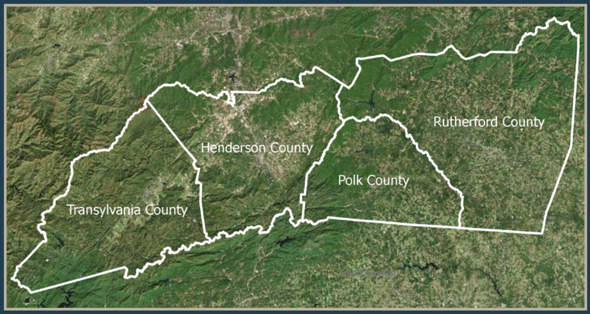

South Mountains
2020 Regional Hazard Mitigation Plan

FINAL - APRIL 2020

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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

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.

It is important to note that this plan was developed over a period of time that started in October of 2018 and was essentially completed with delivery of the draft plan to NCEM in October of 2019. Thus, the plan was not developed in accordance with updated FEMA Region IV Review Standards that were provided in February of 2020.

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

Henderson County	
Flat Rock	Laurel Park
Fletcher	Mills River
Hendersonville	Unincorporated Henderson County
Polk County	
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.

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

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[1]. 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
Phase I – Planning Process	
§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
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4: Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5: Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6: Set Goals

[1] 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)(ii)	Step 7: Review Possible Activities
§201.6(c)(3)(iii)	Step 8: Draft an Action Plan
Phase IV – Plan Maintenance	
§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)
Frady, 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
Henderson County	
Christopher Todd	Manager, Laurel Park
Daniel Cobb	Manager, Mills River
Polk County	
Tim Barth	Manager, Town of Columbus
Zach Ollis	Manager, Town of Tryon
Rutherford County	
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
Transylvania County	
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[2]. 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.

[2] 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 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

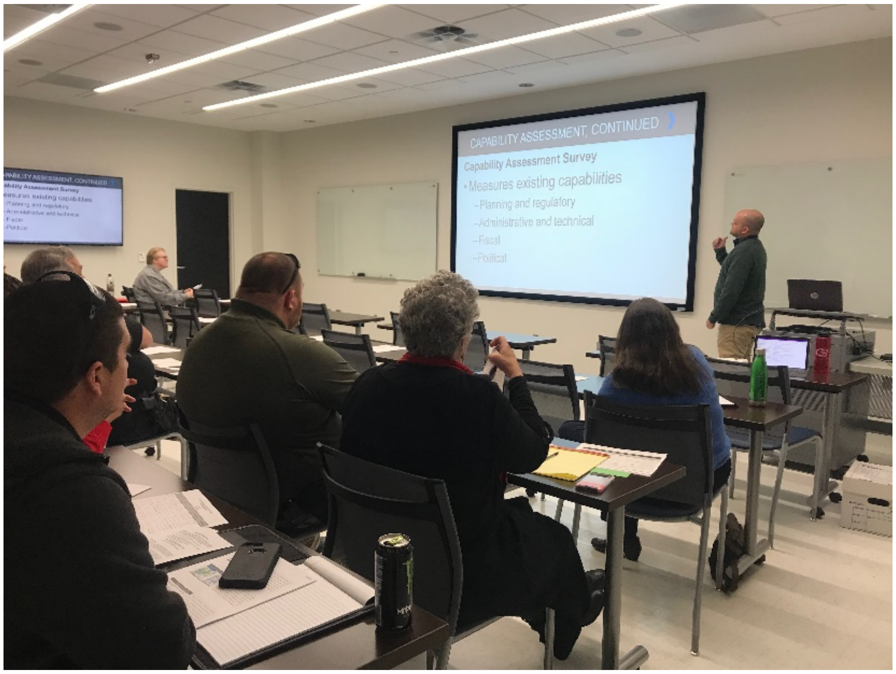
Mr. Slaughter gave an overview of the process for updating the Mitigation Strategy and presented the existing mitigation goals for the regional plan. He asked the Regional Hazard Mitigation Planning Committee to review the goals to determine whether or not they still reflect current vulnerabilities and 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.

The final opportunity for public input on the plan came at each participating jurisdictions' County or City Council meeting where the plan was presented for formal adoption. Each of those meetings are open to the public and therefore provided the public an opportunity to provide any final input or comments on the plan.

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.

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

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

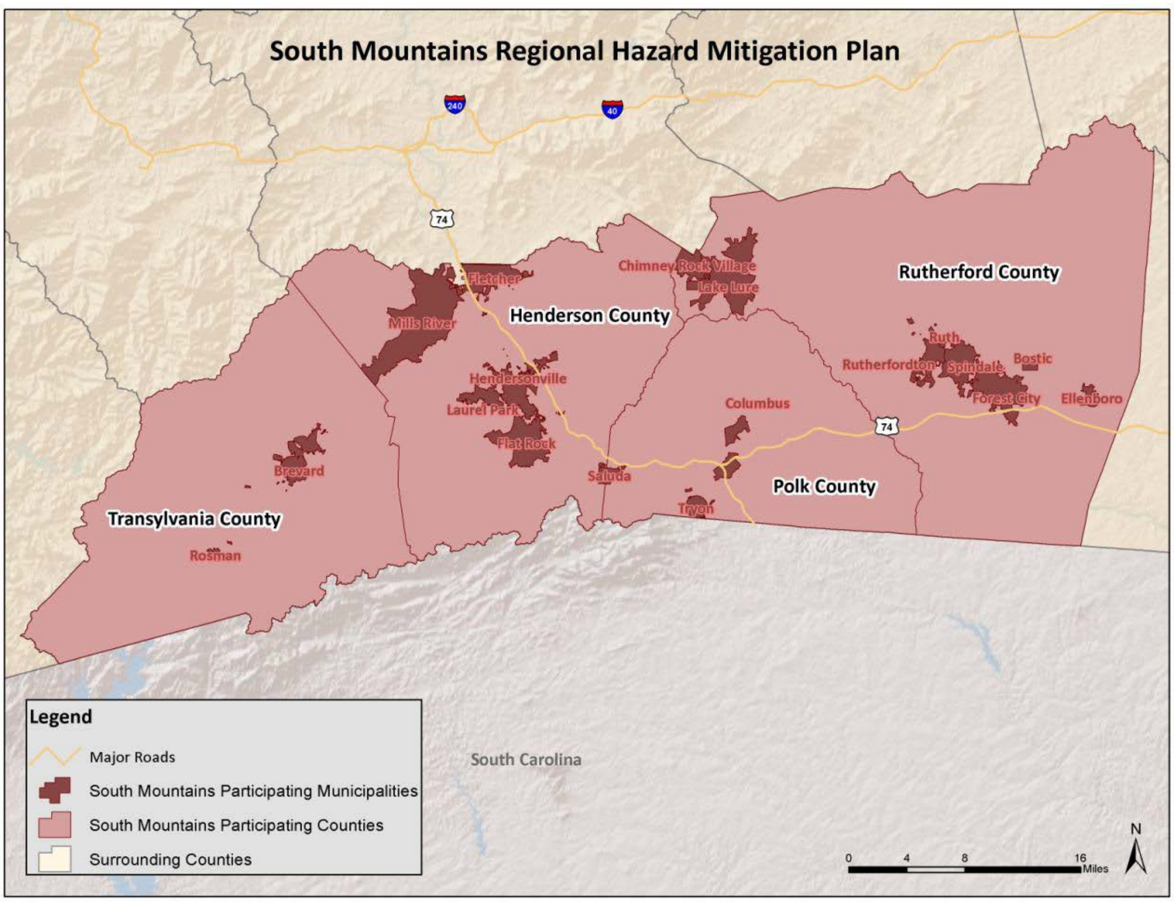
The South Mountains Region enjoys a generally mild year-round climate that is characterized by colder winters and warm summers; however, variation in elevation and topography can drastically affect local weather. According to the Southeast Regional Climate Center, the annual temperature average for this 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.

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[1]. The average annual rainfall typically amounts to 50-56 inches[2].

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



[1] *Polk County Multi-Jurisdictional Multi-Hazard Mitigation Plan, 2010*

[2] *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 though 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 though 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[3]. 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.

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

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:

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[1], 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.

[1] 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

<table>
<tr><th colspan="2">2014 South Mountains Identified Hazards</th><th colspan="2">2020 South Mountains Identified Hazards</th><th>Sub hazards covered in 2020 Plan and Explanations</th></tr>
<tr><td rowspan="8">Atmospheric Hazards</td><td>Drought</td><td>Drought</td><td rowspan="13">Natural Hazards</td><td>Agricultural Drought, Hydrological Drought</td></tr>
<tr><td>Hailstorm</td><td></td><td>Assessed under “Tornadoes/Thunderstorms”</td></tr>
<tr><td>Heat Wave</td><td>Excessive Heat</td><td></td></tr>
<tr><td>Hurricane and Tropical Storm</td><td>Hurricane and Coastal Hazards</td><td>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</td></tr>
<tr><td>Lightning</td><td></td><td>Assessed under “Tornadoes/Thunderstorms”</td></tr>
<tr><td>Tornado</td><td>Tornadoes/Thunderstorms</td><td>Hailstorm, Torrential Rain associated with Severe Thunderstorms, Thunderstorm Wind, Lightning, Waterspout, High Wind</td></tr>
<tr><td>Severe Thunderstorm</td><td></td><td>Assessed under “Tornadoes/Thunderstorms”</td></tr>
<tr><td>Winter Storm and Freeze</td><td>Severe Winter Weather</td><td>Freezing Rain, Snowstorms, Blizzards, Wind Chill, Extreme Cold</td></tr>
<tr><td rowspan="3">Hydrologic Hazards</td><td>Dam and Levee Failure</td><td>Dam Failures</td><td></td></tr>
<tr><td>Erosion</td><td></td><td>Assessed under “Geological”</td></tr>
<tr><td>Flood</td><td>Flooding</td><td></td></tr>
<tr><td rowspan="2">Geologic Hazards</td><td>Earthquake</td><td>Earthquakes</td><td></td></tr>
<tr><td>Landslide</td><td>Geological</td><td>Landslides, Sinkholes, Erosion</td></tr>
<tr><td rowspan="2">Other Hazards</td><td>Wildfire</td><td>Wildfires</td><td rowspan="2">Other Hazards</td><td></td></tr>
<tr><td></td><td>Infectious Disease</td><td></td></tr>
<tr><td rowspan="5">Other Hazards</td><td>Hazardous Materials Incident</td><td>Hazardous Substances</td><td rowspan="5">Technological Hazards</td><td>Hazardous Materials, Hazardous Chemicals, Oil Spill</td></tr>
<tr><td>Nuclear Accident</td><td>Radiological Emergency – Fixed Nuclear Facilities</td><td></td></tr>
<tr><td></td><td>Terrorism</td><td>Chemical, Biological, Radiological, Nuclear, Explosive</td></tr>
<tr><td></td><td>Cyber</td><td></td></tr>
<tr><td></td><td>Electromagnetic Pulse</td><td></td></tr>
</table>

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 ran	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
TOTAL NUMBER OF REPORTED EVENTS	**69**	**65**	**85**	**52**

* 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.

Appendix G includes more detailed information about all previous historical hazard occurrence events as reported to the National Centers for Environmental Information. Some more detailed information about previous historical hazards events can be found in Section 5: Hazard Profiles under each separate hazard profile.

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?
NATURAL HAZARDS			
Avalanche	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the NC State Hazard Mitigation Plan • Review of previous hazard mitigation plans • Review of US Forest Service National Avalanche Center website	• The United States avalanche hazard is limited to mountainous western states including Alaska as well as some areas of low risk in New England. • 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. • Avalanche is not included in the previous South Mountains Regional Hazard Mitigation Plan.
Drought	YES	• Review of the NC State Hazard Mitigation Plan • Review of the North Carolina Drought Monitor website • Review of previous South Mountains Regional Hazard Mitigation Plan.	• 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. • Droughts are discussed in NC State Hazard Mitigation Plan as a lesser hazard. • The NC State Hazard Mitigation Plan lists drought as a top hazard for the South Mountains

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. • Drought is included in the previous South Mountains Regional Hazard Mitigation Plan.
Hailstorm	YES (Assessed under Tornadoes/Thunderstorms)	• Review of NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NOAA NCEI Storm Events Database • Review of previous South Mountains Regional Hazard Mitigation Plan.	• Hailstorm events are discussed in the state plan under the Severe Thunderstorm hazard. • 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. • 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.
Excessive Heat	YES	• Review of NOAA NCEI Storm Events Database • Review of the North Carolina State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan.	• NCEI reports at least one extreme heat event for the South Mountains counties. • The NC State Hazard Mitigation Plan does include Extreme Heat as a hazard for the South Mountains counties. • The NC State Hazard Mitigation Plan reports the west-central portion

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?
			of the state as having a moderate vulnerability in the state. • Extreme Heat was mentioned in all three of the previous hazard mitigation plans in tandem with the drought hazard.
Hurricane and Coastal Hazards	YES	• Review of NC State Hazard Mitigation Plan • Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website • Review of NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations • Review of the previous South Mountains Regional Hazard Mitigation Plan.	• Hurricane and coastal hazard events are discussed in the state plan and are listed as a top hazard in the South Mountains Region. • NOAA historical records indicate 32 hurricanes/coastal hazards have come within 75 miles of the South Mountains Region since 1850. • Four out of eleven disaster declarations in the South Mountains Region are directly related to hurricane and costal hazard events. • The 50-year return period peak gust for hurricane and tropical storm events in the South Mountains Region is between 63-68 mph. • Hurricane and coastal hazards were addressed in the previous South Mountains Regional Hazard Mitigation plan.
Lightning	YES (Assessed under Tornadoes/Thunderstorms)	• Review of FEMA's Multi-Hazard Identification and	• Lightning events are discussed in the state plan as part of the severe thunderstorm hazard.

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 • Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database, NOAA lightning statistics • Review of the previous South Mountains Regional Hazard Mitigation Plan.	• 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. • Given the damage and reported death and injuries, individual analysis is warranted.
Nor'Easter	NO	• Review of NC State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan. • Review of NOAA NCEI Storm Events Database	• Nor'easters are discussed in the state plan. The South Mountains Region, has low vulnerability to this hazard. • 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. • Nor'easters were not identified in the previous version of the South Mountains Regional Hazard Mitigation Plan.
Tornadoes/Thunderstorm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard	• Tornado events are discussed in the NC State Hazard Mitigation Plan. • NCEI reports 18 tornado events in South Mountains Region

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 • Review of the previous South Mountains Regional Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations.	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. • Tornado events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.
Severe Thunderstorm	YES (Assessed under Tornadoes/Thunderstorms)	• 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 NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations.	• Severe thunderstorm events are discussed in the NC State Hazard Mitigation Plan. The South Mountains Region, has a moderate vulnerability in the state. • According to the NC State Hazard Mitigation Plan, severe thunderstorm is a significant hazard for the South Mountains counties. • 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. • Severe thunderstorm events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.

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	• 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 NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations.	• 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. • 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. • Three of the region's eleven disaster declarations were directly related to winter storm events. • Winter storm events were addressed in the previous South Mountains Regional Hazard Mitigation Plan.
Earthquakes	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 the National Geophysical Data Center	• 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). • The previous South Mountains Regional Hazard Mitigation Plan addresses earthquake. • Earthquakes have occurred in and around the State of North Carolina in the past. The

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?
		• USGS Earthquake Hazards Program website	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. • 15 events are known to have occurred in the region according to the National Geophysical Data Center. The greatest MMI reported was a 7. • 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.
Expansive Soils	NO	• 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 USDA Soil Conservation Service's Soil	• 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. • According to FEMA and USDA sources, the South Mountains Region is located in an area that has a "little to no" clay swelling potential. • The previous South Mountains Regional

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	• 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 USGS Landslide Incidence and Susceptibility Hazard Map • Review of the North Carolina Geological Survey database of historic landslides	• Landslide/debris flow events are discussed in the state plan, and ranked a significant hazard in the South Mountains counties. • 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. • 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. • The previous South Mountains Hazard Mitigation Plans addresses landslides.
Land Subsidence	NO	• 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	• 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. • The plan identifies the South Mountains counties as having scored very low for the land subsidence

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. • The previous South Mountains Regional Hazard Mitigation Plan does not identify land subsidence as a potential hazard.
Tsunami	NO	• 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 FEMA "How-to" mitigation planning guidance (Publication 386-2, "Understanding Your Risks – Identifying Hazards and Estimating Losses).	• Tsunamis are discussed in the state plan. However, the South Mountains Region has zero vulnerability to the tsunami hazard. • The previous South Mountains Regional Hazard Mitigation Plan does not address tsunami as a hazard. • No record exists of a catastrophic Atlantic basin tsunami impacting the mid-Atlantic coast of the United States. • Tsunami inundation zone maps are not available for communities located along the U.S. East Coast. • 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.
Volcano	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC	• There are no active volcanoes in North Carolina. • There has not been a volcanic eruption in North Carolina in over 1 million

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 Dam Safety Program's NC Dam Inventory as of 11/20/19	• Dam failure is discussed in the state plan as a top hazard of concern for the South Mountains Region. • Per the NC Dam Inventory, there are 118 high hazard dams in the planning region. (High hazard is defined as "where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads.") • 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	• The flood hazard is thoroughly discussed in the state plan. • Three of the eleven Presidential Disaster Declarations were directly called

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?
		NCEI Storm Events Database • Review of FEMA's NFIP Community Status Book and Community Rating System (CRS) • Review of the previous South Mountains Regional Hazard Mitigation Plan.	flooding events, and hurricane/tropical storm events likely caused severe flooding. • 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. • A small percentage of the South Mountains Region is located in an identified floodplain (100 or 500 year). • 86% of all participating jurisdictions participate in the NFIP. • The previous South Mountains Regional Hazard Mitigation Plan addresses the flood hazard.
Storm Surge	NO	• 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 NOAA NCEI Storm Events Database	• 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. • The previous South Mountains Regional Hazard Mitigation Plan does not address storm surge. • No historical events were reported by NCEI • Given the inland location of the South Mountains Region, storm surge

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?
			would not affect the area.
OTHER HAZARDS			
Wildfires	YES	• Review of NC State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of the NC Division of Forest Resources website	• The NC State Hazard Mitigation Plan identifies wildfires as a hazard that impacts the South Mountains region. • The previous South Mountains Regional Hazard Mitigation Plan addressed wildfire as a hazard. • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of the NC Division of Forest Resources website
Hazardous Substances	YES	• Review of the previous South Mountains Regional Hazard Mitigation Plan.	• The previous South Mountains Regional Hazard Mitigation Plan addressed hazardous substances as a hazard. • This update assesses hazardous materials, hazardous chemicals, and oil spills under this hazard.
Infectious Disease	YES	• Review of NC State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan	• 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.
TECHNOLOGICAL HAZARDS			
Terrorism	YES	• Review of NC State Hazard Mitigation Plan • Review of the previous South	• Although the previous regional hazard mitigation plan did not address terrorism as a hazard, it is assessed in this update to

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?
		Mountains Regional Hazard Mitigation Plan • Review of local official knowledge	maintain consistency with the NC State Hazard Mitigation Plan. • There is a fixed nuclear facility located near the region. •This hazard will assess chemical, biological, radiological, nuclear, and explosive terrorism events.
Radiological Emergency – Fixed Nuclear Facilities	YES	• Review of NC State Hazard Mitigation Plan • Review of the previous South Mountains Regional Hazard Mitigation Plan • Review of IAEA list of fixed nuclear power stations in the United States • Discussion with local officials about location of nuclear power stations	• The McGuire Nuclear Power Station is located on Lake Norman near the region. • The Catawba Nuclear Power Stations is located across the state border in York, South Carolina, and could impact the region • Although radiological emergencies are not identified in the previous plan, local officials expressed a desire to address them in this plan • 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
Cyber	**YES**	• Review of NC State Hazard Mitigation Plan	• Changing future conditions encourage the assessment of the possibility of a cyber attack with the increase in global technology

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?
Electromagnetic Pulse	**YES**	• Review of NC State Hazard Mitigation Plan	• Changing future conditions encourage the 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
☐	Avalanche	☑	Radiological Emergency – Fixed Nuclear Facilities
☑	Drought	☑	Terrorism
☑	Hailstorm**	☑	Cyber
☑	Excessive Heat	☑	Electromagnetic Pulse
☑	Hurricane and Coastal Hazards		**OTHER HAZARDS**
☑	Flooding	☑	Hazardous Substances
☑	Lightning**	☑	Wildfires
☐	Nor'easter	☑	Infectious Disease
☑	Tornadoes/Thunderstorms		
☑	Severe Winter Weather		
☑	Earthquakes		
☑	Dam Failures		
☑	Geological		
☑	Infectious Disease		
☐	Expansive Soils		
☐	Land Subsidence		
☐	Tsunami		
☐	Volcano		
☐	Storm Surge		
☐	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:

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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 hazards 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

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

FIGURE 5.1: SOUTH MOUNTAINS REGION BASE MAP

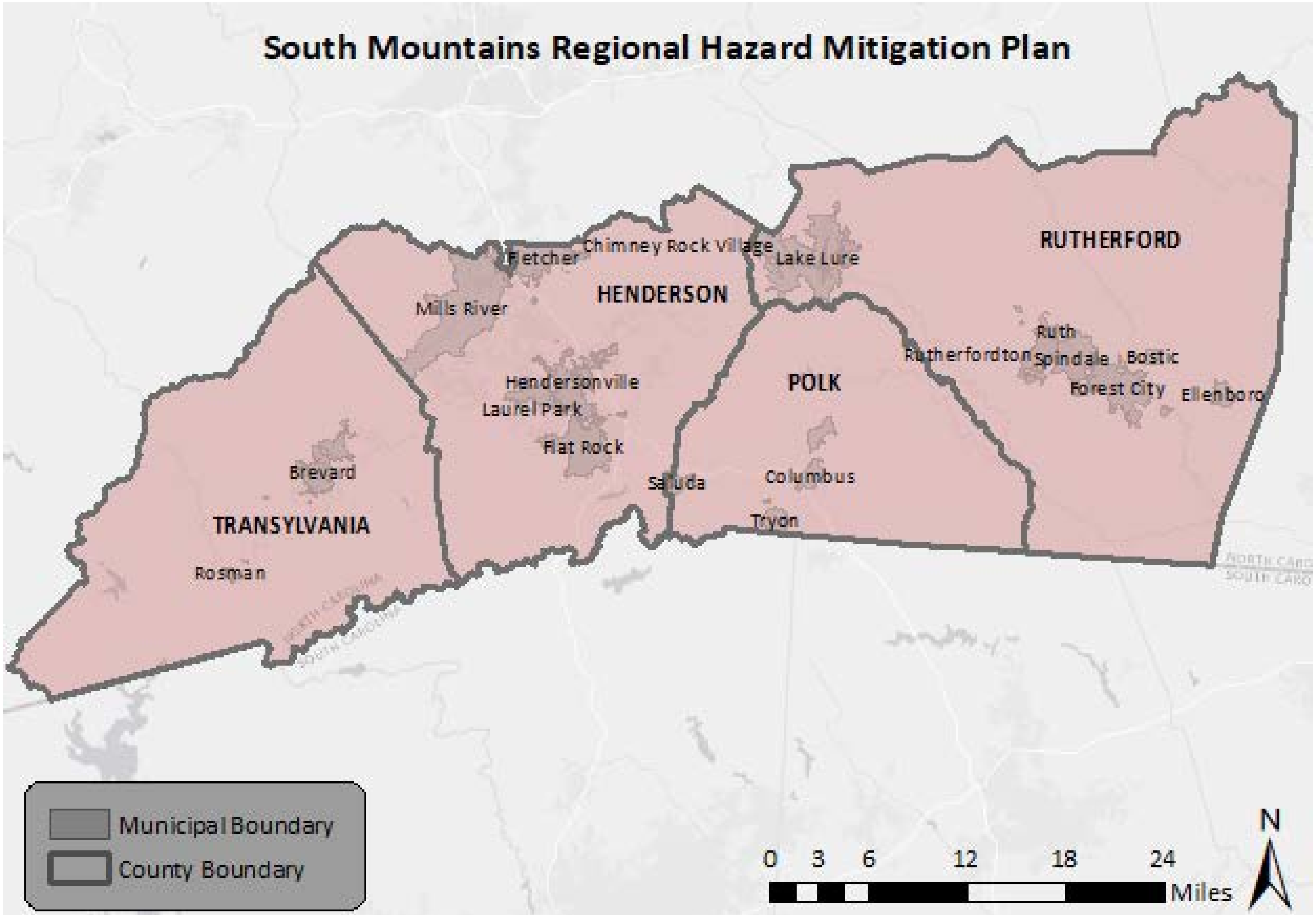


Table 5.2 lists each significant hazard for the South Mountains Region and identifies whether or not it has been determined to be a specific hazard of concern for the eighteen municipal jurisdictions and each of the four county's unincorporated areas. This is the based on the best available data and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

