by last name below.

**TABLE 2.4: MEMBERS DESIGNATING REPRESENTATIVES TO SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLANNING COMMITTEE**

NAME	DEPARTMENT/AGENCY
<b>Henderson County</b>	
Christopher Todd	Manager, Laurel Park
Daniel Cobb	Manager, Mills River
<b>Polk County</b>	
Tim Barth	Manager, Town of Columbus
Zach Ollis	Manager, Town of Tryon
<b>Rutherford County</b>	
Mitchell Harrill	Mayor, Bostic
Peter O’Leary	Mayor, Chimney Rock Village
Jim Rhyne	Mayor, Ellenboro
John Condrey	City Manager, Forest City
Shannon Baldwin	Town Manager, Lake Lure
Denver Buchanan	Mayor, Ruth
Doug Barrick	Town Manager, Rutherfordton
Scott Webber	Town Manager, Spindale
<b>Transylvania County</b>	
Brian Shelton	Mayor, Town of Rosman

Additional participation and input from other identified stakeholders and the general public was sought by the participating counties during the planning process through phone calls and the distribution of emails, advertisements and public notices aimed at informing people on the status of the Hazard Mitigation Plan (public and stakeholder involvement is further discussed later in this section).

### 2.4.1 Multi-Jurisdictional Participation

The *South Mountains Regional Multi-Jurisdictional Hazard Mitigation Plan* includes four counties, and eighteen incorporated municipalities. To satisfy multi-jurisdictional participation requirements, each county and its participating jurisdictions were required to perform the following tasks:

- ❖ Participate in mitigation planning workshops;
- ❖ Identify completed mitigation projects, if applicable;
- ❖ Review and provide feedback on jurisdiction-specific information in the Capability Assessment; and
- ❖ Develop and adopt (or update) their local Mitigation Action Plan.

Each jurisdiction participated in the planning process and has developed a local Mitigation Action Plan unique to their jurisdiction. This provides the means for jurisdictions to monitor and update their Plan on a regular basis.

## 2.5 COMMUNITY MEETINGS AND WORKSHOPS

The preparation of this Plan required a series of meetings and workshops for facilitating discussion, gaining consensus and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted

continuous input and feedback from relevant participants throughout the drafting stages of the Plan.

The following is a summary of the key meetings and community workshops held during the development of the plan update<sup>2</sup>. In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency, such as the approval of specific mitigation actions for their department or agency to undertake and include in the Mitigation Action Plan.

### **2.5.1 Meeting Minutes**

#### **Meeting Minutes from Internal Kickoff Conference Call/Skype Meeting with County Leads and NCEM Representatives**

**October 30, 2018**

##### **Phone Call/Skype Meeting**

Following issuance of a notice to proceed from NCEM, on October 19, 2018 ESP Associates reached out by email to County Emergency Management and Planning Department leads from Henderson, Polk, Rutherford, and Transylvania Counties, NCEM Area 15 Coordinator and the Western Branch Manager to introduce themselves, explain the plan update process in general and schedule a time to hold an informal internal kickoff conference call/Skype meeting.

On October 30, 2018, Nathan Slaughter, Hazard Mitigation Department Manager from ESP Associates, Inc. and Project Manager for the update of the South Mountains Regional Hazard Mitigation Plan conducted a conference call/Skype meeting with the internal lead stakeholders previously mentioned above. He presented important project information about the plan update, gave a brief refresher on hazard mitigation and a reminder about the importance of the plan, provided a project overview to include key objectives, project tasks, schedule and staff, and then defined roles and responsibilities of the project consultant and the participating jurisdictions.

Following the presentation, he discussed with these stakeholders the need to set up a date, time and location for the official project kickoff meeting with the regional hazard mitigation planning committee. The lead internal stakeholders discussed potential meeting dates and locations and decided that December 13, 2018 would be the date of the meeting at a location to be determined later. The details of the official kickoff meeting were then determined through later conversations with Henderson County Planning staff.

#### **Meeting Minutes from South Mountains Regional Hazard Mitigation Planning Committee Kickoff Meeting**

**December 13, 2018**

##### **Henderson County Emergency Services**

Jimmy Brissie, the Henderson County Director of Emergency Management, welcomed everyone to the meeting and introduced Nathan Slaughter and Jamie DeRose.

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<sup>2</sup> Copies of agendas, sign-in sheets, minutes, and handout materials for all meetings and workshops can be found in Appendix D.

Nathan Slaughter, Department Manager from ESP Associates, Inc. and Project Manager for the update of the South Mountains Regional Hazard Mitigation Plan, began the meeting by welcoming the attendees and giving a brief overview of the project and the purpose of the meeting.

Mr. Slaughter led the meeting of the Regional Hazard Mitigation Planning Team and began by having attendees introduce themselves. The 14 attendees included representatives from various departments and local jurisdictions within each of the four counties participating in the plan update. Mr. Slaughter then provided an overview of the items to be discussed at the meeting and briefly reviewed the agenda and presentation slide handouts. He then defined mitigation and gave a review of the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

To continue, Mr. Slaughter provided detailed information about the project. He mentioned that the project is funded by a FEMA PDM grant, and that representatives from each County met together to hire ESP Associates, Inc. to manage the update, thus ensuring that Mr. Slaughter would remain the Project Manager. For this update, there was no local match requirement.

Mr. Slaughter then explained some of the basic concepts of mitigation. He explained how we should think about mitigation: we want to mitigate hazard impacts of existing development in the community (houses, businesses, critical facilities, etc.), and ensure that future development is conducted in a way that doesn't increase vulnerability. This can be achieved by having good plans, policies, and procedures in place.

Following the overview, Mr. Slaughter led the group in an "icebreaker" exercise to refamiliarize meeting participants to various mitigation techniques. He briefly recapped the six different categories of mitigation techniques: emergency services, prevention, natural resource protection, structural projects, public education and awareness, and property protection. Each attendee was then given \$20 in mock currency and asked to "spend" their mitigation money as they personally deemed appropriate among the six mitigation categories. Money was "spent" by placing it in cups labeled with each of the mitigation techniques. Upon completion of the exercise, Jamie DeRose, Lead Planner from ESP, tabulated and shared the results with the group. The most mock money was spent on prevention, followed by emergency services. These results were compared against those from the previous plan development's ice breaker exercise. This helped demonstrate how priorities in mitigation actions have changed since the previous update.

After the icebreaker exercise, Mr. Slaughter reviewed the key objectives of the project, which are to:

- ❖ Coordinate between the three participating counties to update the regional plan
- ❖ Update the plan to demonstrate progress and reflect current conditions
- ❖ Complete the update before the existing plan expires on July 20, 2020
- ❖ Increase public awareness and education
- ❖ Maintain grant eligibility for participating jurisdictions
- ❖ Update the plan in accordance with Community Rating System (CRS) requirements, and
- ❖ Maintain compliance with State and Federal requirements

Next, he explained new elements to this update, which include the NCEM's RMT, Activity 510 compliance for CRS communities, Risk MAP, Community Wildfire Protection Plans, the NC Resilience Assessment, and EMAP compliance.

Mr. Slaughter reviewed the list of participating jurisdictions with the group, which all agreed to participate again. He also explained the planning process and specific tasks to be accomplished for the project, which include the planning process, risk assessment, capability assessment, mitigation strategy, mitigation action plan, and plain maintenance procedures. For the risk assessment portion of the process, Mr. Slaughter asked each county to designate a point of contact to coordinate the gathering of GIS data required for the analysis. He also reviewed the list of identified hazards and the committee agreed to maintain the previous list of hazards for the three counties.

The project schedule was presented and Mr. Slaughter noted that the twelve-month schedule provided ample time to produce a quality plan and meet state and federal deadlines.

Mr. Slaughter discussed what data would need to be collected to complete the project. This includes GIS Data, Capability Assessment Revisions, a Public Participation Survey, and updates to existing Mitigation Actions.

Mr. Slaughter then reviewed the roles and responsibilities of ESP Associates, Inc, the County leads, and the participating jurisdictions. The presentation concluded with a discussion of the next steps to be taken in the project development. He encouraged meeting participants to distribute the Public Participation Survey and shared the public web link. The next HMPT meeting was scheduled for some time in early 2019 to discuss the findings of the risk and capability assessments and to begin updating existing mitigation actions and identify new goals.

**FIGURE 2.2: South Mountains Kickoff Meeting**



**Meeting Minutes from Mitigation Strategy Meeting  
April 3, 2019  
Henderson County Emergency Services**

Nathan Slaughter, Project Manager from ESP Associates, began the meeting by welcoming the attendees and reviewing the meeting handouts, which included an agenda, existing plan goals for the regional plan, instructions for identifying new mitigation goals, and a hard copy of the meeting presentation. Mr. Slaughter asked meeting attendees to introduce themselves and gave a refresher on mitigation, why we plan, and the key objectives of the project. All 4 of the participating counties were represented. He reviewed the participating jurisdictions, project tasks and project schedule. He stated that a draft of the updated Regional Hazard Mitigation Plan would be presented in July.

Jamie DeRose, Lead Planner from ESP Associates, then presented the findings of the risk assessment. She shared the list of all hazards that are addressed in the regional plan, and reviewed the list of hazards addressed in the North Carolina State Hazard Mitigation Plan. She discussed a couple of caveats for the risk assessment and indicated that best available data was used. While that information is helpful, events are often under-reported, so it is important to keep the end goal in sight. The purpose of the risk assessment was shared: to compare hazards and determine which should be the focus of the mitigation actions. Finally, she mentioned to the stakeholders that it ultimately is their risk assessment, so their recommendations for adjustment are welcomed and encouraged.

Ms. DeRose stated that since the last plan was updated, there has been one Presidential disaster declarations that have impacted the areas surrounding the region (Hurricane Florence, 2018), which helped emphasize the need to continue updating the mitigation plan.

The following Hazard Profiles and summaries of each hazard were then shared:

- ❖ DROUGHT: There were 14 regional drought events between 2005 and 2018, and future occurrences are likely.
- ❖ EXTREME HEAT: The average maximum temperatures from the past 48 months were shared with results from a weather station in Hendersonville. Future occurrences are likely.
- ❖ HAILSTORM: There have been 414 recorded events since 1962 that resulted in over \$28 million in property damages. Future occurrences are likely.
- ❖ HURRICANE AND COASTAL STORM: 32 storm tracks have come within 75 miles of the region since 1854. 9 of those were classified as a hurricane or tropical storm. 2 of the hurricanes occurred within the past 5 years. Future occurrences are likely.
- ❖ LIGHTNING: Since 1996, there have been 51 reported occurrences, which resulted in 38 injuries and over \$2 million dollars in property damage. Future occurrences are highly likely.
- ❖ SEVERE THUNDERSTORMS: 605 severe thunderstorm events have been recorded since 1950. These events resulted in 6 deaths, 13 injuries and nearly \$5 million in property damages. Future occurrences are highly likely.
- ❖ TORNADOES: There have been 18 recorded events since 1950, causing 10 injuries and over \$3 million in property damage. 2 of the tornadoes occurred in the last 5 years. Future occurrences are likely.
- ❖ WINTER STORM AND FREEZE: 411 winter weather events that resulted in over \$19 million in property damage have been recorded since 1993. Future occurrences are highly likely.
- ❖ DAM AND LEVEE FAILURE: Of the 327 dams in the region, 124 are considered high hazard dams. No serious breaches have been reported, and future occurrences are unlikely.
- ❖ EROSION: Although little information could be obtained on erosion occurrences in the region, erosion was addressed in the previous plan. Future occurrences are possible.

- ❖ FLOOD: 206 flood events have occurred since 1993, resulting in over \$45 million in property damage. There have also been 342 reported NFIP losses since 1978 and approximately \$4 million in claims. There are 30 repetitive loss properties in the region, and future occurrences are highly likely.
- ❖ EARTHQUAKE: No significant earthquake events have taken place in the region, but future occurrences are possible.
- ❖ LANDSLIDE: No records of severe landslides were reported, but Polk County mentioned having 56 slide sites that resulted in 1 death in 2018. Future occurrences are possible.
- ❖ HAZARDOUS MATERIALS INCIDENTS: 14 serious HAZMAT events have been reported through the PHMSA. There are 26 TRI Facilities in the region. Future occurrences are possible.
- ❖ WILDFIRE: FEMA reports that 182 acres in the region are burned every year on average, although they are mostly small. Recent severe wildfires took place within the region in 2016. Future occurrences are likely.

In concluding the review of Hazard Profiles, Ms. DeRose stated if anyone had additional information for the hazard profiles, or disagreed with any of the data presented, they should call or email her with their concerns.

The results of the hazard identification process were used to generate a Priority Risk Index (PRI), which categorizes and prioritizes potential hazards as high, moderate or low risk based on probability, impact, spatial extent, warning time, and duration. The highest PRI was assigned to Winter Storms and Freeze, followed by Severe Thunderstorm and Flood. The committee reviewed most recent hazard profile data and discussed moving Landslides up in ranking.

Ms. DeRose then displayed maps that presented each county's social vulnerability, as documented by the Center for Disease Control. The maps present how socially vulnerable areas in each county are as compared to the rest of North Carolina. Many indicators were used to determine the social vulnerability, and the factors were grouped into four themes that were based on census-tract levels.

After a brief break, Mr. Slaughter then presented the Capability Assessment Findings. ESP Associates used a scoring system that was used to rank the participating jurisdictions in terms of capability in four major areas (Planning and Regulatory; Administrative and Technical; Fiscal; Political). Important capability indicators include National Flood Insurance Program (NFIP) participation, Building Code Effective Grading Schedule (BCEGS) score, Community Rating System (CRS) participation, and the Local Capability Assessment Survey conducted by ESP Associates.

Mr. Slaughter reviewed the Relevant Plans and Ordinances, Relevant Staff/Personnel Resources, and Relevant Fiscal Resources. All of these categories were used to rate the overall capability of the participating counties and jurisdictions. Most jurisdictions are in the moderate to high range for Planning and Regulatory Capability and in the low to moderate range for Fiscal Capability. There is variation between the jurisdictions for Administrative and Technical Capability, mainly with respect to availability of planners and grant writers. Based upon the scoring methodology, it was determined that all of the participating jurisdictions have moderate or high capabilities to implement hazard mitigation programs and activities.

Mr. Slaughter then transitioned to the Mitigation Strategy portion of the presentation. He began by reviewing some of the major concepts of mitigation and then gave the results of the icebreaker exercise

## SECTION 2: PLANNING PROCESS

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from the first Regional Hazard Mitigation Planning Committee meeting, where attendees were given “money” to spend on various hazard mitigation techniques. The results were as follows:

❖ Prevention	\$116
❖ Emergency Services	\$105
❖ Structural Projects	\$72
❖ Property Protection	\$56
❖ Public Education and Awareness	\$54
❖ Natural Resource Protection	\$52

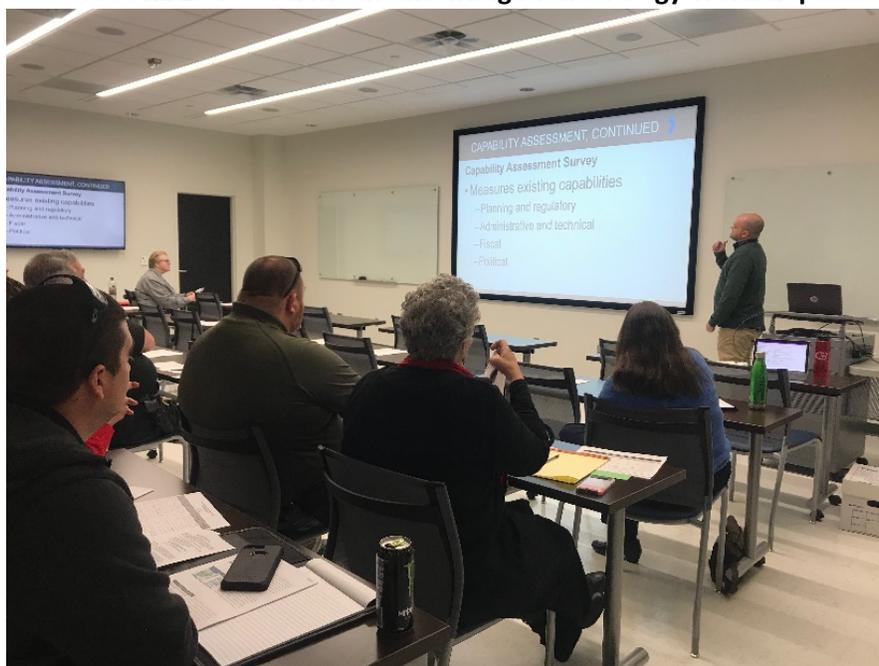
Mr. Slaughter gave an overview of the process for updating the Mitigation Strategy and presented the existing mitigation goals for the regional plan. He asked the Regional Hazard Mitigation Planning Committee to review the goals to determine whether or not they still reflect current vulnerabilities and current mitigation priorities. The committee members agreed that goals were still consistent and up to date.

Mr. Slaughter then indicated that each participating jurisdiction would need to provide a status update for their existing mitigation actions (completed, deleted, or deferred) by May 17, 2019. Mr. Slaughter also discussed the Mitigation Action Worksheets to be completed for any new mitigation actions and requested that all worksheets be returned by May 17, 2019. Mr. Slaughter then presented sample mitigation actions for the committee members to consider to include in their plan update.

Ms. DeRose then discussed the results of the public participation survey that was posted on several of the participating counties’ and jurisdictions’ websites. As of the meeting date, 165 responses had been received. Based on the preliminary results, respondents felt that hurricanes, winter storms, and floods posed the greatest threats to their neighborhood. Most did not live in a floodplain or have flood insurance, but 77.6% of all respondents did not know who to contact regarding reducing their risks to hazards.

Finally, Mr. Slaughter discussed the next steps in the planning process. These included returning mitigation action updates and delivery of a draft plan in July of 2019. He sincerely thanked the group for taking the time to attend and the meeting was adjourned.

FIGURE 2.3: South Mountains Mitigation Strategy Workshop



## 2.6 INVOLVING THE PUBLIC

### 44 CFR Requirement

**44 CFR Part 201.6(b)(1):** The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

An important component of the mitigation planning process involved public participation. 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, they are more likely to gain a greater appreciation of the 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 mitigation strategy aimed at making a home, neighborhood, school, business or entire city safer from the potential effects of hazards.

Public involvement in the development of the *South Mountains Regional Hazard Mitigation Plan* was sought using three methods: (1) physical public meetings, (2) public survey instruments were made available in hard copy and online; and (3) copies of the draft Plan deliverables were made available for public review on county municipal websites and at government offices. Thus, the public was provided two opportunities to be involved in the development of the regional plan at two distinct periods during the planning process: (1) during the drafting stage of the Plan; and (2) upon completion of a final draft Plan, but prior to official plan approval and adoption. In addition, a public participation survey (discussed in greater detail in Section 2.6.1) was made available during the planning process at various locations throughout the region and on county and municipal websites. Documentation of these efforts is provided in Appendix D.

In addition to the two opportunities for public comments previously discussed, each of the participating jurisdictions will hold public meetings before the final plan is officially adopted by the local governing bodies. These meetings will occur at different times once FEMA has granted conditional approval of the Plan. Adoption resolutions will be included in Appendix A.

**Meeting Minutes from Public Meeting #1**

**December 13, 2018**

**Henderson County Emergency Services**

Nathan Slaughter, Department Manager from ESP Associates, Inc. and Project Manager for the update of the South Mountains Regional Hazard Mitigation Plan, began the meeting by meeting individually with each attendee. He gave a brief overview of the project and the purpose of the meeting.

He explained that the project is funded by a FEMA PDM grant and is conducted to comply with the Disaster Mitigation Act of 2000 and NC Senate Bill 300. He then discussed the region's high, moderate, and low risk hazards that the Regional Hazard Mitigation Planning Team had elected.

Next, Mr. Slaughter identified the six hazard mitigation planning techniques: prevention, property protection, natural resource protection, structural projects, emergency services, and public education and awareness. He followed by providing the list of all participating counties and their respective jurisdictions.

Mr. Slaughter then showed an example of the previous Mitigation Action Plan and asked the following questions:

- ◆ Where are trouble spots in your neighborhood?
- ◆ How can mitigation be improved in your community?
- ◆ Which mitigation techniques need improvement?

The meeting concluded after the attendees gave their personal opinions and filled out the public survey.

Placeholder for documentation of final public meeting to be held at least two weeks before the plan is adopted by a local governing body.

### **2.6.1 Public Participation Survey**

The Regional Hazard Mitigation Committee was successful in getting citizens to provide input to the mitigation planning process through the use of the *Public Participation Survey*. The *Public Participation Survey* was designed to capture data and information from residents of the South Mountains Region that might not be able to attend public meetings or participate through other means in the mitigation planning process.

Copies of the *Public Participation Survey* were distributed to the Regional Hazard Mitigation Planning Committee be made available for residents to complete at local public offices. A link to an electronic version of the survey was also posted on each county's and many municipalities' websites. Additionally, media coverage about the project, and the public survey, was provided during the development of the plan.

A total of 166 survey responses were received, which provided valuable input for the Regional Hazard Mitigation Planning Committee to consider in the development of the plan update. Selected survey results are presented below.

- ❖ Approximately 54 percent of survey respondents had been impacted by a disaster, mainly hurricanes, flooding, and severe winter storms.
- ❖ Respondents ranked Severe Winter Storm/Freeze and Severe Thunderstorm/High Wind as the highest threats to their neighborhood (42 percent and 25 percent, respectively) followed by Wildfire (15 percent), and Flood (14 percent).
- ❖ Approximately 54 percent of respondents have taken actions to make their homes more resistant to hazards and 91 percent are interested in making their homes more resistant to hazards.
- ❖ 78 percent of respondents do not know what office to contact regarding reducing their risks to hazards.
- ❖ Emergency Services and Natural Resource Protection were ranked as the most important activities for communities to pursue in reducing risks.

Full results from the public survey can be found by contacting North Carolina Emergency Management’s Hazard Mitigation Planning section.

## 2.7 INVOLVING THE STAKEHOLDERS

### 44 CFR Requirement

**44 CFR Part 201.6(b)(2):** The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other non-profit interests to be involved in the planning process.

At the beginning of the planning process for the development of this plan, the project consultant worked with each of the four County Emergency Management leads to initiate outreach to stakeholders to be involved in the planning process. The project consultant sent out a list of recommended stakeholders provided from FEMA Publication 386-1 titled **Getting Started: Building Support for Mitigation Planning**, which demonstrated the wide range of stakeholders that were considered to participate in the development of this plan. Each of the County Emergency Management leads used that list for reference as they invited stakeholders from their counties to participate in the planning process.

In addition to participation from a wide variety of County-level departments, additional stakeholders that were involved in the process of developing this plan included: North Carolina Division of Emergency Management (NCEM), American Red Cross, and Hendersonville Times-News.

The Regional Hazard Mitigation Committee encouraged more open and widespread participation in the mitigation planning process. The region also went above and beyond in its local outreach efforts through the design and distribution of the *Public Participation Survey*. This opportunity was provided for local officials, residents, businesses, academia, and other private interests in the South Mountains Region to be involved and offer input throughout the local mitigation planning process.

## 2.8 DOCUMENTATION OF PLAN PROGRESS

Progress in hazard mitigation planning for the participating jurisdictions in the South Mountains Region is documented in this plan update. Since hazard mitigation planning efforts officially began in the participating counties with the development of the initial Hazard Mitigation Plans in the late 1990s and early 2000s, many mitigation actions have been completed and implemented in the participating jurisdictions. These actions will help reduce the overall risk to natural hazards for the people and property in the South Mountains Region. The actions that have been completed are documented in Appendix E.

Further documentation of plan implementation progress can be found in the Capability Assessment. Community capability continues to improve for each participating jurisdiction with the implementation of new plans, policies and programs that help to promote hazard mitigation at the local level. The current state of local capabilities for the participating jurisdictions is captured in Section 7: *Capability Assessment*. The participating jurisdictions continue to demonstrate their commitment to hazard mitigation and hazard mitigation planning and have proven this by reconvening the Regional Hazard Mitigation Committee to update the Plan and by continuing to involve the public in the hazard mitigation planning process.

## 2.9 CITY OF BREVARD CRS PLANNING PROCESS DOCUMENTATION

As a participant in the NFIP's CRS program, the City of Brevard has taken additional steps during the 2020 update of this plan to meet the CRS requirements of Activity 510: Floodplain Management Planning and attempt to maximize the number of points the City receives for this activity for this plan. Specific to the planning process, the City ensured the following activities took place:

- Assigned City of Brevard staff to serve on the Regional Hazard Mitigation Planning Committee. The staff members assigned to the committee actively participated in the plan update process and represent a wide range of staff expertise in the areas of mitigation techniques. The City of Brevard staff and their associated area of expertise are listed in Table 2.3.

**TABLE 2.3: CITY OF BREVARD STAFF MEMBERS OF THE SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLANNING TEAM AND THEIR AREA OF EXPERTISE**

NAME	DEPARTMENT / AGENCY / TITLE	MITIGATION TECHNIQUE					
		PREVENTION MEASURES	PROPERTY PROTECTION	NATURAL RESOURCE PROTECTION	EMERGENCY SERVICES	STRUCTURAL PROJECTS	PUBLIC INFORMATION
Owen, Emory	City of Brevard Wastewater Director	X	X	X	X	X	X
Richardson, Dennis	City of Brevard Water Treatment Director	X	X	X	X	X	X
Cooper, Bobby	City of Brevard Fire Chief	X	X	X	X	X	X

- Ensured that the first public meeting held during the plan update process was conducted within the first two months of the planning process. As previously documented, the first meeting in the plan update process (Internal Kickoff Conference Call) was held on October 30. The first public meeting was held in the evening of December 13 following the official Kickoff Meeting with the Regional Hazard Mitigation Planning Committee and just over a month from the beginning of the plan update process.
- Invited multiple outside stakeholders to participate in the plan update process. An email was sent to the following stakeholders to invited them to attend the public meeting. The email invitation is included in Appendix D.
  - Pending confirmation from City staff.

Bold font indicates the organizations that attended the meeting and filled out public surveys.

- Ensured that one additional public meeting was held at least two weeks before submittal of the final plan to City of Brevard’s Mayor and City Council for adoption. As previously documented, this final opportunity for public comment on the plan was held on (date) and the plan was presented to the Mayor and City Council on (date).

# SECTION 3

## COMMUNITY PROFILE

This section of the Plan provides a general overview of the South Mountains Region. It consists of the following four subsections:

- ❖ 3.1 Geography and the Environment
- ❖ 3.2 Population and Demographics
- ❖ 3.3 Housing, Infrastructure, and Land Use
- ❖ 3.4 Employment and Industry

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### 3.1 GEOGRAPHY AND THE ENVIRONMENT

The South Mountains Region is located in the southwestern portion of the North Carolina separated from the Appalachian Mountains to the west by the Catawba River Valley. For the purposes of this plan, the South Mountains Region includes Henderson, Polk, Rutherford, and Transylvania Counties. An orientation map is provided as **Figure 3.1**.

The South Mountains Region is home to various parks, forests, and campgrounds which display the area’s natural beauty and resources. Multiple US designated historic districts and landmarks are present throughout the South Mountains Region. Biking, camping, fishing, hiking, horseback riding, and picnicking are available activities within the region. The region also hosts events and educational programs highlighting the area’s natural characteristics. The South Mountains Region includes a designated South Mountains Game Land maintained by the North Carolina Wildlife Resources Commission. Scenic driving tours are conducted throughout the region to highlight the natural beauty of the landscape.

The total land area of each of the participating counties is presented in **Table 3.1**.

**TABLE 3.1: TOTAL LAND AREAS OF PARTICIPATING COUNTIES**

County	Total Land Area
Henderson County	373 square miles
Polk County	238 square miles
Rutherford County	564 square miles
Transylvania County	379 square miles

The South Mountains Region enjoys a generally mild year-round climate that is characterized by colder winters and warm summers; however, variation in elevation and topography can drastically affect local weather. According to the Southeast Regional Climate Center, the annual temperature average for this area is in the upper-fifties, with an average high in the low-seventies, and average low in the mid-forties. On average, the warmest month within the South Mountains Region is July and the coolest month is January. The highest recorded temperature was 107°F in 1999 and the lowest recorded temperature was -8°F in 1982.

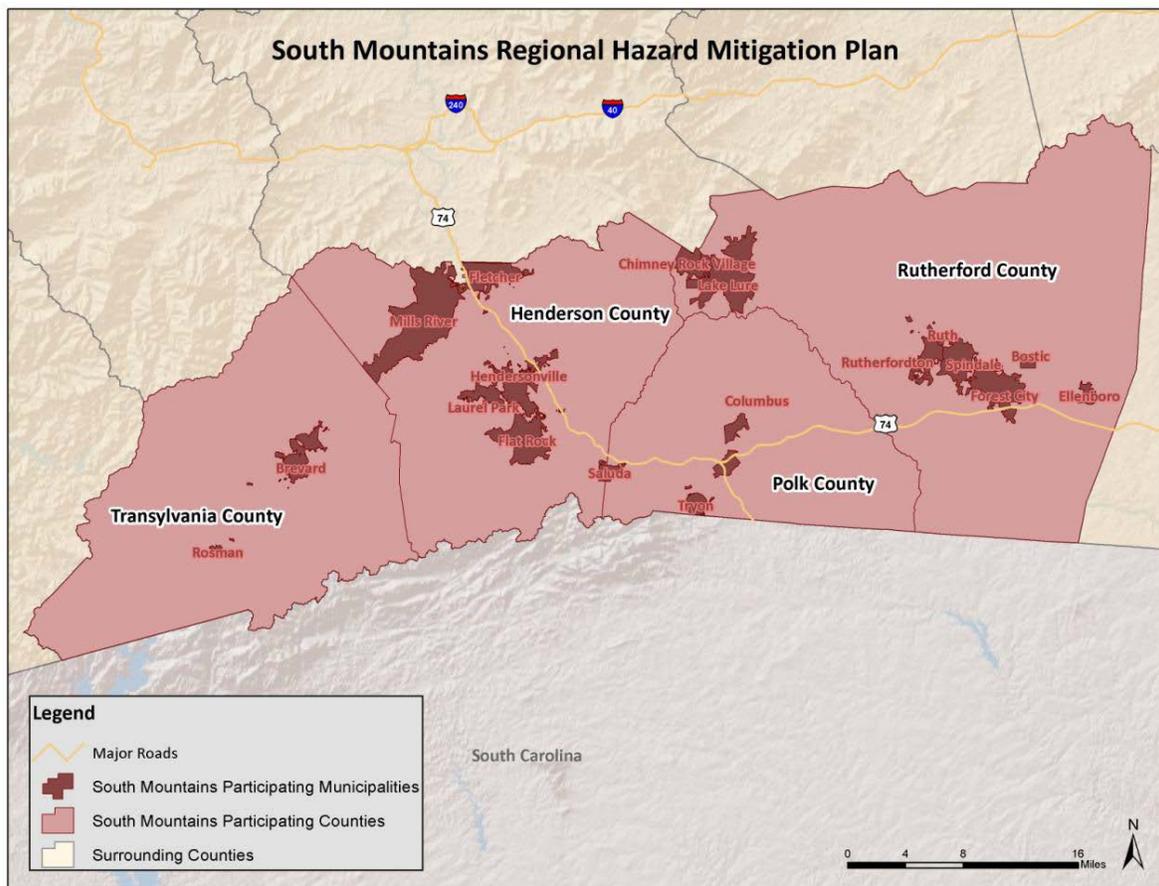
### SECTION 3: COMMUNITY PROFILE

The region is located in the eastern portion of the wettest area of North Carolina and of the eastern United States. Data shows that, on average, the region receives 1-2 inches of precipitation per month with the exception of September and October<sup>1</sup>. The average annual rainfall typically amounts to 50-56 inches<sup>2</sup>.

In the summer, temperatures do reach 90°F or higher. The mean average temperature during the summer months of June, July and August is 72°F, with an average high temperature of 88°F and low temperature of 63°F. Summertime in is typically moderately warm and very humid. At higher elevations, weather is much more pleasant during the summer. Rain in early summer is common. Because of localized summer thunderstorms, some areas of the region get more precipitation than others.

Winter in the South Mountains Region is generally moderate but extremes do occur, especially at higher elevations. Winter lows frequently drop below freezing and temperatures can be even lower at higher elevations. In the winter months the average high temperature is in the lower fifties and the average low temperature drops to the upper-twenties. The region averages about 7 inches of snow per year depending on altitude of the location. Winter precipitation usually results from low pressure storms which pass through the area frequently, mainly occurring in January.

**FIGURE 3.1: SOUTH MOUNTAINS REGION ORIENTATION MAP**



<sup>1</sup> Polk County Multi-Jurisdictional Multi-Hazard Mitigation Plan, 2010

<sup>2</sup> Southeast Regional Climate Center, Forest City Station

## 3.2 POPULATION AND DEMOGRAPHICS

Rutherford County is the largest participating county by area, but Henderson County has the largest population. Between 2000 and 2018, the majority of participating jurisdictions experienced population growth. Henderson County had the highest county growth rate at 9.4% and it is also the most populous county within the region. Population counts from the US Census Bureau for 2000 and estimates for 2018 for each of the participating counties are presented in **Table 3.2**.

**TABLE 3.2: POPULATION COUNTS FOR PARTICIPATING COUNTIES**

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2018 Population Estimates	% Change 2010-2018
Henderson County	69,285	89,173	106,740	116,748	9.4%
Polk County	14,416	18,324	20,510	20,611	0.4%
Rutherford County	56,918	62,899	67,810	66,826	-1.5%
Transylvania County	25,520	29,334	33,090	34,215	3.4%

Source: US Census Bureau, NC Office of State Budget and Management

Based on the 2010 Census and 2018 estimates, the median age of residents of the participating counties ranges from 44 to 52 years. The racial characteristics of the participating counties are presented in **Table 3.3**. Generally, whites make up the majority of the population in the region accounting for over 87 percent of the population in all South Mountains Region Counties. Rutherford County contains the most diverse population.

**TABLE 3.3: DEMOGRAPHICS OF PARTICIPATING COUNTIES**

Jurisdiction	White, Percent (2017)	Black or African American, Percent (2017)	American Indian or Alaska Native, Percent (2017)	Asian, Percent (2017)	Native Hawaiian or Other Pacific Islander, Percent (2017)	Persons of Hispanic Origin, Percent (2017) *	Two or More Races, Percent (2017)
Henderson County	92.6%	3.4%	0.7%	1.2%	0.2%	10.3%	1.8%
Polk County	92.9%	4.4%	0.6%	0.6%	N/A	6.1%	1.5%
Rutherford County	87.1%	9.8%	0.4%	0.7%	0.1%	4.4%	2.0%
Transylvania County	93.3%	3.7%	0.4%	0.7%	0.1%	3.4%	1.8%

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

Source: US Census Bureau, NC Office of State Budget and Management

## 3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

### 3.3.1 Housing

According to the US Census Bureau, in 2018 there were an estimated 124,089 housing units in the South Mountains Region, the majority of which are single family homes or mobile homes. Housing information for the four participating counties is presented in **Table 3.4**. As shown in the table, Henderson County has a lower percentage of seasonal housing units compared to the other counties while Transylvania County has the highest percentage.

**TABLE 3.4: HOUSING CHARACTERISTICS OF PARTICIPATING COUNTIES**

Jurisdiction	Housing Units (2010)	Housing Units (2018)	Seasonal Units, Percent (2017)	Median Home Value (2013-2017)
Henderson County	54,710	58,097	8.3%	\$193,200
Polk County	11,432	11,803	10%	\$205,500
Rutherford County	33,878	34,466	9.1%	\$109,000
Transylvania County	19,163	19,723	15.5%	\$202,100

Source: US Census Bureau

### 3.3.2 Infrastructure

#### *Transportation*

The main major highway that crosses the Smoky Mountain Region is Interstate 26 which runs north to south through Henderson County. US Route 74 is another east-west highway that runs across the state and travels roughly southeast to northwest in the region through Henderson, Polk, and Rutherford Counties. US Route 74 has alternating names and overlaps pre-existing highways in the region (including Interstates 26), but it is considered the commercial backbone and main truck route of Western North Carolina. US Route 276 runs north to south through Transylvania County into South Carolina.

Within Henderson County, the Apple County Public Transit system provides bus service through the City of Hendersonville, Town of Fletcher, and Town of Laurel Park. Asheville Regional/Hendersonville Airport is the largest airport in the mountains serving the South Mountains Region and all of Western North Carolina. The airport currently offers non-stop commercial flights on four airlines to six major cities. The major airport located nearest to the region is the Charlotte Douglas International Airport, which offers non-stop commercial flights on nine airlines to numerous destinations across the eastern US and Midwest as well as to several international destinations. Other major nearby airports include the Hartsfield-Jackson Atlanta International Airport in Georgia and the Nashville Metropolitan Airport in Tennessee.

#### *Utilities*

Electrical power in the South Mountains Region is provided by two public utilities and several electricity cooperatives. Duke Energy Progress provides service to Henderson County, Polk County, Rutherford County, and Transylvania County. The electricity cooperatives servicing the region include Haywood

Electric Membership Corporation in Transylvania County, Rutherford Electric Membership Corporation in Rutherford and Polk Counties, and Halifax Electric Membership Cooperation in Henderson County.

Water and sewer service is provided by many of the towns in the South Mountains Region, but generally municipal water systems are extremely limited in the mountains and private or shared wells and septic systems are considered the norm. Henderson County operates and maintains a public sewer system through the Cane Creek Water and Sewer Districts.

### ***Community Facilities***

There are a number of public buildings and community facilities located throughout the South Mountains Region. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 74 fire/EMS stations, 17 police stations, and 46 schools located within the study area.

Five hospitals are located in the South Mountains Region<sup>3</sup>. The largest is Margaret J. Pardee Memorial Hospital, a 201-bed community hospital center located in the City of Hendersonville. The Rutherford Regional Medical Center in the Town of Rutherfordton has 129 beds and serves both Rutherford County and Cleveland County, east of Rutherford. The three smaller hospitals are Transylvania Regional Hospital in the City of Brevard, Park Ridge Health in the City of Hendersonville, and St. Luke's Hospital in the Town of Columbus with 92 beds, 62 beds, and 35 beds, respectively.

The South Mountains Region contains numerous local, state, and national parks and recreation areas. These include the Blue Ridge Parkway, Carl Sandburg Home National Historic Site, Chimney Rock State Park, Gorges State Park, and Pisgah National Forest. These facilities offer recreational opportunities to area residents and millions of visitors each year.

### **3.3.3 Land Use**

Many areas of the South Mountains Region are undeveloped or sparsely developed due to the mountainous terrain and the conservation of land in state and national parks and forests. As shown in **Figure 3.1** above, there are several small incorporated municipalities located throughout the study area, and these areas are where the region's population is generally concentrated. The incorporated areas are also where many businesses, commercial uses, and institutional uses are located. Land uses in the balance of the study area generally consist of rural residential development, agricultural uses, recreational areas, and forestland.

Local land use (and associated regulations) is further discussed in *Section 7: Capability Assessment*.

## **3.4 EMPLOYMENT AND INDUSTRY**

The early modern economy in the South Mountains Region was built around extractive industries; such as mining, logging, and agriculture; manufacturing; and textiles. Like many other mountain towns in North Carolina, the jurisdictions in the South Mountains Region have focused recent economic development efforts on cultural and natural heritage tourism. Second home development is another growing industry that can also help to boost the economy and promote revitalization.

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<sup>3</sup> Licensed Hospitals in North Carolina, 9/2018 <http://www.ncdhhs.gov/dhsr/data/hllist.pdf>

### SECTION 3: COMMUNITY PROFILE

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According to the North Carolina Department of Commerce, Labor and Economic Analysis Division, in 2018, Henderson County had a labor force consisting of 56,279 workers. The top five employers in Henderson County were the Henderson County Board of Public Education, Margaret R. Pardee Memorial Hospital, Ingles Markets INC, Park Ridge Health, and the County of Henderson. The unemployment rate was 3% compared to the State rate of 3.7%.

In 2018, Polk County had a labor force consisting of 9,026 workers. The top five employers in Polk County were Polk County Public Schools, St. Luke's Hospital, Acts INC, Polk County, and the Tryon International Equestrian Center. The unemployment rate was 3.5% compared to the State rate of 3.7%.

Rutherford County had a labor force of 24,940 workers. The top five employers in Rutherford County were the Rutherford County Board of Education, Rutherford County, Rutherford Regional Health System, Isothermal Community College, and Wal-Mart Associates. The unemployment rate was 4.6% compared to the State rate of 3.7%.

Transylvania County had a labor force of 14,405 workers. In 2018, the top five employers in Transylvania County were Transylvania County Schools, Transylvania County, Transylvania Community Hospitals, Gaia Herbs INC, and Brevard College Corp. The unemployment rate was 3.5% compared to the State rate of 3.7%.

# SECTION 4

## HAZARD IDENTIFICATION

This section describes how the planning committee identified the hazards to be included this plan. It consists of the following five subsections:

- ❖ 4.1 Overview
- ❖ 4.2 Disaster Declarations
- ❖ 4.3 Summary of Hazard Impacts Since Previous Plan
- ❖ 4.4 Hazard Evaluation
- ❖ 4.5 Hazard Identification Results

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### 44 CFR Requirement

**44 CFR Part 201.6(c)(2)(i):** The risk assessment shall include a description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

### 4.1 OVERVIEW

The South Mountains Region is vulnerable to a wide range of natural and human-caused hazards that threaten life and property. Current FEMA regulations and guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused hazards (i.e., technological hazards, terrorism, etc.) is encouraged, though not required, for plan approval. The South Mountains Region has included a comprehensive assessment of both types of hazards.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the participating counties in the South Mountains Region have identified a number of hazards that are to be addressed in its Regional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from the South Mountains Regional Hazard Mitigation Planning Committee members, research of past disaster declarations in the participating counties<sup>1</sup>, and review of the North Carolina State Hazard Mitigation Plan (2018). To maintain consistency, the South Mountains Planning Committee voted to assess the same hazards that were identified in the most recent update of the North Carolina State Hazard Mitigation Plan. A list of all previous hazards covered in the 2014 South Mountains Regional Hazard Mitigation Plan is viewable in **Table 4.1**, along with a summary of the hazards assessed in this update. Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources.

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<sup>1</sup> A complete list of disaster declarations for the South Mountains Region can be found below in Section 4.3.

**TABLE 4.1: 2020 SOUTH MOUNTAINS HAZARDS UPDATE**

2014 South Mountains Identified Hazards		2020 South Mountains Identified Hazards		Sub hazards covered in 2020 Plan and Explanations
<b>Atmospheric Hazards</b>	Drought	Drought	<b>Natural Hazards</b>	Agricultural Drought, Hydrological Drought
	Hailstorm			Assessed under "Tornadoes/Thunderstorms"
	Heat Wave	Excessive Heat		
	Hurricane and Tropical Storm	Hurricane and Coastal Hazards		Storm Surge associated with Hurricanes and Nor'easters, High Wind associated with Hurricanes and Nor'easters, Torrential Rain, Tornadoes Associates with Hurricanes, Severe Winter Weather associated with Nor'easters
	Lightning			Assessed under "Tornadoes/Thunderstorms"
	Tornado	Tornadoes/Thunderstorms		Hailstorm, Torrential Rain associated with Severe Thunderstorms, Thunderstorm Wind, Lightning, Waterspout, High Wind
	Severe Thunderstorm			Assessed under "Tornadoes/Thunderstorms"
	Winter Storm and Freeze	Severe Winter Weather		Freezing Rain, Snowstorms, Blizzards, Wind Chill, Extreme Cold
<b>Hydrologic Hazards</b>	Dam and Levee Failure	Dam Failures	<b>Other Hazards</b>	
	Erosion			Assessed under "Geological"
	Flood	Flooding		
<b>Geologic Hazards</b>	Earthquake	Earthquakes		
	Landslide	Geological		Landslides, Sinkholes, Erosion
<b>Other Hazards</b>	Wildfire	Wildfires	<b>Other Hazards</b>	
		Infectious Disease		
<b>Other Hazards</b>	Hazardous Materials Incident	Hazardous Substances	<b>Technological Hazards</b>	Hazardous Materials, Hazardous Chemicals, Oil Spill
	Nuclear Accident	Radiological Emergency – Fixed Nuclear Facilities		
		Terrorism		Chemical, Biological, Radiological, Nuclear, Explosive
		Cyber		
		Electromagnetic Pulse		

Next, **Table 4.2** lists the disaster declarations in the South Mountains Region. **Table 4.3** lists the hazard events that have impacted the South Mountains region over the last five years.

**Table 4.4** documents the evaluation process used for determining which of the initially identified hazards are considered significant enough to warrant further evaluation in the risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table works to summarize not only those hazards that *were* identified (and why) but also those that *were not* identified (and why not). Hazard events not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the Regional Hazard Mitigation Planning Committee during the plan update process.

Lastly, **Table 4.5** provides a summary of the hazard identification and evaluation process noting that 15 of the 24 initially identified hazards are considered significant enough for further evaluation through this Plan's risk assessment (marked with a "☑").

## 4.2 DISASTER DECLARATIONS

Disaster declarations provide initial insight into the hazards that may impact the South Mountains Regional planning area. Since 1977, eleven presidential disaster declarations have been reported in the South Mountains Region. This includes three storms related to severe storms and flooding, three storms related to severe winter weather events, four storms related to hurricane and coastal hazards, and one storm related to tornadoes.

**TABLE 4.2: SOUTH MOUNTAINS REGION DISASTER DECLARATIONS**

Year	Disaster Number	Description	Henderson County	Polk County	Rutherford County	Transylvania County
1977	542	Severe Storms & Flooding	X	X	X	
1989	827	Tornadoes			X	
1995	1073	Severe Storms, Flooding, High Winds				X
1996	1087	Blizzard of 96	X	X	X	X
1996	1103	Winter Storm	X	X	X	
1996	1134	Hurricane Fran	X	X	X	
1998	1200	Severe Storms and Flooding				X
2002	1448	Severe Ice Storm		X	X	
2004	1546	Tropical Storm Frances	X	X	X	X
2004	1553	Hurricane Ivan	X	X	X	X
2018	4393	Hurricane Florence		X		

### 4.3 SUMMARY OF HAZARD IMPACTS SINCE PREVIOUS PLAN

Since the approval date of the previous South Mountains Regional Hazard Mitigation Plan (7/20/2015), there have been 271 hazard events recorded for the region in the National Centers for Environmental Information Storm Events Database. It is important to take note of those hazard events and consider them in the *Hazard Identification* section to help ensure that the appropriate hazards are being considered in the risk assessment sections and in the Mitigation Strategy. **Table 4.3** documents the hazard events recorded. Details for some of these events are discussed in further detail in the *Hazard Profiles* section.

**TABLE 4.3: SUMMARY OF HAZARD EVENTS SINCE PREVIOUS PLAN**

Hazard Type*	Number of Reported Events in Henderson County	Number of Reported Events in Polk County	Number of Reported Events in Rutherford County	Number of Reported Events in Transylvania County
Cold/Wind Chill	5	3	2	6
Debris Flow	0	1	0	0
Drought	1	2	2	1
Flash Flood	8	4	5	5
Flood	6	3	2	13
Hail	12	12	5	3
Heavy Rain	0	1	0	0
Heavy Snow	3	7	7	2
High Wind	4	1	4	4
Ice Storm	2	1	2	1
Lightning	2	0	1	1
Strong Wind	0	0	1	0
Thunderstorm Wind	16	12	35	5
Tornado	0	1	1	0
Tropical Storm	0	0	0	0
Winter Storm	1	2	2	2
Winter Weather	9	15	15	9
<b>TOTAL NUMBER OF REPORTED EVENTS</b>	<b>69</b>	<b>65</b>	<b>85</b>	<b>52</b>

\* The hazard type names that NCEI uses are different than the names of hazards used in this plan; however, one can still get an understanding of the types of hazards that impact the region as the hazard types are similar in name.

## 4.4 HAZARD EVALUATION

**TABLE 4.4: DOCUMENTATION OF THE HAZARD EVALUATION PROCESS**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
<b>NATURAL HAZARDS</b>			
Avalanche	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of the NC State Hazard Mitigation Plan</li> <li>• Review of previous hazard mitigation plans</li> <li>• Review of US Forest Service National Avalanche Center website</li> </ul>	<ul style="list-style-type: none"> <li>• The United States avalanche hazard is limited to mountainous western states including Alaska as well as some areas of low risk in New England.</li> <li>• Avalanche hazard was removed from the North Carolina State Hazard Mitigation Plan after determining the mountain elevation in Western North Carolina did have enough snow not to produce this hazard.</li> <li>• Avalanche is not included in the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>
Drought	YES	<ul style="list-style-type: none"> <li>• Review of the NC State Hazard Mitigation Plan</li> <li>• Review of the North Carolina Drought Monitor website</li> <li>• Review of previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• There are reports of drought conditions in fourteen out of the last fourteen years in the South Mountains Region, according to the North Carolina Drought Monitor.</li> <li>• Droughts are discussed in NC State Hazard Mitigation Plan as a lesser hazard.</li> <li>• The NC State Hazard Mitigation Plan lists drought as a top hazard for the South Mountains</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
			Region. <ul style="list-style-type: none"> <li>• Drought is included in the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>
Hailstorm	YES (Assessed under Tornadoes/Thunderstorms)	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Hailstorm events are discussed in the state plan under the Severe Thunderstorm hazard.</li> <li>• NCEI reports 414 hailstorm events (0.75 inch size hail to 4.5 inches) for the South Mountains Region between 1962 and 2018. For these events there was over \$28 million (2018 dollars) in property damages.</li> <li>• Although hail is not addressed as an individual hazard in any of the previous hazard mitigation plans, it is addressed as a sub-item under tornadoes/thunderstorms. Given the frequency of the event, individual analysis is warranted.</li> </ul>
Excessive Heat	YES	<ul style="list-style-type: none"> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of the North Carolina State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• NCEI reports at least one extreme heat event for the South Mountains counties.</li> <li>• The NC State Hazard Mitigation Plan does include Extreme Heat as a hazard for the South Mountains counties.</li> <li>• The NC State Hazard Mitigation Plan reports the west-central portion</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
			<p>of the state as having a moderate vulnerability in the state.</p> <ul style="list-style-type: none"> <li>• Extreme Heat was mentioned in all three of the previous hazard mitigation plans in tandem with the drought hazard.</li> </ul>
Hurricane and Coastal Hazards	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website</li> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of historical presidential disaster declarations</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Hurricane and coastal hazard events are discussed in the state plan and are listed as a top hazard in the South Mountains Region.</li> <li>• NOAA historical records indicate 32 hurricanes/coastal hazards have come within 75 miles of the South Mountains Region since 1850.</li> <li>• Four out of eleven disaster declarations in the South Mountains Region are directly related to hurricane and costal hazard events.</li> <li>• The 50-year return period peak gust for hurricane and tropical storm events in the South Mountains Region is between 63-68 mph.</li> <li>• Hurricane and coastal hazards were addressed in the previous South Mountains Regional Hazard Mitigation plan.</li> </ul>
Lightning	YES (Assessed under Tornadoes/Thunderstorms)	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and</li> </ul>	<ul style="list-style-type: none"> <li>• Lightning events are discussed in the state plan as part of the severe thunderstorm hazard.</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		Risk Assessment <ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of NOAA NCEI Storm Events Database, NOAA lightning statistics</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• NCEI reports 51 lightning events for the South Mountains Region since 1996. These events have resulted in a recorded 38 injuries and over \$2 million (2018 dollars) in property damage.</li> <li>• Given the damage and reported death and injuries, individual analysis is warranted.</li> </ul>
Nor'Easter	NO	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of NOAA NCEI Storm Events Database</li> </ul>	<ul style="list-style-type: none"> <li>• Nor'easters are discussed in the state plan. The South Mountains Region, has low vulnerability to this hazard.</li> <li>• NCEI does not report any nor'easter activity for the South Mountains Region. However, nor'easters may have affected the region as severe winter storms. In this case, the activity would be reported under winter storm events.</li> <li>• Nor'easters were not identified in the previous version of the South Mountains Regional Hazard Mitigation Plan.</li> </ul>
Tornadoes/Thunderstorm	YES	<ul style="list-style-type: none"> <li>• Review of FEMA's Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard</li> </ul>	<ul style="list-style-type: none"> <li>• Tornado events are discussed in the NC State Hazard Mitigation Plan.</li> <li>• NCEI reports 18 tornado events in South Mountains Region</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		Mitigation Plan <ul style="list-style-type: none"> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of historical presidential disaster declarations.</li> </ul>	counties since 1950. These events have resulted in no recorded deaths and have caused 10 injuries and over \$3 million (2018 dollars) in property damage with the most severe being an F4. <ul style="list-style-type: none"> <li>• Tornado events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>
Severe Thunderstorm	YES (Assessed under Tornadoes/Thunderstorms)	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of historical presidential disaster declarations.</li> </ul>	<ul style="list-style-type: none"> <li>• Severe thunderstorm events are discussed in the NC State Hazard Mitigation Plan. The South Mountains Region, has a moderate vulnerability in the state.</li> <li>• According to the NC State Hazard Mitigation Plan, severe thunderstorm is a significant hazard for the South Mountains counties.</li> <li>• NCEI reports 605 thunderstorm wind events in the South Mountains Region counties since 1950. These events have resulted in 6 deaths, 13 injuries and nearly \$5 million (2018 dollars) in property damage.</li> <li>• Severe thunderstorm events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Severe Winter Weather	YES	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of NOAA NCEI Storm Events Database</li> <li>• Review of historical presidential disaster declarations.</li> </ul>	<ul style="list-style-type: none"> <li>• Severe winter weather events, including snow storms and ice storms, are discussed in the state plan. They are listed as a top hazard in the South Mountains Region counties.</li> <li>• NCEI reports that the South Mountains counties have been affected by 411 snow and ice events since 1993. These events resulted in over \$19 million (2018 dollars) in damages.</li> <li>• Three of the region’s eleven disaster declarations were directly related to winter storm events.</li> <li>• Winter storm events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>
Earthquakes	YES	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of the National Geophysical Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• Earthquake events are discussed in the state plan and all of the participating counties in the South Mountains Region are considered to be at moderate risk to an earthquake event (no counties are high risk).</li> <li>• The previous South Mountains Regional Hazard Mitigation Plan addresses earthquake.</li> <li>• Earthquakes have occurred in and around the State of North Carolina in the past. The</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		<ul style="list-style-type: none"> <li>• USGS Earthquake Hazards Program website</li> </ul>	<p>state is affected by the Charleston and the New Madrid (near Tennessee) Fault lines which have generated a magnitude 8.0 earthquake in the last 200 years.</p> <ul style="list-style-type: none"> <li>• 15 events are known to have occurred in the region according to the National Geophysical Data Center. The greatest MMI reported was a 7.</li> <li>• According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for the South Mountains Region is approximately 4%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.</li> </ul>
Expansive Soils	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of USDA Soil Conservation Service’s Soil</li> </ul>	<ul style="list-style-type: none"> <li>• Expansive soils are identified in the state plan and are a significant hazard in the Region, but no local reports of expansive soils exist according to local investigation.</li> <li>• According to FEMA and USDA sources, the South Mountains Region is located in an area that has a “little to no” clay swelling potential.</li> <li>• The previous South Mountains Regional</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		Survey	Hazard Mitigation Plan did not identify expansive soils as a potential hazard.
Geological (Landslides, Sinkholes, Erosion)	YES	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> <li>• Review of USGS Landslide Incidence and Susceptibility Hazard Map</li> <li>• Review of the North Carolina Geological Survey database of historic landslides</li> </ul>	<ul style="list-style-type: none"> <li>• Landslide/debris flow events are discussed in the state plan, and ranked a significant hazard in the South Mountains counties.</li> <li>• USGS landslide hazard maps indicate “high landslide incidence” (more than 15% of the area is involved in landsliding) is found in all four counties. All counties also have areas of moderate incidence.</li> <li>• Data provided by NCGS indicate only 1 recorded landslide event in the South Mountains Region, but the more areas are currently in the process of being mapped and warrant further consideration.</li> <li>• The previous South Mountains Hazard Mitigation Plans addresses landslides.</li> </ul>
Land Subsidence	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard</li> </ul>	<ul style="list-style-type: none"> <li>• The state plan delineates certain areas that are susceptible to land subsidence hazards in North Carolina; however none of these areas are located in South Mountains counties.</li> <li>• The plan identifies the South Mountains counties as having scored very low for the land subsidence</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		Mitigation Plan.	hazard. <ul style="list-style-type: none"> <li>• The previous South Mountains Regional Hazard Mitigation Plan does not identify land subsidence as a potential hazard.</li> </ul>
Tsunami	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> <li>• Review of FEMA “How-to” mitigation planning guidance (Publication 386-2, “Understanding Your Risks – Identifying Hazards and Estimating Losses).</li> </ul>	<ul style="list-style-type: none"> <li>• Tsunamis are discussed in the state plan. However, the South Mountains Region has zero vulnerability to the tsunami hazard.</li> <li>• The previous South Mountains Regional Hazard Mitigation Plan does not address tsunami as a hazard.</li> <li>• No record exists of a catastrophic Atlantic basin tsunami impacting the mid-Atlantic coast of the United States.</li> <li>• Tsunami inundation zone maps are not available for communities located along the U.S. East Coast.</li> <li>• FEMA mitigation planning guidance suggests that locations along the U.S. East Coast have a relatively low tsunami risk and need not conduct a tsunami risk assessment at this time.</li> </ul>
Volcano	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC</li> </ul>	<ul style="list-style-type: none"> <li>• There are no active volcanoes in North Carolina.</li> <li>• There has not been a volcanic eruption in North Carolina in over 1 million</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		State Hazard Mitigation Plan • Review of USGS Volcano Hazards Program website	years. • No volcanoes are located near the South Mountains Region.
Dam Failure	YES	• Review of FEMA’s Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan. • Review of North Carolina Division of Land Management website	• Dam failure is discussed in the state plan as a top hazard of concern for the South Mountains Region. • Of the 327 dams reported on the National Inventory of Dams, 124 are high hazard (38%), (High hazard is defined as “where failure or mis operation will probably cause loss of human life.”) • The previous South Mountains Regional Hazard Mitigation Plan addresses dam failure as a hazard.
Erosion	YES (Referenced in Geological Hazards)	• Review of NC State Hazard Mitigation Plan • Review of previous South Mountains Regional Hazard Mitigation Plan	• Erosion is not mentioned as a hazard in the previous plan. • Coastal erosion is discussed in the state plan but only for coastal areas.
Flooding	YES	• Review of NC State Hazard Mitigation Plan • Review of historical disaster declarations • Review of NOAA NCEI Storm Events Database • Review of FEMA’s	• The flood hazard is thoroughly discussed in the state plan. • Three of the eleven Presidential Disaster Declarations were directly called flooding events, and hurricane/tropical storm events likely caused severe flooding.

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		NFIP Community Status Book and Community Rating System (CRS) <ul style="list-style-type: none"> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• NCEI reports that South Mountains Region counties have been affected by 206 flood events since 1993. These events in total caused 6 over \$45 million (2018 dollars) in property damages.</li> <li>• A small percentage of the South Mountains Region is located in an identified floodplain (100 or 500 year).</li> <li>• 86% of all participating jurisdictions participate in the NFIP.</li> <li>• The previous South Mountains Regional Hazard Mitigation Plan addresses the flood hazard.</li> </ul>
Storm Surge	NO	<ul style="list-style-type: none"> <li>• Review of FEMA’s Multi-Hazard Identification and Risk Assessment</li> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> <li>• Review of NOAA NCEI Storm Events Database</li> </ul>	<ul style="list-style-type: none"> <li>• Storm surge is discussed in the state plan under the hurricane hazard and indicates that the South Mountains Region has zero vulnerability to storm surge.</li> <li>• The previous South Mountains Regional Hazard Mitigation Plan does not address storm surge.</li> <li>• No historical events were reported by NCEI</li> <li>• Given the inland location of the South Mountains Region, storm surge would not affect the area.</li> </ul>
<b>OTHER HAZARDS</b>			
Wildfires	YES	• Review of NC	• Review of NC State

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		State Hazard Mitigation Plan <ul style="list-style-type: none"> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> <li>• Review of Southern Wildfire Risk Assessment (SWRA) Data</li> <li>• Review of the NC Division of Forest Resources website</li> </ul>	Hazard Mitigation Plan <ul style="list-style-type: none"> <li>• The previous South Mountains Regional Hazard Mitigation Plan addressed wildfire as a hazard.</li> <li>• Review of Southern Wildfire Risk Assessment (SWRA) Data</li> <li>• Review of the NC Division of Forest Resources website</li> </ul>
Hazardous Substances	YES	<ul style="list-style-type: none"> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan.</li> </ul>	<ul style="list-style-type: none"> <li>• The previous South Mountains Regional Hazard Mitigation Plan addressed hazardous substances as a hazard.</li> <li>• This update assesses hazardous materials, hazardous chemicals, and oil spills under this hazard.</li> </ul>
Infectious Disease	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Although the previous regional hazard mitigation plan did not address infectious diseases as a hazard, it is assessed in this update to maintain consistency with the NC State Hazard Mitigation Plan.</li> </ul>
<b>TECHNOLOGICAL HAZARDS</b>			
Terrorism	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Although the previous regional hazard mitigation plan did not address terrorism as a hazard, it is assessed in this update to maintain consistency with the NC State Hazard Mitigation Plan.</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
		<ul style="list-style-type: none"> <li>• Review of local official knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• There is a fixed nuclear facility located near the region.</li> <li>• This hazard will assess chemical, biological, radiological, nuclear, and explosive terrorism events.</li> </ul>
Radiological Emergency – Fixed Nuclear Facilities	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> <li>• Review of the previous South Mountains Regional Hazard Mitigation Plan</li> <li>• Review of IAEA list of fixed nuclear power stations in the United States</li> <li>• Discussion with local officials about location of nuclear power stations</li> </ul>	<ul style="list-style-type: none"> <li>• The McGuire Nuclear Power Station is located on Lake Norman near the region.</li> <li>• The Catawba Nuclear Power Stations is located across the state border in York, South Carolina, and could impact the region</li> <li>• Although radiological emergencies are not identified in the previous plan, local officials expressed a desire to address them in this plan</li> <li>• Nuclear events can sometimes be caused by natural hazards and deserve some attention in this plan due to some areas of the region being located in the evacuation zone for the McGuire and Catawba Nuclear Power Stations</li> </ul>
Cyber	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard Mitigation Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Changing future conditions encourage the assessment of the possibility of a cyber attack with the increase in global technology</li> </ul>
Electromagnetic Pulse	YES	<ul style="list-style-type: none"> <li>• Review of NC State Hazard</li> </ul>	<ul style="list-style-type: none"> <li>• Changing future conditions encourage the</li> </ul>

**SECTION 4: HAZARD IDENTIFICATION**

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<b>Natural Hazards Considered</b>	<b>Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)</b>	<b>How was this determination made?</b>	<b>Why was this determination made?</b>
		Mitigation Plan	assessment of the possibility of an electromagnetic pulse with the increase in global technology.

## 4.5 HAZARD IDENTIFICATION RESULTS

**TABLE 4.5: SUMMARY RESULTS OF THE HAZARD IDENTIFICATION AND EVALUATION PROCESS**

NATURAL HAZARDS	TECHNOLOGICAL HAZARDS
<input type="checkbox"/> Avalanche	<input checked="" type="checkbox"/> Radiological Emergency – Fixed Nuclear Facilities
<input checked="" type="checkbox"/> Drought	<input checked="" type="checkbox"/> Terrorism
<input checked="" type="checkbox"/> Hailstorm**	<input checked="" type="checkbox"/> Cyber
<input checked="" type="checkbox"/> Excessive Heat	<input checked="" type="checkbox"/> Electromagnetic Pulse
<input checked="" type="checkbox"/> Hurricane and Coastal Hazards	OTHER HAZARDS
<input checked="" type="checkbox"/> Flooding	<input checked="" type="checkbox"/> Hazardous Substances
<input checked="" type="checkbox"/> Lightning**	<input checked="" type="checkbox"/> Wildfires
<input type="checkbox"/> Nor'easter	<input checked="" type="checkbox"/> Infectious Disease
<input checked="" type="checkbox"/> Tornadoes/Thunderstorms	
<input checked="" type="checkbox"/> Severe Winter Weather	
<input checked="" type="checkbox"/> Earthquakes	
<input checked="" type="checkbox"/> Dam Failures	
<input checked="" type="checkbox"/> Geological	
<input checked="" type="checkbox"/> Infectious Disease	
<input type="checkbox"/> Expansive Soils	
<input type="checkbox"/> Land Subsidence	
<input type="checkbox"/> Tsunami	
<input type="checkbox"/> Volcano	
<input type="checkbox"/> Storm Surge	
<input type="checkbox"/> Erosion	

= Hazard considered significant enough for further evaluation in the South Mountains Region hazard risk assessment.

\*\* = Hazard is assessed as a sub hazard under the Tornadoes/Thunderstorms hazard

# SECTION 5

## HAZARD PROFILES

This section includes detailed hazard profiles for each of the hazards identified in the previous section (*Hazard Identification*) as significant enough for further evaluation in the South Mountains Regional Hazard Mitigation Plan. It contains the following subsections:

- ❖ 5.1 Overview
- ❖ 5.2 Study Area
- ❖ 5.3 Drought
- ❖ 5.4 Excessive Heat
- ❖ 5.5 Hurricane and Coastal Hazards
- ❖ 5.6 Tornadoes/Thunderstorms
- ❖ 5.7 Severe Winter Weather
- ❖ 5.8 Earthquakes
- ❖ 5.9 Geological
- ❖ 5.10 Dam Failure
- ❖ 5.11 Flooding
- ❖ 5.12 Wildfires
- ❖ 5.13 Infectious Disease
- ❖ 5.14 Hazardous Substances
- ❖ 5.15 Radiological Emergency – Fixed Nuclear Facilities
- ❖ 5.16 Terrorism
- ❖ 5.17 Cyber
- ❖ 5.18 Electromagnetic Pulse
- ❖ 5.19 Conclusions on Hazard Risk
- ❖ 5.20 Final Determinations

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### 44 CFR Requirement

*44 CFR Part 201.6(c)(2)(i): The risk assessment shall include a description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events*

## 5.1 OVERVIEW

This section includes detailed hazard profiles for each of the hazards identified in the previous section (*Hazard Identification*) as significant enough for further evaluation in the South Mountains Region hazard risk assessment by creating a hazard profile. Each hazard profile includes a general description of the hazard, its location and extent, notable historical occurrences, and the probability of future occurrences. Each profile also includes specific items noted by members of the South Mountains Regional Hazard Mitigation Planning Team as it relates to unique historical or anecdotal hazard information for the counties in the South Mountains Region, or a participating municipality within them.

After reviewing the list of assessed hazards from the previous update, the South Mountains Regional Planning Team moved to amend the hazards in order to be consistent with the State of North Carolina Hazard Mitigation Plan. This required some of the hazard names to change and additional hazards were included in the assessment.

The following hazards were identified:

- ❖ **Natural**
  - ❖ Drought
  - ❖ Excessive Heat
  - ❖ Hurricane and Coastal Hazards
  - ❖ Tornadoes/Thunderstorms (including hailstorms and lightning)
  - ❖ Severe Winter Weather
  - ❖ Geological (including landslides, sinkholes, and erosion)
  - ❖ Dam Failure
  - ❖ Flooding
  
- ❖ **Other**
  - ❖ Wildfires
  - ❖ Infectious Disease
  
- ❖ **Technological**
  - ❖ Hazardous Substances
  - ❖ Radiological Emergency – Fixed Nuclear Facilities
  - ❖ Terrorism
  - ❖ Cyber
  - ❖ Electromagnetic Pulse

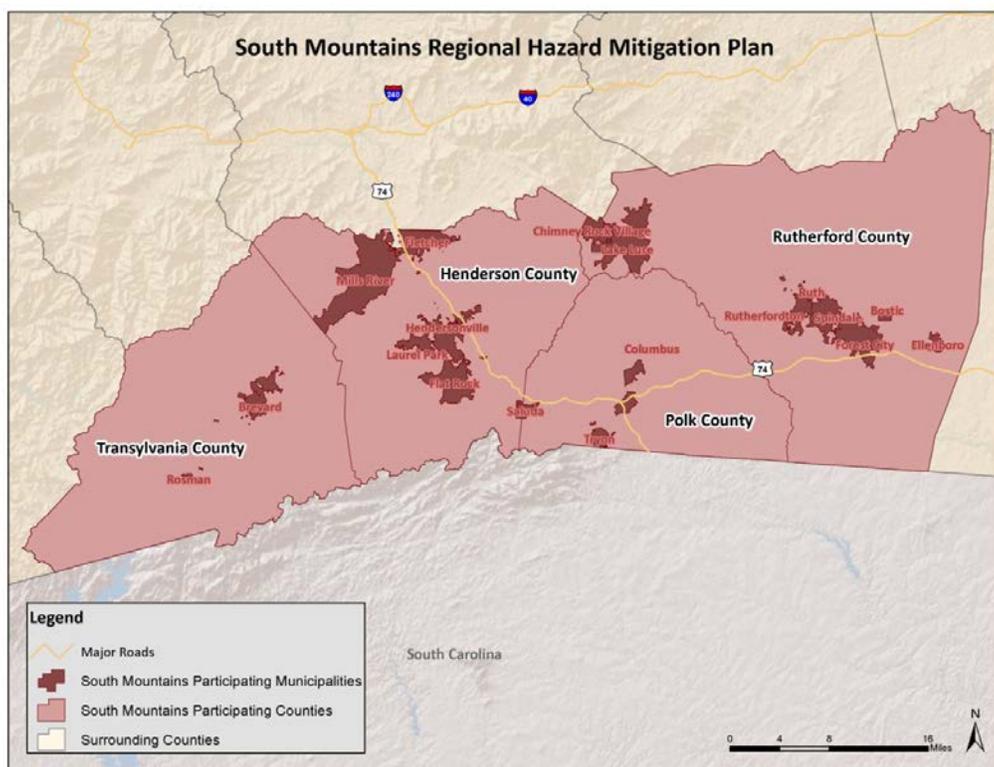
## 5.2 STUDY AREA

Table 5.1 provides a summary table of the participating jurisdictions within each county included in this plan. In addition, Figure 5.1 provides a base map, for reference, of the South Mountains Region.

**TABLE 5.1: PARTICIPATING JURISDICTIONS IN THE SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLAN**

<b>Henderson County</b>	
Flat Rock	Laurel Park
Fletcher	Mills River
Hendersonville	
<b>Polk County</b>	
Columbus	Tryon
Saluda	
<b>Rutherford County</b>	
Bostic	Lake Lure
Chimney Rock Village	Ruth
Ellenboro	Rutherfordton
Forest City	Spindale
<b>Transylvania County</b>	
Brevard	Rosman

**FIGURE 5.1: SOUTH MOUNTAINS REGION BASE MAP**



**Table 5.2** lists each significant hazard for the South Mountains Region and identifies whether or not it has been determined to be a specific hazard of concern for the eighteen municipal jurisdictions and each of the four county’s unincorporated areas. This is the based on the best available data and information from the South Mountains Regional Hazard Mitigation Planning Team. (● = hazard of concern)

**TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN THE SOUTH MOUNTAINS REGION**

Jurisdiction	Drought	Excessive Heat	Hurricane and Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Geological	Dam Failure	Flooding	Wildfires	Infectious Disease	Hazardous Substances	Radiological Emergency	Terrorism	Cyber	Electromagnetic Pulse
<b>Henderson County</b>																
Flat Rock	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fletcher	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hendersonville	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Laurel Park	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Mills River	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>Polk County</b>																
Columbus	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Saluda	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tryon	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>Rutherford County</b>																
Bostic	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Chimney Rock Village	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ellenboro	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Forest City	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lake Lure	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ruth	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rutherfordton	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Spindale	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>Transylvania County</b>																
Brevard	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rosman	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

# Natural Hazards

## 5.3 DROUGHT

### 5.3.1 Background and Description

Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts. Drought may also lead to more severe wildfires.

Droughts are typically classified into one of four types: 1) meteorological, 2) hydrologic, 3) agricultural, or 4) socioeconomic. **Table 5.3** presents definitions for these types of drought.

**TABLE 5.3 DROUGHT CLASSIFICATION DEFINITIONS**

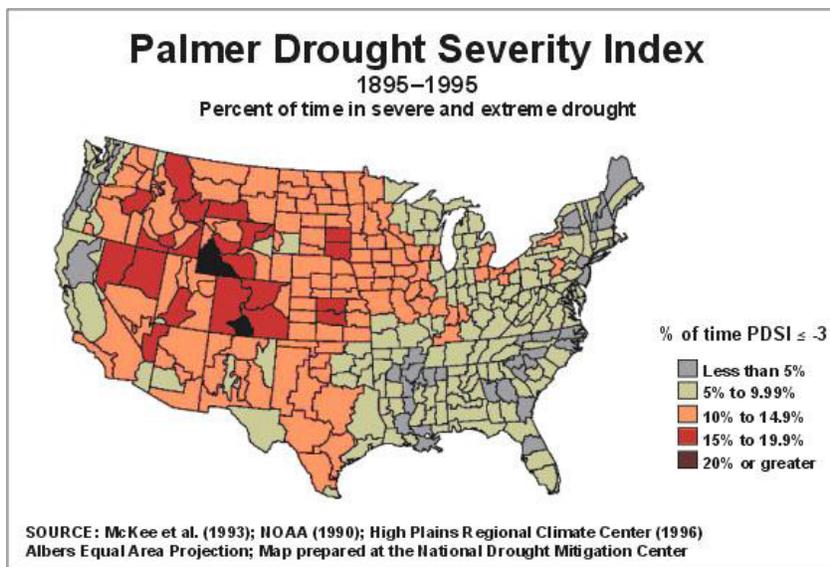
<b>Meteorological Drought</b>	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
<b>Hydrologic Drought</b>	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
<b>Agricultural Drought</b>	Soil moisture deficiencies relative to water demands of plant life, usually crops.
<b>Socioeconomic Drought</b>	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Droughts are slow-onset hazards, but, over time, can have very damaging affects to crops, municipal water supplies, recreational uses, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impact can be significant.

The Palmer Drought Severity Index (PDSI) is based on observed drought conditions and range from -0.5 (incipient dry spell) to -4.0 (extreme drought). Evident in **Figure 5.2**, the Palmer Drought Severity Index Summary Map for the United States, drought affects most areas of the United States, but is less severe in the Eastern United States.

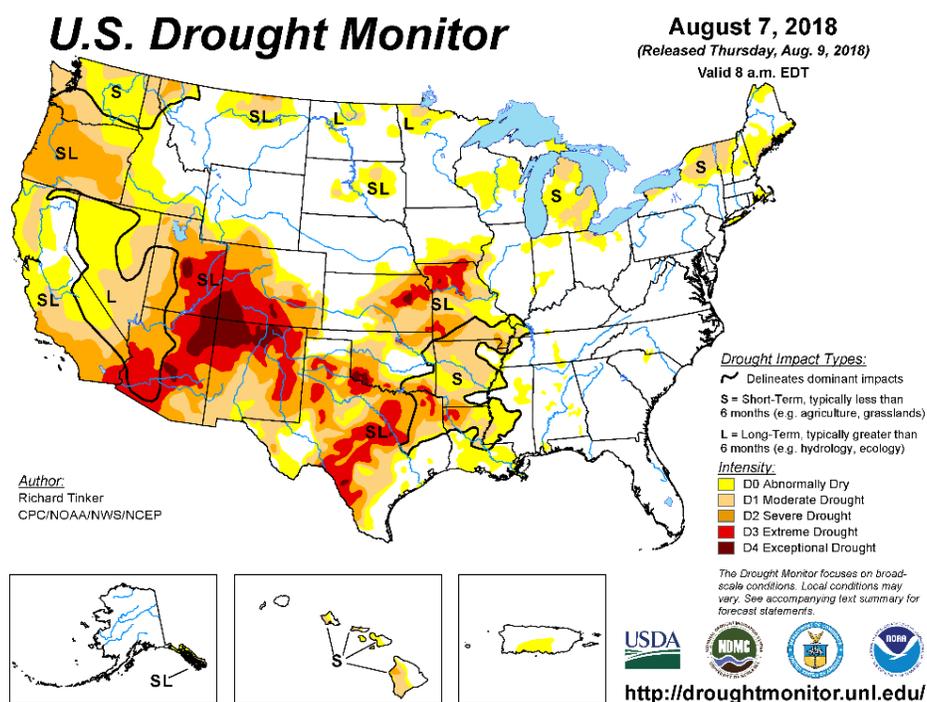
**FIGURE 5.2: PALMER DROUGHT SEVERITY INDEX SUMMARY MAP FOR THE UNITED STATES**



Source: National Drought Mitigation Center

The figure above is the most updated version of the Palmer Drought Severity Index; however, the US Drought Monitor is updated on a weekly basis. An archived map from the summer of 2018 can be seen below in **Figure 5.3** to reflect more current drought conditions in the US.

FIGURE 5.3: US Drought Monitor



### 5.3.2 Location and Spatial Extent

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index (**Figure 5.2**), Western North Carolina has a relatively low risk for drought hazard. However, local areas may experience much more severe and/or frequent drought events than what is represented on the Palmer Drought Severity Index map. Furthermore, it is assumed that the South Mountain Region would be uniformly exposed to drought, making the spatial extent potentially widespread. It is also notable that drought conditions typically do not cause significant damage to the built environment.

### 5.3.3 Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in the South Mountain Region. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2018 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

- ◆ D0: Abnormally Dry
- ◆ D1: Moderate Drought
- ◆ D2: Severe Drought
- ◆ D3: Extreme Drought
- ◆ D4: Exceptional Drought

According to the North Carolina Drought Monitor, at least one or more of the counties in the South Mountains Region has had drought occurrences (including abnormally dry) in 16 of the last 19 years (2000-2018) (**Table 5.4**). It should be noted that the North Carolina Drought Monitor also estimates what percentage of the county is in each classification of drought severity. For example, the most severe classification reported may be exceptional, but a majority of the county may actually be in a less severe condition.

**TABLE 5.4: SUMMARY OF DROUGHT OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number Years with Drought Occurrences	Number Years with Exceptional Drought Occurrences
Henderson County	16	2
Polk County	17	3
Rutherford County	17	3
Transylvania County	18	3

Source: North Carolina Drought Monitor (through October 2018)

### 5.3.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of the South Mountains Region has a probability level of likely (10 to 100 percent annual probability) for future drought events. This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. While reports indicate that there is a much lower probability for extreme, long-lasting drought conditions, NOAA also predicts that central and western North Carolina to have areas of persistent drought and further drought development<sup>1</sup>.

## 5.4 EXCESSIVE HEAT

### 5.4.1 Background and Description

Excessive heat, like drought, poses little risk to property. However, excessive heat can have devastating effects on health. Excessive heat can often be referred to as “extreme heat” or a “heat wave.” According to the National Weather Service, there is no universal definition for a heat wave, but the standard U.S. definition is any event lasting at least three days where temperatures reach ninety degrees Fahrenheit or higher. However, it may also be defined as an event at least three days long where temperatures are ten degrees greater than the normal temperature for the affected area. Heat waves are typically accompanied by humidity but may also be very dry. These conditions can pose serious health threats causing an average of 1,500 deaths each summer in the United States<sup>2</sup>.