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS

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
Henderson County																
Flat Rock	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fletcher	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hendersonville	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Laurel Park	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Mills River	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Polk County																
Columbus	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Saluda	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tryon	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rutherford County																
Bostic	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Chimney Rock Village	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ellenboro	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Forest City	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lake Lure	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ruth	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Rutherfordton	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Spindale	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Transylvania County																
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

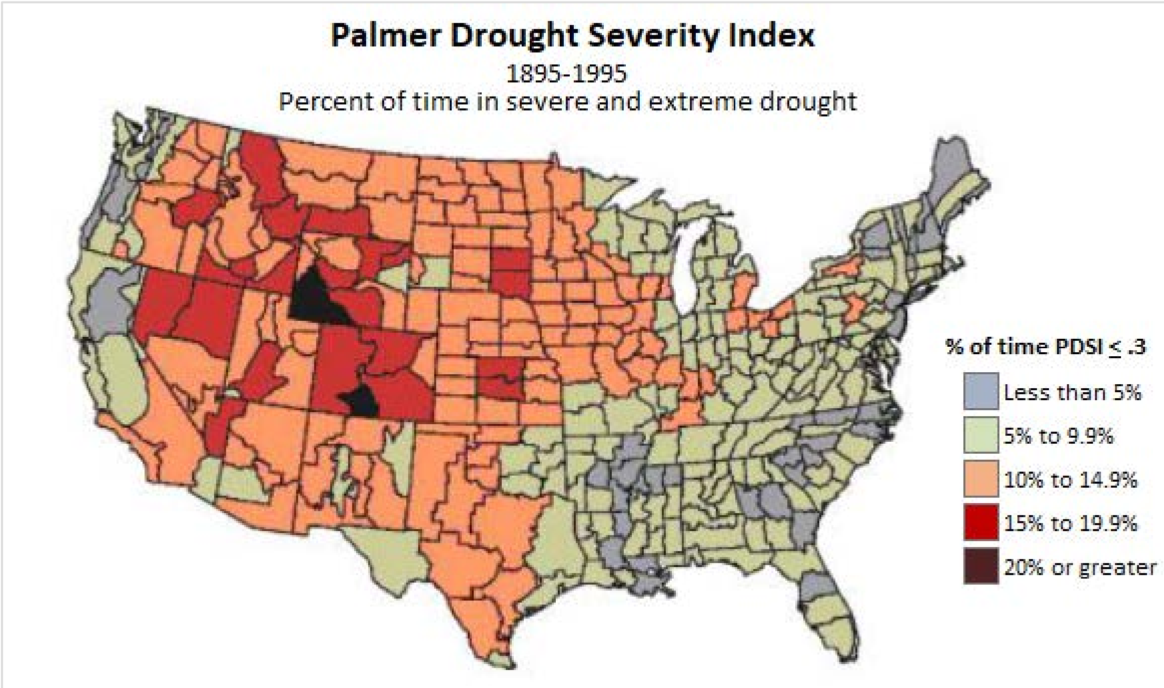
Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops.
Socioeconomic Drought	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 Stated, drought affects most areas of the United States, but is less severe in the Eastern United States.

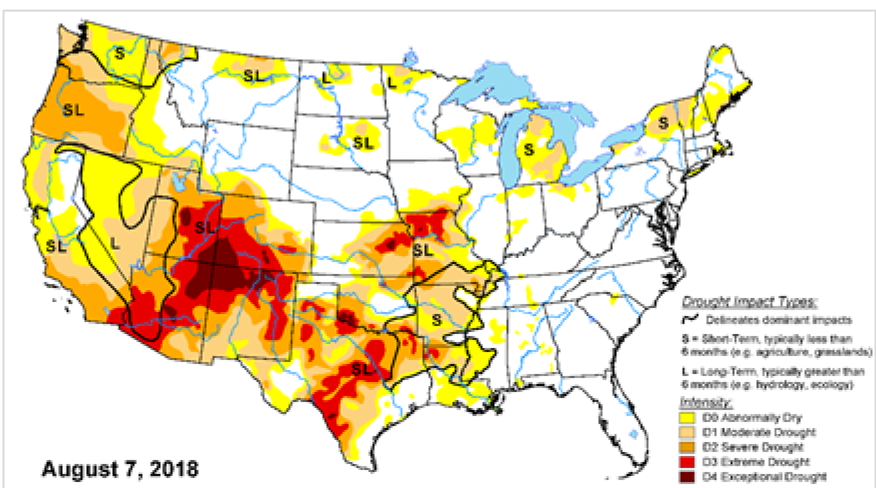
FIGURE 5.2: PALMER DROUGHT SEVERITY INDEX SUMMARY MAP



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

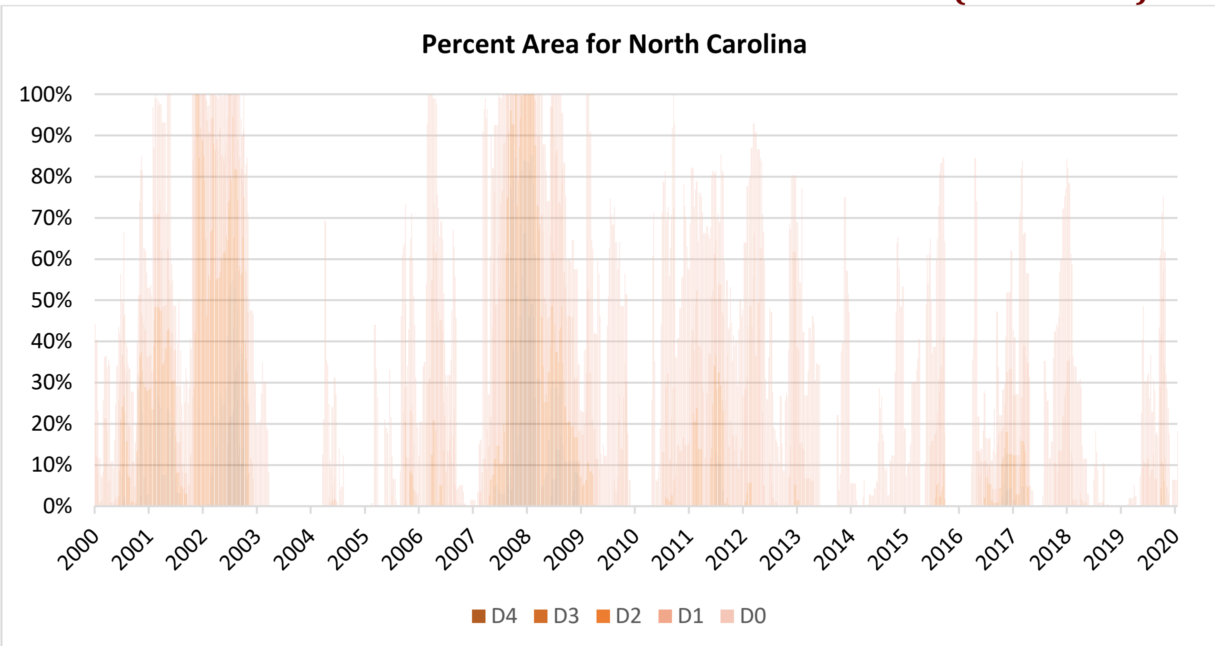
The North Carolina Drought Management Advisory Council also reports data on North Carolina drought conditions from 2000 to 2018 through the North Carolina Drought Monitor. It classifies drought conditions using the scale set by the US Drought Monitor, which classifies conditions on a scale of D0 to D4. Each class is further explained in **Table 5.4.**

TABLE 5.4: USDM DROUGHT CLASSIFICATIONS

Scale	Description	Impacts
D0	Abnormally Dry	- Short-term dryness slowing planting, growth of crops - Some lingering water deficits - Pastures or crops not fully recovered
D1	Moderate Drought	- Some damage to crops, pastures - Some water shortages developing - Voluntary water-use restrictions requested
D2	Severe Drought	- Crop or pasture loss likely - Water shortages common - Water restrictions imposed
D3	Extreme Drought	- Major crop/pasture losses - Widespread water shortages or restrictions
D4	Exceptional Drought	- Exceptional and widespread crop/pasture losses - Shortages of water creating water emergencies

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 Cleveland Gaston Lincoln Region. Since 2000, the longest duration of drought (D1-D4) in North Carolina lasted 155 weeks beginning on January 4, 2000 and ending on December 17, 2002. The most intense period of drought occurred the week of December 11, 2007 where D4 affected 66.2% of North Carolina land. **Figure 5.4** shows the percent area of North Carolina that has experiencing drought conditions from 2000 to 2018.

FIGURE 5.4: NORTH CAROLINA DROUGHT CONDITIONS (2000-2018)



Source: NIDIS, Drought.gov, US Drought Portal

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 5.5: SUMMARY OF DROUGHT OCCURRENCES

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[1].

[1] *U.S. Seasonal Drought Outlook. National Weather Service Climate Prediction Center. http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php*

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[2].

According to the National Oceanic and Atmospheric Administration, heat is the number one weather related killer among natural hazards, followed by frigid winter temperatures[1]. 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 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

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	17	127										
100	87	95	103	112	121	132										

Caution · Extreme Caution · Danger · Extreme Danger

Source: NOAA

[2] http://www.noaawatch.gov/themes/heat.php

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.

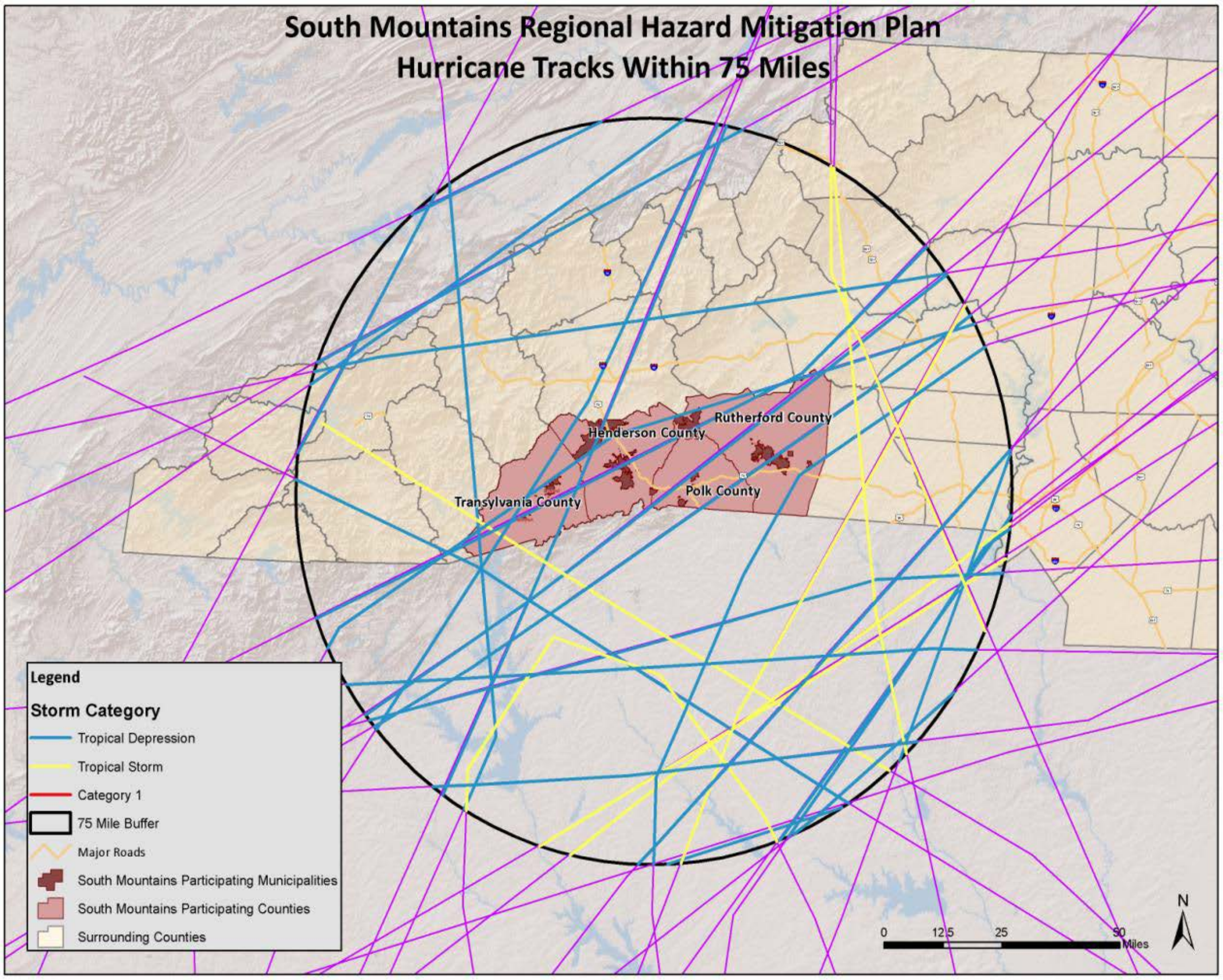
5.5.3 Historical Occurrences

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[3]. 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.

[3] 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



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)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
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[4].

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

[4] 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*.

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 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.

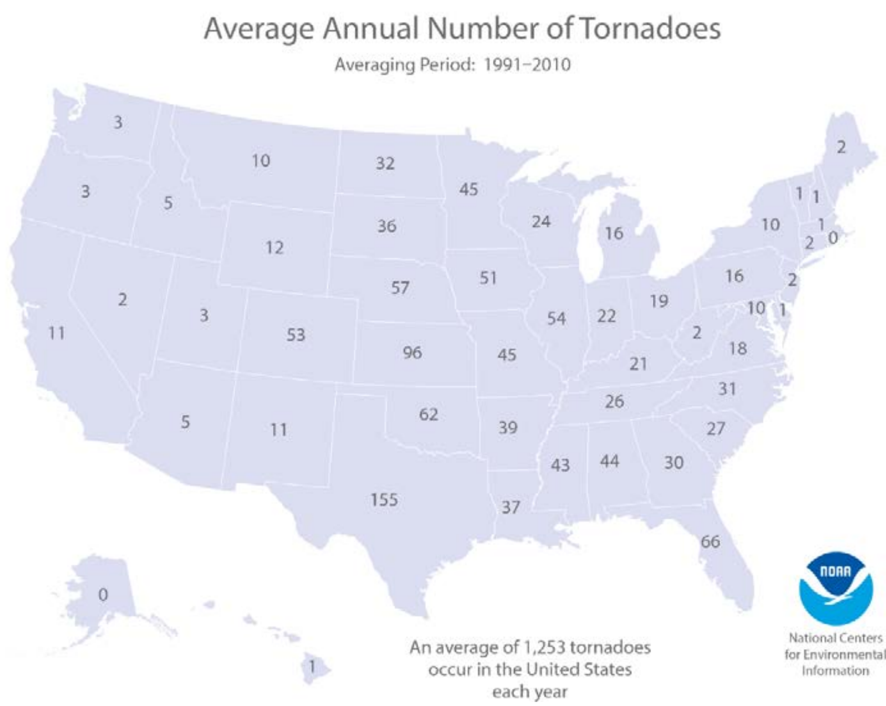
5.6.1 Background and Description

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[5]. 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.

FIGURE 5.6: TORNADO ACTIVITY IN THE UNITED STATES



5 NOAA, 2013.

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 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
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	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.
F2	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.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	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.
F6	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 boards.
1	Moderate	86-110	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.

EF-Scale Number	Intensity Phrase	3 Second Gust (MPH)	Type of Damage Done
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[6], 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.

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."

[6] Lightning and hail hazards are discussed as separate hazards in this section.

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^2	mm to inch conversion (inches)	Typical Damage Impacts
H0	Hard Hail	5	0-20	0 – 0.2	No damage
H1	Potentially Damaging	5-15	>20	0.2 – 0.6	Slight general damage to plants, crops
H2	Significant	10-20	>100	0.4 – 0.8	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	0.8 – 1.2	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	1.0 – 1.6	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	1.2 – 2.0	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		1.6 – 2.4	Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		2.0 – 3.0	Severe roof damage, risk of serious injuries
H8	Destructive	60-90		1.6 – 3.5	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		3.0 – 3.9	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	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

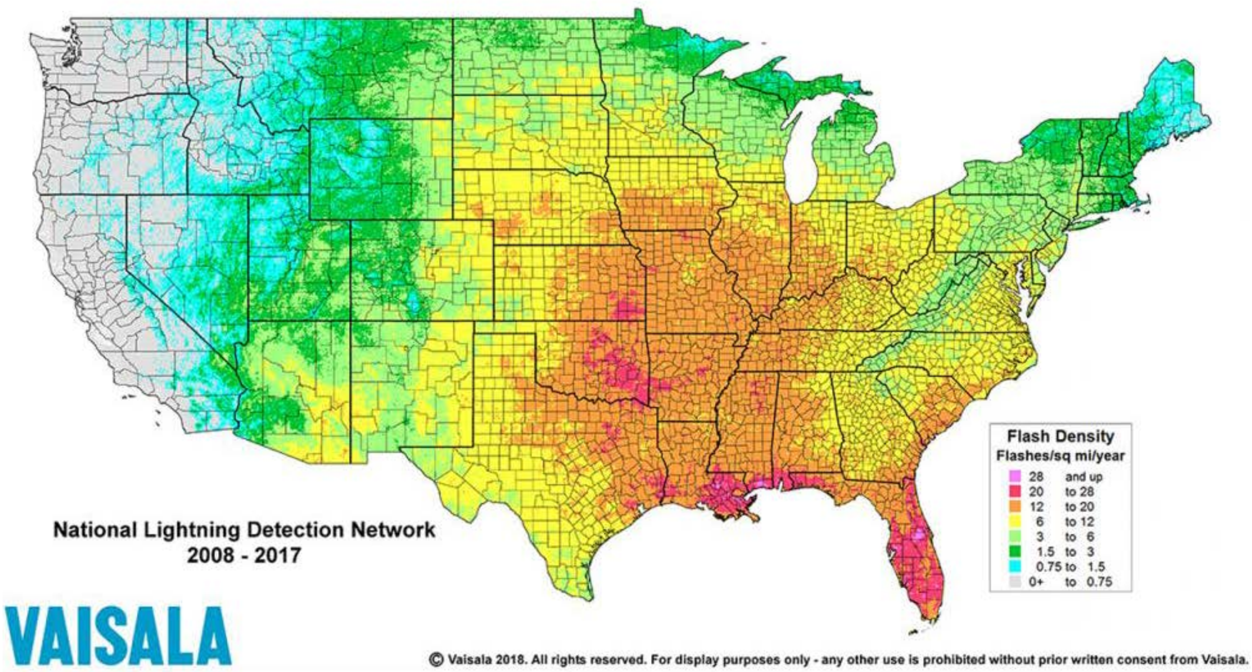
Lightning

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[7]. 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[8]. 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

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

Source: National Centers for Environmental Information

[7] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles.*

[8] 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.

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[9]. According to NCEI, there have been 605 reported thunderstorm and high wind events since 1950 in the South Mountains region[10]. 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

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
Henderson County	**172**	**2/8**	**$3,411,853**
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
Polk County	**105**	**0/2**	**$1,288,879**
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
Rutherford County	**229**	**4/3**	**$2,863,869**
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
Transylvania County	**99**	**0/0**	**$1,160,367**
Brevard	23	0/0	$123,875
Rosman	5	0/0	$0
Unincorporated Area	71	0/0	$1,036,492
South Mountains Regional Total	**605**	**6/13**	**$8,724,968**

Source: National Centers for Environmental Information

[9] 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*.

[10] 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.

Hailstorms

According to the National Centers for Environmental Information, 341 recorded hailstorm events have affected the South Mountains Region since 1963[11]. **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 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

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
Henderson County	**137**	**0/0**	**$28,368,916**
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
Polk County	**73**	0/0	**$4,209**
Columbus	15	0/0	$4,209
Saluda	11	0/0	$0
Tryon	5	0/0	$0
Unincorporated Area	42	0/0	$0
Rutherford County	**116**	**0/0**	**$34,298**
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
Transylvania County	**88**	**0/0**	**$114,971**
Brevard	15	0/0	$86,907
Rosman	7	0/0	$28,064
Unincorporated Area	66	0/0	$0
South Mountains Regional Total	**341**	**0/0**	**$28,522,394**

Source: National Centers for Environmental Information

[11] 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[12]. 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

Location	Number of Occurrences	Deaths/Injuries	Property Damage (2018)
Henderson County	**18**	**0/19**	**$569,317**
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
Polk County	**5**	**0/6**	**$280,758**
Columbus	0	0/0	$0
Saluda	0	0/0	$0
Tryon	2	0/0	$157,282
Unincorporated Area	3	0/6	$123,476
Rutherford County	**15**	**0/7**	**$451,623**
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
Transylvania County	**13**	**0/6**	**$1,073,114**
Brevard	5	0/5	$308,545
Rosman	0	0/0	$0
Unincorporated Area	8	0/1	$764,569
South Mountains Regional Total	**51**	**0/38**	**$2,374,812**

Source: National Centers for Environmental Information

[12] 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.

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 of 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[13]. 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**)[14]. These events resulted in over $19 million (2018 dollars) in damages.

[13] 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*.