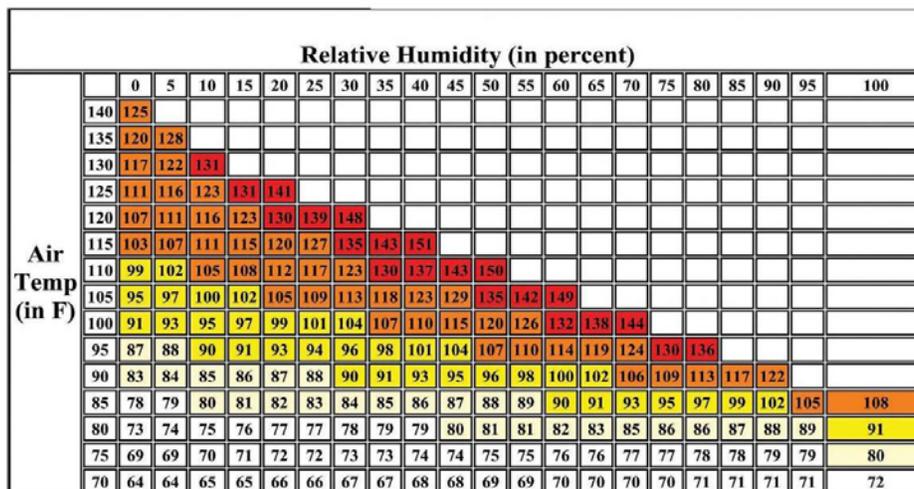
According to the National Oceanic and Atmospheric Administration, heat is the number one weather-related killer among natural hazards, followed by frigid winter temperatures<sup>1</sup>. The National Weather Service devised the Heat Index as a mechanism to better inform the public of heat dangers. The Heat Index Chart, shown in **Figure 5.4**, uses air temperature and humidity to determine the heat index or

<sup>1</sup> U.S. Seasonal Drought Outlook. National Weather Service Climate Prediction Center. [http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/sdo\\_summary.php](http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php)

<sup>2</sup> <http://www.noaa.gov/themes/heat.php>

apparent temperature. **Table 5.5** shows the dangers associated with different heat index temperatures. Some populations, such as the elderly and young, are more susceptible to heat danger than other segments of the population.

**FIGURE 5.4: HEAT INDEX CHART**



Source: NOAA

**TABLE 5.5: HEAT DISORDERS ASSOCIATED WITH HEAT INDEX TEMPERATURE**

Heat Index Temperature (Fahrenheit)	Description of Risks
80°- 90°	Fatigue possible with prolonged exposure and/or physical activity
90°- 105°	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105°- 130°	Sunstroke, heat cramps, and heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
130° or higher	Heatstroke or sunstroke is highly likely with continued exposure

Source: National Weather Service, NOAA

In addition, NOAA has seventeen metropolitan areas participating in the Heat Health Watch/Warning System in order to better inform and warn the public of heat dangers. A Heat Health Watch is issued when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A Heat Warning is issued when an excessive heat event is expected in the next 36 hours. Furthermore, a warning is issued when the conditions are occurring, imminent, or have a high likelihood of occurrence. Urban areas participate in the Heat Health Watch/Warning System because urban areas are at greater risk to heat affects. Stagnant atmospheric conditions trap pollutants, thus adding unhealthy air to excessively hot temperatures. In addition, the “urban heat island effect” can produce significantly higher nighttime temperatures because asphalt and concrete (which store heat longer) gradually release heat at night.

### 5.4.2 Location and Spatial Extent

Extreme heat typically impacts a large area and cannot be confined to any geographic or political boundaries. The entire South Mountains Region is susceptible to extreme heat conditions.

### 5.4.3 Historical Occurrences

Data from the National Centers for Environmental Information was used to determine historical excessive heat and heat wave events in the South Mountains Region. There were no events reported.

In addition, information from the State Climate Office of North Carolina was reviewed to obtain historical temperature records in the region. Temperature information has been reported since 1898. The recorded maximum for each county can be found below in **Table 5.6**.

**TABLE 5.6: HIGHEST RECORDED TEMPERATURE IN THE SOUTH MOUNTAINS REGION**

Location	Date	Temperature (°F)
Henderson County	8/23/1983	101
Polk County	6/22/1964	105
Rutherford County	8/1/1999	107
Transylvania County	6/6/1977	100
South Mountains Regional Maximum	--	107

Source: State Climate Office of North Carolina

The State Climate Office also reports average maximum temperatures in various locations in the region. The most centralized location is in Hendersonville (Henderson County). **Table 5.7** shows the average maximum temperatures from 2015 to 2019 at the Hendersonville observation station, which can be used as a general comparison for the region.

**TABLE 5.7: AVERAGE MAXIMUM TEMPERATURE IN HENDERSONVILLE, HENDERSON COUNTY**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Max (°F)	46.7	50.7	58.5	67.0	74.3	80.6	84.3	82.5	76.9	67.8	58.4	49.7

Source: State Climate Office of North Carolina

### 5.4.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of the South Mountains Region has a probability level of possible (1 to 10 percent annual probability) for future excessive heat events to impact the region.

## 5.5 HURRICANE AND COASTAL HAZARDS

### 5.5.1 Background and Description

Hurricanes and coastal hazards are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a “safety-valve,” limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in the Atlantic basin is about six.

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (**Table 5.8**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

**TABLE 5.8: SAFFIR-SIMPSON SCALE**

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)
1	74-95	Greater than 980
2	96-110	979-965
3	111-129	964-945
4	130-156	944-920
5	157 +	Less than 920

*Source: National Hurricane Center (2018)*

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as “major” hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. **Table 5.9** describes the damage that could be expected for each category of hurricane. Damage during hurricanes may also result from spawned tornadoes, storm surge, and inland flooding associated with heavy rainfall that usually accompanies these storms.

**TABLE 5.9: HURRICANE DAMAGE CLASSIFICATIONS**

Category	Damage Level	Description of Damages	Photo Example
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

Source: National Hurricane Center; Federal Emergency Management Agency

## 5.5.2 Location and Spatial Extent

Hurricanes, coastal hazards, and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States. While coastal areas are most directly exposed to the brunt of landfalling storms, their impact is often felt hundreds of miles inland and they can affect South Mountains Region. All areas in the South Mountains Region are equally susceptible to hurricane and coastal hazards.

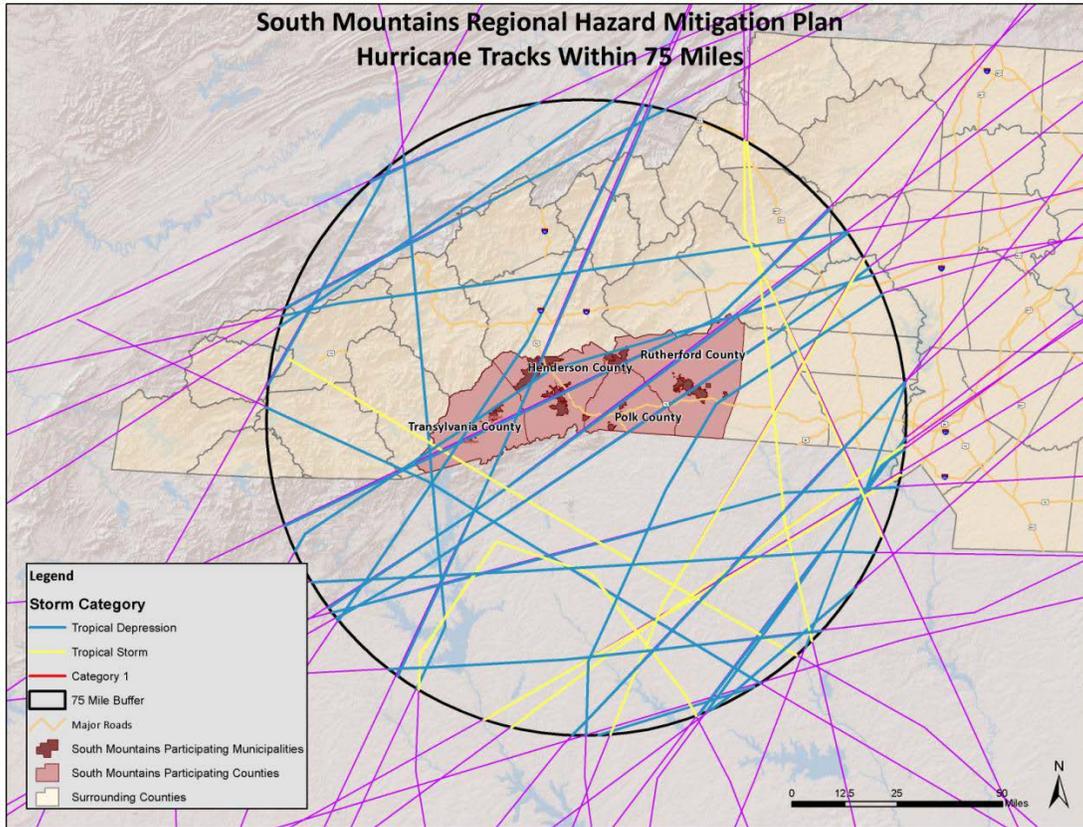
## 5.5.3 Historical Occurrences

According to the National Hurricane Center's historical storm track records, 30 hurricane or tropical storm tracks have passed within 75 miles of the South Mountains Region since 1850<sup>3</sup>. This includes 7 tropical storms and 23 tropical depressions.

Of the recorded storm events, nine storms traversed directly through the South Mountains Region as shown in **Figure 5.5**. **Table 5.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the South Mountains Region) and maximum Category of the storm based on the Saffir-Simpson Scale.

<sup>3</sup> These storm track statistics do not include extra-tropical storms. Though these related hazard events are less severe in intensity, they may cause significant local impact in terms of rainfall and high winds.

**FIGURE 5.5: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES OF THE SOUTH MOUNTAINS REGION**



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

**TABLE 5.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF SOUTH MOUNTAINS REGION (1850–2018)**

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
9/17/1859	NOT NAMED	--	Tropical Depression (TD)
9/24/1886	NOT NAMED	35	Tropical Storm (TS)
8/1/1891	NOT NAMED	35	Tropical Storm (TS)
7/8/1896	NOT NAMED	26	Tropical Depression (TD)
9/28/1901	NOT NAMED	22	Tropical Depression (TD)
10/11/1902	NOT NAMED	31	Tropical Depression (TD)
10/10/1905	NOT NAMED	--	Tropical Depression (TD)
9/18/1906	NOT NAMED	31	Tropical Depression (TD)
9/23/1907	NOT NAMED	40	Tropical Storm (TS)
8/30/1911	NOT NAMED	26	Tropical Depression (TD)
6/17/1912	NOT NAMED	--	Tropical Depression (TD)
9/4/1913	NOT NAMED	26	Tropical Depression (TD)
8/31/1915	NOT NAMED	26	Tropical Depression (TD)

7/15/1916	NOT NAMED	31	Tropical Depression (TD)
8/11/1928	NOT NAMED	35	Tropical Storm (TS)
5/30/1934	NOT NAMED	26	Tropical Depression (TD)
8/28/1949	NOT NAMED	35	Tropical Storm (TS)
9/30/1959	GRACIE	22	Tropical Depression (TD)
8/30/1964	CLEO	22	Tropical Depression (TD)
6/8/1968	CELESTE	53	Tropical Storm (TS)
9/8/1977	BABE	22	Tropical Depression (TD)
8/18/1985	ONE-C	48	Tropical Storm (TS)
9/22/1989	HUGO	22	Tropical Depression (TD)
8/17/1994	BERYL	--	Tropical Depression (TD)
7/24/1997	DANNY	18	Tropical Depression (TD)
7/10/2003	DOLORES	--	Tropical Depression (TD)
9/8/2004	FRANCES	18	Tropical Depression (TD)
9/17/2004	IVAN	13	Tropical Depression (TD)
9/28/2004	JEANNE	18	Tropical Depression (TD)
7/7/2005	CINDY	18	Tropical Depression (TD)
9/14/2018	FLORENCE	40	Tropical Storm (TS)

Source: National Hurricane Center

The National Centers for Environmental Information did not report any events associated with a hurricane or tropical storm in the South Mountains Region between 1950 and 2018. However, federal records indicate that four disaster declarations were made in 1996 (Hurricane Fran), 2004 (Tropical Storm Frances and Hurricane Ivan), and 2018 (Hurricane Florence) for the region<sup>4</sup>.

Flooding is generally the greatest hazard of concern with hurricane and tropical storm events in the South Mountains Region. Most events do not carry winds that are above that of the winter storms and straight line winds received by the South Mountains counties. Some anecdotal information is available for the major storms that have impacted that area as found below:

#### **Hurricane Fran – September 5, 1996**

Just prior to landfall of Hurricane Fran, a small portion of the region, in the Bat Cave (Henderson County), Chimney Rock (Rutherford County), Lake Lure (Rutherford County) areas, received up to 11 inches of rain in a 3 hour period. The rains were the result of nearly stationary, very heavy thunderstorms. Severe damage to property in the immediate area resulted, with about 70 homes and businesses destroyed or significantly damaged. As Hurricane Fran moved inland, it dropped an additional 5 to 10 inches of rain over the area resulting in significant flooding throughout the region.

#### **Tropical Storm Frances – September 7-8, 2004**

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and thousands of trees were downed. Trees fell on structures, vehicles, and power lines. Additionally, the downed trees led to the death of an elderly man in Hendersonville when a tree fell

<sup>4</sup> Not all of the participating counties were declared disaster areas for these storms. A complete listing of historical disaster declarations, including the affected counties, can be found in Section 4: *Hazard Identification*.

through the resident's structure. Flooding also led to numerous landslides in the area which added to the damage of infrastructure and residential and commercial structures. Frances caused significant crop damages totaling \$55 million statewide. North Carolina residents received almost \$20.6 million in federal disaster assistance following the storm.

**Hurricane Ivan** – September 16-17, 2004

Just a week and a half following Tropical Storm Frances, the remnants of Hurricane Ivan hit western North Carolina when many streams and rivers were already well above flood stage. The widespread flooding forced many roads to be closed and landslides were common across the mountain region. Wind gusts reached between 40 and 60 mph across the higher elevations of the Appalachian Mountains resulting in numerous downed trees. More than \$13.8 million of federal aid was dispersed across North Carolina following Ivan.

The Hurricane Frances/Ivan combination of events resulted in widespread road closures (including Highways 64, 280, 25, and 276) as well as infrastructure damages (many bridges and roads were completely washed out), residential structure damages, and commercial structure damages due to massive flooding. Trees were blown down and fell on structures, vehicles, and powerlines, adding to the already widespread debris buildup and power outages.

**Hurricane Florence** – September 14-17, 2018

After peaking as a Category 4, Hurricane Florence made landfall on the coast of North Carolina as a Category 1 storm. However, it slowed to only 3mph while on land and dumped massive amounts of rain throughout the Carolinas. It quickly weakened to a tropical storm as it made its way inward, but some areas experienced record rainfall and widespread flooding. Approximately 1,200 roads were closed in North Carolina. As of June 2019, \$1.3 billion in federal funds were granted for Hurricane Florence in North Carolina, and \$185.8 million of that was given in the form of Public Assistant grants, which Polk County received.

### **5.5.4 Probability of Future Occurrences**

Based on historical occurrence information, it is assumed that all of the South Mountains Region has a probability level of possible (1 to 10 percent annual probability) for future hurricanes and coastal hazards to impact the region.

## **5.6 TORNADOES/THUNDERSTORMS**

For the purposes of maintaining consistency with the State of State of North Carolina Hazard Mitigation Plan, this section will assess tornadoes and thunderstorms, which also include high winds, hailstorms and lightning.

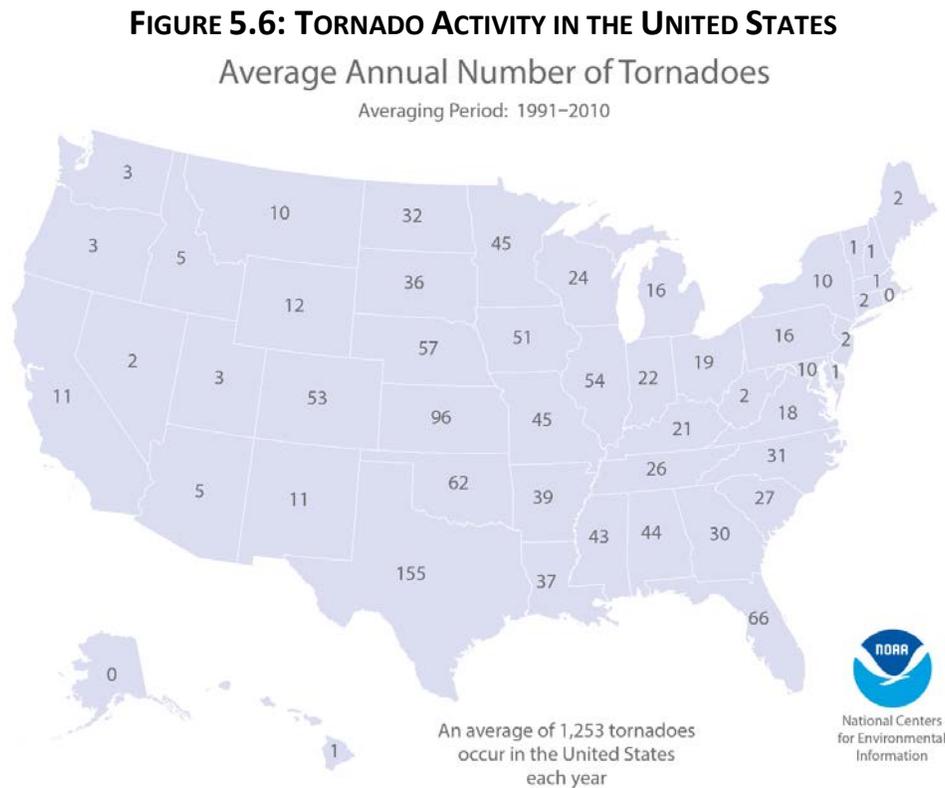
### **5.6.1 Background and Description**

**Tornadoes**

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National

Weather Service, tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 1,200 tornadoes is reported nationwide, resulting in an average of 56 deaths and 1,500 injuries<sup>5</sup>. According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas, and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of “tornado alley”), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 5.6** shows tornado activity in the United States based on the number of recorded tornadoes per 10,000 square miles.



Tornadoes are more likely to occur during the months of March through May and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes). Tornadic magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were

<sup>5</sup> NOAA, 2013.

determined using the traditional version of the Fujita Scale (**Table 5.11**). Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale (**Table 5.12**).

**TABLE 5.11: THE FUJITA SCALE (EFFECTIVE PRIOR TO 2005)**

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
<b>F0</b>	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
<b>F1</b>	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
<b>F2</b>	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
<b>F3</b>	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
<b>F4</b>	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
<b>F5</b>	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
<b>F6</b>	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Source: National Weather Service

**TABLE 5.12 THE ENHANCED FUJITA SCALE (EFFECTIVE 2005 AND LATER)**

EF-Scale Number	Intensity Phrase	3 Second Gust (MPH)	Type of Damage Done
0	Gale	65-85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign

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EF-Scale Number	Intensity Phrase	3 Second Gust (MPH)	Type of Damage Done
1	Moderate	86-110	boards. The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
2	Significant	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
3	Severe	136-165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
4	Devastating	166-200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	Incredible	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Source: National Weather Service

**Thunderstorms**

Thunderstorms can produce a variety of accompanying hazards including wind, hailstorms, and lightning<sup>6</sup>, which are all discussed here. Although thunderstorms generally affect a small area, they are very dangerous and may cause substantial property damage.

Three conditions need to occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this often referred to as the “engine” of the storm). Third, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun’s heat. When these conditions occur simultaneously, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Furthermore, they can move through an area very quickly or linger for several hours.

<sup>6</sup> Lightning and hail hazards are discussed as separate hazards in this section.

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as “severe.” A severe thunderstorm occurs when the storm produces at least one of these three elements: 1) hail of three-quarters of an inch, 2) a tornado, or 3) winds of at least 58 miles per hour.

Thunderstorm events have the capability of producing straight-line winds that can cause severe destruction to communities and threaten the safety of a population. Such wind events, sometimes separate from a thunderstorm event, are common throughout the South Mountains Region. Therefore, high winds are also reported in this section.

High winds can form due to pressure of the Northeast coast that combines with strong pressure moving through the Ohio Valley. This creates a tight pressure gradient across the region, resulting in high winds which increase with elevation. It is common for gusts of 30 to 60 miles per hour during the winter months.

Downbursts are also possible with thunderstorm events. Such events are an excessive burst of wind in excess of 125 miles per hour. They are often confused with tornadoes. Downbursts are caused by down drafts from the base of a convective thunderstorm cloud. It occurs when rain-cooled air within the cloud becomes heavier than its surroundings. Thus, air rushes towards the ground in a destructive yet isolated manner. There are two types of downbursts. Downbursts less than 2.5 miles wide, duration less than 5 minutes, and winds up to 168 miles per hour are called “microbursts.” Larger events greater than 2.5 miles at the surface and longer than 5 minutes with winds up to 130 miles per hour are referred to as “macrobursts.”

**Hailstorms**

Hailstorms are a potentially damaging outgrowth of severe thunderstorms (thunderstorms are discussed separately in Section 5.8). Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop to a sufficient weight and fall as precipitation. Hail typically takes the form of spheres or irregularly-shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth’s surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. **Table 5.13** shows the TORRO Hailstorm Intensity Scale which is a way of measuring hail severity.

**TABLE 5.13: TORRO HAILSTORM INTENSITY SCALE**

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m <sup>2</sup>	mm to inch conversion (inches)	Typical Damage Impacts
<b>H0</b>	Hard Hail	5	0-20	0 – 0.2	No damage
<b>H1</b>	Potentially Damaging	5-15	>20	0.2 – 0.6	Slight general damage to plants, crops
<b>H2</b>	Significant	10-20	>100	0.4 – 0.8	Significant damage to fruit, crops, vegetation
<b>H3</b>	Severe	20-30	>300	0.8 – 1.2	Severe damage to fruit and crops, damage

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m <sup>2</sup>	mm to inch conversion (inches)	Typical Damage Impacts
					to glass and plastic structures, paint and wood scored
<b>H4</b>	Severe	25-40	>500	1.0 – 1.6	Widespread glass damage, vehicle bodywork damage
<b>H5</b>	Destructive	30-50	>800	1.2 – 2.0	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
<b>H6</b>	Destructive	40-60		1.6 – 2.4	Bodywork of grounded aircraft dented, brick walls pitted
<b>H7</b>	Destructive	50-75		2.0 – 3.0	Severe roof damage, risk of serious injuries
<b>H8</b>	Destructive	60-90		1.6 – 3.5	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
<b>H9</b>	Super Hailstorms	75-100		3.0 – 3.9	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
<b>H10</b>	Super Hailstorms	>100			Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: <http://www.torro.org.uk/site/hscale.php>

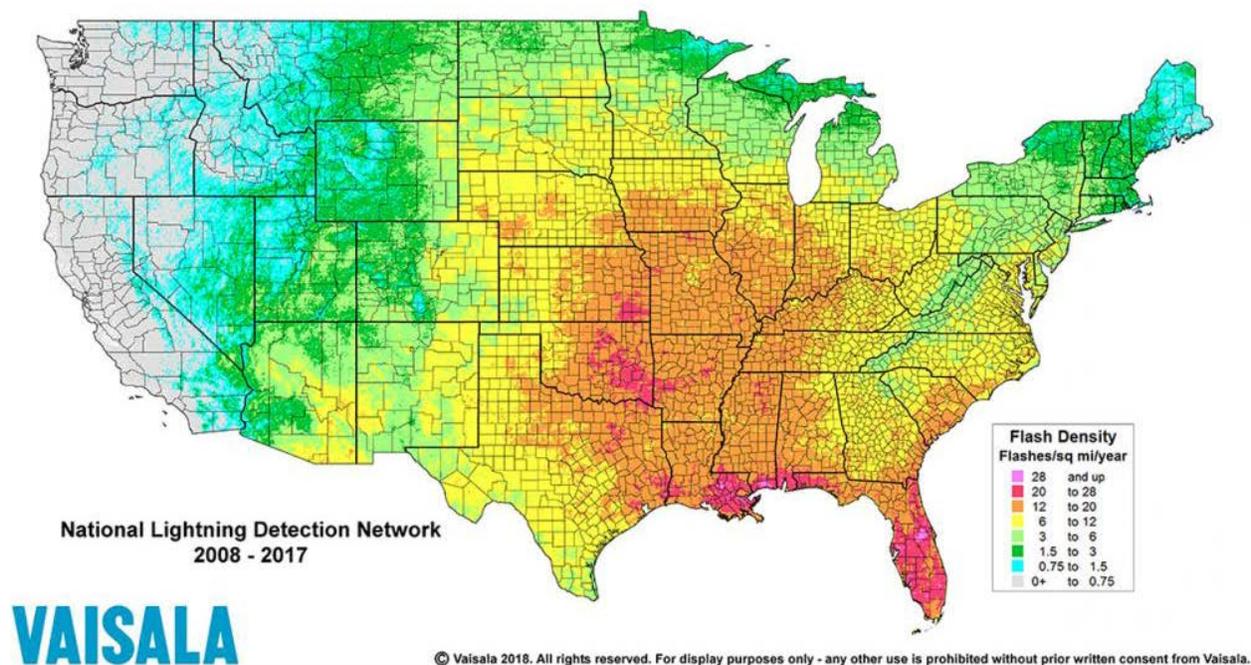
### Lightning

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall.

Lightning strikes occur in very small, localized areas. For example, they may strike a building, electrical transformer, or even a person. According to FEMA, lightning injures an average of 300 people and kills 80 people each year in the United States. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure largely by igniting a fire. Lightning is also responsible for igniting wildfires that can result in widespread damages to property.

**Figure 5.7** shows a lightning flash density map for the years 2008-2017 based upon data provided by Vaisala’s U.S. National Lightning Detection Network (NLDN®).

FIGURE 5.7: LIGHTNING FLASH DENSITY IN THE UNITED STATES



Source: Vaisala U.S. National Lightning Detection Network

## 5.6.2 Location and Spatial Extent

### Tornadoes

Tornadoes occur throughout the state of North Carolina, and thus in the South Mountains Region. Tornadoes typically impact a relatively small area, but damage may be extensive. Event locations are completely random and it is not possible to predict specific areas that are more susceptible to tornado strikes over time. Therefore, it is assumed that the South Mountains Region is uniformly exposed to this hazard.

### Thunderstorms

A thunderstorm/wind event is an atmospheric hazard, and thus has no geographic boundaries. It is typically a widespread event that can occur in all regions of the United States. However, thunderstorms are most common in the central and southern states because atmospheric conditions in those regions are favorable for generating these powerful storms. Also, the South Mountains Region typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that the South Mountains Region has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

### Hailstorms

Hailstorms frequently accompany thunderstorms, so their locations and spatial extents coincide. It is assumed that the South Mountains Region is uniformly exposed to severe thunderstorms; therefore, all areas of the region are equally exposed to hail which may be produced by such storms.

## Lightning

Lightning occurs randomly, therefore it is impossible to predict where and with what frequency it will strike. It is assumed that all of the South Mountains Region is uniformly exposed to lightning.

### 5.6.3. Historical Occurrences

#### Tornadoes

Tornadoes are a somewhat rare occurrence; however, they have and do occur in the South Mountains Region. Tornadoes resulted in one disaster declaration in the South Mountains Region in 1989<sup>7</sup>. According to the National Centers for Environmental Information, there have been a total of 18 recorded tornado events in the South Mountains Region since 1950 (**Table 5.14**), resulting in over \$3 million (2018 dollars) in property damages<sup>8</sup>. In addition, 10 injuries were reported. The magnitude of these tornadoes ranges from F0 to F4 in intensity, although an F5 event is possible. It is important to note that only tornadoes that have been reported are factored into this risk assessment. It is likely that a high number of occurrences have gone unreported over the past 69 years.

**TABLE 5.14: SUMMARY OF TORNADO OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>3</b>	<b>0/0</b>	<b>\$1,218,542</b>
Unincorporated Area	3	0/0	\$1,218,542
<b>Polk County</b>	<b>3</b>	<b>0/0</b>	<b>\$423,633</b>
Tryon	1	0/0	\$204,884
Unincorporated Area	2	0/0	\$218,749
<b>Rutherford County</b>	<b>9</b>	<b>0/10</b>	<b>\$812,861</b>
Rutherfordton	1	0/0	\$0
Forest City	2	0/0	\$75,802
Ellenboro	1	0/0	\$0
Unincorporated Area	5	0/10	\$737,059
<b>Transylvania County</b>	<b>3</b>	<b>0/0</b>	<b>\$848,224</b>
Unincorporated Area	3	0/0	\$848,224
<b>South Mountains Regional Total</b>	<b>18</b>	<b>0/10</b>	<b>\$3,303,260</b>

Source: National Centers for Environmental Information

#### Thunderstorms

Severe storms have not resulted in any disaster declarations in the South Mountains Region in and of themselves; however, several declared disaster events such as the tornadoes of 1989 were likely accompanied by severe storms<sup>9</sup>. According to NCEI, there have been 605 reported thunderstorm and

<sup>7</sup> A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

<sup>8</sup> These tornado events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional tornadoes have occurred in the South Mountains Region. As additional local data becomes available, this hazard profile will be amended.

<sup>9</sup> Not all of the participating counties were declared disaster areas for these events. A complete listing of historical disaster declarations, including the affected counties, can be found in Section 4: *Hazard Identification*.

high wind events since 1950 in the South Mountains region<sup>10</sup>. These events caused over \$8 million (2018 dollars) in damages. There were reports of six deaths and thirteen injuries. **Table 5.15** summarizes this information.

**TABLE 5.15: SUMMARY OF THUNDERSTORM / HIGH WIND OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>172</b>	<b>2/8</b>	<b>\$3,411,853</b>
Flat Rock	0	0/0	\$0
Fletcher	7	0/0	\$91,312
Hendersonville	21	0/3	\$67,362
Laurel Park	3	0/0	\$21,989
Mills River	11	0/0	\$42,881
Unincorporated Area	130	2/5	\$3,188,309
<b>Polk County</b>	<b>105</b>	<b>0/2</b>	<b>\$1,288,879</b>
Columbus	19	0/2	\$39,710
Saluda	3	0/0	\$0
Tryon	13	0/0	\$21,371
Unincorporated Area	70	0/2	\$1,227,798
<b>Rutherford County</b>	<b>229</b>	<b>4/3</b>	<b>\$2,863,869</b>
Bostic	8	0/0	\$0
Chimney Rock Village	7	0/0	\$0
Ellenboro	7	0/0	\$1,371
Forest City	29	0/0	\$584,870
Lake Lure	18	0/0	\$2,774
Ruth	3	0/0	\$0
Rutherfordton	50	1/0	\$433,505
Spindale	4	0/0	\$0
Unincorporated Area	103	3/3	\$1,841,349
<b>Transylvania County</b>	<b>99</b>	<b>0/0</b>	<b>\$1,160,367</b>
Brevard	23	0/0	\$123,875
Rosman	5	0/0	\$0
Unincorporated Area	71	0/0	\$1,036,492
<b>South Mountains Regional Total</b>	<b>605</b>	<b>6/13</b>	<b>\$8,724,968</b>

Source: National Centers for Environmental Information

### Hailstorms

According to the National Centers for Environmental Information, 341 recorded hailstorm events have affected the South Mountains Region since 1963<sup>11</sup>. **Table 5.16** is a summary of the hail events in the South Mountains Region. In all, hail occurrences resulted in over \$28 million (2018 dollars) in

<sup>10</sup> These thunderstorm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional thunderstorm events have occurred in the South Mountains Region. As additional local data becomes available, this hazard profile will be amended.

property damages, most of which were reported in Henderson County. Hail ranged in diameter from 0.75 inches to 2.75 inches. It should be noted that hail is notorious for causing substantial damage to cars, roofs, and other areas of the built environment that may not be reported to the National Centers for Environmental Information. Furthermore, high losses in Henderson County indicate that neighboring counties may also be subject to additional, unreported losses. Therefore, it is likely that damages are greater than the reported value. Additionally, a single storm event may have affected multiple counties.

**TABLE 5.16: SUMMARY OF HAIL OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>137</b>	<b>0/0</b>	<b>\$28,368,916</b>
Flat Rock	8	0/0	\$0
Fletcher	10	0/0	\$5,487,804
Hendersonville	27	0/0	\$9,035,216
Laurel Park	0	0/0	\$0
Mills River	15	0/0	\$0
Unincorporated Area	77	0/0	\$13,845,896
<b>Polk County</b>	<b>73</b>	<b>0/0</b>	<b>\$4,209</b>
Columbus	15	0/0	\$4,209
Saluda	11	0/0	\$0
Tryon	5	0/0	\$0
Unincorporated Area	42	0/0	\$0
<b>Rutherford County</b>	<b>116</b>	<b>0/0</b>	<b>\$34,298</b>
Bostic	2	0/0	\$0
Chimney Rock Village	3	0/0	\$0
Ellenboro	7	0/0	\$0
Forest City	15	0/0	\$0
Lake Lure	8	0/0	\$34,298
Ruth	0	0/0	\$0
Rutherfordton	22	0/0	\$0
Spindale	2	0/0	\$0
Unincorporated Area	57	0/0	\$0
<b>Transylvania County</b>	<b>88</b>	<b>0/0</b>	<b>\$114,971</b>
Brevard	15	0/0	\$86,907
Rosman	7	0/0	\$28,064
Unincorporated Area	66	0/0	\$0
<b>South Mountains Regional Total</b>	<b>341</b>	<b>0/0</b>	<b>\$28,522,394</b>

Source: National Centers for Environmental Information

<sup>11</sup> These hail events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional hail events have affected the South Mountains Region. In addition to NCEI, the North Carolina Department of Insurance office was contacted for information. As additional local data becomes available, this hazard profile will be amended.

### Lightning

According to the National Centers for Environmental Information, there have been a total of 51 recorded lightning events in the South Mountains Region since 1995<sup>12</sup>. These events resulted in more than \$2.3 million (2018 dollars) in damages, as listed in summary **Table 5.17**. Furthermore, lightning caused 38 injuries throughout the South Mountains Region.

It is certain that more than 51 events have impacted the region. Many of the reported events are those that caused damage, and it should be expected that damages are likely much higher for this hazard than what is reported.

**TABLE 5.17: SUMMARY OF LIGHTNING OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>18</b>	<b>0/19</b>	<b>\$569,317</b>
Flat Rock	0	0/0	\$0
Fletcher	0	0/0	\$0
Hendersonville	3	0/0	\$65,811
Laurel Park	0	0/0	\$0
Mills River	0	0/0	\$0
Unincorporated Area	15	0/19	\$503,506
<b>Polk County</b>	<b>5</b>	<b>0/6</b>	<b>\$280,758</b>
Columbus	0	0/0	\$0
Saluda	0	0/0	\$0
Tryon	2	0/0	\$157,282
Unincorporated Area	3	0/6	\$123,476
<b>Rutherford County</b>	<b>15</b>	<b>0/7</b>	<b>\$451,623</b>
Bostic	2	0/0	\$1,426
Chimney Rock Village	1	0/1	\$0
Ellenboro	2	0/0	\$77,239
Forest City	2	0/1	\$77,392
Lake Lure	2	0/0	\$71,496
Ruth	0	0/0	\$0
Rutherfordton	2	0/0	\$68,597
Spindale	0	0/0	\$0
Unincorporated Area	4	0/5	\$155,473
<b>Transylvania County</b>	<b>13</b>	<b>0/6</b>	<b>\$1,073,114</b>
Brevard	5	0/5	\$308,545
Rosman	0	0/0	\$0
Unincorporated Area	8	0/1	\$764,569
<b>South Mountains Regional Total</b>	<b>51</b>	<b>0/38</b>	<b>\$2,374,812</b>

<sup>12</sup> These lightning events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional lightning events have occurred in the South Mountains Region. The State Fire Marshall's office was also contacted for additional information but none could be provided. As additional local data becomes available, this hazard profile will be amended.

*Source: National Centers for Environmental Information*

## **5.6.4 Probability of Future Occurrences**

### **Tornadoes**

According to historical information, tornado events are not an annual occurrence for the region. However, in recent years, the southeastern United States, including North Carolina, has experienced a number of tornado events. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should the South Mountains Region experience a direct tornado strike. The probability of future tornado occurrences affecting the South Mountains Region is likely (10 to 100 percent annual probability).

### **Thunderstorms**

Given the high number of previous events, it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future wind events for the entire planning area.

### **Hailstorms**

Based on historical occurrence information, it is assumed that the probability of future hail occurrences is likely (10 to 100 percent annual probability). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that the entire South Mountains Region has equal exposure to this hazard. It can be expected that future hail events will continue to cause minor damage to property and vehicles throughout the region.

### **Lightning**

Since there were a moderate number of historical lightning events reported throughout the South Mountains Region via NCEI data, it is considered a fairly regular occurrence that often accompanies thunderstorms. In fact, lightning events will assuredly happen on an annual basis, though not all events will cause damage. According to Vaisala's U.S. National Lightning Detection Network (NLDN), the South Mountains Region is located in an area of the country that experienced an average of 4 to 5 lightning flashes per square kilometer per year between 2010 and 2018. Therefore, the probability of future events is highly likely (100 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the region.

## **5.7 SEVERE WINTER WEATHER**

### **5.7.1 Background and Description**

Severe winter weather can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Events may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damages, such as roof collapses on older buildings.

All severe winter weather events have the potential to present dangerous conditions to the affected area. Larger snowfalls pose a greater risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an

accumulation of 4 or more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least 3 hours. Winter storms are often accompanied by sleet, freezing rain, or an ice storm. Such freeze events are particularly hazardous as they create treacherous surfaces.

Ice storms are defined as storms with significant amounts of freezing rain and are a result of cold air damming (CAD). CAD is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes. In the former case, super-cooled droplets can freeze on impact (freezing rain), while in the latter case, the re-frozen water particles are ice pellets (or sleet). Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces. All of the winter storm elements – snow, low temperatures, sleet, ice, etcetera – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions. Furthermore, communication and power may be disrupted for days.

### 5.7.2 Location and Spatial Extent

Nearly the entire continental United States is susceptible to winter storm and freeze events. Some ice and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. The South Mountains Region is accustomed to severe winter weather conditions and often receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire region has uniform exposure to a winter storm.

### 5.7.3 Historical Occurrences

Winter weather has resulted in three disaster declarations in the South Mountains Region. This includes the Blizzard of 1996, one subsequent 1996 winter storm, and an ice storm in 2002<sup>13</sup>. According to the National Centers for Environmental Information, there have been a total of 411 recorded winter storm events in the South Mountains region since 1993 (**Table 5.18**)<sup>14</sup>. These events resulted in over \$19 million (2018 dollars) in damages.

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<sup>13</sup> All of the participating counties were declared disaster areas for these events. A complete listing of historical disaster declarations, including the affected counties, can be found in Section 4: *Hazard Profiles*.

<sup>14</sup> These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is likely that additional winter storm conditions have affected the South Mountains Region. In addition, the 411 events are reported by the county, so many of these storms likely affected all of the counties.

**TABLE 5.19: SUMMARY OF WINTER STORM EVENTS IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Henderson County	124	0/0	\$12,110,763
Polk County	79	0/0	\$1,211,076
Rutherford County	78	0/0	\$2,422,152
Transylvania County	130	0/0	\$3,633,229
<b>South Mountains Regional Total</b>	<b>411</b>	<b>0/0</b>	<b>\$19,377,220</b>

Source: National Centers for Environmental Information

There have been several severe winter weather events in the South Mountains Region. The text below describes three of the major events and associated impacts on the Region. Similar impacts can be expected with severe winter weather.

#### **1996 Winter Storm**

This storm left two feet of snow and several thousand citizens without power for up to nine days. Although shelters were opened, some roads were impassible for up to four days. This event caused considerable disruption to business, industry, schools, and government services.

#### **2002 Ice Storm – December 4-5, 2002**

An ice storm produced up to an inch of freezing rain in central North Carolina impacting 40 counties. A total of 24 people were killed, and as many as 1.8 million people were left without electricity. Additionally, property damage was estimated at almost \$100 million. New records were also set for traffic accidents and school closing durations. The scale of destruction was comparable to that of hurricanes that have impacted the state, such as Hurricane Fran in 1996. The storm cost the state \$97.2 million in response and recovery.

#### **2018 Winter Storm**

This storm developed shortly after midnight on December 9, 2018 and continued into the afternoon. Snowfall was moderate to heavy and both sleet and rain were incorporated. Driving conditions were heavily disrupted and snowfall amounts reached up to 8 inches.

Winter storms throughout the planning area have several negative externalities including hypothermia for those individuals having to remain outdoors for a certain length of time and likely increased impact for the need of medical services, cost of snow and debris cleanup, business and government service interruption, traffic accidents, and power outages. Furthermore, citizens may resort to using inappropriate heating devices that could lead to fire or an accumulation of toxic fumes.

### **5.7.4 Probability of Future Occurrences**

Winter storm events will remain a regular occurrence in the South Mountains Region due to its location in the western part of the state. According to historical information the South Mountains Region often experiences several winter storm events each year. Therefore, the annual probability is likely (10 to 100 percent).

## 5.8 EARTHQUAKES

### 5.8.1 Background and Description

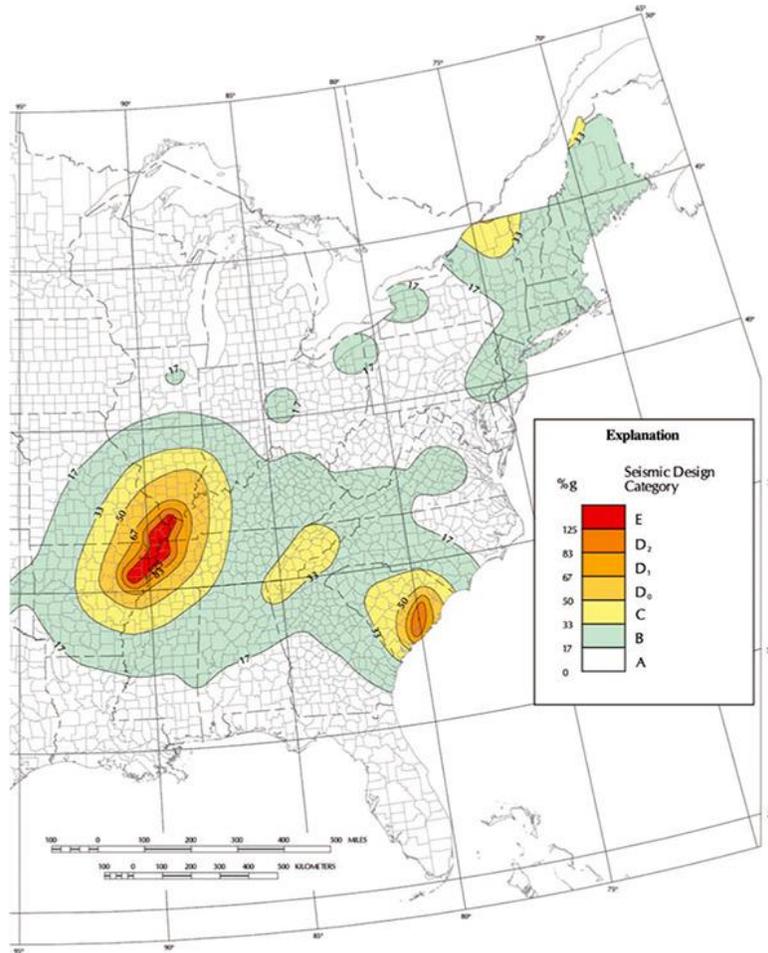
An earthquake is movement or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quick sand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's 10 tectonic plates. The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines located in the central and western states; however, the Eastern United State does face moderate risk to less frequent, less intense earthquake events. **Figure 5.8** shows relative seismic risk for the United States.

FIGURE 5.8: EASTERN UNITED STATES EARTHQUAKE HAZARD MAP



Source: United States Geological Survey

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (**Table 5.19**). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, ranging from “I” corresponding to imperceptible (instrumental) events to “XII” for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in **Table 5.21**.

**TABLE 5.20: RICHTER SCALE**

Richter Magnitudes	Earthquake Effects
< 3.5	Generally not felt, but recorded.
3.5 – 5.3	Often felt, but rarely causes damage.
5.4 – 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: Federal Emergency Management Agency

**TABLE 5.21: MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES**

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Not felt	Not felt except by a very few under especially favorable conditions.	
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.	< 4.2
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.	
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken.	< 4.8

**SECTION 5: HAZARD PROFILES**

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
		Unstable objects overturned. Pendulum clocks may stop.	
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	< 5.4
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	< 6.1
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.	< 6.9
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	< 7.3
I	Not felt	Not felt except by a very few under especially favorable conditions.	< 8.1
II	Weak	Felt only by a few	> 8.1

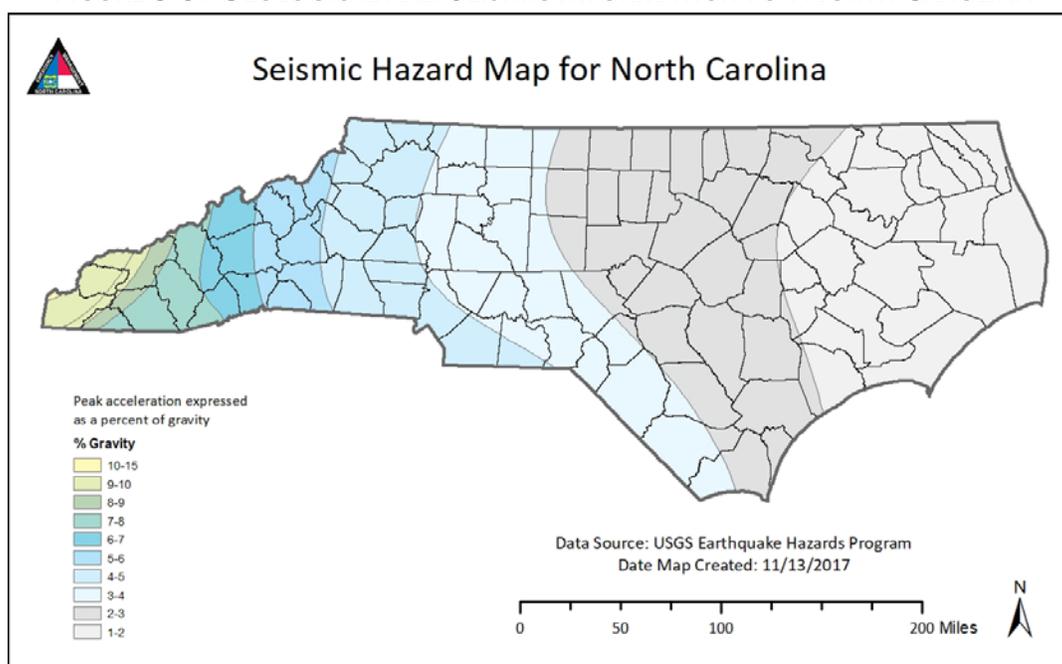
Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
		persons at rest, especially on upper floors of buildings.	

Source: Federal Emergency Management Agency

### 5.8.2 Location and Spatial Extent

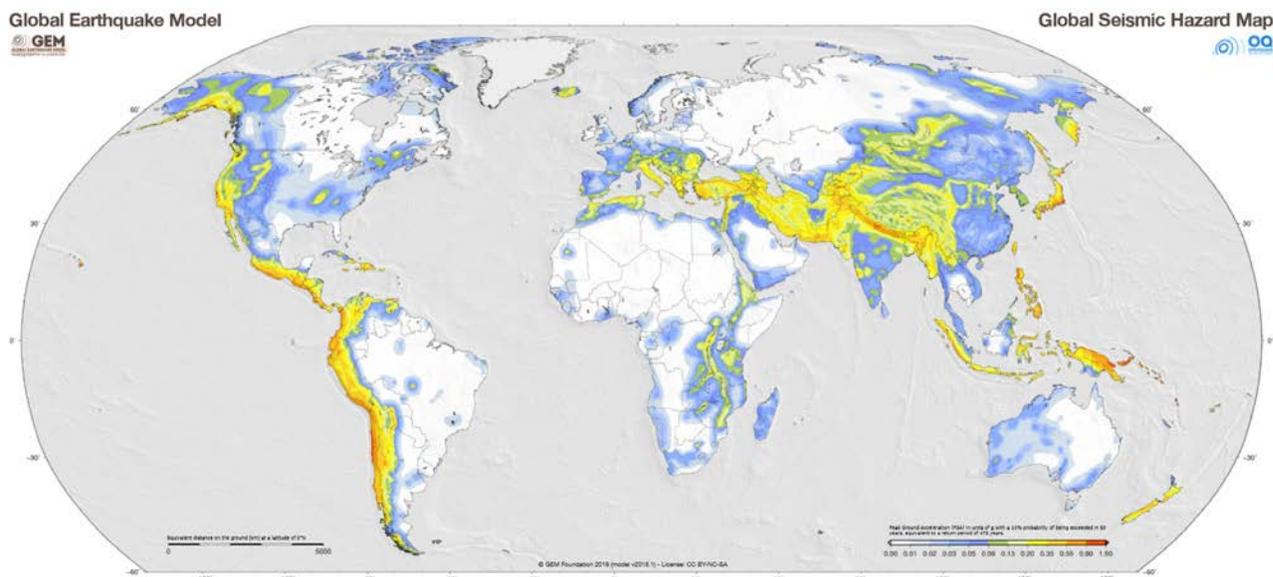
Approximately two-thirds of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes measuring greater than 8 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines throughout North Carolina. **Figure 5.9** is a map showing geological and seismic information for North Carolina.

**FIGURE 5.9: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA**



Source: North Carolina Geological Survey

**Figure 5.10** shows the intensity level associated with the world and the South Mountains Region, based on the national USGS and Global Earthquake Model (GEM). The Global Earthquake Model Global Seismic Hazard Map depicts the geographic distribution of the Peak Ground Acceleration (PGA) with a 10% probability of being exceeded in 50 years. The data represents the probability that the ground motion will reach a certain level during an earthquake. The map was created by collating maps computed using national and regional probabilistic seismic hazard models developed by various institutions and projects, and by GEM Foundation scientists. This indicates that the region as a whole exists within an area of low to moderate seismic risk.

**FIGURE 5.10: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS**

Source: Global Earthquake Model, 2018

### 5.8.3 Historical Occurrences

At least 15 earthquakes are known to have affected the South Mountains Region since 1886. The strongest of these measured a VI on the Modified Mercalli Intensity (MMI) scale. **Table 5.21** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 2018.

**TABLE 5.21: SUMMARY OF SEISMIC ACTIVITY IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
<b>Henderson County</b>	<b>60</b>	<b>VI</b>	<b>&lt; 5.4</b>
Flat Rock	6	VI	< 5.4
Fletcher	5	IV	< 4.8
Hendersonville	10	VI	< 5.4
Laurel Park	0	--	--
Mills River	1	IV	< 4.8
Unincorporated Area	38	VI	< 5.4
<b>Polk County</b>	<b>18</b>	<b>V</b>	<b>&lt; 4.8</b>
Columbus	3	IV	< 4.8
Saluda	5	V	< 4.8
Tryon	4	IV	< 4.8
Unincorporated Area	6	VI	< 4.8
<b>Rutherford County</b>	<b>22</b>	<b>V</b>	<b>&lt; 4.8</b>
Bostic	0	--	--
Chimney Rock Village	3	V	< 4.8

SECTION 5: HAZARD PROFILES

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Ellenboro	1	IV	< 4.8
Forest City	2	IV	< 4.8
Lake Lure	2	IV	< 4.8
Ruth	0	--	--
Rutherfordton	4	V	< 4.8
Spindale	3	IV	< 4.8
Unincorporated Area	7	V	< 4.8
<b>Transylvania County</b>	<b>35</b>	<b>V</b>	<b>&lt; 4.8</b>
Brevard	11	V	< 4.8
Rosman	5	V	< 4.8
Unincorporated Area	19	V	< 4.8
<b>South Mountains Regional Total</b>	<b>135</b>	<b>VI</b>	<b>&lt; 5.4</b>

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting the South Mountains Region, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table 5.22**.

**TABLE 5.22: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA**

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/07/1812	New Madrid, MO	8.7	XII	VI
04/29/1852	Wytheville, VA	5.0	VI	VI
08/31/1861	Wilkesboro, NC	5.1	VII	VII
12/23/1875	Central Virginia	5.0	VII	VI
08/31/1886	Charleston, SC	7.3	X	VII
05/31/1897	Giles County, VA	5.8	VIII	VI
01/01/1913*	Union County, SC	4.8	VII	VI
02/21/1916*	Asheville, NC	5.5	VII	VII
07/08/1926	Mitchell County, NC	5.2	VII	VII
11/03/1928*	Newport, TN	4.5	VI	VI
05/13/1957*	McDowell County, NC	4.1	VI	VI
07/02/1957	Buncombe County, NC	3.7	VI	VI
11/24/1957	Jackson County, NC	4.0	VI	VI
10/27/1959 **	Chesterfield, SC	4.0	VI	VI
07/13/1971	Newry, SC	3.8	VI	VI
11/30/1973*	Alcoa, TN	4.6	VI	VI
11/13/1976	Southwest Virginia	4.1	VI	VI
05/05/1981	Henderson County, NC	3.5	VI	VI

Source: This information compiled by Dr. Kenneth B. Taylor and provided by Tiawana Ramsey of NCEM. Information was compiled from the National Earthquake Center, *Earthquakes of the US* by Carl von Hake (1983), and a compilation of newspaper reports in the Eastern Tennessee Seismic Zone compiled by Arch Johnston, CERI, Memphis State University (1983).

## 5.8.4 Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting the South Mountains Region is unlikely. However, it is possible that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the region. The annual probability level for the region is estimated between 1 and 10 percent (possible). The USGS also uses historical data to predict the probability of a major earthquake within the next 50 years by county. Those results follow: Henderson County – 2.92%; Polk County – 2.38%; Rutherford County – 1.97%; Transylvania County – 3.37%.

## 5.9 GEOLOGICAL

### 5.9.1 Background and Description

For the purposes of maintaining consistency with the State of North Carolina Hazard Mitigation Plan, this section will assess geological hazards which include landslides, sinkholes, and erosion.

#### Landslides

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation, which is driven by gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels.

There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material. Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or “slurry.” Slurry can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

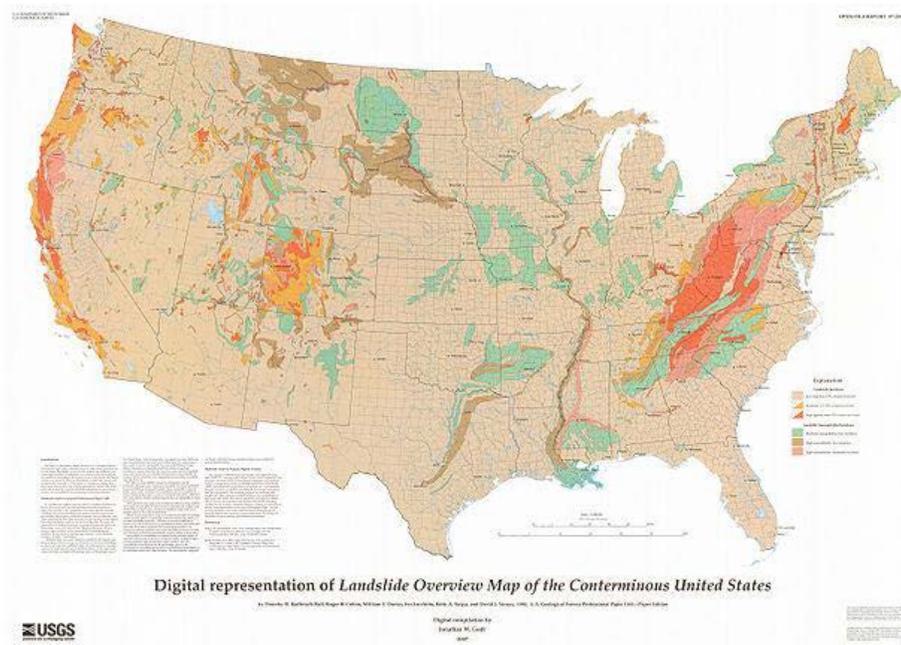
Among the most destructive types of debris flows are those that accompany volcanic eruptions. A spectacular example in the United States was a massive debris flow resulting from the 1980 eruptions of Mount St. Helens, Washington. Areas near the bases of many volcanoes in the Cascade Mountain Range of California, Oregon, and Washington are at risk from the same types of flows during future volcanic eruptions.

**SECTION 5: HAZARD PROFILES**

Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past, relatively flat-lying areas away from sudden changes in slope, and areas at the top or along ridges set back from the tops of slopes.

According to the United States Geological Survey, each year landslides cause \$5.1 billion (2018 dollars) in damage and between 25 and 50 deaths in the United States<sup>15</sup>. **Figure 5.11** delineates areas where large numbers of landslides have occurred and areas that are susceptible to landsliding in the conterminous United States<sup>16</sup>.

**FIGURE 5.11: LANDSLIDE OVERVIEW MAP OF THE CONTERMINOUS UNITED STATES<sup>17</sup>**



Landslide Incidence		Landslide Susceptibility/Incidence	
	Low Incidence (less than 1.5% of area involved)		Moderate susceptibility/low incidence
	Moderate Incidence (1.5%-15% of area involved)		High susceptibility/low incidence
	High Incidence (greater than 15% of area involved)		High susceptibility/moderate incidence

Source: USGS

<sup>15</sup> United States Geological Survey (USGS). United States Department of the Interior. “Landslide Hazards – A National Threat.” 2005.

<sup>16</sup> This map layer is provided in the U.S. Geological Survey Professional Paper 1183, Landslide Overview Map of the Conterminous United States, available online at: [http://landslides.usgs.gov/html\\_files/landslides/nationalmap/national.html](http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html).

<sup>17</sup> Susceptibility not indicated where same or lower than incidence. Susceptibility to landsliding was defined as the probable degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated.

### Sinkholes

According to the United States Geological Survey, a sinkhole is an area of ground that has no natural external surface drainage--when it rains, all of the water stays inside the sinkhole and typically drains into the subsurface. Sinkholes can vary from a few feet to hundreds of acres and from less than 1 to more than 100 feet deep. Some are shaped like shallow bowls or saucers whereas others have vertical walls.

Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater circulating through them. As the rock dissolves, spaces and caverns develop underground. Sinkholes are dramatic because the land usually stays intact for a while until the underground spaces just get too big. If there is not enough support for the land above the spaces then a sudden collapse of the land surface can occur. These collapses can be small, or, as **Figure 5.12** below shows, they can be huge and can occur where a house or road is on top<sup>18</sup>.

**FIGURE 5.12: Sinkhole in North Carolina**



Source: NCEM

### Erosion

Erosion is the gradual breakdown and movement of land due to both physical and chemical processes of water, wind, and general meteorological conditions. Natural, or geologic, erosion has occurred since the Earth's formation and continues at a very slow and uniform rate each year.

There are two types of soil erosion: wind erosion and water erosion. Wind erosion can cause significant soil loss. Winds blowing across sparsely vegetated or disturbed land can pick up soil particles and carry them through the air, thus displacing them. Water erosion can occur over land or in streams and channels. Water erosion that takes place over land may result from raindrops, shallow sheets of water flowing off the land, or shallow surface flow, which becomes concentrated in low spots. Stream channel

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<sup>18</sup> Sinkholes. United States Geological Survey. Retrieved on December 14, 2017 from: <https://water.usgs.gov/edu/sinkholes.html>

erosion may occur as the volume and velocity of water flow increases enough to cause movement of the streambed and bank soils. Major storms, such as hurricanes in coastal areas, may cause significant erosion by combining high winds with heavy surf and storm surge to significantly impact the shoreline.

An area's potential for erosion is determined by four factors: soil characteristics, vegetative cover, topography, climate or rainfall, and topography. Soils composed of a large percentage of silt and fine sand are most susceptible to erosion. As the clay and organic content of these soils increases, the potential for erosion decreases. Well-drained and well-graded gravels and gravel-sand mixtures are the least likely to erode. Coarse gravel soils are highly permeable and have a good capacity for absorption, which can prevent or delay the amount of surface runoff. Vegetative cover can be very helpful in controlling erosion by shielding the soil surface from falling rain, absorbing water from the soil, and slowing the velocity of runoff. Runoff is also affected by the topography of the area including size, shape, and slope. The greater the slope length and gradient, the more potential an area has for erosion. Climate can affect the amount of runoff, especially the frequency, intensity, and duration of rainfall and storms. When rainstorms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature and rainfall amounts define the period of highest erosion risk of the year.

During the past 20 years, the importance of erosion control has gained the increased attention of the public. Implementation of erosion control measures consistent with sound agricultural and construction operations is needed to minimize the adverse effects associated with harmful chemicals run-off due to wind or water events. The increase in government regulatory programs and public concern has resulted in a wide range of erosion control products, techniques, and analytical methodologies in the United States. The preferred method of erosion control in recent years has been the restoration of vegetation.

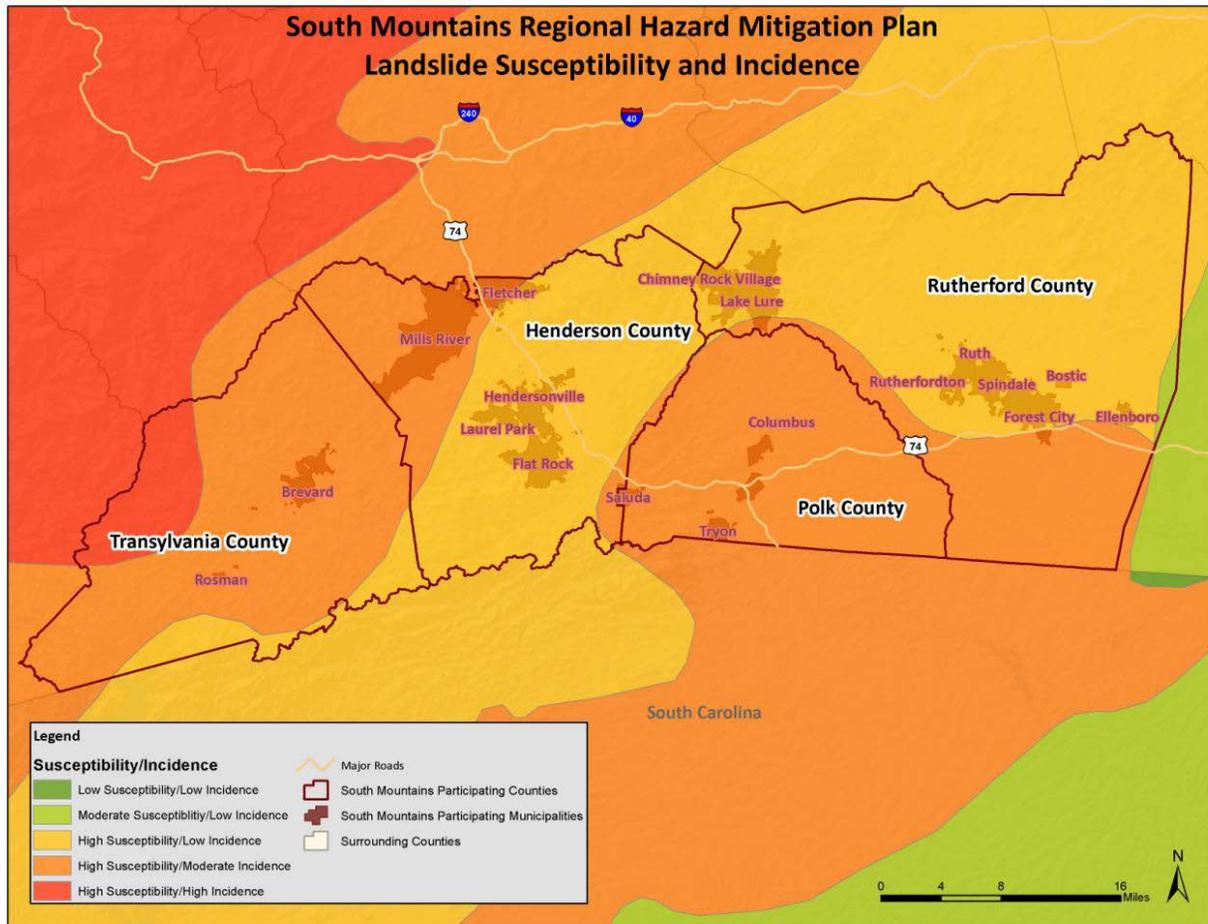
## 5.9.2 Location and Spatial Extent

### Landslides

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the region). Human development can also exacerbate risk by building on previously undevelopable steep slopes and constructing roads by cutting through mountains. Landslides are possible throughout the South Mountains Region.

According to **Figure 5.13** below, some of the region has high landslide activity, especially in Polk and Transylvania Counties. The majority of the region has a moderate incidence occurrence rate. There is high susceptibility throughout the region.

**FIGURE 5.13: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF THE SOUTH MOUNTAINS REGION**

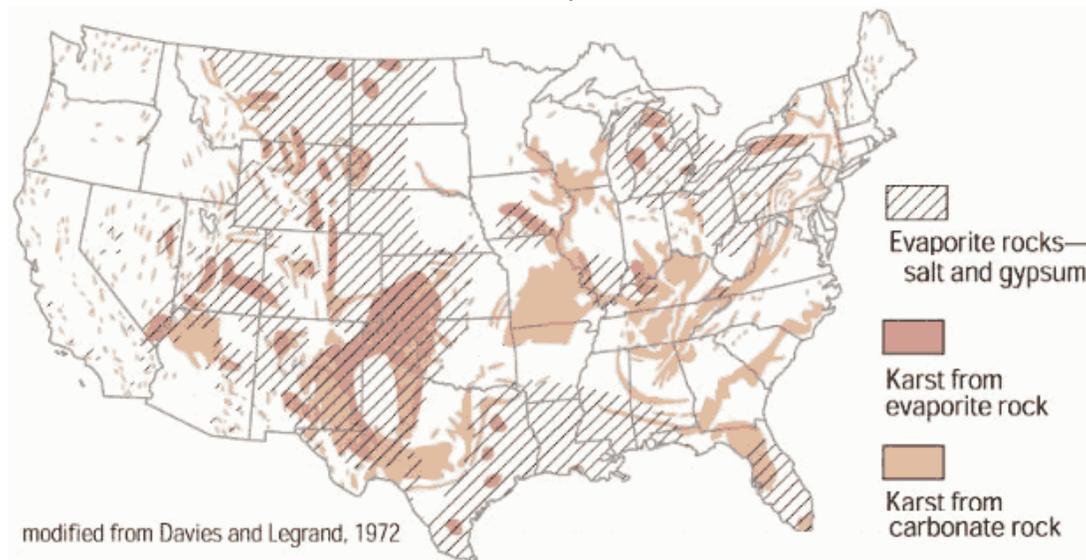


Source: USGS

### Sinkholes

Figure 5.14 below shows areas of the United States where certain rock types that are susceptible to dissolution in water occur. In these areas, the formation of underground cavities can form and catastrophic sinkholes can happen. These rock types are evaporites (salt, gypsum, and anhydrite) and carbonates (limestone and dolomite). Evaporite rocks underlie about 35 to 40 percent of the United States, though in many areas they are buried at great depths. In some cases, sinkholes in North Carolina have been measured at up to 20 to 25 feet in depth, with similar widths.

**FIGURE 5.14: UNITED STATES GEOLOGICAL SURVEY OF KARST MODIFIED FROM DAVIES AND LEGRAND, 1972**



### Erosion

Erosion in the South Mountains Region is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine-grained particles such as sand, South Mountains soils have much greater organic matter content. Furthermore, vegetation also helps to prevent erosion in the area. Erosion occurs in the South Mountains Region, particularly along the banks of rivers and streams, but it is not an extreme threat to any of the participating counties and jurisdictions. No areas of concern were reported by the mitigation council.

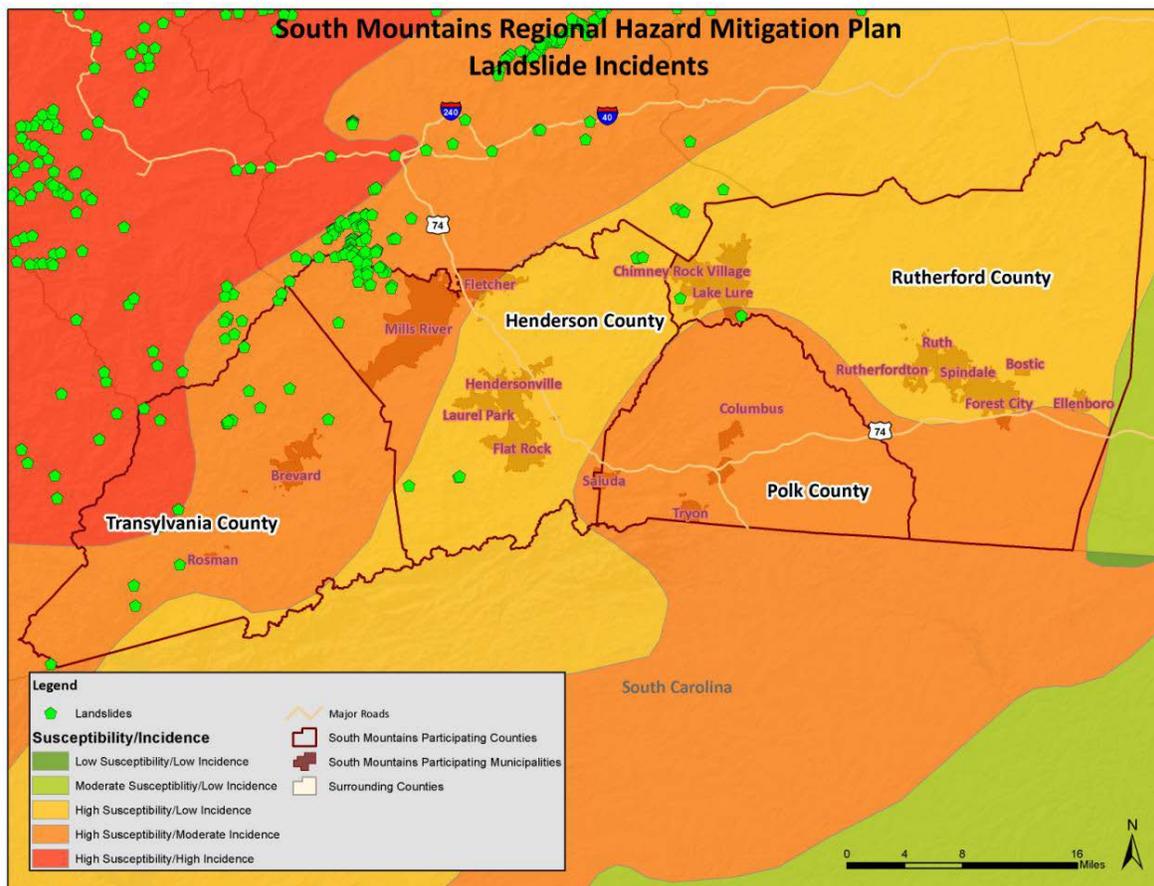
## 5.9.3 Historical Occurrences

### Landslides

Steep topography in some areas of the South Mountains Region makes the planning area susceptible to landslides. Most landslides are caused by heavy rainfall in the area. Building on steep slopes that was not previously possible also contributes to risk. The locations of landslide events in and around the South Mountains region as provided by the North Carolina Geological Survey are presented in **Figure 5.15**. There were no reported incidents in the region<sup>19</sup>. Thorough incidence mapping is in the process of being completed throughout the western portion of North Carolina, though it is not complete. Therefore, it should be noted that many more incidents than what is reported are likely to have occurred in the South Mountains region. Furthermore, in the next update, a more accurate analysis should be performed.

<sup>19</sup> It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

**FIGURE 5.15: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN THE SOUTH MOUNTAINS REGION**



Source: North Carolina Geological Survey

The National Centers for Environmental Information also reported four landslide events in the South Mountains Region. Information from each county is presented below.

#### Henderson and Transylvania County — September 8, 2004

The remnants of Hurricane Frances brought very heavy rainfall to western North Carolina, resulting in widespread severe flooding across the mountains and foothills (Haywood, Transylvania, and Henderson Counties). Flooding developed along Shaws Creek in Henderson County. Flooding was widespread and severe across much of the area, with most creeks and streams in flood. Hundreds of homes and businesses were damaged or destroyed across the area, necessitating a number of evacuations and rescues. Numerous roads and bridges were washed out as well. Resulting landslides caused \$1,626,841 (2018 dollars) of property damage in Henderson County and \$406,710 (2018 dollars) of property damage in Transylvania County.

#### Transylvania County — July 14, 2005

A mudslide off of highway 64 between Rosman and Lake Toxaway moved a mobile home from its foundation, rendering it uninhabitable. There was a total of \$65,563 (2018 dollars) of property damage.

## SECTION 5: HAZARD PROFILES

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### Henderson County — December 1, 2010

After 6 to 10 inches of rain fell in around 24 hours, a landslide developed near the Holiday Drive area, pushing a small house off its foundation. There was a total of \$81,955 (2018 dollars) of property damage.

### Polk County – May 18, 2018

EM reported numerous small to large slope failures developed along the Highway 176 corridor in Polk County after as much as 8 inches of rain fell across the western part of the county in just a few hours. Around 30 homes were damaged, with a couple destroyed. One 59-year-old woman died when her garage collapsed as she was trying to flee her home. Her husband was swept into Highway 176 but survived with mostly minor injuries.

The information below identifies additional historical information reported in the previous hazard mitigation plans.

### Henderson County

In the past in the unincorporated areas of the county, there have been major injuries resulting from landslides but no deaths. Additionally, there has been damage to property and infrastructure and a loss of utilities. However, this damage has been limited to a small portion of the county known as Bat Cave. The Town of Laurel Park also has areas identified as having landslide events and areas prone to landslides; however, there has been no major damage to property, no loss of life, and no major injuries. There has been no landslide damage in any of the other incorporated areas of Henderson County.

During September 2004 when Hurricane Frances and Tropical Storm Ivan moved through Henderson County, landslides caused significant infrastructure damage and the rerouting of neighborhood access. The most significant of the sections identified is the area near US Highway 74 and NC Highway 9 (Bat Cave). Bear Rock Estates was also heavily damaged by a 1,200-foot landslide that resulted from Hurricane Frances. \$2.3 million in federal and state money was used to repair approximately 130 sites across the county, including the Bear Rock slide.

In 1995, excessive rains from a severe thunderstorm/windstorm caused a mudslide which led to the destruction of a home that was not built to county code according to emergency officials. Two people received minor injuries during this incident. Additionally, there was mud and debris that covered parts of US Highway 74 and NC Highway 9 as well as the bridge that led to Chimney Rock. According to the utility company, debris from the slide and storm downed power lines and led to power outages. The storm and slide caused a total of approximately \$2 million in property and infrastructure damage in the area.

### Polk County

In 2002 and 2003, heavy rains combined with development on and along steep slopes caused landslides on Hogback Mountain, White Oak Mountain, Holbert's Cove, Green River Cove, and Highway 176. These landslides closed down portions of state roads and cost approximately \$210,000 to repair.

### Rutherford County

In Rutherford County there have been very few incidents of landslides. Most have occurred along road cuts and have been caused during periods of severe storms.

### Transylvania County

In the past in the unincorporated areas of the county, there has been one residential structure destroyed and no damage to commercial or industrial property because of landslides. In addition, there have been no reported deaths or injuries. However, the county has received significant damage to its infrastructure because of landslides, specifically in the 2004 hurricane season. There has been no landslide damage in any of the incorporated areas of Transylvania County.

The most significant issues the county faces with landslides are road closures, as was seen during Hurricane Frances and Tropical Storm Ivan. These storms spawned numerous slides in the unincorporated areas of Transylvania County; however, two slides were considered significant events. First, a slide covered portions of Sky Drive causing the road to give-way, resulting in \$400,000 in damage. The second major event was on Cardinal Drive West where a slide caused \$300,000 in damages to infrastructure. The slide not only resulted in road damages, but the debris from the slide flowed into Cardinal Lake causing debris blockage issues. The NCDOT has repaired and stabilized both roads that were damaged.

### 2018 Landslide Mapping

In May 2018, three North Carolinians died from landslide incidents. One of the deaths occurred in Polk County. These deaths led State lawmakers to include a budget of \$3.6 million for the Department of Environmental Quality to reboot a landslide mapping program. This project was initially begun in 2004, but legislators stopped funding for it in 2011. The revitalization project has commissioned a NC Geological Survey team to create landslide hazard maps in 19 counties in western North Carolina with a goal to gauge the landslide potential to prevent injuries or deaths.

### **Sinkholes**

In North Carolina, most sinkholes occur in the southern coastal plain due to the high concentration of limestone; however, they are also common in the western part of the state and in the South Mountains region. According to a search of local media outlets across the state, the western area has experienced more than 40 sinkholes over the past 20 years. There are no historical occurrences of sinkholes in the region.

### **Erosion**

Most historical occurrences of erosion are seen near the coast of North Carolina, but the South Mountains region is still susceptible to the hazard. Several sources were vetted to identify areas of erosion in the South Mountains Region. This includes searching local newspapers, interviewing local officials, and reviewing previous hazard mitigation plans. Little information could be found beyond the hazard mitigation plans. Erosion was referenced in the previous South Mountains Regional Hazard Mitigation Plan, but it was found to be a relatively low-risk hazard. The information below identifies historical information presented in the plans.

### Henderson County

There is no recorded history of injuries, deaths, or critical facilities loss due to erosion.

### Polk County

Most recent erosion concerns in Polk County have stemmed from clear-cutting on steep slopes. Heavy erosion from stormwater can lead to large amounts of sedimentation being carried down slopes, causing flooding, property damage, road blockage, or mudslides.

Rutherford County

Erosion was deemed an insignificant hazard.

Transylvania County

There is no recorded history of losses from past erosion.

## 5.9.4 Probability of Future Occurrences

### Landslides

Based on historical information and the USGS susceptibility index, the probability of future landslide events is likely (10 to 100 percent probability). Local conditions may become more favorable for landslides due to heavy rain, for example. This would increase the likelihood of occurrence. It should also be noted that some areas in the South Mountains Region have greater risk than others given factors such as steepness on slope and modification of slopes.

### Sinkholes

Sinkholes have also affected parts of North Carolina in recent history, but most of those impacts have been in the southeastern region of the state, not the South Mountains region. While many sinkholes have been relatively small, it is still possible (between 1 and 10 percent annual probability) that this region will continue to be affected in the future.

### Erosion

Erosion remains a natural, dynamic, and continuous process for the South Mountains Region, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent). However, given the lack of historical events, location, data, and threat to life or property, no further analysis will be done in Section 6: *Vulnerability Assessment*.

## 5.10 DAM FAILURE

### 5.10.1 Background and Description

Worldwide interest in dam and levee safety has risen significantly in recent years. Aging infrastructure, new hydrologic information, and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation, and maintenance.

There are approximately 80,000 dams in the United States today, the majority of which are privately owned. Other owners include state and local authorities, public utilities, and federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power, create lakes for fishing and recreation, and save lives by preventing or reducing floods.

Though dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if development exists downstream. If a levee breaks, scores of properties may become submerged in floodwaters and residents may become trapped by rapidly rising water. The failure of dams and levees has the potential

to place large numbers of people and great amounts of property in harm's way.

### 5.10.2 Location and Spatial Extent

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table 5.23** explains these classifications.

**TABLE 5.23: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS**

Hazard Classification	Description	Quantitative Guidelines
<b>Low</b>	Interruption of road service, low volume roads Less than 25 vehicles per day	Less than 25 vehicles per day
	Economic Damage	Less than \$30,000
<b>Intermediate</b>	Damage to highways, Interruption of service	25 to less than 250 vehicles per day
	Economic Damage	\$30,000 to less than \$200,000
<b>High</b>	Loss of human life*	Probable loss of 1 or more human lives
	Economic Damage	More than \$200,000
	*Probable loss of human life due to breached roadway or bridge on or below the dam	250 or more vehicles per day

Source: North Carolina Division of Energy, Mineral, and Land Resources

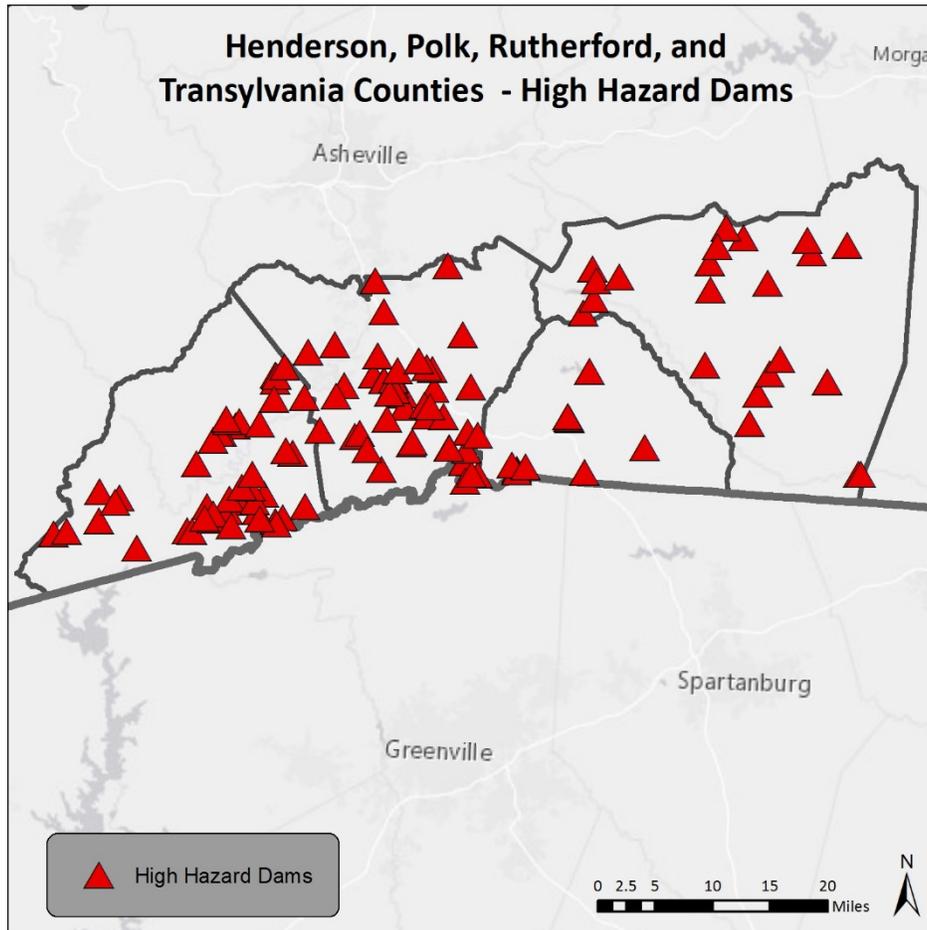
According to the North Carolina Division of Energy, Mineral, and Land Resources, there are 327 dams in the South Mountains Region<sup>20</sup>. **Figure 5.16** shows the dam location and the corresponding hazard ranking for each. Of these dams, 124 are classified as high hazard potential. These high hazard dams are summarized by county in **Table 5.24**.

**TABLE 5.24: SUMMARY OF HIGH HAZARD DAM LOCATION**

Location	Number High Hazard Dams
Henderson County	45
Polk County	10
Rutherford County	22
Transylvania County	47
<b>South Mountains Regional Total</b>	<b>124</b>

Source: North Carolina Division of Energy, Mineral, and Land Resources

<sup>20</sup> The October 23, 2018 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (<http://portal.ncdenr.org/web/lr/dams>) was reviewed and amended by local officials to the best of their knowledge.

**FIGURE 5.16: SOUTH MOUNTAINS REGION HIGH HAZARD DAM LOCATIONS**

Source: North Carolina Division of Land Resources, 2018

It should also be noted that dam regulations for classifying dams was changed in recent history. As a result, generally more dams are classified as high hazard.

### 5.10.3 Historical Occurrences

There is no record of significant dam failure in the South Mountains Region, though little information was available. In addition, it should be noted that several breach scenarios in the area could be catastrophic.

### 5.10.4 Probability of Future Occurrence

Given the current dam inventory and historic data, a dam breach is unlikely (less than 1 percent annual probability) in the future. However, as has been demonstrated in the past, regular monitoring is necessary to prevent these events. No further analysis will be completed in Section 6: *Vulnerability Assessment* as more sophisticated dam breach plans (typically completed by the U.S. Army Corp of Engineers) have been completed for dams of concern in the region.

## 5.11 FLOODING

### 5.11.1 Background and Description

Flooding is the most frequent and costly natural hazard in the United States and is a hazard that has caused more than 10,000 deaths since 1900. Nearly 90 percent of presidential disaster declarations result from natural events where flooding was a major component.

Floods generally result from excessive precipitation and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time along with storm-induced wave action, and flash floods, the product of heavy localized precipitation in a short time period over a given location. 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 surface.

General floods are usually long-term events that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, and other large coastal storms. Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. However, flash flooding events may also occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall or from a sudden release of water held by a retention basin or other stormwater control facility. Although flash flooding occurs most often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as a floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. Flood frequencies, such as the 100-year flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1 percent chance of occurring in any given year and the 500-year flood has a 0.2 percent chance of occurring in any given year.

### 5.11.2 Location and Spatial Extent

There are areas in the South Mountains Region that are susceptible to flood events. Special flood hazard areas in the South Mountains Region were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM). This includes Zone A (1-percent annual chance floodplain), Zone AE (1-percent annual chance floodplain with elevation), Zone X500 (0.2-percent annual chance floodplain). According to GIS analysis, of the 1,554 square miles that make up the South Mountains Region, there are approximately 90 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain) and 4.64 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). The county totals are presented below in **Table 5.25**.

**TABLE 5.25: SUMMARY OF FLOODPLAIN AREAS IN THE SOUTH MOUNTAINS REGION**

Location	100-year area (square miles)	500-year area (square miles)
Henderson County	31.46	2.15
Polk County	12.68	0.75
Rutherford County	28.84	0.25
Transylvania County	16.59	1.49
<b>South Mountains Regional Total</b>	<b>89.57</b>	<b>4.64</b>

These flood zone values account for 6.1 percent of the total land area in the South Mountains Region. It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas. **Figure 5.17** illustrates the location and extent of currently mapped special flood hazard areas for the South Mountains Region based on best available FEMA DFIRM data from October of 2018.

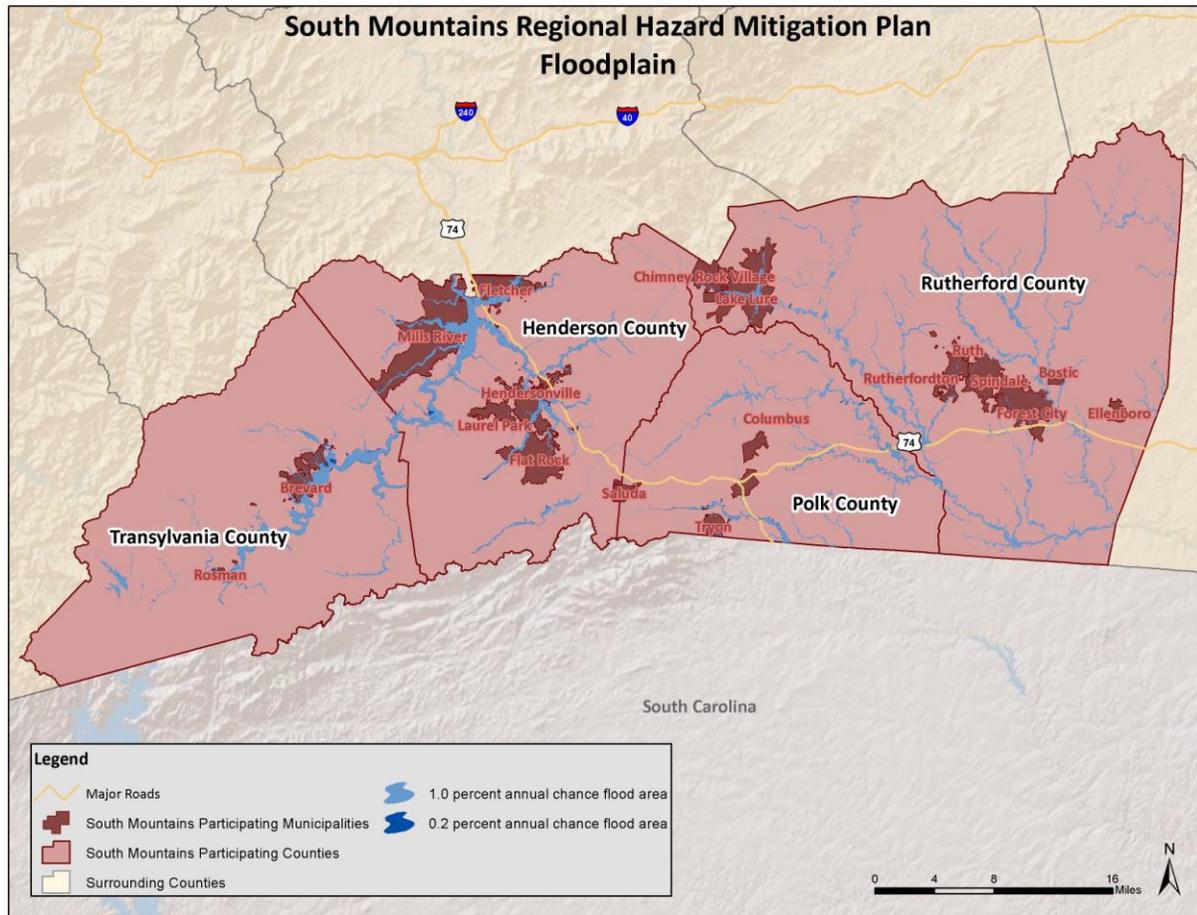
### 5.11.3 Historical Occurrences

Information from the National Centers for Environmental Information was used to ascertain historical flood events. The National Centers for Environmental Information reported a total of 206 events throughout the South Mountains Region since 1993<sup>21</sup>. A summary of these events is presented in **Table 5.26**. These events accounted for over \$45 million (2018 dollars) in property damage throughout the region<sup>22</sup>.

<sup>21</sup> These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

<sup>22</sup> The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

**FIGURE 5.17: SPECIAL FLOOD HAZARD AREAS IN THE SOUTH MOUNTAINS REGION**



Source: Federal Emergency Management Agency DFIRM

**TABLE 5.26: SUMMARY OF FLOOD OCCURRENCES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>85</b>	<b>0/1</b>	<b>\$15,851,885</b>
Flat Rock	1	0/0	\$2,089
Fletcher	6	0/0	\$0
Hendersonville	5	0/0	\$171,544
Laurel Park	1	0/0	\$5,325
Mills River	7	0/0	\$11,840
Unincorporated Area	39	0/1	\$15,661,087
<b>Polk County</b>	<b>21</b>	<b>0/2</b>	<b>\$539,217</b>
Columbus	3	0/0	\$431,164
Saluda	4	0/0	\$27,000
Tryon	1	0/0	\$0
Unincorporated Area	13	0/0	\$81,050

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
<b>Rutherford County</b>	<b>26</b>	<b>0/2</b>	<b>\$8,868,507</b>
Bostic	0	0/0	\$0
Chimney Rock Village	5	0/0	\$43,000
Ellenboro	0	0/0	\$0
Forest City	5	0/2	\$141,868
Lake Lure	3	0/0	\$8,500,363
Ruth	0	0/0	\$0
Rutherfordton	3	0/0	\$2,092
Spindale	0	0/0	\$0
Unincorporated Area	10	0/0	\$181,184
<b>Transylvania County</b>	<b>74</b>	<b>0/10</b>	<b>\$14,381,735</b>
Brevard	3	0/0	\$27,482
Rosman	10	0/10	\$2,369,800
Unincorporated Area	61	0/0	\$11,984,453
<b>South Mountains Regional Total</b>	<b>206</b>	<b>0/15</b>	<b>\$39,641,344</b>

Source: National Centers for Environmental Information

### 5.11.4 Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of September 2018, there have been 345 flood losses reported in the South Mountains Region through the National Flood Insurance Program (NFIP) since 1978, totaling approximately \$4 million in claims payments (2018 dollars). A summary of these figures for each South Mountains county is provided in **Table 5.27**. It should be emphasized that these numbers include only those losses to structures that were insured through the NFIP policies, and for losses in which claims were sought and received. It is likely that many additional instances of flood loss in the South Mountains Region were either uninsured, denied claims payment, or not reported.

**TABLE 5.27: SUMMARY OF INSURED FLOOD LOSSES IN THE SOUTH MOUNTAINS REGION**

Location	Flood Losses	Claims Payments
<b>Henderson County</b>	<b>176</b>	<b>\$1,629,913</b>
Flat Rock	0	\$0
Fletcher	0	\$0
Hendersonville	148	\$1,629,913
Laurel Park	2	\$4,682
Mills River*	--	--
Unincorporated Area	26	\$406,846
<b>Polk County</b>	<b>31</b>	<b>\$458,147</b>
Columbus	0	\$0
Saluda	0	\$0
Tryon	3	\$68,792
Unincorporated Area	28	\$389,355
<b>Rutherford County</b>	<b>55</b>	<b>\$1,035,433</b>

Location	Flood Losses	Claims Payments
Bostic	0	\$0
Chimney Rock Village	1	\$15,740
Ellenboro*	--	--
Forest City	0	\$0
Lake Lure	2	\$5,600
Ruth	0	\$0
Rutherfordton	2	\$780
Spindale	0	\$0
Unincorporated Area	50	\$1,013,313
<b>Transylvania County</b>	<b>83</b>	<b>\$551,197</b>
Brevard	15	\$151,991
Rosman	29	\$93,223
Unincorporated Area	39	\$305,983
<b>South Mountains Regional Total</b>	<b>345</b>	<b>\$3,647,690</b>

\*This community does not participate in the National Flood Insurance Program. Therefore, no values are reported.  
Source: FEMA NFIP

### 5.11.5 Repetitive Loss Properties

FEMA defines a repetitive loss property as any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP. Currently there are over 140,000 repetitive loss properties nationwide.

Currently (as of 2018), there are 30 non-mitigated repetitive loss properties located in the South Mountains Region, which accounted for 101 losses and more than \$1.8 million in claims payments under the NFIP. The average claim amount for these properties is \$18,251. Many of the 30 properties are single family residential and the remaining are other residential, commercial, or government-owned buildings. Without mitigation, these properties will likely continue to experience flood losses. **Table 5.28** presents a summary of these figures for the South Mountains Region.

**TABLE 5.28: SUMMARY OF REPETITIVE LOSS PROPERTIES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Properties	Number of Losses	Total Payments
<b>Henderson County</b>	<b>18</b>	<b>70</b>	<b>\$1,375,147</b>
Flat Rock	0	0	\$0
Fletcher	0	0	\$0
Hendersonville	18	70	\$1,375,147
Laurel Park	0	0	\$0
Mills River*	--	--	--
Unincorporated Area	0	0	\$0
<b>Polk County</b>	<b>1</b>	<b>3</b>	<b>\$15,819</b>
Columbus	0	0	\$0
Saluda	0	0	\$0

Location	Number of Properties	Number of Losses	Total Payments
Tryon	0	0	\$0
Unincorporated Area	0	0	\$0
<b>Rutherford County</b>	<b>6</b>	<b>15</b>	<b>\$300,007</b>
Bostic	0	0	\$0
Chimney Rock Village	0	0	\$0
Ellenboro*	--	--	--
Forest City	0	0	\$0
Lake Lure	0	0	\$0
Ruth	0	0	\$0
Rutherfordton	0	0	\$0
Spindale	0	0	\$0
Unincorporated Area	6	15	\$300,007
<b>Transylvania County</b>	<b>5</b>	<b>13</b>	<b>\$152,452</b>
Brevard	0	0	\$0
Rosman	3	8	\$80,805
Unincorporated Area	2	5	\$71,647
<b>South Mountains</b>	<b>30</b>	<b>101</b>	<b>\$1,843,425</b>
<b>Regional Total</b>	<b>30</b>	<b>101</b>	<b>\$1,843,425</b>

\*This community does not participate in the National Flood Insurance Program. Therefore, no values are reported.

Source: FEMA NFIP

### 5.11.6 Probability of Future Occurrences

Flood events will remain a threat in the South Mountains Region, and the probability of future occurrences will remain likely (between 10 and 100 percent annual probability). The probability of future flood events based on magnitude and according to best available data is illustrated in the figures above, which indicates those areas susceptible to the 1-percent annual chance flood (100-year floodplain) and the 0.2-percent annual chance flood (500-year floodplain).

It can be inferred from the floodplain location maps, previous occurrences, and repetitive loss properties that risk varies throughout the South Mountains Region. For example, Henderson and Rutherford Counties have more floodplains and higher histories of flood occurrences, and thus higher risks of flood than other counties. Flooding is not the greatest hazard of concern, but will continue to occur and cause damage. Therefore, mitigation actions may be warranted, particularly for repetitive loss properties.

# Other Hazards

## 5.12 WILDFIRES

### 5.12.1 Background and Description

A wildfire is any outdoor fire (i.e. grassland, forest, brush land) that is not under control, supervised, or prescribed<sup>23</sup>. Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors.

Nationally, over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning. In North Carolina, a majority of fires are caused by debris burning.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildfires are usually signaled by dense smoke that fills the area for miles around.

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards (such as tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high wildfire hazard areas. Furthermore, the increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through the brush and timber and destroy property within minutes.

Wildfires can result in severe economic losses as well. Businesses that depend on timber, such as paper mills and lumber companies, experience losses that are often passed along to consumers through higher prices and sometimes jobs are lost. The high cost of responding to and recovering from wildfires can deplete state resources and increase insurance rates. The economic impact of wildfires can also be felt in the tourism industry if roads and tourist attractions are closed due to health and safety concerns.

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks, and fuel management can be designed as part of an overall fire defense system to aid in fire control. Fuel management, prescribed burning, and cooperative land management planning can also be encouraged to reduce fire hazards.

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<sup>23</sup> Prescription burning, or “controlled burn,” undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

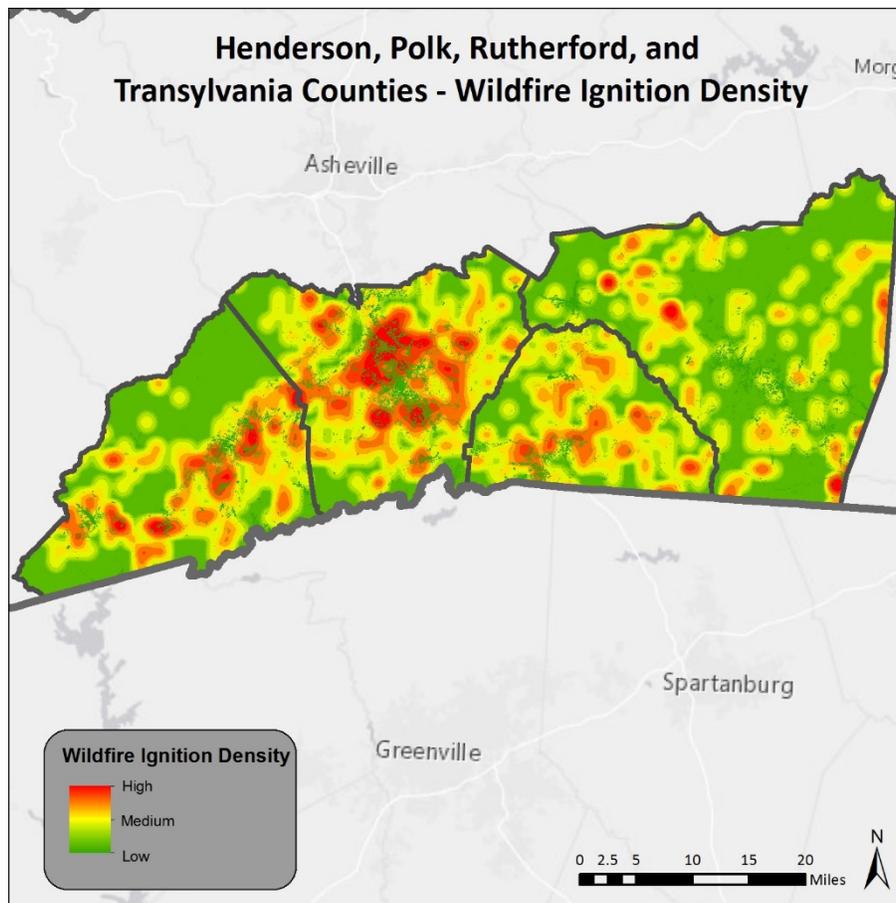
### 5.12.2 Location and Spatial Extent

The entire region is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, may make a wildfire more likely. Furthermore, areas in the urban-wildland interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas.

### 5.12.3 Historical Occurrences

**Figure 5.18** shows the Wildfire Ignition Density in the South Mountains Region based on data from the Southern Wildfire Risk Assessment. This data represents the likelihood of wildfire igniting in the area, which is derived from historical wildfire occurrences to create an average ignition rate map.

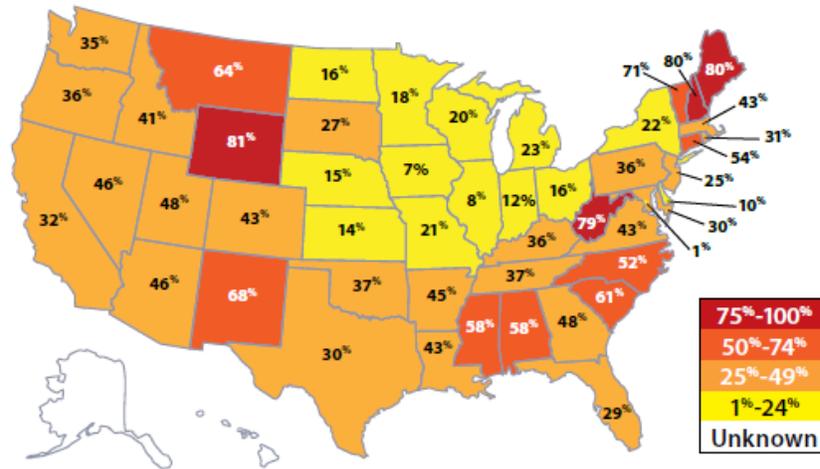
**FIGURE 5.18: WILDFIRE IGNITION DENSITY IN THE SOUTH MOUNTAINS REGION**



Source: Southern Wildfire Risk Assessment

Every state also has a Wildland Urban Interface (WUI), which is the rating of potential impact of wildfires on people and their homes. The WUI is not a fixed geographical location, but rather a combination of human development and vegetation where wildfires have the greatest potential to result in negative impacts. Nationally, one-third of all homes lie in the WUI, which is a growing danger. Below, **Figure 5.19** shows a map of each state’s WUI. Based on the data from the US Department of Agriculture, 52% of homes in North Carolina lie within the WUI.

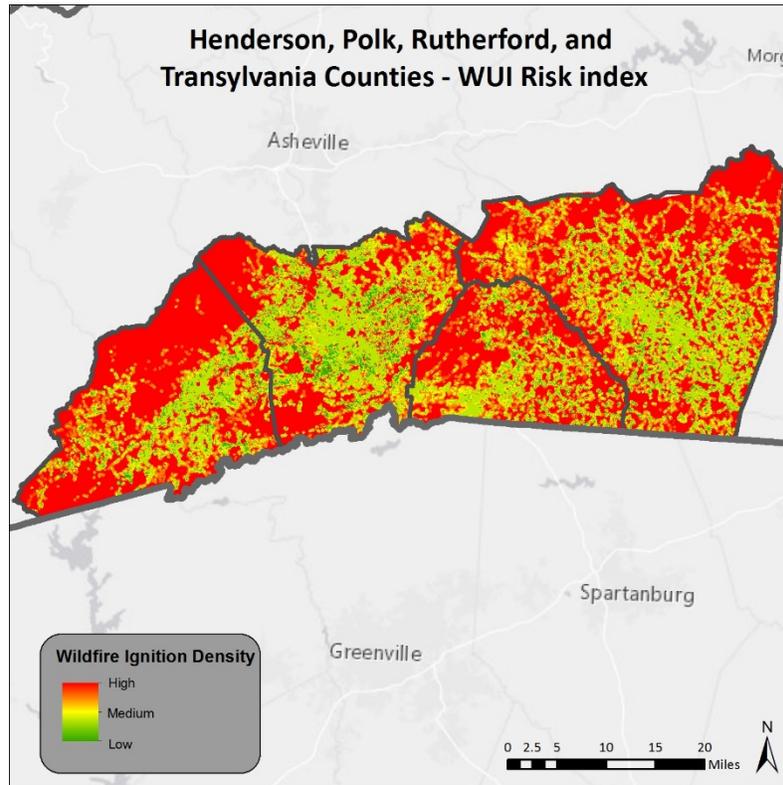
**FIGURE 5.19: PERCENT OF TOTAL HOMES IN THE WILDLAND URBAN INTERFACE**



Source: US Department of Agriculture

Below, **Figure 5.20** displays the WUI Risk Index specifically for the South Mountains Region.

**FIGURE 5.20: WILDLAND URBAN INTERFACE RISK INDEX**



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2003 to 2018, the south Mountain Region experiences an average of 140 wildfires annually which burn a combined 686 acres, on average. The data indicates that most of these fires are small, averaging about four acre per fire. Although it is certain that more wildfires have occurred in the region, NCEI reports that only three have taken place in recent history. No deaths, injuries, nor property damage were reported. Those occurrences are documented in **Table 5.29** below, followed by a narrative of the most recent occurrence.

**TABLE 5.29: SUMMARY OF WILDFIRE OCCURRENCES (1990-2019)**

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018 Dollars)
Henderson County	0	0/0	\$0
Polk County	1	0/0	\$0
Rutherford County	2	0/0	\$0
Transylvania County	0	0/0	\$0

Source: National Centers for Environmental Information

### **Party Rock Fire – 11/05/16-11/30/16**

An extended period of abnormally dry weather and drought conditions that began in late winter of 2016, and continued through the year resulted in very dry vegetation across western North Carolina by mid-autumn. This was exacerbated by an unusually warm late summer and fall, when temperatures averaged as much as 5 degrees above normal. In these conditions, multiple wildfires ignited and spread during the first week of November, culminating in one of the worst wildfire episodes in recent western North Carolina history. Multiple large fires burned, mainly across the southern mountains, and most of these fires were not completely contained until a cold front brought much-needed rain to the area at the end of the month. The Party Rock fire burned more than 7,000 acres in the Lake Lure/Chimney Rock/Bat Cave area. Chimney Rock State Park was closed throughout much of the month, while Chimney Rock Village was evacuated multiple times during adverse fire weather conditions.

### **5.12.4 Probability of Future Occurrences**

Wildfire events will be an ongoing occurrence in the South Mountains Region. The likelihood of wildfires increases during drought cycles and abnormally dry conditions. Fires are likely to stay small in size but could increase due local climate and ground conditions. Dry, windy conditions with an accumulation of forest floor fuel (potentially due to ice storms or lack of fire) could create conditions for a large fire that spreads quickly. It should also be noted that some areas do vary somewhat in risk. For example, highly developed areas are less susceptible unless they are located near the urban-wildland boundary. The risk will also vary due to assets. Areas in the urban-wildland interface will have much more property at risk, resulting in increased vulnerability and need to mitigate compared to rural, mainly forested areas. The probability assigned to the South Mountains Region for future wildfire events is likely (10 to 100 percent annual probability).

## **5.13 INFECTIOUS DISEASE**

### **5.13.1 Background and Description**

For the purposes of this plan, this section will assess infectious diseases and vector-borne diseases within the South Mountains Region.

#### **Infectious Disease**

Communicable, or infectious, diseases are conditions that result in clinically evident illness which are transmissible directly from one person to another or indirectly through vectors such as insects, air, water, blood, or other objects. The impact of communicable disease can range from the mild effects of the common cold to the extreme lethality of pneumonic plague or anthrax. The public health system in the United States was developed in large part as a response to the often urgent need to respond to or prevent outbreaks of communicable diseases. Through public health methods of disease reporting, vaccinations, vector control, and effective treatments, most communicable diseases are well controlled in the United States and across the South Mountains Region. However, control systems can fail and when people come together from locations outside of the state, outbreaks can occur, even in the most modern of communities. In this section, some of the more significant potential communicable disease concerns are described.

The threats discussed in this section usually do not occur on a regular basis, though some are more frequent. The diseases described herein do not originate from intentional exposure (such as through terrorist actions) but do present significant issues and concerns for the public health community. There are numerous infectious diseases that rarely, if ever, occur in the State of North Carolina, such as botulism or bubonic plague. Some highly dangerous diseases which could potentially be used as biological weapons, such as anthrax, pneumonic plague, and smallpox, are safely housed and controlled in laboratory settings such as at the Center for Disease Control and Prevention (CDC). Other diseases have not (yet) mutated into a form that can infect humans, or otherwise lie dormant in nature.

There have been several significant viral outbreaks from emerging diseases in recent years of both national and international importance. The Zika virus and West Nile virus are viruses that are typically passed to humans or animals by mosquitoes and made major news as emergent disease threats. Meanwhile, diseases that are spread directly between human beings such as Severe Acute Respiratory Syndrome (SARS) and Ebola have also been identified as serious threats. While each of these conditions caused a great deal of public health concern when they were first identified, SARS has virtually disappeared, West Nile virus occurs with low frequency and causes serious disease in only a very small percentage of cases, Ebola has been more or less contained and a vaccine is in development, and many people infected with Zika will not experience symptoms from the disease.

Other communicable diseases pose a much more frequent threat to the citizens of in the region. Some of the infectious diseases of greatest concern include influenza, particularly in a pandemic form, as well as norovirus, and multiple antibiotic-resistant tuberculosis. Even in one of its normal year-to-year variants, influenza (commonly referred to as “flu”) can result in serious illness and even death in young children, the elderly and immune-compromised persons. But there is always the potential risk of the emergence of influenza in one of the pandemic H1N1 forms, such as in the “Spanish Flu” outbreak of 1918-19, which killed over 50 million people worldwide. Every year, North Carolina sees hundreds of cases of influenza, leading to hundreds of hours of lost productivity in businesses due to sick employees. Of note, a vaccine for influenza is produced every year and, according to the CDC, is highly effective in preventing the disease.

Norovirus is recognized as the leading cause of foodborne-disease outbreaks in the United States. The virus can cause diarrhea, vomiting, and stomach pain, and is easily spread from person to person through contaminated food or water and by surface to surface contact. Especially vulnerable populations to this virus include those living or staying in nursing homes and assisted living facilities and other healthcare facilities such as hospitals. Norovirus could also be a threat in the event of large public gatherings such as sporting events, concerts, festivals, and so forth. North Carolina often experiences norovirus outbreaks on an annual basis. No vaccine or treatment exists for the Norovirus, making it especially dangerous for the public in the event of an outbreak.

Public health threats can occur at any time and can have varying impacts. Discussions between public health professionals, planning officials, and first response agencies are essential in order to facilitate safe, effective, and collaborative efforts toward outbreaks.

### **Vector-Borne Diseases**

Bacterial, viral and parasitic diseases that are transmitted by mosquitoes, ticks and fleas are collectively called “vector-borne diseases” (the insects and arthropods are the “vectors” that carry the diseases). Although the term “vector” can also apply to other carriers of disease — such as mammals that can

transmit rabies or rodents that can transmit hantavirus — those diseases are generally called zoonotic (animal-borne) diseases.

The most common vector-borne diseases found in North Carolina and the South Mountains Region are carried by ticks and mosquitoes. The tick-borne illnesses most often seen in the state are Rocky Mountain Spotted Fever, ehrlichiosis, Lyme disease and Southern Tick-Associated Rash Illness (STARI). The most frequent mosquito-borne illnesses, or "arboviruses," in North Carolina include La Crosse encephalitis, West Nile virus and Eastern equine encephalitis. An outbreak of the West Nile Virus began showing up in the United States in 1999, with North Carolina reporting 63 cases from that time through the end of 2016.

### **5.13.2 Location and Spatial Extent**

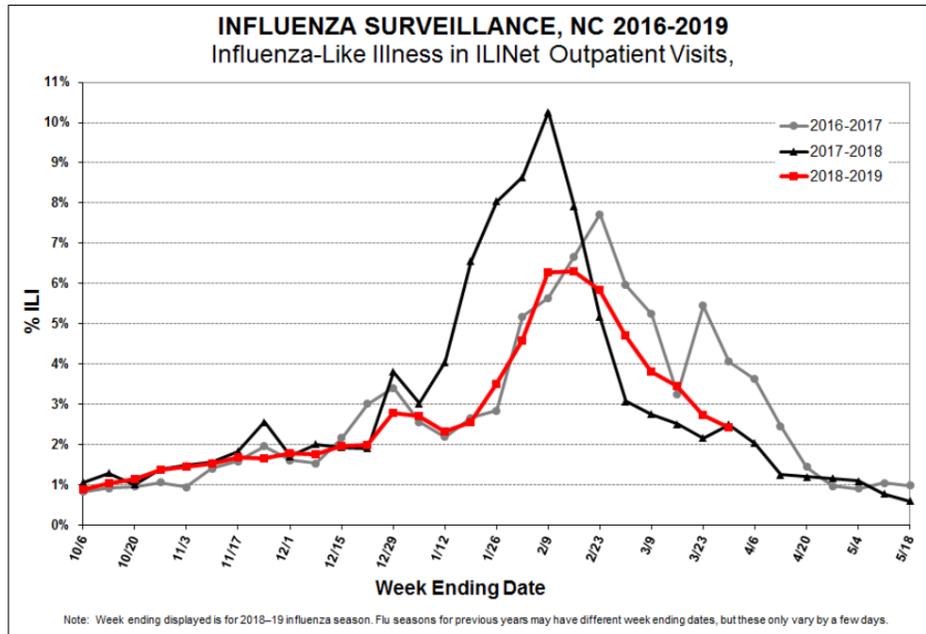
Extent is difficult to measure for an infectious disease event as the extent is largely dependent on the type of disease and on the effect that it has on the population (discussed above). Extent can be somewhat defined by the number of people impacted, which depending on the type of disease could number in the tens of thousands within the state.

### **5.13.3 Historical Occurrences**

#### **Infectious Disease**

The influenza is historically the most common infectious disease that has occurred in the South Mountains Region. Cases of the flu tend to occur in the late fall and early winter months. In recent years, cases of the influenza and influenza-like illnesses have been reported in hospitals. As seen in **Figure 5.21** below, 172 people throughout North Carolina died from the flu between 2018 and 2019.

**FIGURE 5.21: Influenza Surveillance, NC 2016-2019**



N.C. Flu-Associated Deaths\*

**2**  
New Flu Deaths 3/24/19-3/30/19

**172**  
Total Flu Deaths This Season (9/30/2018-5/18/2019)

Source: NC Department of Health and Human Services

**Vector-Borne Diseases**

In 2016, North Carolina state health officials encouraged citizens to take preventative measures against mosquito bites to avoid contracting the Zika virus. \$477,500 dollars was allocated from the Governor’s yearly budget to develop an infrastructure to detect, prevent, control, and respond to the Zika virus and other vector-borne illnesses<sup>24</sup>.

**5.13.4 Probability of Future Occurrence**

It is difficult to predict the future probability of infectious diseases due to the difficulty with obtaining information on this type of hazard. The most common and probable disease in the state has shown to be influenza; however, based on historical data, it is relatively unlikely (between 1 and 33.3 percent annual probability) that the South Mountains Region will experience an outbreak of infectious diseases in the future.

<sup>24</sup> <https://www.ncdhhs.gov/news/press-releases/nc-prepared-zika-virus-risk-local-virus-carrying-mosquitoes-low>

# Technological Hazards

## 5.14 HAZARDOUS SUBSTANCES

### 5.14.1 Background and Description

Hazardous materials can be found in many forms and quantities that can potentially cause death; serious injury; long-lasting health effects; and damage to buildings, homes, and other property in varying degrees. Such materials are routinely used and stored in many homes and businesses and are also shipped daily on the nation's highways, railroads, waterways, and pipelines. This subsection on the hazardous material hazard is intended to provide a general overview of the hazard, and the threshold for identifying fixed and mobile sources of hazardous materials is limited to general information on rail, highway, and FEMA-identified fixed HAZMAT sites determined to be of greatest significance as appropriate for the purposes of this plan.

Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation related accidents in the air, by rail, on the nation's highways, and on the water. Approximately 6,774 HAZMAT events occur each year, 5,517 of which are highway incidents, 991 are railroad incidents, and 266 are due to other causes<sup>25</sup>. In essence, HAZMAT incidents consist of solid, liquid, and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind, and possibly wildlife as well.

HAZMAT incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes, and earthquakes, which in addition to causing incidents can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills, and a variety of other environmental pollutants that caused widespread toxicological concern.

Hazardous material incidents can include the spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous material, but exclude: (1) any release which results in exposure to poisons solely within the workplace with respect to claims which such persons may assert against the employer of such persons; (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel or pipeline pumping station engine; (3) release of source, byproduct, or special nuclear material from a nuclear incident; and (4) the normal application of fertilizer.

### 5.14.2 Location and Spatial Extent

As a result of the 1986 Emergency Planning and Community Right to Know Act (EPCRA), the Environmental Protection Agency provides public information on hazardous materials. One facet of this program is to collect information from industrial facilities on the releases and transfers of certain toxic

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<sup>25</sup> FEMA, 1997.

agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. The South Mountains Region has 26 TRI sites. These sites are shown in **Figure 5.22**.

### **FIGURE 5.22: TOXIC RELEASE INVENTORY (TRI) SITES IN THE SOUTH MOUNTAINS REGION**

In addition to “fixed” hazardous materials locations, hazardous materials may also impact the region via roadways and rail. Many roads in the region are narrow or winding, making hazardous material transport in the area treacherous. All roads that permit hazardous material transport are considered potentially at risk to an incident.

## **5.14.3 Historical Occurrences**

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” is a hazardous materials incident that involves:

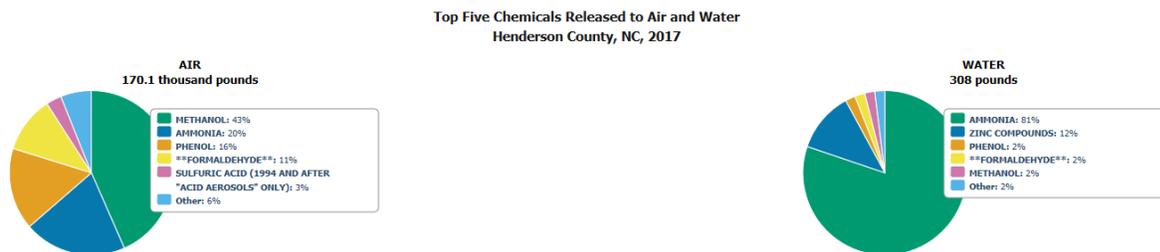
- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 galls or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

However, prior to 2002, a hazardous material “serious incident” was defined as follows:

- a fatality or major injury due to a hazardous material,
- closure of a major transportation artery or facility or evacuation of six or more person due to the presence of hazardous material, or
- a vehicle accident or derailment resulting in the release of a hazardous material.

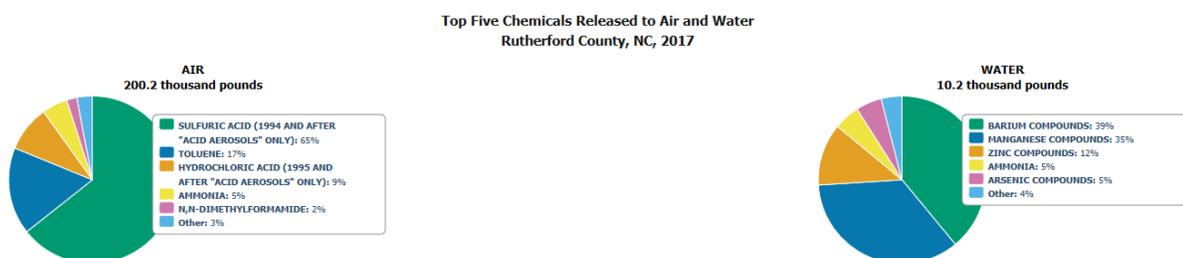
Updated information regarding county specific releases and TRI sites have been provided through 2016. In Henderson County, there are 14 reported TRI facilities. On-site releases have overall gone down in recent years and the majority of the releases by environmental mediums (land, water, or air) have been through land. In Rutherford County, 11 TRI facilities have been reported. On-site releases have primarily been through air, but have overall lessened since 2013. Transylvania County has 1 reported TRI facility. There are no TRI facilities in Polk County, and there were no reports of top chemicals released in Transylvania County. In the following two figures, the top five chemicals released through air and water are shown for Henderson and Rutherford Counties in the region.

**FIGURE 5.23: TOP CHEMICALS RELEASED IN HENDERSON COUNTY**



Source: Environmental Protection Agency

**FIGURE 5.24: TOP CHEMICALS RELEASED IN RUTHERFORD COUNTY**



Source: Environmental Protection Agency

Table 5.30 summarizes the serious HAZMAT incidents reported in the South Mountains Region.

**TABLE 5.30: SUMMARY OF HAZMAT INCIDENTS IN THE SOUTH MOUNTAINS REGION**

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
<b>Henderson County</b>	<b>9</b>	<b>0/0</b>	<b>\$775,819</b>
Flat Rock	0	0/0	\$0
Fletcher	1	0/0	\$5,095
Hendersonville	4	0/0	\$156,079
Laurel Park	1	0/0	\$8,770
Mills River	0	0/0	\$0
Unincorporated Area	3	0/0	\$605,875
<b>Polk County</b>	<b>2</b>	<b>0/0</b>	<b>\$231,707</b>
Columbus	0	0/0	\$0
Saluda	1	0/0	\$154,424
Tryon	0	0/0	\$0
Unincorporated Area	1	0/0	\$231,707
<b>Rutherford County</b>	<b>1</b>	<b>0/0</b>	<b>\$386,975</b>
Bostic	0	0/0	\$0
Chimney Rock Village	0	0/0	\$0
Ellenboro	0	0/0	\$0
Forest City	1	0/0	\$386,975

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Lake Lure	0	0/0	\$0
Ruth	0	0/0	\$0
Rutherfordton	0	0/0	\$0
Spindale	0	0/0	\$0
Unincorporated Area	0	0/0	\$0
<b>Transylvania County</b>	<b>2</b>	<b>0/0</b>	<b>\$87,395</b>
Brevard	1	0/0	\$38,060
Rosman	0	0/0	\$0
Unincorporated Area	1	0/0	\$49,335
<b>South Mountains Regional Total</b>	<b>14</b>	<b>0/0</b>	<b>\$1,481,896</b>

Source: U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration

### 5.14.4 Probability of Future Occurrence

Given the location of 26 toxic release inventory sites in the South Mountains Region and prior rail and roadway incidents, it is possible that a hazardous material incident may occur in the region (between 1 and 10 percent annual probability). County and municipal officials are mindful of this possibility and take precautions to prevent such an event from occurring. Furthermore, there are detailed plans in place to respond to an occurrence.

## 5.15 RADIOLOGICAL EMERGENCY – FIXED NUCLEAR FACILITIES

### 5.15.1 Background and Description

Although not referenced in the previous South Mountains Regional Hazard Mitigation Plan, radiological emergencies will be assessed in this update.

A nuclear and radiation accident is defined by the International Atomic Energy Agency as “an event that has led to significant consequences to people, the environment or the facility. Often, this type of incident results from damage to the reactor core of a nuclear power plant which can release radioactivity into the environment. The degree of exposure from nuclear accidents has varied from serious to catastrophic. While radiological emergencies generally are a rare occurrence, many incidents are extremely well known due to their large-scale impact and serious effects on people and the environment.

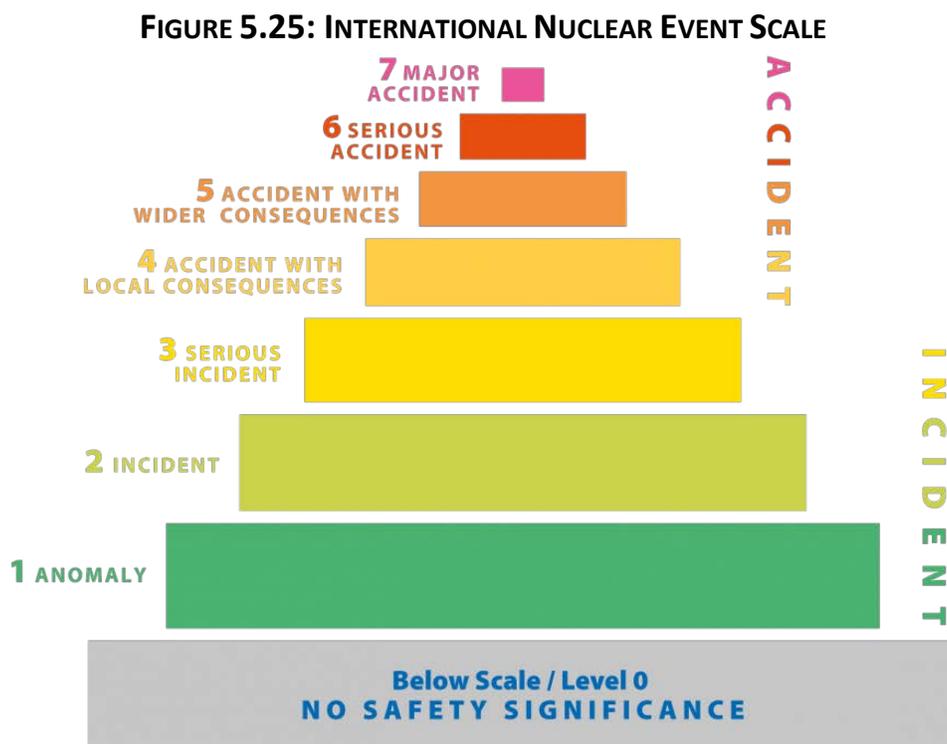
Oconee Nuclear Station, which is the plant located closest to the South Mountains Region, is a 2,568 megawatt power plant that began commercial operation in 1973. It is one of the first three nuclear stations built by Duke Energy and its reactor is a pressurized water reactor. The plant operates with a very high level of security.

The region is also located within a close proximity to the Catawba Nuclear Station in South Carolina and the McGuire Nuclear Station in North Carolina. The Catawba plant was commissioned in 1985 and

the second unit was added in 1986. It also operates with a very high level of security. It is jointly owned by North Carolina Municipal Power Agency Number One. Its first unit began operating in 1985, followed by the next unit in 1986, and is only 11 miles southwest of Charlotte, NC<sup>26</sup>.

### 5.15.2 Location and Spatial Extent

The entire region is at risk to a nuclear incident. However, areas in the eastern part of the region are more susceptible due to their proximity to the Oconee Nuclear Station. The International Atomic Energy Association has developed a scale called the International Nuclear and Radiological Event Scale (INES) which provides a quantitative means of assessing the extent of a nuclear event. This scale, like the MMI used for earthquakes, is logarithmic which means that each increasing level on the scale represents an event 10 times more severe than the previous level (Figure 5.25).



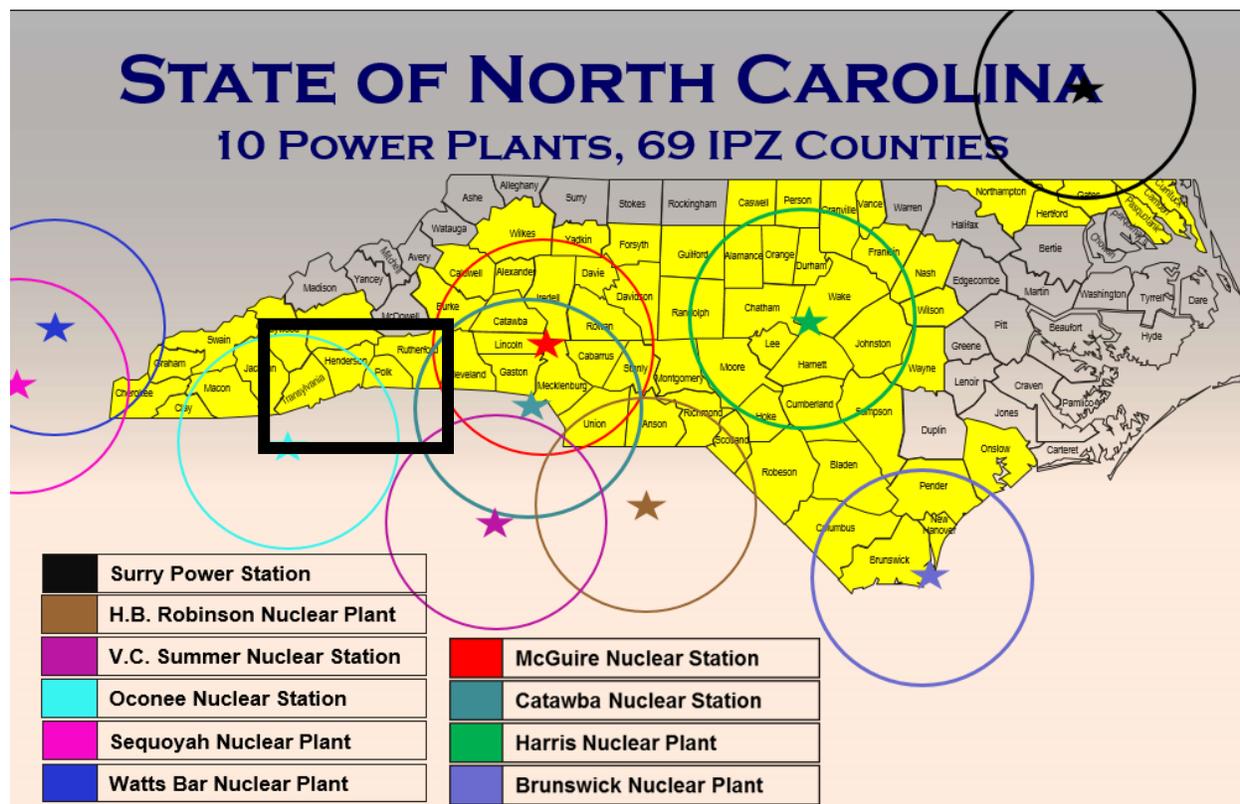
Source: International Atomic Energy Agency

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants. Areas located within 10 miles of the station are considered to be within the zone of highest risk to a nuclear incident and this radius is the designated evacuation radius recommended by the Nuclear Regulatory Commission. Within the 10 mile zone, the primary concern is exposure to and inhalation of radioactive contamination. The most concerning effects in the secondary 50 mile zone are related to ingestion of food and liquids that may have been contaminated. All areas of the counties that are not located within the 10 mile radius are located within this 50 mile radius that is still considered to be at risk from a nuclear incident.

<sup>26</sup> <https://www.duke-energy.com/our-company/about-us/power-plants>

All of the aforementioned nuclear plants – Oconee Nuclear Station, McGuire Nuclear Station, and the Catawba Nuclear Station – are within fifty miles of the South Mountains counties. A map of all power plants in North Carolina can be seen below in **Figure 5.26**. Note that the South Mountains region is identified in the black box.

**FIGURE 5.26: NORTH CAROLINA NUCLEAR POWER STATIONS INCIDENT HAZARD ZONES**



Source: International Atomic Energy Agency

### 5.15.3 Historical Occurrences

Although there have been no major nuclear events at either the Oconee, McGuire or Catawba Nuclear Stations, there is some possibility that one could occur as there have been incidents in the past in the United States at other facilities and at facilities around the world.

### 5.15.4 Probability of Future Occurrences

A nuclear event is a very rare occurrence in the United States due to the intense regulation of the industry. There have been incidents in the past, but it is considered unlikely (less than 1 percent annual probability).

## 5.16 TERRORISM

### 5.16.1 Background and Description

Terrorism was not referenced in the previous South Mountains Regional Hazard Mitigation Plan, but is addressed in this update. For the purpose of this report, terrorism encompasses explosive, chemical, radiological, biological, nuclear, and other threats.

Terrorism is defined in the United States by the Code of Federal Regulations is “the unlawful use of force or violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof, in furtherance of political or social objectives.” Terrorist acts may include assassinations, kidnappings, hijackings, bombings, small arms attacks, vehicle ramming attacks, edged weapon attacks, incendiary attacks, cyber-attacks (computer based), and the use of chemical, biological, nuclear and radiological weapons. For the purposes of this plan, cyber-attacks are included as a separate hazard.

Historically the main categories of weapons of mass destruction (WMDs) used in terror attacks are Chemical, Biological, Radiological, Nuclear, and Explosive (collectively referred to as CBRNE). As we rank these categories, considering immediate danger posed, impact, probability, technical feasibility, frequency, and historical success, they are typically ranked in the following way.

#### **Explosive**

Explosive attacks lead all others due to their immediate danger to life and health, immediate and measurable impact, high probability, low cost/easy degree of technical feasibility, and a long history of successful attacks.

#### **Chemical**

Chemical attacks can pose immediate danger to life and health depending upon the materials used. Chemicals are easy to access, low cost, and easy to deploy. Chemical terrorism can have high and persistent impacts to people and places. These types of attacks are probable and have enjoyed historical success.

#### **Radiological**

Radiological attacks can pose significant threats to life and health depending upon the specific materials used. Radiological materials while restricted and regulated are accessible to people with some knowledge in this discipline. While radiological incidents have occurred, they occur less frequently than explosive and chemical attacks.

#### **Biological**

Biological attacks can pose significant threats to life and health. They are typically deployed as diseases and bio-toxins. They require some degree of technical expertise in order to be deployed successfully. While biological incidents have occurred, they occur less frequently than explosive and chemical attacks.

### Nuclear

While yielding a very high impact, the Nuclear attack is extremely rare due to the fact that it is cost prohibitive and very technically difficult to achieve. This type of attack, however, could be state sponsored which makes it viable.

### OTHER

Terrorism Hazard Assessment must also account for modern trends and changes. An additional “OTHER” category should be considered that includes small arms attacks, vehicle ramming attacks, edged weapon attacks, and incendiary attacks.

## 5.16.2 Location and Spatial Extent

All parts of North Carolina are vulnerable to a terror event; however, terrorism tends to target more densely populated areas. The map in **Figure 5.25** displays the population density in the South Mountains region using census tract levels.

### FIGURE 5.27: POPULATION DENSITY IN THE SOUTH MOUNTAINS REGION

Furthermore, the most recent population counts of each participating county and jurisdictions can be seen in **Table 5.31** below.

**TABLE 5.31: 2017 POPULATION ESTIMATES FOR THE SOUTH MOUNTAINS REGION**

Location	2018 Population Estimate
<b>Henderson County</b>	<b>116,748</b>
Flat Rock	3,362
Fletcher	8,333
Hendersonville	14,107
Laurel Park	2,321
Mills River	7,352
Unincorporated Area	81,273
<b>Polk County</b>	<b>20,611</b>
Columbus	995
Saluda	692
Tryon	1,612
Unincorporated Area	17,312
<b>Rutherford County</b>	<b>66,826</b>
Bostic	377
Chimney Rock Village	116
Ellenboro	831
Forest City	7,153
Lake Lure	1,152
Ruth	415
Rutherfordton	4,058
Spindale	4,227
Unincorporated Area	48,497

Location	2018 Population Estimate
<b>Transylvania County</b>	<b>34,215</b>
Brevard	7,900
Rosman	609
Unincorporated Area	25,706
<b>South Mountains Regional Total</b>	<b>238,400</b>

Source: US Census Bureau, NC Office of State Budget and Management

### 5.16.3 Historical Occurrences

No extreme cases of terror attacks have previously affected the South Mountains region. However, as the population in the area continues to increase, so does the chance of an attack.

### 5.16.4 Probability of Future Occurrences

The South Mountains region has experienced no major terrorist attacks, but the area's population is continuing to rise. The probability of future occurrences of a terrorist attack, while unlikely (between 1 and 10 percent annual probability) is a real possibility that the area must be prepared for.

## 5.17 CYBER

### 5.17.1 Background and Description

Cyberattacks are deliberate attacks on information technology systems in an attempt to gain illegal access to a computer, or purposely cause damage. As the world and the South Mountains region become more technologically advanced and dependent upon computer systems, the threat of cyberattacks is becoming increasingly prevalent. Also known as computer network attacks, cyberattacks are difficult to recognize and typically use malicious code to alter computer data or steal information.

Mitigating and preparing for cyberattacks is challenging because of how diverse and complex attacks can be. The FBI is the lead federal agency for investigating cyberattacks by criminals, overseas adversaries, and terrorists. In North Carolina, the Department of Information Technology is the lead agency that maintains Cybersecurity and Risk Management resources.

Cyberattacks can happen in both the public and private sector. They may be carried out by a specific individual, or by groups from afar. Many attacks attempt to steal money or to disturb normal operations. According to the 2017 Verizon Report of Data Breaching, 93% of all data breaches had a financial or espionage motive, and espionage cases are rising.

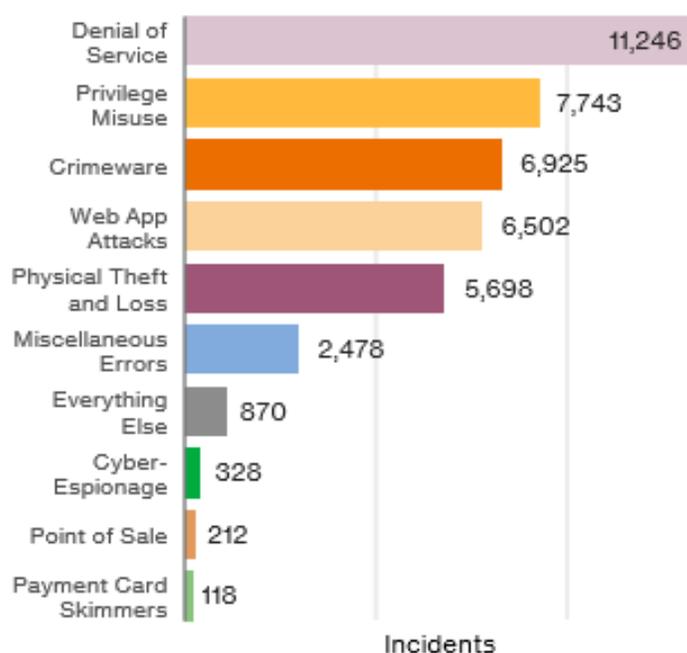
There are many types of cyberattack incident patterns, which include:

- **Web App Attacks:** Incidents in which web applications were attacked, which can include exploiting code-level vulnerabilities in the application.
- **Point-of-Sale Intrusions:** Remote attacks against environments where card-present retail transactions are conducted.
- **Insider and Privilege Misuse:** Unapproved or malicious use of organizational resources.
- **Miscellaneous Errors:** Incidents in which unintentional actions directly compromise an attribute of a security asset.

- Physical Theft and Loss: Incidents where an information asset went missing.
- Crimeware: Instances involving malware that do not fit into a more specific pattern.
- Payment Card Skimmers: Incidents involving skimming devices physically implanted on an asset that reads magnetic stripe data from payment cards.
- Cyber-espionage: Unauthorized network or system access linked to state-affiliated actors.
- Denial-of-Service Attacks: Any attack intended to compromise the availability of networks and systems that are designed to overwhelm systems, resulting in performance degradation or interruption of service.

Figure 5.28 below displays nationwide cyberattack incident patterns from the 2017 Verizon Data Breach Investigations Report.

**FIGURE 5.28: PERCENTAGE AND COUNTS OF INCIDENTS PER PATTERN**



Source: 2017 Verizon Data Breach Investigations Report

### 5.17.2 Location and Spatial Extent

Cyberattacks happen all over the world and are not restricted to a certain locational boundary. They tend to affect the public industry rather than private industries.

### 5.71.3 Historical Occurrences

In North Carolina and the South Mountains region, the Department of Information Technology specializes in cybersecurity and risk management. Within the department, the NC Information Sharing and Analysis Center gathers information on cyber threats within the State raise cybersecurity.

In 2016, North Carolina reported the highest number of cybercrimes in the “non-payment/non-delivery” sector, which can be seen in **Table 5.32** below.

**TABLE 5.32: NORTH CAROLINA CYBERCRIMES AND VICTIM COUNTS IN 2016**

Crime Type by Victim Count			
Crime Type	Victim Count	Crime Type	Victim Count
419/Overpayment	614	Health Care Related	10
Advanced Fee	384	IPR/Copyright and Counterfeit	58
Auction	442	Identity Theft	345
BEC/EAC	254	Investment	28
Charity	10	Lottery/Sweepstakes	119
Civil Matter	28	Malware/Scareware	62
Confidence Fraud/Romance	326	Misrepresentation	102
Corporate Data Breach	74	No Lead Value	121
Credit Card Fraud	274	Non-payment/Non-Delivery	1,844
Crimes Against Children	19	Other	218
Criminal Forums	0	Personal Data Breach	569
Denial of Service	28	Phishing/Vishing/Smishing/Pharming	399
Employment	467	Ransomware	67
Extortion	468	Re-shipping	25
Gambling	1	Real Estate/Rental	280
Government Impersonation	319	Tech Support	298
Hacktivist	2	Terrorism	6
Harassment/Threats of Violence	364	Virus	29
Descriptors*			
Social Media	455	Virtual Currency	38

Source: FBI Internet Crime Complaint Center, 2016

Although the South Mountains region has not reported any major catastrophic cyberattacks, the potential to experience one is unpredictable and can happen at any time.

### 5.17.4 Probability of Future Occurrences

As the world's dependency on technology grows, the possibility of experiencing cyberattacks rises as well. There have not been severe past occurrences in the region, and it is considered unlikely (less than 1 percent annual probability) to experience one in the near future.

## 5.18 ELECTROMAGNETIC PULSE

### 5.18.1 Background and Description

The United States Department of Energy defines electromagnetic pulses (EMPs) as "intense pulses of electromagnetic energy resulting from solar-caused effects or man-made nuclear and pulse power devices." EMPs can be naturally occurring or human-caused hazards. Examples of natural EMP events include:

- Lightning electromagnetic pulse
- Electrostatic discharge
- Meteoric electromagnetic pulse, and
- Coronal mass ejection, also known as a solar electromagnetic pulse.

A human-caused EMP (such as a nuclear EMP) is a technological hazard that can cause severe damage to electrical components attached to power lines or communication systems. One of the most complex aspects of EMPs is the fact they are invisible, unpredictable, and rapid. They can also overload electronic devices that people heavily rely on every day. EMPs are harmless to people biologically; however, an

EMP attack could damage electronic systems such as planes or cars. This could cause destruction of property and life and potentially generate disease or societal collapse.

In 2015, Congress amended the Homeland Security Act of 2002 by passing the Critical Infrastructure Protection Act (CIPA), which protects Americans from an EMP. It also required reporting of EMP threats, research and development, and a campaign to educate planners and emergency responders about EMP events.

### 5.18.2 Location and Spatial Extent

An EMP can happen in any location, and they are relatively unpredictable. Due to advancing technologies, densely populated may be more prone to damages from an EMP. Therefore, bigger cities in the South Mountains region may be more susceptible.

### 5.18.3 Historical Occurrences

There have been no reports of EMP occurrences in the South Mountains region.

### 5.18.4 Probability of Future Occurrences

The probability of an EMP is unlikely (less than 1 percent annual probability), but an occurrence could have catastrophic impacts.

## 5.19 CONCLUSIONS ON HAZARD RISK

The hazard profiles presented in this section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its “How-to” guidance document titled *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, stakeholder input, and professional and experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies, and technical reports.

### 5.19.1 Hazard Extent

**Table 5.33** describes the extent of each natural hazard identified for the South Mountains Region. The extent of a hazard is defined as its severity or magnitude, as it relates to the planning area.

**TABLE 5.33 EXTENT OF SOUTH MOUNTAINS REGION HAZARDS**

Natural Hazards	
Drought	Drought extent is defined by the North Carolina Drought Monitor Classifications which include Abnormally Dry, Moderate Drought, Severe Drought, Extreme Drought, and Exceptional Drought (page 5:6). According to the North Carolina Drought Monitor Classifications, the most severe drought condition is Exceptional. Each of the participating counties has received this ranking (four times) in 13 of the last 14 reporting years. Two of the counties have reported drought conditions in 14 out of the last 14 reporting years.
Excessive Heat	The extent of excessive heat can be defined by the maximum temperature reached. The highest temperature recorded in

	<p>the South Mountains Region is 107 degrees Fahrenheit (reported on August 1, 1999).</p> <ul style="list-style-type: none"> <li>• Henderson County: 101°F</li> <li>• Polk County: 105°F</li> <li>• Rutherford County: 107°F</li> <li>• Transylvania County: 100°F</li> </ul>
<p>Hurricane and Coastal Hazards</p>	<p>Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Table 5.8). The greatest classification of hurricane to traverse directly through the South Mountains Region was Hurricane Celeste which carried tropical force winds of 53 knots upon arrival. The following list the greatest extent of hurricane winds to pass through the area, though it should be noted that stronger storms could impact the region without a direct hit:</p> <ul style="list-style-type: none"> <li>• Henderson County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots)</li> <li>• Polk County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots)</li> <li>• Rutherford County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots)</li> <li>• Transylvania County: Unnamed 1916 Storm, Tropical Storm (40 knots)</li> </ul>
<p>Tornadoes/Thunderstorms</p>	<p><u>Tornadoes</u>: Tornado hazard extent is measured by tornado occurrences in the US provided by FEMA (Figure 5.6) as well as the Fujita/Enhanced Fujita Scale (Tables 5.12 and 5.13). The greatest magnitude reported in the region was an F4 (reported on May 5, 1989).</p> <ul style="list-style-type: none"> <li>• Henderson County: F1</li> <li>• Polk County: F1</li> <li>• Rutherford County: F4</li> <li>• Transylvania County: F2</li> </ul> <p><u>Thunderstorms</u>: Thunderstorm extent is defined by the number of thunder events and wind speeds reported. According to a 63-year history from the National Climatic Data Center, the strongest recorded wind event in the South Mountains Region was reported on March 1, 1999 at 77 knots (approximately 89 mph). It should be noted that future events may exceed these historical occurrences.</p> <ul style="list-style-type: none"> <li>• Henderson County: 70 knots</li> <li>• Polk County: 65 knots</li> <li>• Rutherford County: 77 knots</li> <li>• Transylvania County: 70 knots</li> </ul> <p><u>Lightning</u>: According to the Vaisala flash density map (Figure 5.7), the South Mountains Region is located in an area that experiences 2 to 4 lightning flashes per square kilometer per year. It should be noted that future lightning occurrences may exceed these figures.</p> <p><u>Hailstorms</u>: Hail extent can be defined by the size of the hail stone. The largest hail stone reported in the South Mountains Region was 2.75 inches (reported on June 24, 1986). It should be noted that future events may exceed this.</p> <ul style="list-style-type: none"> <li>• Henderson County: 2.5 inches</li> </ul>

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	<ul style="list-style-type: none"> <li>• Polk County: 2.75 inches</li> <li>• Rutherford County: 2.0 inches</li> <li>• Transylvania County: 2.75 inches</li> </ul>
Severe Winter Weather	<p>The extent of winter storms can be measured by the amount of snowfall received (in inches). The greatest 24-hour snowfall was reported in the region was 22 inches reported on March 2, 1942. Due to variations in elevation throughout the region, extent totals will vary for each participating jurisdiction and reliable data on snowfall totals is not available.</p> <ul style="list-style-type: none"> <li>• Henderson County: 22 inches</li> <li>• Polk County: 15 inches</li> <li>• Rutherford County: 16 inches</li> <li>• Transylvania County: 17 inches</li> </ul>
Earthquakes	<p>Earthquake extent can be measured by the Richter Scale (Table 5.20) and the Modified Mercalli Intensity (MMI) scale (Table 5.21) and the distance of the epicenter from the South Mountains Region. According to data provided by the National Geophysical Data Center, the greatest MMI to impact the region was VI (strong) with a correlating Richter Scale measurement of approximately 5.4 (reported on May 5, 1981). The epicenter of this earthquake was located 10.0 km away.</p> <ul style="list-style-type: none"> <li>• Henderson County: VI, 10.0 km to epicenter</li> <li>• Polk County: V, 31.0 km to epicenter</li> <li>• Rutherford County: V, 241.0 km to epicenter</li> <li>• Transylvania County: V, 26.0 km to epicenter</li> </ul>
Geological	<p><u>Landslide</u>: As noted above in the landslide profile, the landslide data provided by the North Carolina Geological survey is incomplete. This provides a challenge when trying to determine an accurate extent for the landslide hazard. However, when using the USGS landslide susceptibility index, extent can be measured with incidence, which is high throughout most of the South Mountain counties.</p> <p><u>Sinkhole</u>: The western part of North Carolina and the South Mountains region is susceptible to sinkholes; however, there are no historical records of sinkholes in the region.</p> <p><u>Erosion</u>: The extent of erosion can be defined by the measurable rate of erosion that occurs. There are no erosion rate records available for the South Mountains region.</p>
Dam Failure	<p>Dam failure extent is defined using the North Carolina Division of Land Resources criteria (Table 5.23). Of the 327 dams in South Mountains Region, 124 are classified as high-hazard.</p> <ul style="list-style-type: none"> <li>• Henderson County: 45 high hazard dams</li> <li>• Polk County: 10 high hazard dams</li> <li>• Rutherford County: 22 high hazard dams</li> <li>• Transylvania County: 47 high hazard dams</li> </ul>
Flooding	<p>Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity. The amount of land in the floodplain accounts for 6.1 percent of the total land area in the South Mountains Region. Flood depth and velocity are recorded via United States Geological Survey stream gages throughout the region. While a gage does</p>

	<p>not exist for each participating jurisdiction, there is one at or near many areas. The greatest peak discharge recorded for the area was reported on October 5, 1964. Water reached a discharge of 30,000 cubic feet per second and the stream gage height was recorded at 25.50 feet. Additional peak discharge readings and gage heights are in the table below.</p> <table border="1"> <thead> <tr> <th>Location/Jurisdiction</th> <th>Date</th> <th>Peak Discharge (cfs)</th> <th>Gage Height (ft)</th> </tr> </thead> <tbody> <tr> <td>Henderson County</td> <td></td> <td></td> <td></td> </tr> <tr> <td>French Broad River near Fletcher</td> <td>9/8/2004</td> <td>25,500</td> <td>20.13</td> </tr> <tr> <td>Rutherford County</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cove Creek near Lake Lure</td> <td>6/5/1957</td> <td>7,050</td> <td>18.53</td> </tr> <tr> <td>Transylvania County</td> <td></td> <td></td> <td></td> </tr> <tr> <td>French Broad Rover at Blantyre</td> <td>10/5/1964</td> <td>30,000</td> <td>25.50</td> </tr> </tbody> </table>	Location/Jurisdiction	Date	Peak Discharge (cfs)	Gage Height (ft)	Henderson County				French Broad River near Fletcher	9/8/2004	25,500	20.13	Rutherford County				Cove Creek near Lake Lure	6/5/1957	7,050	18.53	Transylvania County				French Broad Rover at Blantyre	10/5/1964	30,000	25.50
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<b>Other Hazards</b>																													
Wildfires	<p>Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2003-2018. Analyzing the data by county indicates the following wildfire hazard extent for each county.</p> <ul style="list-style-type: none"> <li>• Henderson County: The greatest number of fires to occur in any year was 77 in 2006.</li> <li>• Polk County: The greatest number of fires to occur in any year was 34 in 2006.</li> <li>• Rutherford County: The greatest number of fires to occur in any year was 95 in 2011.</li> <li>• Transylvania County: The greatest number of fires to occur in any year was 35 in 2006.</li> </ul> <p>Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the region.</p>																												
Infectious Disease	<p>There is no available method for determining dollar losses due to infectious diseases at this time; however, \$477,500 dollars was allocated from the Governor’s yearly budget in 2016 for preventative measures regarding the Zika Virus. The entire South Mountains region is susceptible to infectious diseases such as the flu, which kills hundreds of people annually.</p>																												
<b>Technological Hazards</b>																													
Hazardous Materials Incident	<p>According to USDOT PHMSA, the largest hazardous materials incident reported in the region is 1,6587.5 LGA released on the highway on December 6, 1998. It should be noted that larger events are possible.</p> <ul style="list-style-type: none"> <li>• Henderson County: 25 LGA</li> <li>• Polk County: 1,6587.5 LGA</li> <li>• Rutherford County: 0</li> <li>• Transylvania County: 50 LGA</li> </ul>																												
Radiological Emergency – Fixed Nuclear Facilities	<p>Although there is no history of a nuclear accident at the Oconee, McGuire or Catawba Nuclear Stations, other events across the globe and in the United States in particular indicate</p>																												

	that an event is possible. Since several national and international events were Level 7 events on the INES, the potential for a Level 7 event at Oconee, McGuire or Catawba is possible.
Terrorism	Although no severe terrorism attacks have been reported in the South Mountains region, the entire area is still at risk to a future event. Densely populated areas, such as cities, are considered more susceptible. Terror events have the potential to affect the human population, buildings and infrastructure, and the economy in the region.
Cyber	No cyber attacks have been historically reported in the South Mountains region. Technology usage, however, is increasing. A cyber attack could potentially devastate the region’s economy and could have lasting negative impacts.
Electromagnetic Pulse	Electromagnetic Pulse (EMP) occurrences have not taken place in the South Mountains region, but the risk still exists. If an EMP were to occur, the effects would negatively impact first responders and communication efforts and may cause panic within the area.

### 5.19.2 Priority Risk Index

In order to draw some meaningful planning conclusions on hazard risk for the South Mountains Region, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). The purpose of the PRI is to categorize and prioritize all potential hazards for the South Mountains Region as high, moderate, or low risk. Combined with the asset inventory and quantitative vulnerability assessment provided in the next section, the summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for the jurisdictions in the South Mountains Region to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for the South Mountains Region is based principally on the PRI, a tool used to measure the degree of risk for identified hazards in a particular planning area. The PRI is used to assist the South Mountains Regional Hazard Mitigation Planning Team in gaining consensus on the determination of those hazards that pose the most significant threat to the South Mountains counties based on a variety of factors. The PRI is not scientifically based, but is rather meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks in the South Mountains Region based on standardized criteria.

The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon weighting factor<sup>27</sup>, as summarized in **Table 5.34**. To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories

<sup>27</sup> The Regional Hazard Mitigation Planning Team, based upon any unique concerns or factors for the planning area, may adjust the PRI weighting scheme during future plan updates.

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equals the final PRI value, as demonstrated in the example equation below:

$$\text{PRI VALUE} = [(\text{PROBABILITY} \times .30) + (\text{IMPACT} \times .30) + (\text{SPATIAL EXTENT} \times .20) + (\text{WARNING TIME} \times .10) + (\text{DURATION} \times .10)]$$

According to the weighting scheme and point system applied, the highest possible value for any hazard is 4.0. When the scheme is applied for the South Mountains Region, the highest PRI value is 3.0 (Severe Winter Weather). Prior to being finalized, PRI values for each identified hazard were reviewed and accepted by the members of the Regional Hazard Mitigation Planning Team.

**TABLE 5.34: PRIORITY RISK INDEX FOR THE SOUTH MOUNTAINS REGION**

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1% and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area	1	20%

PRI Category	Degree of Risk			Assigned
		affected		
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

### 5.19.3 Priority Risk Index Results

**Table 5.35** summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the Regional Hazard Mitigation Planning Team. The results were then used in calculating PRI values and making final determinations for the risk assessment.

**TABLE 5.35: SUMMARY OF PRI RESULTS FOR THE SOUTH MOUNTAINS REGION**

Hazard	Subhazard(s) Assessed	Category/Degree of Risk					PRI Score
		Probability	Impact	Spatial Extent	Warning Time	Duration	
<b>Natural Hazards</b>							
Drought		Likely	Minor	Large	More than 24 hours	More than 1 week	2.5
Excessive Heat		Possible	Minor	Large	More than 24 hours	Less than 1 week	2.1
Hurricane and Coastal Hazards		Possible	Critical	Large	More than 24 hours	Less than 24 hours	2.3
Tornadoes/ Thunderstorms	Hailstorm, Lightning	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hours	3.1
Severe Winter		Likely	Critical	Large	More	Less than	3.3

Hazard	Subhazard(s) Assessed	Category/Degree of Risk					
		Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Weather					than 24 hours	one week	
Earthquakes		Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.0
Geological	Landslide, Sinkholes, Erosion	Possible	Limited	Small	Less than 6 hours	Less than 6 hours	2.2
Dam Failure		Unlikely	Critical	Moderate	Less than 6 hours	Less than 24 hours	2.3
Flooding		Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3.0
<b>Other Hazards</b>							
Wildfires		Likely	Minor	Small	Less than 6 hours	More than 1 week	2.6
Infectious Disease		Unlikely	Minor	Small	More than 24 hours	More than 1 week	1.6
<b>Technological Hazards</b>							
Hazardous Substances		Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Radiological Emergency	Fixed Nuclear Facilities	Unlikely	Critical	Small	6 to 12 hours	Less than 1 week	1.9
Terrorism		Unlikely	Critical	Small	Less than 6 hours	Less than 24 hours	2.2
Cyber		Unlikely	Minor	Small	Less than 6 hours	Less than 24 hours	1.5
Electromagnetic Pulse		Unlikely	Minor	Large	12 to 24 hours	Less than 6 hours	1.3

## 5.20 FINAL DETERMINATIONS

The conclusions drawn from the hazard profiling process for the South Mountains Region, including the PRI results and input from the Regional Hazard Mitigation Planning Team, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk. For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of the South Mountains Region. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future plan updates.

**SECTION 5: HAZARD PROFILES**

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A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment*.

**Table 5.36** ranks the hazards that were assessed in the update that were renamed to be consistent with the State of State of North Carolina Hazard Mitigation Plan. These conclusions were based on the PRI calculations and input from the South Mountains Regional Planning Committee.

**TABLE 5.36: 2020 CONCLUSIONS ON HAZARD RISK FOR THE SOUTH MOUNTAINS REGION**

<b>HIGH RISK</b>	Winter Storm and Freeze Thunderstorm Wind / High Wind Flooding Wildfires
<b>MODERATE RISK</b>	Drought Hurricanes and Coastal Hazards Dam Failure Excessive Heat Geological Hazardous Substances
<b>LOW RISK</b>	Terrorism Earthquakes Radiological Emergency Infectious Disease Cyber Electromagnetic Pulse

# SECTION 6

## VULNERABILITY ASSESSMENT

This section identifies and quantifies the vulnerability of the jurisdictions within the South Mountains Region to the significant hazards identified in the previous sections (*Hazard Identification and Profiles*). It consists of the following subsections:

- ❖ 6.1 Overview
- ❖ 6.2 Methodology
- ❖ 6.3 Explanation of Data Sources
- ❖ 6.4 Asset Inventory
- ❖ 6.5 Vulnerability Assessment Results
- ❖ 6.6 Conclusions on Hazard Vulnerability

### 44 CFR Requirement

44 CFR Part 201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. The description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

## 6.1 OVERVIEW

This section builds upon the information provided in Section 4: *Hazard Identification and Section 5: Hazard Profiles* by identifying and characterizing an inventory of assets in the South Mountains Region. Additionally, an assessment is conducted for each identified hazard, including the potential impact and expected amount of damages it may cause. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard. In doing so, each county and their participating jurisdictions may better understand their unique risks to identified hazards and be better prepared to evaluate and prioritize specific hazard mitigation actions.

This section begins with an explanation of the methodology applied to complete the vulnerability assessment, followed by a summary description of the asset inventory as compiled for jurisdictions in the South Mountains Region. The remainder of this section focuses on the results of the assessment conducted.

## 6.2 METHODOLOGY

This vulnerability assessment was conducted using three distinct methodologies: (1) A stochastic

risk assessment; (2) a geographic information system (GIS)-based analysis; and (3) a risk modeling software analysis. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation, including historical occurrence information provided in the *Hazard Identification* and *Hazard Profiles* sections. A brief description of the three different approaches is provided on the following pages.