[14] 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

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
South Mountains Regional Total	**411**	**0/0**	**$19,377,220**

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

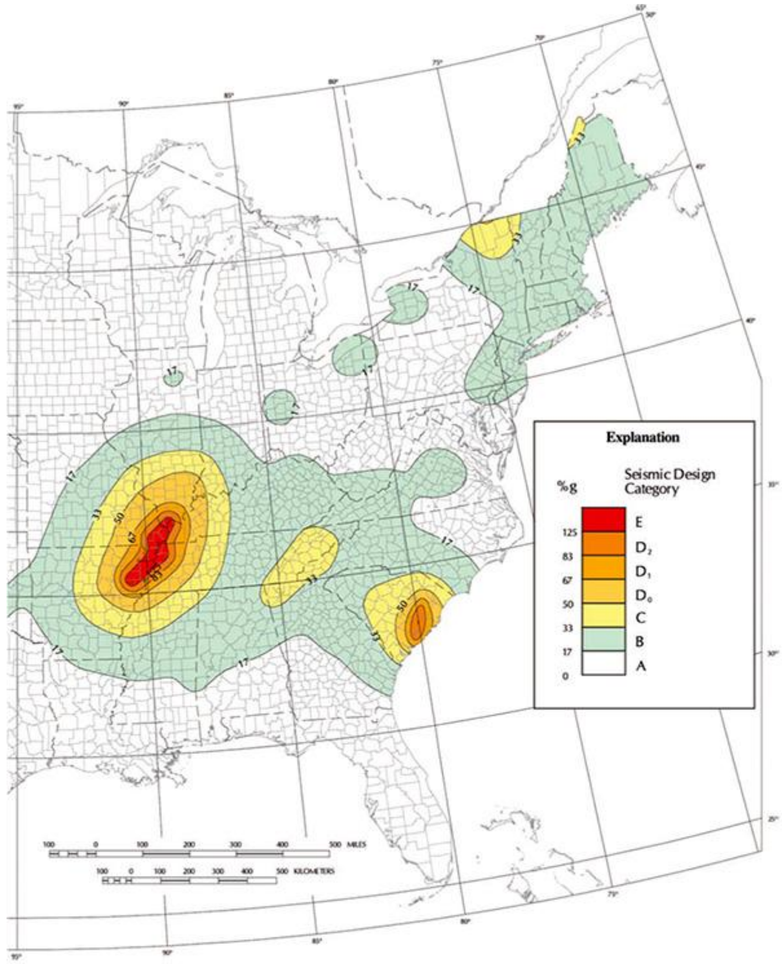
An earthquake is movement or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured 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

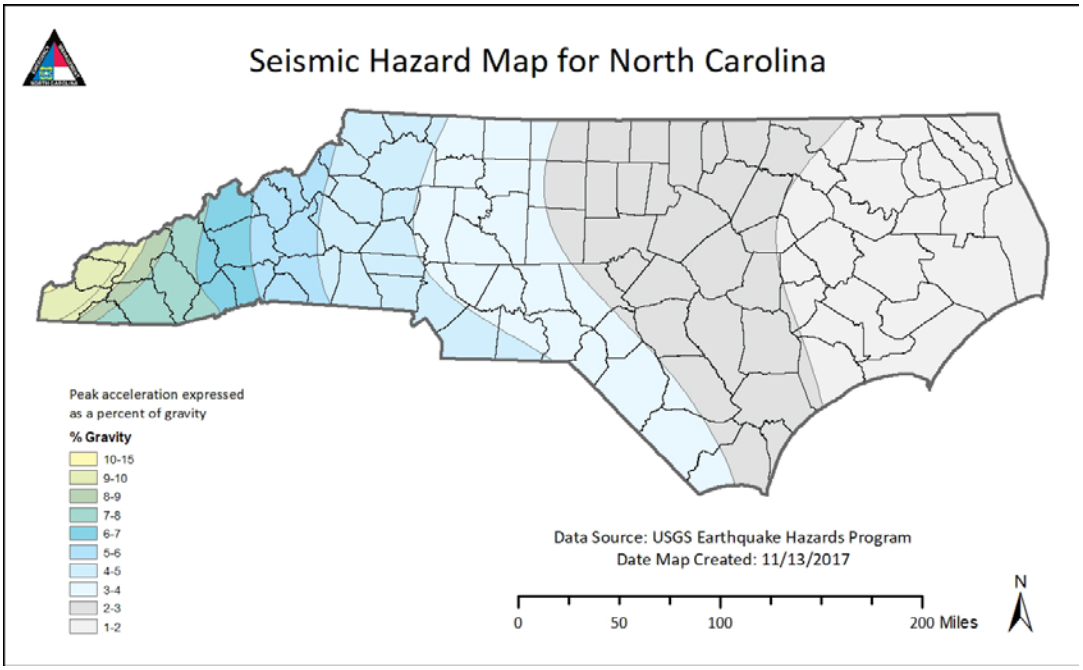
Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Not felt	Not felt except by a very few under especially favorable conditions.	
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.	< 4.2
III	Weak	Felt quite noticeably by persons indoors, especially 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. Unstable objects overturned. Pendulum clocks may stop.	< 4.8
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 persons at rest, especially on upper floors of buildings.	> 8.1

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.

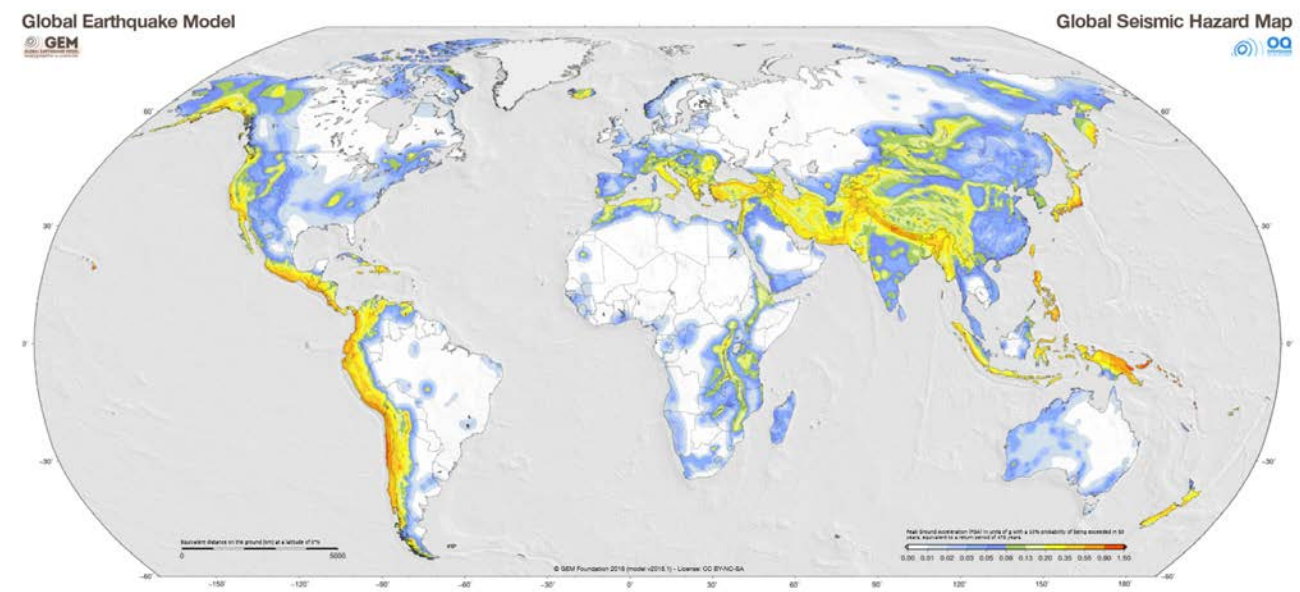
FIGURE 5.9: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



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

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Henderson County	**60**	**VI**	**< 5.4**
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
Polk County	**18**	**V**	**< 4.8**
Columbus	3	IV	< 4.8
Saluda	5	V	< 4.8
Tryon	4	IV	< 4.8
Unincorporated Area	6	VI	< 4.8
Rutherford County	**22**	**V**	**< 4.8**
Bostic	0	--	--
Chimney Rock Village	3	V	< 4.8
Ellenboro	1	IV	< 4.8
Forest City	2	IV	< 4.8
Lake Lure	2	IV	< 4.8
Ruth	0	--	--

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Rutherfordton	**4**	**V**	**< 4.8**
Spindale	**3**	**IV**	**< 4.8**
Unincorporated Area	**7**	**V**	**< 4.8**
Transylvania County	**35**	**V**	**< 4.8**
Brevard	**11**	**V**	**< 4.8**
Rosman	**5**	**V**	**< 4.8**
Unincorporated Area	**19**	**V**	**< 4.8**
South Mountains Regional Total	**135**	**VI**	**< 5.4**

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
02/071812	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.

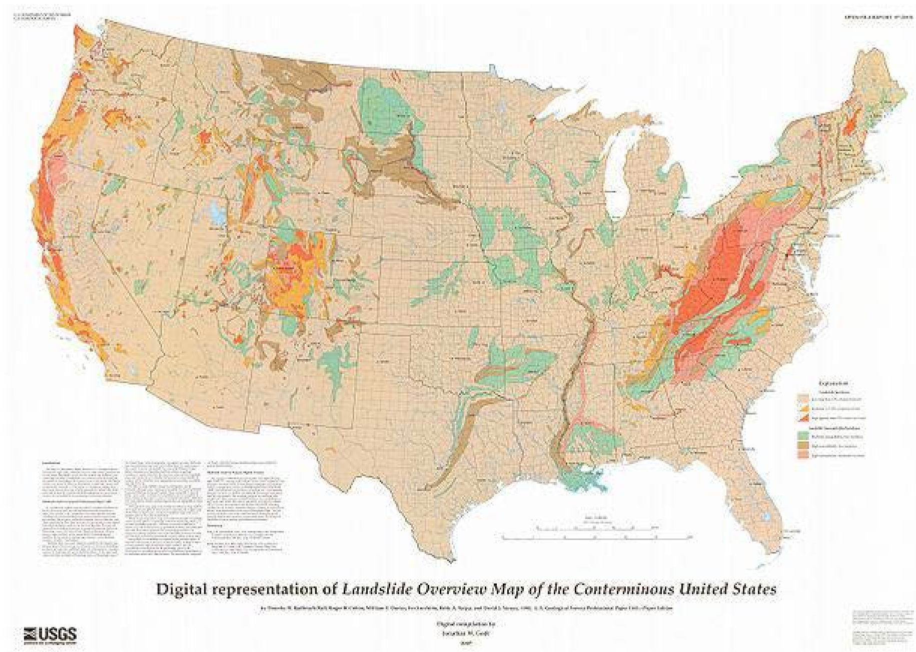
Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved 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[15]. **Figure 5.11** delineates areas where

[15] United States Geological Survey (USGS). United States Department of the Interior. "Landslide Hazards – A National Threat." 2005.

large numbers of landslides have occurred and areas that are susceptible to landsliding in the conterminous United States[16].

FIGURE 5.11: LANDSLIDE OVERVIEW MAP OF THE CONTERMINOUS UNITED STATES[17]



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

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,

[16] 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.

[17] 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.

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[18].

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 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 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 fines and 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

[18] *Sinkholes. United States Geological Survey. Retrieved on December 14, 2017 from: https://water.usgs.gov/edu/sinkholes.html*

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.

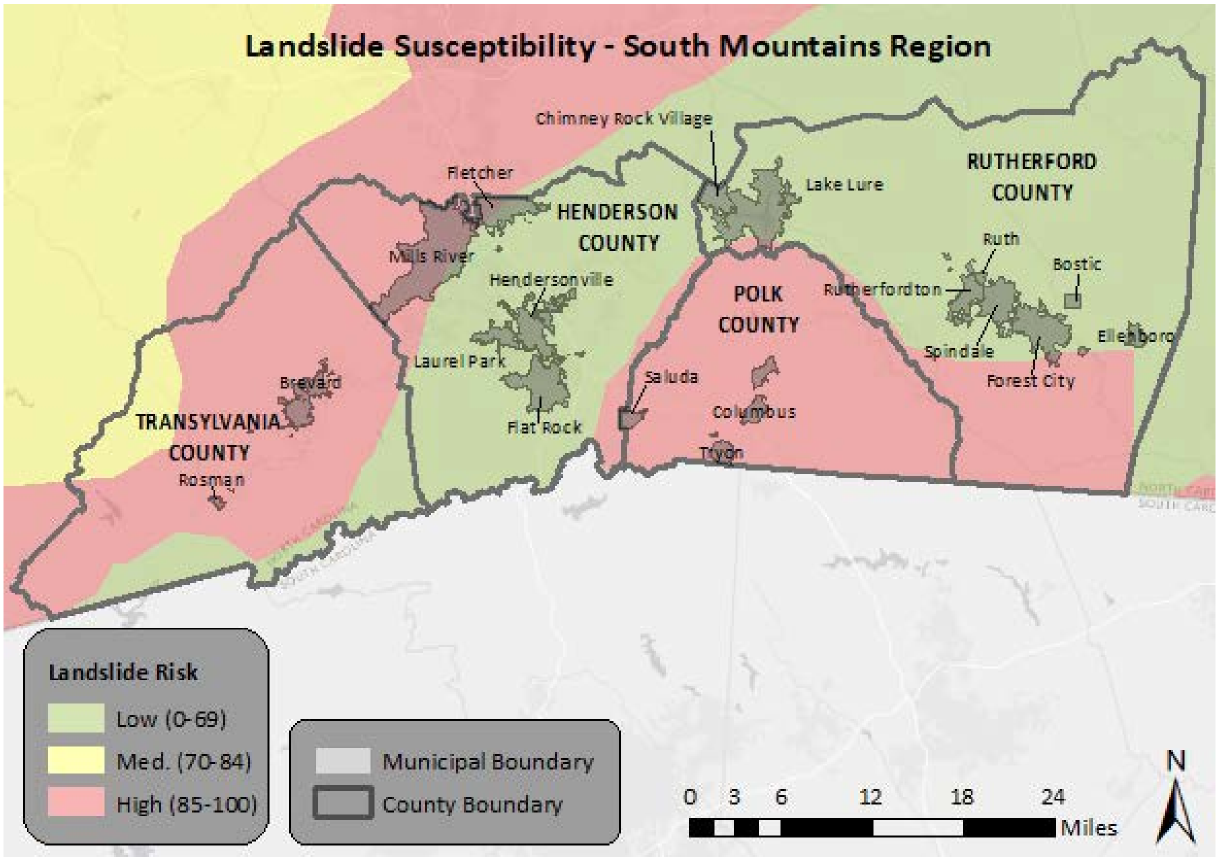
5.9.2 Location and Spatial Extent

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

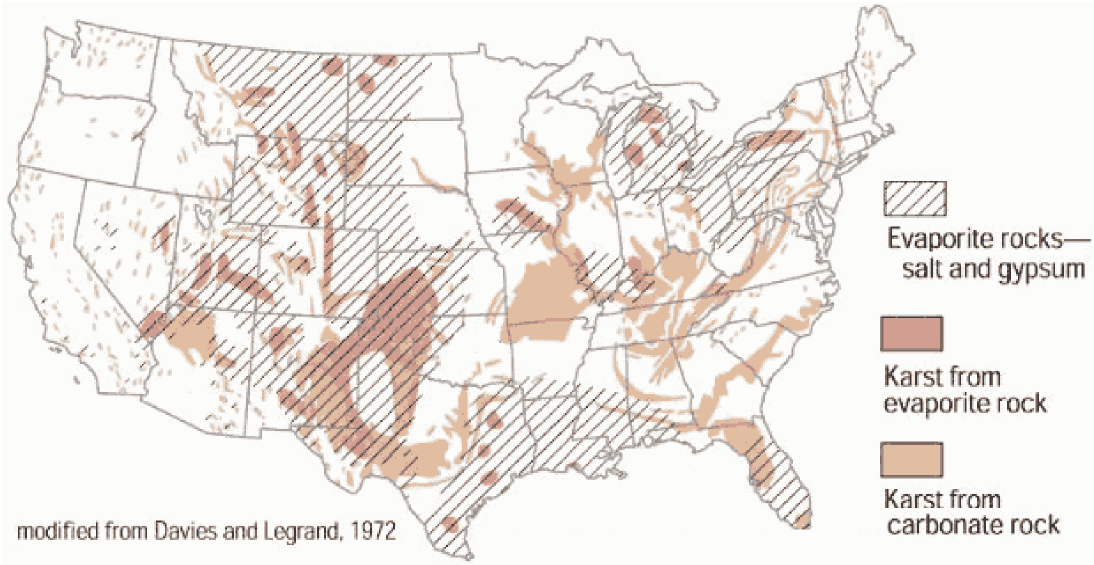


Source: USGS

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.

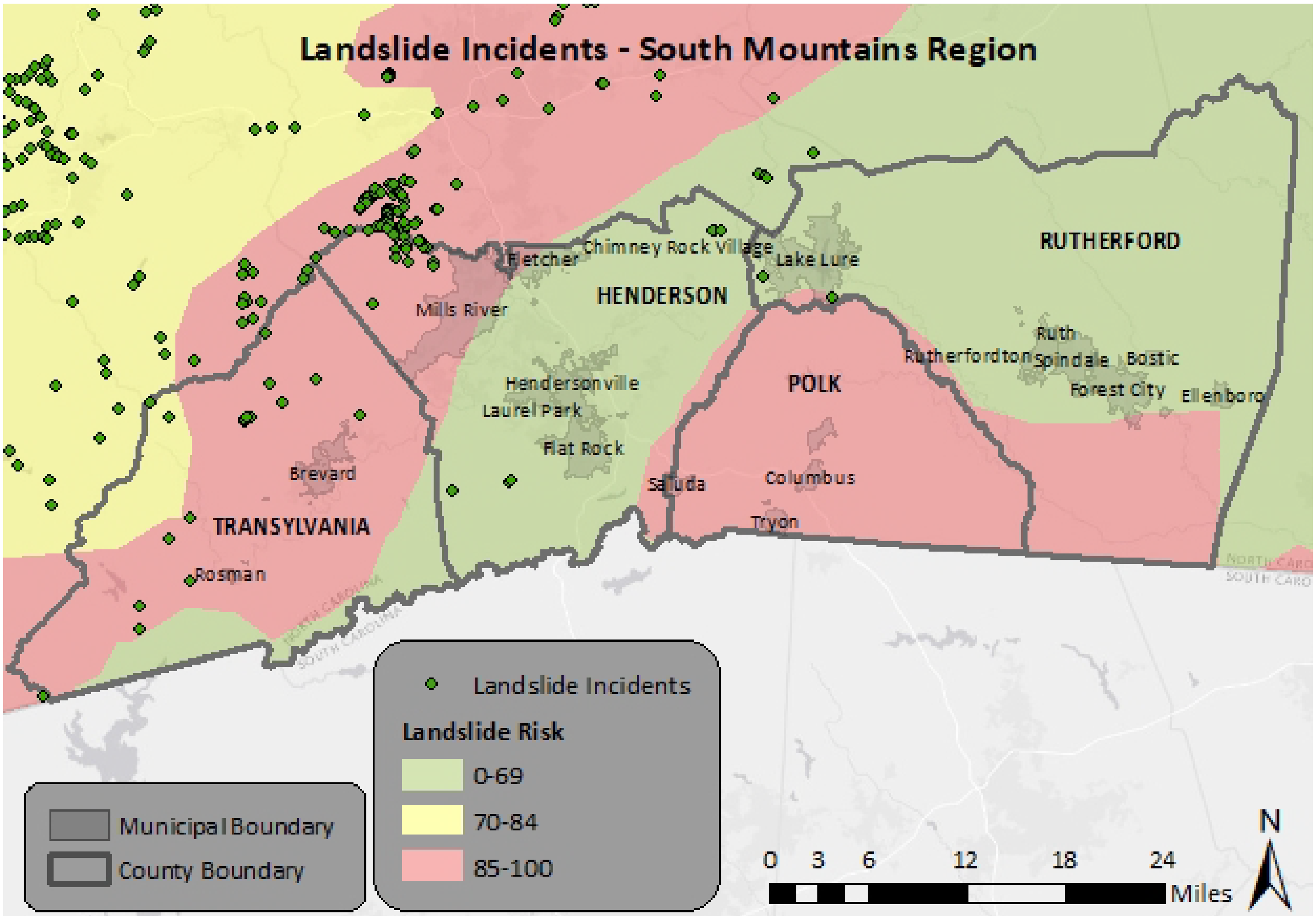
5.9.3 Historical Occurrences

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[19]. 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.

[19] 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.
- **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, landsides 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 landside 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 NCDEQ Dam Safety Office 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
Low	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
Intermediate	Damage to highways, Interruption of service	25 to less than 250 vehicles per day
	Economic Damage	$30,000 to less than $200,000
High	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[20]. **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.**

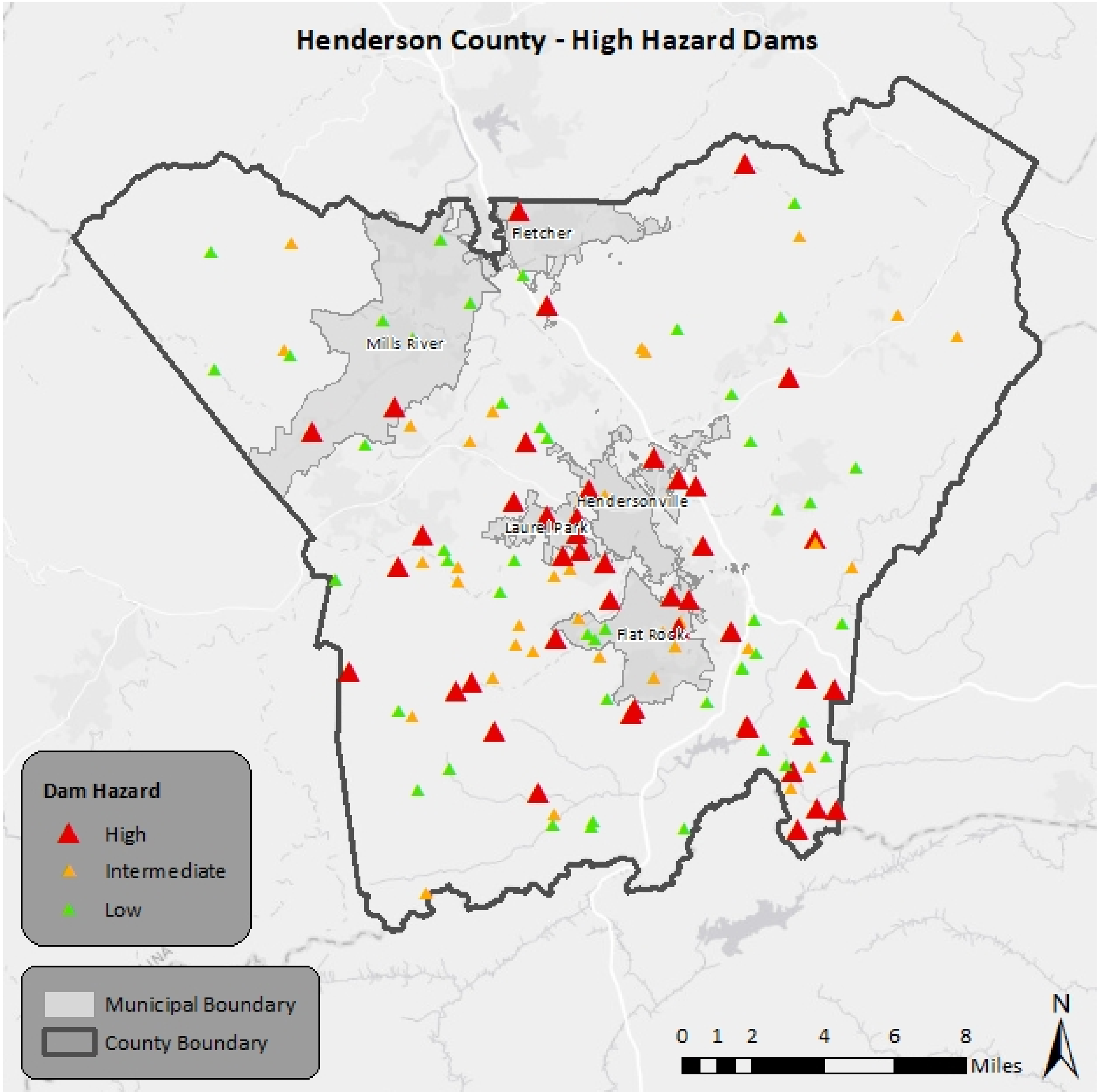
TABLE 5.24: SUMMARY OF HIGH HAZARD DAM LOCATION