### 6.2.1 Stochastic Risk Assessment

The stochastic risk assessment methodology was applied to analyze hazards of concern that were outside the scope of hazard risk models and the GIS-based risk assessment. This involves the consideration of annualized loss estimates and impacts of current and future buildings and populations. Annualized loss is the estimated long-term weighted average value of losses to property in any single year in a specified geographic area (i.e., municipal jurisdiction or county). This methodology is applied primarily to hazards that do not have geographically-definable boundaries and are therefore excluded from spatial analysis through GIS. A stochastic risk methodology was used for the following hazards:

- ❖ Geological
- ❖ Tornadoes/Thunderstorms
- ❖ Severe Winter Weather
- ❖ Hazardous Substances

With the exception of Hazardous Substances, the hazards listed above are considered atmospheric and have the potential to affect all current and future buildings and all populations. **Table 6.1** provides information about all improved property in the South Mountains region that is vulnerable to these hazards. For all hazards annualized loss estimates were determined using the best available data on historical losses from sources including NOAA's National Centers for Environmental Information records, South Mountains Region county hazard mitigation plans, and local knowledge. Annualized loss estimates were generated by totaling the amount of property damage over the period of time for which records were available, and calculating the average annual loss. Given the standard weighting analysis, losses can be readily compared across hazards providing an objective approach for evaluating mitigation alternatives.

For the dam failure<sup>1</sup>, drought, excessive heat, infectious disease, radiological emergency, terrorism, cyber, EMP, and geological hazards, no data with historical property damages was available. Therefore a detailed vulnerability assessment could not be completed for these hazards at this time.

The results for these hazards are found at the end of this section in **Table 6.25**.

### 6.2.2 GIS-Based Analysis

Other hazards have specified geographic boundaries that permit additional analysis using

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<sup>1</sup> As noted in Section 5: *Hazard Profiles*, dam failure could be catastrophic to structures and populations in the inundation area. However, due to lack of data, no additional analysis was performed. Further, local USACE and NCDENR also complete separate dam failure plans to identify risk and response measures.

Geographic Information Systems (GIS). These hazards include:

- ❖ Flooding
- ❖ Hazardous Substances
- ❖ Geological (Landslide)
- ❖ Wildfires

The objective of the GIS-based analysis was to determine the estimated vulnerability of critical facilities and populations for the identified hazards in the South Mountains Region using best available geospatial data. Digital data was collected from local, regional, state, and national sources for hazards and buildings. This included local tax assessor records for individual parcels and buildings and georeferenced point locations for identified assets (critical facilities and infrastructure, special populations, etc.) when available. ESRI® ArcGIS™ 10.6.1 was used to assess hazard vulnerability utilizing digital hazard data, as well as local building data. Using these data layers, hazard vulnerability can be quantified by estimating the assessed building value for parcels and/or buildings determined to be located in identified hazard areas. To estimate vulnerable populations in hazard areas, digital Census 2010 data by census tract was obtained and was supplemented with current population estimates from the US Census Bureau. This was intersected with hazard areas to determine exposed population counts. Unfortunately, due to the large scale of census tracts, the results are limited, but will be revised as population by census block becomes available for all areas in the region. The results of the analysis provided an estimate of the number of people and critical facilities, as well as the assessed value of parcels and improvements, determined to be potentially at risk to those hazards with delineable geographic hazard boundaries.

### **6.2.3 Risk Management Tool**

The Risk Management Tool (RMT) was developed by NCEM-RM as a tool to simplify hazard mitigation plan development into a single, automated, tool-based format to include geospatially based risk assessment data, also developed by the NCEM-RM. The RMT is a twofold system used to create and/or update a local and state hazard mitigation plan. The two parts of the RMT are a step-by-step system that will prompt a user to input information and narrative as well as upload pictures, documents and other information as needed. The second part of the system is the Risk Tool. The Risk Tool will run a risk assessment at the building level for each hazard selected based on predetermined calculations for each hazard. Some hazards will have a single return period and others have multi-return periods. The availability of multi-returns periods are based on the availability of datasets for each hazard and the degree of detail in each dataset.

The Risk Assessment produced by the Risk Tool will also identify high-risk structures in the planning area and estimate cost by types of mitigation projects (wind retrofits, elevation, acquisition, mitigation reconstruction) and benefit-cost estimates by type of mitigation. The mitigation tool is only meant to begin the process of thinking about problem areas where mitigation may be of interest to the jurisdiction and property owners. It is also designed to drive mitigation actions that are specific, measurable, attainable, realistic and timely.

Finally, the Risk Assessment Tool also assesses vulnerable populations, such as children and elderly persons. Data used to assess these populations is from the US 2010 Census. According to the US Census Bureau, those defined as “elderly,” are 65 years old or older, while those defined as “children” are 5

years old or younger. It is important to note that the numbers assessed are from the most recent Census in 2010.

Once all of the information was input into the system, a hazard mitigation plan can then be exported into multiple document formats. The system will also store the plan so that when it is time to update the plan, the information is already in the system.

The RMT was originally developed as part of the Integrated Hazard Risk Management (IHRM) pilot project which included Durham, Edgecombe, Macon and New Hanover counties. The pilot was successful and it was determined that there is a need and interest in a system designed to be used statewide and potentially nationwide in the future. The RMT used in this update was the second version created by NCEM.

A list of the hazards assessed by the RMT follows:

- ❖ Hurricane and Coastal Hazards
- ❖ Tornadoes/Thunderstorms
- ❖ Earthquakes
- ❖ Flooding
- ❖ Wildfires

All conclusions are presented in “**Conclusions on Hazard Vulnerability**” at the end of this section.

#### **Hazard Prioritization**

When it comes to evaluating hazards and determining which hazards a jurisdiction should spend the most time and effort addressing, a number of factors affect the prioritization. As discussed in *Section 5: Hazard Profiles*, the risk (magnitude, probability, location) of a hazard is one of the primary driving forces that helps determine the relative importance of addressing the potential impacts of a hazard. However, the assessment of a hazard’s risk is generally focused on the hazard itself and how severe or likely it could be within geographic scope of the study area. This assessment does not necessarily analyze the potential effects of that hazard on humans and the built environment. This is a critical component of planning for hazards since a hazard that does not impact human life, safety, or welfare is typically not considered as important to address through mitigation. The analysis that follows attempts to bring this consideration into the planning process by estimating the impacts on humans and the built environment and prioritizing hazards accordingly.

## 6.3 EXPLANATION OF DATA SOURCES

### **Hurricane and Coastal Hazards**

NCEM's Risk Management Tool assessed vulnerable areas to the Hurricane and Coastal Hazards. For this assessment, vulnerable buildings and populations were analyzed against damages provoked by hurricane winds.

### **Tornadoes/Thunderstorms**

NCEM's Risk Management Tool analyzed the vulnerable buildings and populations of the Tornadoes/Thunderstorms hazard. Sub hazards assessed under the thunderstorms hazard include hail and lightning; however, for the purposes of this assessment, thunderstorm winds were the only risk analyzed.

### **Earthquakes**

NCEM's Risk Management Tool assessed vulnerable areas to the earthquake hazard. This assessment included susceptible buildings by the type of structure, and the potential dollar losses associated with the buildings. It also analyzed susceptible populations, such as children and elderly.

### **Geological (Landslide)**

Data from the U.S. Geological Survey was used to first determine what areas are considered high, moderate, or low susceptibility areas to the landslide hazard. Data was downloaded in an ArcGIS compatible format. This allowed the parcel data received by local governments to be layered on top of the landslide regions to assess vulnerability to landslide occurrences.

### **Flooding**

FEMA Digital Flood Insurance Rate Maps (DFIRMs) were used to determine flood vulnerability. DFIRM data can be used in ArcGIS for mapping purposes and, they identify several features including floodplain boundaries and base flood elevations. Identified areas on the DFIRM represent some features of a Flood Insurance Rate Maps including the 100-year flood areas (1.0-percent annual chance flood), and the 500-year flood areas (0.2-percent annual chance flood). For the vulnerability assessment, local parcel data and critical facilities were overlaid on the 100-year floodplain areas and 500-year floodplain areas. This data was also supplemented with the NCEM RMT data, which assessed structure type and vulnerable populations within the floodplain areas. It should be noted that such an analysis does not account for building elevation.

### **Wildfires**

The data used to determine vulnerability to wildfires in the South Mountains Region is based on GIS data called the Southern Wildfire Risk Assessment (SWRA). It was provided for use in this plan by the North Carolina Division of Forest Resources. A specific layer known as the "Wildland Urban Interface" (WUI) was used to determine vulnerability of people and property. This layer uses the key input of housing density to define potential wildfire impacts to people and homes. The WUI Risk Index is then derived from a scale of -1 to -9, with the least negative impact being a -1, and uses flame length to measure fire intensity. The primary purpose of this data is to highlight areas of concern that may be conducive to mitigation actions. Many assumptions are made, making it not a true probability; however, it does provide a comparison of risk throughout the region. Data was also supplemented with the data from NCEM's RMT, which assessed vulnerable buildings, potential dollar losses of those buildings, and susceptible populations.

### **Hazardous Substances**

Hazardous materials incidents can occur in both fixed facilities and through mobile transportation. For the fixed incident analysis, Toxic Release Inventory (TRI) data was used. The Toxic Release Inventory is a publicly available database from the federal Environmental Protection Agency (EPA) that contains information on toxic chemicals, releases, and other waste management activities reported annually by certain covered industry groups, as well as federal facilities. This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and was further expanded by the Pollution Prevention Act of 1990. Facilities that meet certain activity thresholds must annually report their releases and other waste management activities for listed toxic chemicals to the EPA and to their state or tribal entity. A facility must report if it meets the following criteria:

- ❖ The facility falls within one of the following industrial categories: manufacturing; metal mining; coal mining; electric generating facilities that combust coal and/or oil; chemical wholesale distributors; petroleum terminals and bulk storage facilities; RCRA Subtitle C treatment, storage, and disposal (TSD) facilities; and solvent recovery services;
- ❖ Has 10 or more full-time employee equivalents; and
- ❖ Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000
- ❖ pounds of any listed chemical during the calendar year. Persistent, bioaccumulative, and toxic (PBT) chemicals are subject to different thresholds of 10 pounds, 100 pounds, or 0.1 grams depending on the chemical.

For the mobile hazardous materials incident analysis, transportation data including major highways and railroads were obtained from the North Carolina Department of Transportation. This data is ArcGIS compatible, lending itself to buffer analysis to determine risk.

## **6.4 ASSET INVENTORY**

An inventory of geo-referenced assets within the South Mountains counties and jurisdictions was compiled in order to identify and characterize those properties potentially at risk to the identified hazards<sup>2</sup>. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Under this assessment, two categories of physical assets were created and then further assessed through GIS analysis. Additionally, social assets are addressed to determine population at risk to the identified hazards. These are presented below in Section 6.4.2.

### **6.4.1 Physical and Improved Assets**

The two categories of physical assets consist of:

1. **Improved Property:** Includes all improved properties in the South Mountains Region according to local parcel data provided by counties and the Tribe. The information has been

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<sup>2</sup> While potentially not all-inclusive for the jurisdictions in the Smoky Mountain region, “georeferenced” assets include those assets for which specific location data is readily available for connecting the asset to a specific geographic location for purposes of GIS analysis.

expressed in terms of the number of parcels and total assessed value of improvements (buildings) that may be exposed to the identified hazards.

2. **Critical Facilities:** Critical facilities vary by jurisdiction. When provided, the critical facilities provided by the jurisdiction are used in this section. If no critical facilities are identified, facilities were used from Hazus-MH which includes fire stations, police station, medical care facilities, schools, and emergency operation centers. It should be noted that this listing is not all-inclusive for assets located in the region, but it is anticipated that it will be expanded during future plan updates as more geo-referenced data becomes available for use in GIS analysis.

The following tables provide a detailed listing of the geo-referenced assets that have been identified for inclusion in the vulnerability assessment for the South Mountains Region.

**Table 6.1** lists the number of parcels, total value of parcels, total number of parcels with improvements, and the total assessed value of improvements for participating areas of the South Mountains Region (study area of vulnerability assessment)<sup>3</sup>.

**TABLE 6.1: IMPROVED PROPERTY IN THE SOUTH MOUNTAINS REGION**

Location <sup>4</sup>	Number of Parcels	Total Assessed Value of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
<b>Henderson County</b>	<b>67,633</b>	<b>\$11,631,180,800</b>	<b>47,428</b>	<b>\$8,669,984,200</b>
Flat Rock	2,692	\$866,769,100	2,102	\$653,952,400
Fletcher	3,449	\$773,169,100	3,010	\$562,137,600
Hendersonville	10,231	\$2,173,539,700	8,573	\$1,527,584,200
Laurel Park	1,745	\$328,143,700	1,262	\$256,028,500
Mills River	3,480	\$850,509,900	2,808	\$597,140,500
Unincorporated Area	46,036	\$6,639,049,300	29,673	\$5,073,141,000
<b>Polk County</b>	<b>17,580</b>	<b>\$3,403,072,143</b>	<b>10,472</b>	<b>\$1,758,155,848</b>
Columbus	582	\$157,943,257	444	\$105,478,936
Saluda	694	\$116,375,711	484	\$72,103,817
Tryon	1,105	\$173,792,348	837	\$124,320,390
Unincorporated Area	15,199	\$2,954,960,827	8,707	\$1,456,252,705
<b>Rutherford County</b>	<b>56,565</b>	<b>\$5,372,648,553</b>	<b>31,946</b>	<b>\$3,515,072,482</b>
Bostic	258	\$25,274,384	179	\$22,127,584
Chimney Rock Village	464	\$51,189,492	218	\$21,767,392
Ellenboro	513	\$22,978,419	383	\$17,280,819
Forest City	4,530	\$444,723,215	3,223	\$317,109,845
Lake Lure	4,960	\$813,187,548	2,042	\$369,657,648

<sup>3</sup> Total assessed values for improvements is based on tax assessor records as joined to digital parcel data. This data does not include dollar figures for tax-exempt improvements such as publicly-owned buildings and facilities. It should also be noted that, due to record keeping, some duplication is possible thus potentially resulting in an inflated value exposure for an area.

<sup>4</sup> Number of buildings for each county is based on the number of parcels with an improved building value greater than zero.

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Ruth	217	\$16,224,743	150	\$12,582,243
Rutherfordton	2,256	\$261,255,059	1,596	\$214,590,459
Spindale	2,787	\$182,678,907	1,897	\$143,354,047
Unincorporated Area	40,580	\$3,555,136,786	22,258	\$2,396,602,445
<b>Transylvania County</b>	<b>32,528</b>	<b>\$23,348,568,298</b>	<b>20,065</b>	<b>\$11,086,316,675</b>
Brevard	5,688	\$4,293,454,014	4,575	\$3,380,610,250
Rosman	240	\$81,592,280	153	\$68,540,400
Unincorporated Area	26,600	\$18,973,522,004	15,337	\$7,637,166,025
<b>South Mountains Regional Total</b>	<b>174,306</b>	<b>\$43,755,469,794</b>	<b>109,911</b>	<b>\$25,029,529,205</b>

Source: Local governments

The following table lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, schools, and other critical facilities located in the South Mountains Region. Local governments at the county level provided a majority of the data for this analysis. In addition, **Figure 6.1** shows the locations of essential facilities in the South Mountains Region. **Table 6.25**, at the end of this section, shows a complete list of the critical facilities by name, as well as the hazards that affect each facility. As noted previously, this list is not all inclusive and only includes information provided by the counties.

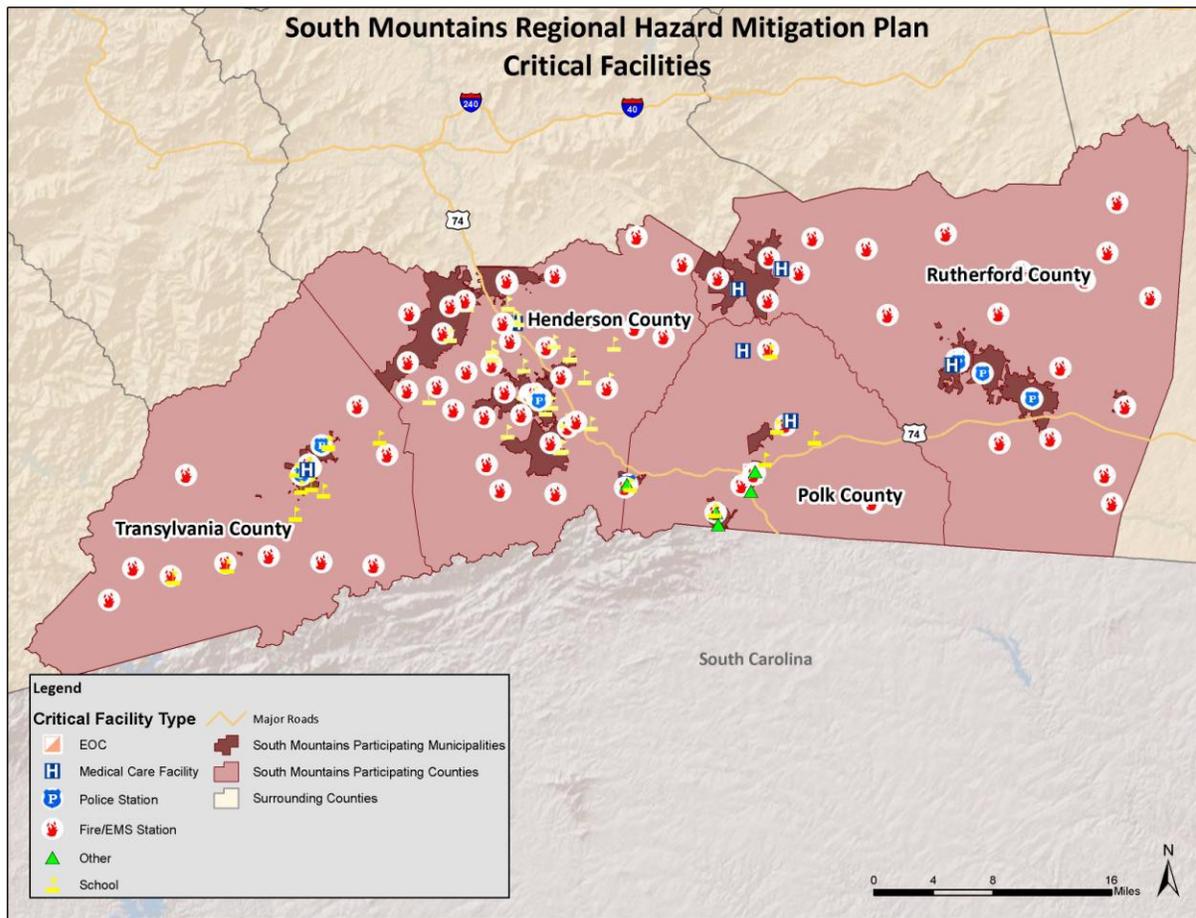
**TABLE 6.2: CRITICAL FACILITY INVENTORY IN THE SOUTH MOUNTAINS REGION**

Location	Fire/EMS Stations	Police Stations	Medical Care Facilities	EOCs	Schools	Government	Other
<b>Henderson County</b>	<b>35</b>	<b>7</b>	<b>42</b>	<b>0</b>	<b>40</b>	<b>35</b>	<b>12</b>
Flat Rock	1	0	0	0	0	1	0
Fletcher	1	1	2	0	1	2	1
Hendersonville	2	4	23	0	7	12	4
Laurel Park	2	1	1	0	0	0	3
Mills River	5	0	3	0	2	1	0
Unincorporated Area	24	1	13	0	30	17	4
<b>Polk County</b>	<b>10</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>
Columbus	1	3	2	0	2	0	0
Saluda	1	1	0	0	1	0	0
Tryon	1	1	2	0	1	0	0
Unincorporated Area	7	0	0	0	3	0	0
<b>Rutherford County</b>	<b>22</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>25</b>	<b>0</b>	<b>0</b>
Bostic	4	0	0	0	0	0	0
Chimney Rock Village	1	0	0	0	0	0	0
Ellenboro	2	0	1	0	0	0	0
Forest City	5	1	0	0	17	0	0
Lake Lure	3	0	0	0	0	0	0
Ruth	0	0	0	0	0	0	0
Rutherfordton	3	2	2	0	8	0	0
Spindale	1	1	0	0	1	0	0

Unincorporated Area	3	0	1	0	1	0	0
<b>Transylvania County</b>	<b>13</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>
Brevard	2	1	1	0	2	0	1
Rosman	1	0	0	0	0	0	0
Unincorporated Area	10	1	0	0	0	0	1
<b>South Mountains Regional Total</b>	<b>80</b>	<b>18</b>	<b>51</b>	<b>0</b>	<b>74</b>	<b>35</b>	<b>14</b>

Source: Local governments

**FIGURE 6.1: CRITICAL FACILITY LOCATIONS IN THE SOUTH MOUNTAINS REGION**



Source: Hazus-MH 2.1

### 6.4.2 Social Vulnerability

In addition to identifying those assets potentially at risk to identified hazards, it is important to identify and assess those particular segments of the resident population in the South Mountains Region that are potentially at risk to these hazards.

**Table 6.3** lists the population by county according to U.S. Census 2010 population estimates. The population estimates are updated using the most recent vintage tables dated July 1, 2018. The total

population in the South Mountains Region according to Census data is 505,582.

**TABLE 6.3: TOTAL POPULATION IN THE SOUTH MOUNTAINS REGION**

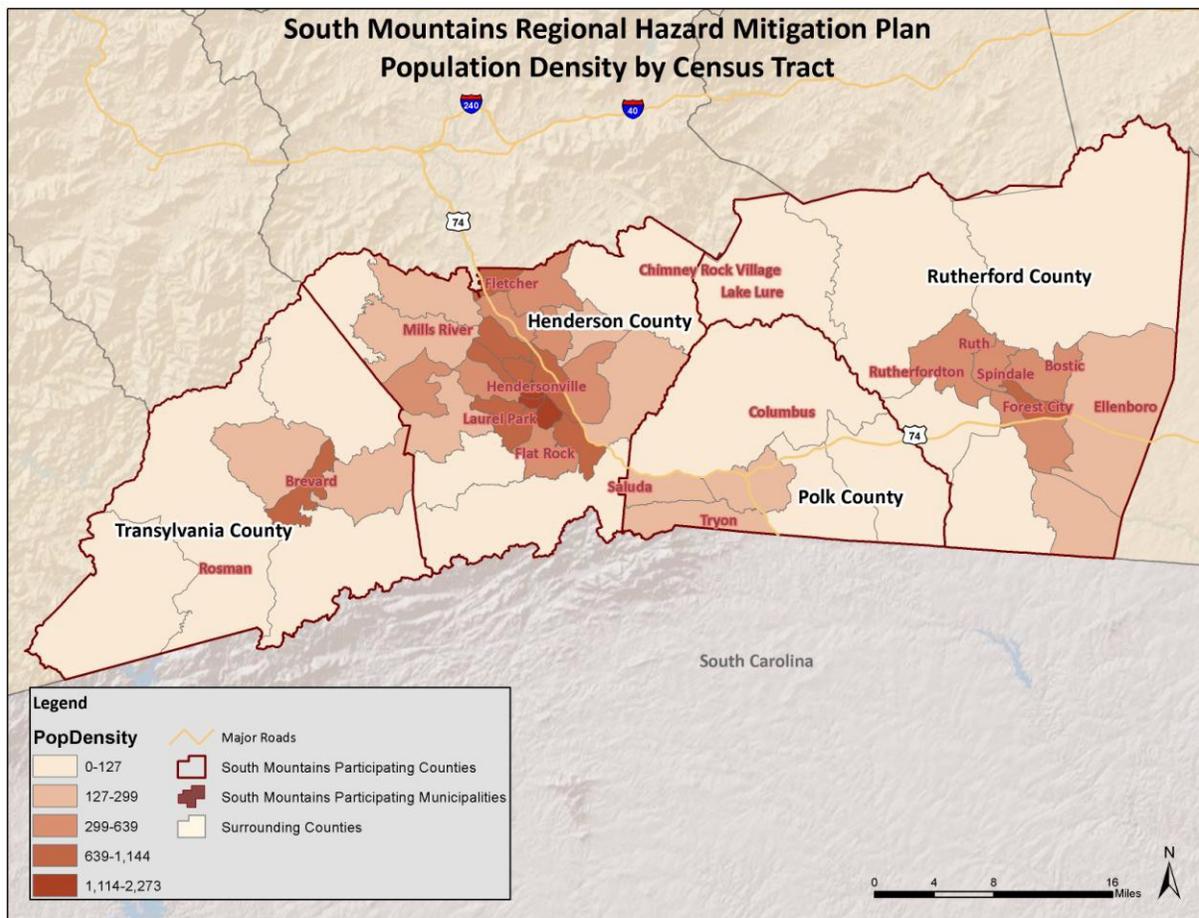
Location	2018 Population Estimates
Henderson County	116,748
Polk County	20,611
Rutherford County	66,826
Transylvania County	34,215
<b>South Mountains Regional Total</b>	<b>238,400</b>

Source: U.S. Census Bureau

Additional population estimates are presented in Section 3: *Community Profile*.

In addition, **Figure 6.2** illustrates the population density by census tract as it was reported by the US Census Bureau in 2010 and updated with 2017 population estimates.

**FIGURE 6.2: POPULATION DENSITY IN THE SOUTH MOUNTAINS REGION**



Source: U.S. Census Bureau, 2010

### 6.4.3 Development Trends and Changes in Vulnerability

Since the previous county hazard mitigation plans were approved (in 2015), the South Mountains Region has experienced limited growth and development. **Table 6.4** shows the number of building units constructed since 2014 according to the US Census American Community Survey.

**TABLE 6.4: BUILDING COUNTS FOR THE SOUTH MOUNTAINS REGION**

Location	Total Housing Units (2017)	Units Built 2014 or Later	% Building Stock Built Post-2014
<b>Henderson County</b>	<b>56,398</b>	<b>525</b>	<b>0.93</b>
Flat Rock	2,171	0	0.00
Fletcher	3,728	69	1.85
Hendersonville	8,027	55	0.69
Laurel Park	1,449	8	0.55
Mills River	2,934	24	0.82
Unincorporated Area	38,089	369	0.97
<b>Polk County</b>	<b>11,603</b>	<b>70</b>	<b>0.60</b>
Columbus	601	0	0.00
Saluda	526	3	0.57
Tryon	1,109	0	0.00
Unincorporated Area	9,367	67	0.72
<b>Rutherford County</b>	<b>34,181</b>	<b>166</b>	<b>0.49</b>
Bostic	183	0	0.00
Chimney Rock Village	210	0	0.00
Ellenboro	372	0	0.00
Forest City	3,687	0	0.00
Lake Lure	2,352	0	0.00
Ruth	209	0	0.00
Rutherfordton	2,151	0	0.00
Spindale	1,924	0	0.00
Unincorporated Area	23,093	166	0.72
<b>Transylvania County</b>	<b>19,493</b>	<b>84</b>	<b>0.43</b>
Brevard	4,125	26	0.63
Rosman	319	2	0.63
Unincorporated Area	15,049	56	0.37
<b>South Mountains Regional Total</b>	<b>121,675</b>	<b>845</b>	<b>0.69</b>

Source: US Census Bureau, Local governments

**Table 6.5** shows population growth estimates for the region from 2010 to 2017 based on the US Census Annual Estimates of Resident Population and 2017 population estimates.

**TABLE 6.5: POPULATION GROWTH FOR THE SOUTH MOUNTAINS REGION**

Location	2018	2017	2016	2010	% Change 2010-2018
<b>Henderson County</b>	<b>116,748</b>	<b>115,457</b>	<b>113,723</b>	<b>106,740</b>	<b>9.38%</b>
Flat Rock	3,362	3,325	3,273	3,114	7.96%
Fletcher	8,333	8,238	8,102	7,187	15.95%
Hendersonville	14,107	13,962	13,764	13,137	7.38%
Laurel Park	2,321	2,297	2,268	2,180	6.47%
Mills River	7,359	7,272	7,157	6,802	8.19%
Unincorporated Area	81,266	80,363	79,159	74,320	9.35%
<b>Polk County</b>	<b>20,611</b>	<b>20,518</b>	<b>20,388</b>	<b>20,510</b>	<b>0.49%</b>
Columbus	995	991	984	999	-0.40%
Saluda	692	690	691	719	-3.76%
Tryon	1,612	1,609	1,605	1,646	-2.07%
Unincorporated Area	17,312	17,228	17,108	17,146	0.97%
<b>Rutherford County</b>	<b>66,826</b>	<b>66,568</b>	<b>66,311</b>	<b>67,810</b>	<b>-1.45%</b>
Bostic	377	376	375	386	-2.33%
Chimney Rock Village	116	116	115	113	2.65%
Ellenboro	831	827	826	873	-4.81%
Forest City	7,153	7,146	7,139	7,476	-4.32%
Lake Lure	1,152	1,147	1,143	1,192	-3.36%
Ruth	415	412	410	440	-5.68%
Rutherfordton	4,058	4,048	4,017	4,213	-3.68%
Spindale	4,227	4,218	4,207	4,321	-2.18%
Unincorporated Area	48,497	48,278	48,079	48,796	-0.61%
<b>Transylvania County</b>	<b>32,415</b>	<b>33,825</b>	<b>33,406</b>	<b>33,090</b>	<b>-2.04%</b>
Brevard	7,900	7,826	7,762	7,609	3.82%
Rosman	609	602	594	576	5.73%
Unincorporated Area	23,906	25,397	25,050	24,905	-4.01%
<b>South Mountains Regional Total</b>	<b>236,600</b>	<b>236,368</b>	<b>233,828</b>	<b>228,150</b>	<b>3.70%</b>

Source: US Census Bureau, Local governments

Based on the above data, the rate of residential development and population growth in the region since 2010 has slightly increased, most dramatically in Henderson County. The overall population increased slightly in Polk County, too, but has decreased in the majority of the participating jurisdictions. Both Rutherford and Transylvania Counties have decreased overall in population since 2010. Changes in development do impact the region's vulnerability since the last update. The greater the population, the greater the risk is that persons are impacted by hazards. It should be noted that if future development occurs in vulnerable areas, populations and infrastructure will be exposed to potential hazards.

## 6.5 VULNERABILITY ASSESSMENT RESULTS

As noted earlier, only hazards with a specific geographic boundary, modeling tool, or sufficient historical data allow for further analysis. Those results are presented here. All other hazards are assumed to impact the entire planning region (drought, excessive heat, hailstorm, lightning, and severe winter weather) or, due to lack of data, analysis would not lead to credible results (sinkholes, erosion, dam failure, infectious disease, terrorism, cyber, EMP). The total region exposure, and thus risk, was presented in **Table 6.25**.

The hazards presented in this subsection include: hurricane and coastal hazards, tornadoes/thunderstorms, earthquakes, landslides, flooding, wildfires, and hazardous substances.

### 6.5.1. Hurricane and Coastal Hazards

Historical evidence indicates that the South Mountains Region has a significant risk to the hurricane and tropical storm hazard, mostly due to the location of the state of North Carolina. In recent years, there have been four disaster declarations from hurricanes in the region (Hurricane Hugo, Tropical Storm Frances, Hurricane Katrina Evacuation). The most recent hurricane experienced by the region was Hurricane Florence in 2018. Many more storm tracks have come near or traversed through the region, as shown and discussed in Section 5: Hazard Profiles.

Numerous secondary hazards, such as erosion, flooding, tornadoes, and high winds, tend to be a result of hurricanes or tropical storms. These cumulative effects often make potential loss estimates difficult to calculate and track.

NCEM's Risk Management Tool analyzes hurricane winds and no other hazards often associated with hurricanes; therefore, only hurricane winds are analyzed in this section. Building and population vulnerabilities to hurricane winds in a 50-year frequency event (return period) are reported in the following **Table 6.6** and **Table 6.7**.

It is assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard.

**TABLE 6.6: BUILDING VULNERABILITIES TO HURRICANE WINDS IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>27,549</b>	<b>48,732</b>	<b>\$5,003,698</b>	<b>2,604</b>	<b>\$957,422</b>	<b>686</b>	<b>\$292,295</b>	<b>52,022</b>	<b>\$6,253,415</b>
Flat Rock	651	1,894	\$261,892	59	\$15,120	33	\$5,593	1,986	\$282,604
Fletcher	961	2,689	\$238,066	173	\$169,810	18	\$5,976	2,880	\$413,853
Hendersonville	6,145	7,632	\$881,693	1,176	\$317,548	147	\$54,366	8,955	\$1,253,607
Laurel Park	997	957	\$143,138	36	\$32,653	6	\$641	999	\$176,432
Mills River	1,288	3,270	\$318,008	139	\$140,712	45	\$20,797	3,454	\$479,517
Unincorporated Area	17,507	32,290	\$3,160,901	1,021	\$281,579	437	\$204,922	33,748	\$3,647,402
<b>Polk County</b>	<b>11,074</b>	<b>10,137</b>	<b>\$863,723</b>	<b>738</b>	<b>\$192,501</b>	<b>194</b>	<b>\$85,137</b>	<b>11,069</b>	<b>\$1,141,362</b>
Columbus	499	358	\$29,927	109	\$9,940	32	\$5,580	499	\$45,447

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Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Saluda	474	401	\$46,428	57	\$4,351	15	\$1,325	473	\$52,104
Tryon	1,527	1,277	\$118,897	203	\$14,300	44	\$6,635	1,524	\$139,832
Unincorporated Area	8,574	8,101	\$668,471	369	\$163,910	103	\$71,597	8,573	\$903,979
<b>Rutherford County</b>	<b>37,096</b>	<b>34,997</b>	<b>\$3,121,496</b>	<b>2,503</b>	<b>\$903,071</b>	<b>450</b>	<b>\$178,793</b>	<b>37,950</b>	<b>\$4,203,359</b>
Bostic	201	186	\$9,712	7	\$183	8	\$3,796	201	\$13,691
Chimney Rock Village	200	171	\$8,386	26	\$458	3	\$370	200	\$9,214
Ellenboro	499	472	\$31,907	16	\$2,896	11	\$371	499	\$35,174
Forest City	5,379	4,646	\$431,408	634	\$255,974	91	\$22,671	5,371	\$710,053
Lake Lure	1,687	1,549	\$183,641	120	\$59,893	18	\$16,682	1,687	\$260,215
Ruth	192	161	\$12,304	19	\$3,543	12	\$1,033	192	\$16,880
Rutherfordton	1,874	1,591	\$164,604	233	\$53,964	49	\$4,445	1,873	\$223,013
Spindale	2,095	1,878	\$178,508	191	\$113,922	25	\$5,202	2,094	\$297,632
Unincorporated Area	24,969	24,343	\$2,101,026	1,257	\$412,238	233	\$124,223	25,833	\$2,637,487
<b>Transylvania County</b>	<b>11,301</b>	<b>20,041</b>	<b>\$1,366,504</b>	<b>1,113</b>	<b>\$168,875</b>	<b>401</b>	<b>\$71,485</b>	<b>21,555</b>	<b>\$1,606,864</b>
Brevard	3,710	4,590	\$304,894	508	\$77,088	210	\$39,008	5,308	\$420,990
Rosman	175	279	\$18,772	27	\$472	16	\$6,417	322	\$25,661
Unincorporated Area	7,416	15,172	\$1,042,838	578	\$91,315	175	\$26,060	15,925	\$1,160,213
<b>South Mountains Regional Total</b>	<b>87,020</b>	<b>113,907</b>	<b>\$10,355,421</b>	<b>6,958</b>	<b>\$2,221,869</b>	<b>1,731</b>	<b>\$627,710</b>	<b>122,596</b>	<b>\$13,205,000</b>

Source: NCEM Risk Management Tool

**TABLE 6.7: POPULATION VULNERABILITIES TO HURRICANE WINDS IN THE SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>23,639</b>	<b>5,957</b>	<b>105,700</b>
Flat Rock	678	171	3,032
Fletcher	1,598	403	7,143
Hendersonville	4,645	1,171	20,769
Laurel Park	483	122	2,162
Mills River	1,498	377	6,698
Unincorporated Area	14,737	3,713	65,896
<b>Polk County</b>	<b>4,962</b>	<b>925</b>	<b>20,378</b>
Columbus	228	43	938
Saluda	172	33	707
Tryon	621	115	2,551
Unincorporated Area	3,941	734	16,182
<b>Rutherford County</b>	<b>11,667</b>	<b>3,857</b>	<b>67,479</b>
Bostic	66	22	381
Chimney Rock Village	20	6	116
Ellenboro	148	49	856
Forest City	1,925	637	11,133
Lake Lure	205	67	1,187

Location	Elderly At Risk	Children At Risk	Total At Risk
Ruth	77	25	442
Rutherfordton	744	246	4,301
Spindale	750	248	4,342
Unincorporated Area	7,732	2,557	44,721
<b>Transylvania County</b>	<b>8,437</b>	<b>1,499</b>	<b>32,680</b>
Brevard	2,568	456	9,948
Rosman	132	24	513
Unincorporated Area	5,737	1,019	22,219
<b>South Mountains Regional Total</b>	<b>48,705</b>	<b>12,238</b>	<b>226,237</b>

Source: NCEM Risk Management Tool

**SOCIAL VULNERABILITY**

Given some equal susceptibility across the entire South Mountains Region, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

**CRITICAL FACILITIES**

Given equal vulnerability across the South Mountains Region, all critical facilities are considered to be at risk. Although some buildings may perform better than others in the face of such an event due to construction, age, and other factors, determining individual building response is beyond the scope of this plan. However, this plan will consider mitigation actions for vulnerable structures, including critical facilities, to reduce the impacts of the hurricane wind hazard. A list of specific critical facilities and their associated risk can be found in **Table 6.25** at the end of this section.

In conclusion, a hurricane event has the potential to impact many existing and future buildings, critical facilities, and populations in the South Mountains Region. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

**6.5.2 Tornadoes/Thunderstorms**

**Tornadoes**

A probabilistic scenario was created to estimate building and population vulnerabilities in the South Mountains region for the tornado hazard. For this scenario, a tornado ranked F2 on the Fujita scale was analyzed. The Risk Management Tool analyzed this information which has been reported in **Table 6.8** and **Table 6.9**.

**TABLE 6.8: BUILDING VULNERABILITY TO THE TORNADES HAZARD IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>27,759</b>	<b>49,208</b>	<b>\$7,033,718,797</b>	<b>2,605</b>	<b>\$2,920,143,027</b>	<b>686</b>	<b>\$736,961,626</b>	<b>52,499</b>	<b>\$10,690,823,450</b>
Flat Rock	665	1,936	\$540,479,559	59	\$40,874,353	33	\$16,633,132	2,028	\$597,987,044
Fletcher	963	2,705	\$386,825,113	173	\$512,116,039	18	\$19,200,016	2,896	\$918,141,168
Hendersonville	6,173	7,694	\$1,069,496,576	1,177	\$993,433,240	147	\$182,329,163	9,018	\$2,245,258,979
Laurel Park	1,007	968	\$208,063,422	36	\$63,535,450	6	\$4,153,946	1,010	\$275,752,818
Mills River	1,303	3,294	\$454,832,759	139	\$336,325,212	45	\$50,363,068	3,478	\$841,521,039
Unincorporated Area	17,648	32,611	\$4,374,021,368	1,021	\$973,858,733	437	\$464,282,301	34,069	\$5,812,162,402
<b>Polk County</b>	<b>11,147</b>	<b>10,208</b>	<b>\$1,357,464,496</b>	<b>739</b>	<b>\$551,302,686</b>	<b>195</b>	<b>\$175,838,752</b>	<b>11,142</b>	<b>\$2,084,605,932</b>
Columbus	499	358	\$52,663,813	109	\$66,291,396	32	\$17,106,385	499	\$136,061,593
Saluda	475	402	\$51,341,700	57	\$23,699,843	15	\$8,009,102	474	\$83,050,645
Tryon	1,546	1,295	\$195,007,841	204	\$97,190,785	44	\$29,265,823	1,543	\$321,464,449
Unincorporated Area	8,627	8,153	\$1,058,451,142	369	\$364,120,662	104	\$121,457,442	8,626	\$1,544,029,245
<b>Rutherford County</b>	<b>37,278</b>	<b>35,183</b>	<b>\$4,096,226,618</b>	<b>2,504</b>	<b>\$2,591,112,971</b>	<b>450</b>	<b>\$376,334,811</b>	<b>38,137</b>	<b>\$7,063,674,401</b>
Bostic	205	190	\$16,620,098	7	\$1,401,825	8	\$14,278,300	205	\$32,300,224
Chimney Rock Village	200	171	\$19,187,815	26	\$5,411,706	3	\$2,417,973	200	\$27,017,493
Ellenboro	499	472	\$39,114,006	16	\$8,868,406	11	\$2,265,191	499	\$50,247,603
Forest City	5,388	4,655	\$602,649,515	634	\$837,041,500	91	\$59,949,819	5,380	\$1,499,640,834
Lake Lure	1,699	1,561	\$257,575,958	120	\$70,466,271	18	\$11,859,460	1,699	\$339,901,689
Ruth	193	162	\$20,466,441	19	\$9,016,533	12	\$4,887,834	193	\$34,370,808
Rutherfordton	1,879	1,596	\$202,898,001	233	\$253,220,407	49	\$19,885,448	1,878	\$476,003,856
Spindale	2,102	1,885	\$232,414,408	191	\$300,402,124	25	\$18,887,212	2,101	\$551,703,744
Unincorporated Area	25,113	24,491	\$2,705,300,376	1,258	\$1,105,284,199	233	\$241,903,574	25,982	\$4,052,488,150
<b>Transylvania County</b>	<b>11,422</b>	<b>20,274</b>	<b>\$2,547,065,896</b>	<b>1,114</b>	<b>\$633,327,179</b>	<b>401</b>	<b>\$233,799,734</b>	<b>21,789</b>	<b>\$3,414,192,809</b>
Brevard	3,775	4,671	\$518,811,556	508	\$359,621,007	210	\$156,310,103	5,389	\$1,034,742,666
Rosman	175	279	\$17,483,495	27	\$3,813,522	16	\$14,200,162	322	\$35,497,179
Unincorporated Area	7,472	15,324	\$2,010,770,845	579	\$269,892,650	175	\$63,289,469	16,078	\$2,343,952,964
<b>South Mountains Regional Total</b>	<b>87,606</b>	<b>114,873</b>	<b>\$15,034,475,807</b>	<b>6,962</b>	<b>\$6,695,885,863</b>	<b>1,732</b>	<b>\$1,522,934,923</b>	<b>123,567</b>	<b>\$23,253,296,592</b>

Source: NCEM Risk Management Tool

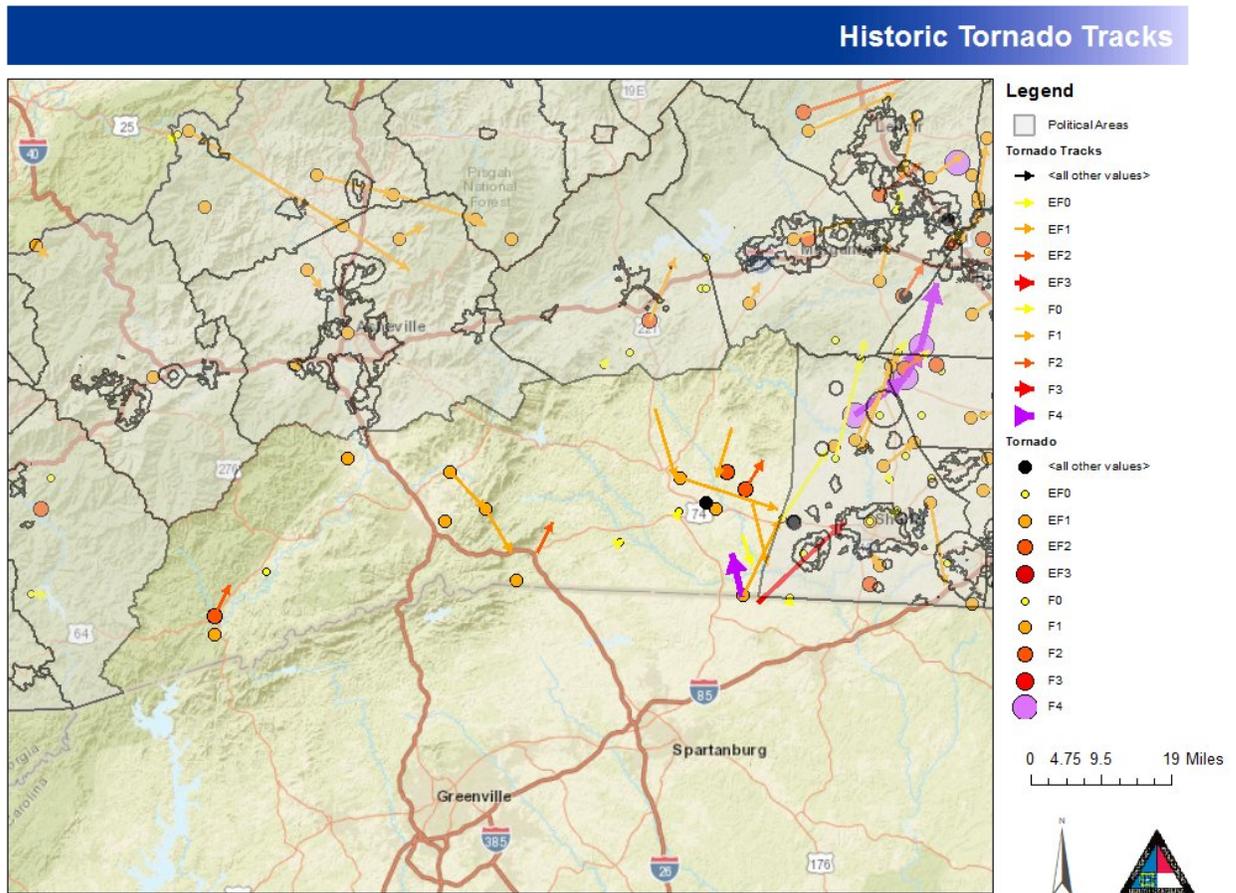
**TABLE 6.9: POPULATION VULNERABILITY TO THE TORNADES HAZARD IN THE SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>23,863</b>	<b>6,013</b>	<b>106,703</b>
Flat Rock	693	175	3,099
Fletcher	1,607	405	7,185
Hendersonville	4,682	1,180	20,935
Laurel Park	489	123	2,187
Mills River	1,509	380	6,747
Unincorporated Area	14,883	3,750	66,550
<b>Polk County</b>	<b>4,996</b>	<b>932</b>	<b>20,518</b>
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,966	739	16,285
<b>Rutherford County</b>	<b>11,726</b>	<b>3,877</b>	<b>67,820</b>
Bostic	67	22	389
Chimney Rock Village	20	6	116
Ellenboro	148	49	856
Forest City	1,929	638	11,154
Lake Lure	207	68	1,196
Ruth	77	25	445
Rutherfordton	746	247	4,314
Spindale	753	249	4,358
Unincorporated Area	7,779	2,573	44,992
<b>Transylvania County</b>	<b>8,539</b>	<b>1,517</b>	<b>33,076</b>
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,794	1,029	22,441
<b>South Mountains Regional Total</b>	<b>49,124</b>	<b>12,339</b>	<b>228,117</b>

Source: NCEM Risk Management Tool

A map of historical tornado points of origin and paths can be seen below in **Figure 6.3**.

FIGURE 6.3: HISTORICAL TORNADO TRACKS IN THE SOUTH MOUNTAINS REGION



Source: NCEM Risk Management Tool

**Thunderstorms**

A probabilistic scenario was created to estimate building and population vulnerabilities in the South Mountains region for the thunderstorm hazard. For this scenario, damages due to thunderstorm winds on a 50-year frequency event (return period) were analyzed. It is important to note that this data does not include damages caused by other remnants of thunderstorms, such as lightning or hail. The Risk Management Tool analyzed this information which has been reported below in **Table 6.10** and **Table 6.11**.

**TABLE 6.10: BUILDING VULNERABILITY TO THUNDERSTORM WINDS IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>27,758</b>	<b>49,203</b>	<b>\$18,000,943</b>	<b>2,605</b>	<b>\$4,743,326</b>	<b>686</b>	<b>\$1,464,593</b>	<b>52,494</b>	<b>\$24,208,863</b>
Flat Rock	665	1,936	\$1,124,310	59	\$75,668	33	\$30,184	2,028	\$1,230,163
Fletcher	963	2,705	\$902,411	173	\$861,304	18	\$22,696	2,896	\$1,786,411
Hendersonville	6,173	7,694	\$2,890,313	1,177	\$1,453,067	147	\$248,143	9,018	\$4,591,523
Laurel Park	1,007	968	\$499,577	36	\$173,529	6	\$3,569	1,010	\$676,675
Mills River	1,303	3,294	\$1,214,485	139	\$735,648	45	\$97,008	3,478	\$2,047,141
Unincorporated Area	17,647	32,606	\$11,369,847	1,021	\$1,444,110	437	\$1,062,993	34,064	\$13,876,950
<b>Polk County</b>	<b>11,125</b>	<b>10,188</b>	<b>\$3,125,138</b>	<b>738</b>	<b>\$961,063</b>	<b>194</b>	<b>\$433,003</b>	<b>11,120</b>	<b>\$4,519,203</b>
Columbus	499	358	\$121,772	109	\$41,640	32	\$26,436	499	\$189,848
Saluda	475	402	\$142,140	57	\$19,777	15	\$5,878	474	\$167,795
Tryon	1,545	1,295	\$408,744	203	\$53,704	44	\$28,351	1,542	\$490,799
Unincorporated Area	8,606	8,133	\$2,452,482	369	\$845,942	103	\$372,338	8,605	\$3,670,761
<b>Rutherford County</b>	<b>37,255</b>	<b>35,161</b>	<b>\$10,637,649</b>	<b>2503</b>	<b>\$4,112,474</b>	<b>450</b>	<b>\$840,432</b>	<b>38,114</b>	<b>\$15,590,553</b>
Bostic	205	190	\$39,112	7	\$538	8	\$24,987	205	\$64,637
Chimney Rock Village	200	171	\$33,580	26	\$1,953	3	\$2,706	200	\$38,238
Ellenboro	499	472	\$111,629	16	\$13,112	11	\$1,050	499	\$125,791
Forest City	5,388	4,655	\$1,471,494	634	\$1,138,224	91	\$102,191	5,380	\$2,711,908
Lake Lure	1,699	1,561	\$633,468	120	\$236,180	18	\$82,875	1,699	\$952,523
Ruth	193	162	\$51,548	19	\$18,032	12	\$4,790	193	\$74,370
Rutherfordton	1,879	1,596	\$555,295	233	\$195,183	49	\$15,139	1,878	\$765,617
Spindale	2,102	1,885	\$599,384	191	\$535,321	25	\$19,939	2,101	\$1,154,644
Unincorporated Area	25,090	24,469	\$7,142,139	1,257	\$1,973,931	233	\$586,755	25,959	\$9,702,825
<b>Transylvania County</b>	<b>11,421</b>	<b>20,264</b>	<b>\$5,223,062</b>	<b>1,113</b>	<b>\$754,867</b>	<b>401</b>	<b>\$311,362</b>	<b>21,778</b>	<b>\$6,289,291</b>
Brevard	3,775	4,671	\$1,164,802	508	\$337,777	210	\$167,037	5,389	\$1,669,616
Rosman	175	279	\$56,755	27	\$1,065	16	\$27,660	322	\$85,480
Unincorporated Area	7,471	15,314	\$4,001,505	578	\$416,025	175	\$116,665	16,067	\$4,534,195
<b>South Mountains Regional Total</b>	<b>87,559</b>	<b>114,816</b>	<b>\$36,986,792</b>	<b>6,959</b>	<b>\$10,571,730</b>	<b>1,731</b>	<b>\$3,049,390</b>	<b>123,506</b>	<b>\$50,607,910</b>

Source: NCEM Risk Management Tool

**TABLE 6.11: POPULATION VULNERABILITY TO THUNDERSTORM WINDS IN THE SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>23,861</b>	<b>6,012</b>	<b>106,693</b>
Flat Rock	693	175	3,099
Fletcher	1,607	405	7,185
Hendersonville	4,682	1,180	20,935
Laurel Park	489	123	2,187
Mills River	1,509	380	6,747
Unincorporated Area	14,881	3,749	66,540
<b>Polk County</b>	<b>16,792</b>	<b>4,833</b>	<b>88,763</b>
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,956	737	16,245
<b>Rutherford County</b>	<b>11,719</b>	<b>3,875</b>	<b>67,780</b>
Bostic	67	22	389
Chimney Rock Village	20	6	116
Ellenboro	148	49	856
Forest City	1,929	638	11,154
Lake Lure	207	68	1,196
Ruth	77	25	445
Rutherfordton	746	247	4,314
Spindale	753	249	4,358
Unincorporated Area	7,772	2,571	44,952
<b>Transylvania County</b>	<b>8,535</b>	<b>1,516</b>	<b>33,061</b>
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,790	1,028	22,426
<b>South Mountains Regional Total</b>	<b>60,907</b>	<b>16,236</b>	<b>296,297</b>

Source: NCEM Risk Management Tool

### SOCIAL VULNERABILITY

It is assumed that all existing populations and future populations are at risk to the tornadoes/thunderstorms hazard.

### CRITICAL FACILITIES

All critical facilities should still be considered at-risk to damage should an event occur. A list of all individual critical facilities in the region can be found in **Table 6.25**.

### 6.5.3. Earthquakes

A probabilistic scenario was created to estimate building and population vulnerabilities in the South Mountains region for the earthquake hazard with a 500-year frequency (return period). The Risk Management Tool analyzed this information which has been reported below in **Table 6.12** and **Table 6.13**.

**TABLE 6.12: BUILDING VULNERABILITY TO THE EARTHQUAKE HAZARD IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>27,759</b>	<b>49,208</b>	<b>\$16,941,761</b>	<b>2605</b>	<b>\$13,809,002</b>	<b>686</b>	<b>\$3,791,487</b>	<b>52,499</b>	<b>\$34,542,252</b>
Flat Rock	665	1,936	\$1,180,074	59	\$173,512	33	\$91,667	2,028	\$1,445,253
Fletcher	963	2,705	\$953,024	173	\$2,486,804	18	\$102,165	2,896	\$3,541,993
Hendersonville	6,173	7,694	\$2,783,479	1,177	\$5,304,194	147	\$1,060,198	9,018	\$9,147,872
Laurel Park	1,007	968	\$541,280	36	\$280,888	6	\$24,683	1,010	\$846,851
Mills River	1,303	3,294	\$1,099,660	139	\$1,144,919	45	\$287,056	3,478	\$2,531,635
Unincorporated Area	17,648	32,611	\$10,384,244	1,021	\$4,418,685	437	\$2,225,718	34,069	\$17,028,648
<b>Polk County</b>	<b>11,147</b>	<b>10,208</b>	<b>\$3,212,331</b>	<b>739</b>	<b>\$2,589,208</b>	<b>195</b>	<b>\$903,671</b>	<b>11,142</b>	<b>\$6,705,208</b>
Columbus	499	358	\$142,701	109	\$355,692	32	\$100,031	499	\$598,424
Saluda	475	402	\$128,404	57	\$117,508	15	\$44,495	474	\$290,406
Tryon	1,546	1,295	\$535,631	204	\$493,465	44	\$168,951	1,543	\$1,198,046
Unincorporated Area	8,627	8,153	\$2,405,595	369	\$1,622,543	104	\$590,194	8,626	\$4,618,332
<b>Rutherford County</b>	<b>37,278</b>	<b>35,183</b>	<b>\$9,115,408</b>	<b>2504</b>	<b>\$11,467,660</b>	<b>450</b>	<b>\$1,893,739</b>	<b>38,137</b>	<b>\$22,476,806</b>
Bostic	205	190	\$37,888	7	\$6,900	8	\$56,314	205	\$101,101
Chimney Rock Village	200	171	\$53,671	26	\$27,157	3	\$13,272	200	\$94,100
Ellenboro	499	472	\$91,439	16	\$38,834	11	\$13,708	499	\$143,981
Forest City	5,388	4,655	\$1,540,267	634	\$3,593,664	91	\$320,043	5,380	\$5,453,974
Lake Lure	1,699	1,561	\$639,926	120	\$313,336	18	\$49,301	1,699	\$1,002,563
Ruth	193	162	\$44,226	19	\$35,365	12	\$25,236	193	\$104,827
Rutherfordton	1,879	1,596	\$487,521	233	\$1,223,695	49	\$116,615	1,878	\$1,827,831
Spindale	2,102	1,885	\$540,618	191	\$1,480,464	25	\$124,000	2,101	\$2,145,082
Unincorporated Area	25,113	24,491	\$5,679,852	1,258	\$4,748,245	233	\$1,175,250	25,982	\$11,603,347
<b>Transylvania County</b>	<b>11,422</b>	<b>20,274</b>	<b>\$6,901,705</b>	<b>1,114</b>	<b>\$3,251,460</b>	<b>401</b>	<b>\$1,421,547</b>	<b>21,789</b>	<b>\$11,574,713</b>
Brevard	3,775	4,671	\$1,584,242	508	\$1,766,662	210	\$926,903	5,389	\$4,277,808
Rosman	175	279	\$49,796	27	\$23,464	16	\$89,446	322	\$162,706
Unincorporated Area	7,472	15,324	\$5,267,667	579	\$1,461,334	175	\$405,198	16,078	\$7,134,199
<b>South Mountains Regional Total</b>	<b>87,606</b>	<b>114,873</b>	<b>\$36,171,205</b>	<b>6,962</b>	<b>\$31,117,330</b>	<b>1,732</b>	<b>\$8,010,444</b>	<b>123,567</b>	<b>\$75,298,979</b>

Source: NCEM Risk Management Tool

**TABLE 6.13: POPULATION VULNERABILITY TO THE EARTHQUAKE HAZARD IN THE SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>23,863</b>	<b>6,013</b>	<b>106,703</b>
Flat Rock	693	175	3,099
Fletcher	1,607	405	7,185
Hendersonville	4,682	1,180	20,935
Laurel Park	489	123	2,187
Mills River	1,509	380	6,747
Unincorporated Area	14,883	3,750	66,550
<b>Polk County</b>	<b>4,996</b>	<b>932</b>	<b>20,518</b>
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,966	739	16,285
<b>Rutherford County</b>	<b>11,726</b>	<b>3,877</b>	<b>67,820</b>
Bostic	67	22	389
Chimney Rock Village	20	6	116
Ellenboro	148	49	856
Forest City	1,929	638	11,154
Lake Lure	207	68	1,196
Ruth	77	25	445
Rutherfordton	746	247	4,314
Spindale	753	249	4,358
Unincorporated Area	7,779	2,573	44,992
<b>Transylvania County</b>	<b>8,539</b>	<b>1,517</b>	<b>33,076</b>
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,794	1,029	22,441
<b>South Mountains Regional Total</b>	<b>49,124</b>	<b>12,339</b>	<b>228,117</b>

Source: NCEM Risk Management Tool

### SOCIAL VULNERABILITY

It is assumed that all existing populations and future populations are at risk to the earthquake hazard.

### CRITICAL FACILITIES

All critical facilities should still be considered at-risk to minor damage should an event occur. A list of all individual critical facilities in the region can be found in **Table 6.25**.

In conclusion, an earthquake could potentially impact all existing and future buildings, facilities, and populations in the South Mountains region. Though minor earthquakes are often recorded but not felt, they may rattle breakables and cause minimal damage. Furthermore, major earthquakes have potential to damage structures. Severe impacts of earthquakes may result in debris clean-up, service disruption,

building collapse, and fatalities. Specific vulnerabilities for assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available. Furthermore, mitigation actions to address earthquake vulnerability will be considered.

#### 6.5.4. Geological (Landslide)

GIS analysis was used to complete the vulnerability assessment for landslides in the South Mountains Region. The potential dollar value of exposed land and property total can be determined using the USGS Landslide Susceptibility Index (detailed in Section 5: *Hazard Profiles*), county level tax parcel data, and GIS analysis. **Table 6.14** presents the potential at-risk property where available. All areas of the South Mountains Region are identified as moderate or high incidence areas by the USGS landslide data. The incidence levels (high and moderate) were used to identify different areas of concern for the analysis below.

**TABLE 6.14: TOTAL POTENTIAL AT-RISK PARCELS FOR THE GEOLOGICAL (LANDSLIDE) HAZARD**

Location	Number of Parcels at Risk		Number of Improvements at Risk		Total Value of Improvements at Risk (\$)	
	Moderate	High	Moderate	High	Moderate	High
<b>Henderson County</b>	<b>0</b>	<b>10,338</b>	<b>0</b>	<b>7,196</b>	<b>\$0</b>	<b>\$1,315,342,700</b>
Flat Rock	0	0	0	0	\$0	\$0
Fletcher	0	1,467	0	1,337	\$0	\$233,371,300
Hendersonville	0	0	0	0	\$0	\$0
Laurel Park	0	0	0	0	\$0	\$0
Mills River	0	3,632	0	2,645	\$0	\$556,340,200
Unincorporated Area	0	5,239	0	3,214	\$0	\$525,631,200
<b>Polk County</b>	<b>0</b>	<b>17,470</b>	<b>0</b>	<b>10,413</b>	<b>\$0</b>	<b>\$1,742,637,947</b>
Columbus	0	582	0	444	\$0	\$105,478,936
Saluda	0	694	0	484	\$0	\$72,103,817
Tryon	0	1,099	0	831	\$0	\$123,701,661
Unincorporated Area	0	15,095	0	8,654	\$0	\$1,441,353,533
<b>Rutherford County</b>	<b>0</b>	<b>11,706</b>	<b>0</b>	<b>7,515</b>	<b>\$0</b>	<b>\$607,323,288</b>
Bostic	0	0	0	0	\$0	\$0
Chimney Rock Village	0	0	0	0	\$0	\$0
Ellenboro	0	0	0	0	\$0	\$0
Forest City	0	195	0	143	\$0	\$6,477,514
Lake Lure	0	9	0	5	\$0	\$3,921,900
Ruth	0	0	0	0	\$0	\$0
Rutherfordton	0	9	0	2	\$0	\$661,256
Spindale	0	0	0	0	\$0	\$0
Unincorporated Area	0	11,493	0	7,365	\$0	\$596,262,618
<b>Transylvania County</b>	<b>812</b>	<b>34,029</b>	<b>423</b>	<b>22,511</b>	<b>\$52,435,480</b>	<b>\$11,788,239,115</b>
Brevard	0	5,688	0	4,575	\$0	\$3,380,610,250
Rosman	0	0	0	0	\$0	\$0

Location	Number of Parcels at Risk		Number of Improvements at Risk		Total Value of Improvements at Risk (\$)	
	Moderate	High	Moderate	High	Moderate	High
Unincorporated Area	812	28,341	423	17,936	\$52,435,480	\$8,407,628,865
<b>South Mountains Regional Total</b>	<b>812</b>	<b>73,543</b>	<b>423</b>	<b>47,635</b>	<b>\$52,435,480</b>	<b>\$15,453,543,050</b>

Source: United States Geological Survey, Local governments

**SOCIAL VULNERABILITY**

Given moderate to high susceptibility across the entire South Mountains Region, it is assumed that the total population is at risk.

**CRITICAL FACILITIES**

There are 67 critical facilities located in a high susceptibility area, including the following: 32 fire/EMS stations, 6 police stations, 14 schools, and 14 others. All but one of the remaining critical facilities are located in low incidence areas, and one is located in a moderate incidence area. A list of specific critical facilities and their associated risk can be found in **Table 6.25** at the end of this section.

In conclusion, a landslide has the potential to impact many existing and future buildings, facilities, and populations in the South Mountains Region, though some areas are at a higher risk than others due to a variety of factors. For example, steep slopes and modified slopes bear a greater risk than flat areas. Specific vulnerabilities for South Mountains assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available.

**6.5.5 Flooding**

Historical evidence indicates that the South Mountains Region is susceptible to flood events. A total of 206 flood events have been reported by the National Centers for Environmental Information since 1993, resulting in over \$45 million dollars in damages, but no fatalities. On an annualized level, these damages amounted to over \$73,000 for the South Mountains Region.

In order to assess flood risk, a GIS-based analysis was used to estimate exposure to flood events using Digital Flood Insurance Rate Map (DFIRM) data in combination with local tax assessor records for each of the South Mountains counties. The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total assessed building values for only those improved properties that were confirmed to be located within an identified floodplain. **Table 6.15** presents the potential at-risk property. Both the number of parcels and the approximate value are presented.

**TABLE 6.15: ESTIMATED EXPOSURE OF PARCELS TO THE FLOODING HAZARD**

Location	1.0-percent ACF			2.0-percent ACF		
	Approx. Number of Parcels	Approx. Number of Improved Buildings	Approx. Improved Value of Buildings	Approx. Number of Parcels	Approx. Number of Improved Buildings	Approx. Improved Value of Buildings
<b>Henderson County</b>	<b>4,793</b>	<b>3,286</b>	<b>\$856,697,700</b>	<b>3,526</b>	<b>2,652</b>	<b>\$657,226,300</b>
Flat Rock	141	95	\$33,549,200	58	33	\$10,601,900
Fletcher	581	519	\$116,853,400	608	556	\$117,941,800
Hendersonville	995	757	\$173,932,600	840	687	\$133,409,700
Laurel Park	71	59	\$7,012,200	100	85	\$11,297,600
Mills River	363	211	\$60,319,600	331	203	\$65,988,800
Unincorporated Area	2,642	1,645	\$465,030,700	1,589	1,088	\$317,986,500
<b>Polk County</b>	<b>2,357</b>	<b>1,331</b>	<b>\$322,449,711</b>	<b>1,236</b>	<b>798</b>	<b>\$164,643,151</b>
Columbus	3	2	\$293,119	0	0	\$0
Saluda	582	444	\$105,478,936	694	484	\$72,103,817
Tryon	93	46	\$11,088,296	5	4	\$1,915,816
Unincorporated Area	1,679	839	\$205,589,360	537	310	\$90,623,518
<b>Rutherford County</b>	<b>5,603</b>	<b>3,047</b>	<b>\$663,262,427</b>	<b>1,260</b>	<b>793</b>	<b>\$75,657,278</b>
Bostic	1	1	\$5,300	258	179	\$22,127,584
Chimney Rock Village	87	42	\$4,938,301	96	51	\$5,452,801
Ellenboro	513	383	\$17,280,819	513	383	\$17,280,819
Forest City	174	76	\$15,682,600	83	37	\$10,100,676
Lake Lure	934	698	\$132,502,666	14	10	\$2,557,400
Ruth	10	3	\$311,600	0	0	\$0
Rutherfordton	221	132	\$14,083,308	37	26	\$2,206,700
Spindale	35	18	\$3,078,957	0	0	\$0
Unincorporated Area	3,628	1,694	\$475,378,876	259	107	\$15,931,298
<b>Transylvania County</b>	<b>4,707</b>	<b>3,418</b>	<b>\$7,015,773,422</b>	<b>3,908</b>	<b>2,970</b>	<b>\$6,981,774,552</b>
Brevard	951	740	\$2,355,233,346	874	693	\$2,376,791,136
Rosman	61	34	\$5,021,870	73	44	\$5,351,680
Unincorporated Area	3,695	2,644	\$4,655,518,206	2,961	2,233	\$4,599,631,736
<b>South Mountains Regional Total</b>	<b>17,460</b>	<b>11,082</b>	<b>\$8,858,183,260</b>	<b>9,930</b>	<b>7,213</b>	<b>\$7,879,301,281</b>

Source: FEMA DFIRM

To assess flood risk, the NCEM Risk Management Tool (RMT) analyzed buildings located in the 1 percent

chance of annual floodplains. The buildings are assessed by the type of building (commercial, residential, or public) and also assesses Pre-Firm buildings, or structures built before flood code regulations were installed. This data is broken down by jurisdiction in **Table 6.16**.

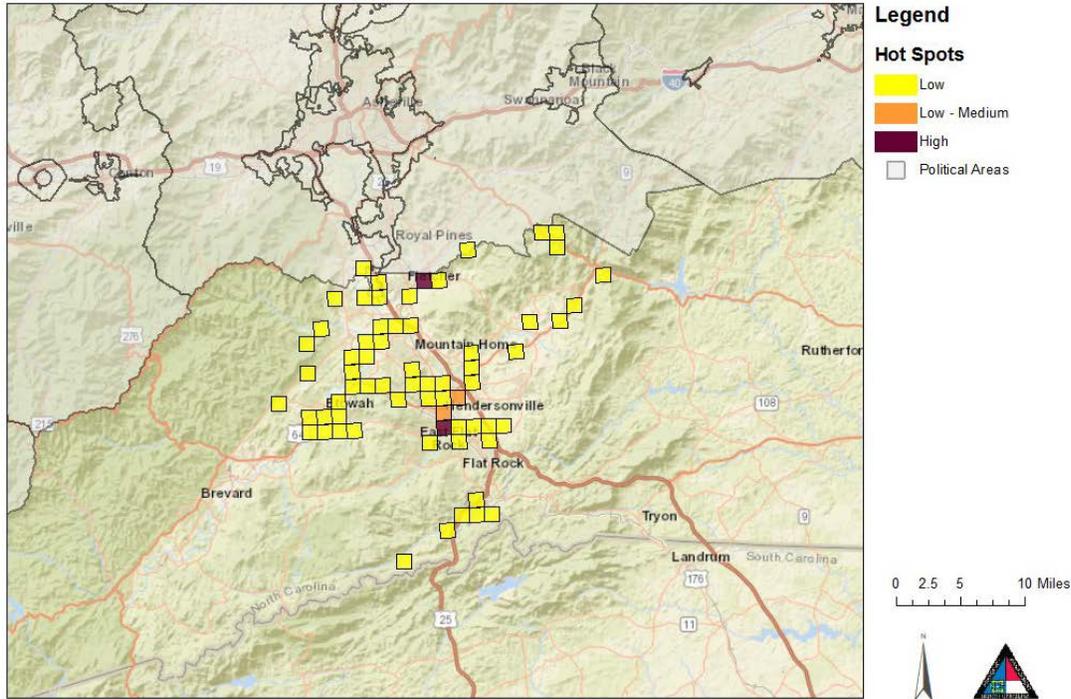
**TABLE 6.16: BUILDING VULNERABILITY FOR THE 100-YEAR FLOODPLAINS IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>378</b>	<b>485</b>	<b>\$2,892,028</b>	<b>116</b>	<b>\$5,098,735</b>	<b>7</b>	<b>\$175,458</b>	<b>608</b>	<b>\$8,166,221</b>
Flat Rock	3	5	\$7,203	0	\$0	0	\$0	5	\$7,203
Fletcher	11	24	\$112,174	14	\$2,115,550	0	\$0	38	\$2,227,724
Hendersonville	134	107	\$677,239	70	\$2,119,905	1	\$36,525	178	\$2,833,669
Laurel Park	0	0	\$0	0	\$0	0	\$0	0	\$0
Mills River	23	66	\$160,029	3	\$51,861	0	\$0	69	\$211,890
Unincorporated Area	207	283	\$1,935,383	29	\$811,419	6	\$138,933	318	\$2,885,735
<b>Polk County</b>	<b>125</b>	<b>107</b>	<b>\$1,038,222</b>	<b>16</b>	<b>\$889,325</b>	<b>2</b>	<b>\$32,241</b>	<b>125</b>	<b>\$1,959,788</b>
Columbus	0	0	\$0	0	\$0	0	\$0	0	\$0
Saluda	0	0	\$0	0	\$0	0	\$0	0	\$0
Tryon	45	33	\$198,209	10	\$618,947	2	\$32,241	45	\$849,397
Unincorporated Area	80	74	\$840,013	6	\$270,378	0	\$0	80	\$1,110,391
<b>Rutherford County</b>	<b>192</b>	<b>163</b>	<b>\$3,171,398</b>	<b>29</b>	<b>\$532,643</b>	<b>6</b>	<b>\$96,201</b>	<b>198</b>	<b>\$3,800,243</b>
Bostic	0	0	\$0	0	\$0	0	\$0	0	\$0
Chimney Rock Village	0	0	\$0	0	\$0	0	\$0	0	\$0
Ellenboro	0	0	\$0	0	\$0	0	\$0	0	\$0
Forest City	11	9	\$37,650	2	\$13,270	0	\$0	11	\$50,920
Lake Lure	23	18	\$234,968	3	\$204,358	2	\$24,868	23	\$464,194
Ruth	0	0	\$0	0	\$0	0	\$0	0	\$0
Rutherfordton	13	7	\$63,994	5	\$67,952	1	\$11,403	13	\$143,350
Spindale	1	1	\$798	0	\$0	0	\$0	1	\$798
Unincorporated Area	144	128	\$2,833,988	19	\$247,063	3	\$59,930	150	\$3,140,981
<b>Transylvania County</b>	<b>507</b>	<b>656</b>	<b>\$5,261,252</b>	<b>58</b>	<b>\$3,221,240</b>	<b>26</b>	<b>\$935,582</b>	<b>740</b>	<b>\$9,418,074</b>
Brevard	269	359	\$2,668,961	30	\$1,118,656	3	\$113,414	392	\$3,901,031
Rosman	24	26	\$115,903	2	\$4,870	0	\$0	28	\$120,773
Unincorporated Area	214	271	\$2,476,388	26	\$2,097,714	23	\$822,168	320	\$5,396,270
<b>South Mountains Regional Total</b>	<b>1,202</b>	<b>1,411</b>	<b>\$12,362,900</b>	<b>219</b>	<b>\$9,741,943</b>	<b>41</b>	<b>\$1,239,482</b>	<b>1,671</b>	<b>\$23,344,326</b>

Source: NCEM Risk Management Tool

Figures 6.4-6.7 below displays visual hotspots of potential dollar losses for the flood hazard in all South Mountain counties. Based on the photo, most hot spots are in an area with low vulnerability. The following photo provides potential dollar losses for Henderson County.

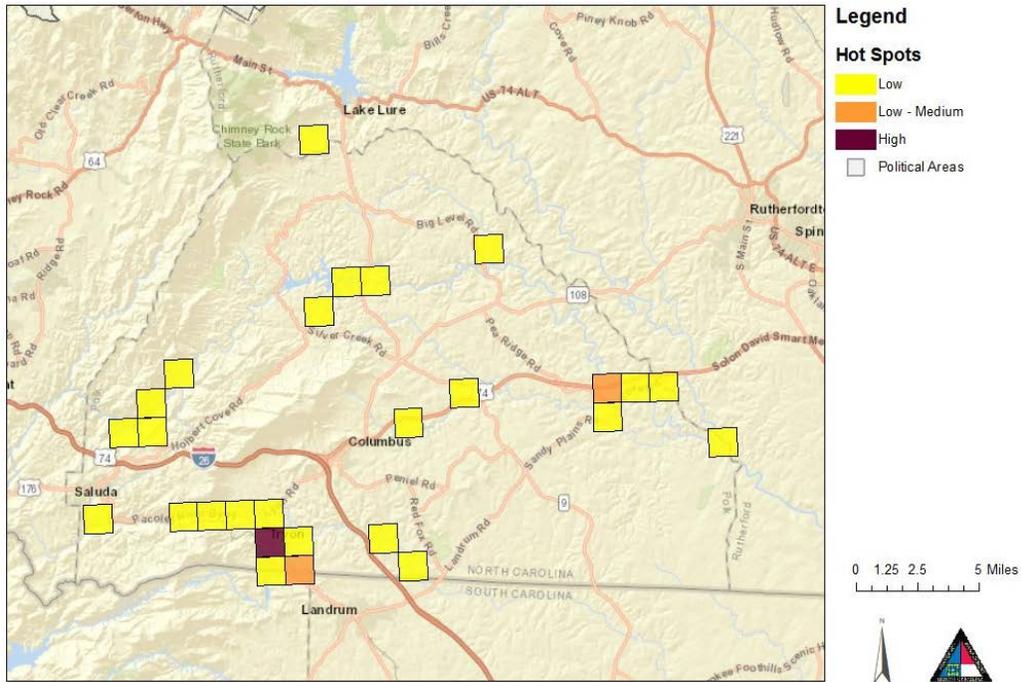
**FIGURE 6.4: POTENTIAL DOLLAR LOSSES FOR FLOODING IN HENDERSON COUNTY**



Source: NCEM Risk Management Tool

The same information for Polk County is presented below in Figure 6.5.

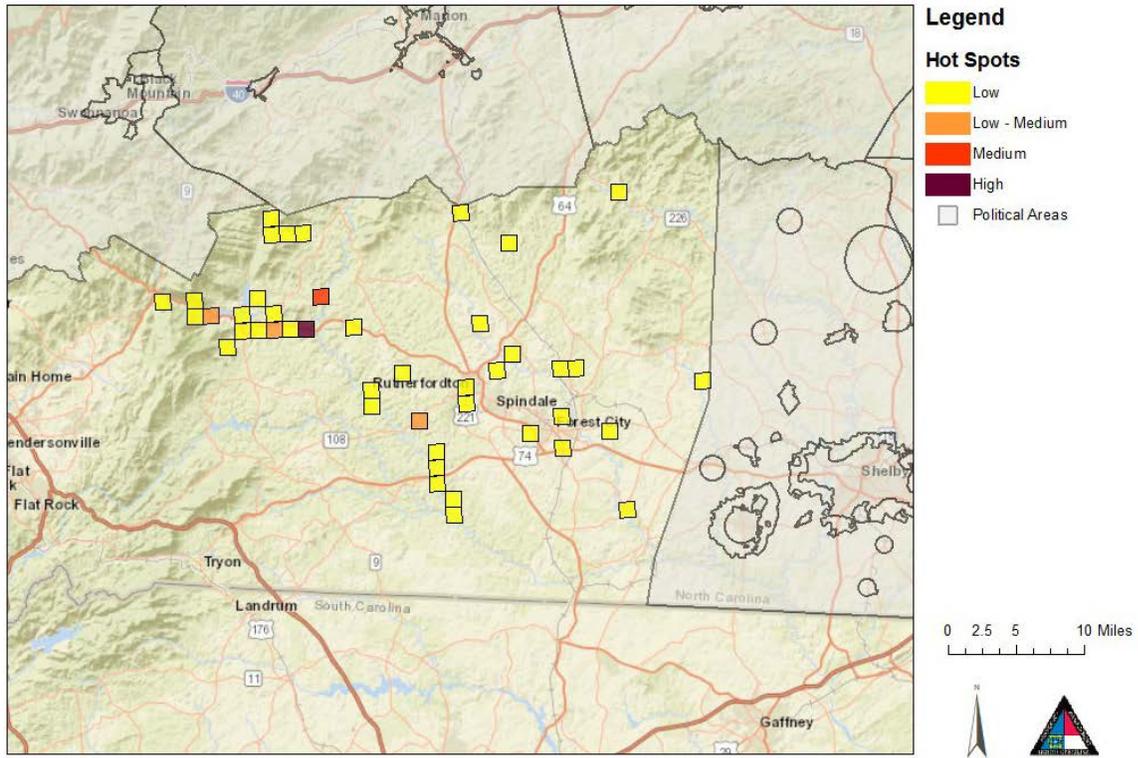
FIGURE 6.5: POTENTIAL DOLLAR LOSSES FOR FLOODING IN POLK COUNTY



Source: NCEM Risk Management Tool

The same information for Rutherford County is presented below in **Figure 6.6**.

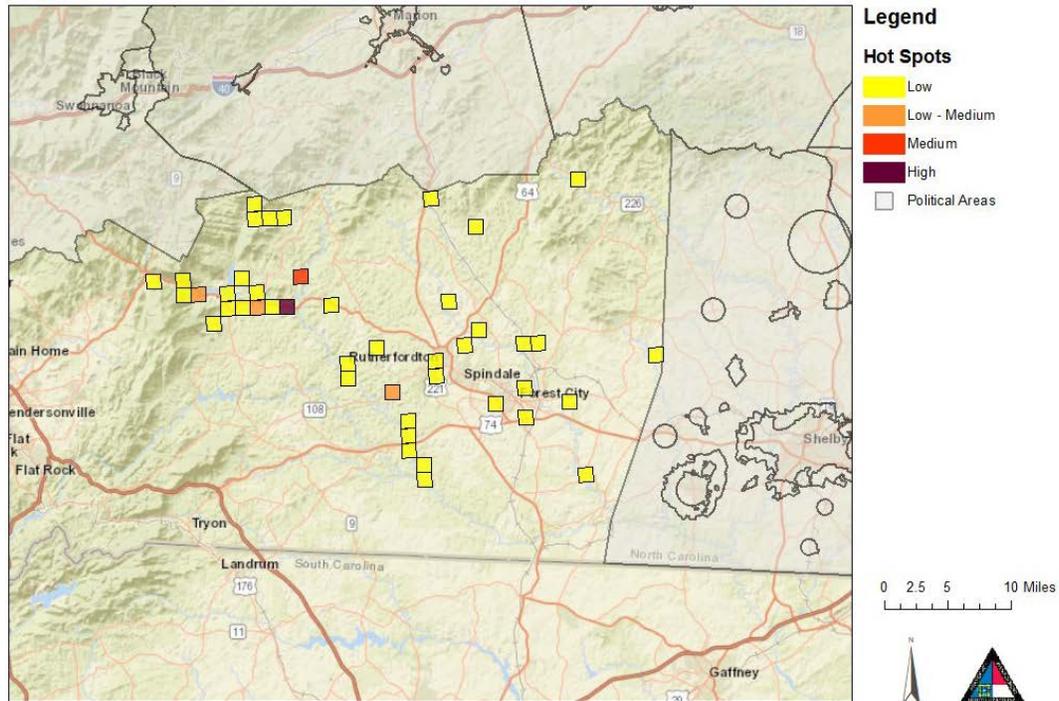
**FIGURE 6.6: POTENTIAL DOLLAR LOSSES FOR FLOODING IN RUTHERFORD COUNTY**



Source: NCEM Risk Management Tool

Finally, the same information for Transylvania County is presented below in **Figure 6.7**.

**FIGURE 6.7: POTENTIAL DOLLAR LOSSES FOR FLOODING IN TRANSYLVANIA COUNTY**



Source: NCEM Risk Management Tool

**Table 6.17** assesses the vulnerability of the region’s population. This data is also from the RMT and analyzes the populations of elderly and children living at risk to the 1 percent annual flooding.

**TABLE 6.17: POPULATION VULNERABILITY FOR 100-YEAR FLOODPLAINS THE IN SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>240</b>	<b>61</b>	<b>1,075</b>
Flat Rock	2	0	8
Fletcher	14	4	64
Hendersonville	64	16	287
Laurel Park	0	0	0
Mills River	30	8	135
Unincorporated Area	130	33	581
<b>Polk County</b>	<b>52</b>	<b>10</b>	<b>212</b>
Columbus	0	0	0
Saluda	0	0	0
Tryon	16	3	65
Unincorporated Area	36	7	147
<b>Rutherford County</b>	<b>50</b>	<b>16</b>	<b>294</b>
Bostic	0	0	0
Chimney Rock Village	0	0	3
Ellenboro	0	0	0

Location	Elderly At Risk	Children At Risk	Total At Risk
Forest City	4	1	21
Lake Lure	2	1	14
Ruth	0	0	0
Rutherfordton	3	1	19
Spindale	0	0	2
Unincorporated Area	41	13	235
<b>Transylvania County</b>	<b>314</b>	<b>55</b>	<b>1,217</b>
Brevard	200	35	773
Rosman	12	2	48
Unincorporated Area	102	18	396
<b>South Mountains</b>	<b>656</b>	<b>142</b>	<b>2,798</b>
<b>Regional Total</b>	<b>656</b>	<b>142</b>	<b>2,798</b>

Source: NCEM Risk Management Tool

**SOCIAL VULNERABILITY**

A national Census has not been conducted since 2010; therefore, 2010 Census tract level population counts are outdated for this update. However, population estimates from the US Census Bureau as of July 1, 2017 were available at a jurisdictional level. This data was analyzed to present at-risk populations to the flooding hazard in the South Mountains region and can be seen below in **Figure 6.8**.

**FIGURE 6.8: POPULATION DENSITY NEAR FLOODPLAINS**

**CRITICAL FACILITIES**

The critical facility analysis revealed that there are only five critical facilities located in the South Mountains Region’s 1.0-percent and 2.0-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. (As previously noted, this analysis does not consider building elevation, which may negate risk.) These facilities are a fire station and another facility in Transylvania County, and two fire stations and one medical care facility in Henderson County. There are no critical facilities in a floodplain in Rutherford or Polk Counties. A list of specific critical facilities and their associated risk can be found in **Table 6.25** at the end of this section.

In conclusion, a flood has the potential to impact many existing and future buildings, facilities, and populations in the South Mountains Region, though some areas are at a higher risk than others. All types of structures in a floodplain are at-risk, though elevated structures will have a reduced risk. As noted, the floodplains used in this analysis include the 100-year and 500-year FEMA regulated floodplain boundaries. It is certainly possible that more severe events could occur beyond these boundaries or urban (flash) flooding could impact additional structures. Such site-specific vulnerability determinations should be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions. **Table 6.18** below lists repetitive loss properties and their associated payments for each county.

**TABLE 6.18: SUMMARY OF REPETITIVE LOSS PROPERTIES IN THE SOUTH MOUNTAINS REGION**

Location	Number of Properties	Number of Losses	Total Payments
<b>Henderson County</b>	<b>18</b>	<b>70</b>	<b>\$1,375,148</b>
Flat Rock	0	0	\$0
Fletcher	0	0	\$0
Hendersonville	16	66	\$1,214,752
Laurel Park	0	0	\$0
Mills River	0	0	\$0
Unincorporated Area	2	4	\$160,396
<b>Polk County</b>	<b>1</b>	<b>2</b>	<b>\$1,843,425</b>
Columbus	0	0	\$0
Saluda	0	0	\$0
Tryon	0	0	\$0
Unincorporated Area	1	2	\$1,843,425
<b>Rutherford County</b>	<b>6</b>	<b>15</b>	<b>\$300,007</b>
Bostic	0	0	\$0
Chimney Rock Village	0	0	\$0
Ellenboro	0	0	\$0
Forest City	0	0	\$0
Lake Lure	0	0	\$0
Ruth	0	0	\$0
Rutherfordton	0	0	\$0
Spindale	0	0	\$0
Unincorporated Area	6	15	\$300,007
<b>Transylvania County</b>	<b>5</b>	<b>13</b>	<b>\$152,432</b>
Brevard	0	0	\$0
Rosman	0	0	\$0
Unincorporated Area	5	13	\$152,432
<b>South Mountains Regional Total</b>	<b>30</b>	<b>100</b>	<b>\$3,671,012</b>

Source: National Flood Insurance Program

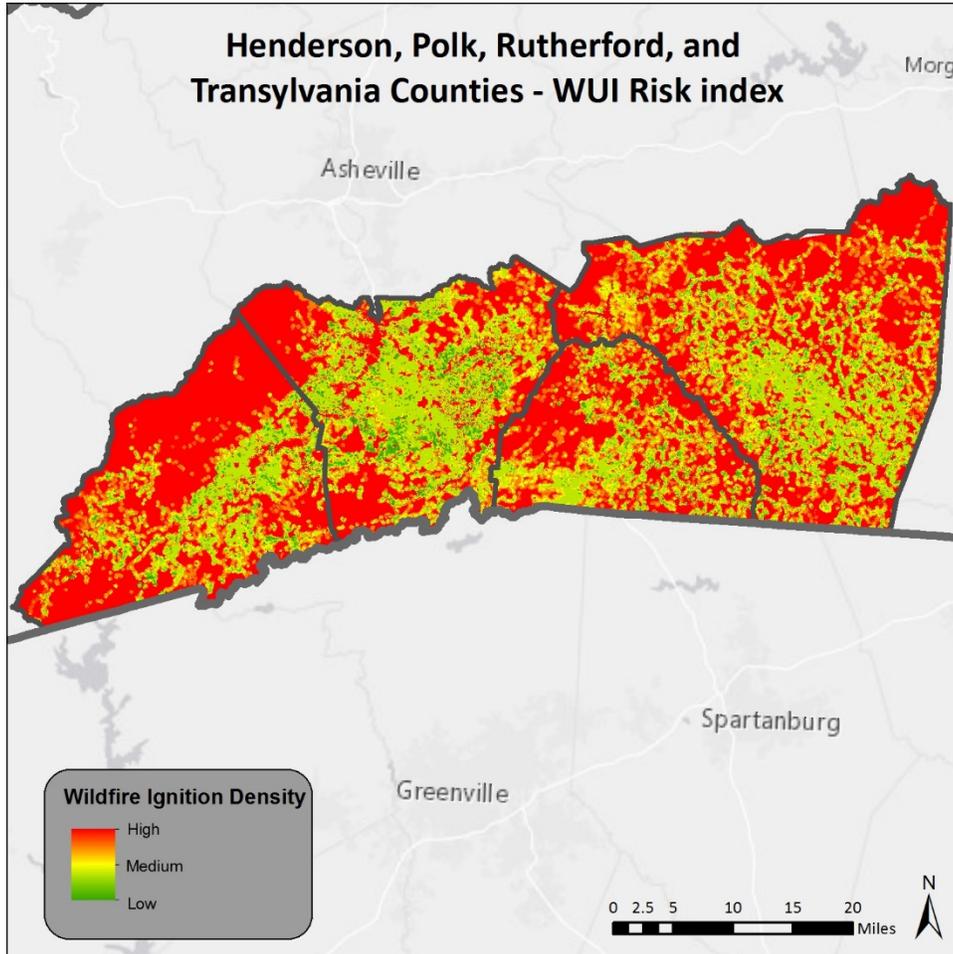
### 6.5.6 Wildfires

Although historical evidence indicates that the South Mountains Region is susceptible to wildfire events, there are few reports of damage. Therefore, it is difficult to calculate a reliable annualized loss figure. Annualized loss is considered negligible though it should be noted that a single event could result in significant damages throughout the region.

To estimate exposure to wildfire, the Wildland Urban Interface (WUI) Risk Index for the region was obtained through the Southern Wildfire Risk Assessment. The WUI uses a Response Function modeling approach and rates the potential impact of a wildfire on people and their homes. The index ranges from -1 to -9, with -9 being the most negative impact. For example, an area with high housing density and

high flame lengths are rated -9, while an area with low housing density and low flame lengths are rated -1. At-risk areas fall within the range of -7 to -9. This index was layered with parcel data using GIS analysis. **Figure 6.9** shows the WUI Risk Index for the region below.

**FIGURE 6.9: WILDLAND URBAN INTERFACE RISK INDEX IN THE SOUTH MOUNTAINS REGION**



Source: Southern Wildfire Risk Assessment

Based on the data above, the region contains many areas where the value falls into an at-risk category. The region has somewhat more land labeled as at-risk compared to other regions of North Carolina. Overall, there is likely more risk in this region than in other areas of the country as well.

**SOCIAL VULNERABILITY**

Even though not all areas have equal vulnerability, there is some susceptibility across the entire South Mountains Region. It is assumed that the total population is at risk to the wildfire hazard. Determining the exact number of people in certain wildfire zones is difficult with existing data and could be misleading.

**CRITICAL FACILITIES**

Although no county had many critical facilities in the at-risk area (-7 or higher) for wildfires, Henderson County had the most with 7 facilities. These facilities were two medical care facilities, two schools, and three fire/EMS stations. Rutherford County had 3 at-risk facilities, and Polk County only had 2.

Transylvania County did not have any at-risk critical facilities. This data reflects a slightly elevated risk in Henderson County for critical facilities to wildfires.

Table 6.19 shows the results of the GIS analysis.

**TABLE 6.19: CRITICAL FACILITIES IN THE AT-RISK WUI RISK INDEX AREA**

Location	Number of At-Risk Critical Facilities
Henderson County	7
Polk County	2
Rutherford County	3
Transylvania County	0
<b>South Mountains Regional Total</b>	<b>12</b>

Source: Southern Wildfire Risk Assessment, Local governments

Additional information was provided through the NCEM Risk Management Tool (RMT). This data describes vulnerability in both built and living environments and can be seen in below in Table 6.20 and Table 6.21.

**TABLE 6.20: BUILDING VULNERABILITY TO WILDFIRE HAZARDS IN THE SOUTH MOUNTAINS REGION**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
<b>Henderson County</b>	<b>20,222</b>	<b>37,308</b>	<b>\$6,395,632,845</b>	<b>1,426</b>	<b>\$2,285,904,538</b>	<b>497</b>	<b>\$1,007,988,629</b>	<b>39,231</b>	<b>\$9,689,526,014</b>
Flat Rock	622	1,624	\$502,742,745	58	\$49,854,132	33	\$27,491,886	1,715	\$580,088,763
Fletcher	430	1,442	\$263,122,311	66	\$209,538,121	12	\$27,374,313	1,520	\$500,034,745
Hendersonville	3,562	5,167	\$919,719,932	483	\$838,476,896	72	\$194,773,749	5,722	\$1,952,970,578
Laurel Park	879	855	\$234,697,434	23	\$77,381,481	4	\$5,498,202	882	\$317,577,118
Mills River	1,070	2,500	\$381,401,360	103	\$159,958,535	39	\$80,842,159	2,642	\$622,202,054
Unincorporated Area	13,659	25,720	\$4,093,949,063	693	\$950,695,373	337	\$672,008,320	26,750	\$5,716,652,756
<b>Polk County</b>	<b>5,309</b>	<b>4,836</b>	<b>\$823,685,689</b>	<b>349</b>	<b>\$348,431,318</b>	<b>122</b>	<b>\$195,612,978</b>	<b>5,307</b>	<b>\$1,367,729,984</b>
Columbus	286	210	\$43,013,120	55	\$63,415,601	21	\$23,421,386	286	\$129,850,107
Saluda	223	190	\$27,110,787	24	\$13,287,015	8	\$8,104,656	222	\$48,502,457
Tryon	1,020	904	\$187,974,693	83	\$54,617,218	32	\$35,018,656	1,019	\$277,610,567
Unincorporated Area	3,780	3,532	\$565,587,089	187	\$217,111,484	61	\$129,068,280	3,780	\$911,766,853
<b>Rutherford County</b>	<b>2,216</b>	<b>2,097</b>	<b>\$321,123,037</b>	<b>128</b>	<b>\$177,524,326</b>	<b>24</b>	<b>\$25,757,282</b>	<b>2,249</b>	<b>\$524,404,644</b>
Bostic	0	0	\$0	0	\$0	0	\$0	0	\$0
Chimney Rock	36	35	\$5,804,489	1	\$311,417	0	\$0	36	\$6,115,906

**SECTION 6: VULNERABILITY ASSESSMENT**

Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Village									
Ellenboro	2	2	\$291,768	0	\$0	0	\$0	2	\$291,768
Forest City	32	29	\$5,745,279	2	\$1,010,834	1	\$616,256	32	\$7,372,369
Lake Lure	189	170	\$43,846,411	16	\$27,243,223	3	\$4,464,303	189	\$75,553,937
Ruth	0	0	\$0	0	\$0	0	\$0	0	\$0
Rutherfordton	0	0	\$0	0	\$0	0	\$0	0	\$0
Spindale	0	0	\$0	0	\$0	0	\$0	0	\$0
Unincorporated Area	1,957	1,861	\$265,435,090	109	\$148,958,852	20	\$20,676,723	1,990	\$435,070,664
<b>Transylvania County</b>	<b>8,239</b>	<b>15,020</b>	<b>\$2,354,210,047</b>	<b>755</b>	<b>\$606,974,071</b>	<b>259</b>	<b>\$290,712,373</b>	<b>16,034</b>	<b>\$3,251,896,492</b>
Brevard	2,490	3,355	\$516,486,377	304	\$325,640,670	129	\$197,880,900	3,788	\$1,040,007,947
Rosman	99	149	\$11,743,345	11	\$2,678,206	6	\$12,547,947	166	\$26,969,499
Unincorporated Area	5,650	11,516	\$1,825,980,325	440	\$278,655,195	124	\$80,283,526	12,080	\$2,184,919,046
<b>South Mountains Regional Total</b>	<b>35,986</b>	<b>59,261</b>	<b>\$9,894,651,618</b>	<b>2,658</b>	<b>\$3,418,834,253</b>	<b>902</b>	<b>\$1,520,071,262</b>	<b>62,821</b>	<b>\$14,833,557,134</b>

Source: NCEM Risk Management Tool

**TABLE 6.21: POPULATION VULNERABILITY TO WILDFIRE HAZARD FOR THE SOUTH MOUNTAINS REGION**

Location	Elderly At Risk	Children At Risk	Total At Risk
<b>Henderson County</b>	<b>17,896</b>	<b>4,509</b>	<b>80,028</b>
Flat Rock	582	147	2,604
Fletcher	856	216	3,827
Hendersonville	3,146	793	14,068
Laurel Park	431	108	1,929
Mills River	1,145	288	5,121
Unincorporated Area	11,736	2,957	52,479
<b>Polk County</b>	<b>2,370</b>	<b>442</b>	<b>9,736</b>
Columbus	134	25	553
Saluda	81	16	334
Tryon	437	81	1,795
Unincorporated Area	1,718	320	7,054
<b>Rutherford County</b>	<b>630</b>	<b>207</b>	<b>3,641</b>
Bostic	0	0	0
Chimney Rock Village	4	1	23
Ellenboro	1	0	4
Forest City	12	4	69
Lake Lure	23	7	131
Ruth	0	0	0
Rutherfordton	0	0	0

Location	Elderly At Risk	Children At Risk	Total At Risk
Spindale	0	0	0
Unincorporated Area	590	195	3,414
<b>Transylvania County</b>	<b>6,299</b>	<b>1,119</b>	<b>24,401</b>
Brevard	1,876	333	7,268
Rosman	70	13	274
Unincorporated Area	4,353	773	16,859
<b>South Mountains Regional Total</b>	<b>27,195</b>	<b>6,277</b>	<b>117,806</b>

Source: NCEM Risk Management Tool

### 6.5.7 Hazardous Substances

Although historical evidence and existing Toxic Release Inventory sites indicate that the South Mountains Region is susceptible to hazardous substance events, there are few reports of damage. Therefore, a calculated annualized loss figure may not be completely reliable.

Most hazardous substance incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. In a hazardous substance incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather conditions will directly affect how the hazard develops. Certain chemicals may travel through the air or water, affecting a much larger area than the point of the incidence itself. Non-compliance with fire and building codes, as well as failure to maintain existing fire and containment features, can substantially increase the damage from a hazardous materials release. The duration of a hazardous materials incident can range from hours to days. Warning time is minimal to none.

In order to conduct the vulnerability assessment for this hazard, GIS intersection analysis was used for fixed and mobile areas and parcels<sup>5</sup>. In both scenarios, two sizes of buffers—0.5 mile and 1 mile—were used. These areas are assumed to respect the different levels of effect: immediate (primary) and secondary. Primary and secondary impact sites were selected based on guidance from FEMA 426, Reference Manual to Mitigate Potential Terrorist Attacks against Buildings and engineering judgment. For the fixed site analysis, geo-referenced TRI listed toxic sites in the South Mountains Region, along with buffers, were used for analysis as shown in **Figure 6.10**. For the mobile analysis, the major roads (Interstate highway, U.S. highway, and State highway) and railroads, where hazardous materials are primarily transported that could adversely impact people and buildings, were used for the GIS buffer analysis. **Figure 6.11** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table 6.22** (fixed sites), **Table 6.23** (mobile railroad sites) and **Table 6.24** (mobile road sites)<sup>6</sup>.

#### FIGURE 6.10: TOXIC RELEASE INVENTORY (TRI) FACILITIES IN THE SOUTH MOUNTAINS REGION

<sup>5</sup> This type of analysis will likely yield inflated results (generally higher than what is actually reported after an actual event).

<sup>6</sup> Note that parcels included in the 1-mile analysis are also included in the 0.5-mile analysis.

**TABLE 6.22: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES (FIXED SITES) IN THE SOUTH MOUNTAINS REGION**

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
<b>Henderson County</b>	<b>1,607</b>	<b>1,219</b>	<b>\$306,709,600</b>	<b>5,385</b>	<b>4,280</b>	<b>\$773,091,200</b>
Flat Rock	261	208	\$41,604,800	676	530	\$100,025,600
Fletcher	235	167	\$76,138,800	1,047	815	\$191,091,700
Hendersonville	438	365	\$69,221,500	1,264	1,072	\$168,256,600
Laurel Park	0	0	\$0	0	0	\$0
Mills River	35	21	\$27,069,200	346	281	\$101,951,100
Unincorporated Area	638	458	\$92,675,300	2,052	1,582	\$211,766,200
<b>Polk County</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>0</b>	<b>0</b>	<b>\$0</b>
Columbus	0	0	\$0	0	0	\$0
Saluda	0	0	\$0	0	0	\$0
Tryon	0	0	\$0	0	0	\$0
Unincorporated Area	0	0	\$0	0	0	\$0
<b>Rutherford County</b>	<b>1,203</b>	<b>799</b>	<b>\$155,362,128</b>	<b>3,072</b>	<b>2,051</b>	<b>\$309,502,004</b>
Bostic	0	0	\$0	0	0	\$0
Chimney Rock Village	0	0	\$0	0	0	\$0
Ellenboro	0	0	\$0	0	0	\$0
Forest City	0	0	\$0	0	0	\$0
Lake Lure	0	0	\$0	0	0	\$0
Ruth	0	0	\$0	0	0	\$0
Rutherfordton	964	670	\$75,993,573	1,654	1,185	\$142,491,130
Spindale	0	0	\$0	0	0	\$0
Unincorporated Area	239	129	\$79,368,555	1,418	866	\$167,010,874
<b>Transylvania County</b>	<b>0</b>	<b>0</b>	<b>\$0</b>	<b>0</b>	<b>0</b>	<b>\$0</b>
Brevard	0	0	\$0	0	0	\$0
Rosman	0	0	\$0	0	0	\$0
Unincorporated Area	0	0	\$0	0	0	\$0
<b>South Mountains Regional Total</b>	<b>2,810</b>	<b>2,018</b>	<b>\$462,071,728</b>	<b>8,457</b>	<b>6,331</b>	<b>\$1,082,593,204</b>

Source: EPA, Local governments

**FIGURE 6.11: MOBILE HAZMAT BUFFERS IN THE SOUTH MOUNTAINS REGION****TABLE 6.23: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES  
(MOBILE ANALYSIS – RAIL)**

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
<b>Henderson County</b>	<b>26,675</b>	<b>20,924</b>	<b>\$3,596,933,600</b>	<b>67,655</b>	<b>47,424</b>	<b>\$8,669,128,000</b>
Flat Rock	949	749	\$161,666,500	2,692	2,102	\$653,952,400
Fletcher	2,195	1,819	\$356,731,000	3,449	3,010	\$562,137,600
Hendersonville	8,422	7,041	\$1,175,950,800	10,231	8,573	\$1,527,584,200
Laurel Park	1,357	1,046	\$195,738,100	1,745	1,262	\$256,028,500
Mills River	4	0	\$0	3,840	2,808	\$597,140,500
Unincorporated Area	13,748	10,269	\$1,706,847,200	45,698	29,669	\$5,072,284,800
<b>Polk County</b>	<b>2,372</b>	<b>1,715</b>	<b>\$256,876,178</b>	<b>3,802</b>	<b>2,586</b>	<b>\$393,509,928</b>
Columbus	0	0	\$0	0	0	\$0
Saluda	519	368	\$55,531,122	680	474	\$70,284,673
Tryon	901	717	\$111,151,983	1,105	837	\$124,320,390
Unincorporated Area	952	630	\$90,193,073	2,017	1,275	\$198,904,865
<b>Rutherford County</b>	<b>5,437</b>	<b>3,627</b>	<b>\$333,264,430</b>	<b>11,033</b>	<b>7,430</b>	<b>\$842,325,201</b>
Bostic	258	179	\$22,127,584	258	179	\$22,127,584
Chimney Rock Village	0	0	\$0	0	0	\$0
Ellenboro	479	364	\$16,740,019	513	383	\$17,280,819
Forest City	1,507	1,067	\$104,978,004	3,743	2,639	\$255,036,965
Lake Lure	0	0	\$0	0	0	\$0
Ruth	0	0	\$0	0	0	\$0
Rutherfordton	0	0	\$0	0	0	\$0
Spindale	0	0	\$0	0	0	\$0
Unincorporated Area	3,193	2,017	\$189,418,823	6,519	4,229	\$547,879,833
<b>Transylvania County</b>	<b>1,783</b>	<b>1,251</b>	<b>\$510,469,223</b>	<b>3,708</b>	<b>2,629</b>	<b>\$885,549,831</b>
Brevard	621	471	\$333,504,617	1,505	1,167	\$535,268,725
Rosman	0	0	\$0	0	0	\$0
Unincorporated Area	1,162	780	\$176,964,606	2,203	1,462	\$350,281,106
<b>South Mountains Regional Total</b>	<b>36,267</b>	<b>27,517</b>	<b>\$4,697,543,431</b>	<b>86,198</b>	<b>60,069</b>	<b>\$10,790,512,960</b>

Source: NCDOT, Local governments

**TABLE 6.24: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES  
(MOBILE ANALYSIS – ROAD)**

Location	0.5 Mile Buffer			1.0 Mile Buffer		
	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value	Approx. Number of Parcels	Approx. Number Improved	Approx. Improved Value
<b>Henderson County</b>	<b>67,648</b>	<b>47,423</b>	<b>\$8,669,411,900</b>	<b>67,663</b>	<b>47,428</b>	<b>\$8,669,984,200</b>
Flat Rock	1,278	1,011	\$501,365,522	1,957	1,284	\$564,663,941
Fletcher	3,449	3,010	\$562,137,600	3,449	3,010	\$562,137,600
Hendersonville	10,231	8,573	\$1,527,584,200	10,231	8,573	\$1,527,584,200
Laurel Park	1,745	1,262	\$256,028,500	1,745	1,262	\$256,028,500
Mills River	3,840	2,808	\$597,140,500	3,840	2,808	\$597,140,500
Unincorporated Area	47,105	30,759	5,225,155,578	46,441	30,491	5,162,429,459
<b>Polk County</b>	<b>17,577</b>	<b>10,470</b>	<b>\$1,757,995,236</b>	<b>17,580</b>	<b>10,472</b>	<b>\$1,758,155,848</b>
Columbus	582	444	\$105,478,936	582	444	\$105,478,936
Saluda	694	484	\$105,478,936	694	484	\$105,478,936
Tryon	1,105	837	\$124,320,390	1,105	837	\$124,320,390
Unincorporated Area	15,196	8,705	\$1,422,716,974	15,199	8,707	\$1,422,877,586
<b>Rutherford County</b>	<b>56,515</b>	<b>31,943</b>	<b>\$3,515,047,082</b>	<b>56,546</b>	<b>31,945</b>	<b>\$3,515,066,682</b>
Bostic	258	179	\$22,127,584	258	179	\$22,127,584
Chimney Rock Village	464	218	\$21,767,392	464	218	\$21,767,392
Ellenboro	513	383	\$17,280,819	513	383	\$17,280,819
Forest City	4,530	3,223	\$317,109,845	4,530	3,223	\$317,109,845
Lake Lure	4,960	2,042	\$369,657,648	4,960	2,042	\$369,657,648
Ruth	217	150	\$12,582,243	217	150	\$12,582,243
Rutherfordton	2,256	1,596	\$214,590,459	2,256	1,596	\$214,590,459
Spindale	2,787	1,897	\$143,354,047	2,787	1,897	\$143,354,047
Unincorporated Area	40,530	22,255	\$2,396,577,045	40,561	22,257	\$2,396,596,645
<b>Transylvania County</b>	<b>32,517</b>	<b>20,062</b>	<b>\$11,084,781,035</b>	<b>32,521</b>	<b>20,062</b>	<b>\$11,084,781,035</b>
Brevard	5,688	4,575	\$3,380,610,250	5,688	4,575	\$3,380,610,250
Rosman	240	153	\$68,540,400	240	153	\$68,540,400
Unincorporated Area	26,589	15,334	\$7,635,630,385	26,593	15,334	\$7,635,630,385
<b>South Mountains Regional Total</b>	<b>174,257</b>	<b>109,898</b>	<b>\$25,027,235,253</b>	<b>174,310</b>	<b>109,907</b>	<b>\$25,027,987,765</b>

Source: NCDOT, Local governments

### SOCIAL VULNERABILITY

Given high susceptibility across the entire South Mountains Region, it is assumed that the total population is at risk to hazardous materials incidents. It should be noted that areas of population

concentration may be at an elevated risk due to a greater burden to evacuate population quickly.

### **CRITICAL FACILITIES**

#### *Fixed Site Analysis:*

The critical facility analysis for fixed TRI sites revealed that there are 39 facilities located in a HAZMAT risk zone. The primary impact zone (0.5-mile buffer) includes 10 facilities throughout the region. Rutherford County has the most facilities in the primary impact zone with 6 facilities. The facilities are also in the secondary, 1-mile zone. A list of specific critical facilities and their associated risk can be found in **Table 6.26** at the end of this section.

#### *Mobile Analysis:*

The critical facility analysis for road and railroad transportation corridors revealed that there are 271 critical facilities located in the primary (0.5 mile) mobile HAZMAT buffer areas for roads and railroads throughout the region. Although this is a worst-case scenario model, it indicates that all of the critical facilities in the South Mountains region are vulnerable to a potential mobile HAZMAT incident. Additionally, there are 271 critical facilities located in the secondary (1 mile) buffer area of both roads and railroads. This may be the result of many critical facilities being located near major roadways for ease of access, but it is nonetheless important to recognize the vulnerability of these facilities. A list of specific critical facilities and their associated risk can be found in **Table 6.25** at the end of this section.

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in the South Mountains Region. Those areas in a primary buffer are at the highest risk, though all areas carry some vulnerability due to variations in conditions that could alter the impact area such direction and speed of wind, volume of release, etc.

### **6.5.8 Drought**

Vulnerability to drought in the South Mountains region is to agricultural products grown in the region and to water supply for the citizens and businesses in the region. At the time of the 2020 update of this plan, there is very limited data available to conduct a detailed vulnerability assessment for this hazard. Future updates of the plan will attempt to better define vulnerability in more specific detail.

### **6.5.9 Excessive Heat**

Vulnerability to excessive heat in the South Mountains region is to the people in the region. Most vulnerable populations to excessive heat are the elderly and very young. However, heat stroke and exhaustion can plague anyone. People who are overweight, who overexert during work or exercise, and who are ill or are on certain medications are also at greater risk of suffering from heat-related illness. Risks from exposure to extreme heat include heat cramps, heat exhaustion, heat stroke, and death. Many of the impacts of extreme heat on people are the result of heat exhaustion or improperly functioning air conditioning units.

There is limited vulnerability from excessive heat to property, infrastructure and any critical facilities. At the time of the 2020 update of this plan, there is very limited data available to conduct a detailed vulnerability assessment for this hazard. Future updates of the plan will attempt to better define vulnerability in more specific detail.

### **6.5.10 Severe Winter Weather**

The entire South Mountains region is vulnerable to severe winter weather. Severe weather most often impacts people indirectly and has more of an impact on infrastructure and to the built environment to some extent. Because the South Mountains region is a mountainous area, it is much more accustomed to winter weather and therefore, are often more prepared to deal with it. However, these areas are also much more likely to experience larger accumulations of precipitation and colder temperatures than areas further east. At the time of the 2020 update of this plan, there is very limited data available (or available data is protected) to conduct a detailed vulnerability assessment for this hazard. Future updates of the plan will attempt to better define vulnerability in more specific detail.

### **6.5.11 Dam Failure**

Vulnerability to dam failure in the South Mountains region is essentially limited to the people, property, infrastructure, any critical facilities and the environment located in areas immediately downstream of dams, especially high hazard dams. At the time of the 2020 update of this plan, there is very limited data available (or available data is protected) to conduct a detailed vulnerability assessment for this hazard. Future updates of the plan will attempt to better define vulnerability in more specific detail.

## **6.6 CONCLUSIONS ON HAZARD VULNERABILITY**

The results of this vulnerability assessment are useful in at least three ways:

- ◆ Improving our understanding of the risk associated with the natural hazards in the South Mountains region through better understanding of the complexities and dynamics of risk, how levels of risk can be measured and compared, and the myriad of factors that influence risk. An understanding of these relationships is critical in making balanced and informed decisions on managing the risk.
- ◆ Providing a baseline for policy development and comparison of mitigation alternatives. The data used for this analysis presents a current picture of risk in the South Mountains Region. Updating this risk “snapshot” with future data will enable comparison of the changes in risk with time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in the region.
- ◆ Comparing the risk among the natural hazards addressed. The ability to quantify the risk to all these hazards relative to one another helps in a balanced, multi-hazard approach to risk management at each level of governing authority. This ranking provides a systematic framework to compare and prioritize the very disparate natural hazards that are present in the South Mountains Region. This final step in the risk assessment provides the necessary information for local officials to craft a mitigation strategy to focus resources on only those hazards that pose the most threat to Henderson, Polk, Rutherford, and Transylvania counties.

Exposure to hazards can be an indicator of vulnerability. Economic exposure can be identified through locally assessed values for improvements (buildings), and social exposure can be identified by estimating the population exposed to each hazard. This information is especially important for decision-makers to use in planning for evacuation or other public safety related needs.

The types of assets included in these analyses include all building types in the participating jurisdictions.

Specific information about the types of assets that are vulnerable to the identified hazards is included in each hazard subsection (for example, all building types are considered at risk to the winter storm hazard and commercial, residential, and government owned facilities are at risk to repetitive flooding, etc).

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to natural hazards including drought, hurricane and coastal hazards, tornadoes/thunderstorms, and severe winter weather. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table 6.25** shows the critical facilities vulnerable to additional hazards analyzed in this section. The table lists those assets that are determined to be exposed to each of the identified hazards (marked with an “X”).

**TABLE 6.25: At-Risk Critical Facilities**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
<b>Henderson County</b>																		
2 Etowah School Rd	Medical	X	X	X	X	X	X			X						X	X	X
6503 Brevard Dr	Medical	X	X	X	X	X	X			X					X	X	X	X
100 Hospital Dr	Medical	X	X	X	X	X	X								X	X	X	X
6625 Hendersonville Rd	Medical	X	X	X	X	X	X								X	X	X	X
4800 Asheville Hwy Suite 4804	Medical	X	X	X	X	X	X								X	X	X	X
80 Drs Dr Site 2	Medical	X	X	X	X	X	X								X	X	X	X
Suite 27	Medical	X	X	X	X	X	X								X	X	X	X
80 Doctors Dr	Medical	X	X	X	X	X	X								X	X	X	X
Suite 52	Medical	X	X	X	X	X	X								X	X	X	X
50 Hospital Dr	Medical	X	X	X	X	X	X								X	X	X	X
4806 Asheville Hwy	Medical	X	X	X	X	X	X								X	X	X	X
Infirmary	Medical	X	X	X	X	X	X								X	X	X	X
12 Cane Creek Rd	Medical	X	X	X	X	X	X							X	X	X	X	X
Pardee/Mission Clinic	Medical	X	X	X	X	X	X			X					X	X	X	X
550 N Justice St	Medical	X	X	X	X	X	X								X	X	X	X
800 N Justice St	Medical	X	X	X	X	X	X								X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
705 6th Av W	Medical	X	X	X	X	X	X								X	X	X	X
Hendersonville Family Health Center	Medical	X	X	X	X	X	X								X	X	X	X
165 Coolridge St	Medical	X	X	X	X	X	X								X	X	X	X
2579 Chimney Rock Rd	Medical	X	X	X	X	X	X								X	X	X	X
2595 Chimney Rock Rd	Medical	X	X	X	X	X	X								X	X	X	X
510 Balsam Rd	Medical	X	X	X	X	X	X							X	X	X	X	X
Pardee Urgent Care	Medical	X	X	X	X	X	X								X	X	X	X
1700 Asheville Hwy	Medical	X	X	X	X	X	X		X						X	X	X	X
110 S Railroad Ave	Medical	X	X	X	X	X	X								X	X	X	X
1210 Greenville Hwy	Medical	X	X	X	X	X	X							X	X	X	X	X
204 S King St	Medical	X	X	X	X	X	X								X	X	X	X
512 Park Hill Ct	Medical	X	X	X	X	X	X								X	X	X	X
691 Blythe Street Ct	Medical	X	X	X	X	X	X								X	X	X	X
685 Blythe Street Ct	Medical	X	X	X	X	X	X								X	X	X	X
689 Blythe Street Ct	Medical	X	X	X	X	X	X								X	X	X	X
1411 Greenville Hwy	Medical	X	X	X	X	X	X						X		X	X	X	X
687 Blythe St Ct A-B	Medical	X	X	X	X	X	X								X	X	X	X
Burkes Outlet	Medical	X	X	X	X	X	X								X	X	X	X
Lot 1	Medical	X	X	X	X	X	X							X	X	X	X	X
Lot 3	Medical	X	X	X	X	X	X							X	X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other					
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)
Lot 4	Medical	X	X	X	X	X	X						X	X	X	X	X
1363 7th Ave	Medical	X	X	X	X	X	X							X	X	X	X
1701 Old Village Rd	Medical	X	X	X	X	X	X							X	X	X	X
10 Cross Road Dr	Medical	X	X	X	X	X	X			X				X	X	X	X
125 Vance Hill Dr	Medical	X	X	X	X	X	X			X		X		X	X	X	X
127 Vance Hill Dr	Medical	X	X	X	X	X	X			X				X	X	X	X
17 Cane Creek Rd	School	X	X	X	X	X	X						X	X	X	X	X
West Henderson HS	School	X	X	X	X	X	X							X	X	X	X
Rugby MS	School	X	X	X	X	X	X							X	X	X	X
Etowah ES	School	X	X	X	X	X	X							X	X	X	X
2075 N Rugby Rd	School	X	X	X	X	X	X							X	X	X	X
Captain Gilmer	School	X	X	X	X	X	X							X	X	X	X
Fletcher Academy	School	X	X	X	X	X	X							X	X	X	X
4800 Howard Gap Rd	School	X	X	X	X	X	X							X	X	X	X
Fletcher ES	School	X	X	X	X	X	X							X	X	X	X
East Henderson HS	School	X	X	X	X	X	X						X	X	X	X	X
Spearman Bldg	School	X	X	X	X	X	X							X	X	X	X
Arts & Sciences Bldg	School	X	X	X	X	X	X							X	X	X	X
General Studies Bldg	School	X	X	X	X	X	X							X	X	X	X
Patton Bldg	School	X	X	X	X	X	X							X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other					
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)
Continuing Ed Bldg	School	X	X	X	X	X	X						X	X	X	X	X
961B Upward Rd	School	X	X	X	X	X	X					X		X	X	X	X
Admin Bldg	School	X	X	X	X	X	X							X	X	X	X
Library	School	X	X	X	X	X	X							X	X	X	X
New Hillandale ES	School	X	X	X	X	X	X						X	X	X	X	X
North Henderson HS	School	X	X	X	X	X	X							X	X	X	X
Apple Valley MS	School	X	X	X	X	X	X							X	X	X	X
Atkins ES	School	X	X	X	X	X	X							X	X	X	X
Dana ES	School	X	X	X	X	X	X							X	X	X	X
Ednyville ES	School	X	X	X	X	X	X					X		X	X	X	X
Clear Creek ES	School	X	X	X	X	X	X							X	X	X	X
Main House	School	X	X	X	X	X	X							X	X	X	X
222 Education Dr	School	X	X	X	X	X	X							X	X	X	X
Sugarloaf School	School	X	X	X	X	X	X							X	X	X	X
Technology Bldg	School	X	X	X	X	X	X							X	X	X	X
2424 Middle Fork	School	X	X	X	X	X	X							X	X	X	X
613 Glover St	School	X	X	X	X	X	X							X	X	X	X
Hendersonville MS	School	X	X	X	X	X	X							X	X	X	X
Hendersonville ES	School	X	X	X	X	X	X							X	X	X	X
311 8th Ave W	School	X	X	X	X	X	X							X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Immaculata Catholic School	School	X	X	X	X	X	X								X	X	X	X
620 Oakland St	School	X	X	X	X	X	X								X	X	X	X
Bruce Drysdale School	School	X	X	X	X	X	X								X	X	X	X
Fellowship Hall	School	X	X	X	X	X	X						X	X	X	X	X	X
Glen Marlowe ES	School	X	X	X	X	X	X			X				X	X	X	X	X
New Mills River ES	School	X	X	X	X	X	X			X					X	X	X	X
Blue Ridge FD 2	Fire/EMS	X	X	X	X	X	X					X			X	X	X	X
Fletcher FD	Fire/EMS	X	X	X	X	X	X						X		X	X	X	X
Mountain Home FD 3	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Fletcher FD 2	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Green River FD 2	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Green River FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Blue Ridge FD	Fire/EMS	X	X	X	X	X	X							X	X	X	X	X
Bat Cave FD Storage	Fire/EMS	X	X	X	X	X	X								X	X	X	X
EMS 3	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Bat Cave FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Mountain Home FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Edneyville FD 2	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Edneyville FD 3	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Valley Hill FD 2	Fire/EMS	X	X	X	X	X	X					X			X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other							
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)	
Etowah FD	Fire/EMS	X	X	X	X	X	X	X	X							X	X	X	X
Valley Hill FD 3	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Gerton FD	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Etowah Horse Shoe 2	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Fletcher FS 2	Fire/EMS	X	X	X	X	X	X	X	X							X	X	X	X
Etowah Horse Shoe 4	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Etowah Horse Shoe 3	Fire/EMS	X	X	X	X	X	X	X		X						X	X	X	X
Dana FD	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Green River FS 3	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Known Dupe EMS	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Valley Hill FS 2	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
EM HQ	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Hendersonville FD	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Henderson FS 2	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Valley Hill FS 4	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Valley Hill FD	Fire/EMS	X	X	X	X	X	X	X								X	X	X	X
Mills River FD	Fire/EMS	X	X	X	X	X	X	X		X						X	X	X	X
Mills River FS 4	Fire/EMS	X	X	X	X	X	X	X		X						X	X	X	X
Mills River FS 3	Fire/EMS	X	X	X	X	X	X	X		X						X	X	X	X
Mills River FS 2	Fire/EMS	X	X	X	X	X	X	X		X			X			X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other							
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)	
EMS 2	Fire/EMS	X	X	X	X	X	X	X		X		X		X		X	X	X	X
Police Station	Police	X	X	X	X	X	X							X		X	X	X	X
DMV/SHP Offices	Police	X	X	X	X	X	X									X	X	X	X
145 5th Ave	Police	X	X	X	X	X	X									X	X	X	X
Impound Lot	Police	X	X	X	X	X	X									X	X	X	X
Henderson County Detention Center	Police	X	X	X	X	X	X									X	X	X	X
Law Enforcement Center	Police	X	X	X	X	X	X									X	X	X	X
441 White Pine Dr	Police	X	X	X	X	X	X									X	X	X	X
Flat Rock Town Hall	Government	X	X	X	X	X	X									X	X	X	X
6360 Hendersonville Rd	Government	X	X	X	X	X	X							X		X	X	X	X
133 Old Fanning Bridge Rd	Government	X	X	X	X	X	X							X		X	X	X	X
NCDOT Maintenance Yard	Government	X	X	X	X	X	X									X	X	X	X
New Animal Shelter	Government	X	X	X	X	X	X									X	X	X	X
802 Stoney Mtn Rd	Government	X	X	X	X	X	X									X	X	X	X
802 Stoney Mtn Rd Landfill Office	Government	X	X	X	X	X	X									X	X	X	X
802 Stoney Mtn Rd Activity Center	Government	X	X	X	X	X	X									X	X	X	X
Stoney Mtn	Government	X	X	X	X	X	X									X	X	X	X
National Guard Armory	Government	X	X	X	X	X	X						X	X		X	X	X	X
Old Hillandale ES	Government	X	X	X	X	X	X							X		X	X	X	X
246 Education Dr	Government	X	X	X	X	X	X									X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
222 Education Dr	Government	X	X	X	X	X	X								X	X	X	X
Transfer Station	Government	X	X	X	X	X	X								X	X	X	X
NCDOT Maintenance Yard 2	Government	X	X	X	X	X	X								X	X	X	X
NCDOT Maintenance Yard 3	Government	X	X	X	X	X	X								X	X	X	X
NCDOT Maintenance Yard 4	Government	X	X	X	X	X	X								X	X	X	X
Scale House	Government	X	X	X	X	X	X								X	X	X	X
999 High Country Ln	Government	X	X	X	X	X	X								X	X	X	X
801 Glover St	Government	X	X	X	X	X	X								X	X	X	X
NC Coop Ext	Government	X	X	X	X	X	X								X	X	X	X
75 E Central St/BOE	Government	X	X	X	X	X	X							X	X	X	X	X
Henderson County Courthouse	Government	X	X	X	X	X	X								X	X	X	X
Old Courthouse	Government	X	X	X	X	X	X								X	X	X	X
Main Office Bldg	Government	X	X	X	X	X	X								X	X	X	X
1347 Spartanway Hwy	Government	X	X	X	X	X	X						X		X	X	X	X
1222 Spartanway Hwy	Government	X	X	X	X	X	X						X		X	X	X	X
County Finance	Government	X	X	X	X	X	X								X	X	X	X
Social Security Administration	Government	X	X	X	X	X	X								X	X	X	X
100 N King St	Government	X	X	X	X	X	X								X	X	X	X
Hendersonville OP Center	Government	X	X	X	X	X	X								X	X	X	X
County HR Office	Government	X	X	X	X	X	X								X	X	X	X

SECTION 6: VULNERABILITY ASSESSMENT

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Gym	Government	X	X	X	X	X	X								X	X	X	X	
Small Office Building	Government	X	X	X	X	X	X								X	X	X	X	
96 School House Rd	Government	X	X	X	X	X	X			X					X	X	X	X	
Public Works	Other	X	X	X	X	X	X						X		X	X	X	X	
Proposed EM Radio Tower	Other	X	X	X	X	X	X								X	X	X	X	
Valley Hill FD Repeater	Other	X	X	X	X	X	X								X	X	X	X	
EM Tower	Other	X	X	X	X	X	X								X	X	X	X	
Hendersonville City Garage	Other	X	X	X	X	X	X								X	X	X	X	
310 Williams St	Other	X	X	X	X	X	X								X	X	X	X	
203 2nd Ave	Other	X	X	X	X	X	X								X	X	X	X	
1369 N Main St	Other	X	X	X	X	X	X								X	X	X	X	
EM Tower	Other	X	X	X	X	X	X								X	X	X	X	
Viper Radio Tower for SHP	Other	X	X	X	X	X	X								X	X	X	X	
Laurel Park Maint Shed	Other	X	X	X	X	X	X								X	X	X	X	
EM Radio Tower	Other	X	X	X	X	X	X								X	X	X	X	
<b>Polk County</b>																			
Polk County HS	School	X	X	X	X	X	X								X	X	X	X	
Polk County Early College	School	X	X	X	X	X	X								X	X	X	X	
Polk Central	School	X	X	X	X	X	X								X	X	X	X	
Sunny View ES	School	X	X	X	X	X	X					X			X	X	X	X	

**SECTION 6: VULNERABILITY ASSESSMENT**

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Polk County MS	School	X	X	X	X	X	X								X	X	X	X	
Saluda ES	School	X	X	X	X	X	X								X	X	X	X	
Tryon ES	School	X	X	X	X	X	X								X	X	X	X	
Columbus PD	Police	X	X	X	X	X	X			X					X	X	X	X	
NC SHP Polk Substation	Police	X	X	X	X	X	X			X					X	X	X	X	
Polk County Sheriff Dept	Police	X	X	X	X	X	X			X					X	X	X	X	
Saluda PD	Police	X	X	X	X	X	X			X					X	X	X	X	
Tryon PD HQ	Police	X	X	X	X	X	X			X					X	X	X	X	
ACTS Home Health Agency	Medical	X	X	X	X	X	X			X					X	X	X	X	
St. Luke's Hospital	Medical	X	X	X	X	X	X			X					X	X	X	X	
Foothills Family Care Home	Medical	X	X	X	X	X	X			X					X	X	X	X	
Twin Lanes Family Care Home	Medical	X	X	X	X	X	X			X					X	X	X	X	
Saluda FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Sunnyview Fire and Rescue	Fire/EMS	X	X	X	X	X	X			X		X			X	X	X	X	
Green Creek FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Mill Spring FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Sunny View FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Mill Spring FD 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Green Creek FD 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Columbus FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	

SECTION 6: VULNERABILITY ASSESSMENT

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		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)	
Columbus FD 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
Tryon FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X	
<b>Rutherford County</b>																			
Dellinger's Family Care Home	Medical	X	X	X	X	X	X								X	X	X	X	
Joyful Home Family Care	Medical	X	X	X	X	X	X								X	X	X	X	
Rutherford Hospital, Inc.	Medical	X	X	X	X	X	X						X		X	X	X	X	
Kelly's Family Care	Medical	X	X	X	X	X	X			X					X	X	X	X	
Pinacle ES	School	X	X	X	X	X	X								X	X	X	X	
Mt Vernon/Ruth ES	School	X	X	X	X	X	X								X	X	X	X	
Sunshine ES	School	X	X	X	X	X	X								X	X	X	X	
East Rutherford HS	School	X	X	X	X	X	X								X	X	X	X	
Harris ES	School	X	X	X	X	X	X			X					X	X	X	X	
Carver Center	School	X	X	X	X	X	X								X	X	X	X	
R/S MS	School	X	X	X	X	X	X					X	X		X	X	X	X	
Cliffside ES	School	X	X	X	X	X	X			X					X	X	X	X	
Chase HS	School	X	X	X	X	X	X			X					X	X	X	X	
Proctor School	School	X	X	X	X	X	X			X					X	X	X	X	
East MS	School	X	X	X	X	X	X								X	X	X	X	
Forrest City ES	School	X	X	X	X	X	X						X		X	X	X	X	
Forest Hunt ES	School	X	X	X	X	X	X			X					X	X	X	X	

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Masters Academy	School	X	X	X	X	X	X			X			X	X	X	X	X	X
County Office	School	X	X	X	X	X	X							X	X	X	X	X
Lake Lure Classical Academy	School	X	X	X	X	X	X								X	X	X	X
Ellenboro ES	School	X	X	X	X	X	X								X	X	X	X
Spindale ES	School	X	X	X	X	X	X								X	X	X	X
Trinity School	School	X	X	X	X	X	X							X	X	X	X	X
Chase MS	School	X	X	X	X	X	X			X					X	X	X	X
Thomas Jefferson HS	School	X	X	X	X	X	X			X					X	X	X	X
Thomas Jefferson Academy	School	X	X	X	X	X	X			X		X			X	X	X	X
Dunbar ES	School	X	X	X	X	X	X							X	X	X	X	X
Thomas Jefferson ES	School	X	X	X	X	X	X			X		X		X	X	X	X	X
Isothermal College	School	X	X	X	X	X	X								X	X	X	X
Rutherford County Sheriff	Police	X	X	X	X	X	X						X	X	X	X	X	X
Rutherfordton PD	Police	X	X	X	X	X	X						X	X	X	X	X	X
Spindale PD	Police	X	X	X	X	X	X								X	X	X	X
Forest City PD	Police	X	X	X	X	X	X								X	X	X	X
Cherry Mtn Station 1	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Cherry Mtn Station 2	Fire/EMS	X	X	X	X	X	X					X			X	X	X	X
Cherry Mtn Station 3	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Bostic FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Chimney Rock FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Cliffside Station 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Cliffside Station 1	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Hollis Polkville FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Ellenboro FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Hudlow Station 2	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Hudlow Station 1	Fire/EMS	X	X	X	X	X	X								X	X	X	X
SDO FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Forest City FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Sandy Mush FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Bills Creek Station 1	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Fairfield Mountains FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Lake Lure FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Shingle Hollow FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Green Hill FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Rutherfordton FD	Fire/EMS	X	X	X	X	X	X					X	X		X	X	X	X
Spindale FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Union Mills FD	Fire/EMS	X	X	X	X	X	X								X	X	X	X
<b>Transylvania County</b>																		
Transylvania Community Hospital,	Medical	X	X	X	X	X	X			X					X	X	X	X

**SECTION 6: VULNERABILITY ASSESSMENT**

FACILITY NAME	FACILITY TYPE	Natural								Geological		Other						
		Drought	Excessive Heat	Hurricane & Coastal Hazards	Tornadoes/Thunderstorms	Severe Winter Weather	Earthquakes	Flood 100-year	Flood 500-year	Landslide - High Incidence	Landslide - Mod. Incidence	Wildfires	Fixed HAZMAT 0.5 Mile	Fixed HAZMAT 1 Mile	Mobile HAZMAT 0.5 Mile (Road)	Mobile HAZMAT 1 Mile (Road)	Mobile HAZMAT 0.5 Mile (Rail)	Mobile HAZMAT 1 Mile (Rail)
Inc.																		
Brevard PD	Police	X	X	X	X	X	X								X	X	X	X
Transylvania County Sheriff's Office	Police	X	X	X	X	X	X			X					X	X	X	X
Brevard College	School	X	X	X	X	X	X			X					X	X	X	X
Blue Ridge Community College	School	X	X	X	X	X	X			X					X	X	X	X
Transylvania County EMS Brevard	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Transylvania County EMS Quebec	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Brevard FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Rosman FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
North Transylvania FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Connestee Fire Rescue	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Lake Toxaway Fire Rescue	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Little River FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Balsam Grove FD	Fire/EMS	X	X	X	X	X	X				X				X	X	X	X
Cedar Mtn Fire Rescue	Fire/EMS	X	X	X	X	X	X	X							X	X	X	X
Lake Toxaway Fire Rescue 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Connestee Fire Rescue 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Little River FD 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Brevard Airport	Other	X	X	X	X	X	X	X		X					X	X	X	X
Transylvania County Airport	Other	X	X	X	X	X	X			X					X	X	X	X



# SECTION 7

## CAPABILITY ASSESSMENT

This section of the Plan discusses the capability of the communities in the South Mountains Region to implement hazard mitigation activities. It consists of the following four subsections:

- ❖ 7.1 What is a Capability Assessment?
- ❖ 7.2 Conducting the Capability Assessment
- ❖ 7.3 Capability Assessment Findings
- ❖ 7.4 Conclusions on Local Capability

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### 7.1 WHAT IS A CAPABILITY ASSESSMENT?

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects.<sup>1</sup> As in any planning process, it is important to try to establish which goals, objectives, and/or actions are feasible based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical, and likely to be implemented over time, given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources, and current political climate.

A capability assessment has two primary 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. Careful examination of local capabilities will detect any existing gaps, shortfalls, or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. A capability assessment also highlights the positive mitigation measures already in place or being implemented at the local government level, which should continue to be supported and enhanced through future mitigation efforts.

The capability assessment completed for the South Mountains Region serves as a critical planning step and an integral part of the foundation for designing an effective hazard mitigation strategy. Coupled with the Risk Assessment, the Capability Assessment helps identify and target meaningful mitigation actions for incorporation in the Mitigation Strategy portion of the Hazard Mitigation Plan. It not only helps establish the goals and objectives for the region to pursue under this Plan, but it also ensures that those goals and objectives are realistically achievable under given local conditions.

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<sup>1</sup> While the Final Rule for implementing the Disaster Mitigation Act of 2000 does not require a local capability assessment to be completed for local hazard mitigation plans, it is a critical step in developing a mitigation strategy that meets the needs of the region while taking into account their own unique abilities. The Rule does state that a community's mitigation strategy should be "based on existing authorities, policies, programs and resources, and its ability to expand on and improve these

## 7.2 CONDUCTING THE CAPABILITY ASSESSMENT

In order to facilitate the inventory and analysis of local government capabilities within the South Mountains counties, a detailed Capability Assessment Survey was completed for each of the participating jurisdictions based on the information found in existing hazard mitigation plans and local government websites. The survey questionnaire compiled information on a variety of “capability indicators” such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the region’s ability to implement hazard mitigation actions. Other indicators included information related to the communities’ fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes. The current political climate, an important consideration for any local planning or decision-making process, was also evaluated with respect to hazard mitigation.

At a minimum, survey results provide an extensive inventory of existing local plans, ordinances, programs, and resources that are in place or under development in addition to their overall effect on hazard loss reduction. However, the survey instrument can also serve to identify gaps, weaknesses, or conflicts that counties and local jurisdictions can recast as opportunities for specific actions to be proposed as part of the hazard mitigation strategy.

The information collected in the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify each jurisdiction’s overall capability.<sup>2</sup> According to the scoring system, each capability indicator was assigned a point value based on its relevance to hazard mitigation.

Using this scoring methodology, a total score and an overall capability rating of “high,” “moderate,” or “limited” could be determined according to the total number of points received. These classifications are designed to provide nothing more than a general assessment of local government capability. The results of this capability assessment provide critical information for developing an effective and meaningful mitigation strategy.

## 7.3 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this Plan to provide insight into the relevant capacity of the jurisdictions in the South Mountains Region to implement hazard mitigation activities. All information is based upon the review of existing hazard mitigation plans and local government websites through the Capability Assessment Survey and input provided by local government officials during meetings of the South Mountains Regional Hazard Mitigation Planning Team.

### 7.3.1 Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction’s commitment to guiding and managing growth, development, and redevelopment in a responsible manner while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and transportation planning; the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built; as well as protecting environmental, historic,

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<sup>2</sup> The scoring methodology used to quantify and rank the region’s capability can be found in Appendix B.

and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision-making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools and programs that are in place or under development for the jurisdictions in the South Mountains Region along with their potential effect on loss reduction. This information will help identify opportunities to address existing gaps, weaknesses, or conflicts with other initiatives in addition to integrating the implementation of this Plan with existing planning mechanisms where appropriate.

**Table 7.1** provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the jurisdictions in the South Mountains Region. A checkmark (✓) indicates that the given item is currently in place and being implemented. An asterisk (\*) indicates that the given item is currently being developed for future implementation. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the South Mountains Regional Hazard Mitigation Plan.

**TABLE 7.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS**

Planning / Regulatory Tool	HENDERSON COUNTY	Flat Rock	Fletcher	Hendersonville	Laurel Park	Mills River	POLK COUNTY	Columbus	Saluda	Tryon	RUTHERFORD COUNTY	Bostic	Chimney Rock Village	Ellenboro	Forest City	Lake Lure	Ruth	Rutherfordton	Spindale	TRANSYLVANIA COUNTY	Brevard	Rosman	
Hazard Mitigation Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Comprehensive Land Use Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Floodplain Management Plan																				✓	✓	✓	
Open Space Management Plan (Parks & Rec/Greenway Plan)			✓	✓	✓	✓										✓				✓	✓		
Stormwater Management Plan/Ordinance	✓			✓	✓										✓							✓	
Natural Resource Protection Plan																							
Flood Response Plan																							
Emergency Operations Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Continuity of Operations Plan	✓			✓																			
Evacuation Plan																							
Disaster Recovery Plan				✓																			
Capital Improvements Plan	✓		✓	✓	✓	✓	✓	✓		✓	✓				✓	✓			✓		✓	✓	
Economic Development Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Historic Preservation Plan																							
Flood Damage Prevention Ordinance	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓
Zoning Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓			✓	✓		✓	
Subdivision Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓					✓	✓	
Unified Development Ordinance	✓	✓	✓			✓	*	✓		✓			✓		✓							✓	
Post-Disaster Redevelopment Ordinance																							
Building Code	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fire Code	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
National Flood Insurance Program (NFIP)	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	✓	✓	✓	✓
NFIP Community Rating System																						✓	

A more detailed discussion on the region’s planning and regulatory capability follows.

### 7.3.2 Emergency Management

Hazard mitigation is widely recognized as one of the four primary phases of emergency management. The three other phases include preparedness, response, and recovery. In reality, each phase is interconnected with hazard mitigation, as **Figure 7.1** suggests. Opportunities to reduce potential losses through mitigation practices are most often implemented before disaster strikes, such as the elevation of flood prone structures or the continuous enforcement of policies that prevent and regulate development that is vulnerable to hazards due to its location, design, or other characteristics. Mitigation opportunities will also be presented during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane, and certainly during the long-term recovery and redevelopment process following a hazard event.

**FIGURE 7.1: THE FOUR PHASES OF EMERGENCY MANAGEMENT**



Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the Capability Assessment Survey asked several questions across a range of emergency management plans in order to assess the South Mountains Region’s willingness to plan and their level of technical planning proficiency.

**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. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation strategy.

- ❖ Each of the four counties participating in this multi-jurisdictional plan has previously adopted a hazard mitigation plan. Each participating municipality was included in their respective county’s plan.

**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.

- ❖ The City of Hendersonville is the only participating jurisdiction that has adopted a disaster recovery plan. The other jurisdictions should consider developing a plan to guide the recovery and reconstruction process following a disaster.

**Emergency Operations Plan:** An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.

- ❖ Henderson County, Polk County, Rutherford County, and Transylvania County each maintain emergency operations plans through their respective Emergency Management Departments.
- ❖ Henderson County coordinates all emergency management operations for the county and its incorporated municipalities.
- ❖ All emergency management operations for Polk County are coordinated through the Polk County Emergency Management Agency. Although, the municipalities may choose to have their own emergency management agency, the coordination of resources during an emergency will be managed through the county.
- ❖ Rutherford County maintains a countywide emergency operations plan that covers all of its municipalities. However, the Town of Lake Lure has adopted its own town emergency operations plan administered by the town's Emergency Management Department.
- ❖ Transylvania County maintains a countywide emergency operations plan that covers all of its municipalities.

**Continuity of Operations Plan:** A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event.

- ❖ Only Henderson County and the City Hendersonville have continuity of operations plans in place.

### 7.3.3 General Planning

The implementation of hazard mitigation activities often involves agencies and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists, and others. In many instances, concurrent local planning efforts will help to achieve or complement hazard mitigation goals, even though they are not designed as such. Therefore, the Capability Assessment Survey also asked questions regarding general planning capabilities and the degree to which hazard mitigation is integrated into other on-going planning efforts in the South Mountains Region.

**Comprehensive Land Use Plan:** A comprehensive land use plan establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically, a comprehensive plan contains sections on demographic conditions, land use, transportation elements,

and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions.

- ❖ Henderson County and its participating municipalities have each adopted a local comprehensive plan.
- ❖ Polk County, the Town of Columbus, and the City of Saluda have each adopted a local land use plan.
- ❖ Rutherford County has adopted a land use plan that encompasses the county as well as the Town of Bostic, the Village of Chimney Rock, the Town of Ellenboro, the Town of Forest City, the Town of Lake Lure, the Town of Ruth, the Town of Rutherfordton, and the Town of Spindale. Chimney Rock Village, Forest City, Lake Lure, Rutherfordton, and Spindale have also adopted municipal-level comprehensive plans.
- ❖ Transylvania County has adopted a comprehensive plan that addresses land uses within the county and the Town of Rosman. The City of Brevard has adopted a city land use plan.

**Capital Improvements Plan:** A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

- ❖ Henderson County, the Town of Fletcher, the City of Hendersonville, the Town of Laurel Park, and the Town Mills River have capital improvement plans in place.
- ❖ Polk County, the Town of Columbus, and the Town of Tyron have capital improvement plans in place.
- ❖ Rutherford County, the Town of Forest City, the Town of Lake Lure, and the Town of Rutherfordton also have capital improvement plans.
- ❖ Transylvania County and the City of Brevard have capital improvement plans.

**Historic Preservation Plan:** A historic preservation plan is intended to preserve historic structures or districts within a community. An often-overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way.

- ❖ None of the counties or municipalities participating in this multi-jurisdictional plan have a historic preservation plan.

**Zoning Ordinance:** Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful

tool when applied in identified hazard areas.

- ❖ Henderson County and each of its participating municipalities administer a zoning ordinance.
- ❖ Polk County and each of its participating municipalities also administer a zoning ordinance.
- ❖ Rutherford County does not have a zoning ordinance. However, the municipalities of Chimney Rock Village, Forest City, Lake Lure, Rutherfordton, and Spindale have adopted zoning ordinances that are overseen by municipal zoning administrators.
- ❖ Transylvania County does not have a zoning ordinance. However, the City of Brevard has adopted a zoning ordinance that is administered by the city.

**Subdivision Ordinance:** A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

- ❖ Henderson County and all of its participating municipalities have adopted and enforce subdivision regulations.
- ❖ Polk County and all of its participating municipalities have also adopted and enforce subdivision regulations.
- ❖ Rutherford County, the Village of Chimney Rock, the Town of Forest City, and the Town of Lake Lure have each adopted subdivision regulations.
- ❖ Transylvania County and the City of Brevard have also both adopted subdivision regulations.

**Building Codes, Permitting, and Inspections:** Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

- ❖ North Carolina has a state compulsory building code, which applies throughout the state; however, jurisdictions may adopt codes if approved as providing adequate minimum standards. All of the participating counties and municipalities have adopted a building code.
- ❖ Henderson County provides building code enforcement for the county and all of its municipalities.
- ❖ Polk County Building Inspections enforces the building code within the county.
- ❖ Rutherford County provides building code enforcement not only for the county but also for the Village of Chimney Rock and the Towns of Lake Lure, Rutherfordton, Ruth, Spindale, Ellenboro, and Bostic.
- ❖ Transylvania County enforces the building code for the county and both of its municipalities.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program developed by the Insurance Services

Office, Inc. (ISO).<sup>3</sup> In North Carolina, the North Carolina Department of Insurance assesses the building codes in effect in a particular community and how the community enforces its building codes *with special emphasis on mitigation of losses from natural hazards*. The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The concept is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses and, as a result, should have lower insurance rates.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education as well as the number of inspections performed per day. This type of information combined with local building codes is used to determine a grade for that jurisdiction. The grades range from 1 to 10 with a BCEGS grade of 1 representing exemplary commitment to building code enforcement and a grade of 10 indicating less than minimum recognized protection.

### 7.3.4 Floodplain Management

Flooding represents the greatest natural hazard facing the nation. At the same time, the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the *National Flood Insurance Program* (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this assessment as a key indicator for measuring local capability.

In order for a county or municipality to participate in the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by a 100-year flood event and that new development in the floodplain will not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community.

**Table 7.2** provides NFIP policy and claim information for each participating jurisdiction in the South Mountains Region.

**TABLE 7.2: NFIP POLICY AND CLAIM INFORMATION**

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Closed Claims	Total Payments to Date
<b>HENDERSON COUNTY†</b>	03/01/82	01/06/10	224	\$55,227,900	4	\$239,353
Flat Rock	12/12/08	01/06/10	25	\$5,590,000	0	\$0
Fletcher	10/28/03	01/06/10	0	\$0	1	\$14,745
Hendersonville	01/20/82	01/06/10	163	\$37,851,500	116	\$1,336,191
Laurel Park	10/02/08	01/06/10	7	\$2,135,000	1	\$2,980
Mills River*	--	--	--	--	--	--
<b>POLK COUNTY†</b>	01/01/87	10/02/08	37	\$8,536,300	10	\$87,286
Columbus	04/24/09	10/02/08	1	\$600,000	0	\$0
Saluda	02/19/10	10/02/08	1	\$175,000	0	\$0
Tryon	08/19/86	10/02/08(M)	15	\$2,957,000	0	\$0
<b>RUTHERFORD COUNTY†</b>	06/01/87	01/06/10	63	\$14,961,300	30	\$626,560
Bostic	09/25/09	01/06/10	1	\$350,000	0	\$0
Chimney Rock Village	02/14/97	01/06/10	15	\$3,659,000	0	\$0
Ellenboro*	--	--	--	--	--	--
Forest City	06/17/86	01/06/10	4	\$1,015,000	0	\$0
Lake Lure	03/04/97	01/06/10	24	\$8,866,000	0	\$0
Ruth	09/28/18	01/06/10	--	--	--	--
Rutherfordton	06/17/86	01/06/10	6	\$1,378,000	0	\$0
Spindale	06/04/79	01/06/10	2	\$400,000	0	\$0
<b>TRANSYLVANIA COUNTY†</b>	01/02/80	04/19/10	157	\$43,712,400	21	\$305,983
Brevard	09/29/78	04/19/10	109	\$26,894,400	11	\$150,815
Rosman	06/02/72	04/19/10	15	\$3,030,100	21	\$93,223

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## SECTION 7: CAPABILITY ASSESSMENT

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†Includes unincorporated areas of county only

\*Community does not participate in the NFIP

(M) – No Elevation Determined, all Zone A, C and X

Source: NFIP Community Status information as of 8/15/19; NFIP claims and policy information as of 6/30/13

All jurisdictions listed above that are participants in the NFIP will continue to comply with all required provisions of the program and will work to adequately comply in the future utilizing a number of strategies. For example, the jurisdictions will coordinate with NCEM and FEMA to develop maps and regulations related to special flood hazard areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management program in a way that reduces the risk of flooding to people and property.

The Town of Ellenboro does not participate in the NFIP because none of its land area is currently located within the floodplain. The Towns of Mills River does not participate in the NFIP due to lack of available funding and political support.

**Community Rating System:** An additional indicator of floodplain management capability is the active participation of local jurisdictions in the Community Rating System (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP by adding extra local measures to provide protection from flooding. All of the 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class rating. Class ratings, which range from 10 to 1, are tied to flood insurance premium reductions as shown in **Table 7.3**. As class rating improves (the lower the number the better), the percent reduction in flood insurance premiums for NFIP policyholders in that community increases.

**TABLE 7.3: CRS PREMIUM DISCOUNTS, BY CLASS**

CRS Class	Premium Reductio
1	45%
2	40%
3	35%
4	30%
5	25%
6	20%
7	15%
8	10%
9	5%
10	0

Source: FEMA

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years based on community comments. Changes were made with the intent to make the CRS more user-friendly and make extensive technical assistance available for communities who request it.

- ❖ The City of Brevard is the only jurisdiction that currently participates in the CRS. Participation in the CRS program should be considered as a mitigation action by the counties and other municipalities. The program would be most beneficial to Henderson County, the City of Hendersonville, and Transylvania County, which have 224, 163, and 157 NFIP policies, respectively.

**Flood Damage Prevention Ordinance:** A flood damage prevention ordinance establishes minimum building standards in the floodplain with the intent to minimize public and private losses due to flood conditions.

- ❖ All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. All counties and municipalities participating in this hazard mitigation plan, with the exception of the Towns of Mills River, Ellenboro, and Ruth, also participate in the NFIP and they all have adopted flood damage prevention regulations.

**Floodplain Management Plan:** A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts.

- ❖ Transylvania County has a floodplain management plan that contains information about the location of floodplains within the jurisdictions.

**Open Space Management Plan:** An open space management plan is designed to preserve, protect, and restore largely undeveloped lands in their natural state and to expand or connect areas in the public domain such as parks, greenways, and other outdoor recreation areas. In many instances, open space

management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity.

- ❖ Henderson County does not have an open space management plan in place. However, the Town of Fletcher has a greenway master plan, the City of Hendersonville has a parks and greenspace master plan, the Town of Laurel Park has a parks and greenways plan, and the Town of Mills River has a parks master plan.
- ❖ Neither Polk County nor any of its participating municipalities have adopted an open space management plan.
- ❖ Rutherford County does not have an open space management plan. However, the Town of Lake Lure has adopted a parks, recreation, trails, and open space plan.
- ❖ Transylvania County and the City of Brevard have adopted a joint comprehensive parks and recreation master plan.

**Stormwater Management Plan:** A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- ❖ Henderson County and the City of Brevard are the only participating jurisdictions that have stormwater management plans in place; however, the following jurisdictions have adopted stormwater management regulations through various ordinances: Henderson County, the City of Hendersonville, the Town of Laurel Park, and the Town of Forest City.

### 7.3.5 Administrative and Technical Capability

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using Geographic Information Systems (GIS) to analyze and assess community hazard vulnerability. The Capability Assessment Survey was used to capture information on administrative and technical capability through the identification of available staff and personnel resources.

**Table 7.4** provides a summary of the capability assessment results for the South Mountains Region with regard to relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

TABLE 7.4: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	HENDERSON COUNTY	Flat Rock	Fletcher	Hendersonville	Laurel Park	Mills River	POLK COUNTY	Columbus	Saluda	Tryon	RUTHERFORD COUNTY	Bostic	Chimney Rock Village	Ellenboro	Forest City	Lake Lure	Ruth	Rutherfordton	Spindale	TRANSYLVANIA COUNTY	Brevard	Rosman	
Planners with knowledge of land development / land management practices	✓		✓	✓			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Planners or engineers with an understanding of natural and/or human-caused hazards	✓		✓	✓			✓	✓		✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓
Emergency Manager	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Floodplain Manager	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓
Land Surveyors																							
Scientists familiar with the hazards of the community	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Staff with education or expertise to assess the community's vulnerability to hazards	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Personnel skilled in GIS and/or Hazus	✓	✓	✓	✓	✓	✓	✓				✓					✓				✓	✓	✓	✓
Resource development staff or grant writers																							

Credit for having a floodplain manager was given to those jurisdictions that have a flood damage prevention ordinance, and therefore an appointed floodplain administrator, regardless of whether the appointee was dedicated solely to floodplain management. Credit was given for having a scientist familiar with the hazards of the community if a jurisdiction has a Cooperative Extension Service or Soil and Water Conservation Department. Credit was also given for having staff with education or expertise to assess the community's vulnerability to hazards if a staff member from the jurisdiction was a participant on the existing hazard mitigation plan's planning committee.

### **7.3.6 Fiscal Capability**

The ability of a local government to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of outside grant funding awards or locally-based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project, such as the acquisition of flood-prone homes, which can require a substantial commitment from local, state, and federal funding sources.

The Capability Assessment Survey was used to capture information on the region's fiscal capability through the identification of locally available financial resources.

**Table 7.5** provides a summary of the results for the South Mountains Region with regard to relevant fiscal resources. A checkmark (✓) indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds) according to the previous county hazard mitigation plans.

**TABLE 7.5: RELEVANT FISCAL RESOURCES**

Fiscal Tool / Resource	HENDERSON COUNTY	Flat Rock	Fletcher	Hendersonville	Laurel Park	Mills River	POLK COUNTY	Columbus	Saluda	Tryon	RUTHERFORD COUNTY	Bostic	Chimney Rock Village	Ellenboro	Forest City	Lake Lure	Ruth	Rutherfordton	Spindale	TRANSYLVANIA COUNTY	Brevard	Rosman	
Capital Improvement Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community Development Block Grants (CDBG)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Special Purpose Taxes (or taxing districts)	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gas / Electric Utility Fees																							
Water / Sewer Fees																							
Stormwater Utility Fees																							
Development Impact Fees																							
General Obligation, Revenue, and/or Special Tax Bonds																							
Partnering Arrangements or Intergovernmental Agreements	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other: HMGP, FMA, PDM, PA, SBA, other federal grants, etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

### 7.3.7 Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority or may conflict with or be seen as an impediment to other goals of the community, such as growth and economic development. Therefore, the local political climate must be considered in designing mitigation strategies as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

The Capability Assessment Survey was used to capture information on political capability of the South Mountains Region. Previous county-level hazard mitigation plans were reviewed for general examples of local political capability, such as guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e., building codes, floodplain

management, etc.).

- ❖ The previous county hazard mitigation plans identified existing ordinances that address natural hazards or are related to hazard mitigation such as emergency management, flood damage prevention, watershed protection, erosion and sedimentation control, zoning, and subdivision.
- ❖ Opposition to mitigation measures is not evident in Henderson County or its incorporated municipalities. In fact, Henderson County has taken a proactive approach to mitigation through the development of governing documents which promote the mitigation process. The Henderson County Governing Board is well educated on the hazards that threaten the county and has advisory boards that specialize in specific areas of hazard reduction. The county (its governing board, staff, and citizenry) appears highly capable and willing to promote the economic efficiency and social utility of the mitigation measures contained in this plan. In addition, they appear willing to assist all local municipalities in the implementation of strategies identified herein and specific to municipal jurisdictions.
- ❖ Mitigation strategies have been presented to the Polk County Planning Board on various occasions. The results have included an effort to map all county water sources in GIS, an updated and adopted flood prevention ordinance, adopting a soil and erosion ordinance, and recommended changes to the subdivision ordinance incorporating changes to road requirements and emergency apparatus. This demonstrates favorable political support and a willingness to adopt hazard mitigation efforts in an active manner.
- ❖ Rutherford County has experienced the devastating effects of natural hazards (i.e., recent hurricanes and ice storms). The citizens, property owners, business owners, and elected officials of the county are committed to implementing a hazard mitigation plan in order to reduce community vulnerability. The Rutherford County Board of Commissioners, the professional staff, and the citizens of the county are continually striving to make Rutherford County a safer community in which to live, work, and play. The county recognizes that implementation of a hazard mitigation plan is an essential component in helping to achieve these goals.
- ❖ Opposition to mitigation measures is not evident in Transylvania County or its incorporated municipalities. In fact, Transylvania County has taken a proactive approach to mitigation through the development of governing documents which promote the mitigation process. The Transylvania County Governing Board is well educated on the hazards that threaten the county and has advisory boards that specialize in specific areas of hazard reduction. The county (its governing board, staff, and citizenry) appears highly capable and willing to promote the economic efficiency and social utility of the mitigation measures contained in this plan. In addition, they appear willing to assist all local municipalities in the implementation of strategies identified herein and specific to municipal jurisdictions.

## 7.4 CONCLUSIONS ON LOCAL CAPABILITY

In order to form meaningful conclusions on the assessment of local capability, a quantitative scoring methodology was designed and applied to results of the Capability Assessment Survey. This methodology, further described in Appendix B, attempts to assess the overall level of capability of the South Mountains Region to implement hazard mitigation actions.

The overall capability to implement hazard mitigation actions varies among the participating jurisdictions. For planning and regulatory capability, the majority of the jurisdictions are in the moderate range. There is more variation in the administrative and technical capability among the jurisdictions with larger jurisdictions generally having greater staff and technical resources. Almost all of jurisdictions are in the limited range for fiscal capability.

**Table 7.6** shows the results of the capability assessment using the designed scoring methodology. The capability score is based solely on the information found in existing hazard mitigation plans and readily available on the jurisdictions' government websites. According to the assessment, the average local capability score for all jurisdictions is 30.7, which falls into the moderate capability ranking.

**TABLE 7.6: CAPABILITY ASSESSMENT RESULTS**

Jurisdiction	Overall Capability Score	Overall Capability Rating
HENDERSON COUNTY	42	High
Flat Rock	28	Moderate
Fletcher	35	Moderate
Hendersonville	41	High
Laurel Park	32	Moderate
Mills River	24	Moderate
POLK COUNTY	37	Moderate
Columbus	30	Moderate
Saluda	25	Moderate
Tryon	28	Moderate
RUTHERFORD COUNTY	36	Moderate
Bostic	24	Moderate
Chimney Rock Village	29	Moderate
Ellenboro	17	Limited
Forest City	33	Moderate

**SECTION 7: CAPABILITY ASSESSMENT**

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Lake Lure	34	Moderate
Ruth	17	Limited
Rutherfordton	28	Moderate
Spindale	27	Moderate
TRANSYLVANIA COUNTY	41	High
Brevard	41	High
Rosman	26	Moderate

As previously discussed, one of the reasons for conducting a Capability Assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified for each jurisdiction in the tables found throughout this section. The participating jurisdictions used the Capability Assessment as part of the basis for the Mitigation Actions that are identified in Section 9; therefore, each jurisdiction addresses their ability to expand on and improve their existing capabilities through the identification of their Mitigation Actions.