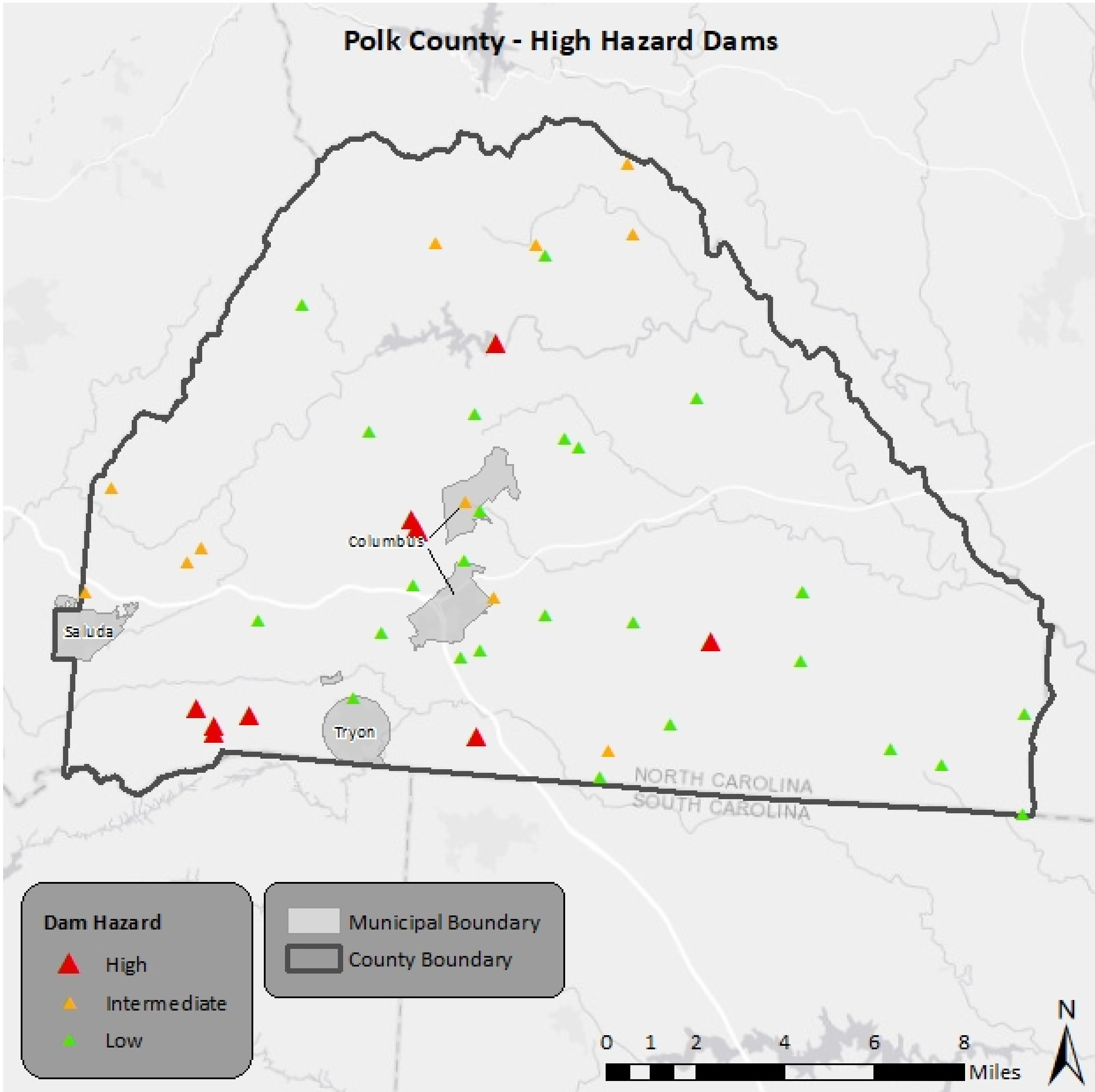
Location	Number High Hazard Dams
Henderson County	45
Polk County	10
Rutherford County	22
Transylvania County	47
South Mountains Regional Total	**124**

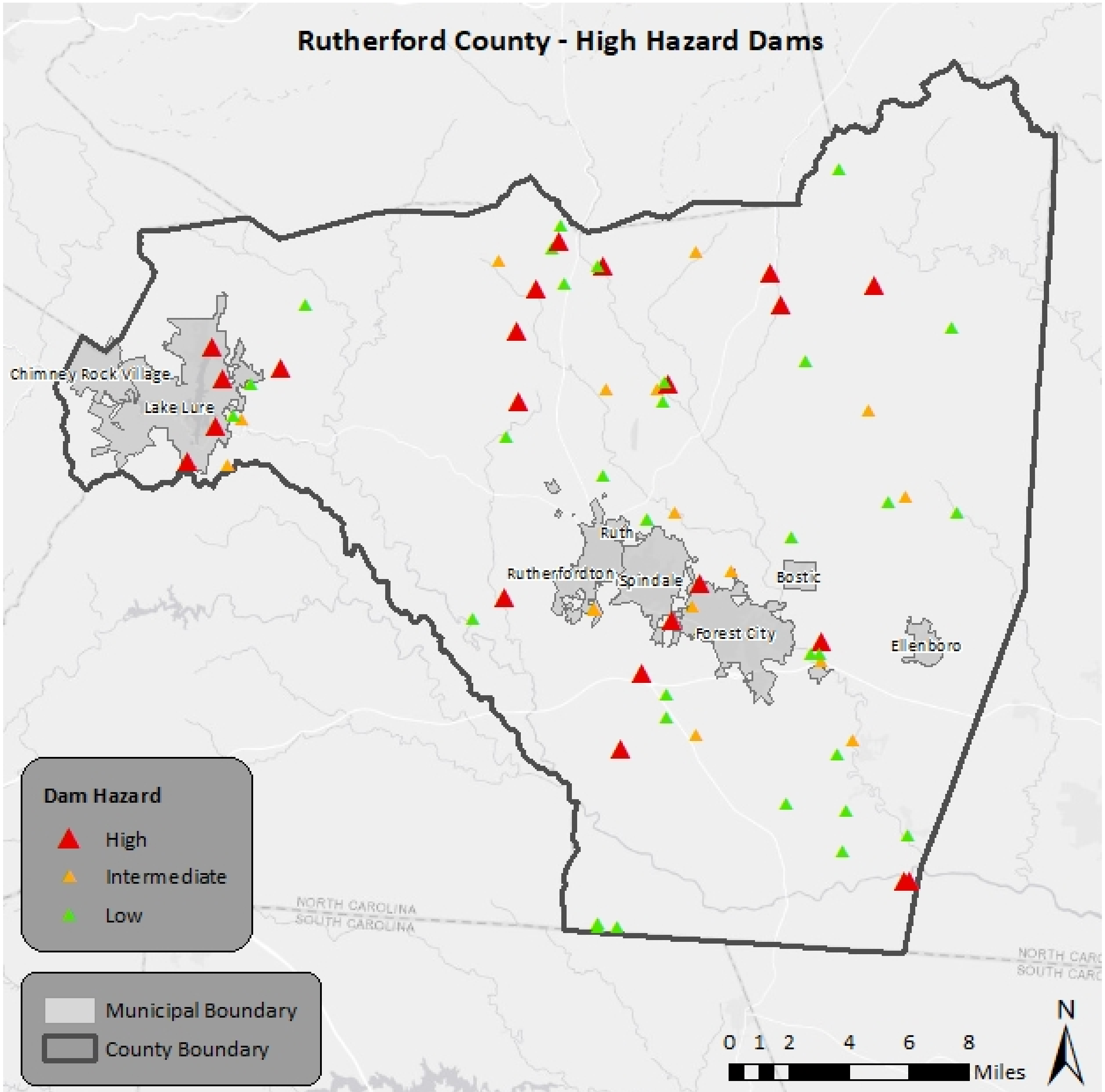
Source: North Carolina Division of Energy, Mineral, and Land Resources

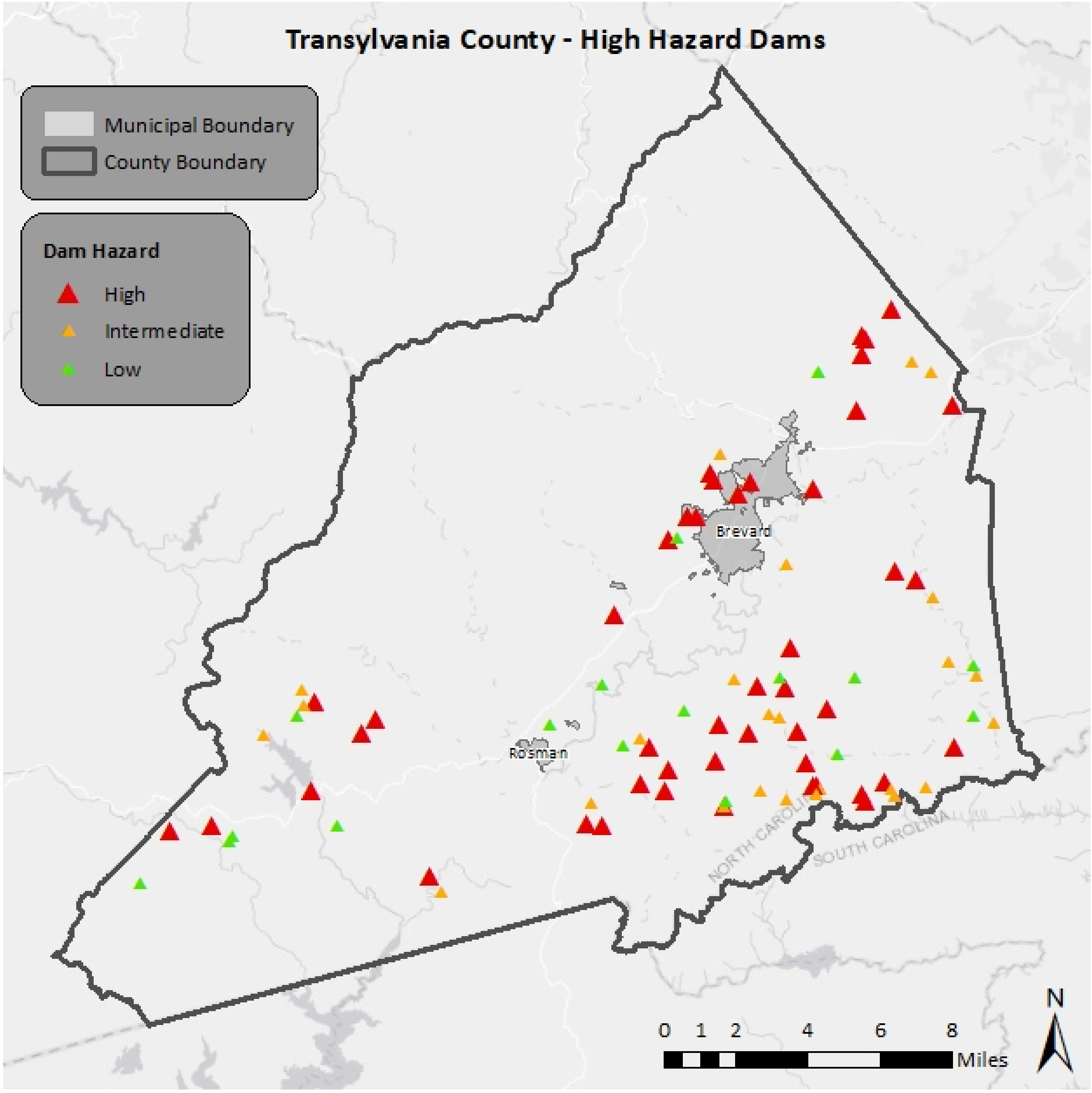
[20] The October 23, 2018 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (http://portal.ncdenr.org/web/lr/dams) was reviewed and amended by local officials to the best of their knowledge.

FIGURE 5.16: SOUTH MOUNTAINS REGION HIGH HAZARD DAM LOCATIONS




Polk County - High Hazard Dams
Columbus
Saluda
Tryon
NORTH CAROLINA
SOUTH CAROLINA
Dam Hazard
High
Intermediate
Low
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N


Rutherford County - High Hazard Dams
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
NORTH CAROLINA
SOUTH CAROLINA
Dam Hazard
High
Intermediate
Low
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N



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

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
South Mountains Regional Total	**89.57**	**4.64**

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.

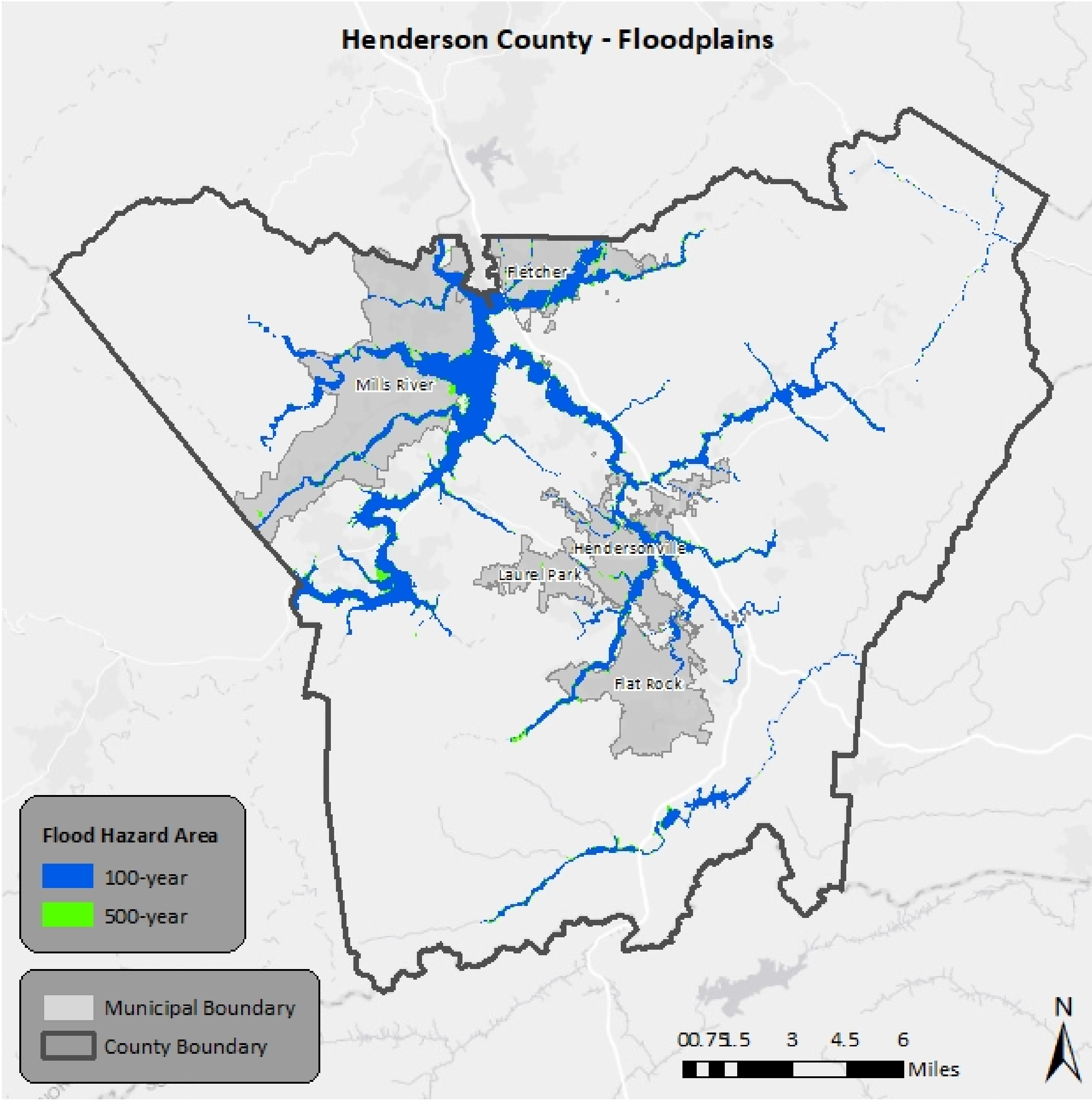
5.11.3 Historical Occurrences

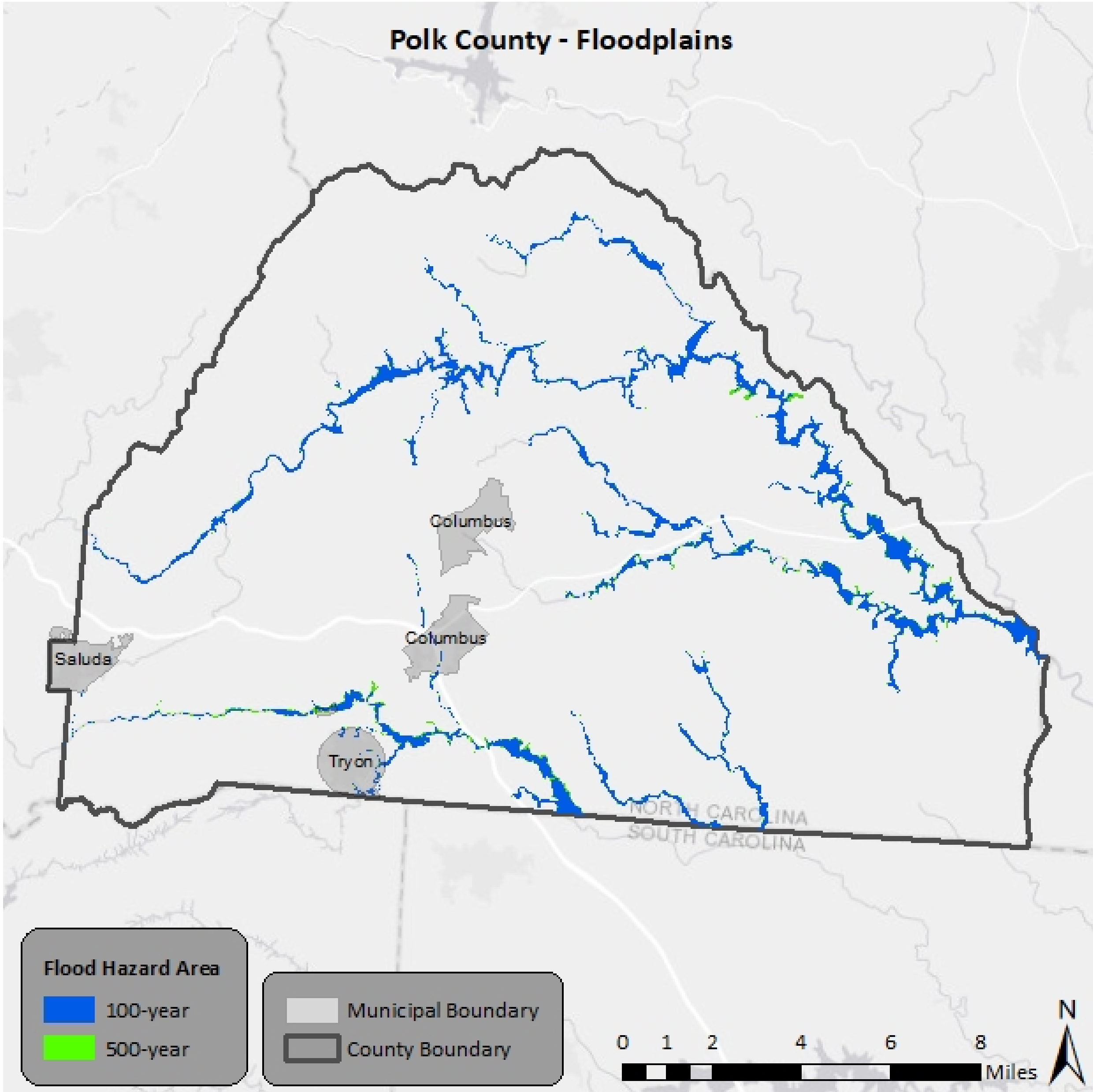
Information from the National Centers for Environmental Information was used to ascertain historical flood events. The National Centers for Environmental Information reported a total of 206 events throughout the South Mountains Region since 1993[21]. A summary of these events is presented in **Table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

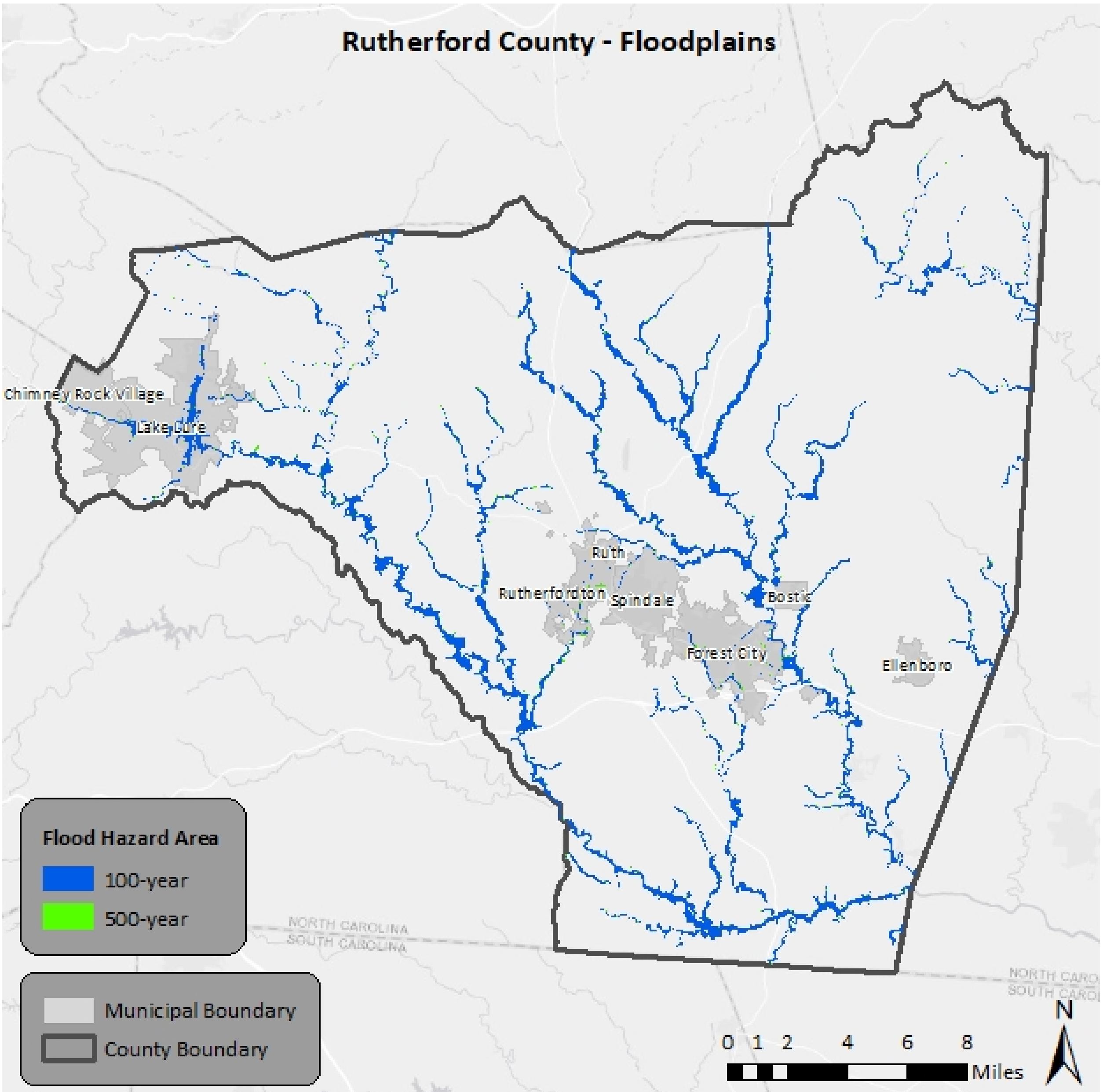
[21] These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