### **7.4.1 Linking the Capability Assessment with the Risk Assessment and the Mitigation Strategy**

The conclusions of the Risk Assessment and Capability Assessment serve as the foundation for the development of a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, the Regional Hazard Mitigation Planning Team considered not only each jurisdiction's level of hazard risk, but also their existing capability to minimize or eliminate that risk.

# SECTION 8

## MITIGATION STRATEGY

This section of the Plan provides the blueprint for the participating jurisdictions in the South Mountains Region to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the South Mountains Regional Hazard Mitigation Planning Team and the findings and conclusions of the *Capability Assessment* and *Risk Assessment*. It consists of the following five subsections:

- ❖ 8.1 Introduction
- ❖ 8.2 Mitigation Goals
- ❖ 8.3 Identification and Analysis of Mitigation Techniques
- ❖ 8.4 Selection of Mitigation Techniques for the South Mountains Region
- ❖ 8.5 Plan Update Requirement

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### 8.1 INTRODUCTION

The intent of the Mitigation Strategy is to provide the South Mountains Region communities with the goals that will serve as guiding principles for future mitigation policy and project administration, along with an analysis of mitigation techniques available to meet those goals and reduce the impact of identified hazards. It is designed to be comprehensive, strategic, and functional in nature:

- ❖ In being *comprehensive*, the development of the strategy includes a thorough review of all hazards and identifies extensive mitigation measures intended to not only reduce the future impacts of high risk hazards, but also to help the region achieve compatible economic, environmental, and social goals.
- ❖ In being *strategic*, the development of the strategy ensures that all policies and projects proposed for implementation are consistent with pre-identified, long-term planning goals.
- ❖ In being *functional*, each proposed mitigation action is linked to established priorities and assigned to specific departments or individuals responsible for their implementation with target completion deadlines. When necessary, funding sources are identified that can be used to assist in project implementation.

The first step in designing the Mitigation Strategy includes the identification of mitigation goals. Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas through a local ordinance) and hazard mitigation projects that seek to address specifically targeted hazard risks (such as the acquisition and relocation of a repetitive loss structure).

The second step involves the identification, consideration, and analysis of available mitigation measures

to help achieve the identified mitigation goals. This is a long-term, continuous process sustained through the development and maintenance of this Plan. Alternative mitigation measures will continue

to be considered as future mitigation opportunities are identified, as data and technology improve, as mitigation funding becomes available, and as this Plan is maintained over time.

The third and last step in designing the Mitigation Strategy is the selection and prioritization of specific mitigation actions for the South Mountains Region (provided separately in Section 9: *Mitigation Action Plan*). Each county and participating jurisdiction has its own Mitigation Action Plan (MAP) that reflects the needs and concerns of that jurisdiction. The MAP represents an unambiguous and functional plan for action and is considered to be the most essential outcome of the mitigation planning process.

The MAP includes a prioritized listing of proposed hazard mitigation actions (policies and projects) for the participating counties and municipalities to complete. Each action has accompanying information, such as those departments or individuals assigned responsibility for implementation, potential funding sources, and an estimated target date for completion. The MAP provides those departments or individuals responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring success or progress over time. The cohesive collection of actions listed in the MAP can also serve as an easily understood menu of mitigation policies and projects for those local decision makers who want to quickly review the recommendations and proposed actions of the Regional Hazard Mitigation Plan.

In preparing each Mitigation Action Plan for the South Mountains Region, officials considered the overall hazard risk and capability to mitigate the effects of hazards as recorded through the risk and capability assessment process, in addition to meeting the adopted mitigation goals and unique needs of the community.

### **8.1.1 Mitigation Action Prioritization**

In the previous versions of the participating jurisdictions' hazard mitigation plans, not all actions were prioritized. In addition, there needed to be consistency among the counties and jurisdiction regarding how they prioritized their actions. Therefore, for the 2014 South Mountains Regional plan, the Regional Hazard Mitigation Planning Team members were tasked with establishing a priority for each action at the second Planning Team meeting. Prioritization of the proposed mitigation actions was based on the following six factors:

- ❖ Effect on overall risk to life and property
- ❖ Ease of implementation
- ❖ Political and community support
- ❖ A general economic cost/benefit review<sup>1</sup>

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<sup>1</sup> Only a general economic cost/benefit review was considered by the Regional Hazard Mitigation Planning Committee through the process of selecting and prioritizing mitigation actions. Mitigation actions with "high" priority were determined to be the most cost effective and most compatible with the participating jurisdictions' unique needs. Actions with a "moderate" priority were determined to be cost-effective and compatible with jurisdictional needs, but may be more challenging to complete administratively or fiscally than "high" priority actions. Actions with a "low" priority were determined to be important community needs, but the community likely identified several potential challenges in terms of implementation (e.g. lack of

- ❖ Funding availability
- ❖ Continued compliance with the NFIP

The point of contact for each county helped coordinate the prioritization process by reviewing each action and working with the lead agency/department responsible to determine a priority for each action using the six factors listed above.

Using these criteria, actions were classified as high, moderate, or low priority by the participating jurisdiction officials.

## 8.2 MITIGATION GOALS

### 44 CFR Requirement

**44 CFR Part 201.6(c)(3)(i):** The mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, and as part of the development of the initial South Mountains Regional Hazard Mitigation Plan, the South Mountains counties and the participating municipalities have developed goal statements for local hazard mitigation planning in the region. To develop these goals, the previous four county hazard mitigation plans were reviewed to determine areas of consistency. The project consultant reviewed the goals from each of the four existing plans that were combined to form this regional plan. Many of the goals were similar and regional goals were formulated based on commonalities found between the goals in each plan.

During the development of the initial regional plan for the region, the proposed regional goals were presented, reviewed, voted on, and accepted by the Planning Team at the second Regional Hazard Mitigation Planning Team meeting. This process of combining goals from the previous plans served to highlight the planning process that had occurred in each county prior to joining this regional planning effort. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The South Mountains Regional Mitigation Goals are presented in **Table 8.1**. Consistent implementation of actions over time will ensure that community goals are achieved.

As part of the development of the 2020 update of this plan, the goals found in Table 8.1 were reviewed and discussed at the 4/3/19 meeting of the Regional Hazard Mitigation Planning Committee. It was determined that the goals are still applicable for the region.

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funding, technical obstacles). A more detailed cost/benefit analysis will be applied to particular projects prior to the application for or obligation of funding, as appropriate.

**TABLE 8.1: SOUTH MOUNTAINS REGIONAL MITIGATION GOALS**

Goal	
Goal #1	Improve public education/awareness
Goal #2	Protect human life, safety and welfare by minimizing the potential for damage to personal property, infrastructure, and loss of life due to natural and human caused hazards.
Goal #3	Protect and maintain emergency services infrastructure and equipment to support emergency responders and improve disaster response time/operations.
Goal #4	Improve technical, legal, and institutional capability to respond to and recover from disasters.
Goal #5	Reduce or eliminate the risk of natural disasters.

### 8.3 IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

<b>44 CFR Requirement</b>
<b>44 CFR Part 201.6(c)(3)(ii):</b> The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effect of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In formulating the Mitigation Strategy for the South Mountains Region, a wide range of activities were considered in order to help achieve the established mitigation goals, in addition to addressing any specific hazard concerns. These activities were discussed during the South Mountains Regional Hazard Mitigation Planning Team meetings. In general, all activities considered by the Regional Hazard Mitigation Planning Team can be classified under one of the following six broad categories of mitigation techniques: Prevention, Property Protection, Natural Resource Protection, Structural Projects, Emergency Services, and Public Awareness and Education. These are discussed in detail below.

### 8.3.1 Prevention

Preventative activities are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- ❖ Planning and zoning
- ❖ Building codes
- ❖ Open space preservation
- ❖ Floodplain regulations
- ❖ Storm-water management regulations
- ❖ Drainage system maintenance
- ❖ Capital improvements programming
- ❖ Riverine / fault zone setbacks

### 8.3.2 Property Protection

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- ❖ Acquisition
- ❖ Relocation
- ❖ Building elevation
- ❖ Critical facilities protection
- ❖ Retrofitting (e.g., wind-proofing, flood-proofing, seismic design techniques, etc.)
- ❖ Safe rooms, shutters, shatter-resistant glass
- ❖ Insurance

### 8.3.3 Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples include:

- ❖ Floodplain protection
- ❖ Watershed management
- ❖ Riparian buffers
- ❖ Forest and vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- ❖ Erosion and sediment control
- ❖ Wetland preservation and restoration

- ❖ Habitat preservation
- ❖ Slope stabilization

### **8.3.4 Structural Projects**

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- ❖ Reservoirs
- ❖ Dams / levees / dikes / floodwalls
- ❖ Diversions / detention / retention
- ❖ Channel modification
- ❖ Storm sewers

### **8.3.5 Emergency Services**

Although not typically considered a “mitigation” technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- ❖ Warning systems
- ❖ Evacuation planning and management
- ❖ Emergency response training and exercises
- ❖ Sandbagging for flood protection
- ❖ Installing temporary shutters for wind protection

### **8.3.6 Public Education and Awareness**

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- ❖ Outreach projects
- ❖ Speaker series / demonstration events
- ❖ Hazard map information
- ❖ Real estate disclosure
- ❖ Library materials
- ❖ School children educational programs
- ❖ Hazard expositions

## **8.4 SELECTION OF MITIGATION TECHNIQUES FOR THE SOUTH MOUNTAINS REGION**

In order to determine the most appropriate mitigation techniques for the communities in the South Mountains Region, the Regional Hazard Mitigation Planning Team members thoroughly reviewed and considered the findings of the *Capability Assessment* and *Risk Assessment* to determine the best activities for their respective communities. Other considerations included the effect of each mitigation action on overall risk to life and property, its ease of implementation, its degree of political and community support, its general cost-effectiveness, and funding availability (if necessary).

## **8.5 PLAN UPDATE REQUIREMENT**

In keeping with FEMA requirements for plan updates, the Mitigation Actions identified in the previous South Mountains Region county plans were evaluated to determine their 2020 implementation status. Updates on the implementation status of each action are provided. Any changes to the relative priority of the actions are noted as well. The mitigation actions provided in Section 9: Mitigation Action Plan include the mitigation actions from the previous plans as well as any new mitigation actions proposed through the 2020 planning process. Actions identified as completed in the 2014 version of the plan have been moved to Appendix E.

# SECTION 9

## MITIGATION ACTION PLAN

This section includes the listing of the mitigation actions proposed by the participating jurisdictions in the South Mountains Region. It consists of the following two subsections:

- ❖ 9.1 Overview
- ❖ 9.2 Mitigation Action Plans

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### 44 CFR Requirement

**44 CFR Part 201.6(c)(3)(iii):** The mitigation strategy shall include an action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.

## 9.1 OVERVIEW

As described in the previous section, the Mitigation Action Plan, or MAP, provides a functional plan of action for each jurisdiction. It is designed to achieve the mitigation goals established in Section 8: *Mitigation Strategy* and will be maintained on a regular basis according to the plan maintenance procedures established in Section 10: *Plan Maintenance*.

Each proposed mitigation action has been identified as an effective measure (policy or project) to reduce hazard risk for the South Mountains Region. Each action is listed in the MAP in conjunction with background information such as hazard(s) addressed and relative priority. Other information provided in the MAP includes potential funding sources to implement the action should funding be required (not all proposed actions are contingent upon funding). Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for carrying the action out as well as a timeframe for its completion. These implementation mechanisms ensure that the South Mountains Regional Hazard Mitigation Plan remains a functional document that can be monitored for progress over time. The proposed actions are not listed in priority order, though each has been assigned a priority level of “high,” “moderate,” or “low” as described below and in Section 8 (page 8.2).

The Mitigation Action Plan is organized by mitigation strategy category (Prevention, Property Protection, Natural Resource Protection, Structural Projects, Emergency Services, or Public Education and Awareness). The following are the key elements described in the Mitigation Action Plan:

- ❖ Hazard(s) Addressed—Hazard which the action addresses.
- ❖ Relative Priority—High, moderate, or low priority as assigned by the jurisdiction.
- ❖ Lead Agency/Department—Department responsible for undertaking the action.

- ❖ Potential Funding Sources—Local, State, or Federal sources of funds are noted here, where applicable.
- ❖ Implementation Schedule—Date by which the action the action should be completed. More information is provided when possible.
- ❖ Implementation Status (2020)—Indication of completion, progress, deferment, or no change since the previous plan. If the action is new, that will be noted here.

## 9.2 MITIGATION ACTION PLANS

The mitigation actions proposed by each of the participating jurisdictions are listed in 22 individual MAPs on the following pages. **Table 9.1** shows the location of each jurisdiction’s MAP within this section as well as the number of mitigation actions proposed by each jurisdiction.

**TABLE 9.1: INDIVIDUAL MAP LOCATIONS**

Location	Page	Number of Mitigation Actions
<b>Henderson County</b>	<b>9:3</b>	<b>23</b>
Flat Rock	9:8	3
Fletcher	9:9	4
Hendersonville	9:10	5
Laurel Park	9:11	3
Mills River	9:12	5
<b>Polk County</b>	<b>9:13</b>	<b>21</b>
Columbus	9:18	10
Saluda	9:21	13
Tryon	9:24	10
<b>Rutherford County</b>	<b>9:27</b>	<b>13</b>
Bostic	9:30	3
Chimney Rock Village	9:31	6
Ellenboro	9:33	3
Forest City	9:34	4
Lake Lure	9:35	4
Ruth	9:37	5
Rutherfordton	9:39	3
Spindale	9:40	4
<b>Transylvania County</b>	<b>9:41</b>	<b>7</b>
Brevard	9:45	7
Rosman	9:47	7

## Henderson County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-4	Install stream gauges on major waterways throughout the County to collect data on stream water height and velocity (this will also assist in mitigating erosion hazards).	FL/ER	Low	General Revenue and Grants	County EMA	2025	This will remain an ongoing item based on funding availability.
P-5	Implement scaling as a method of preventative maintenance to reduce the amount of loose debris that could lead to landslides during high precipitation events or seismic events	LS	Moderate	General Revenue and Grants	NCDOT	2025	DOT continues to make improvements in high probability areas along State maintained roads
P-7	Develop a stand-by acquisition grant application that lists properties with a high potential for damage or destruction due to a dam/levee failure.	D	Low	General Revenue and Grants	County EMA	2025	Properties have been identified through the GIS layer development. No funding has been awarded for acquisition, so this will remain an action going forward.
P-8	Develop a stand-by acquisition grant application that lists properties located in multi-hazard areas specifically those properties located near US HWY 74 and NC HWY 9 (Bat Cave) which are prone not only to flash flooding but also to severe landslides.	FL/LS	Low	General Revenue and Grants	County EMA	2025	Properties have been identified; landowners are unwilling to sell at this time. Will continue to pursue this action as possible and as funding is available.
P-9	Educate citizens about safety during flood conditions, including the dangers of driving on flooded roads.	FL	Low	County EMA	General Revenue and Grants	2025	New action

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-10	Distribute flood protection safety pamphlets or brochures to the owners of flood-prone property.	FL	Low	Planning Dept.	General Revenue and Grants	2020	New action. Continue education initiatives through online and print media
P-11	Join the Community Rating System (CRS) program within the next two years.	FL	Moderate	Flood Damage Prevention Administrator	General Revenue	2021	New Action. Develop and distribute materials in conjunction with EMA and Building Services.
P-12	Seek grant funding for mitigation opportunities eligible under the most current version of the UHMA Guidance and Public Assistance 406 mitigation Guidance at the time of the application. Projects may include, but are not limited to: acquisition, elevation, mitigation reconstruction, and wet/dry flood proofing to commercial and/or residential structures as applicable; redundant power to critical facilities, storm shelters and other activities that reduce the loss of life and property as a result of impacts from natural hazards.	All	Moderate	Federal Grants	Henderson County Emergency Management	As funding becomes available.	New action for the 2020 plan update.
<b>Property Protection</b>							
PP-1	Incorporate development and construction standards into the Zoning and Subdivision Ordinances to further regulate construction in areas prone to landslides.	LS/FL	High	General Revenue	Planning Dept.	2025	Policymakers continue to review this item. Additional education and information has been shared with industry and community leaders.
PP-2	Circulate an assessment survey to determine what methods or devices County agencies have in place for securing equipment and furniture during earthquake events.	EQ	Low	General Revenue	IT Dept.	2025	Additional improvements have been made as budgeting, upgrades and renovations are taking place.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Natural Resource Protection</b>							
NRP-5	Establishing a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc.	FL	Moderate	General Revenue	Planning Dept.	In Process	New action. The County has adopted a Greenway Master Plan to encourage planned growth of existing and new greenways.
NRP-6	Increase Wildfire Risk Awareness	WF	Moderate	General Revenue	County EMA	In Process	New action. The county EMA works with the NC Forest Service to identify areas for education. These efforts can be increased.
NRP-7	Install flood telemetry systems in sewage lift stations.	FL	Moderate	General Revenue	Engineering Dept.	Complete	New action. Lift stations have a monitored SCADA system in place to allow quick response to emergencies.
NRP-8	Install watertight covers or inflow guards on sewer manholes, converting and raising manholes in flood prone areas.	FL	Moderate	General Revenue	Engineering Dept.	In Process	New action. Staff continue to evaluate the needs and make improvements as funding allows
<b>Emergency Services</b>							
ES-3	Establish auxiliary power systems via portable generators for all primary County buildings and schools. Make certain to include the wiring closets to accommodate technology routing.	All	High	General Revenue and Grants	Engineering Dept	2025	Ongoing project as budgets allow.
ES-6	Reaffirm plans with emergency service agencies and providers for isolation and evacuation during HAZMAT events.	HM	Moderate	General Revenue and Grants	County EMA	2025, Annually review and update	Ongoing, 8 new facility preplans developed in 2018

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
ES-7	Incorporate the procedures for tracking high water marks following a flood into emergency response plans.	FL	Moderate	General Revenue	County EMA	2020	New action. Utilize technology to identify high water marks when able and share data with key stakeholders for forecasting future needs.
ES-8	Keeping aerial photography current, especially in rapidly developing areas.	ALL	Low	General Revenue	IT Department	2021	New action. Utilize current technology to maintain GIS layers for aerial photography of key hazard areas in Henderson County.
<b>Public Education and Awareness</b>							
PEA-2	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	Low	General Revenue	Planning Department	2025	Building Services and Fire Services will continue to provide education and outreach as available.
PEA-3	Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the County and local administration buildings.	All	Low	General Revenue	Planning Department	2025	This item will continue as additional outreach is needed.
PEA-4	Manually disperse and have a website posting which provides information about the Henderson County Multi-Jurisdictional Hazard Mitigation Plan and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on then plan.	All	High	General Revenue	County EMA	2025, Annually review and update materials	This item will continue as information and materials are updated.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
PEA-5	Circulate information related to the property owner requirements and regulations related to the maintenance and repair of private roadways.	LS/FL	Low	General Revenue	EMA/Planning Department	2020	New action. Develop outreach materials for distribution to the public online and in-person.
PEA-6	Educate property owners regarding options for mitigating their properties from flooding through outreach activities.	FL	Low	General Revenue	EMA	2021	New action. Develop outreach materials for distribution to the public online and in-person.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees County EMA = Henderson County Emergency Management							

## Village of Flat Rock Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
p-4	Convene the Planning Board to identify recommendations to reduce the vulnerability to landslides in the developed areas of Flat Rock and present them to the Village Council.	LS	High	General Revenue	Village Council	2025	This item will continue. Policymakers continue to review this item. Additional education and information has been shared with the Village.
<b>Public Education and Awareness Activities</b>							
PEA-1	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	Low	General Revenue	Planning Dept.	2025	Building Services and Fire Services will continue to provide education and outreach as available.
PEA-2	Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the County and local administration buildings.	All	Low	General Revenue	Planning Dept.	2025	This item will continue as information and materials are updated.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees County EMA = Henderson County Emergency Management Village = Village of Flat Rock							

## Town of Fletcher Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
p-3	Develop a stand-by acquisition grant application that lists properties located in the floodplain.	FL	Moderate	Grants	Town Council	2025	Same action, no funding has been available for this action item.
p-4	Identify properties adjacent to the railroad tracks and post in a GIS system for potential buyout of highly vulnerable structures.	HM	Moderate	General Revenue and Grants	Town Council	2025	Same action, no funding has been available for this action item.
<b>Public Education and Awareness Activities</b>							
PEA-1	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	Low	General Revenue	Planning Department	2025	Building services and Fire services will continue to provide education and outreach as available.
PEA-2	Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the County and local administration buildings.	All	Low	General Revenue	Planning Department	2025	This item will continue as additional outreach is needed.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees County EMA = Henderson County Emergency Management Town = Town of Fletcher							

## City of Hendersonville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Encourage community to participate in the CRS program.	FL	Moderate	General Revenue and Grants	Development Assistance Department	2025	The City of Hendersonville is planning to participate in the CRS.
P-3	Develop a stand-by acquisition grant application that lists properties identified as repetitive loss properties due to water events.	FL	Moderate	Federal Grant	Planning Department	2025	We will be applying for mitigation grants to mitigate these properties.
P-4	Develop a stand-by acquisition grant application that lists properties adjacent to railroads	HM	Moderate	Grants	Zoning Department	Action being deleted.	This action is being deleted as it is not feasible at this time. It will be removed during the 2025 update.
<b>Emergency Services</b>							
ES-3	Purchase generators to use as an emergency power supply for water and sewer treatment plants if power is lost during a disaster.	All	High	General Revenue and Grants	Water and Sewer Dept.	2025	Backup power will be installed to water distribution and sewer collection systems.
ES-5	Develop an action plan to reroute and control traffic during emergency situations. Remote control capability has been implemented throughout the City.	All	High	General Revenue and Grants	Police Dept.	2025	Remote control capability has been implemented throughout the City, but an action plan has not been developed.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees County EMA = Henderson County Emergency Management City = City of Hendersonville							

## Town of Laurel Park Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Natural Resource Protection</b>							
NRP-2	Work in conjunction with the NCFS to create and maintain fire breaks; especially on Town ROW and support efforts with private property owners and HOAs.	Fire	High	General Revenue and NCFS	Town Manager	Ongoing	Needs update
<b>Emergency Services</b>							
ES-2	Purchase generators for all local emergency facilities.	All	High	General Revenue and Grants	Town Council	2025	The Town of Laurel Park has purchased and installed natural gas operated generators for the Town Hall and the Public Works Department to facilitate emergency management operations during power outages. Other facilities will be evaluated for generator need going forward.
<b>Public Education and Awareness Activities</b>							
PEA-1	Implement a citizen notification system (email, text, automated phone call)	All	Medium	General Revenues	Town Council	2025	Contract in review currently and system will need to be updated accordingly.

## Town of Mills River Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Encourage Town participation in the National Flood Insurance Program and subsequent participation in the Community Rating System Program.	FL	High	General Revenue	Town Council	2025	Town Council will consider participation
P-2	Develop a Flood Damage Prevention Ordinance.	FL	Moderate	General Revenue	Town Council	2025	Town Council will consider development
P-3	Develop a Stormwater Management Plan.	FL	Moderate	General Revenue	Town Council	2025	Town Council consider development
<b>Public Education and Awareness Activities</b>							
PEA-1	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	Low	General Revenue	Planning Department	2025	Contractors have been educated to some degree, but more outreach is needed and the program needs to be re-evaluated. This action will be carried out going forward.
PEA-2	Provide new home and property buyers with information on quality redevelopment and safe housing development. The information is probably most efficiently dispersed at the County and local administration buildings.	All	Low	General Revenue	Planning Department	2025	The county has developed a brochure to provide information on safe housing development. However, further means of outreach need to be integrated.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures   EQ = Earthquake LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   County EMA = Henderson County Emergency Management   Town = Town of Mills River							

## Polk County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Incorporate a GIS to maintain building/parcel data for purposes of conducting more detailed hazard risk assessments and for tracking permitting/land use patterns.	All	Moderate	NCEM/FEMA/Local Funds	Polk County MIS	Continual	Continue to update GIS system as needed
P-3	Review the subdivision ordinances to determine storm water drainage to minimize flooding potential.	FL	High	Local Funds	Planning and Zoning	Completed	Completed. This action will be removed during the 2025 update.
P-5	Work with the LEPC and emergency services to ensure proper SARA Title III reporting.	HM	Moderate	Local Funds	LEPC	Annually	This committee will need to meet and stay up to date on any new requirements that are passed concerning Title III reporting.
P-6	Identify and map landslide-prone areas in County	LS	High	State of NC, Grant funding	NC Geological Survey, County ES	2025	New action. Most recent landslide was in 2018. 56 identifiable landslides by NC Geological Survey
P-7	Work with State of NC to expand FIMAN into Polk County – new gauges are needed on the Green River and White Oak Creek	FL	High	NCEM/FEMA Grants	County ES, NCEM	2024	New action. Recent flooding exposed lack of monitoring capabilities.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-8	Seek grant funding for mitigation opportunities eligible under the most current version of the UHMA Guidance and Public Assistance 406 mitigation Guidance at the time of the application. Projects may include, but are not limited to: acquisition, elevation, mitigation reconstruction, and wet/dry flood proofing to commercial and/or residential structures as applicable; redundant power to critical facilities, storm shelters and other activities that reduce the loss of life and property as a result of impacts from natural hazards.	All	Moderate	Federal Grants	Polk County Emergency Management	As funding becomes available.	New action for the 2020 plan update.
<b>Property Protection</b>							
PP-3	Implement a program that identifies streams that are impacted by beaver dams and creates a solution to the flooding caused by the dams.	FL	Low	NCEM/FEMA/Local Funds	Public Works	Action Deleted	No issues of beaver dams in County/State implements program. This action will be removed during the 2025 update.
PP-4	Create a private bridge registry for bridges built over the county's four major streams.	FL	Low	Local Funds	GIS	2022	All bridges have been identified, but additional mapping of the bridges would be useful and measures still need to be carried out to mitigate the bridges themselves.
PP-5	Identify and remove large obstructions in the county's major streams.	FL	Low	NCDA&CS/ NCEM/ FEMA/Local Funds	Soil & Water	2024	In the past, major obstructions have been removed, but this will continue to be an issue. Seek grant funding to move this program forward.
<b>Emergency Services</b>							
ES-2	Develop and implement hazard mitigation planning web page on Polk County Emergency Management web site.	All	Moderate	Local	County ES	Completed	The county posts its hazard mitigation plan up on the website. This action will be removed during the 2025 update.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
ES-3	Enhance weather monitoring to attain earlier severe winter and ice storm warnings, as well as any severe weather related events.	S/I	Moderate	NCEM/FEMA/Local Funds	Communications Department	Continual	Many steps have been taken to enhance weather monitoring over the past several years, but with new advancements in equipment and systems, this program will need to be reviewed and updated. Continue to work closely with the National Weather Service.
ES-5	Develop an inventory list of required equipment needed by Emergency Service agencies for hazardous material spills.	HM	Moderate	Local Funds	Polk County Chief's Assoc.	2022	A list has been developed, but there are still items that are needed to complete the inventory to maximize response to spills.
ES-6	Enhance County emergency Services' radio system for better interoperability with other agencies.	All	High	Grant funding as available, Local Funds (approximate cost \$850,000)	County ES	2024	New action. Outdated equipment during recent emergencies made communication difficult.
ES-7	Acquire a drone to assist with assessing and monitoring emergencies.	FL, T, WF, S/I, LS/ER, HAZMAT, D, ES	Moderate	Grant funding, County Funding (approximate cost \$30,000)	County ES	2024	New action. A drone would have helped in damage assessments after recent storms. Could also help locate missing persons and many other emergencies.
ES-8	Acquire generators for emergency shelters.	FL, LS, S/I, HU, T, WF, D	High	FEMA Grant Funding (approximate cost \$400,000)	County ES	2024-2028	New action. Numerous events in 2018 required shelters. They would be most beneficial at PCHS, PCMS, Sunnyview Elementary School, Cooper Gap Baptist Church, and Tryon 7 <sup>th</sup> Day Adventist Church

**SECTION 9 MITIGATION ACTION PLAN**

Structural Projects							
SP-1	Turner-Shoal Dam Upgrade: Construction updates to strengthen the dam.	FL/D	High	County Funds	County ES, Public Works, DENR	2024	Some updates to the dam have been implemented but the dam is still in need of upgrade in some areas.
SP-2	Coordinate with NCDOT to repair/replace storm water drainage on Main Street Saluda	FL	Moderate	City Funds (estimated cost of \$250,000)	City of Saluda	2030	New action for the 2020 update. Main Street drainage includes a 135-year-old rock culvert. The culvert is failing and collapsing the sidewalk.
Public Education and Awareness							
PEA-1	Promote the availability of flood insurance to property owners by direct mail at least once a year.	FL	High	Local Funds	Planning and Zoning	Annually	Information has been sent out annually on the tax notices in the past. This program will need to be updated in the future and will be evaluated to determine if new outreach mechanisms are needed.
Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
PEA-2	Provide brochures, flyers, and pamphlets on all hazards that affect Polk County. Information will be placed in departments/agencies that are considered high traffic areas.	All	Low	Local Funds	County ES	Annually	Information has been placed in high traffic areas, but the county will continue to look at ways to improve outreach including through online surveys (carried out in this plan) and other means, such as community events.
PEA-4	Provide a booth with hazard mitigation information at all major community events.	All	Low	Local Funds	County ES	Annually	The county has provided informational booths at many events including fairs and community gatherings. Information displayed will need to be updated periodically.

**SECTION 9 MITIGATION ACTION PLAN**

PEA-5	Work to extend broadband/fiber/cell service and internet in unserved/underserved areas of the County.	All	High	Grant funding as available, Local Fund	County ES	Ongoing	This is a new action. There is a county-wide lack of service for emergency communications.
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FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake  
 LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County ES = Polk County Emergency Services

## Town of Columbus Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-2	Work with the LEPC and emergency services to ensure proper SARA Title III reporting.	HM	Moderate	Local Funds	LEPC	Annually	This committee will need to meet and stay up to date on any new requirements that are passed concerning Title III reporting.
<b>Property Protection</b>							
PP-1	Implement a program that identifies streams that are impacted by beaver dams and creates a solution to the flooding caused by the dams.	FL	Low	NCEM/FEMA Local Funds	Polk County Public Works	Action Deleted	No issues of beaver dams in County/State implements program. This action will be removed during the 2025 update.
PP-2	Create a private bridge registry for bridges built over the county's four major streams.	FL	Low	Local Funds	Polk County ES	2022	All bridges have been identified, but additional mapping of the bridges would be useful and measures still need to be carried out to mitigate the bridges themselves.
PP-3	Identify and remove large obstructions in the county's major streams.	FL	Low	NCEM/FEMA Local Funds	Public Works	2024	In the past, major obstructions have been removed, but this will continue to be an issue. Seek grant funding to move this program forward.

**SECTION 9 MITIGATION ACTION PLAN**

Emergency Services							
ES-1	Develop an inventory list of required equipment needed by Emergency Service agencies for hazardous material spills.	HM	Moderate	Local Funds	Polk county Chief's Association	2022	A list has been developed, but there are still items that are needed to complete the inventory to maximize response to spills.
ES-2	Incorporate a Geographic Information System to maintain building/parcel data for purposes of conducting more detailed hazard risk assessments and for tracking permitting/land use patterns.	All	Moderate	NCEM/ FEMA/Local Funds	Polk County MIS	2025	A GIS system has been built and includes building and parcel data. However, this data will need to be updated as it is out of date.
ES-3	Develop and implement hazard mitigation planning web page on Polk County Emergency Services web site.	All	Moderate	Local	County ES	Completed	The county posts its hazard mitigation plan up on the website. This action will be removed during the 2025 update.
Structural Projects							
SP-1	Complete an emergency waterline from Henderson County	DR	High	Local Funds	County ES	2025	This project has been discussed and is in the works, but is not complete. More work will need to be done going forward
Public Education and Awareness Activities							
PEA-1	Provide brochures, flyers (e.g NFIP), and pamphlets on all hazards that affect Polk County. Information will be placed in departments/ agencies that are considered high traffic areas.	All	Low	Local Funds	County ES	2025	Information has been placed in high traffic areas, but the county will continue to look at ways to improve outreach including through online surveys (carried out in this plan) and other means.

**SECTION 9 MITIGATION ACTION PLAN**

PEA-3	Provide a booth with hazard mitigation information at all community.	All	Low	Local Funds	County ES	2025	The county has provided informational booths at many events including fairs and community gatherings. Information displayed will need to be updated periodically.
<p>FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures            EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County ES = Polk County Emergency Services            Town = Town of Columbus</p>							

## City of Saluda Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Work with the LEPC and emergency services to ensure proper SARA Title III reporting.	HM	Moderate	Local Funds	LEPC	Annually	This committee will need to meet and stay up to date on any new requirements that are passed concerning Title III reporting.
<b>Property Protection</b>							
PP-1	Implement a program that identifies streams that are impacted by beaver dams and creates a solution to the flooding caused by the dams.	FL	Low	NCEM/FEMA Local Funds	Polk county Public Works	Action Deleted	No issues of beaver dams in County/State implements program. This action will be removed during the 2025 update.
PP-2	Create a private bridge registry for bridges built over the county's four major streams.	FL	Low	Local Funds	Public Works	2022	All bridges have been identified, but additional mapping of the bridges would be useful and measures still need to be carried out to mitigate the bridges themselves.
PP-3	Identify and remove large obstructions in the county's major streams.	FL	Low	NCEM FEMA Local Funds	Public Works	2024	In the past, major obstructions have been removed, but this will continue to be an issue. Seek grant funding to move this program forward.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Emergency Services</b>							
ES-1	Develop an inventory list of required equipment needed by Emergency Service agencies for hazardous material spills.	HM	Moderate	Local Funds	Polk County Chief's Assoc.	2022	A list has been developed, but there are still items that are needed to complete the inventory to maximize
ES-4	Develop and implement hazard mitigation planning web page on Polk County Emergency Services web site.	All	Moderate	Local	County ES	Completed	The county posts its hazard mitigation plan up on the website. This action will be removed during the 2025 update.
ES-5	Develop a plan to mitigate likelihood of access isolation due to natural phenomena such as ice, snow, landslide, or winter storm.	S/I, LS, WS	Low	City of Saluda	City of Saluda	2025	New action for the 2020 update. Recent winter storms clogged roads with stuck vehicles making roads impassable thus eliminating physical connections to Henderson and Polk County.
ES-6	Generators are needed for critical infrastructure	All	High	State and Federal Grants as available or City of Saluda	City of Saluda	2025	New action for the 2020 update. Outdated electrical equipment and lack of generators does not provide backup power to lift stations during storm events. Generators are needed at 176 Lift Station, Laurel Drive Life Station and Dip Lift station.
ES-7	Coordinate with Polk County to enhance County Emergency Services' radio system for better interoperability with other agencies.	All	High	State and Federal Grants as available	County ES	2024	New action for the 2020 plan. Outdated equipment during recent emergencies made communication difficult.
ES-8	Increase access to broadband/fiber/cell service/internet in unserved/underserved areas of the City.	All	Moderate	Wilkes Communication	City of Saluda	2024	New action for the 2020 plan. Outdated phone and internet equipment throughout the City provides unreliable internet and phone service.

**SECTION 9 MITIGATION ACTION PLAN**

Structural Projects							
SP-1	Complete an emergency waterline from Henderson County.	DR	High	Local Funds	Town Manager	2025	This project has been discussed and is in the works, but is not complete. More work will need to be done going forward.
Public Education and Awareness Activities							
PEA-1	Provide brochures, flyers (e.g NFIP), and pamphlets on all hazards that affect Polk County. Information will be placed in departments/agencies that are considered high traffic areas.	All	Low	Local Funds	County ES	2025	Information has been placed in high traffic areas, but the county will continue to look at ways to improve outreach including through online surveys (carried out in this plan) and other means.
PEA-3	Provide a booth with hazard mitigation information at all community.	All	Low	Local Funds	County ES	2025	The county has provided informational booths at many events including fairs and community gatherings. Information displayed will need to be updated periodically.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County ES = Polk County Emergency Services    City = City of Saluda							

## Town of Tryon Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Work with the LEPC and emergency services to ensure proper SARA Title III reporting.	HM	Moderate	Local Funds	LEPC	2025, Annually	County Emergency Services meets with the LEPC on a quarterly basis and has reported on SARA Title III over the past 5 years. Going forward, this committee will need to meet and stay up to date on any new requirements that are passed concerning Title III reporting.
<b>Property Protection</b>							
PP-1	Implement a program that identifies streams that are impacted by beaver dams and creates a solution to the flooding caused by the dams.	FL	Low	NCEM/ FEMA/Local Funds	Polk County Public works	2025	A program that identifies and addresses beaver dams is in the works, but it has not been fully implemented so additional effort will need to be carried out.
PP-2	Create a private bridge registry for bridges built over the county's four major streams.	FL	Low	Local Funds	Public Works	2025	All bridges have been identified, but additional mapping of the bridges would be useful and measures still need to be carried out to mitigate the bridges themselves.
PP-3	Identify and remove large obstructions in the county's major streams.	FL	Low	NCEM/FEMA/ Local Funds	Public Works	2025	In the past, major obstructions have been removed, but this will continue to be an issue and the county will implement this program going forward.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Emergency Services</b>							
ES-1	Develop an inventory list of required equipment needed by Emergency Service agencies for hazardous material spills.	HM	Moderate	Local Funds	Polk County Chief's Association	2022	A list has been developed, but there are still items that are needed to complete the inventory to maximize response to spills.
ES-2	Incorporate a Geographic Information System to maintain building/parcel data for purposes of conducting more detailed hazard risk assessments and for tracking permitting/land use patterns.	All	Moderate	NCEM/FEMA/Local Funds	Polk County MIS	2025	A GIS system has been built and includes building and parcel data. However, this data will need to be updated as it is out of date.
ES-4	Develop and implement hazard mitigation planning web page on Polk County Emergency Services web site.	All	Moderate	Local	County ES	2025	The county posts its hazard mitigation plan up on the website, but a page dedicated to hazard mitigation plan will still need to be developed.
<b>Structural Projects</b>							
SP-1	Complete an emergency waterline from Henderson County.	DR	High	Local Funds	Town Managers	2025	This project has not yet started.
<b>Public Education and Awareness Activities</b>							
PEA-1	Provide brochures, flyers (e.g NFIP), and pamphlets on all hazards that affect Polk County. Information will be placed in departments/agencies that are considered high traffic areas.	All	Low	Local Funds	County ES	2025	Information has been placed in high traffic areas, but the county will continue to look at ways to improve outreach including through online surveys (carried out in this plan) and other means.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
PEA-3	Provide a booth with hazard mitigation information at all community gatherings.	All	Low	Local Funds	County ES	2025	The county has provided informational booths at many events including fairs and community gatherings. Information displayed will need to be updated periodically.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures EQ = Earthquake   LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   County ES = Polk County Emergency Services Town = Town of Tryon							

## Rutherford County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-7	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Marshall	2025	Deferred due to funding and a lack of community interest
P-9	Develop parcel specific land use maps.	All	Moderate		GIS Department	2025	Deferred, the county has not been able to develop parcel specific land use maps due to lack of staff time. It will work to complete this action going forward.
P-10	Seek grant funding for mitigation opportunities eligible under the most current version of the UHMA Guidance and Public Assistance 406 mitigation Guidance at the time of the application. Projects may include, but are not limited to: acquisition, elevation, mitigation reconstruction, and wet/dry flood proofing to commercial and/or residential structures as applicable; redundant power to critical facilities, storm shelters and other activities that reduce the loss of life and property as a result of impacts from natural hazards.	All	Moderate	Federal Grants	Rutherford County Emergency Management	As funding becomes available	New action for the 2020 plan update.

**SECTION 9 MITIGATION ACTION PLAN**

Natural Resource Protection							
NRP-1	Research and evaluate the possibility of stream buffers along the floodplains.	FL	Moderate		Planning Department	2025	Deferred, the county has not had sufficient staff time and funding to research/evaluate stream buffers, so it will work to complete this action in the next cycle.
NRP-2	Identify open space, greenways, and conservation areas along the floodplains and as soon as feasible should plan for acquisition or easements.	FL	Moderate	Grant Funds	Planning Department	2025	Deferred due to funding constraints. The county will work to complete this action in the next cycle.
NRP-3	Develop buffers along streams and rivers prone to repetitive flooding	FL	Moderate		Planning Department	2025	Deferred due to funding constraints. The county will work to complete this action in the next cycle.
Emergency Services							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA Local Funds NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
Structural Projects							
SP-1	Encourage the Broad River Water Authority, the Town of Forest City, and the Cleveland County Water District to continue to expand into the rural areas of the county.	DR/WF	Moderate	Local Funds	County Fire Marshall	2025	Completed, but additional extensions are planned for other areas, so this action will be carried over to the next cycle.

**SECTION 9 MITIGATION ACTION PLAN**

SP-3	Public water suppliers should study the feasibility of water storage, either in the form of extra basins at the intake or treatment facility, or in the form of larger reservoirs.	DR	Low		Water System managers	2025	Deferred due to lack of funding. The county will work to improve water storage capacity in the future.
<b>Public Education and Awareness</b>							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
PEA-2	Create brochures or handouts that would be available to the public regarding a host of issues related to fire and burning.	WF	Moderate	Local Funds	County Fire Marshall	2025	Deferred, Not adequate on personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
PEA-3	Provide information to citizens regarding drought, heat, and shortage of water. Information could be available as brochures, notification on water bills, public service announcements, newspaper articles, etc.	WF/DR	High		Water system managers	2025	Deferred although some information has been provided to customers, additional information should be developed and sent out to the public.

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 EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department

## Town of Bostic Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to lack of community interest. The town will work to become more involved in the Firewise program going forward.
<b>Emergency Services</b>							
ES-1	Provide a quick-connect emergency generator hook-up for the communications center.	All	High	General Revenue and Grants	Police Department	2025	This is a revision to the previous ES-1 action and will be implemented by 2025 if feasible.
ES-6	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	2025	Some training on damage assessments have been completed, but more are necessary to improve the overall process and efficiency.
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## Chimney Rock Village Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Develop a storm water Management Ordinance. Encourage Town participation in the Community Rating System.	FL	High	General Revenue and Grants	Town Council	2025	The storm water Management plan is included in Land Development Code adopted March 2006. Completed Plan but no funding to implement. The village will need to work on developing an implementation plan.
P-3	Develop a stand-by acquisition grant application that lists properties located in the floodplain.	FL	Moderate	Grants	Town Council	2025	Deferred due to lack of funding and staff time to create the application and develop a list of eligible properties
P-5	Initiate a storm water study to determine if storm water is exacerbating flooding along waterways, and provide solutions or alternatives to manage this problem.	FL	Moderate	General Revenue	Public Works	2025	Deferred due to lack of funding to complete stormwater study. A comprehensive stormwater study should be completed in the future.
P-6	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to lack of funding. The town will work to become more involved in the Firewise program going forward.

**SECTION 9 MITIGATION ACTION PLAN**

Emergency Services							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
Public Education and Awareness Activities							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures   EQ = Earthquake   LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   EMD = Rutherford County Emergency Management Department   Village = Chimney Rock Village							

## Town of Ellenboro Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to lack of community interest. The town will work to become more involved in the Firewise program going forward.
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Public Education and Awareness Activities</b>							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department Town = Town of Ellenboro							

## Town of Forest City Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Initiate a storm water study to determine if storm water is exacerbating flooding along waterways, and provide solutions or alternatives to manage this problem.	FL	Moderate	General Revenue	Public Works	2025	Deferred due to lack of funding to complete storm water study. A comprehensive storm water study should be completed in the future.
P-3	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	New Action
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Public Education and Awareness Activities</b>							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department Town = Town of Forest City							

## Town of Lake Lure Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Initiate a storm water study to determine if storm water is exacerbating flooding along waterways, and provide solutions or alternatives to manage this problem.	FL	Moderate	General Revenue	Public Works	2025	Deferred due to lack of funding to complete storm water study. A comprehensive storm water study should be completed in the future.
P-3	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	New Action
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA Local Funds NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Public Education and Awareness Activities</b>							

**SECTION 9 MITIGATION ACTION PLAN**

PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
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 EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department  
 Town = Town of Lake Lure

## Town of Ruth Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Encourage Town participation in the National Flood Insurance Program and subsequent participation in the Community Rating System Program.	FL	High	Local Funds	Town Council	Completed	Completed: The Town joined the NFIP on 09/28/18. This action will be removed from the plan for the 2025 update.
P-2	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to lack of community interest. The Town will work to become more involved in the Firewise program going forward.
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Structural Projects</b>							
SP-1	Encourage the Broad River Water Authority, the Town of Forest City, and the Cleveland County Water District to continue to expand into the rural areas of the county.	DR/WF	Moderate	Local Funds	County Fire Marshall	2025	Completed, but additional extensions are planned for other areas, so this action will be carried over to the next cycle.

**SECTION 9 MITIGATION ACTION PLAN**

Public Education and Awareness Activities							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2017	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
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## Town of Rutherfordton Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to funding and a lack of community interest
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Public Education and Awareness Activities</b>							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, Not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures EQ = Earthquake   LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   EMD = Rutherford County Emergency Management Department   Town = Town of Rutherfordton							

## Town of Spindale Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Initiate a storm water study to determine if storm water is exacerbating flooding along waterways, and provide solutions or alternatives to manage this problem.	FL	Moderate	General Revenue	Public Works	2025	Deferred due to lack of funding to complete storm water study. A comprehensive storm water study should be completed in
P-3	Encourage small communities, towns, fire departments, or neighborhoods to participate in the Fire Wise Program and become certified Fire Wise Communities.	WF	Moderate	Grant Funds	Fire Chief	2025	Deferred due to lack of community interest. The town will work to become more involved in the Firewise program going forward.
<b>Emergency Services</b>							
ES-2	All critical facilities that do not have backup power generation capabilities should seek funding in order to obtain these capabilities.	All	Moderate	FEMA/Local Funds/NCEM	EMD	2025	Deferred due to funding constraints. The county would like to equip all critical facilities with backup power generation capabilities in the future, so it will seek funding to do so.
<b>Public Education and Awareness Activities</b>							
PEA-1	Create a brochure to be made available to the public, documenting what to do when extended power outages occur.	All	Moderate	Local Funds	County EM Staff	2025	Deferred, not adequate personnel or staff time to create outreach materials. The county will work to complete this in the next several years.

**SECTION 9 MITIGATION ACTION PLAN**

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures  
 EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department  
 Town = Town of Spindale

**Transylvania County Mitigation Action Plan**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Seek grant funding for mitigation opportunities eligible under the most current version of the UHMA Guidance and Public Assistance 406 mitigation Guidance at the time of the application. Projects may include, but are not limited to: acquisition, elevation, mitigation reconstruction, and wet/dry flood proofing to commercial and/or residential structures as applicable; redundant power to critical facilities, storm shelters and other activities that reduce the loss of life and property as a result of impacts from natural hazards.	All	Moderate	Federal Grants	Transylvania County Emergency Management	As funding becomes available	New action for the 2020 plan update.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Emergency Services</b>							
ES-1	Obtain inundation maps for high hazard dams that pose the greatest risk to life and property.	FL/D	Low		ES	2025	The emergency management office continues to work with local dam owners and engineers in the preparation of inundation maps and preplanning based on NC DENR recommendations and protocols. As plans are approved by DENR, copies are submitted to the local emergency management office and the inundation mapping is incorporated into the GIS system. The county will continue to work on this action going forward.

**SECTION 9 MITIGATION ACTION PLAN**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Structural Projects</b>							
SP-1	Elevate Wilson Road Bridge.	FL/HU	High		County Manager	Aim for 2030	No funding has been located for this project as yet. The project is on hold until funding can be located.
<b>Public Education and Awareness</b>							
PEA-1	Hold a hazard mitigation seminar, including information on preparedness for all hazards significant to Transylvania County, Brevard, and Rosman and promotion of participation in FireWise.	All	High	NCEM and Local Funds	County Manager	2025	The first event was first held on June 18, 2012. Several agencies participated in the event with educational material and speakers for the public to learn about things they could do around their own home to mitigate dangers to themselves and others. The county will look to hold additional seminars going forward.
PEA-2	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	High	Local Funds	Building Inspections	2025, Annual review and update	Printed material was developed and is distributed through the county building department. This material is reviewed and updated annually.

**SECTION 9 MITIGATION ACTION PLAN**

PEA-3	Provide new home and property buyers with information on quality redevelopment, safe housing development, and FireWise Communities. The information is probably most efficiently dispersed at the community administration buildings.	All	High	Local Funds	Building Inspector	2025, Annual review and update	The printed material was developed and is distributed through the county building department, county administrative offices, city of Brevard administrative offices, and the town of Rosman administrative offices. This material is reviewed and updated annually.
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Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
PEA-4	Manually disperse and have a website posting on the County and City websites, which provides information about the South Mountains Regional Hazard Mitigation Plan , and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on the plan.	All	High	Local Funds	County Manager	2025, Annual review and update	The plan is linked on all the local government websites and a feedback channel through the website is monitored for comment and suggestion. The county evaluates and updates its outreach plan on an annual basis

FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures  
 EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TH = Thunderstorms ES = Transylvania County Emergency Services

## City of Brevard Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Update components of existing storm water Management Plan.	FL	High	Local Funds	Floodplain Manager-Planning Department	2025	Although a storm water Management Plan is in place, a review and update of the plan is necessary.
P-4	Increase the culvert at Cherry Street and Old Hendersonville Highway.	FL/HU	Moderate	State Funds	NCDOT	2025	The culvert increase has not been completed, but is on schedule to be completed by 2025.
<b>Emergency Services</b>							
ES-1	Obtain inundation maps for high hazard dams that pose the greatest risk to life and property.	FL/D	Low	State or Federal Funds	ES	2025	The emergency management office continues to work with local dam owners and engineers in the preparation of inundation maps and preplanning based on NC DENR recommendations and protocols. As plans are approved by DENR, copies are submitted to the local emergency management office and the inundation mapping is incorporated into the GIS system. The county will continue to work on this action going forward.

**SECTION 9 MITIGATION ACTION PLAN**

Structural Projects							
SP-1	Elevate Old Hendersonville HWY between Osborne Road and Cherry Street and between Cherry Street and Dodson Flats.	FL/HU	Low		NCDOT	2025	This action is the responsibility of NCDOT and is being evaluated/carried out through the NCSTIP. The project has not been completed, but will continue to be worked on through the NCSTIP.
Public Education and Awareness Activities							
PEA-2	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	High	Local Funds	Building Inspections	2025, Annual review and update	Printed material was developed and is distributed through the county building department. This material is reviewed and updated annually.
PEA-3	Provide new home and property buyers with information on quality redevelopment, safe housing development, and FireWise Communities. The information is probably most efficiently dispersed at the community administration buildings.	All	High	Local Funds	Planning Department	2025, Annual review and update	The printed material was developed and is distributed through the county building department, county administrative offices, city of Brevard administrative offices, and the town of Rosman administrative offices. This material is reviewed and updated annually.

**SECTION 9 MITIGATION ACTION PLAN**

PEA-4	Manually disperse and have a website posting on the County and City websites, which provides information about the Multi-Jurisdictional Hazard Mitigation Plan for Transylvania County, and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on the plan.	All	High	Local Funds	City Manager	2025, Annual review and update	The plan is linked on all the local government websites and a feedback channel through the website is monitored for comment and suggestion. The county evaluates and updates its outreach plan on an annual basis
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FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake  
 LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TH = Thunderstorms ES = Transylvania County Emergency Services City = City of Brevard

## Town of Rosman Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Develop a Stormwater Management Plan	FL	Low	Local Funds	Floodplain Manager	2030	The emergency management office continues to work with local dam owners and engineers in the preparation of inundation maps and preplanning based on NC DENR recommendations and protocols. As plans are approved by DENR, copies are submitted to the local emergency management office and the inundation mapping is incorporated into the GIS
<b>Emergency Services</b>							
ES-1	Obtain inundation maps for high hazard dams that pose the greatest risk to life and property.	FL/D	Low	State or Federal Funds	ES	2025	The emergency management office continues to work with local dam owners and engineers in the preparation of inundation maps and preplanning based on NC DENR recommendations and protocols. As plans are approved by DENR, copies are submitted to the local emergency management office and the inundation mapping is incorporated into the GIS

**SECTION 9 MITIGATION ACTION PLAN**

ES-3	Purchase and install generators for the Town's four wells.	All	Moderate	NCEM and Local Funds	Town Mayor	2025	The town is still attempting to locate grant funds for this project so that it can install the generators. It will work to complete this action in the future.
Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Structural Projects</b>							
SP-1	Elevate Main Street between Depot Street and Old Rosman Highway	FL	High	FEMA, NCEM and Local Funds	Town Mayor	2030	The town is trying to locate funding sources for this project. It could be potential split between the state and the town since both maintain the roadway.
<b>Public Education and Awareness Activities</b>							
PEA-2	Educate contractors about principles for quality redevelopment and safe housing development through written materials or a County sponsored workshop.	All	High	Local Funds	Building Inspectors	2025, Annual review and update	Printed material was developed and is distributed through the county building department. This material is reviewed and updated annually.
PEA-3	Provide new home and property buyers with information on quality redevelopment, safe housing development, and FireWise Communities. The information is probably most efficiently dispersed at the community administration buildings.	All	High	Local Funds	Building Inspectors	2025, Annual review and update	The printed material was developed and is distributed through the county building department, county administrative offices, city of Brevard administrative offices, and the town of Rosman administrative offices. This material is reviewed and updated annually.

**SECTION 9 MITIGATION ACTION PLAN**

PEA-4	Manually disperse and have a website posting on the County and City websites, which provides information about the Multi-Jurisdictional Hazard Mitigation Plan for Transylvania County, and relevant mitigation measures the public can take. In addition, provide a response/reply section where residents can comment on the effectiveness of the current plan and where they can make suggestions for future revisions on the plan.	All	High	Local Funds	Town Mayor	2025, Annual review and update	The plan is linked on all the local government websites and a feedback channel through the website is monitored for comment and suggestion. The county evaluates and updates its outreach plan on an annual basis
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FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake  
 LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TH = Thunderstorms ES = Transylvania County Emergency Services Town = Town of Rosman



# SECTION 10

## PLAN MAINTENANCE

This section discusses how the South Mountains Region Mitigation Strategy and Mitigation Action Plan will be implemented and how the Regional Hazard Mitigation Plan will be evaluated and enhanced over time. This section also discusses how the public will continue to be involved in a sustained hazard mitigation planning process. It consists of the following four subsections:

- ❖ 10.1 Implementation and Integration
- ❖ 10.2 Monitoring, Evaluation and Enhancement
- ❖ 10.3 Continued Public Involvement
- ❖ 10.4 Evaluation of Monitoring, Evaluation and Update Process

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### 44 CFR Requirement

#### 44 CFR Part 201.6(c)(4)(i):

The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

#### 44 CFR Part 201.6(c)(4)(ii):

The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

## 10.1 IMPLEMENTATION AND INTEGRATION

Each agency, department or other partner participating under the South Mountains Regional Hazard Mitigation Plan is responsible for implementing specific mitigation actions as prescribed in the Mitigation Action Plan. Every proposed action listed in the Mitigation Action Plan is assigned to a specific “lead” agency or department in order to assign responsibility and accountability and increase the likelihood of subsequent implementation.

In addition to the assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. The counties in the South Mountains Region will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan.

The participating jurisdictions will integrate this Hazard Mitigation Plan into relevant City and County government decision-making processes or mechanisms, where feasible. This includes integrating the requirements of the Hazard Mitigation Plan into other local planning documents, processes or mechanisms, such as comprehensive or capital improvement plans, when appropriate. The members of the Southern Mountains Regional Hazard Mitigation Planning Committee will remain charged with

ensuring that the goals and mitigation actions of new and updated local planning documents for their agencies or departments are consistent, or do not conflict with, the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in the Southern Mountains Region.

Since the initial plan was adopted in 2015, each County and participating jurisdiction has worked to integrate the hazard mitigation plan into other planning mechanisms where applicable/feasible. Examples of how this integration has occurred have been documented in the Implementation Status discussion provided for each of the mitigation actions found in Section 9. Specific examples of how integration has occurred include:

- ❖ Integrating the mitigation plan into reviews and updates of floodplain management ordinances
- ❖ Integrating the mitigation plan into reviews and updates of County emergency operations plans
- ❖ Integrating the mitigation plan into review and updates of building codes
- ❖ Integrating the mitigation plan into the capital improvements plan through identification of mitigation actions that require local funding.

Opportunities to further integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the Regional Hazard Mitigation Planning Committee, individual county meetings, and the annual review process described herein. Although it is recognized that there are many possible benefits to integrating components of this Plan into other local planning mechanisms, the development and maintenance of this stand-alone Regional Hazard Mitigation Plan is deemed by the South Mountain Regional Hazard Mitigation Planning Committee to be the most effective and appropriate method to implement local hazard mitigation actions at this time.

## **10.2 MONITORING, EVALUATION, AND ENHANCEMENT**

Periodic revisions and updates of the Hazard Mitigation Plan are required to ensure that the goals of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal and state regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the Mitigation Action Plan.

When determined necessary, the South Mountain Regional Hazard Mitigation Planning Committee shall meet in March of every year to evaluate and monitor the progress attained and to revise, where needed, the activities set forth in the Plan. The findings and recommendations of the Regional Hazard Mitigation Planning Committee shall be documented in the form of a report that can be shared with interested City and County Council members. The Regional Hazard Mitigation Planning Committee will also meet following any disaster events warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within the South Mountain Region. For future updates of the plan, North Carolina Emergency Management's Hazard Mitigation Planning section will help coordinate the reconvening of the Regional Hazard Mitigation Planning Committee for these reviews through coordination with each County's Emergency Management Departments. The Emergency Management Director from Henderson, Polk, Rutherford and Transylvania Counties will maintain ultimate responsibility for their respective County's plan implementation and monitoring, evaluation and update.

### **Five (5) Year Plan Review**

The Plan will be thoroughly reviewed by the Regional Hazard Mitigation Planning Committee every five years to determine whether there have been any significant changes in the South Mountain Region that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, an increased exposure to hazards, an increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the Plan.

The plan review provides participating jurisdiction officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. North Carolina Emergency Management's Hazard Mitigation Planning section will help coordinate the reconvening the Regional Hazard Mitigation Planning Committee and conducting the five-year review through coordination with each County's Emergency Management Departments.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- ❖ Do the goals address current and expected conditions?
- ❖ Has the nature or magnitude of risks changed?
- ❖ Are the current resources appropriate for implementing the Plan?
- ❖ Are there implementation problems, such as technical, political, legal or coordination issues with other agencies?
- ❖ Have the outcomes occurred as expected?
- ❖ Did County departments participate in the plan implementation process as assigned?

Following the five-year review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the South Mountain Regional Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the North Carolina Division of Emergency Management (NCEM) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

### **Disaster Declaration**

Following a disaster declaration, the South Mountain Regional Hazard Mitigation Plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility North Carolina Emergency Management's Hazard Mitigation Planning section to coordinate the reconvening of the Regional Hazard Mitigation Planning Committee, through coordination with each County's Emergency Management Department, and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

### **Reporting Procedures**

The results of the five-year review will be summarized by the Regional Hazard Mitigation Planning Committee in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of

implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

**Plan Amendment Process**

Upon the initiation of the amendment process, representatives from South Mountain counties will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected County departments, residents, and businesses. Information will also be forwarded to the North Carolina Division of Emergency Management. This information will be disseminated in order to seek input on the proposed amendment(s) for no less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the Regional Hazard Mitigation Planning Committee for final consideration. The Planning Committee will review the proposed amendment along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the Regional Hazard Mitigation Planning Committee:

- ❖ There are errors, inaccuracies or omissions made in the identification of issues or needs in the Plan
- ❖ New issues or needs have been identified which are not adequately addressed in the Plan
- ❖ There has been a change in information, data, or assumptions from those on which the Plan is based

Upon receiving the recommendation from the Regional Hazard Mitigation Planning Committee and prior to adoption of the Plan, the participating jurisdictions will hold a public hearing, if deemed necessary. The governing bodies of each participating jurisdiction will review the recommendation from the Regional Hazard Mitigation Planning Committee (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing bodies will take one of the following actions:

- ❖ Adopt the proposed amendments as presented
- ❖ Adopt the proposed amendments with modifications
- ❖ Refer the amendments request back to the Regional Hazard Mitigation Planning Committee for further revision, or
- ❖ Defer the amendment request back to the Regional Hazard Mitigation Planning Committee for further consideration and/or additional hearings

## 10.3 CONTINUED PUBLIC INVOLVEMENT

### 44 CFR Requirement

#### 44 CFR Part 201.6(c)(4)(iii):

The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process

Public participation is an integral component to the mitigation planning process and will continue to be essential as this Plan evolves over time. As described above, significant changes or amendments to the Plan shall require a public hearing prior to any adoption procedures.

Other efforts to involve the public in the maintenance, evaluation and revision process will be made as necessary. These efforts may include:

- ❖ Advertising meetings of the Regional Hazard Mitigation Planning Committee in local newspapers, public bulletin boards and/or County office buildings
- ❖ Designating willing and voluntary citizens and private sector representatives as official members of the Regional Hazard Mitigation Planning Committee
- ❖ Utilizing local media to update the public on any maintenance and/or periodic review activities taking place
- ❖ Utilizing the county websites to advertise any maintenance and/or periodic review activities taking place, and
- ❖ Keeping copies of the Plan in public libraries.

## 10.4 EVALUATION OF MONITORING, EVALUATION AND UPDATE PROCESS

Over the past five years, the participating jurisdictions have been independently implementing, monitoring and evaluating their own mitigation action plans. Progress made in implementing actions has been documented in Section 9: Mitigation Action Plan where each action contains a narrative about the implementation status of the action as of 2020. That said, the jurisdiction did waiver slightly from the monitoring and evaluation process defined in the original version of the plan, but still made significant process in implementing their mitigation action plans. During the 2020 update of this plan, the Regional Hazard Mitigation Planning Committee determined that the procedures for the upcoming five-year monitoring and evaluation process will remain as defined above, with minor revisions as noted, and will be re-evaluated during the next plan update process.

The five-year comprehensive update process began as early as 2018 when North Carolina Emergency Management made the decision to set aside HMGP funding from Hurricane Matthew to fund the South Mountains Regional Hazard Mitigation Plan. To facilitate this effort, NCEM assigned the plan update to their pre-qualified hazard mitigation planning consultants ESP Associates. Representatives from ESP Associates first reached out to South Mountain representatives in October 2018 to initiate the plan update process. More details about the plan update process are provided in Section 2, Planning Process.

For the next update of this plan, NCEM's Hazard Mitigation Planning section will continue take the lead on organizing and initiating the 5-year update of the plan.

# Appendix A

## Plan Adoption

This appendix includes the FEMA APP Letter and the local adoption resolutions for each of the participating jurisdictions.

**Resolution of Adoption  
South Mountains Regional Hazard Mitigation Plan**

WHEREAS, the citizens and property within \_\_\_\_\_ County are subject to the effects of natural hazards and manmade hazard events that pose threats to lives and cause damages to property, and with the knowledge and experience that certain areas, i.e., flood hazard areas, are particularly susceptible to flood hazard events; and

WHEREAS, the County desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the Legislature of the State of North Carolina has in Part 6, Article 21 of Chapter 143; Parts 3, 5, and 8 of Article 19 of Chapter 160A; and Article 8 of Chapter 160A of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has in Section 1 Part 166A of the North Carolina General Statutes (adopted in Session Law 2001-214—Senate Bill 300 effective July 1, 2001), states in Item (a) (2) “For a state of disaster proclaimed pursuant to G.S. 166A-6(a) after August 1, 2002, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act”; and

WHEREAS, Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act states that local governments must develop a hazard mitigation plan in order to receive future Hazard Mitigation Grant Program Funds; and

WHEREAS, it is the intent of the Board of Commissioners of \_\_\_\_\_ County to fulfill this obligation in order that the County will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County;

NOW, therefore, be it resolved that the Board of Commissioners of \_\_\_\_\_ County hereby:

1. Adopts the South Mountains Regional Hazard Mitigation Plan; and
2. Vests \_\_\_\_\_ (OFFICIAL, OFFICE OR AGENCY) with the responsibility, authority, and the means to:
  - (a) Inform all concerned parties of this action.
  - (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map, and identify floodplain or flood-related erosion areas, and cooperate with neighboring communities with respect to management of adjoining floodplain and/or flood-related erosion areas in order to prevent aggravation of existing hazards.
  - (c) Adjust the boundaries of County and municipal planning jurisdictions whenever a municipal annexation or extraterritorial jurisdiction expansion results in a change whereby a municipality assumes or relinquishes the authority to adopt and enforce floodplain management regulations for a particular area in order that all Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) accurately represent the planning jurisdiction boundaries. Provide notification of boundary revisions along with a map suitable for reproduction, clearly delineating municipal corporate limits and extraterritorial jurisdiction boundaries to all concerned parties.
3. Appoints the \_\_\_\_\_ (OFFICIAL, OFFICE OR AGENCY) to assure that the Hazard Mitigation Plan is reviewed annually and in greater detail as least once every five years to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the \_\_\_\_\_ County Board of Commissioners for consideration.
4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the

Hazard Mitigation Plan.

Adopted on \_\_\_\_\_

By: \_\_\_\_\_  
(Signatures of Governing Body of Municipality)

Certified by: SEAL

Date:

# Appendix B

## Planning Tools

This appendix includes the following:

1. Blank Public Survey
2. Blank Capability Assessment Survey
3. Scoring Criteria for Capability Assessment
4. Blank Mitigation Action Worksheet

## PUBLIC SURVEY FOR HAZARD MITIGATION PLANNING

### **We need your help!**

Henderson, Polk, Transylvania, and Rutherford Counties and the municipalities within the counties are working together to become less vulnerable to natural disasters, and your participation in the process is important to us!

The counties, along with local jurisdictions and other partners, are working to update the multi-jurisdictional *South Mountains Regional Hazard Mitigation Plan*. This Plan identifies and assesses our community's natural hazard risks and identifies strategies that determine how to best minimize or manage those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

**Please help us by completing this survey by February 28, 2019 and returning it to:**

Jamie DeRose, ESP Associates, Inc  
2200 Gateway Centre Blvd., Suite 216  
Morrisville, NC 27560

Surveys can also be emailed to [jderose@esspassociates.com](mailto:jderose@esspassociates.com).

An electronic version of this survey can be found at: <https://s.surveypplanet.com/JoRVQduiP>

If you have any questions regarding this survey or would like to learn about more ways you can participate in the update of the *South Mountains Regional Hazard Mitigation Plan*, please contact ESP Associates, Inc, planning consultant for the project. You may reach Jamie DeRose (ESP Associates) at 919-415-2757 or by email at [jderose@esspassociates.com](mailto:jderose@esspassociates.com).

### **1. Where do you live?**

- |   |   |
|---|---|
| <input type="checkbox"/> Unincorporated Henderson County    | <input type="checkbox"/> Forest City    |
| <input type="checkbox"/> Unincorporated Polk County         | <input type="checkbox"/> Hendersonville |
| <input type="checkbox"/> Unincorporated Transylvania County | <input type="checkbox"/> Lake Lure      |
| <input type="checkbox"/> Unincorporated Rutherford County   | <input type="checkbox"/> Laurel Park    |
| <input type="checkbox"/> Brevard                            | <input type="checkbox"/> Mills River    |
| <input type="checkbox"/> Bostic                             | <input type="checkbox"/> Rosman         |
| <input type="checkbox"/> Chimney Rock Village               | <input type="checkbox"/> Ruth           |
| <input type="checkbox"/> Columbus                           | <input type="checkbox"/> Rutherfordton  |
| <input type="checkbox"/> Ellenboro                          | <input type="checkbox"/> Saluda         |
| <input type="checkbox"/> Flat Rock                          | <input type="checkbox"/> Spindale       |
| <input type="checkbox"/> Fletcher                           | <input type="checkbox"/> Tryon          |
|   | <input type="checkbox"/> Other: _____   |

**2. Have you ever experienced or been impacted by a disaster?**

- Yes
- No

**a. If “Yes,” please explain:**

**3. How concerned are you about the possibility of your community being impacted by a disaster?**

- Extremely concerned
- Somewhat concerned
- Not concerned

**4. Please select the one hazard you think is the *highest threat* to your neighborhood:**

- |   |  |
|---|--|
| <input type="checkbox"/> Dam / Levee Failure          | <input type="checkbox"/> Hurricane / Tropical Storm    |
| <input type="checkbox"/> Drought                      | <input type="checkbox"/> Landslide                     |
| <input type="checkbox"/> Earthquake                   | <input type="checkbox"/> Lightning                     |
| <input type="checkbox"/> Erosion                      | <input type="checkbox"/> Nuclear Accident              |
| <input type="checkbox"/> Extreme Heat                 | <input type="checkbox"/> Thunderstorm Wind / High Wind |
| <input type="checkbox"/> Flood                        | <input type="checkbox"/> Tornado                       |
| <input type="checkbox"/> Hailstorm                    | <input type="checkbox"/> Wildfire                      |
| <input type="checkbox"/> Hazardous Materials Incident | <input type="checkbox"/> Winter Storm / Freeze         |

**5. Please select the one hazard you think is the *second-highest threat* to your neighborhood:**

- |   |   |
|---|---|
| <input type="checkbox"/> Dam / Levee Failure          | <input type="checkbox"/> Hurricane / Tropical Storm |
| <input type="checkbox"/> Drought                      | <input type="checkbox"/> Landslide                  |
| <input type="checkbox"/> Earthquake                   | <input type="checkbox"/> Lightning                  |
| <input type="checkbox"/> Erosion                      | <input type="checkbox"/> Nuclear Accident           |
| <input type="checkbox"/> Extreme Heat                 | <input type="checkbox"/> Thunderstorm / High Wind   |
| <input type="checkbox"/> Flood                        | <input type="checkbox"/> Tornado                    |
| <input type="checkbox"/> Hailstorm                    | <input type="checkbox"/> Wildfire                   |
| <input type="checkbox"/> Hazardous Materials Incident | <input type="checkbox"/> Winter Storm / Freeze      |

**6. Is there another hazard not listed above that you think is a wide-scale threat to your neighborhood?**

- Yes (please explain): \_\_\_\_\_
- No

**7. Is your home located in a FEMA floodplain?**

- Yes
- No
- I don't know

**8. Do you have flood insurance for your home/personal property?**

- Yes
- No
- I don't know

**a. If "No," why not?**

- My home is not located in a floodplain
- I rent
- It's too expensive
- I don't need it because it never floods
- I don't need it because my home is elevated or otherwise protected
- I never really considered it
- Other (please explain): \_\_\_\_\_

**9. Have you taken any actions to make your home, neighborhood, or family safer from hazards?**

- Yes
- No

**b. If "Yes," please explain:**

**10. Are you interested in making your home, neighborhood, or family more resistant to hazards?**

- Yes
- No

**11. Do you know what office to contact regarding risks from hazards in your area?**

- Yes
- No

**12. What is the most effective way for you to receive information about how to make your home, neighborhood, or family more resistant to hazards?**

- Newspaper
- Television advertising
- Television programs
- Radio advertising
- Radio programs
- Internet
- Email
- Mail
- Public workshops/meetings
- School meetings
- Other (please explain): \_\_\_\_\_

**13. In your opinion, what are some steps your local government could take to reduce the risk of future hazard damages in your neighborhood?**

**14. Are there any other issues regarding the risks and losses from hazards or disasters that you would like to mention?**

**15. A number of community-wide activities can reduce vulnerability to hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each category is for your community to consider.**

Category	Very Important	Somewhat Important	Not Important
<p><b><u>1. Prevention</u></b>            Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b><u>2. Property Protection</u></b>            Actions that involve modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b><u>3. Natural Resource Protection</u></b>            Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b><u>4. Structural Projects</u></b>            Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, detention/retention basins, channel modification, retaining walls, and storm sewers.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b><u>5. Emergency Services</u></b>            Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><b><u>6. Public Education and Awareness</u></b>            Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**THANK YOU FOR YOUR PARTICIPATION!**

*This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):*

**Name:** \_\_\_\_\_

**Address:** \_\_\_\_\_

\_\_\_\_\_

**Phone:** \_\_\_\_\_ **E-Mail:** \_\_\_\_\_

## Local Capability Assessment Survey

Jurisdiction/Agency: \_\_\_\_\_

Phone: \_\_\_\_\_

Point of Contact: \_\_\_\_\_

E-mail: \_\_\_\_\_

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction by placing an "X" in the appropriate box. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Strongly Supports, Helps Facilitate or Hinders) with another "X". Finally, please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Department / Agency Responsible	Effect on Loss Reduction			Comments
				Strongly Supports	Helps Facilitate	Hinders	
Hazard Mitigation Plan							
Comprehensive Land Use Plan (or General, Master or Growth Mgt. Plan)							
Floodplain Management Plan							
Open Space Management Plan (or Parks & Rec./ Greenways Plan)							
Stormwater Management Plan / Ordinance							
Natural Resource Protection Plan							
Flood Response Plan							
Emergency Operations Plan							
Continuity of Operations Plan							
Evacuation Plan							
Other Plans (please explain under Comments)							

### Local Capability Assessment Survey

Planning / Regulatory Tool	In Place	Under Development	Department / Agency Responsible	Effect on Loss Reduction			Comments
				Strongly Supports	Facilitates	Hinders	
Disaster Recovery Plan							
Capital Improvements Plan							
Economic Development Plan							
Historic Preservation Plan							
Floodplain Ordinance (or Flood Damage Prevention Ordinance)							
Zoning Ordinance							
Subdivision Ordinance							
Unified Development Ordinance							
Post-disaster Redevelopment / Reconstruction Ordinance							
Building Code							
Fire Code							
National Flood Insurance Program (NFIP)							
NFIP Community Rating System (CRS Program)							

## Local Capability Assessment Survey

**2. ADMINISTRATIVE AND TECHNICAL CAPABILITY** - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "X" in the appropriate box . Then, if YES, please identify the department or agency they work under and provide any other comments you may have in the space provided or with attachments.

Staff / Personnel Resources	Yes	No	Department / Agency	Comments
Planners with knowledge of land development and land management practices				
Engineers or professionals trained in construction practices related to buildings and/or infrastructure				
Planners or engineers with an understanding of natural and/or human-caused hazards				
Emergency manager				
Floodplain manager				
Land surveyors				
Scientist familiar with the hazards of the community				
Staff with education or expertise to assess the community's vulnerability to hazards				
Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program				
Resource development staff or grant writers				

### Local Capability Assessment Survey

**3. FISCAL CAPABILITY** - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes* (including as match funds for State of Federal mitigation grant funds). Then, identify the primary department or agency responsible for its administration or allocation and provide any other comments you may have in the space provided or with attachments.

Financial Resources	Yes	No	Department / Agency	Comments
Capital Improvement Programming				
Community Development Block Grants (CDBG)				
Special Purpose Taxes (or taxing districts)				
Gas / Electric Utility Fees				
Water / Sewer Fees				
Stormwater Utility Fees				
Development Impact Fees				
General Obligation, Revenue and/or Special Tax Bonds				
Partnering arrangements or intergovernmental agreements				
Other: _____				

## Local Capability Assessment Survey

**4. POLITICAL CAPABILITY** - Political capability can be generally measured by the degree to which local political leadership is willing to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum State or Federal requirements (e.g., building codes, floodplain management, etc.). Please identify some general examples of these efforts if available and/or reference where more documentation can be found.

**Local Capability Assessment Survey**

**5. SELF-ASSESSMENT OF CAPABILITY** - Please provide an approximate measure of your jurisdiction's capability to effectively implement hazard mitigation strategies to reduce hazard vulnerabilities. Using the following table, please place an "X" in the box marking the most appropriate degree of capability (Limited, Moderate or High) based upon best available information and the responses provided in Sections 1-4 of this survey.

	DEGREE OF CAPABILITY		
	LIMITED	MODERATE	HIGH
Planning and Regulatory Capability			
Administrative and Technical Capability			
Fiscal Capability			
Political Capability			
<b>OVERALL CAPABILITY</b>			

## Points System for Capability Ranking

**0-19 points = Limited overall capability**  
**20-39 points = Moderate overall capability**  
**40-68 points = High overall capability**

### **I. Planning and Regulatory Capability (Up to 43 points)**

*Yes = 3 points*

*Under Development = 1 point*

*Included under County plan/code/ordinance/program = 1 point*

*No = 0 points*

- Hazard Mitigation Plan
- Comprehensive Land Use Plan
- Floodplain Management Plan
- National Flood Insurance Program
- NFIP Community Rating System

*Yes = 2 points*

*Under Development = 1 point*

*Included under County plan/code/ordinance/program = 1 point*

*No = 0 points*

- Open Space Management Plan / Parks & Recreation Plan
- Stormwater Management Plan
- Natural Resource Protection Plan
- Flood Response Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Flood Damage Prevention Ordinance
- Post-disaster Redevelopment / Reconstruction Ordinance

*Yes = 1 point*

*No = 0 points*

- Capital Improvements Plan
- Economic Development Plan
- Historic Preservation Plan
- Zoning Ordinance
- Subdivision Ordinance
- Unified Development Ordinance
- Building Code
- Fire Code

## **II. Administrative and Technical Capability (Up to 15 points)**

*Yes = 2 points*

*Service provided by County = 1 point*

*No = 0 points*

- Planners with knowledge of land development and land management practices
- Engineers or professionals trained in construction practices related to buildings and/or infrastructure
- Planners or engineers with an understanding of natural and/or human-caused hazards
- Emergency manager
- Floodplain manager

*Yes = 1 point*

*No = 0 points*

- Land surveyors
- Scientist familiar with the hazards of the community
- Staff with education or expertise to assess the community's vulnerability to hazards
- Personnel skilled in Geographical Information Systems (GIS) and/or Hazus
- Resource development staff or grant writers

## **III. Fiscal Capability (Up to 10 points)**

*Yes = 1 point*

*No = 0 points*

- Capital Improvement Programming
- Community Development Block Grants (CDBG)
- Special Purpose Taxes (or tax districts)
- Gas / Electric Utility Fees
- Water / Sewer Fees
- Stormwater Utility Fees
- Development Impact Fees
- General Obligation / Revenue / Special Tax Bonds
- Partnering arrangements or intergovernmental agreements
- Other

## MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in the South Mountains Region will consider to reduce the negative effects of identified hazards. The worksheets provide a simple yet effective method of organizing potential actions in a user-friendly manner that can easily be incorporated into the Region's Hazard Mitigation Plan.

The worksheets are to be used as part of a strategic planning process and are designed to be:

- a.) completed electronically (worksheets and instructions will be e-mailed to members of the Hazard Mitigation Planning Team following the Mitigation Strategy Workshop);
- b.) reviewed with your department/organization for further consideration; and
- c.) returned according to the contact information provided below.

Electronic copies may be e-mailed to: [nslaughter@espassociates.com](mailto:nslaughter@espassociates.com)

Hard copies can be mailed to:

Nathan Slaughter

2200 Gateway Centre Blvd

Morrisville, NC 27560

## INSTRUCTIONS

Each mitigation action should be considered to be a separate local project, policy or program and each individual action should be entered into a separate worksheet. By identifying the implementation requirements for each action, the worksheets will help lay the framework for engaging in distinct actions that will help reduce the community's overall vulnerability and risk. Detailed explanations on how to complete the worksheet are provided below.

**Proposed Action:** Identify a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives.

**Site and Location:** Provide details with regard to the physical location or geographic extent of the proposed action, such as the location of a specific structure to be mitigated, whether a program will be citywide, countywide or regional, etc.

**History of Damages:** Provide a brief history of any known damages as it relates to the proposed action and the hazard(s) being addressed. For example, the proposed elevation of a repetitive loss property should include an overview of the number of times the structure has flooded, total dollar amount of damages if available, etc.

**Hazard(s) Addressed:** List the hazard(s) the proposed action is designed to mitigate against.

**Category:** Indicate the most appropriate category for the proposed action as discussed during the Mitigation Strategy Workshop (Prevention; Property Protection; Natural Resource Protection; Structural Projects; Emergency Services; Public Education and Awareness).

**Priority:** Indicate whether the action is a "high" priority, "moderate" priority or "low" priority based generally on the following criteria:

1. Effect on overall risk to life and property
2. Ease of implementation / technical feasibility
3. Project costs versus benefits
4. Political and community support
5. Funding availability

**Estimated Cost:** If applicable, indicate what the total cost will be to accomplish this action. This amount will be an estimate until actual final dollar amounts can be determined. Some actions (such as ordinance revisions) may only cost “local staff time” and should be noted so.

**Potential Funding Sources:** If applicable, indicate how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, a cost-sharing federal or state grant program, etc.

**Lead Agency/Department Responsible:** Identify the local agency, department or organization that is best suited to implement the proposed action.

**Implementation Schedule:** Indicate when the action will begin and when the action is expected to be completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort.

**Comments:** This space is provided for any additional information or details that may not be captured under the previous headings.

<b>MITIGATION ACTION</b>	
<b>Proposed Action:</b>	
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	
<b>History of Damages:</b>	

<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	
<b>Category:</b>	
<b>Priority (High, Moderate, Low):</b>	
<b>Estimated Cost:</b>	
<b>Potential Funding Sources:</b>	
<b>Lead Agency/Department Responsible:</b>	
<b>Implementation Schedule:</b>	

<b>COMMENTS</b>

# **Appendix C**

## **Local Mitigation Plan Review Tool**

# Appendix D

## Planning Process Documentation

This appendix includes:

1. Meeting Agendas
2. Meeting Sign-In Sheets
3. Neighboring Jurisdiction Outreach Documentation
4. Public Survey Summary Results

# **AGENDA**

## **South Mountains Regional Hazard Mitigation Plan Hazard Mitigation Plan Update Kickoff Meeting**

December 13, 2018

10:00AM - Noon

### **1) Introductions**

### **2) Overview of Mitigation/Icebreaker Exercise**

### **3) Project Overview**

- a) Key Objectives
- b) Project Tasks
- c) Project Schedule
- d) Project Staffing

### **4) Roles & Responsibilities**

- a) ESP
- b) County Leads
- c) Participating Jurisdictions

### **5) Next Steps**

- a) Data collection efforts
- b) Begin public outreach
- c) Discuss next Hazard Mitigation Planning Team meeting

### **6) Questions, Issues or Concerns**

# **AGENDA**

## **South Mountains Regional Hazard Mitigation Plan Mitigation Strategy Workshop**

**April 3, 2019  
10:00AM - Noon**

- 1) Introductions**
- 2) Mitigation Recap**
- 3) Project Schedule**
- 4) Risk Assessment Findings**
  - a) Hazard Identification**
  - b) Hazard Profiles**
  - c) Hazard Vulnerability Assessment**
- 5) Capability Assessment Findings**
- 6) Mitigation Strategy**
- 7) Summary of Public Involvement**
- 8) Plan Maintenance**
- 9) Next Steps**

**South Mountains Regional Hazard Mitigation Plan  
Kickoff Meeting**

**December 13, 2018**

**10:00AM - Noon**

Name	Agency	City	Phone Number	E-mail Address
NATHAN CANNON	CITY OF SALUDA	CITY OF SALUDA	828-749-2581	CITYMANAGER@ CITY OF SALUDANC.COM
Tom's Panner	City of Saluda PD	City of Saluda	828-749-2691	Chief@cityofsaluda.nc.gov
Jimmy BRISSIE	Henderson County EM		828-697-4728	jbrissie@hendersoncountync.gov
Susan Frady	Development Assistance City of Hendersonville	City of Hendersonville	828-697-3010	sfrady@hvt.nc.gov
Daniel Heyman	Development Assistance City of Hendersonville	City of Hendersonville	828-697-3010	dheyman@hvt.nc.gov
Bobby Arledge	Polk Co. EM	Polk Co.	828-894-6342	barledge@polknc.org
Cathy Ruth	Polk Co. Planner	Polk Co.	828-894-2732	Cruth@polknc.org

Name	Agency	City	Phone Number	E-mail Address
Chris Ferguson	NCEM		(919) 825-2569	Christopher.ferguson@ncdps.gov
Tim McFallis	Henderson Co. EM		828-674-9699	Tmcfallis@hendersoncountync.gov





**South Mountains Regional Hazard Mitigation Plan Update  
Mitigation Strategy Workshop**

**April 3, 2019**

**10AM - Noon**

Name	Agency	City	Phone Number	E-mail Address
Susan Frady	City of Hendersonville	Hendersonville	828-697-3010	sfrady@hvlnc.gov
Daniel Heyman	City of Hendersonville	Hendersonville	828-697-3010	dheyman@hvlnc.gov
Chris Ferguson	NCEM	STATE	(919) 825-2569	christopher.ferguson@ncdps.gov
Jimmy Brissie	HENDERSON County Em	Hendersonville, NC	828-697-4728	jonissie@hendersoncountync.gov
Tim McFalls	Henderson County Em	Hendersonville, NC	828-697-4728	tmcfalls@hendersoncountync.gov
Joe Virdisni	City of Hendersonville Fire Dept.	Hendersonville, NC	828-674-5608	JVirdisni@HVCnc.gov
Jonathan Cannon	CITY OF SALUDA	SALUDA NC	828-749-2581	CITYMANAGER@CITYOF SALUDANC.COM
Debby Ruth	Polk Co.	Polk Co.	828 894 2732	planning@polknc.org
Jamie Davidson	<del>Polk Co.</del>	Mill Spring, NC	828-894-5823	je1972@windstream.net

**South Mountains Regional Hazard Mitigation Plan Update  
Mitigation Strategy Workshop**

**April 3, 2019**

**10AM - Noon**

Name	Agency	City	Phone Number	E-mail Address
Bobby Arledge	Polk County Emergency management	Columbus	828-894-6342	barledge@polknc.org
Kevin Shook	Transylvania County Emergency Management	Brevard	828-884-3108	Kevinshook@ transylvania.com
PATRICIA CHASTIE	VILLAGE OF FLAT ROCK	FLAT ROCK	828-697-8100	administrator@villageof flatrock.org
KEVIN WALDRUP	HENDERSON COUNTY EMERGENCY SERVICES	HENDERSON CO	828-697-4728	Kwadrup@hendersoncounty nc.gov
James Conner	Selma PD	Selma	827-719-2691	Chief@CityofSelmaNC.com
Frankie Hamrick	Rutherford County EM	Rutherford Co	828-287-6090	frankie.hamrick@rutherfordcounty nc.gov
John Greenway	Rutherford County Emergency Management	Rutherford Co.	828-748-3200	John.Greenway@RutherfordCountyNC.gov

**South Mountains Regional Hazard Mitigation Plan  
Public Meeting**

**December 13, 2018**

**6:00PM**

Name	Agency	City	Phone Number	E-mail Address
DEREK LACEY	Hendersonville Times-News	Hendersonville	256-302-6782	derek.lacey @bluendgenow.com
Ken Fitch	member of public	Hendersonville	828 216 3552	Parkslands@aol.com
Jimmy Brissie	Henderson County EM		828-697-4728	jbrissie@ hendersoncountync.gov
Jamie DeRose	ESP		252.723.9122	jderose@ espassociates.com
Nathan Slaughter	ESP		919.415.2726	nslaughter@ espassociates.com

## Nathan Slaughter

---

**From:** Nathan Slaughter  
**Sent:** Thursday, August 29, 2019 11:27 AM  
**To:** rick.peterson@cherokeecountysc.com; todddillard@jacksonnc.org; michaelposton@jacksonnc.org; gregory.shuping@haywoodcountync.gov; kris.boyd@haywoodcountync.gov; jerry.vehaun@buncombecounty.org; william.kehler@mcdowellgov.com; rharmon@mcdowellgov.com; Michael.Willis@burkenc.org; perry.davis@clevelandcounty.com; chris.martin@clevelandcounty.com; skrein@oconeesc.com; communitydevelopmentinfo@oconeesc.com; dkwiatek@co.pickens.sc.us; jmarett@greenvillecounty.org; dbryson@spartanburgcounty.org; Nathan L. Pennington  
**Subject:** NOTIFICATION: South Mountains Regional Hazard Mitigation Plan

Good morning

You are receiving this email because a neighboring County (Henderson County, Polk County, Rutherford County and/or Transylvania

County NC), along with the municipalities within those counties and other participating partners, are now working to update the region's multi-jurisdictional *South Mountains Regional Hazard Mitigation Plan* as required by the Federal Emergency Management Agency (FEMA). The purpose of this plan is to identify and assess the region's natural hazard risks and determine strategies for how to best minimize or manage those risks. Upon completion, the plan will represent a comprehensive multi-jurisdictional *Hazard Mitigation Plan* for the four-county region.

You are being notified of this planning process for two purposes:

1. FEMA requires that neighboring jurisdictions be provided an opportunity to be involved in the planning process.
2. You may want to contribute information to these jurisdictions to consider as they update their hazard mitigation plan.

I serve as the Project Manager for the update of the plan. Please let me know if you would like to contribute information, be invited to any upcoming meetings in the development of the plan or if you would like to receive a copy of the draft plan.

Should you have any questions about the South Mountains Regional Hazard Mitigation Plan, please do not hesitate to contact me. Thank you for your time!

**Nathan Slaughter, AICP, CFM**

Department Manager – Hazard Mitigation

**ESP Associates, Inc.**

2200 Gateway Centre Boulevard – Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com)

[nslaughter@espassociates.com](mailto:nslaughter@espassociates.com)

919.415.2726 | Direct

919.678.1070 | Office

919.244.9536 | Cell

Neighboring Jurisdictions for the South Mountains Region

Jurisdiction	Name	Title	Email
Cherokee County SC	Rick Peterson	Cherokee County EM Director	<a href="mailto:rick.peterson@cherokeecountysc.com">rick.peterson@cherokeecountysc.com</a>
Jackson County NC	Todd Dillard	Jackson County EM Director	<a href="mailto:toddillard@jacksonnc.org">toddillard@jacksonnc.org</a>
	Mike Poston	Jackson County Planning Director	<a href="mailto:michaelposton@jacksonnc.org">michaelposton@jacksonnc.org</a>
Haywood County NC	Greg Shuping	Haywood County EM Director	<a href="mailto:gregory.shuping@haywoodcountync.gov">gregory.shuping@haywoodcountync.gov</a>
	Kris Boyd	Haywood County Development services Director	<a href="mailto:kris.boyd@haywoodcountync.gov">kris.boyd@haywoodcountync.gov</a>
Buncombe County NC	Jerry VeHaun	Buncombe County EM Director	<a href="mailto:jerry.vehaun@buncombecounty.org">jerry.vehaun@buncombecounty.org</a>
	Nathan Pennington	Buncombe County Planning Director	<a href="mailto:Nathan.Pennington@buncombecounty.org">Nathan.Pennington@buncombecounty.org</a>
McDowell County NC	William Kehler	McDowell County EM Director	<a href="mailto:william.kehler@mcdowellgov.com">william.kehler@mcdowellgov.com</a>
	Ronald Harmon	McDowell County Planning Administrator	<a href="mailto:rharmon@mcdowellgov.com">rharmon@mcdowellgov.com</a>
Burke County NC	Michael Willis	Burke County ES Director	<a href="mailto:Michael.Willis@burkenc.org">Michael.Willis@burkenc.org</a>
Cleveland County NC	Perry David	Cleveland County EM Director	<a href="mailto:perry.davis@clevelandcounty.com">perry.davis@clevelandcounty.com</a>
	Chris Martin	Cleveland County Senior Planner	<a href="mailto:chris.martin@clevelandcounty.com">chris.martin@clevelandcounty.com</a>
Oconee County, SC	Scott Krein	Oconee County EM Director	<a href="mailto:skrein@oconeesc.com">skrein@oconeesc.com</a>
		Oconee County Community Development	<a href="mailto:communitydevelopmentinfo@oconeesc.com">communitydevelopmentinfo@oconeesc.com</a>
Pickens County, SC	Denise Wiatek	Pickens County EM Director	<a href="mailto:dkwiatek@co.pickens.sc.us">dkwiatek@co.pickens.sc.us</a>
Greenville County, SC	Jim Marett	Greenville County Interim EM Director	<a href="mailto:jmarett@greenvillecounty.org">jmarett@greenvillecounty.org</a>
Spartanburg County, SC	Doug Bryson	Spartanburg County EM Director	<a href="mailto:dbryson@spartanburgcounty.org">dbryson@spartanburgcounty.org</a>

# PUBLIC SURVEY RESULTS



- As of April 1, **165** public responses for the region
  - Most responses from Saluda (**24.8%**)
  - Q: Most disasters experienced?  
A: Hurricanes and remnants, Winter Storms, Flooding
  - Q: Highest threat to the region?  
A: Severe Winter/Ice Storms (**42.4%**)
  - Q: Second highest threat?  
A: Severe Thunderstorms (**24.8%**)
  - Internet is the most effective way to receive information

# PUBLIC SURVEY RESULTS, CONTINUED

- Q: Any other threats in the community?  
A: Wildfires in 2016, Blizzard of 1993, Turner Shoals Dam break
- **87.9%** of homes NOT located in a floodplain
- **81.8%** of homes do NOT have flood insurance
- **77.6%** of responses said they do NOT know what office to contact regarding risk reduction
- Q: What are some examples of steps taken to make home/neighborhood more resistant to disasters?
  - Tree trimming/removal
  - Increasing drainage (French drains)
  - Creating emergency evacuation plans
  - Generators



**Q: What are some steps your local government could take to reduce or eliminate the risk of future hazard damages?**

- Tree trimming
- Slope development ordinances
- Hazard drills in schools
- Burying power lines
- Repairing roads

# PUBLIC SURVEY RESULTS, CONTINUED

**Q: Out of the following mitigation techniques, which do you consider “very important?”**

- **Emergency Services: 84.2%**
  - ZERO votes for “Not important”
- **Natural Resources Protection: 81.2%**
- **Prevention: 74.5%**
- **Public Education and Awareness: 65.5%**
- **Structural Projects: 63.0%**
- **Property Protection: 53.9%**

**From:** [Jimmy Brissie](#)  
**To:** "[Alison Alexander](#)"; "[Brian Pahle](#)"; "[Jeff Wells](#)"; "[John Connet](#)"; "[Mark Biberdorf](#)"; "[VOFR@bellsouth.net](#)"  
**Cc:** [Steve Wyatt](#); [Amy Brantley](#); [Mike Barnett](#); [Kevin Waldrup](#); [Cathy Justice](#)  
**Subject:** Henderson County Hazard Mitigation Plan Review Kickoff Meeting  
**Date:** Tuesday, November 20, 2018 2:53:00 PM  
**Attachments:** [Memo - Hazard Mitigation Plan Nov 2018.pdf](#)

---

Henderson County Municipal Partners,

Every four years it is recommended counties update their Hazard Mitigation Plan. This plan is an integral part in community planning and ensuring compliance with disaster grant funding, our last plan became effective January 2015. North Carolina Emergency Management has partnered with a North Carolina contractor to conduct the update of our regional plan which includes Henderson, Transylvania, Polk and Rutherford Counties. We have a kickoff meeting scheduled for Thursday December 13<sup>th</sup> at the Henderson County Emergency Services Center from 10AM until noon, with lunch to follow. Your involvement in this process is very important, towards the end of the project we will need each jurisdiction participating to adopt a resolution reflecting their participation. Please see the attached memo for additional information. Please have your staff attending the kickoff meeting RSVP with Cathy Justice in our office at [cjustice@hendersoncountync.org](mailto:cjustice@hendersoncountync.org).

Feel free to contact me with questions or concerns.

Jimmy Brissie, Director  
Henderson County Emergency Services  
[jbrissie@hendersoncountync.org](mailto:jbrissie@hendersoncountync.org)  
828-697-4728 (P)  
828-698-6164 (F)

**From:** [Jimmy Brissie](#)  
**To:** [Steve Wyatt](#); [Amy Brantley](#); [Alison Alexander](#); [Connet, John](#); [Brian Pahle](#); [Jeff Wells](#); [Mark Biberdorf](#); [VOFR@bellsouth.net](mailto:VOFR@bellsouth.net)  
**Cc:** [Jimmy Brissie](#)  
**Subject:** Fwd: Thursday's South Mountains RHMP Kickoff Meeting  
**Date:** Tuesday, December 11, 2018 8:28:24 PM

---

Good evening,

We are still planning on having our Hazard Mitigation Plan Update kickoff meeting this Thursday at our facility on Asheville Highway. The workshop will be from 10am - noon (followed by lunch). There will also be a brief public information session that evening from 6p-7p. As a side note we all can guess what our number one hazard was in our 2015 plan.....winter weather. Regretfully Rocky failed to share the hidden location of the "off button" with me.

I hope you will be able to join us Thursday.

Jimmy Brissie  
....sent by wireless device

From: Jamie Derosé  
Sent: Tuesday, December 11, 11:17  
Subject: Thursday's South Mountains RHMP Kickoff Meeting  
To: Jimmy Brissie, [barledge@polknc.org](mailto:barledge@polknc.org), [kevin.shook@transylvaniacounty.org](mailto:kevin.shook@transylvaniacounty.org), [frankie.hamrick@rutherfordcountync.gov](mailto:frankie.hamrick@rutherfordcountync.gov)  
Cc: Nathan Slaughter, [christopher.ferguson@ncdps.gov](mailto:christopher.ferguson@ncdps.gov)

Good morning all,

Although we recently received some crazy winter weather, the South Mountains Regional Hazard Mitigation Plan Kickoff Meeting is **still on as scheduled**. Weather conditions in Henderson County are expected to improve by Thursday, so hopefully all attendees will have no issues on the roads. As a reminder, the meeting information is as follows:

**Kickoff Meeting: December 13, 2018 from 10AM-noon**

Henderson County Emergency Services Center  
2529 Asheville Highway  
Hendersonville, NC 28791  
(across from Hunter Subaru)

**Public Meeting: December 13, 2018 from 6PM-7PM**

Henderson County Emergency Services Center  
2529 Asheville Highway  
Hendersonville, NC 28791  
(across from Hunter Subaru)

Please be sure to let anyone who is planning on attending aware that we will still hold the meeting in Henderson County. If you expect that you will not be able to participate, please

contact me so that we can plan accordingly.

Thank you and we look forward to seeing everyone on Thursday!

**Jamie L. DeRose**

**ESP Associates, Inc .**

2200 Gateway Centre Blvd

Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com)

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919.415.2757 | Direct

252.723.9122 | Cell

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Jimmy Brissie

....sent by wireless device

**From:** [Jimmy Brissie](#)  
**To:** ["Alison Alexander"](#); ["Brian Pahle"](#); ["Jeff Wells "](#); ["John Connet"](#); ["Mark Biberdorf"](#); ["VOFR@bellsouth.net"](#); [sfrady@hvinc.gov](#)  
**Cc:** ["Steve Wyatt"](#); ["Amy Brantley"](#)  
**Subject:** FW: South Mountains RHMP Repetitive Loss Property Request - County Leads  
**Date:** Friday, January 4, 2019 4:38:00 PM  
**Attachments:** [Repetitive Loss Property Information Request.doc](#)

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City Managers,

Attached is a request from ESP Associates with regards to our Regional Hazard Mitigation Plan. They need accesses to your NFIP repetitive loss data from NCEM and need your approval to access the data. Please see the request below and submit your authorization letter directly to Mr. Crew with NCEM. Feel free to CC me or contact me if I may be of assistance.

Best,

Jimmy Brissie, Director  
Henderson County Emergency Services  
[jbrissie@hendersoncountync.gov](mailto:jbrissie@hendersoncountync.gov)  
828-697-4728 (P)  
828-698-6164 (F)

---

**From:** Jamie Derosé <[jderose@espassociates.com](mailto:jderose@espassociates.com)>  
**Sent:** Wednesday, January 2, 2019 2:11 PM  
**To:** Jimmy Brissie <[JBrissie@Hendersoncountync.gov](mailto:JBrissie@Hendersoncountync.gov)>; [barledge@polknc.org](mailto:barledge@polknc.org); Kevin Shook <[Kevin.Shook@transylvaniacounty.org](mailto:Kevin.Shook@transylvaniacounty.org)>; [frankie.hamrick@rutherfordcountync.gov](mailto:frankie.hamrick@rutherfordcountync.gov)  
**Subject:** South Mountains RHMP Repetitive Loss Property Request - County Leads

Good afternoon all,

I hope everyone enjoyed the holidays and that 2019 has started well!

To conduct our vulnerability assessment for the South Mountains Regional Hazard Mitigation Plan, we need repetitive loss data from each participating county and municipality. However, since the data is private, each municipality must send a letter to Mr. Chris Crew at NCEM that specifically requests the release of records.

1. Please see the attached sample letter.
2. Forward the letter to each participating municipality and ask for them to fill out the respective information on official letterhead.
3. The letters can then be scanned and emailed to Mr. Crew at [john.crew@ncdps.gov](mailto:john.crew@ncdps.gov)
4. Once he receives the email, he can distribute the data.

If the letters are sent out soon, we're hoping to have a quick turnaround with the data. As always, please do not hesitate to contact me if you have any other questions or concerns.

Thank you!

**Jamie L. DeRose**

**ESP Associates, Inc.**

2200 Gateway Centre Blvd

Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com)

[jderose@espassociates.com](mailto:jderose@espassociates.com)

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**From:** [Jimmy Brissie](#)  
**To:** [Jeff Wells](#)  
**Subject:** FW: REMINDER: South Mountains RHMP Mitigation Strategy Workshop - April 3  
**Date:** Tuesday, March 26, 2019 1:49:00 PM

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Jeff,

I apologize we have not had to chance to connect since your announcement. I know you are looking forward to heading back East, we will certainly miss having you here in Henderson County. I wanted to make sure you were aware of our second meeting for our regional Hazard Mitigation Plan next week. As this project progresses I will be glad to work with your staff to ensure it is properly briefed and reviewed by the new Manager upon their arrival. I hope to see you before you head out of town. Thanks!

Jimmy Brissie, Director  
Henderson County Emergency Services  
[jbrissie@hendersoncountync.gov](mailto:jbrissie@hendersoncountync.gov)  
828-697-4728 (P)  
828-698-6164 (F)

---

**From:** Jamie DeRose <jderose@espassociates.com>  
**Sent:** Tuesday, March 26, 2019 9:10 AM  
**To:** Jimmy Brissie <jbrissie@hendersoncountync.gov>; Kevin Shook <Kevin.Shook@transylvaniacounty.org>; citymanager@cityofsaludanc.com; chief@cityofsaludanc.com; sfrady@hvlnc.gov; dheyman@hvlnc.gov; barledge@polknc.org; cruth@polknc.org; Tim McFalls <tmcfalls@hendersoncountync.gov>; jvindigni@hvlnc.gov; m.biberdorf@fletchercnc.org; frankie.hamrick@rutherfordcountync.gov; btrotter@laurelpark.org; mcapps@laurelpark.org; zoning@villageofflatrock.org; tmcfalls@hendersoncountync.gov  
**Cc:** Nathan Slaughter <nslaughter@espassociates.com>; EMGroupMitigationPlans@ncdps.gov; Jamie Davidson <jej1972@windstream.net>; Ferguson, Christopher <Christopher.Ferguson@ncdps.gov>  
**Subject:** REMINDER: South Mountains RHMP Mitigation Strategy Workshop - April 3

Hello all,

This is a friendly reminder about the South Mountains Regional Hazard Mitigation Plan Mitigation Strategy Workshop next **Wednesday, April 3<sup>rd</sup> from 10AM-noon.**

The meeting will be held at the **Henderson County Emergency Services Center at 2529 Asheville Highway in Hendersonville, NC 28791** (across from Hunter Subaru). Lunch will be provided after the meeting.

If you haven't already, please make plans to attend this important meeting. We will discuss our findings of the risk and capabilities assessments and work to update the mitigation strategy.

Thank you and we look forward to seeing you next week!

**Jamie L. DeRose**

**ESP Associates, Inc.**

2200 Gateway Centre Blvd

Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com)

[jderose@espassociates.com](mailto:jderose@espassociates.com)

919.415.2757 | Direct

252.723.9122 | Cell

**From:** [Jimmy Brissie](#) on behalf of [Jamie DeRose](#)  
**To:** [mmorgan@laurelpark.org](mailto:mmorgan@laurelpark.org); [Bobbie Trotter \(btrotter@laurelpark.org\)](mailto:Bobbie.Trotter@laurelpark.org); [Jimmy Brissie](#); [mcapps@laurelpark.org](mailto:mcapps@laurelpark.org); [Kevin Shook](mailto:Kevin.Shook); [Jeff Wells](mailto:Jeff.Wells); [citymanager@cityofsaludanc.com](mailto:citymanager@cityofsaludanc.com); [administrator@villageofflatrock.org](mailto:administrator@villageofflatrock.org); [chief@cityofsaludanc.com](mailto:chief@cityofsaludanc.com); [sfrady@hvlnc.gov](mailto:sfrady@hvlnc.gov); [dheyman@hvlnc.gov](mailto:dheyman@hvlnc.gov); [barledge@polknc.org](mailto:barledge@polknc.org); [cruth@polknc.org](mailto:cruth@polknc.org); [tmcfalls@hendersoncountync.org](mailto:tmcfalls@hendersoncountync.org); [jvindigni@hvlnc.gov](mailto:jvindigni@hvlnc.gov); [m.biberdorf@fletchernc.org](mailto:m.biberdorf@fletchernc.org); [Nathan Slaughter](mailto:Nathan.Slaughter); [Ferguson, Christopher](mailto:Ferguson.Christopher); [Jamie Davidson](mailto:Jamie.Davidson); [frankie.hamrick@rutherfordcountync.gov](mailto:frankie.hamrick@rutherfordcountync.gov)  
**Cc:** [Cathy Ruth](#)  
**Subject:** FW: South Mountains RHMP Mitigation Strategy Workshop - April 3

---

Good morning,

Below are the details for our next meeting on April 3rd for work on our Regional Hazard Mitigation Plan.

Thanks!

Jimmy Brissie

-----Original Appointment-----

From: Jamie DeRose <[jderose@espassociates.com](mailto:jderose@espassociates.com)> <<mailto:jderose@espassociates.com>> >  
Sent: Wednesday, February 13, 2019 8:14 AM  
To: Jamie DeRose; Jimmy Brissie; Kevin Shook; [citymanager@cityofsaludanc.com](mailto:citymanager@cityofsaludanc.com) <<mailto:citymanager@cityofsaludanc.com>> ; [chief@cityofsaludanc.com](mailto:chief@cityofsaludanc.com) <<mailto:chief@cityofsaludanc.com>> ; [sfrady@hvlnc.gov](mailto:sfrady@hvlnc.gov) <<mailto:sfrady@hvlnc.gov>> ; [dheyman@hvlnc.gov](mailto:dheyman@hvlnc.gov) <<mailto:dheyman@hvlnc.gov>> ; [barledge@polknc.org](mailto:barledge@polknc.org) <<mailto:barledge@polknc.org>> ; [cruth@polknc.org](mailto:cruth@polknc.org) <<mailto:cruth@polknc.org>> ; [tmcfalls@hendersoncountync.org](mailto:tmcfalls@hendersoncountync.org) <<mailto:tmcfalls@hendersoncountync.org>> ; [jvindigni@hvlnc.gov](mailto:jvindigni@hvlnc.gov) <<mailto:jvindigni@hvlnc.gov>> ; [m.biberdorf@fletchernc.org](mailto:m.biberdorf@fletchernc.org) <<mailto:m.biberdorf@fletchernc.org>> ; Nathan Slaughter; Ferguson, Christopher; Jamie Davidson; [frankie.hamrick@rutherfordcountync.gov](mailto:frankie.hamrick@rutherfordcountync.gov) <<mailto:frankie.hamrick@rutherfordcountync.gov>>  
Cc: Cathy Ruth  
Subject: South Mountains RHMP Mitigation Strategy Workshop - April 3  
When: Wednesday, April 3, 2019 10:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).  
Where: Henderson County Emergency Services Center

Good morning all,

The meeting details for the next phase of the South Mountains Regional Hazard Mitigation Plan Update have been confirmed. Please mark your calendars for the following:

Wednesday, April 3 from 10AM – Noon

Henderson County Emergency Services Center  
2529 Asheville Highway  
Henderson, NC 28791  
(Across from Hunter Subaru)

This meeting will be what we call the "Mitigation Strategy Workshop." It is an important meeting that will again last for 2 hours. We will present the findings from the updated risk and capability assessments and work to update the mitigation strategy for all participating jurisdictions. Lunch will be provided following the meeting.

This invitation has been extended to everyone who participated in the first Kickoff Meeting; however, if there are any other stakeholders or municipalities that did not previously attend, please feel free to share this invitation with them.

If you have any questions or concerns, please do not hesitate to contact me or Nathan Slaughter ([nslaughter@espassociates](mailto:nslaughter@espassociates), 919.415.2726).

Thank you and we look forward to seeing you on April 3rd!

Jamie L. DeRose

ESP Associates, Inc.

2200 Gateway Centre Blvd

Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com) <<http://www.espassociates.com/>>

[jderose@espassociates.com](mailto:jderose@espassociates.com) <<mailto:jderose@espassociates.com>>

919.415.2757 | Direct

252.723.9122 | Cell

**From:** [Jimmy Brissie](#)  
**To:** "Jeff Wells "; "Mark Biberdorf"; "Michael Morgan"; "Pat Christie"; "Brian Pahle"; "Connet, John"  
**Cc:** [sfrady@hvlnc.gov](mailto:sfrady@hvlnc.gov); [jvindigni@hvlnc.gov](mailto:jvindigni@hvlnc.gov); [Steve Wyatt](#); [Amy Brantley](#); [btrotter@laurelpark.org](mailto:btrotter@laurelpark.org)  
**Subject:** FW: South Mountains Mitigation Strategy Meeting Follow Up  
**Date:** Monday, April 8, 2019 9:32:00 AM  
**Attachments:** [SMtns Mitigation Strategy Presentation.pdf](#)  
[Instructions for Mit Action Worksheets.doc](#)  
[Henderson County Revised Mitigation Actions.docx](#)  
[Polk County Revised Mitigation Actions.docx](#)  
[Rutherford County Revised Mitigation Actions.docx](#)  
[Transylvania County Revised Mitigation Actions.docx](#)

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City & Town Managers,

Last week we held our second workday for our regional hazard mitigation plan, thank you to those who were able to attend. This work session was geared towards reviewing our hazards and vulnerabilities, attached is a copy of the PowerPoint presentation. We all have some homework from this work session:

- Attached is a copy of Henderson County's Mitigation Actions, these include your municipality. **Please review these and provide feedback to ESP by May 17<sup>th</sup>, 2019.** The instructions are listed below and also attached. Be sure to include any new actions you would like to add.
- I did submit countywide repetitive loss data which included municipalities, you can disregard her request for that data.

If you have questions or concerns please let me know. Thanks for your leadership!

Jimmy Brissie, Director  
Henderson County Emergency Services  
[jbrissie@hendersoncountync.gov](mailto:jbrissie@hendersoncountync.gov)  
828-697-4728 (P)  
828-698-6164 (F)

---

**From:** Jamie DeRose <[jderose@espassociates.com](mailto:jderose@espassociates.com)>  
**Sent:** Thursday, April 4, 2019 1:45 PM  
**To:** [barledge@polknc.org](mailto:barledge@polknc.org); Kevin Shook <[Kevin.Shook@transylvaniacounty.org](mailto:Kevin.Shook@transylvaniacounty.org)>; [administrator@villageofflatrock.org](mailto:administrator@villageofflatrock.org); [Kevin Waldrup <Kevin.Waldrup@hendersoncountync.gov>](mailto:Kevin.Waldrup@hendersoncountync.gov); [chief@cityofsaludanc.com](mailto:chief@cityofsaludanc.com); [frankie.hamrick@rutherfordcountync.gov](mailto:frankie.hamrick@rutherfordcountync.gov); [john.greenway@rutherfordcountync.gov](mailto:john.greenway@rutherfordcountync.gov); [sfrady@hvlnc.gov](mailto:sfrady@hvlnc.gov); [dheyman@hvlnc.gov](mailto:dheyman@hvlnc.gov); Jimmy Brissie <[jbrissie@hendersoncountync.gov](mailto:jbrissie@hendersoncountync.gov)>; Tim McFalls <[tmcfalls@hendersoncountync.gov](mailto:tmcfalls@hendersoncountync.gov)>; [jvindigni@hvlnc.gov](mailto:jvindigni@hvlnc.gov); [citymanager@cityofsaludanc.com](mailto:citymanager@cityofsaludanc.com); [planning@polknc.org](mailto:planning@polknc.org); Jamie Davidson <[jej1972@windstream.net](mailto:jej1972@windstream.net)>  
**Cc:** Nathan Slaughter <[nslaughter@espassociates.com](mailto:nslaughter@espassociates.com)>; Ferguson, Christopher <[Christopher.Ferguson@ncdps.gov](mailto:Christopher.Ferguson@ncdps.gov)>; [EMGroupMitigationPlans@ncdps.gov](mailto:EMGroupMitigationPlans@ncdps.gov)  
**Subject:** South Mountains Mitigation Strategy Meeting Follow Up

Thank you for your participation in yesterday's South Mountains RHMP Mitigation Strategy Meeting!

As promised, a PDF version of the PowerPoint presentation is attached for your reference.

Don't forget about your "homework!" Also attached is an electronic version of the Mitigation Action Worksheet with directions on how to identify new actions for each county. Here is a link to FEMA's Mitigation Ideas that we mentioned during the presentation that you may reference while identifying new goals: [https://www.fema.gov/media-library-data/20130726-1904-25045-2423/fema\\_mitigation\\_ideas\\_final\\_01252013.pdf](https://www.fema.gov/media-library-data/20130726-1904-25045-2423/fema_mitigation_ideas_final_01252013.pdf)

It is also important to review the previous mitigation actions from the last update. An electronic copy of each county's existing actions are attached in the Microsoft Word documents. Please note that the previous actions that were deleted or completed have been highlighted in gray – These actions do **NOT** necessarily need to be updated, as they have already been deleted or completed, and are simply for your reference. The updated actions can be placed in the column labeled "Implementation Status Update (2019)." Keep in mind that it is perfectly fine if an action is labeled as "deleted" or "deferred," but please explain the reasoning. Also be sure to prioritize each action as "high," "moderate," or "low." **These updates and newly identified actions are due to ESP by May 17, 2019.**

Again, if you have not sent me your county's Repetitive Property Loss data, please do so at your earliest convenience.

If you have any questions, concerns, or feedback from yesterday's meeting, please let us know! We encourage your ideas and opinions in the development of the plan and are happy to make changes if necessary. As we move forward, if you think of something that should be mentioned in the plan (i.e. vulnerable areas, new goals, repetitive loss properties, etc.), be sure to contact us.

Finally, be on the lookout for a calendar invitation for the next meeting. We will likely have a Webinar meeting to share the draft plan with all stakeholders. We will let you all know the time and date of that meeting once they are confirmed.

Thank you again for taking the time to meet with us, and we hope you all have a great weekend!

**Jamie L. DeRose**

**ESP Associates, Inc.**

2200 Gateway Centre Blvd

Suite 216

Morrisville, NC 27560

[www.espassociates.com](http://www.espassociates.com)

[jderose@espassociates.com](mailto:jderose@espassociates.com)

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## Emergency Management

- Homeland Security
- Emergency Information
- NC Emergency Management
- FEMA
- + Weather
- Emergency Operations Plan
- Hazard Mitigation
- Consumer Product Safety Commission RECALLS
- Special Needs Registry Application
- Suggestion Box

### Regional Hazard Mitigation Plan Public Meeting

South Mountains Regional Hazard Mitigation Plan Update – Public Meeting

Henderson, Polk, Rutherford, and Transylvania counties are working together to update the regional Hazard Mitigation Plan. Natural disasters in our area are inevitably going to occur; however, the purpose of this plan is to assess our community's natural hazard risks and determine how to lessen our vulnerability when disaster strikes.

Public input and support are essential parts of this plan. In order to develop the most effective and beneficial plan possible, your input is needed! A public meeting will be held on December 13th from 6pm-7pm at the Henderson County Emergency Services Center in Hendersonville.

All interested residents from these counties and participating jurisdictions are invited to attend the meeting. By applying a collective approach to hazard mitigation plan development, we will contribute to a more resilient community! We look forward to seeing you on the 13th!

December 13th, 2018  
6PM-7PM

Henderson County Emergency Services Center  
2529 Asheville Highway  
Hendersonville, NC 28791

### Contact Information

**Emergency Management**  
P: [\(828\) 697-4728](tel:8286974728)

2529 Asheville Highway  
Hendersonville, NC 28791

**Hours of Operation**  
Monday - Friday  
8:00 a.m. - 4:30 p.m.

Please give us your comments!

[View Full Contact Details](#)





## Officials prepare for disasters with update to hazard mitigation plan

By Derek Lacey

Times-News Staff Writer

Posted Dec 16, 2018 at 3:25 PM

With snow still covering much of Henderson County, officials met at the county Emergency Services Center Thursday evening to begin the process of updating the region's plan for mitigating the effects of natural and manmade hazards.

The 137-page South Mountains Regional Hazard Mitigation Plan assesses the natural hazards risks for Henderson, Polk, Rutherford and Transylvania counties and their municipalities, detailing how to lessen the area's vulnerability when disaster strikes.

The aim is to reduce the area's vulnerability to those hazards and promote sound public policy designed to protect people, infrastructure, property and the environment by increasing public awareness, documenting resources and more, to work toward a safer and more sustainable community.

At the public meeting Thursday, Nathan Slaughter, Hazard Mitigation Department manager with Raleigh-based ESP Associates, presented the plan update process, noting that stakeholders from all four counties met to go over the plan Thursday before the public meeting.

Local officials, including emergency personnel from all four of the region's counties, met Thursday before the public meeting to begin the process, reviewing the current plan. Public input will be collected through the end of February and the new plan must be submitted in July of next year before it takes effect in July 2020, when the current plan expires.

Public input gathered will be presented to that stakeholder group of local officials as it puts the new plan together, Slaughter said, taking into account everything from trouble spots in specific neighborhoods to preferred mitigation techniques.

Federal and state legislation requires the adoption of a hazard mitigation plan in order to get funding for hazard mitigation measures like raising or moving buildings, improving infrastructure or repairing natural buffers. The plan must be updated every five years.

Eleven natural hazards were identified by the Federal Emergency Management Association for the current plan, including winter storms or extreme cold, wildfires, flooding, severe thunderstorms, dam or levee failure, tornadoes, Nor'easters, hazardous material events, riverine erosion, earthquakes and landslides.

Ken Fitch, who attended the meeting, expressed concern about recent developments exacerbating flooding and causing other concerns, and wondered how the hazard mitigation plan would be turned into action on the part of local officials.

"How does this help determine action?" Fitch asked.

Slaughter explained that it's a grassroots effort, with local emergency management officials, planners, public works and more. Any specific actions would have to come from that stakeholder team, as there are no requirements from FEMA that any metrics be met. It's up to that local stakeholder group.

Fitch also raised concerns about other areas, like out-of-date FEMA floodplain maps and increasing development in the county and how that may translate to worsening conditions when hazards like heavy rains or flooding come along.

Henderson County Emergency Services Director Jimmy Brissie, also at the meeting, said the mitigation plan serves as a tool for local agencies and doesn't get into such granular detail.

"We're actually very fortunate, we have in the county, pretty good regulations that protects that compared to other parts of the state," he said. "Could it be better? Entirely possible."

It's as much a planning tool as a prevention tool and gives local officials a road map of what they need to be worried about, and it's up to policy-makers and stakeholders to implement that, Brissie said.

He gave the example of an issue that came before the Henderson County Planning Board earlier this year, a petition to relax certain floodplain fill requirements that was ultimately voted down.

“Using things like this (plan) and conversations with stakeholders, the planning board at that time, turned that down,” Brissie said. “By not making a change you could call that progress.”

Planners are collecting public comment through Feb. 28, with surveys available at <https://s.surveypplanet.com/JoRVQduiP>, with questions on threats to communities, flood insurance, actions taken to protect homes against hazards and what actions local governments could take to reduce the risk from future hazard damages. The survey link is also posted on the county’s website at [www.hendersoncountync.gov](http://www.hendersoncountync.gov).



## Officials prepare for disasters with update to hazard mitigation plan

By Derek Lacey

Times-News Staff Writer

Posted Dec 16, 2018 at 3:25 PM

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Public input gathered will be presented to that stakeholder group of local officials as it puts the new plan together, Slaughter said, taking into account everything from trouble spots in specific neighborhoods to preferred mitigation techniques.



## Emergency Management

- Homeland Security
- Emergency Information
- NC Emergency Management
- FEMA
- + Weather
- Emergency Operations Plan
- Hazard Mitigation Plan
- Regional Hazard Mitigation Plan Public Input
- Consumer Product Safety Commission RECALLS
- Special Needs Registry Application
- Suggestion Box

### Regional Hazard Mitigation Plan Public Input

Henderson, Polk, Transylvania, and Rutherford Counties and the municipalities within the counties are working together to become less vulnerable to natural disasters, and your participation in the process is important to us!

The counties, along with local jurisdictions and other partners, are working to update the multi-jurisdictional Regional Hazard Mitigation Plan. This plan identifies and assesses our community's natural hazard risks and identifies strategies that determine how to best minimize or manage those risks.

A survey has been created as an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Link to Survey: <https://s.surveypplanet.com/JoRVQduiP>

[Printer-friendly version](#)   [PDF version](#)

### Contact Information

**Emergency Management**  
P: [\(828\) 697-4728](tel:8286974728)

2529 Asheville Highway  
Hendersonville, NC 28791

**Hours of Operation**  
Monday - Friday  
8:00 a.m. - 4:30 p.m.

Please give us your comments!

[View Full Contact Details](#)





# Hendersonville, NC City Government

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### Hendersonville, NC City Government

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Henderson, Polk, Transylvania, and Rutherford Counties and the municipalities within the counties are working together to become less vulnerable to natural disasters, and your participation in the process is important to us!

The counties, along with local jurisdictions and other partners, are working to update the multi-jurisdictional Regional Hazard Mitigation Plan. This plan identifies and assesses our community's natural hazard risks and identifies strategies that determine how to best minimize or manage those risks.

A survey has been created as an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Link to Survey: <https://s.surveypplanet.com/JoRVQduiP>

We appreciate your involvement!

HENDERSONVILLENC.GOV

### Regional Hazard Mitigation Public Input Survey - City of Hendersonville, NC

Henderson, Polk, Transylvania, and Rutherford Counties and the municipalities within the counties are working together to become less vulnerable to natural disasters, and your participation in the process is...



hvlnc

# SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLAN PUBLIC INPUT SURVEY



<https://s.surveypal.com/JoRVQduiP>



**hvlnc** Leaders in our area are working to become less vulnerable to natural disasters. Help by providing feedback in a short more

25 MINUTES AGO

Add a comment...





HVLNC @HVL\_NC · 5s



Henderson, Polk, Transylvania & Rutherford Counties along with municipalities are working together to become less vulnerable to natural disasters. Your input is important. Take this survey to help our area with the planning process:  
[s.surveypplanet.com/JoRVQduiP](https://s.surveypplanet.com/JoRVQduiP)

## SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLAN PUBLIC INPUT SURVEY



<https://s.surveypplanet.com/JoRVQduiP>



## City of Hendersonville Fire Department, NC



Published by Allison Nock [?] · 1 min · 🌐

Our Fire Department and Development Assistance Department were represented at the South Mountains Regional Hazard Mitigation meeting last week. Along with neighboring counties, we are continuing to assess our community's natural hazard risks and identifies strategies that determine how to best minimize or manage those risks.

Help us by sharing your opinions and concerns in a short survey:  
<https://s.surveypplanet.com/JoRVQduiP>

HENDERSONVILLENC.GOV

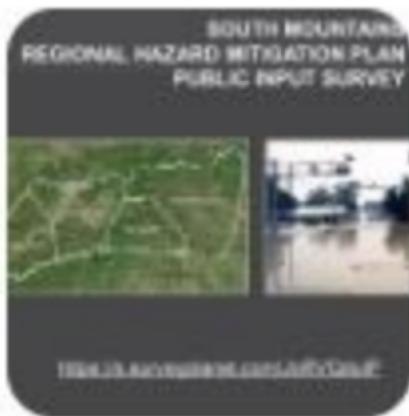
### **Regional Hazard Mitigation Public Input Survey - City of Hendersonville, NC**

Henderson, Polk, Transylvania, and Rutherford Counties and the municipalities within the counties are working together to become less vulnerable to natural disasters, and your participation in the process is...



**Hendersonville Fire** @HVLFD · 6m

A public input survey has been released to assist our area leaders with natural disaster planning. Give your feedback at [s.surveymonkey.com/JoRVQduiP](https://s.surveymonkey.com/JoRVQduiP)



**HVLNC** @HVL\_NC

Henderson, Polk, Transylvania & Rutherford Counties along with municipalities are working together to become less vulnerable to natural disasters. Your input is important. Take this survey to help our area with the planning...



## South Mountains Regional Hazard Mitigation Plan Update – Public Meeting

Henderson, Polk, Rutherford, and Transylvania counties are working together to update the regional Hazard Mitigation Plan. Natural disasters in our area are inevitably going to occur; however, the purpose of this plan is to assess our community's natural hazard risks and determine how to lessen our vulnerability when disaster strikes.

Public input and support are essential parts of this plan. In order to develop the most effective and beneficial plan possible, your input is needed! A public meeting will be held on December 13<sup>th</sup> from 6pm-7pm at the Henderson County Emergency Services Center in Hendersonville.

All interested residents from these counties and participating jurisdictions are invited to attend the meeting. By applying a collective approach to hazard mitigation plan development, we will contribute to a more resilient community! We look forward to seeing you on the 13<sup>th</sup>!

**December 13<sup>th</sup>, 2018**

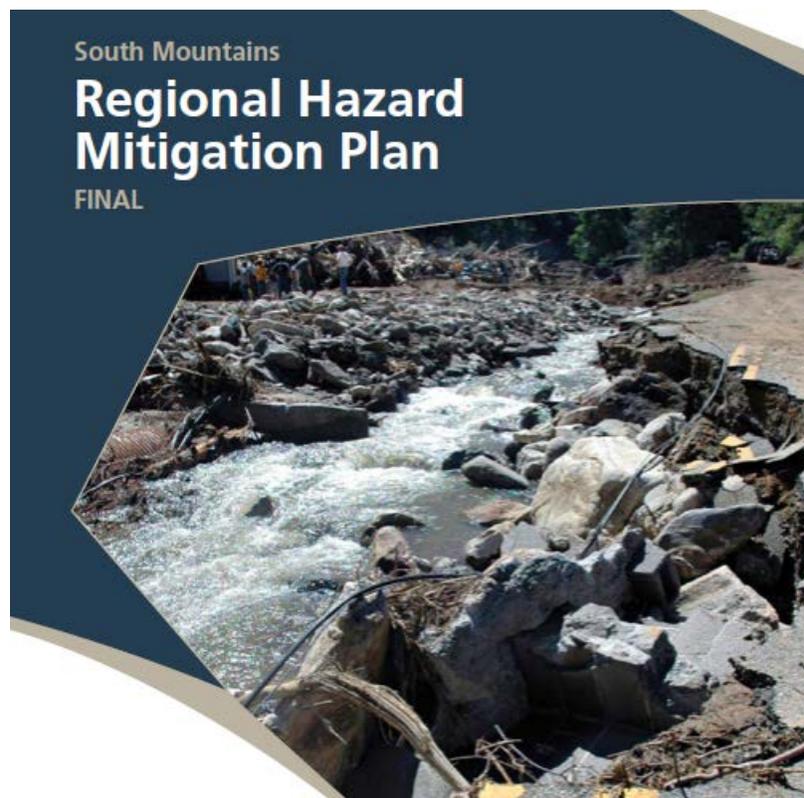
**6PM-7PM**

**Henderson County Emergency Services Center**

**2529 Asheville Highway**

**Hendersonville, NC 28791**

(across from hunter Subaru)



## Nathan Slaughter

---

**From:** Kevin Shook <Kevin.Shook@transylvaniacounty.org>  
**Sent:** Tuesday, January 8, 2019 9:33 AM  
**To:** Nathan Slaughter  
**Subject:** RE: quick question re: HMP

THIS MESSAGE ORIGINATED OUTSIDE OF ESP ASSOCIATES, INC. USE CAUTION WHEN OPENING ATTACHMENTS, CLICKING LINKS, OR RESPONDING TO REQUESTS FOR INFORMATION.

City of Brevard Representatives.

Bobby Cooper, Fire Chief  
Emory Owen, Brevard Wastewater Director  
Dennis Richardson, Brevard Water Treatment Director

No one from the Town of Rosman was there, but I have talked with the Mayor and he has said I can represent the Town of Rosman. He is supposed to respond to my email where I asked him if he wanted me to represent the town so I have it in writing.

Kevin R Shook, Emergency Management Coordinator  
Transylvania County Emergency Services  
Shipping : 155 Public Safety Way  
Mailing : 101 S Broad St  
Brevard, NC 28712  
Phone (828)884-3108 ext 2  
Fax (828)862-8925  
email kevin.shook@transylvaniacounty.org  
email tcem3@citcom.net

---

**From:** Nathan Slaughter <nslaughter@espassociates.com>  
**Sent:** Thursday, January 03, 2019 11:55 AM  
**To:** Kevin Shook <Kevin.Shook@transylvaniacounty.org>  
**Subject:** quick question re: HMP

Good morning Mr. Shook

I hope all is well with you and that you had a nice holiday. I have a quick question about the kickoff meeting we had for the regional hazard mitigation plan in Hendersonville on Dec 13. Who were the folks there representing Brevard? They didn't sign the sign-in sheet and I want to make sure we give them the proper credit for being there. I believe it was 2, maybe three gentlemen. Also, was anyone there from Rosman?

Thank for your help!

**Nathan Slaughter, AICP, CFM**  
Department Manager – Hazard Mitigation  
**ESP Associates, Inc.**  
[2200 Gateway Centre Boulevard – Suite 216](#)

Morrisville, NC 27560  
[www.espassociates.com](http://www.espassociates.com)

[nslaughter@espassociates.com](mailto:nslaughter@espassociates.com)

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919.244.9536 | Cell

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# Appendix E:

## Completed Mitigation Actions

### Henderson County Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Implementation Schedule	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Develop a County Storm water Management Plan	FL	Moderate	General Revenue	Engineering Department	Completed	Adopted Storm water Ordinance 9-1-2010
P-2	Incorporate into the County Zoning and Subdivision Ordinances construction standards for privately owned bridges	ALL	Moderate	General Revenue	Engineering Department	Completed	Private bridge standards are included in Land Development Code 200A-105F.
P-3	Develop a County Storm water Management Plan	FL	High	General Revenue	GIS	Completed	A GIS layer has been developed that includes water and sewer lines.
P-6	Develop a County Storm water Management Plan	D	High	General Revenue	GIS Department/ County EMA	Completed	Henderson County has developed a dam/levee structural database with the assistance of the NC Department of Environment and Natural Resources, Dam Safety Division

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Implementation Schedule	2020 Action Implementation Status
<b>Property Protection</b>							
PP-3	Establish policy to assure all computer equipment and furniture is secured in a manner to avoid toppling during an earthquake.	EQ	Low	General Revenue	Information Technology	Completed	IT policy in place to ensure computer equipment is secured to a desk or rack mounted.
PP-4	Incorporate GIS modeling to show areas of the County prone to more serious damage during earthquake conditions.	EQ	High	General Revenue and Grants	GIS Department	Completed	HAZUS run completed during the 2014 Hazard Mitigation Regional Planning Update.
<b>Natural Resource Protection</b>							
NRP-1	Develop a plan, which will include annual monitoring of sediment transport and erosion, to address the long – term issue of river and stream erosion in the County.	ER	High	General Revenue and Grants	Engineering Department	Completed	Completed; This was accomplished by adding erosion division in October 2007.
NRP-2	Support State enforcement of sedimentation and erosion control regulations.	ER	High	General Revenue and Grants	Engineering Department	Completed	This has been accomplished and will continue to maintain and support.

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Implementation Schedule	2020 Action Implementation Status
NRP-3	Coordinate efforts with the U.S. Forestry Service to enforce banning burns.	WF	High	General Revenue	County EMA	Completed	USFS is notified when burning bans are in place and during red flag burning days. This will be continued going forward.
NRP-4	Encourage development and enlargement of buffers and green areas.	WF	High	General Revenue	Planning Dept	Completed	Land Development Code addresses buffers and green areas.
<b>Emergency Services</b>							
ES-1	Establish two – way radio communication for key personnel (i.e. County Manager, Emergency Services providers, Shelter Teams, etc.).	All	High	General Revenue and Grants	County EMA	Completed	New communications system will be installed by September 2014
ES-2	Include 311 systems, pre-scripted messaging in communications system.	All	Moderate	General Revenue and Grants	County EMA	Completed	3-1-1 is not available to Henderson County through AT&T. We have implemented a reverse 9-1-1 mass notification system so this action is complete.
ES-4	Assure adequate training for emergency personnel to respond to HAZMAT events is on-going.	HM	Moderate	General Revenue	County EMA	Completed	Hazardous Materials training is provided on an annual basis through Blue Ridge Community College

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Implementation Schedule	2020 Action Implementation Status
ES-5	Incorporate procedures for handling hazardous materials into GIS modeling.	HM	High	General Revenue	GIS Department	Completed	CAMEO, Aloha and other plume modeling products are available and in use.
<b>Public Education and Awareness</b>							
PEA-1	Hold a County sponsored hazard mitigation seminar for the county residents, including information on preparedness for all hazards significant to Henderson County.	All	Low	General Revenue	County EMA	Completed	Preparedness information included as a regular article in county monthly newsletter. Preparedness Fair held October 2013 at Jackson Park.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees County EMA = Henderson County Emergency Management							

## Village of Flat Rock Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Encourage Village participation in the National Flood Insurance Program and subsequent participation in the Community	FL	High	General Revenue	Village Council	Completed	Completed and in the program where residents have purchased NFIP as required by their lenders.
P-2	Develop a local Flood Damage Presentation Ordinance.	FL	High	General Revenue and Grants	Village Council	Completed	The Flood Damage Ordinance was adopted December 11, 2008. Ordinance last amended November 2013
P-3	Hire and educate a permanent Building Inspector/Code Enforcement Officer to enforce the Village's current Zoning Ordinance, Subdivision Ordinance, and the North Carolina State Building Codes within the planning jurisdiction of the Village of Flat Rock.	All	High	General Revenue	Village Council	Completed	This was achieved by contracting with Henderson County to provide a Building Inspector and the Village has a Code Enforcement officer. Zoning and Planning handled in house. County enforces building
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County EMA = Henderson County Emergency Management    Village = Village of Flat Rock							

**Town of Fletcher Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Develop a Floodplain Management Plan. The Floodplain Management Plan is included in Land Development Code adopted March 2006. Rating System Program.	FL	High	General Revenue	Town Council	Completed	The Floodplain Management Plan is included in Land Development Code adopted March 2006.
P-2	Develop a Storm water Management Ordinance. Encourage Town participation in the Community Rating System.	FL	High	General Revenue and Grants	Town Council	Completed	Complete. The Storm water Management plan is included in Land Development Code adopted March 2006.
FL = Flood      DR = Drought      ES = Expansive Soils      HU = Hurricane      T = Tornado      WF= Wildfire      S/I = Snow/Ice      ET = Extreme Temperatures EQ = Earthquake      LS = Landslide      L = Lightning      ER = Erosion      HM = HAZMAT      D = Dams/Levees      County EMA = Henderson County Emergency Management Village = Village of Flat Rock							

**City of Hendersonville Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Develop a Storm water Management Plan	FL	High	General Revenue and Grants	Engineering Department	Completed	Henderson County participates in the State Storm water Management Plan.
P-5	Update and revise the local Land Use and Development Plan. The most recent plan was approved in 1980.	All	High	General Revenue and Grants	Planning Department	Completed	This has been completed by the implementation of the 2030 Hendersonville Comprehensive Plan in April of 2009. Comp. Plan approved in April of 2009.
P-6	Update and revise the local Subdivision Ordinance	All	High	General Revenue and Grants	Planning Department	Completed	This has been completed by the implementation of the 2030 Hendersonville Comprehensive Plan in April of 2009.
P-7	Work with local governments (especially Henderson County) to develop local Water Shortage Response Guidelines (in different phases) as a part of the Henderson County Emergency Operations Plan.	Dr	High	General Revenue and Grants	Planning Department	Completed	Drought plan developed and included into Henderson County Emergency Operations Plan

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Emergency Services							
ES-1	Update and revise the local Subdivision Ordinance.	All	High	General Revenue and Grants	Police Department	Completed	Communications System and center updated
ES-2	Work with local governments (especially Henderson County) to develop local Water Shortage Response Guidelines (in different phases) as a part of the Henderson County Emergency Operations Plan.	All	High	Grants	Police and Fire Department	Completed	A two-way communications system is in place for emergency services.
ES-4	Purchase generators to use at the operations center that controls information technology, communications and protection for fiber optic cable.	All	High	General Revenue and Grants	Information Technology	Completed	New ops center with generator back-up is in place

FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures  
 EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County EMA = Henderson County Emergency Management    City = City of Hendersonville

**Town of Laurel Park Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Develop a Stormwater Management Plan.	FL	High	General Revenue	Town Council	Completed	The Storm Water Management Ordinance was developed and approved January 15, 2008 and is enforced as required
<b>Property Protection</b>							
PP-1	Encourage Town participation in the National Flood Insurance Program and subsequent participation in the Community Rating System Program.	FL	High	General Revenue	Town Council	Completed	Completed – Town Participates
<b>Natural Resource Protection</b>							
NRP-1	Monitor trees and branches, at risk of breaking in wind, ice, and snow events. This will be accomplished by Pruning or thinning of trees or branches when they pose an immediate threat to property, utility lines or other significant structures or critical facilities in the community.	All	High	General Revenue	Town Council	Completed	The Town of Laurel Park continues to work with Duke Energy on an annual basis to monitor and remove trees and branches at risk of breaking during high winds, ice, and snow events to minimize power line damage during a storm. The Town also assesses and removes hazardous trees on the ROW to ensure access.

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Emergency Services							
ES-1	Purchase portable evacuation, detour, and re-route traffic signs for use during an emergency.	All	High	General Revenue and Grants	Town Council	Completed	Signs have been purchased and are ready for use in an emergency.

FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures  
 EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees  
 County EMA = Henderson County Emergency Management    Town = Town of Laurel Park

**Polk County Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Encourage communities to participate in the Community Rating System (CRS).	All	High	Local Funds	County ES	Deleted	County decided not to pursue this due to lack of staff time
P-4	Identify, list, and map all available water sources	WF	High	Local Funds	County ES	Completed	Available water sources have been identified and mapped, so this action is completed
P-6	Municipalities will develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	S/I	Moderate	NCEM/FEMA Local Funds	County ES	Completed	The municipalities have developed programs for mitigation that work in conjunction with the county.
<b>Property Protection</b>							
PP-1	Review and consider adoption of a storm water wetland requirement when developments with a certain number of acres of hard surfaces are constructed.	FL	Moderate	Local Funds	Planning and Zoning	Completed	Complete and incorporated in zoning ordinance
PP-2	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	S/I	Moderate	NCEM/FEMA Local Funds	Public Works	Completed	The county has a program in place to implement mitigation programs and activities to reduce risk.

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Emergency Services							
ES-1	Develop and implement a Community Emergency Response Team (CERT)	All	Moderate	NCEM/FEMA Local Funds	LEPC	Deleted	LEPC has decided not to pursue this due to lack of time/funding.
ES-4	Provide water from the Broad River along the Hwy. 9 corridor in the unincorporated areas of Polk County.	DR	High	Local Funds	County ES	Completed	Water is provided from the Broad River to unincorporated areas of Polk County.
ES-6	Incorporate a Geographic Information System to maintain building/parcel data for purposes of conducting more detailed hazard risk assessments and for tracking permitting/land use patterns.	All	Moderate	NCDEM/FEMA Local Funds	County ES, Public Works, DENR	2019	Some updates to the dam have been implemented but the dam is still in need of upgrade in some areas.
ES-7	Install county-wide warning system for all hazards.	All	Moderate	NCEM/FEMA Local Funds	Polk County Communications	Completed	This system was installed.
Public Education and Awareness							
PEA-3	Develop and Implement a reverse calling system.	All	Low	NCEM/FEMA Local Funds	Polk County Communications	Completed	A reverse calling system has been installed and is ready for use.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures EQ = Earthquake   LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   County ES = Polk County Emergency Services							

### Town of Columbus Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Identify, list, and map all water sources available	WF	High	Local Funds	Fire Department	Completed	Available water sources have been identified and mapped, so this action is completed
P-3	Develop and implement a Community Emergency Response Team (CERT).	All	Moderate	NCEM/FEMA Local Funds	LEPC	Deleted	LEPC has decided not to pursue this due to lack of time/funding
P-4	Municipalities will develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	S/I	Moderate	NCEM/FEMA Local Funds	County ES	Completed	The municipalities have developed programs for mitigation that work in conjunction with the county
<b>Emergency Services</b>							
ES-4	Install county-wide warning system for all hazards.	All	Moderate	NCEM FEMA/Local Funds	Polk County Communications	Completed	This system was installed.
<b>Public Education and Awareness Activities</b>							
PEA-2	Develop and Implement a reverse calling system.	All	Low	NCEM/ FEMA/Local Funds	Polk County Communications	Completed	A reverse calling system has been installed and is ready for use.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County ES = Polk County Emergency Services Town = Town of Columbus							

**City of Saluda Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Work to complete the necessary requirements to join the National Flood Insurance Program.	FL	High	Local Funds	City Public Works	Completed	The City joined the NFIP on 02/19/10.
P-3	Municipalities will develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from winter storms.	S/I	Moderate	NCEM FEMA Local Funds	County ES	Completed	The municipalities have developed programs for mitigation that work in conjunction with the county
<b>Emergency Services</b>							
ES-2	Incorporate a Geographic Information System to maintain building/parcel data for purposes of conducting more detailed hazard risk assessments and for tracking permitting/land use patterns	All	Moderate	NCEM FEMA Local Funds	Polk County MIS	Deleted	Not going to pursue due to lack of staff time
ES-3	Develop and implement a Community Emergency Response Team (CERT).	All	Moderate	NCEM FEMA Local Funds	LEPC	Deleted	LEPC has decided not to pursue this due to lack of time/funding
ES-5	Install county-wide warning system for all hazards.	All	Moderate	NCEM FEMA Local Funds	Polk County Communications	Completed	This system was installed.
<b>Public Education and Awareness Activities</b>							
PEA-2	Develop and Implement a reverse calling system.	All	Low	NCEM/FE MA/Local Funds	Polk County Communications	Completed	A reverse calling system has been installed and is ready for use.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures EQ = Earthquake    LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    County ES = Polk County Emergency Services    City = City of Saluda							

### Town of Tryon Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Municipalities will develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from winter storms	S/I	Moderate	NCEM FEMA Local Funds	County ES	Completed	The municipalities have developed programs for mitigation that work in conjunction with the county
<b>Emergency Services</b>							
ES-3	Develop and implement a Community Emergency Response Team (CERT).	All	Moderate	NCEM FEMA Local Funds	LEPC	Deleted	LEPC has decided not to pursue this due to lack of time/funding
ES-5	Install county-wide warning system for all hazards.	All	Moderate	NCEM FEMA Local Funds	Polk County Communications	Completed	This system was installed.
<b>Public Education and Awareness Activities</b>							
PEA-2	Develop and Implement a reverse calling system.	All	Low	NCEM FEMA Local Funds	Polk County Communications	Completed	A reverse calling system has been installed and is ready for use.
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures   EQ = Earthquake   LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   County ES = Polk County Emergency Services   Town = Town of Tryon							

## Rutherford County Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Encourage power companies or public utilities to continue to be aggressive in the general maintenance and clearing of utility rights-of-way and easements.	All	Moderate	N/A	EMD	Completed	Completed 2012 spraying continues annually
P-2	Document the location and prioritization of critical facilities.	All	Moderate	N/A	EMD	Completed	Completed 2013 mapped by GIS
P-3	Document the location and preparedness of the emergency shelters.	All	High	N/A	EMD	Completed	Completed 2013 and identified in EOP
p-4	Use future growth projections to present alternative utility layout.	All	Low	N/A	EMD	Deleted	Deleted, this action was deemed to be not technically feasible
p-5	Plan for debris collection and disposal.	All	Moderate		EMD	Completed	Completed 2013
P-6	Review all aspects of emergency response to ensure that emergency services are more than adequate to protect public health and safety.	All	Moderate	N/A	EMD	Completed	Completed 2012
p-8	Update and enforce subdivision regulations, particularly regarding subjects such as accessibility, density and streets and roads.	All	Moderate		Planning Department	Completed	Completed at this time
P-10	Utilize drought tolerant farming practices.	DR	Moderate		County Extension Service	Deleted	Deleted, this action was deemed to be outside the scope of the CES.

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

Property Protection							
PP-1	Encourage power companies or public utilities to continue to place utilities underground in new developments, and to relocate existing overhead utilities underground where feasible.	All	Moderate		EMD	Completed	Completed 2012
Emergency Services							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EMD	Completed	Completed 2012
Structural Projects							
SP-2	Build interconnects between the various water systems.	DR	Low		Water System Manager	Completed	Completed
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department							

**Town of Bostic Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Participate in and enforce the National Flood Insurance Program.	FL	Moderate		Floodplain Administrator	Completed	The town currently participates in the NFIP.
<b>Emergency Services</b>							
ES-2	Provide a two – way communication system for emergency services. Continue to provide two-way communications for emergency services.	All	High	Grants	Police and Fire Departments	Completed	Two-way communication systems have been implemented and are in place.
ES-3	Purchase generators to use as an emergency power supply for water and sewer treatment plants if power is lost during a disaster.	All	High	General Revenue and Grants	Water and Sewer Department	Completed	Generators have been purchased for water and sewer treatment plants
ES-4	Purchase generators to use at the operations center that controls information technology, communications and protection for fiber optic cable.	All	High	General Revenue and Grants	Information Technology	Completed	Completed
ES-5	Develop an action plan to reroute and control traffic during emergency situations.	All	High	General Revenue and Grants	Police Department	Completed	Remote control capability has been implemented throughout the City.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department    Town = Town of Bostic							

### Chimney Rock Village Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-1	Develop a Floodplain Management Plan.	FL	High	General Revenue and Grants	Town Council	Completed	The Floodplain Management Plan is included in Land Development Code adopted March 2006.
P-4	Identify properties adjacent to the railroad tracks and post in a GIS system for potential buyout of highly vulnerable structures.	HM	Moderate	General Revenue and Grants	Town Council	Deleted	This action was determined to not be applicable so it has been deleted.
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department    Village = Chimney Rock Village							

**Town of Ellenboro Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-1	Participate in and enforce the National Flood Insurance Program.	FL	Moderate		Floodplain Administrator	Deleted	No Floodplain in jurisdiction
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department Town = Town of Ellenboro							

**Town of Forest City Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Enforce general and nuisance Ordinances to clear brush and debris.	WF	Moderate		Code Enforcement	Completed	Completed. These ordinances have been put in place and are being enforced.
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department Town = Town of Forest City							

**Town of Lake Lure Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Enforce general and nuisance Ordinances to clear brush and debris.	WF	Moderate		Code Enforcement	Completed	Completed. These ordinances have been put in place and are being enforced.
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department Town = Town of Lake Lure							

**Town of Ruth Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood   DR = Drought   ES = Expansive Soils   HU = Hurricane   T = Tornado   WF= Wildfire   S/I = Snow/Ice   ET = Extreme Temperatures   EQ = Earthquake LS = Landslide   L = Lightning   ER = Erosion   HM = HAZMAT   D = Dams/Levees   EMD = Rutherford County Emergency Management Department   Town = Town of Ruth							

**Town of Rutherfordton Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Enforce general and nuisance Ordinances to clear brush and debris.	WF	Moderate		Code Enforcement	Completed	Completed. These ordinances have been put in place and are being enforced.
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department Town = Town of Rutherfordton							

### Town of Spindale Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Enforce general and nuisance Ordinances to clear brush and debris.	WF	Moderate		Code Enforcement	Completed	Completed. These ordinances have been put in place and are being enforced.
<b>Emergency Services</b>							
ES-1	Seek training in order to provide capable and quick damage assessment and identify mitigation opportunities presented by disaster events.	All	High	Local Funds	EM Staff	Completed	Completed 2012
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees EMD = Rutherford County Emergency Management Department Town = Town of Spindale							

## Transylvania County Completed Mitigation Actions

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
P-1	Perform a County Building Inspection Residential Home Plan Review	FL	Moderate	Local Funds	Building Inspections/ Board of Commissioners	Completed	This action is in place, each new building permit request is reviewed by the county building department to ensure current building codes are in place. The owner is given printed material in reference to exterior preparation concerning urban fire interface, water mitigation measures, etc.
<b>Emergency Services</b>							
ES-2	Install a new reverse 911 system	All	High	Local Funds	County communications Director	Completed	2020 Update: The county has updated the community notification system to a hosted solution with IPAWS ability. Annual cost of \$13,000.
FL = Flood    DR = Drought    ES = Expansive Soils    HU = Hurricane    T = Tornado    WF= Wildfire    S/I = Snow/Ice    ET = Extreme Temperatures    EQ = Earthquake LS = Landslide    L = Lightning    ER = Erosion    HM = HAZMAT    D = Dams/Levees    EMD = Rutherford County Emergency Management Department ES = Transylvania County Emergency/Services							

**City of Brevard Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-1	Continue participation in the Community Rating System Program	FL/ER/HU/T	High	Local Funds	CRS Coordinator-Planning Department	Completed	Complete, the city participates in the CRS program and will continue to do so.
P-3	Perform a County Building Inspection Residential Home Plan Review.	FL/HU	Moderate	Local Funds	Building Inspections	Completed	This action is in place, each new building permit request is reviewed by the county building department to ensure current building codes are in place. The owner is given printed material in reference to exterior preparation concerning urban fire interface, water mitigation measures, etc.
<b>Property Protection</b>							
PP-1	Continue enforcement of “No Adverse Impact” requirements for all development in designated Special Flood Hazard Areas.	FL	High	Local Funds	Planning Department	Completed	This requirement is in place and is being enforced. It will continue to be enforced going forward.
<b>Natural Resource Protection</b>							
NRP-1	Continue Enforcement of “Steep Slope” development regulations	LS	High	Local Funds	Planning Department	Completed	This regulation is in place and is being enforced. It will continue to be enforced going forward.
NRP-2	Continue Enforcement of Sedimentation and Erosion Control regulations	ES/LS	High	Local Funds	Planning Department	Completed	This regulation is in place and is being enforced. It will continue to be enforced going forward.