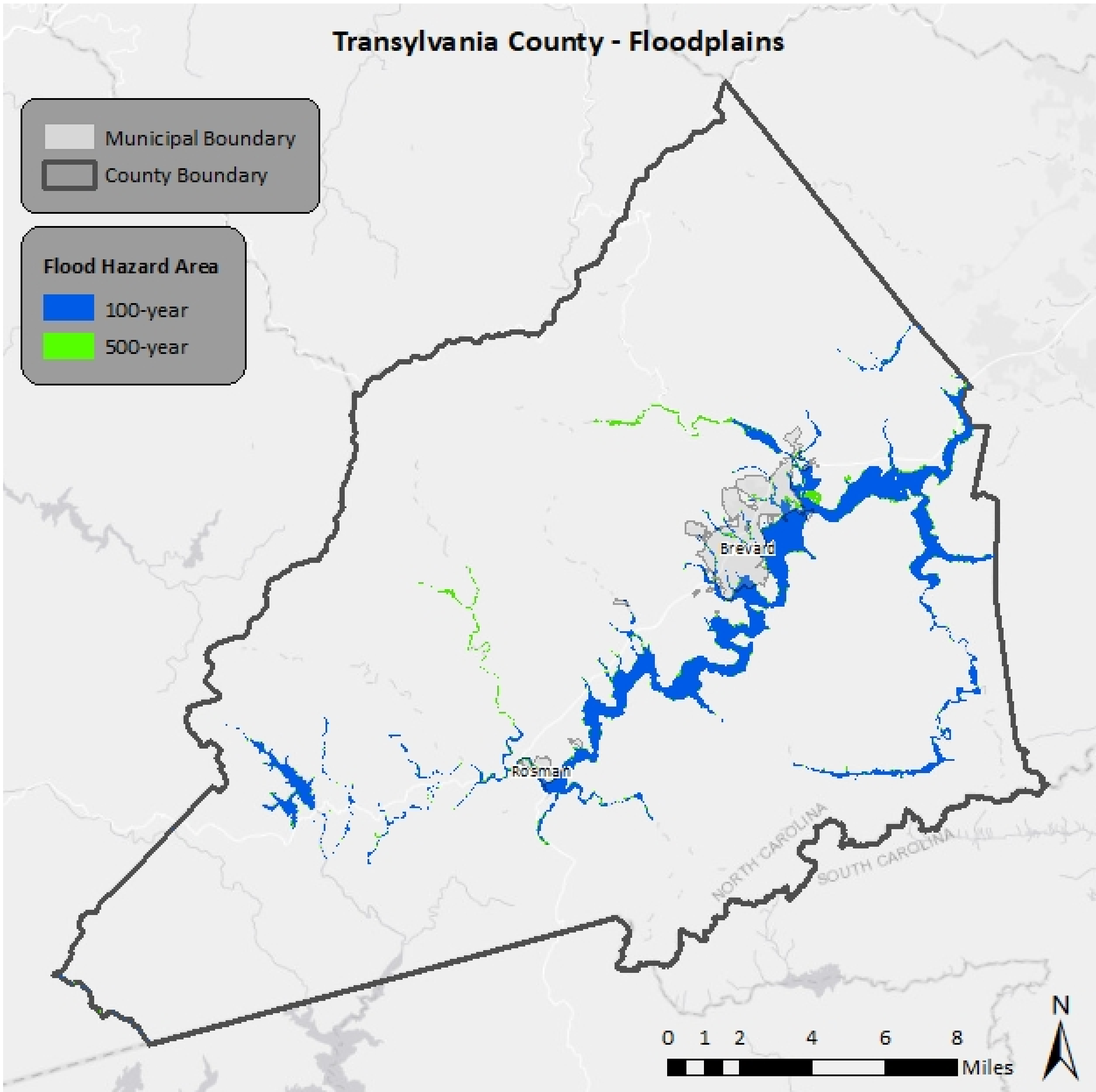
[22] The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

FIGURE 5.17: SPECIAL FLOOD HAZARD AREAS




Polk County - Floodplains
Columbus
Columbus
Saluda
Tryon
NORTH CAROLINA
SOUTH CAROLINA
Flood Hazard Area
100-year
500-year
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N


Rutherford County - Floodplains
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
NORTH CAROLINA
SOUTH CAROLINA
Flood Hazard Area
100-year
500-year
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N



Source: Federal Emergency Management Agency DFIRM

TABLE 5.26: SUMMARY OF FLOOD OCCURRENCES

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Henderson County	**85**	**0/1**	**$15,851,885**
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
Polk County	**21**	**0/2**	**$539,217**
Columbus	3	0/0	$431,164

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Saluda	4	0/0	$27,000
Tryon	1	0/0	$0
Unincorporated Area	13	0/0	$81,050
Rutherford County	**26**	**0/2**	**$8,868,507**
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
Transylvania County	**74**	**0/10**	**$14,381,735**
Brevard	3	0/0	$27,482
Rosman	10	0/10	$2,369,800
Unincorporated Area	61	0/0	$11,984,453
South Mountains Regional Total	**206**	**0/15**	**$39,641,344**

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

Location	Flood Losses	Claims Payments
Henderson County	**176**	**$1,629,913**
Flat Rock	0	$0
Fletcher	0	$0
Hendersonville	148	$1,629,913
Laurel Park	2	$4,682
Mills River*	--	--
Unincorporated Area	26	$406,846
Polk County	**31**	**$458,147**
Columbus	0	$0
Saluda	0	$0
Tryon	3	$68,792
Unincorporated Area	28	$389,355
Rutherford County	**55**	**$1,035,433**
Bostic	0	$0
Chimney Rock Village	1	$15,740
Ellenboro*	--	--

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

**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

Location	Number of Properties	Number of Losses	Total Payments
Henderson County	**18**	**70**	**$1,375,147**
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
Polk County	**1**	**3**	**$15,819**
Columbus	0	0	$0
Saluda	0	0	$0
Tryon	0	0	$0
Unincorporated Area	0	0	$0
Rutherford County	**6**	**15**	**$300,007**
Bostic	0	0	$0
Chimney Rock Village	0	0	$0
Ellenboro*	--	--	--
Forest City	0	0	$0
Lake Lure	0	0	$0

Location	Number of Properties	Number of Losses	Total Payments
Ruth	0	0	$0
Rutherfordton	0	0	$0
Spindale	0	0	$0
Unincorporated Area	6	15	$300,007
Transylvania County	**5**	**13**	**$152,452**
Brevard	0	0	$0
Rosman	3	8	$80,805
Unincorporated Area	2	5	$71,647
South Mountains Regional Total	**30**	**101**	**$1,843,425**

**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[23]. 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.

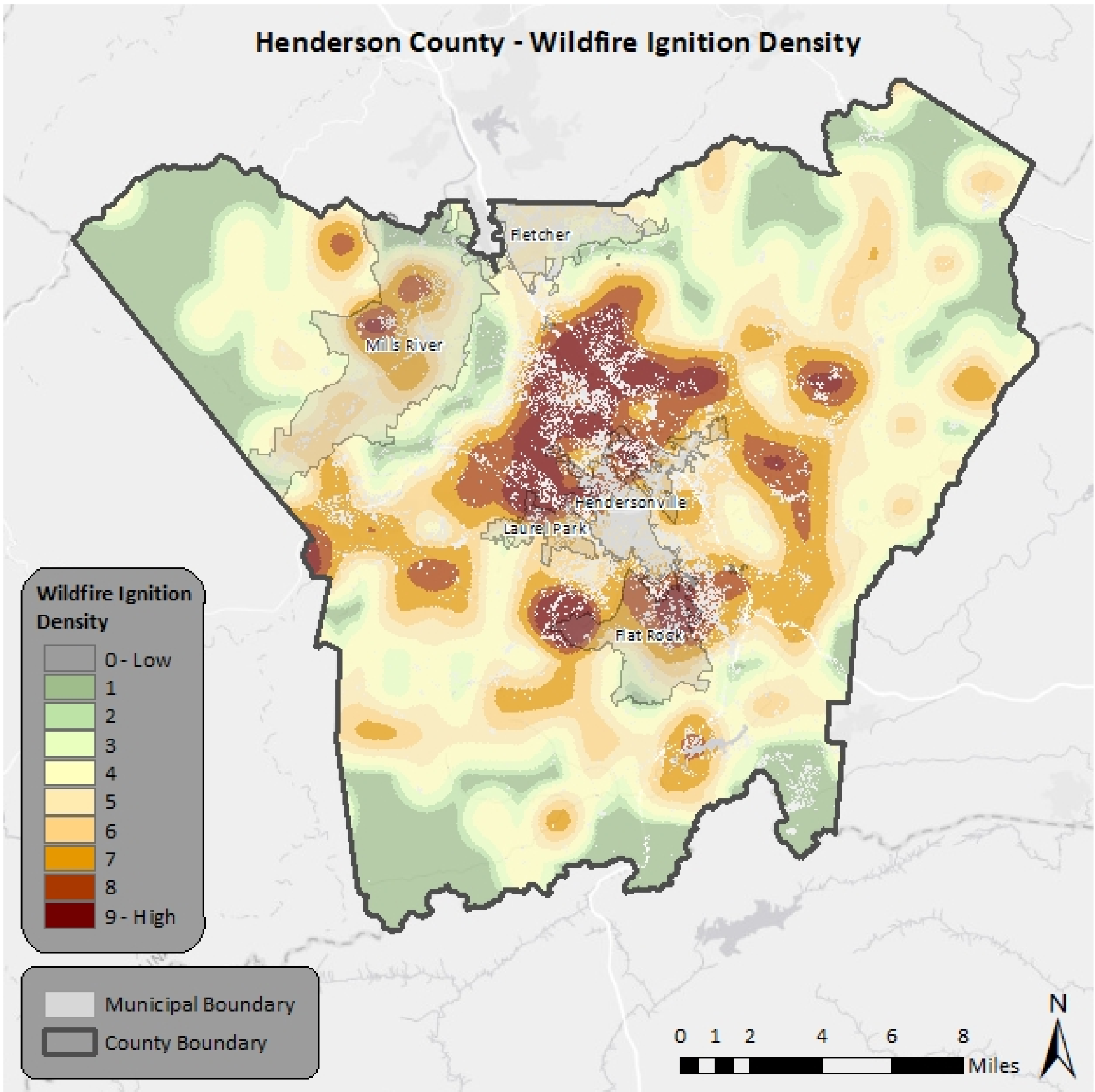
[23] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

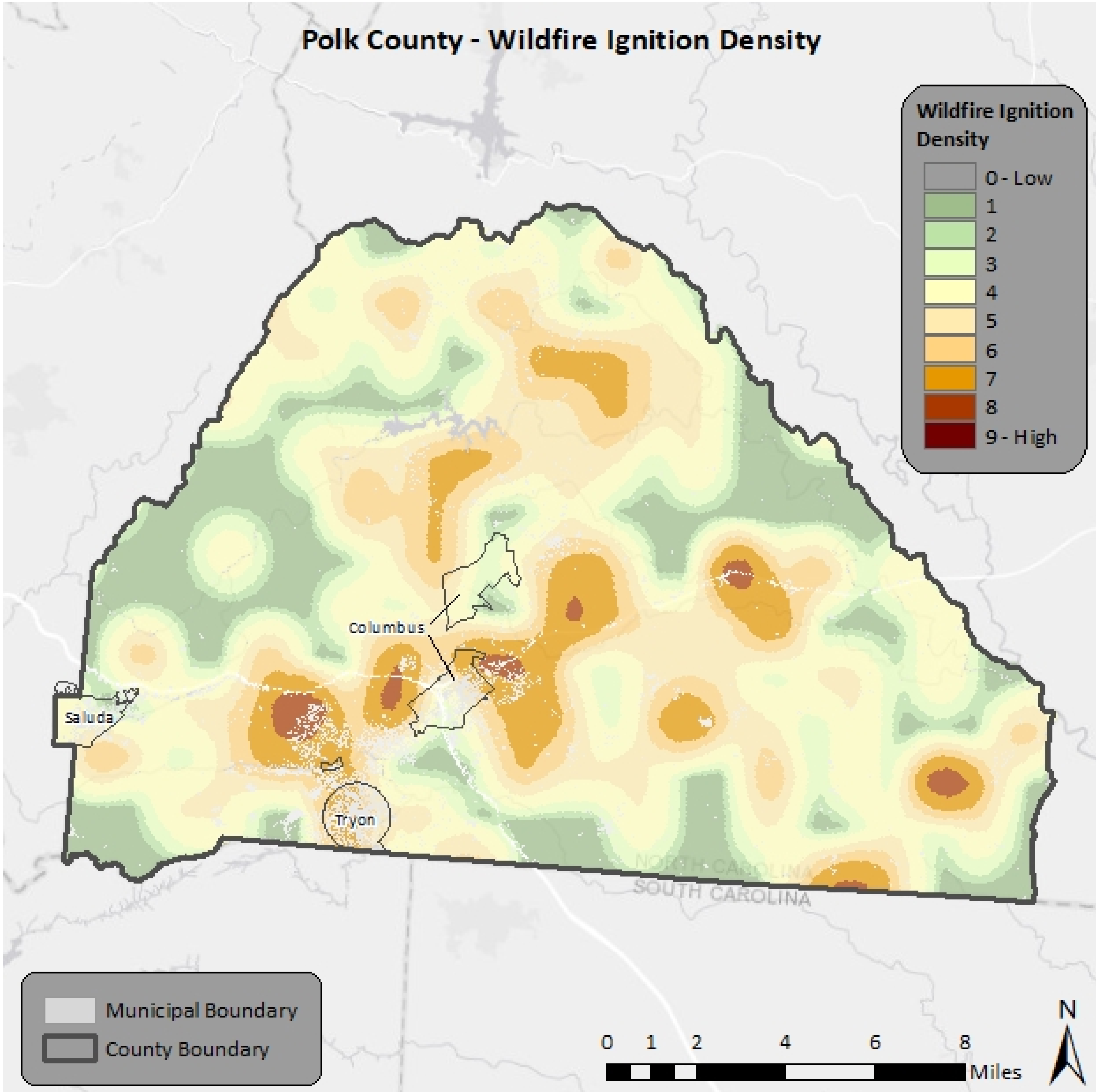
5.12.2 Location and Spatial Extent

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.

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




Polk County - Wildfire Ignition Density
Wildfire Ignition Density
0 - Low
1
2
3
4
5
6
7
8
9 - High
Columbus
Saluda
Tryon
NORTH CAROLINA
SOUTH CAROLINA
Municipal Boundary
County Boundary
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Miles
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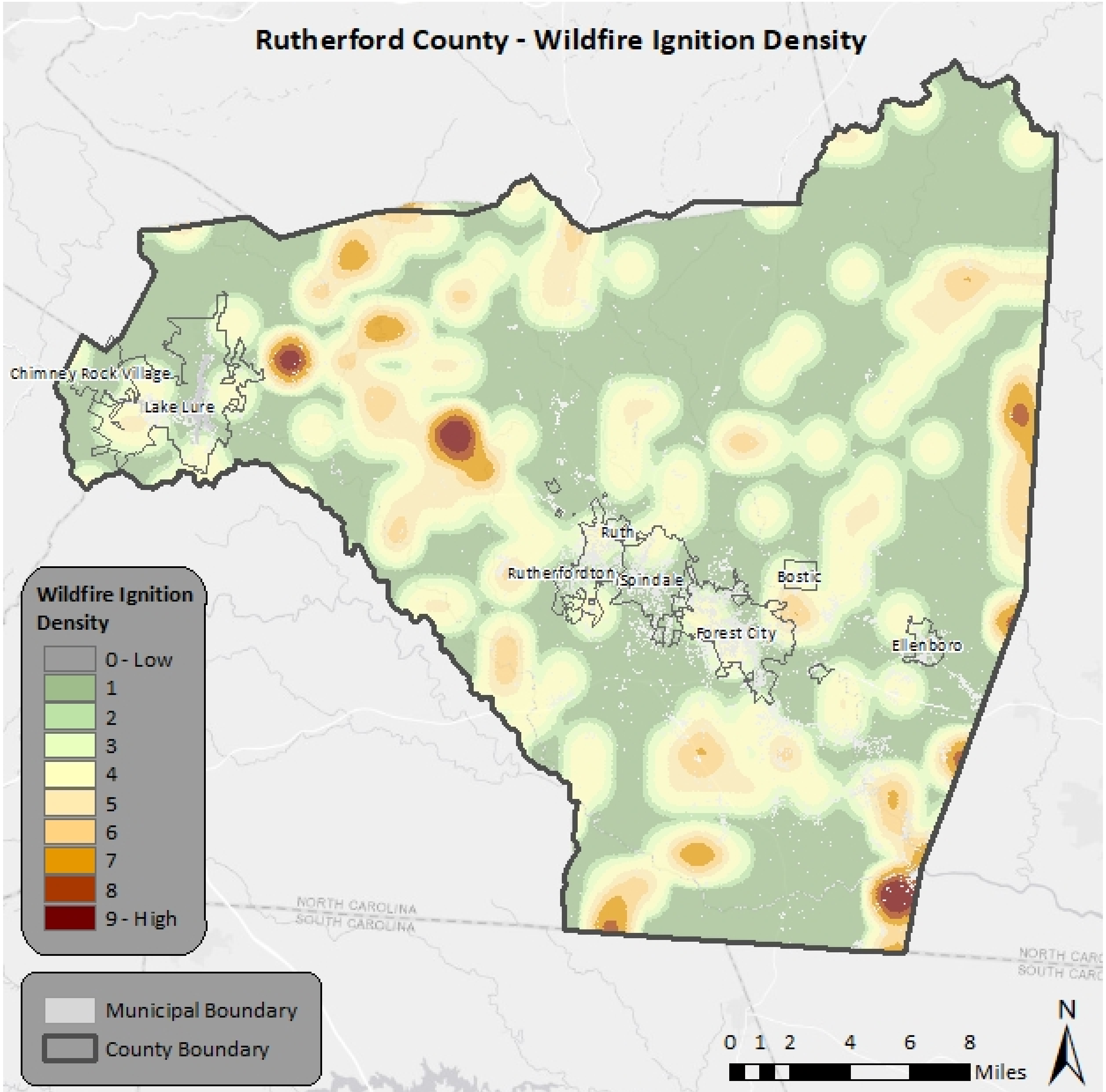
Rutherford County - Wildfire Ignition Density
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
NORTH CAROLINA
SOUTH CAROLINA
Wildfire Ignition Density
0 - Low
1
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3
4
5
6
7
8
9 - High
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
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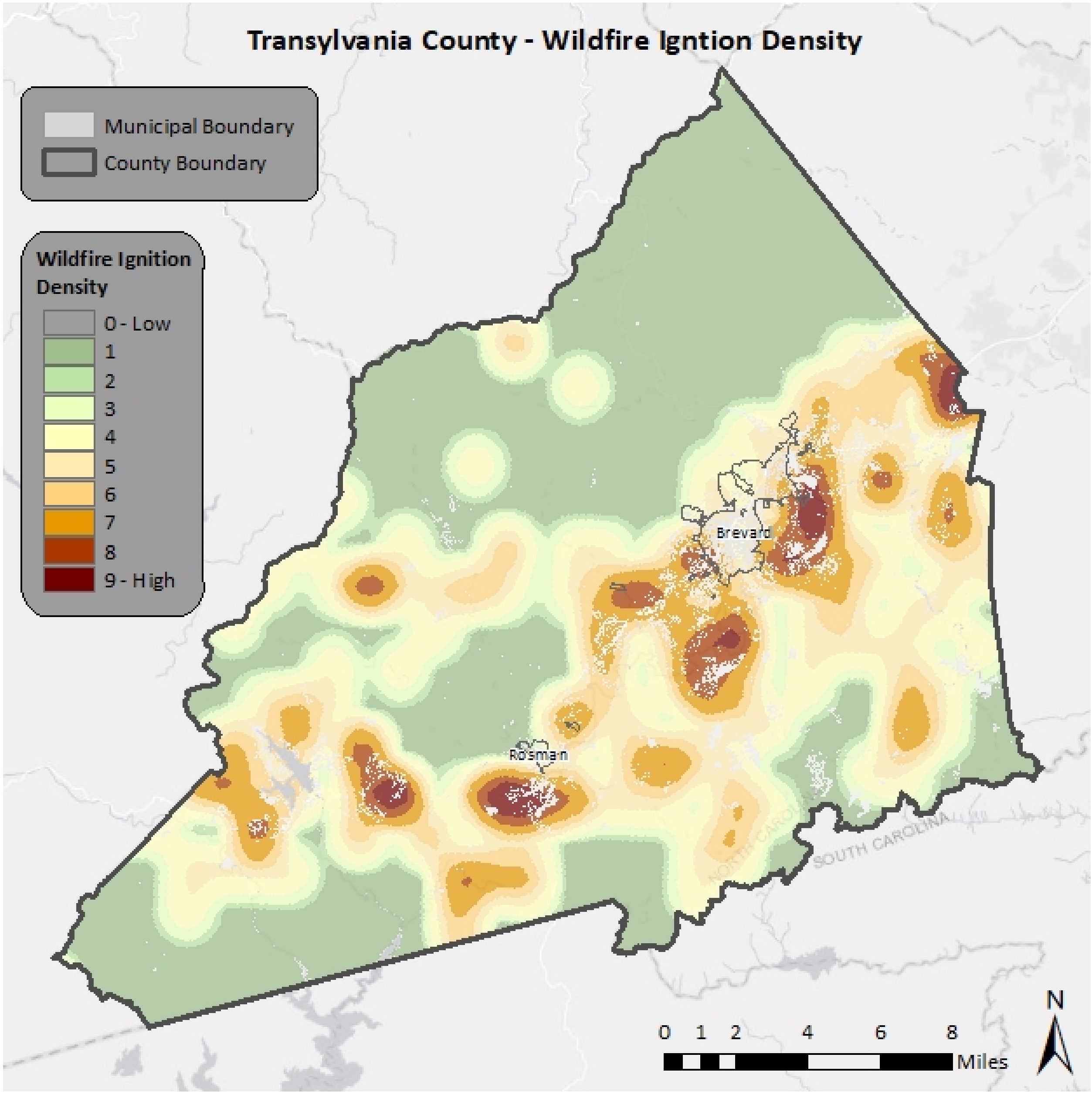
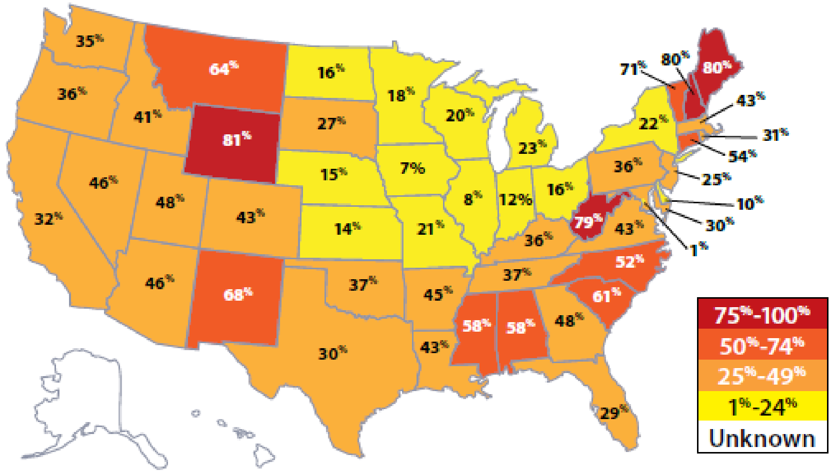


Source: Southern Wildfire Risk Assessment

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.