**APPENDIX E: COMPLETED MITIGATION ACTIONS**

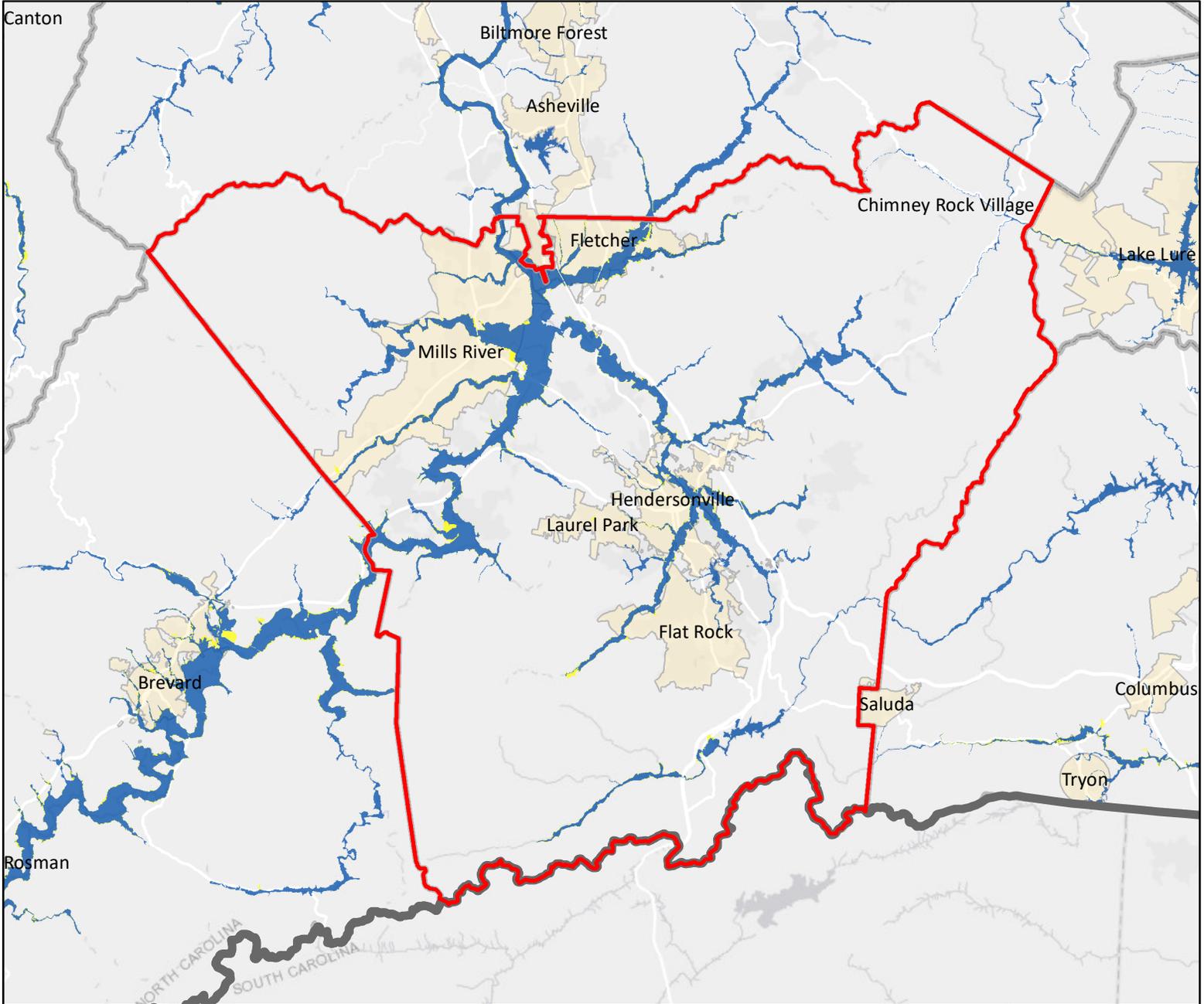
NRP-3	Continue Enforcement of Surface Water Protection Areas	FL	High	Local Funds	Planning Department	Completed	This regulation is in place and is being enforced. It will continue to be enforced going forward.
<b>Emergency Services</b>							
ES-2	Install a new reverse 911 system.	All	High	Local Funds	County Communications Director	Completed	2020 Update: The county has updated the community notification system to a hosted solution with IPAWS ability. Annual cost of \$13,000.
<b>Structural Projects</b>							
SP-2	Elevate Island Ford Road between Walnut Hollow Road and S. County Club Road.	FL/HU	High		City Manager	Deleted	This action is being deleted from the city's action plan as it is not a city responsibility.
<b>Public Education and Awareness Activities</b>							
PEA-1	Hold a hazard mitigation seminar, including information on preparedness for all hazards significant to Transylvania County, Brevard, and Rosman and promotion of participation in FireWise.	All	High	NCEM and Local Funds	City Manager	Completed	The event was held on June 18, 2012. Several agencies participated in the event with educational material and speakers for the public to learn about things they could do around their own home to mitigate dangers to themselves and others.
<p>FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake          LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TH = Thunderstorms ES = Transylvania County Emergency Services          City = City of Brevard</p>							

**Town of Rosman Completed Mitigation Actions**

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
<b>Prevention</b>							
P-2	Develop a Storm Waste Management Plan	FL	Moderate	Local Funds	Building Inspectors	Completed	That action is in place, each new building permit request is reviewed by the county building department to ensure current building codes are in place. The owner is given printed material in reference to exterior preparation concerning urban fire interface, water mitigation measures, etc.
<b>Emergency Services</b>							
ES-2	Install a new reverse 911 system.	All	High	Local Funds	County Communications Director	Completed	2020 Update: The county has updated the community notification system to a hosted solution with IPAWS ability. Annual cost of \$13,000.
<b>Public Education and Awareness Activities</b>							
PEA-1	Hold a hazard mitigation seminar, including information on preparedness for all hazards significant to Transylvania County, Brevard, and Rosman and promotion of participation in FireWise.	All	High	NCEM and Local Funds	City Manager	Completed	The first event was held on June 18, 2012. Several agencies participated in the event with educational material and speakers for the public to learn about things they could do around their own home to mitigate dangers to themselves and others.
FL = Flood DR = Drought ES = Expansive Soils HU = Hurricane T = Tornado WF= Wildfire S/I = Snow/Ice ET = Extreme Temperatures EQ = Earthquake LS = Landslide L = Lightning ER = Erosion HM = HAZMAT D = Dams/Levees TH = Thunderstorms ES = Transylvania County Emergency Services Town = Town of Rosman							



# Henderson County - Flood Hazard Areas



## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

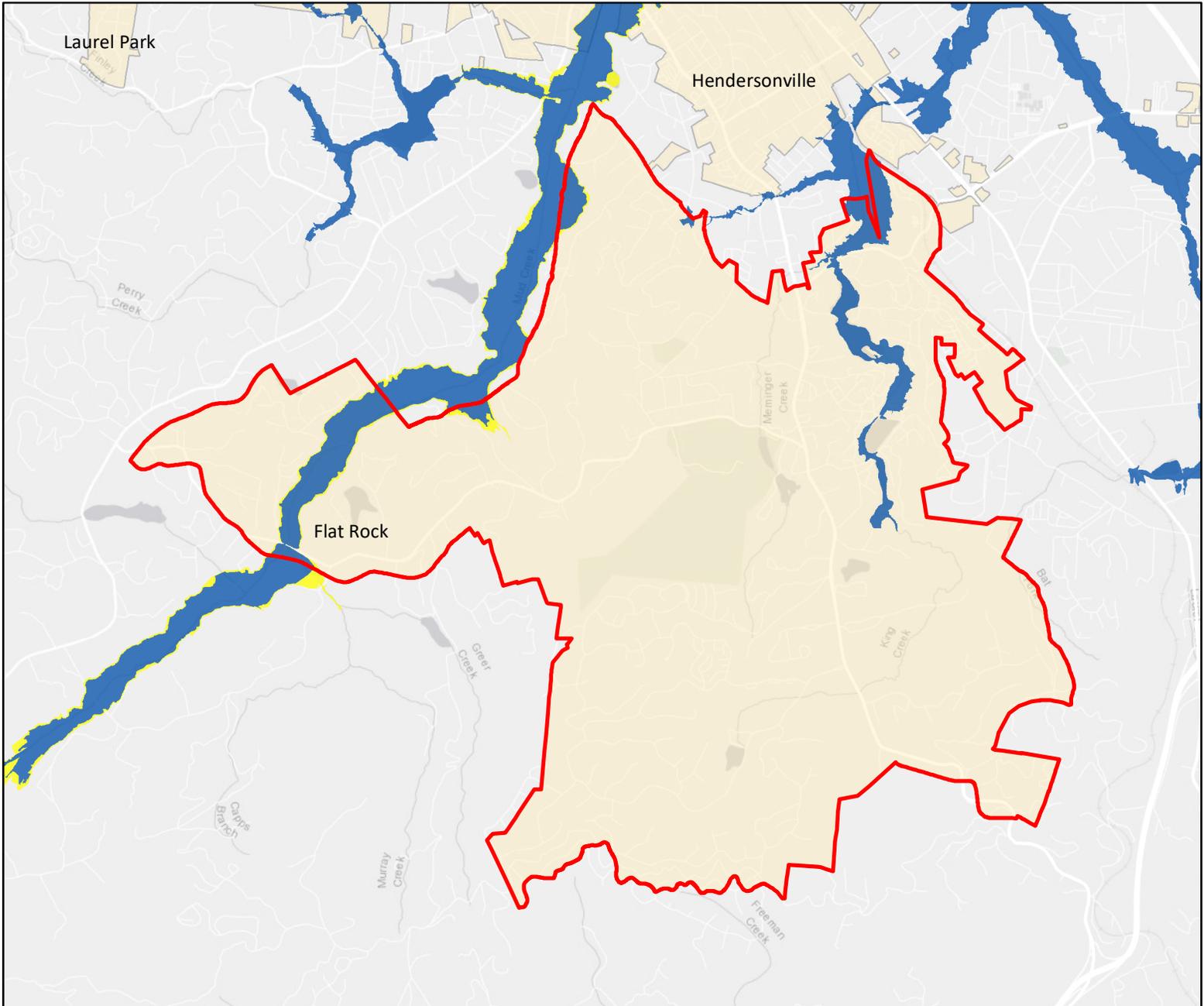
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Flat Rock - Flood Hazard Areas



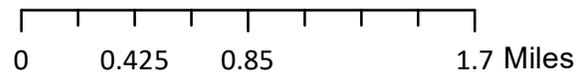
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

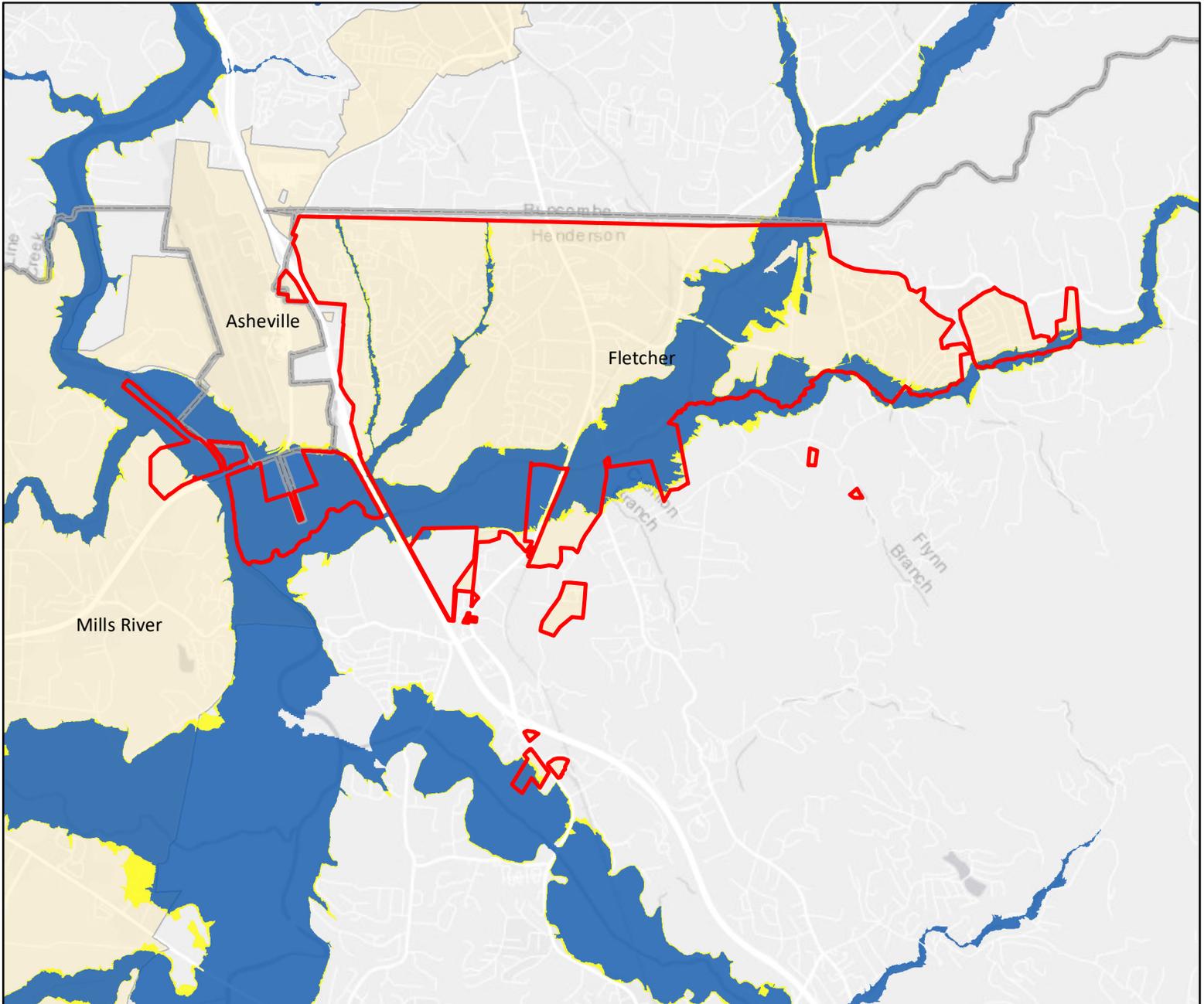
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Fletcher - Flood Hazard Areas



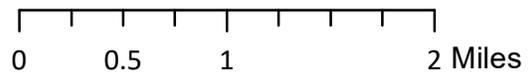
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

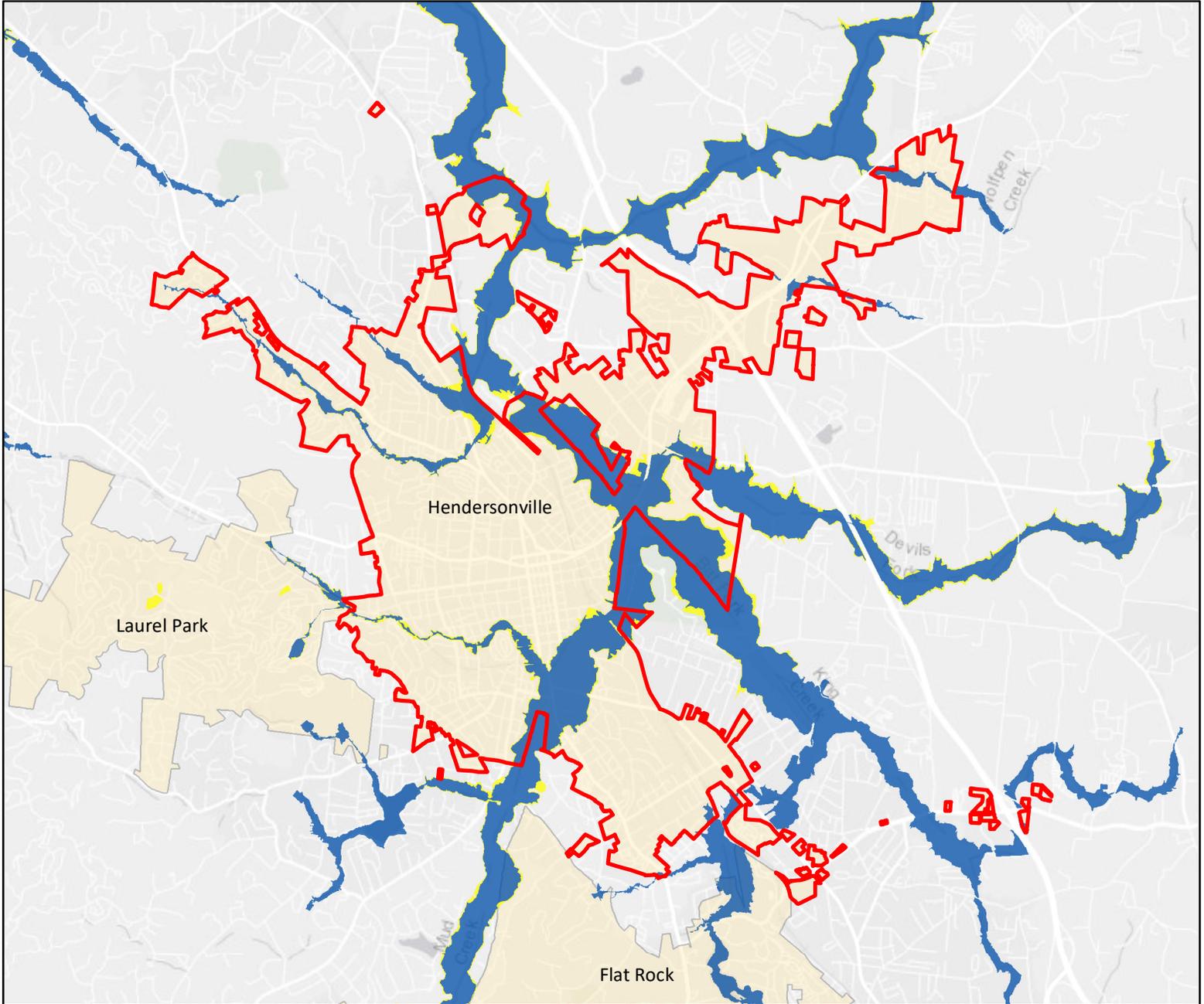
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Hendersonville - Flood Hazard Areas



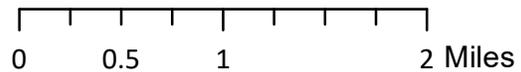
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

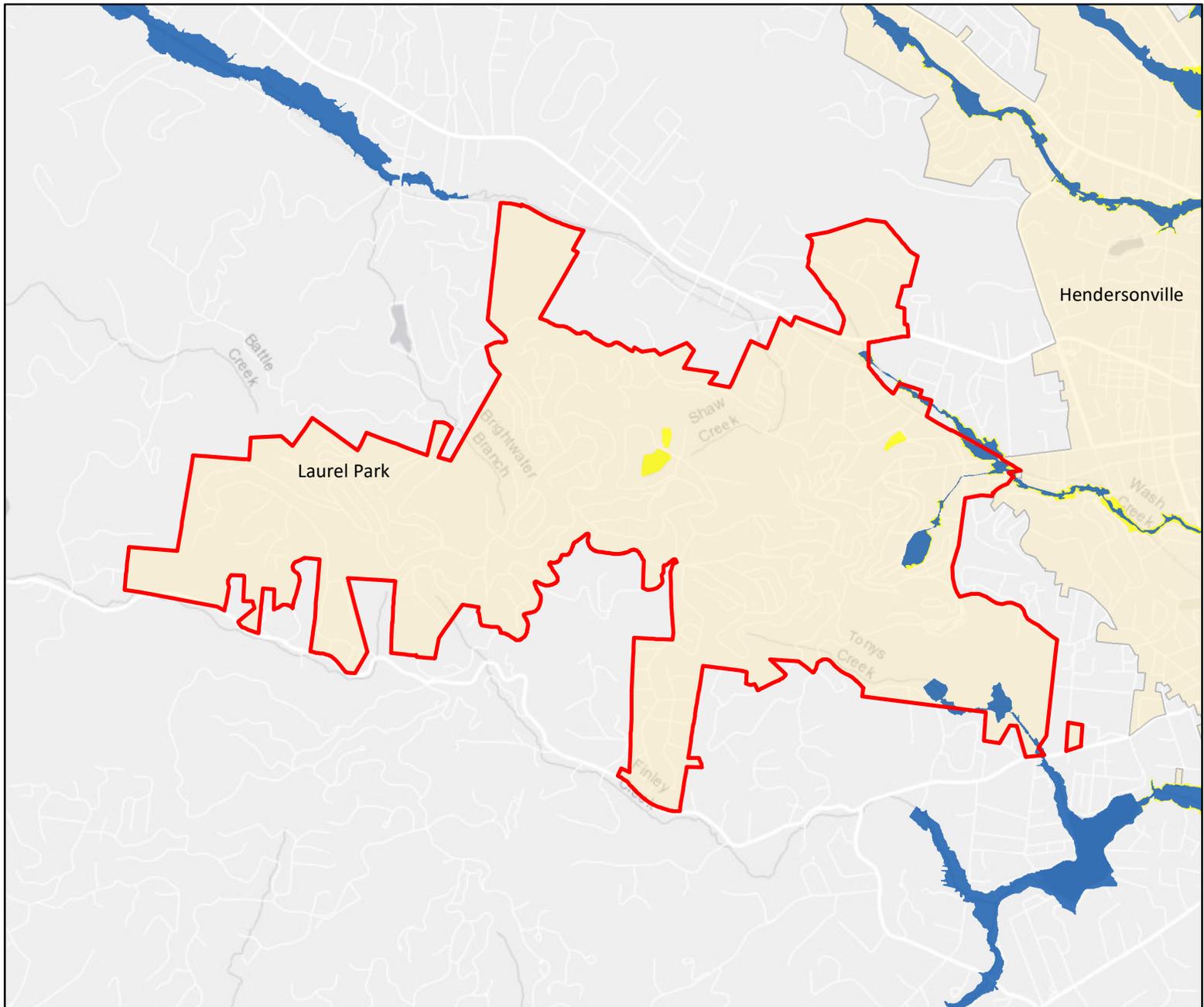
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Laurel Park - Flood Hazard Areas



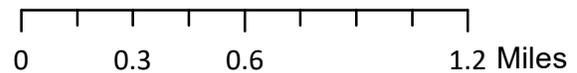
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

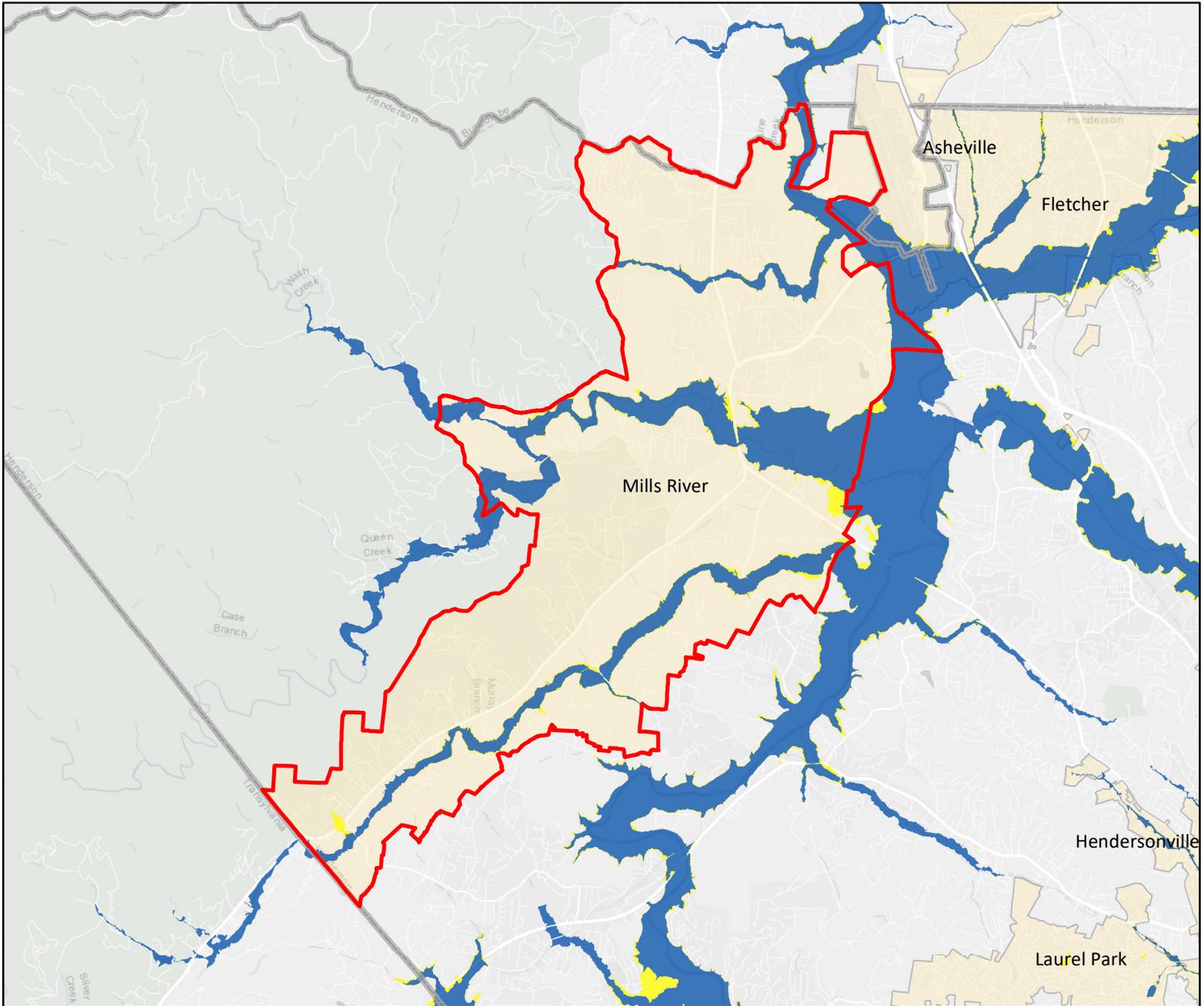
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Mills River - Flood Hazard Areas



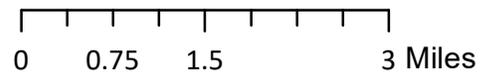
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

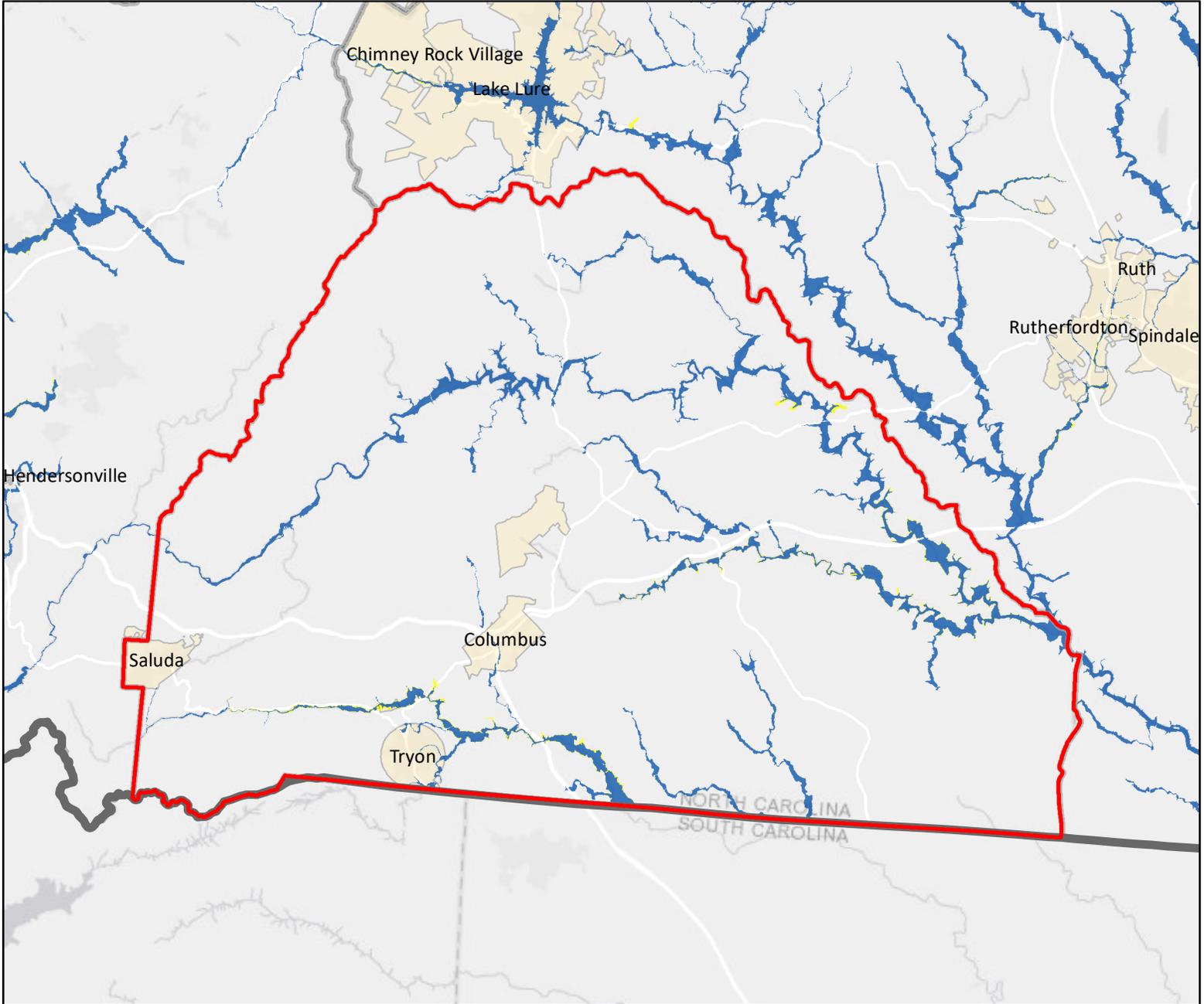
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Polk County - Flood Hazard Areas



## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

## Flood Zone

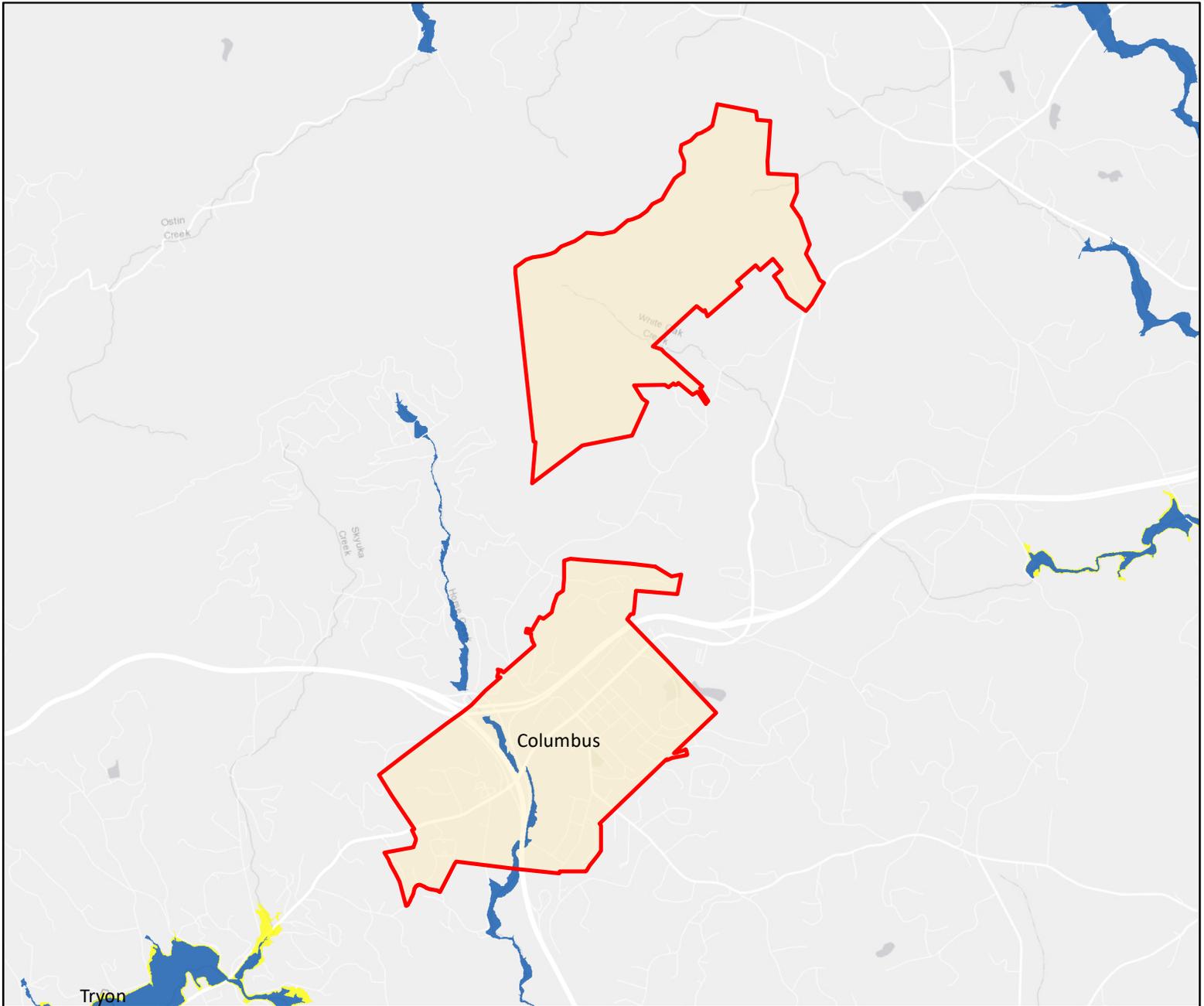
-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 2 4 8 Miles



# Columbus - Flood Hazard Areas



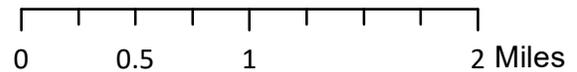
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

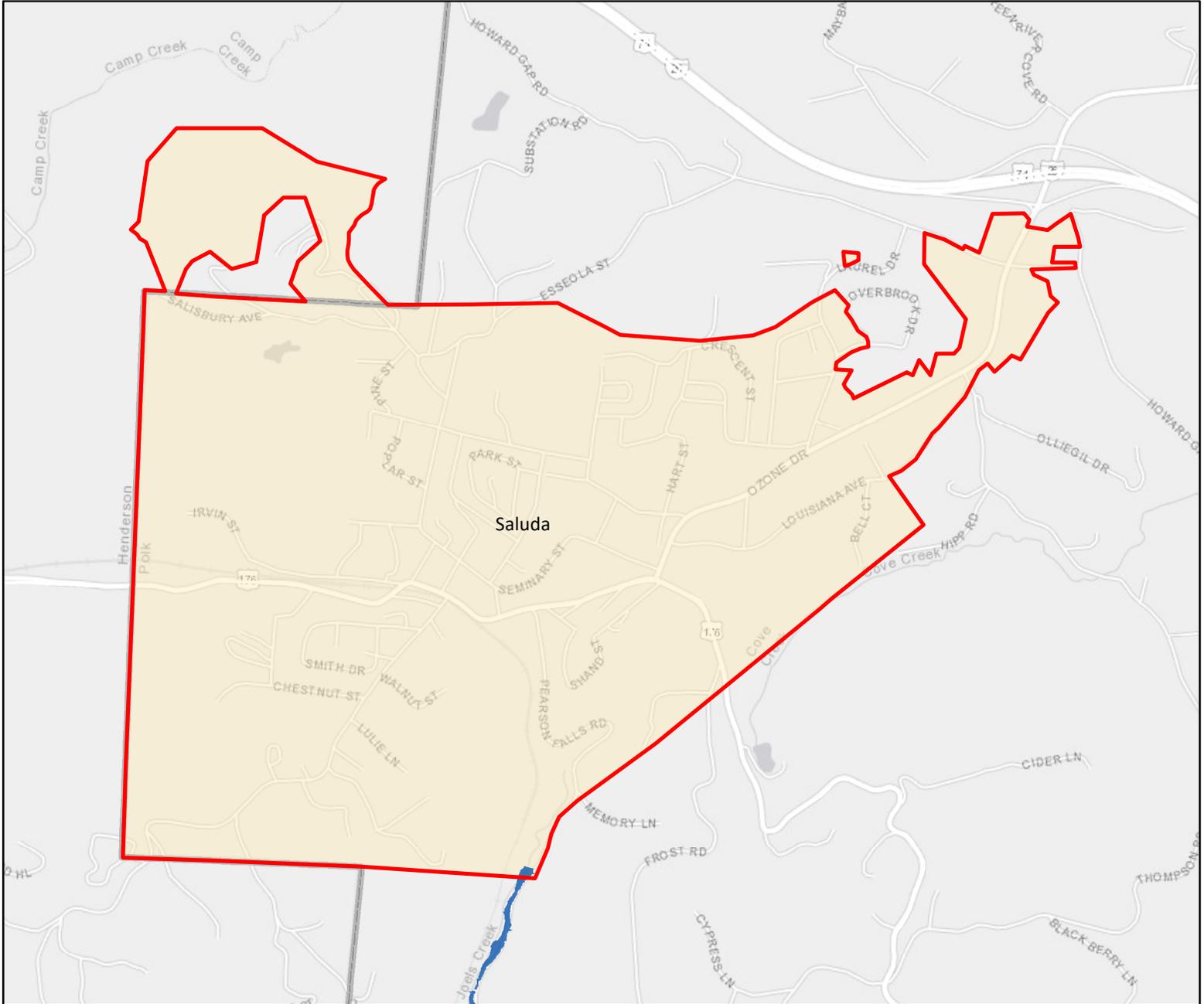
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Saluda - Flood Hazard Areas



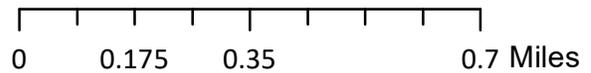
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

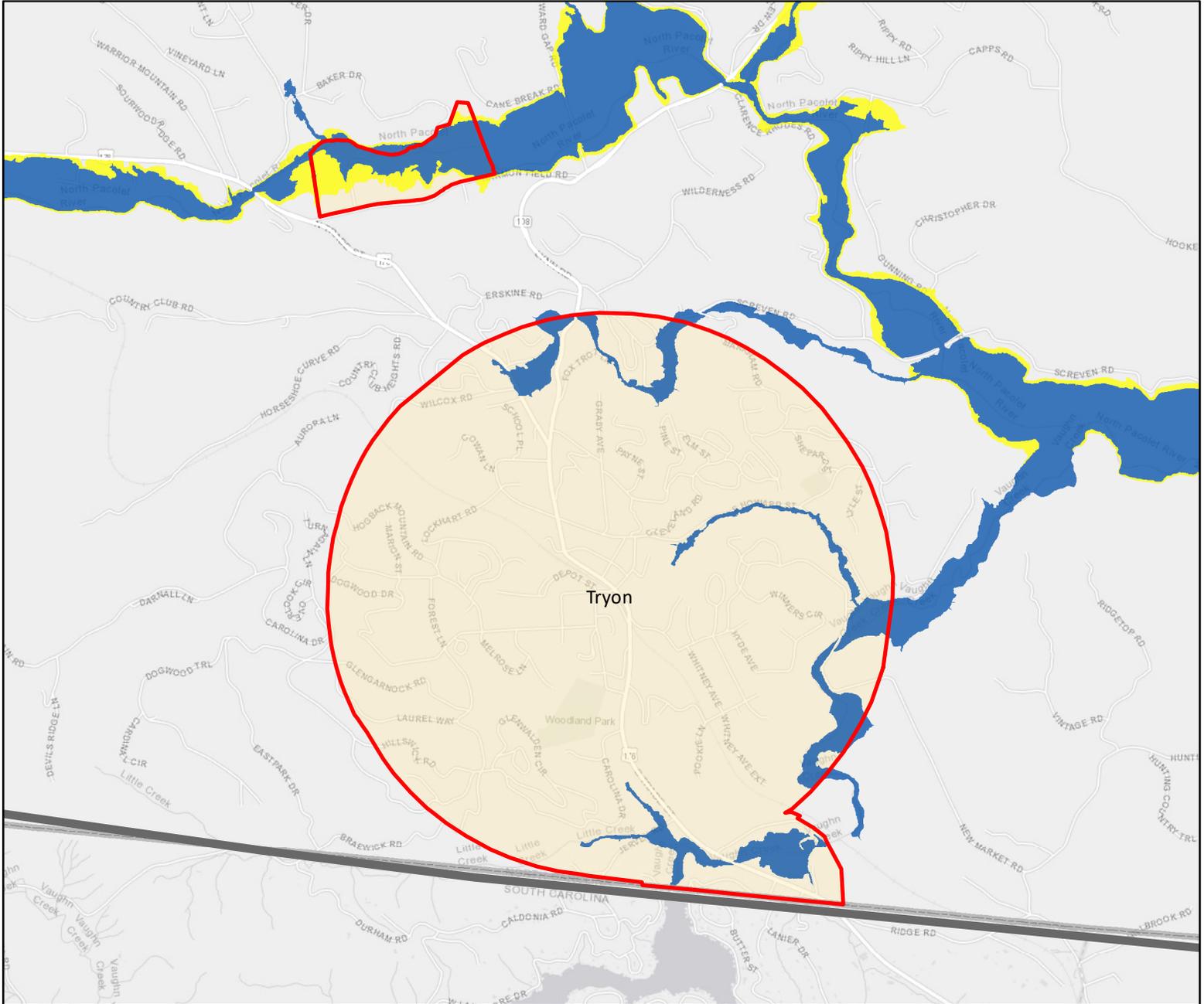
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Tryon - Flood Hazard Areas



## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

## Flood Zone

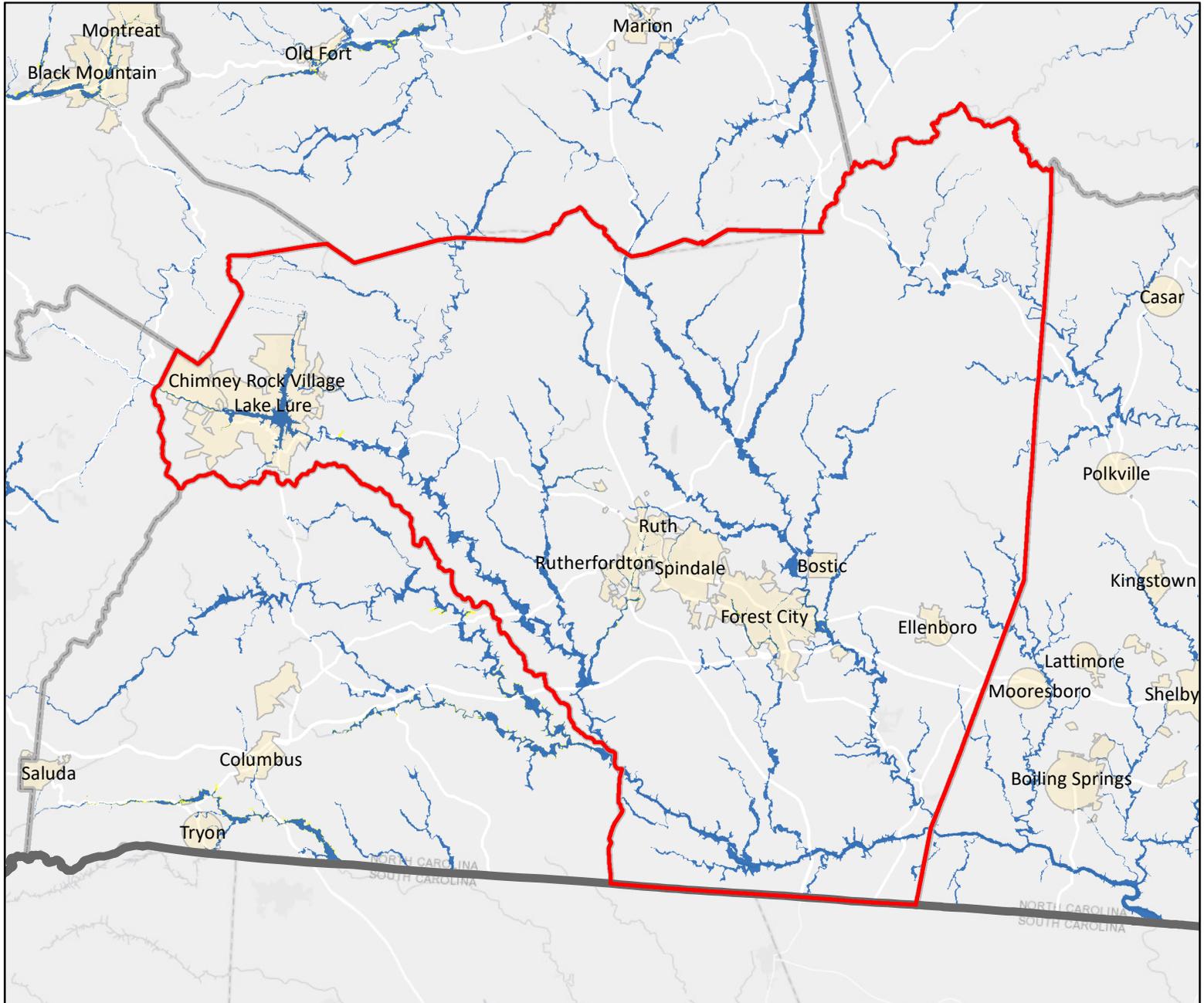
-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.225 0.45 0.9 Miles



# Rutherford County - Flood Hazard Areas



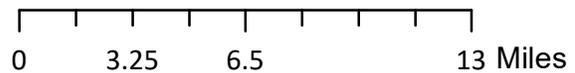
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

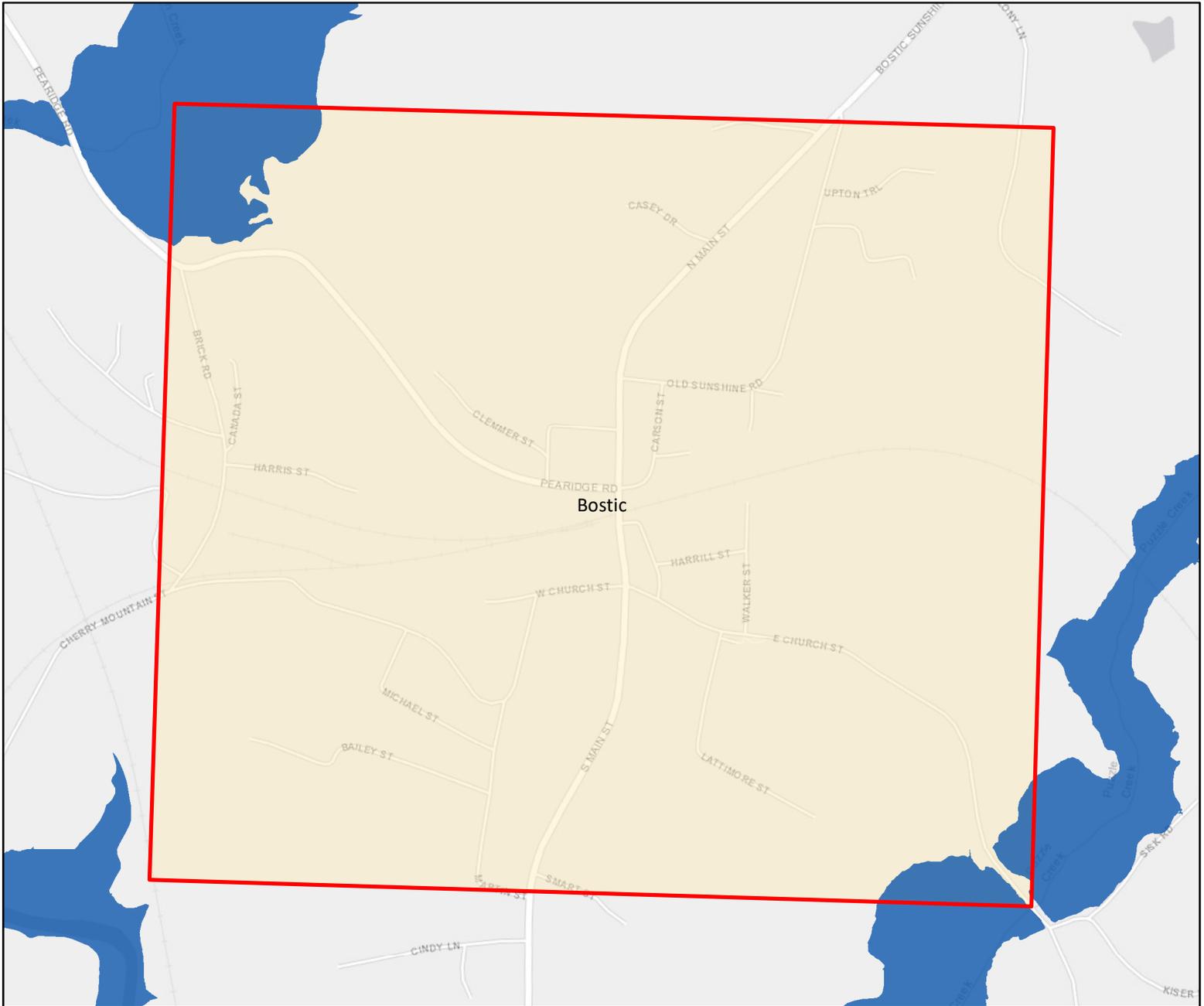
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Bostic - Flood Hazard Areas



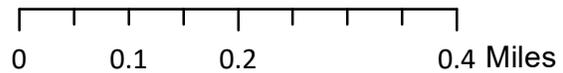
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

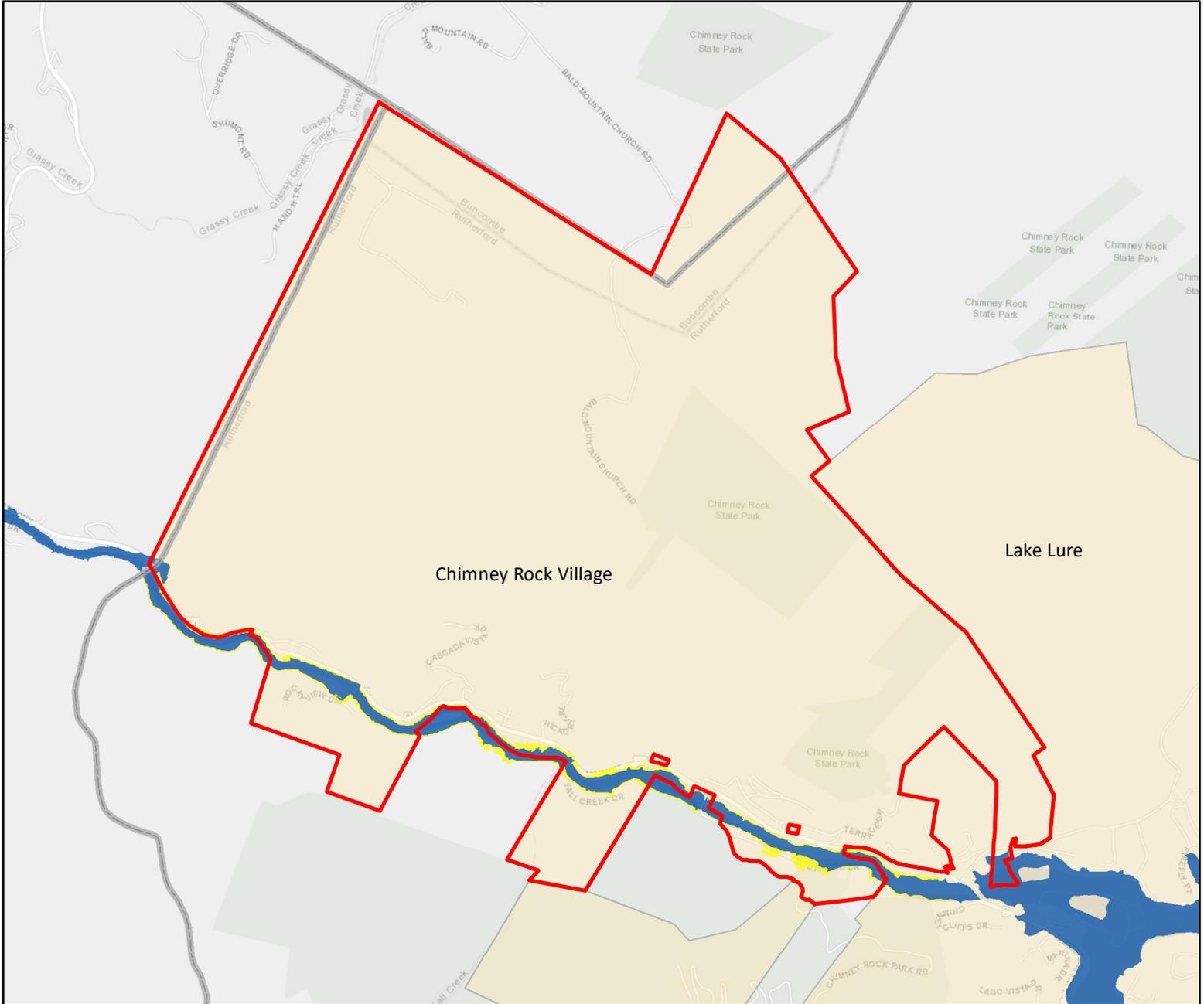
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Chimney Rock Village - Flood Hazard Areas



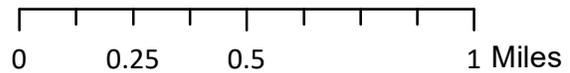
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

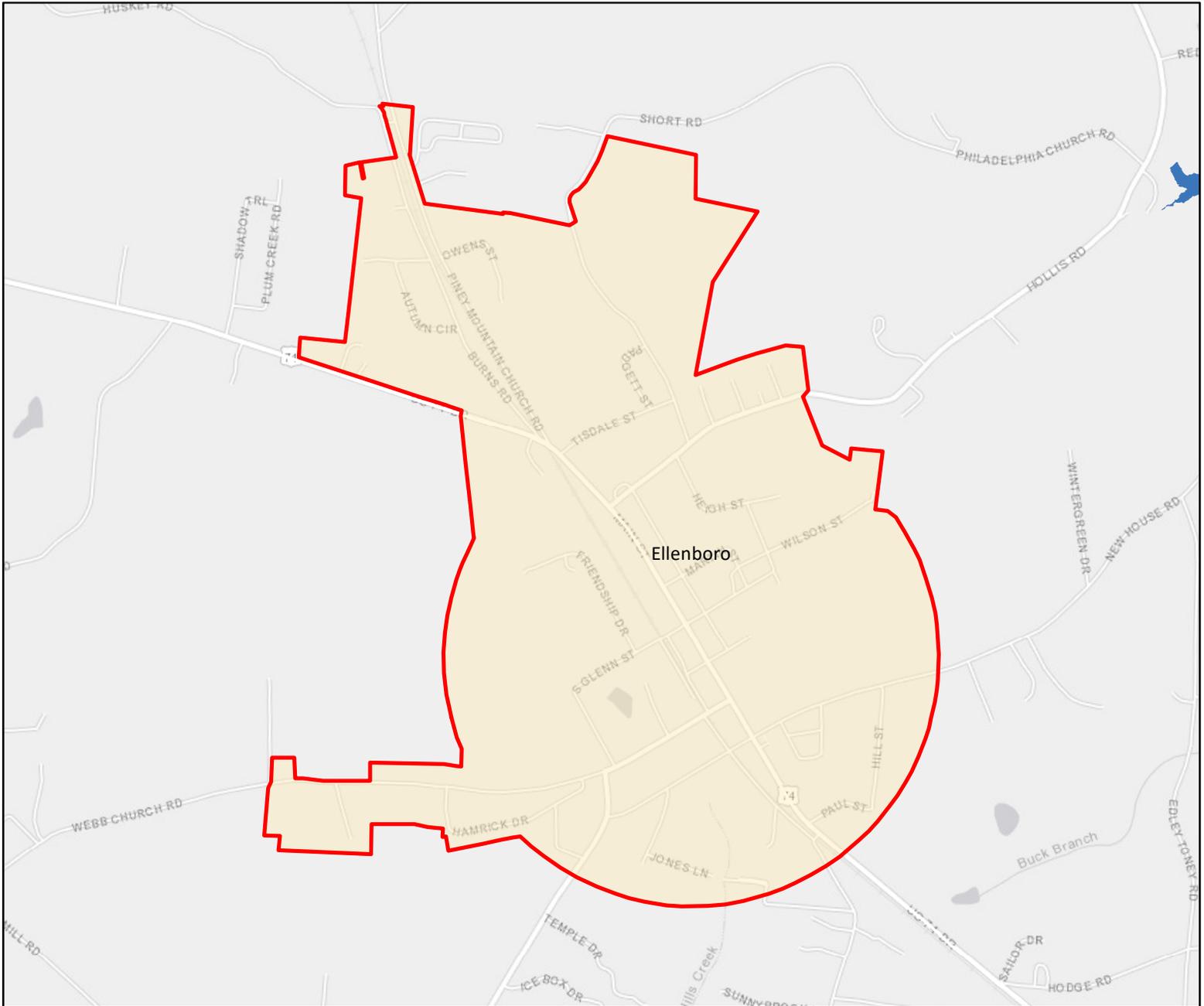
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Ellenboro - Flood Hazard Areas



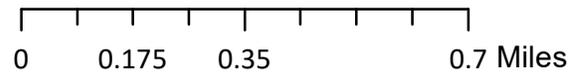
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

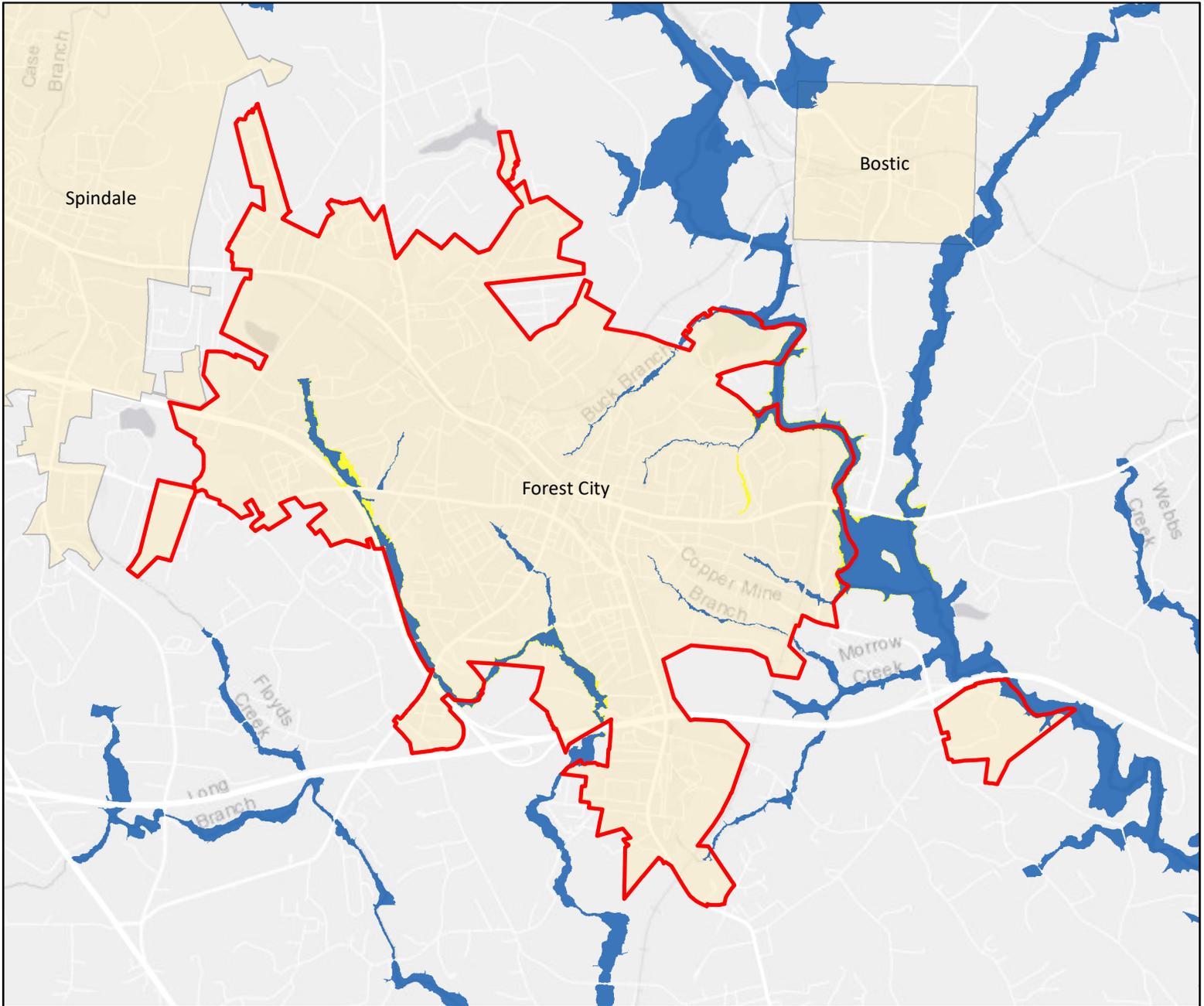
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Forest City - Flood Hazard Areas



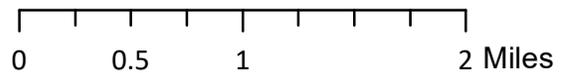
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

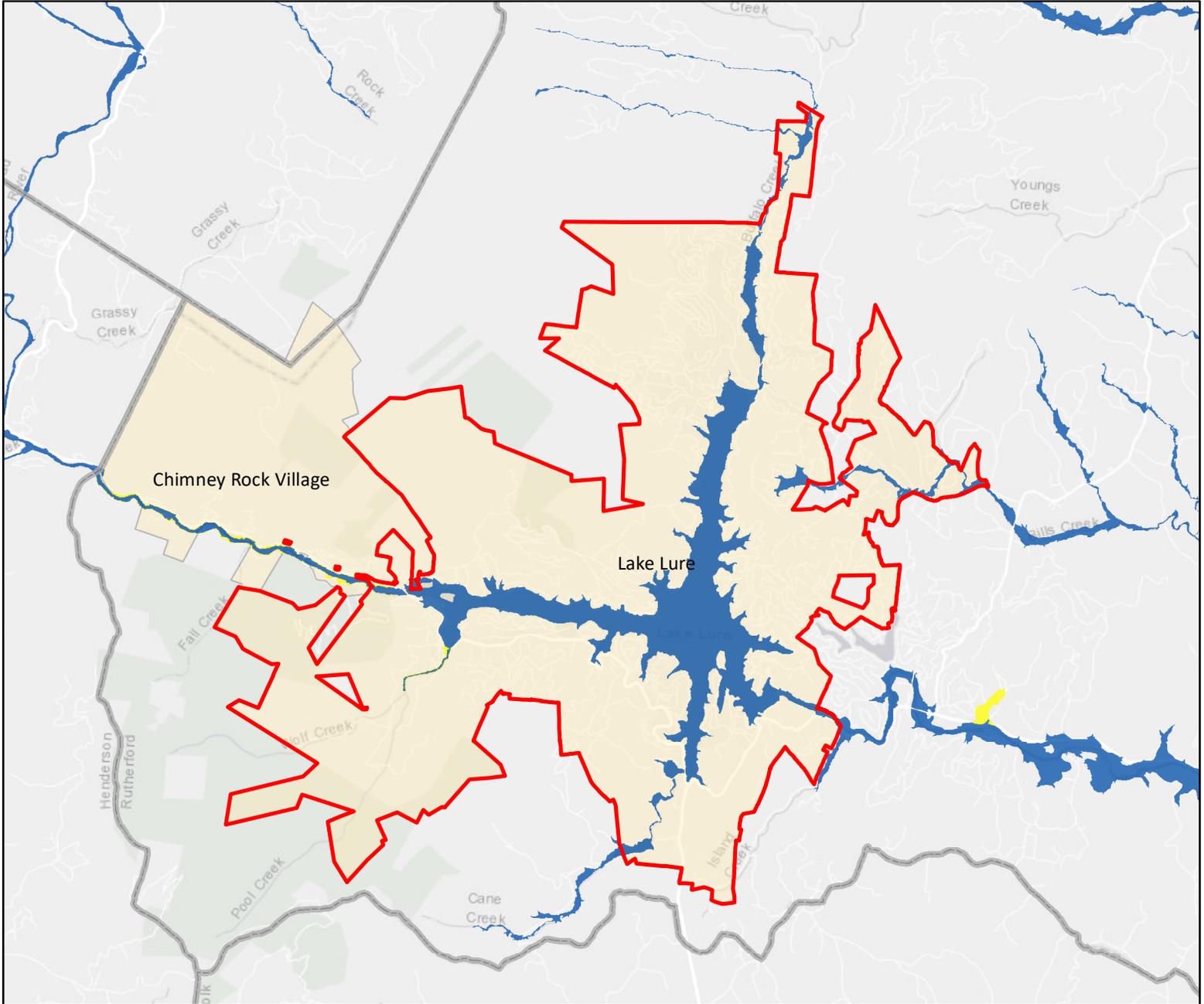
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Lake Lure - Flood Hazard Areas



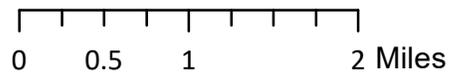
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

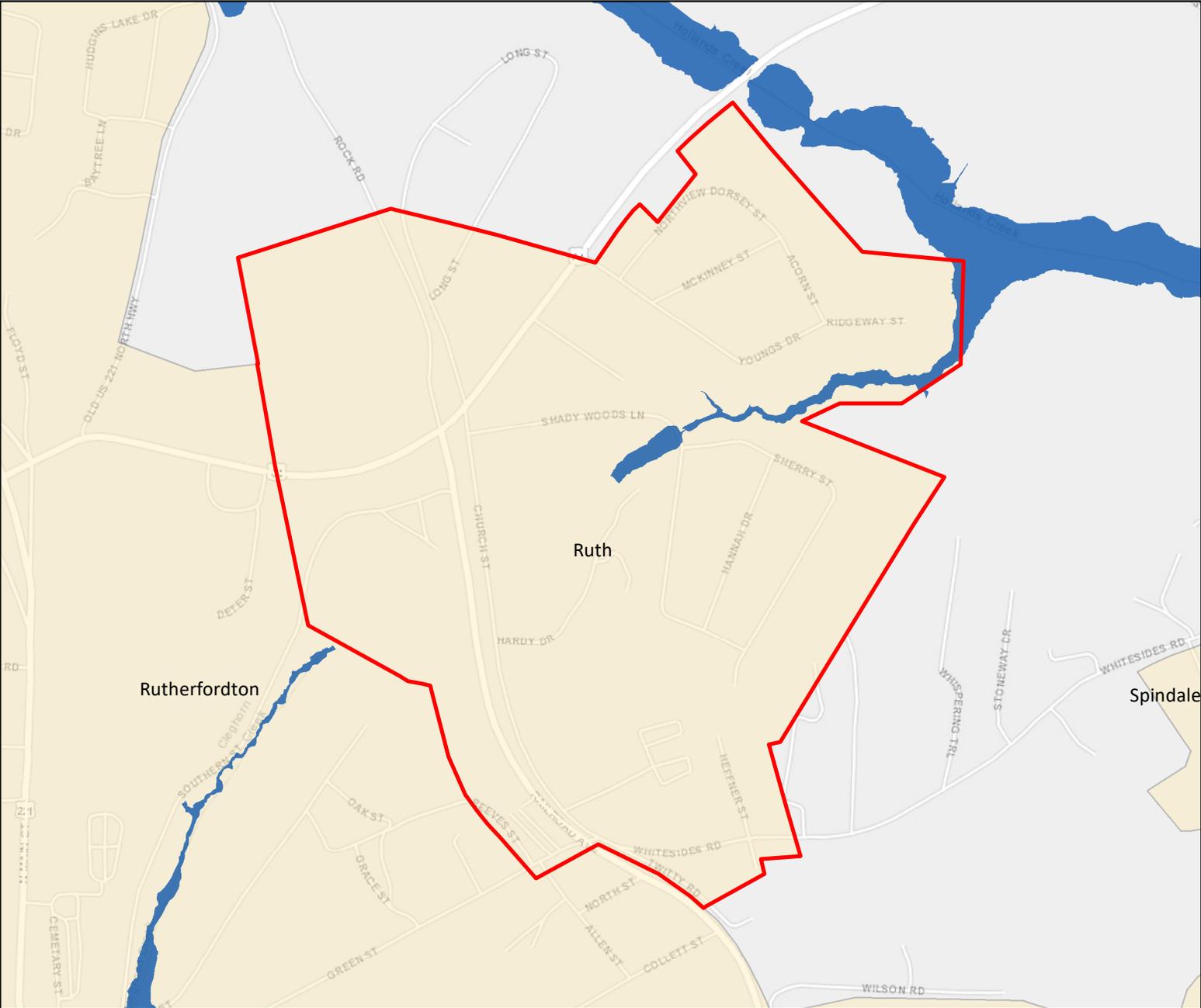
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Ruth - Flood Hazard Areas



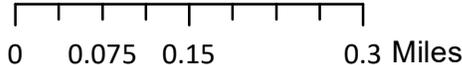
### Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

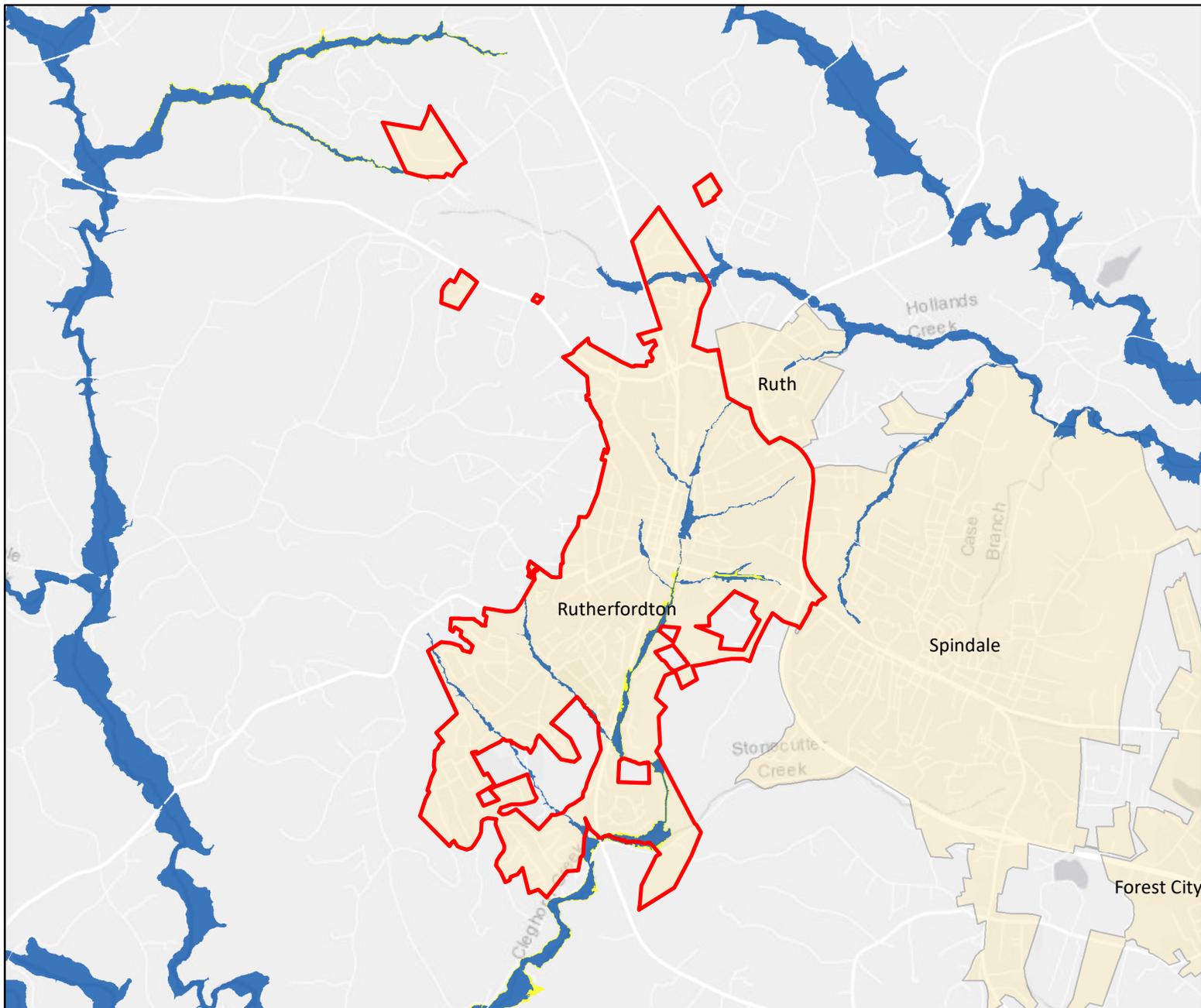
### Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Rutherfordton - Flood Hazard Areas



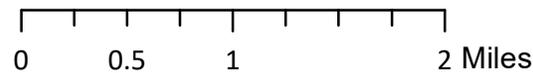
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

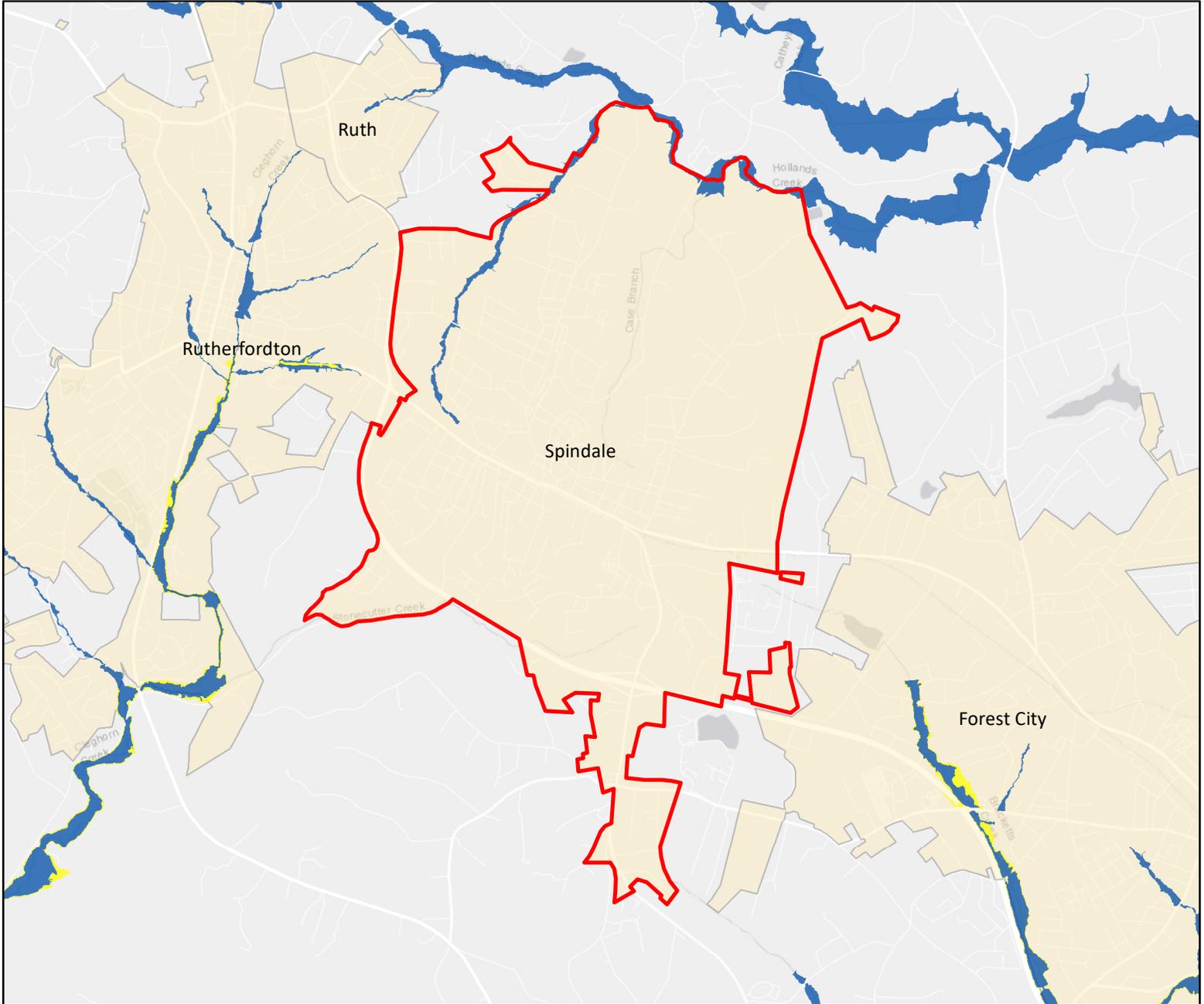
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Spindale - Flood Hazard Areas



## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

## Flood Zone

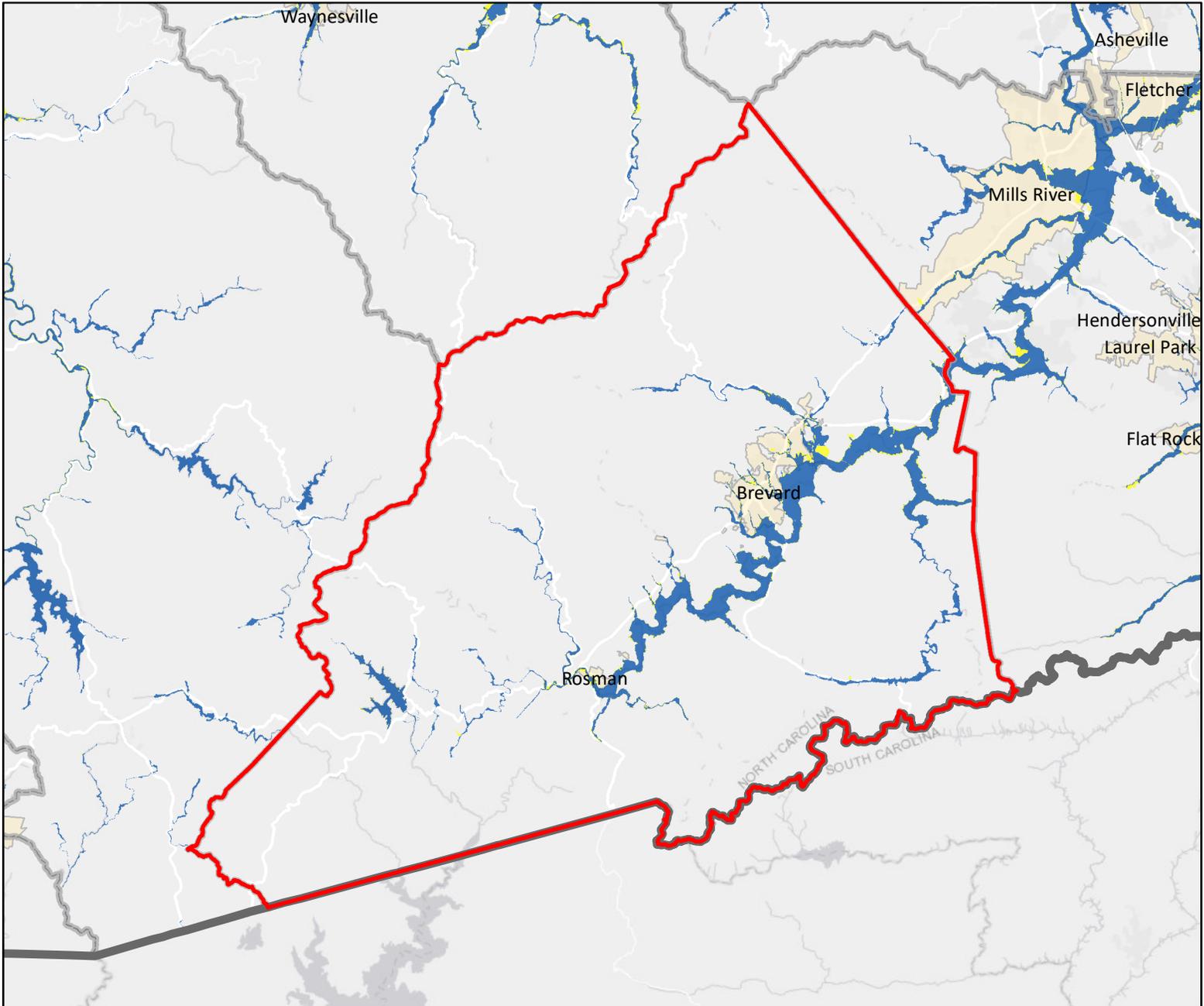
-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.425 0.85 1.7 Miles



# Transylvania County - Flood Hazard Areas



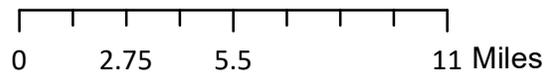
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

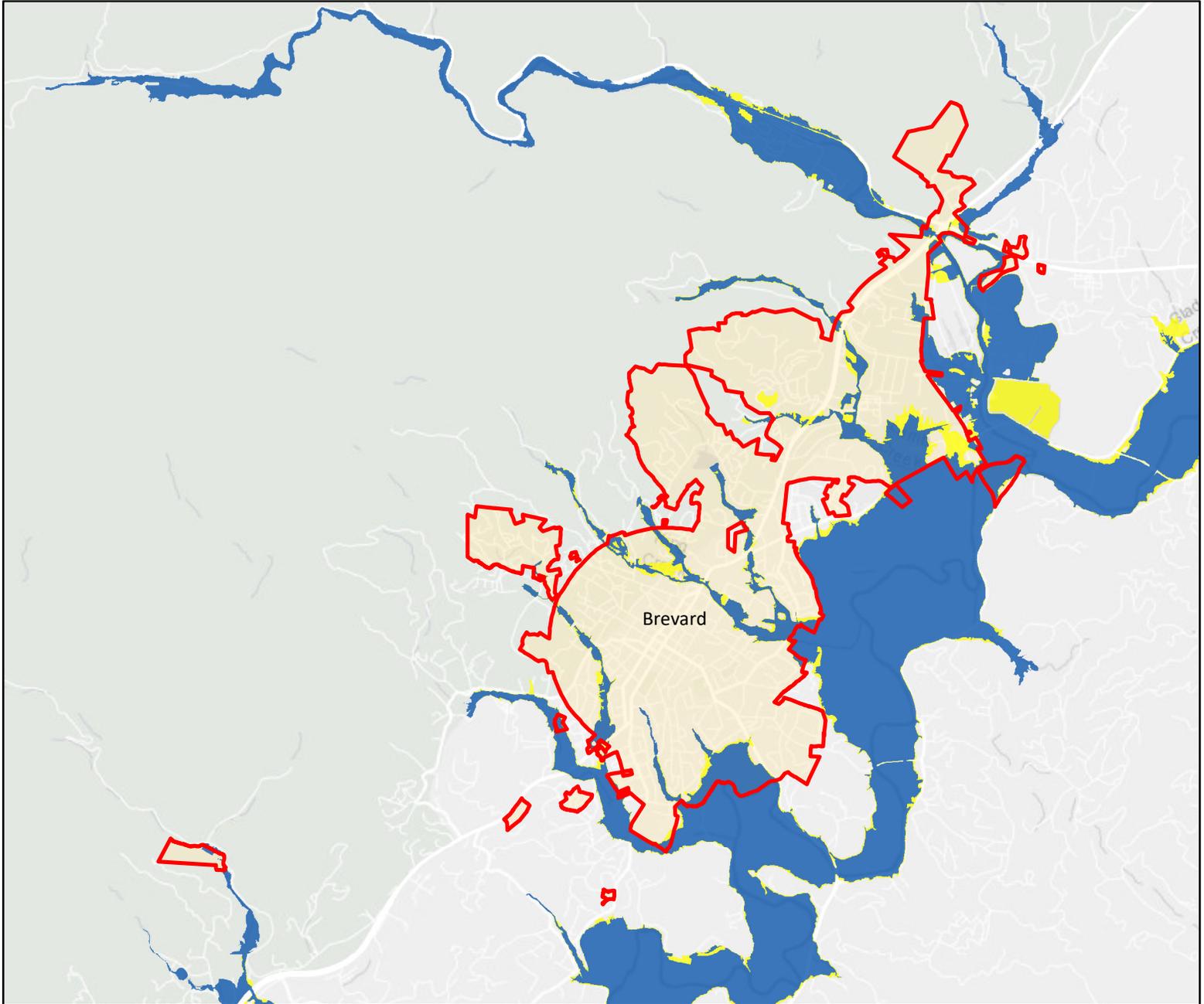
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Brevard - Flood Hazard Areas



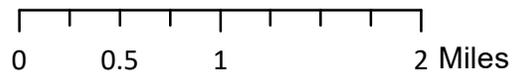
## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

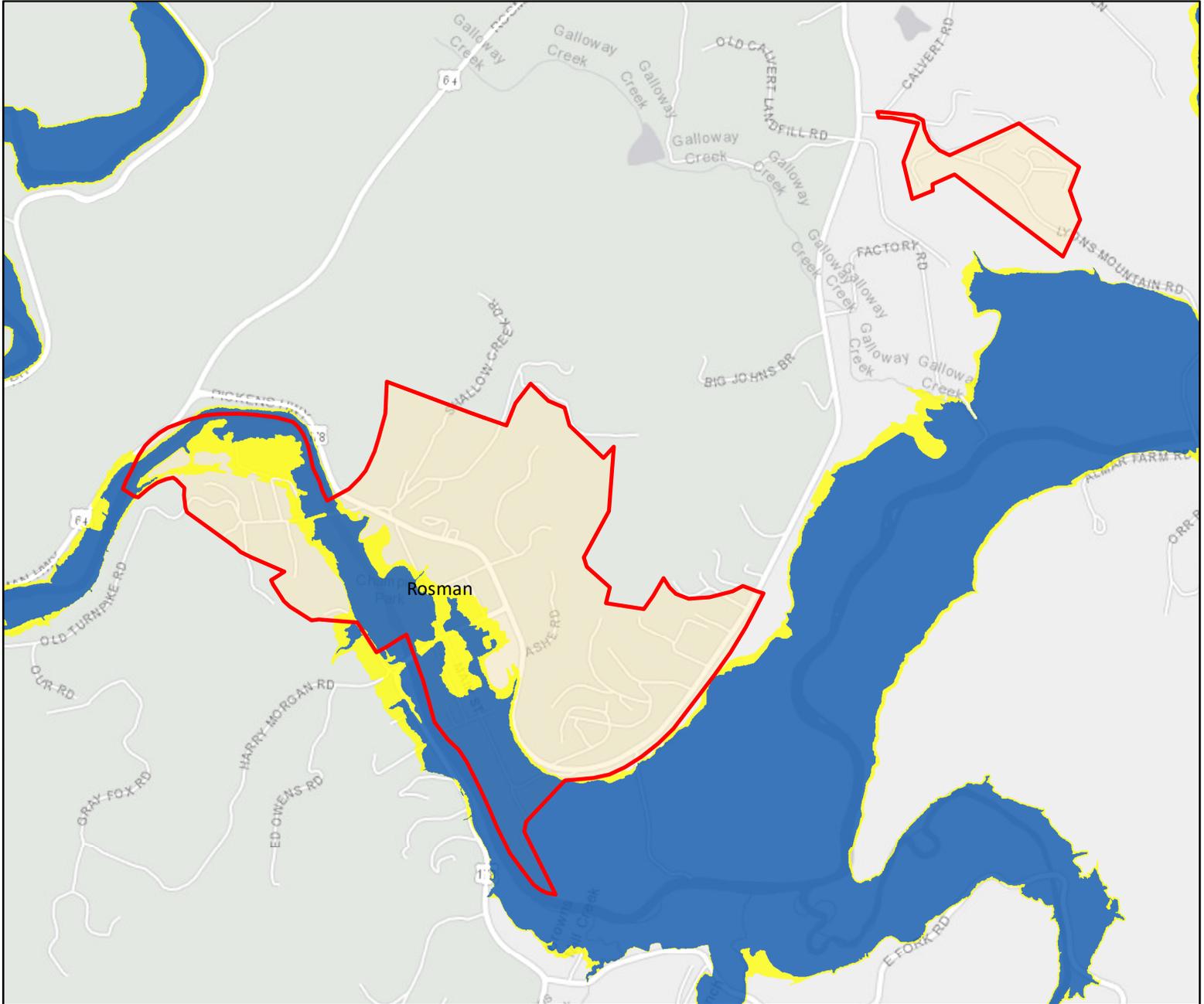
## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program



# Rosman - Flood Hazard Areas



## Legend

-  County Boundary
-  Municipal Boundary
-  Major Roads

## Flood Zone

-  100 Year Flood Zone
-  500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