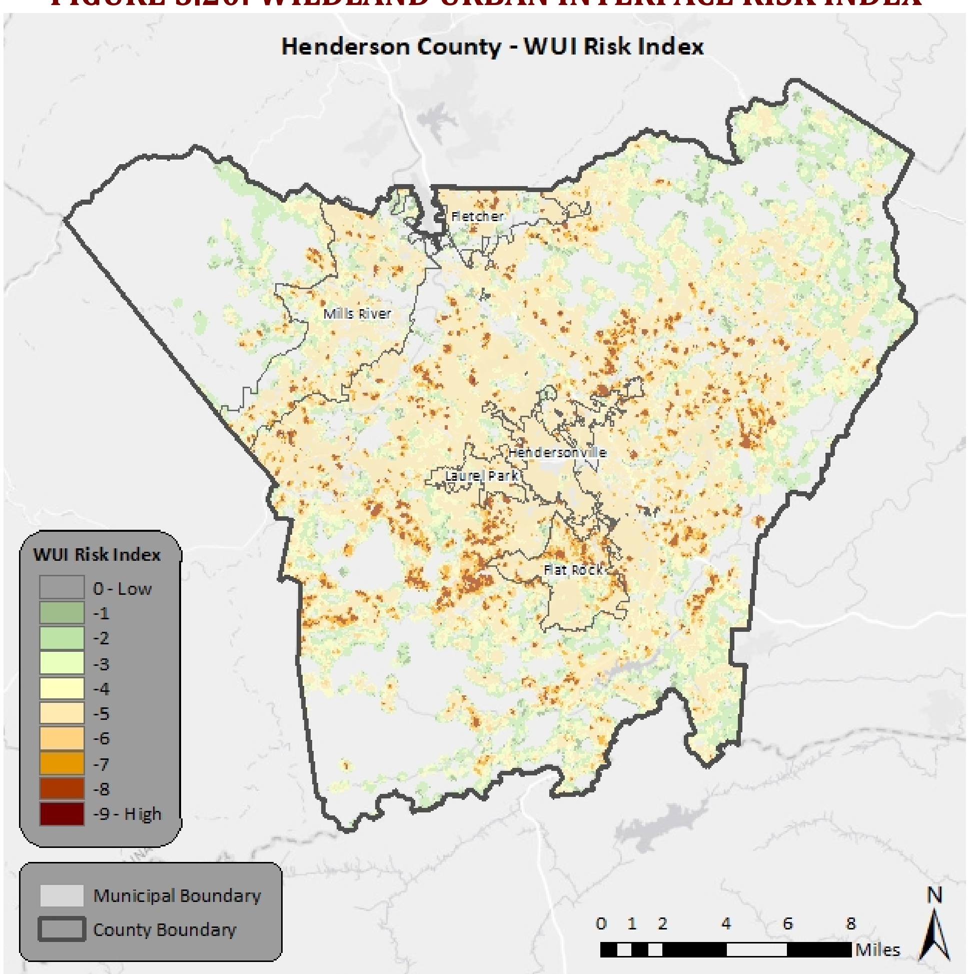
FIGURE 5.19: PERCENT OF TOTAL HOMES IN THE WILDLAND URBAN INTERFACE

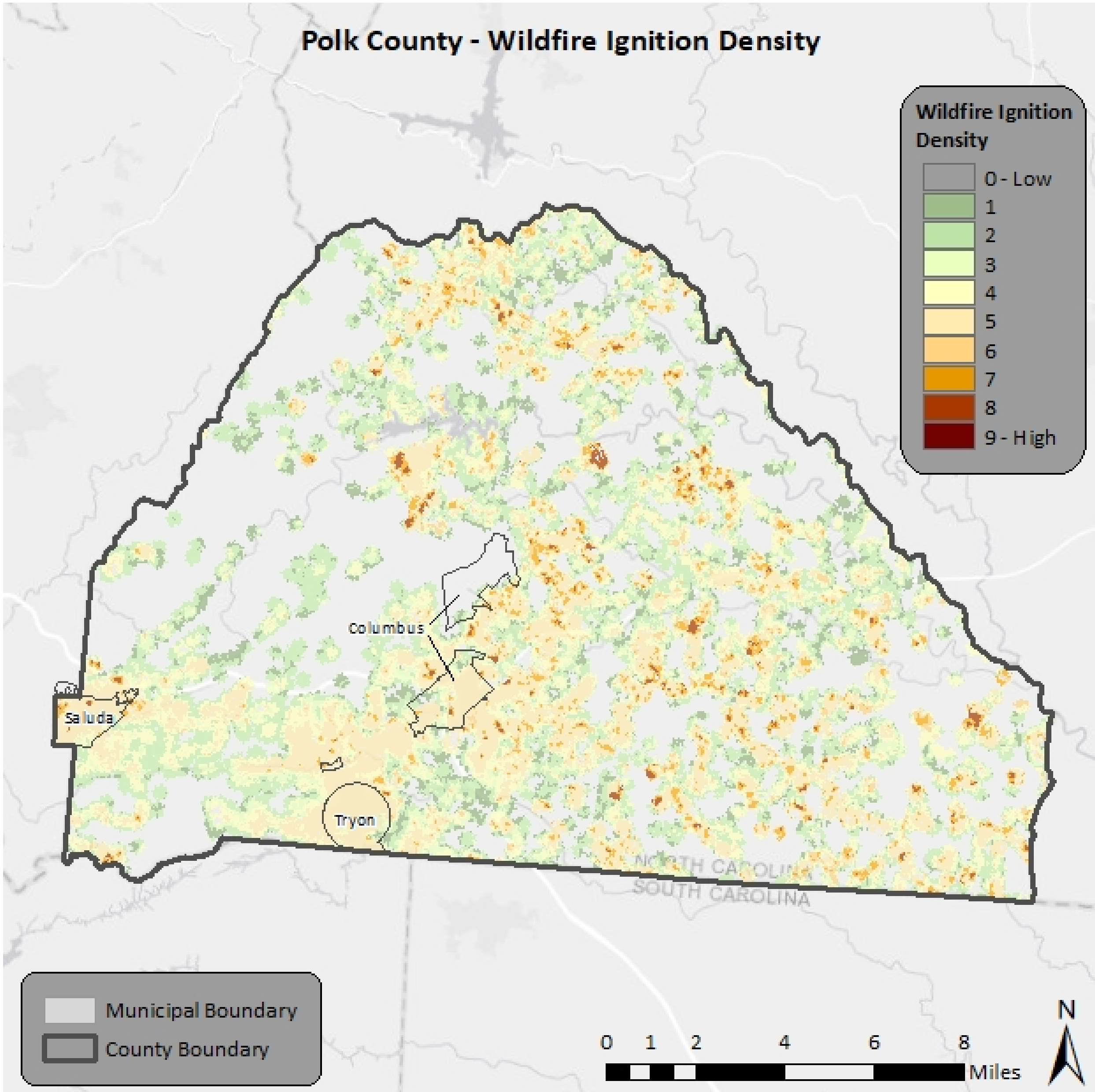


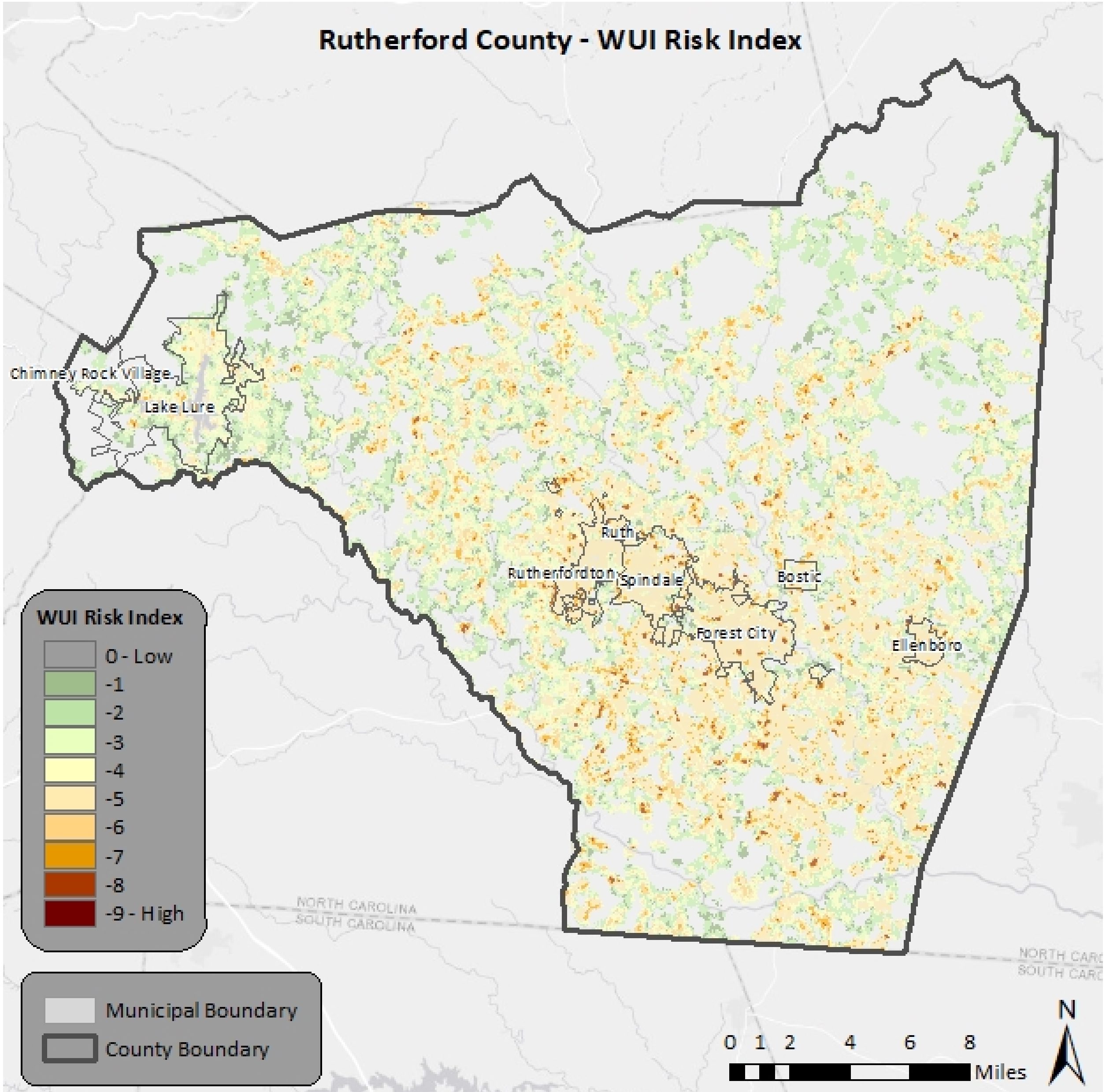
Source: US Department of Agriculture

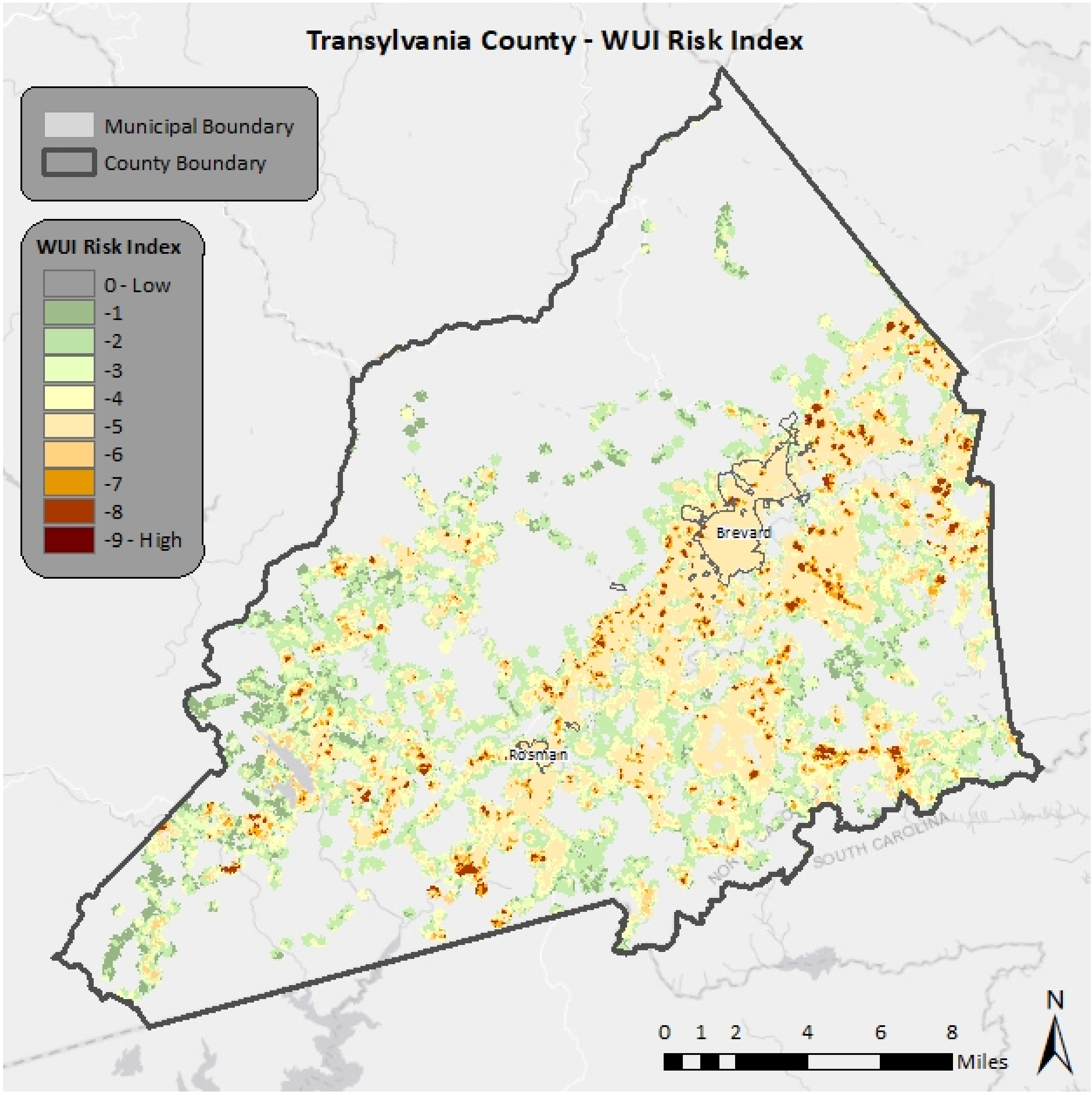
Below, **Figure 5.20** displays the WUI Risk Index specifically for the South Mountains Region.

FIGURE 5.20: WILDLAND URBAN INTERFACE RISK INDEX




Polk County - Wildfire Ignition Density
Wildfire Ignition Density
0 - Low
1
2
3
4
5
6
7
8
9 - High
Columbus
Saluda
Tryon
NORTH CAROLINA
SOUTH CAROLINA
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N


Rutherford County - WUI Risk Index
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
WUI Risk Index
0 - Low
-1
-2
-3
-4
-5
-6
-7
-8
-9 - High
NORTH CAROLINA
SOUTH CAROLINA
Municipal Boundary
County Boundary
0 1 2 4 6 8
Miles
N



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2003 to 2018, the south Mountains 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.

5.12.3 Historical Occurrences

Information from the National Association of State Foresters was used to ascertain historical wildfire events. The National Association of State Foresters reported that a total of 779 events that impacted an area greater than 1 acre have occurred throughout the South Mountains Region since 2001[24]. A summary of these events is presented in **Table 5.30**. The largest of these events was the Party Rock Fire which occurred in Rutherford County in 2016 and impacted 7,913 acres.

TABLE 5.30: SUMMARY OF WILDFIRE EVENTS (2001-2018)

Location	Number of Events	Number of Acres Burned
Henderson County	**226**	**1,367.55**
Flat Rock	3	31.7
Fletcher	2	4.8
Hendersonville	4	10.7
Laurel Park	0	0
Mills River*	12	26.03
Unincorporated Area	205	1,294.32
Polk County	**157**	**2,622**
Columbus	1	18
Saluda	0	0
Tryon	1	4
Unincorporated Area	155	2,600
Rutherford County	**297**	**22,633.13**
Bostic	0	0
Chimney Rock Village	5	62.53
Ellenboro*	0	0
Forest City	3	5.5
Lake Lure	11	54.85
Ruth	1	3
Rutherfordton	0	0
Spindale	1	5
Unincorporated Area	276	22,502.25
Transylvania County	**99**	**968.65**
Brevard	7	39.62
Rosman	0	0
Unincorporated Area	92	929.03
South Mountains Regional Total	**779**	**27,591.33**

Chimney Rock State Park Fire - 2/12/2011

A wildfire that began in the Chimney Rock State Park area on the 12th quickly spread during a period of windy and very dry conditions. The fire burned almost 1500 acres near the Polk and Rutherford County line south of Chimney Rock before being contained on the 20th.

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

[24] These events are only inclusive of those reported by NASFI. It is likely that additional occurrences have occurred and have gone unreported.

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

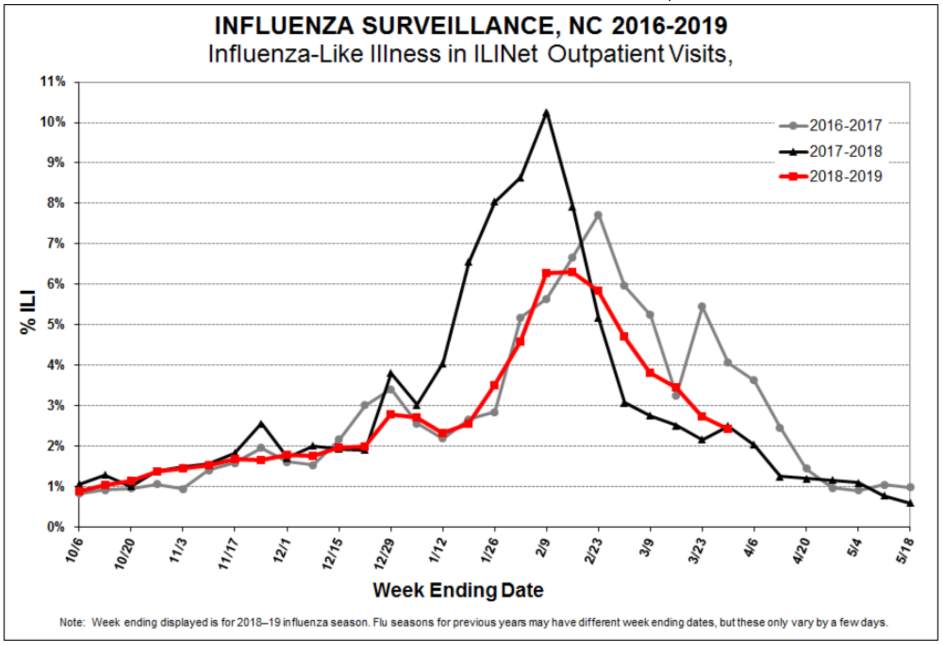
Extent is difficult to measure for an infectious disease event as the extent is largely dependent on the type of disease and on the effect that it has on the population (discussed above). Extent can be somewhat defined by the number of people impacted, which depending on the type of disease could number 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[25].

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.

[25] 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[26]. 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 toxological 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.

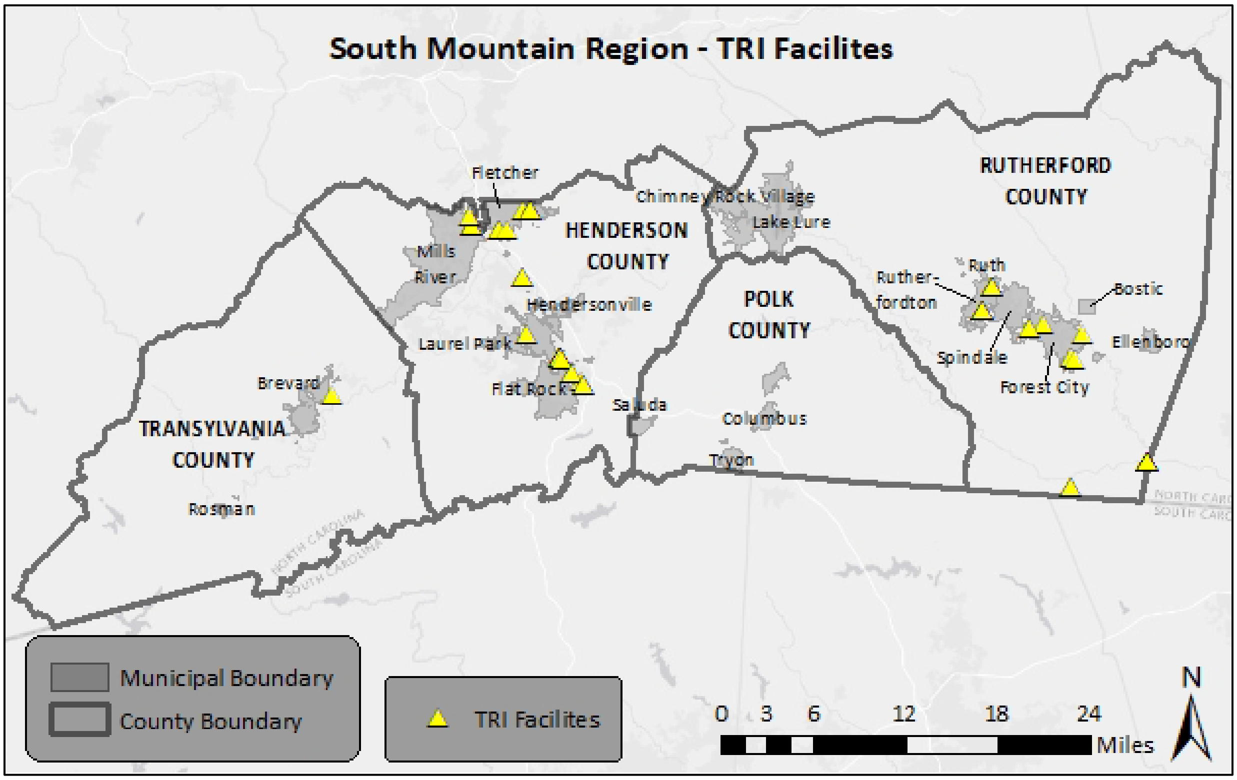
5.14.2 Location and Spatial Extent

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

[26] 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 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.

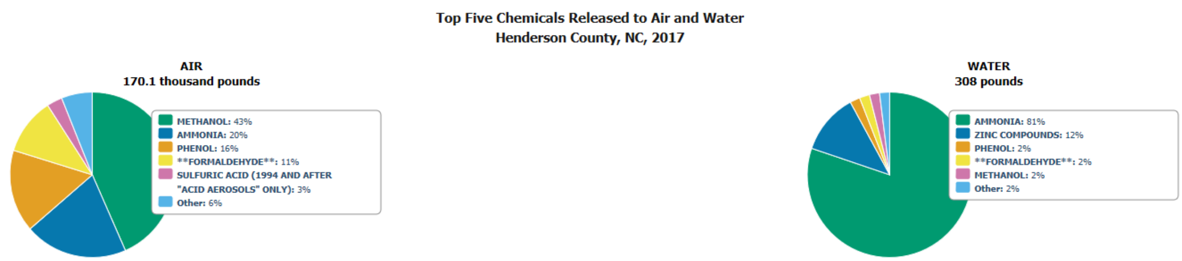
However, prior to 2002, a hazardous material "serious incident" was defined as follows:

- 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.

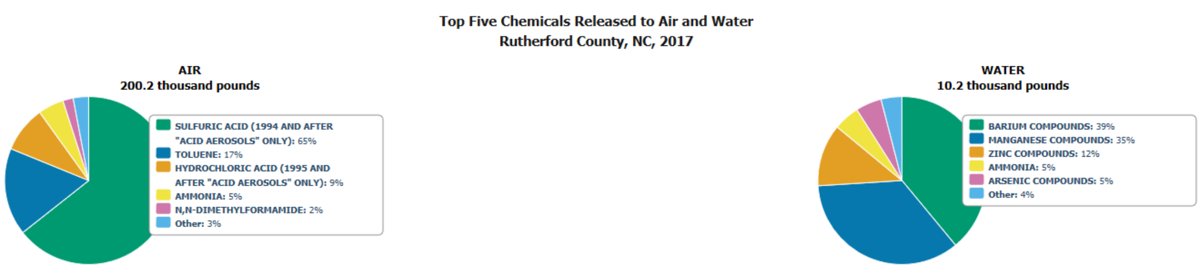
Updated information regarding county specific releases and TRI sites have been provided through 2016. In Henderson County, there are 14 reported TRI facilities. On-site releases have overall gone down in recent years and the majority of the releases by environmental mediums (land, water, or air) have 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

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Henderson County	**9**	**0/0**	**$775,819**
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
Polk County	**2**	**0/0**	**$231,707**

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2018)
Columbus	0	0/0	$0
Saluda	1	0/0	$154,424
Tryon	0	0/0	$0
Unincorporated Area	1	0/0	$231,707
Rutherford County	**1**	**0/0**	**$386,975**
Bostic	0	0/0	$0
Chimney Rock Village	0	0/0	$0
Ellenboro	0	0/0	$0
Forest City	1	0/0	$386,975
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
Transylvania County	**2**	**0/0**	**$87,395**
Brevard	1	0/0	$38,060
Rosman	0	0/0	$0
Unincorporated Area	1	0/0	$49,335
South Mountains Regional Total	**14**	**0/0**	**$1,481,896**

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.

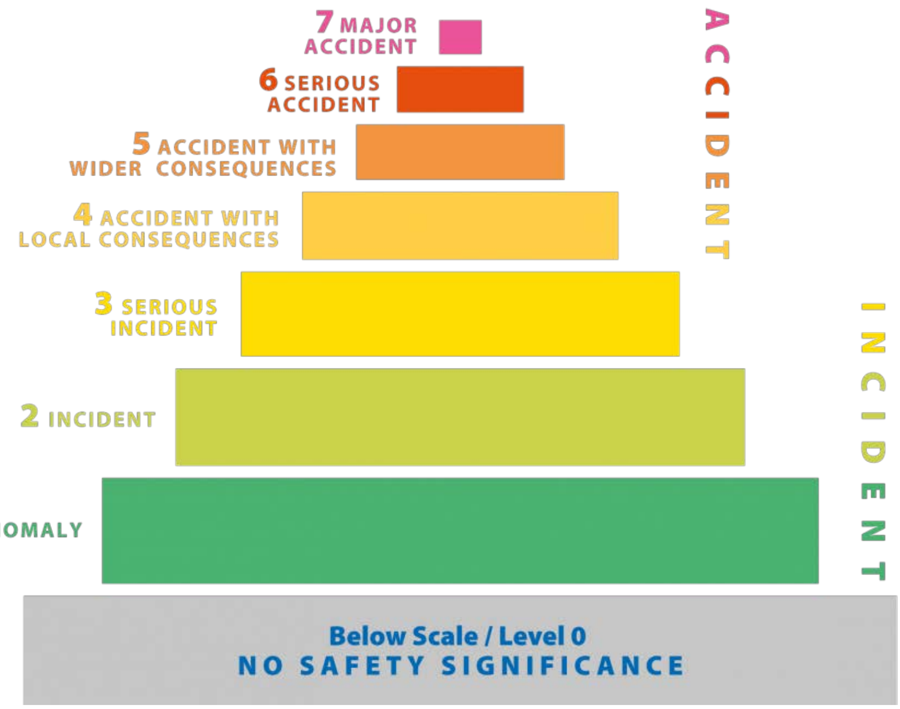
Oconee Nuclear Station, which is the plant located closest to the South Mountains Region, is a 2,568-megawatt power plan that began commercial operation in 1973. It is one of the first three nuclear stations built by Duke Energy and its reactor is a pressurized water reactor. The plant operates with 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[27].

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**).

FIGURE 5.25: INTERNATIONAL NUCLEAR EVENT SCALE



Source: International Atomic Energy Agency

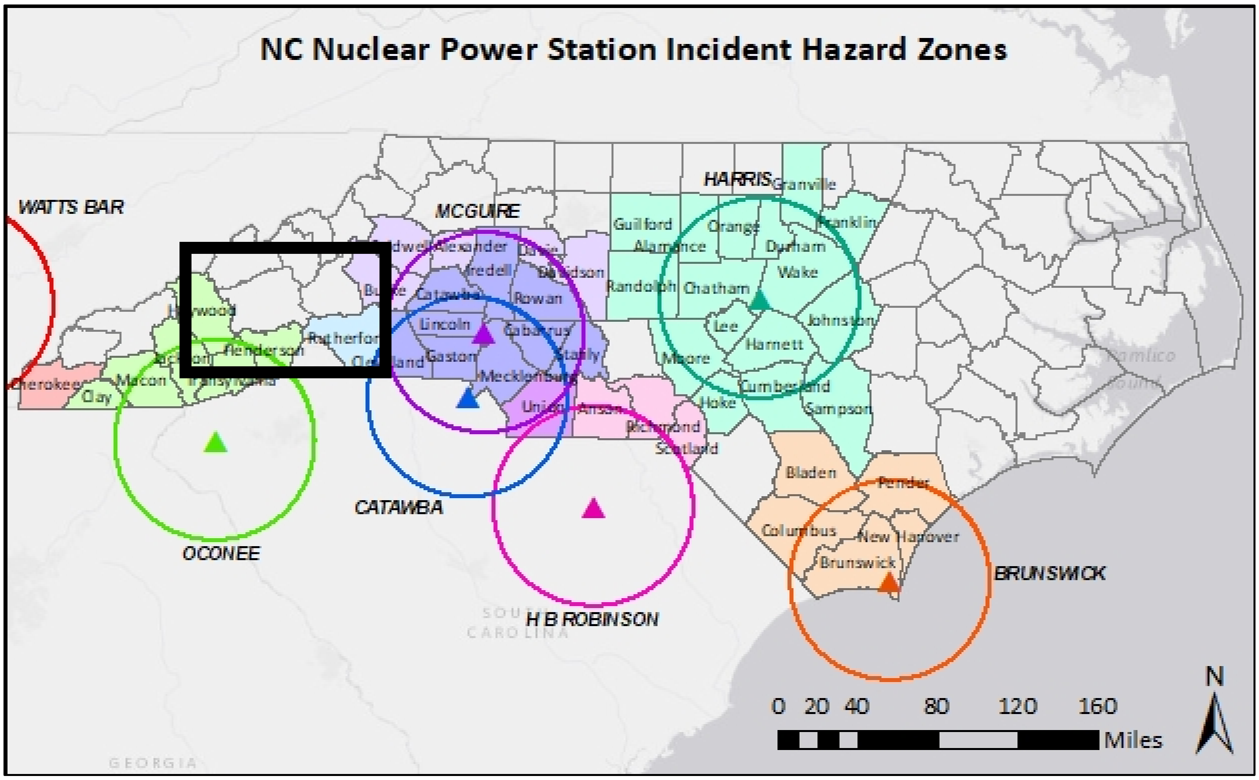
The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants. Areas located within 10 miles of the station are considered to be within the zone of highest risk to a nuclear incident and this radius is the designated evacuation radius recommended by the Nuclear Regulatory 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

[27] *https://www.duke-energy.com/our-company/about-us/power-plants*

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.

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.

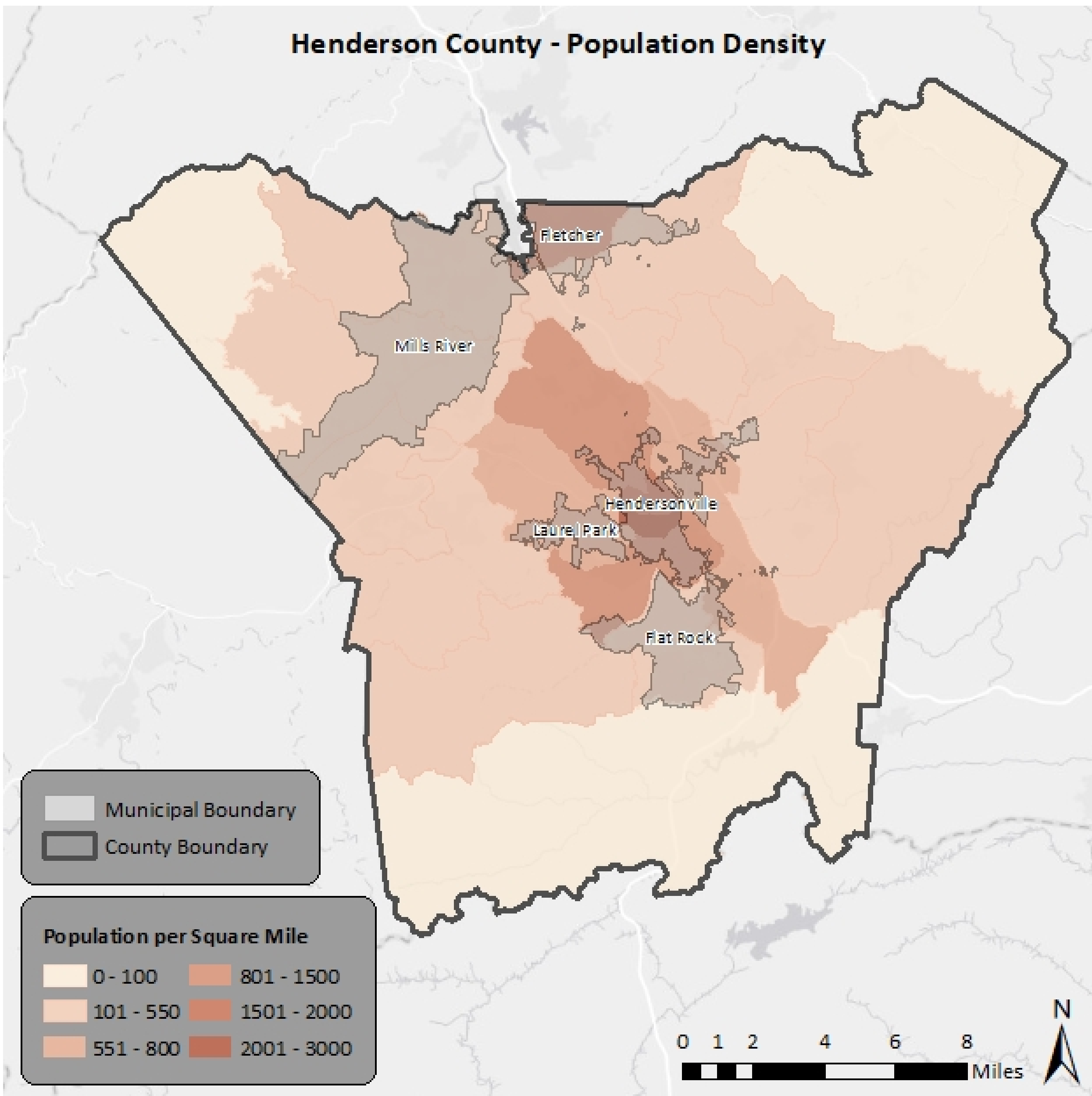
OTHER

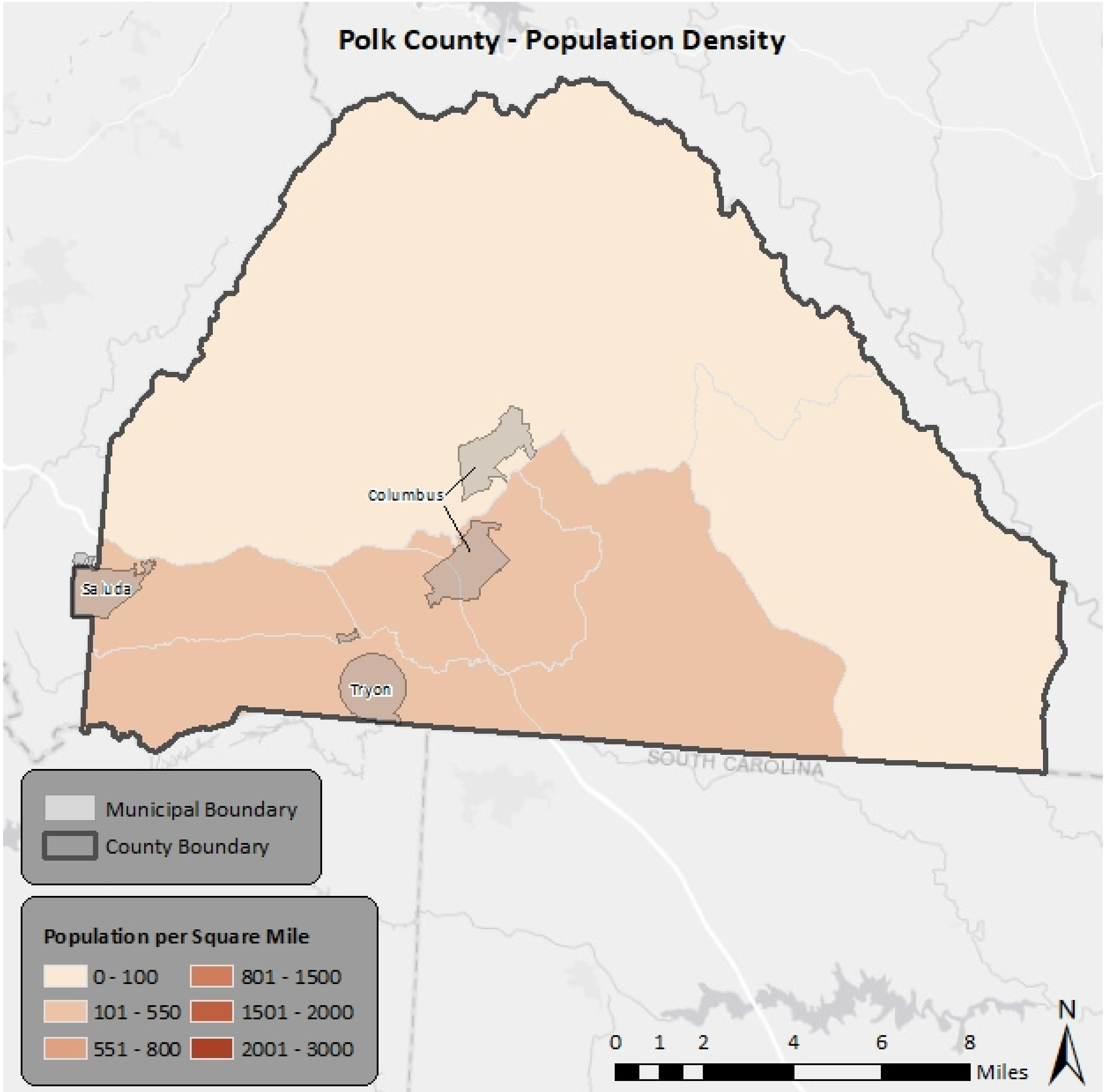
Terrorism Hazard Assessment must also account for modern trends and changes. An additional "OTHER" category should be considered that includes small arms attacks, vehicle ramming attacks, edged weapon attacks, and incendiary attacks.

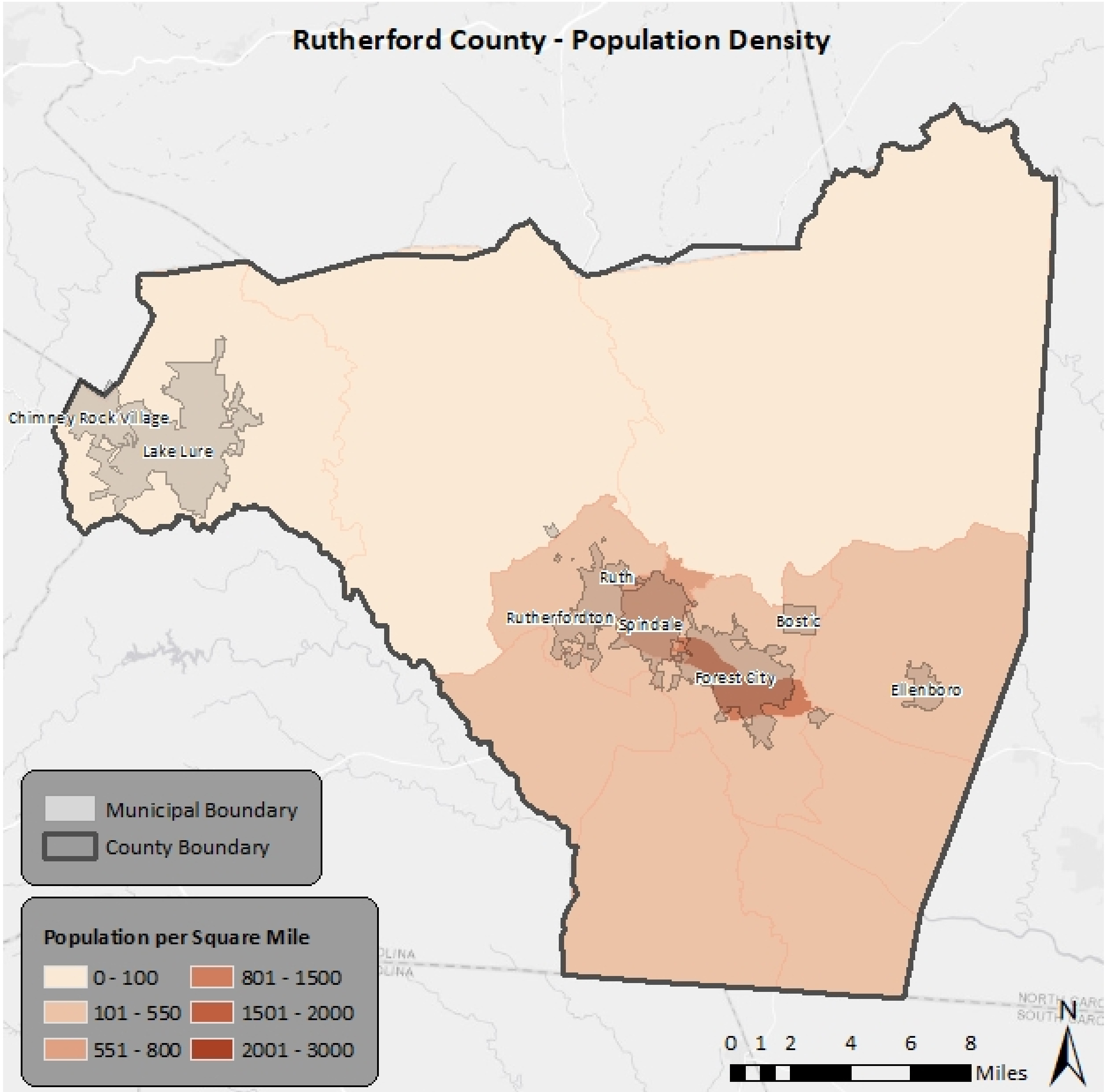
5.16.2 Location and Spatial Extent

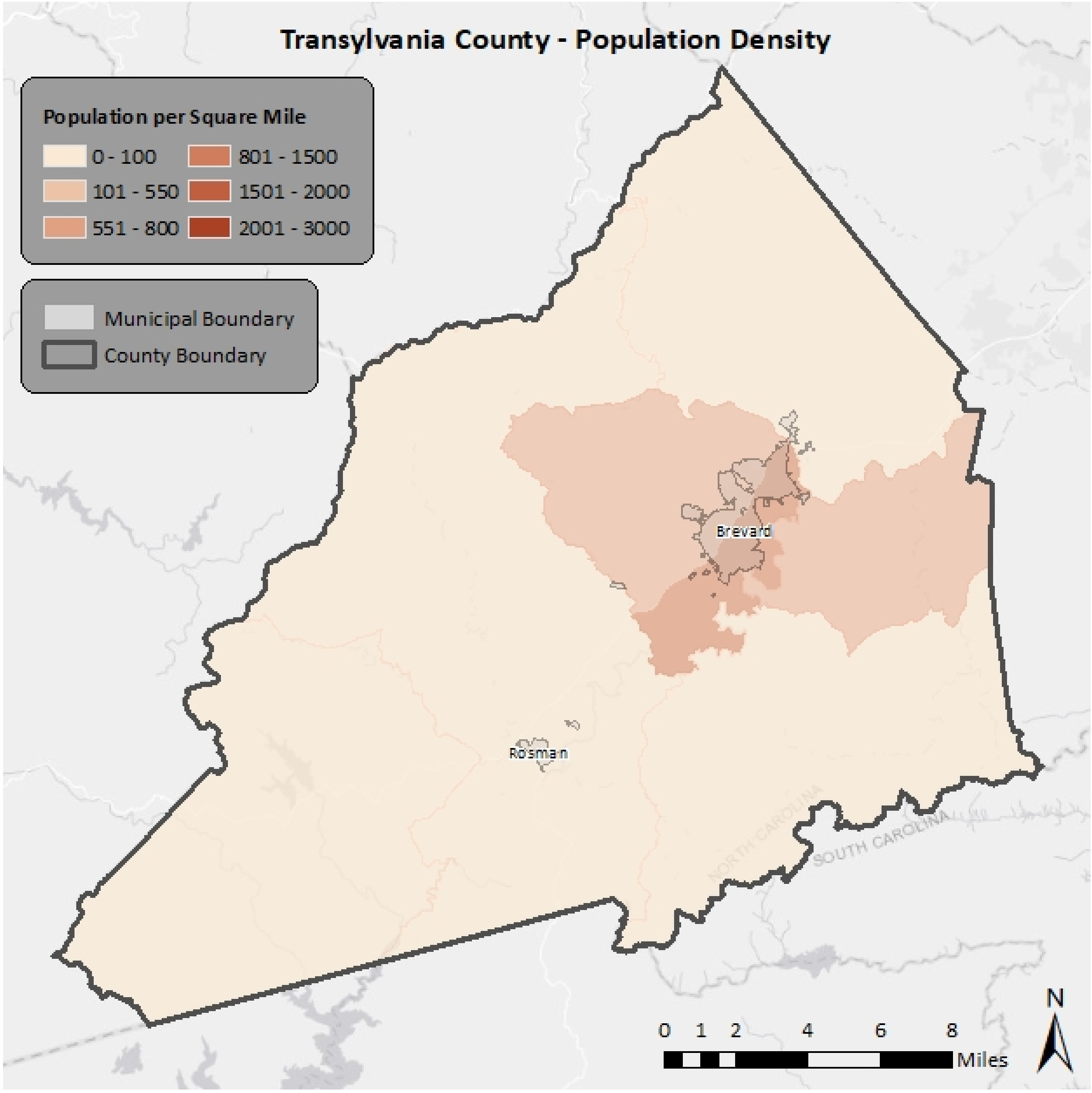
All parts of North Carolina are vulnerable to a terror event; however, terrorism tends to target more densely populated areas. The map in **Figure 5.25** displays the population density in the South Mountains region using census tract levels.

FIGURE 5.27: POPULATION DENSITY IN THE SOUTH MOUNTAINS REGION




Polk County - Population Density
Columbus
Saluda
Tryon
SOUTH CAROLINA
Municipal Boundary
County Boundary
Population per Square Mile
0 - 100
101 - 550
551 - 800
801 - 1500
1501 - 2000
2001 - 3000
0 1 2 4 6 8
Miles
N


Rutherford County - Population Density
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
Municipal Boundary
County Boundary
Population per Square Mile
0 - 100
101 - 550
551 - 800
801 - 1500
1501 - 2000
2001 - 3000
0 1 2 4 6 8
Miles
N



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

Location	2018 Population Estimate
Henderson County	**116,748**
Flat Rock	3,362
Fletcher	8,333
Hendersonville	14,107
Laurel Park	2,321
Mills River	7,352
Unincorporated Area	81,273

Location	2018 Population Estimate
Polk County	**20,611**
Columbus	995
Saluda	692
Tryon	1,612
Unincorporated Area	17,312
Rutherford County	**66,826**
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
Transylvania County	**34,215**
Brevard	7,900
Rosman	609
Unincorporated Area	25,706
South Mountains Regional Total	**238,400**

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.

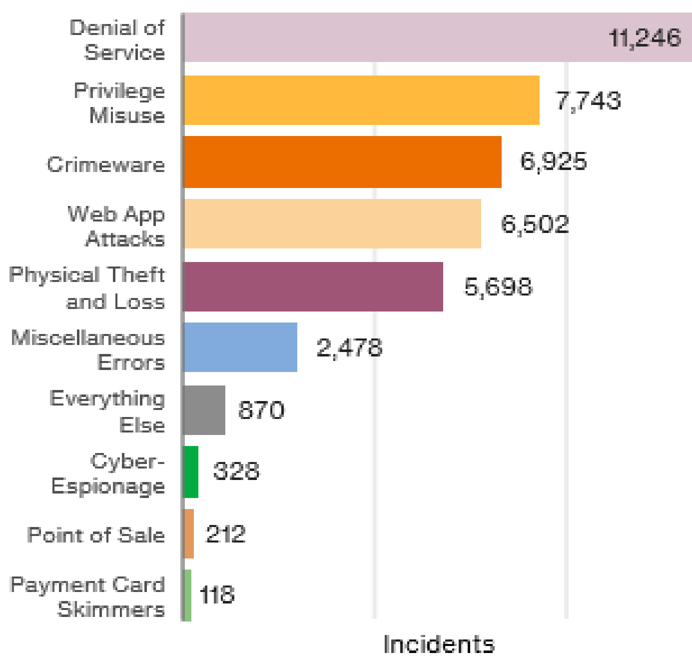
Cyberattacks can happen in both the public and private sector. They may be carried out by a specific individual, or by groups from afar. Many attacks attempt to steal money or to disturb normal operations. According to the 2017 Verizon Report of Data Breaching, 93% of all data breaches had a financial 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 the South Mountains Region is 107 degrees Fahrenheit (reported on August 1, 1999). • Henderson County: 101°F • Polk County: 105°F • Rutherford County: 107°F • Transylvania County: 100°F
Hurricane and Coastal Hazards	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: • Henderson County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots) • Polk County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots) • Rutherford County: Unnamed 1902 Storm, Category 2 Hurricane (31 knots) • Transylvania County: Unnamed 1916 Storm, Tropical Storm (40 knots)
Tornadoes/ Thunderstorms	Tornadoes: 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). • Henderson County: F1 • Polk County: F1 • Rutherford County: F4 • Transylvania County: F2 Thunderstorms: 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.

	• Henderson County: 70 knots • Polk County: 65 knots • Rutherford County: 77 knots • Transylvania County: 70 knots Lightning: 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. Hailstorms: 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. • Henderson County: 2.5 inches • Polk County: 2.75 inches • Rutherford County: 2.0 inches • Transylvania County: 2.75 inches
Severe Winter Weather	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. • Henderson County: 22 inches • Polk County: 15 inches • Rutherford County: 16 inches • Transylvania County: 17 inches
Earthquakes	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. • Henderson County: VI, 10.0 km to epicenter • Polk County: V, 31.0 km to epicenter • Rutherford County: V, 241.0 km to epicenter • Transylvania County: V, 26.0 km to epicenter
Geological	Landslide: 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. Sinkhole: 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. Erosion: 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.
Dam Failure	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. • Henderson County: 45 high hazard dams • Polk County: 10 high hazard dams • Rutherford County: 22 high hazard dams • Transylvania County: 47 high hazard dams
Flooding	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 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.

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

Other Hazards	
Wildfires	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 foreach county. • Henderson County: The greatest number of fires to occur in any year was 77 in 2006. • Polk County: The greatest number of fires to occur in any year was 34 in 2006. • Rutherford County: The greatest number of fires to occur in any year was 95 in 2011. • Transylvania County: The greatest number of fires to occur in any year was 35 in 2006. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the region.
Infectious Disease	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.
Technological Hazards	
Hazardous Materials Incident	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. • Henderson County: 25 LGA • Polk County: 1,6587.5 LGA • Rutherford County: 0 • Transylvania County: 50 LGA
Radiological Emergency – Fixed Nuclear Facilities	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 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[28], 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 equals the final PRI value, as demonstrated in the example equation below:

PRI VALUE = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .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.

[28] 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.

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 affected	1	20%
	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					
		Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Natural Hazards							
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 Weather		Likely	Critical	Large	More than 24 hours	Less than one week	3.3
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
Other Hazards							
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
Technological Hazards							
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.

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

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind / High Wind Flooding Wildfires
MODERATE RISK	Drought Hurricanes and Coastal Hazards Dam Failure Excessive Heat Geological Hazardous Substances
LOW RISK	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

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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[1], 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 Geographic Information Systems (GIS). These hazards include:

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[1] 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.

- 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[2]. 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. <u>Improved Property</u>: Includes all improved properties in the South Mountains Region according to local parcel data provided by counties and the Tribe. The information has been

[2] 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)[3].

TABLE 6.1: IMPROVED PROPERTY IN THE SOUTH MOUNTAINS REGION

Location[4]	Number of Parcels	Total Assessed Value of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Henderson County	**67,633**	**$11,631,180,800**	**47,428**	**$8,669,984,200**
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
Polk County	**17,580**	**$3,403,072,143**	**10,472**	**$1,758,155,848**
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
Rutherford County	**56,565**	**$5,372,648,553**	**31,946**	**$3,515,072,482**
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
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

[3] 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.
[4] Number of buildings for each county is based on the number of parcels with an improved building value greater than zero.

Unincorporated Area	40,580	$3,555,136,786	22,258	$2,396,602,445
Transylvania County	**32,528**	**$23,348,568,298**	**20,065**	**$11,086,316,675**
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
South Mountains Regional Total	**174,306**	**$43,755,469,794**	**109,911**	**$25,029,529,205**

Source: Local governments

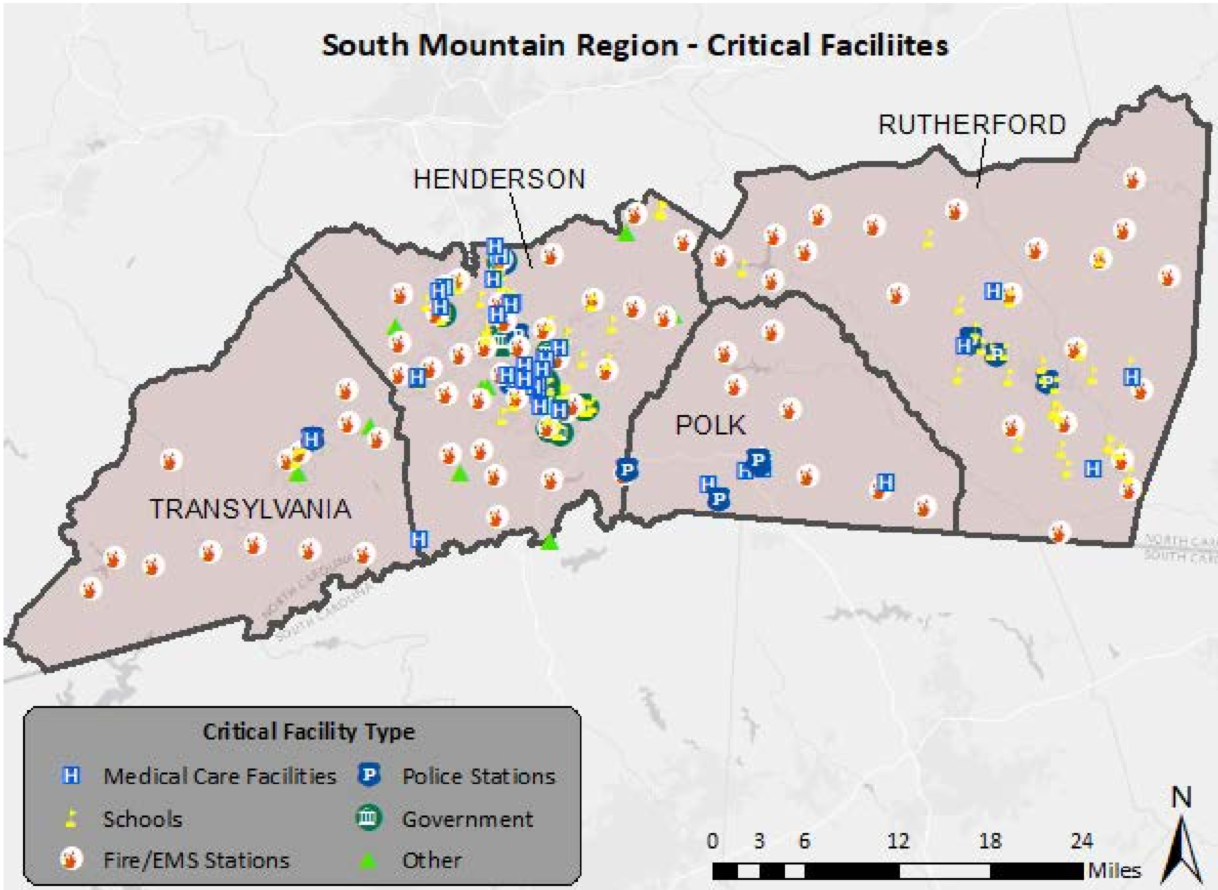
The following table lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, schools, and other critical facilities located in the South Mountains Region. Local governments at the county level provided a majority of the data for this analysis. In addition, **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
Henderson County	**35**	**7**	**42**	**0**	**40**	**35**	**12**
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
Polk County	**10**	**5**	**4**	0	**7**	**0**	**0**
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
Rutherford County	**22**	**4**	**4**	**0**	**25**	**0**	**0**
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
Transylvania County	**13**	**2**	**1**	**0**	**2**	**0**	**2**
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
South Mountains Regional Total	**80**	**18**	**51**	**0**	**74**	**35**	**14**

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

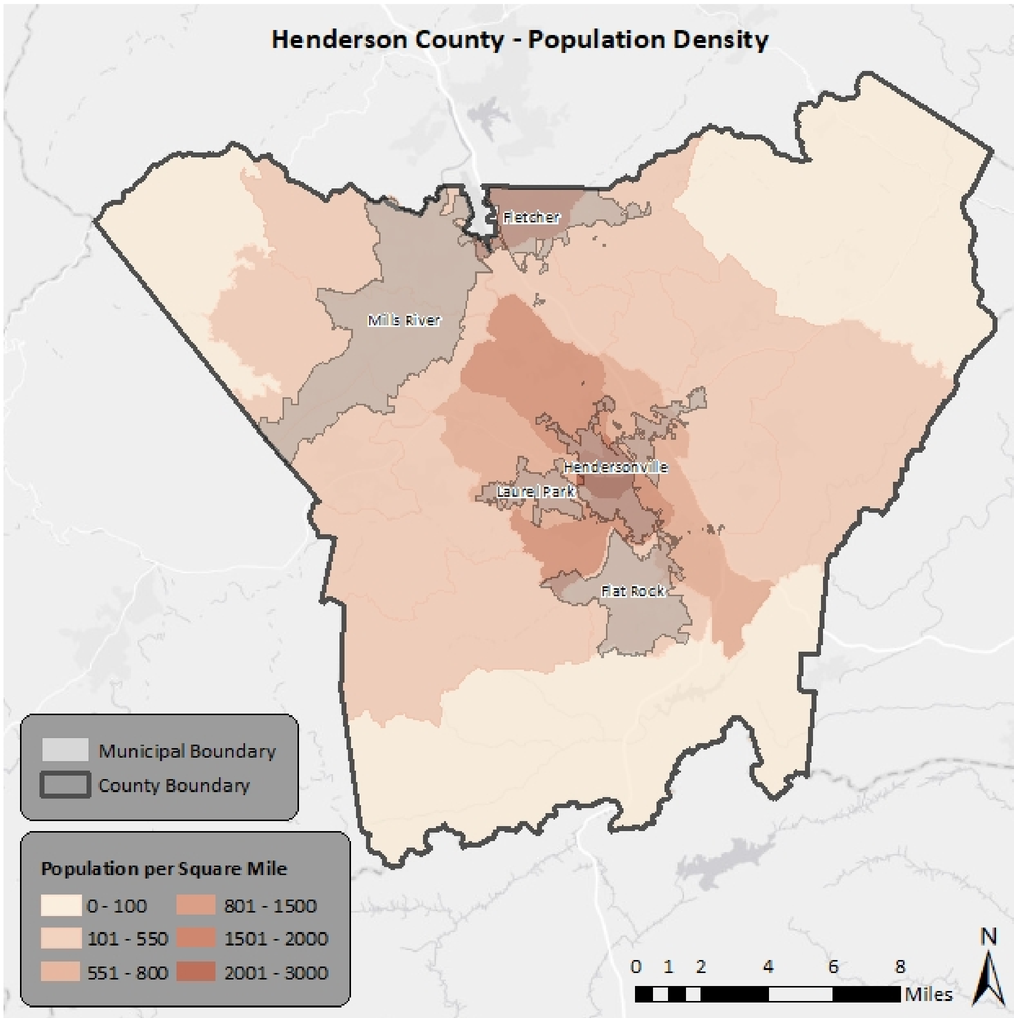
Location	2018 Population Estimates
Henderson County	116,748
Polk County	20,611
Rutherford County	66,826
Transylvania County	34,215
South Mountains Regional Total	**238,400**

Source: U.S. Census Bureau

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

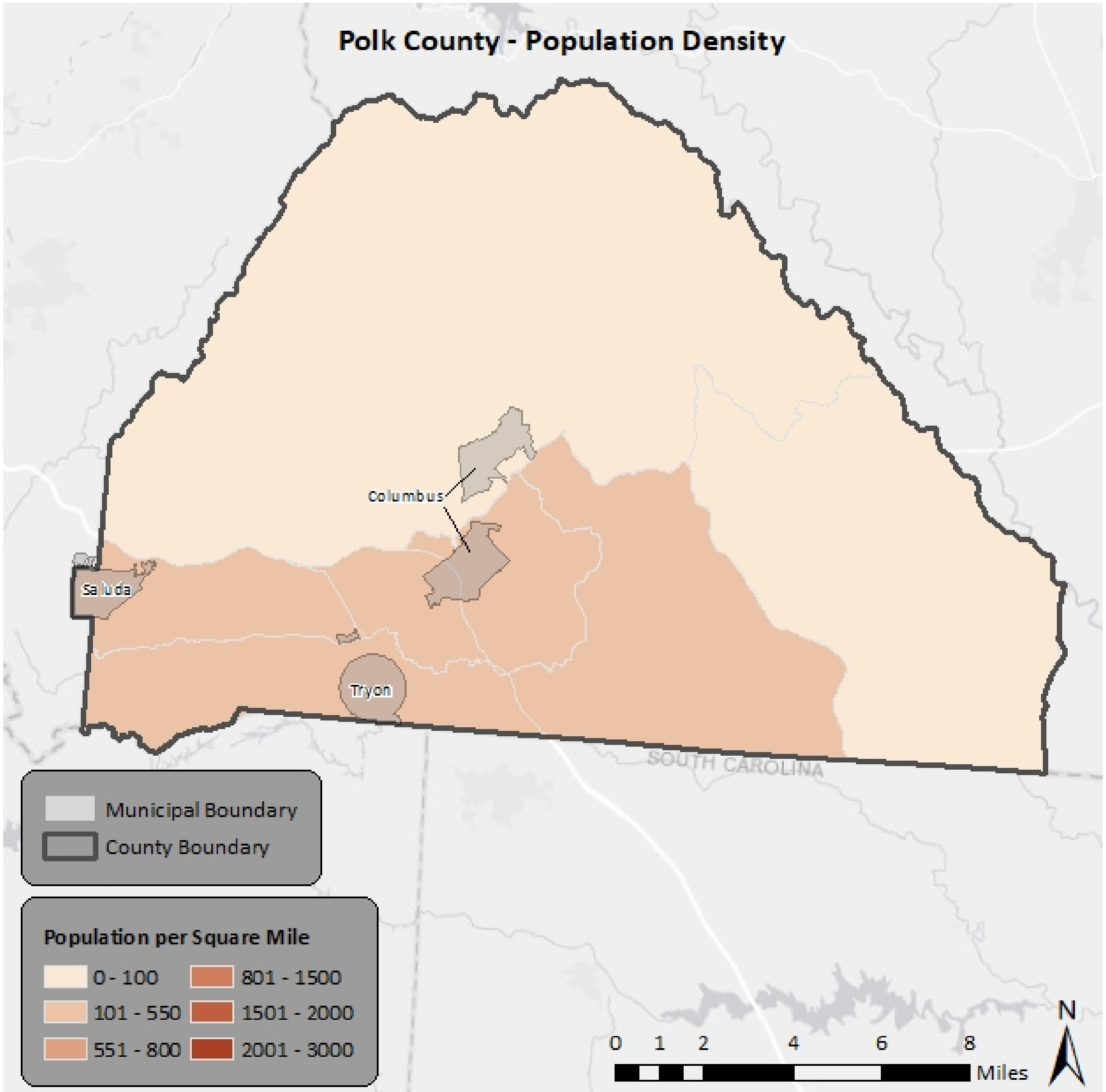
In addition, **Figure 6.2** illustrates the population density by census tract as it was reported by the US Census Bureau in 2010 and updated with 2017 population estimates.

FIGURE 6.2: POPULATION DENSITY IN HENDERSON COUNTY



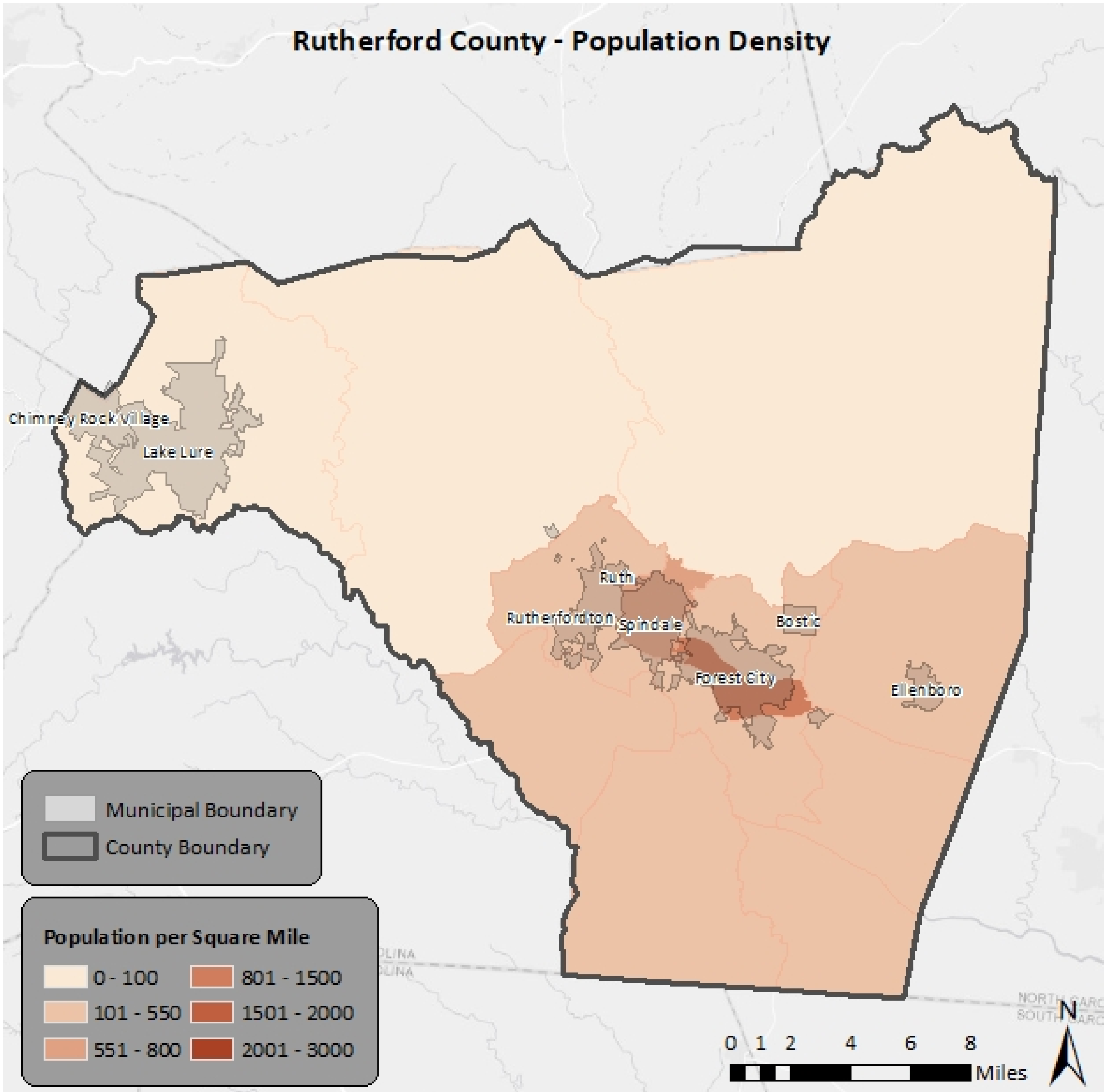
Source: U.S. Census Bureau, 2010

FIGURE 6.3: POPULATION DENSITY IN POLK COUNTY



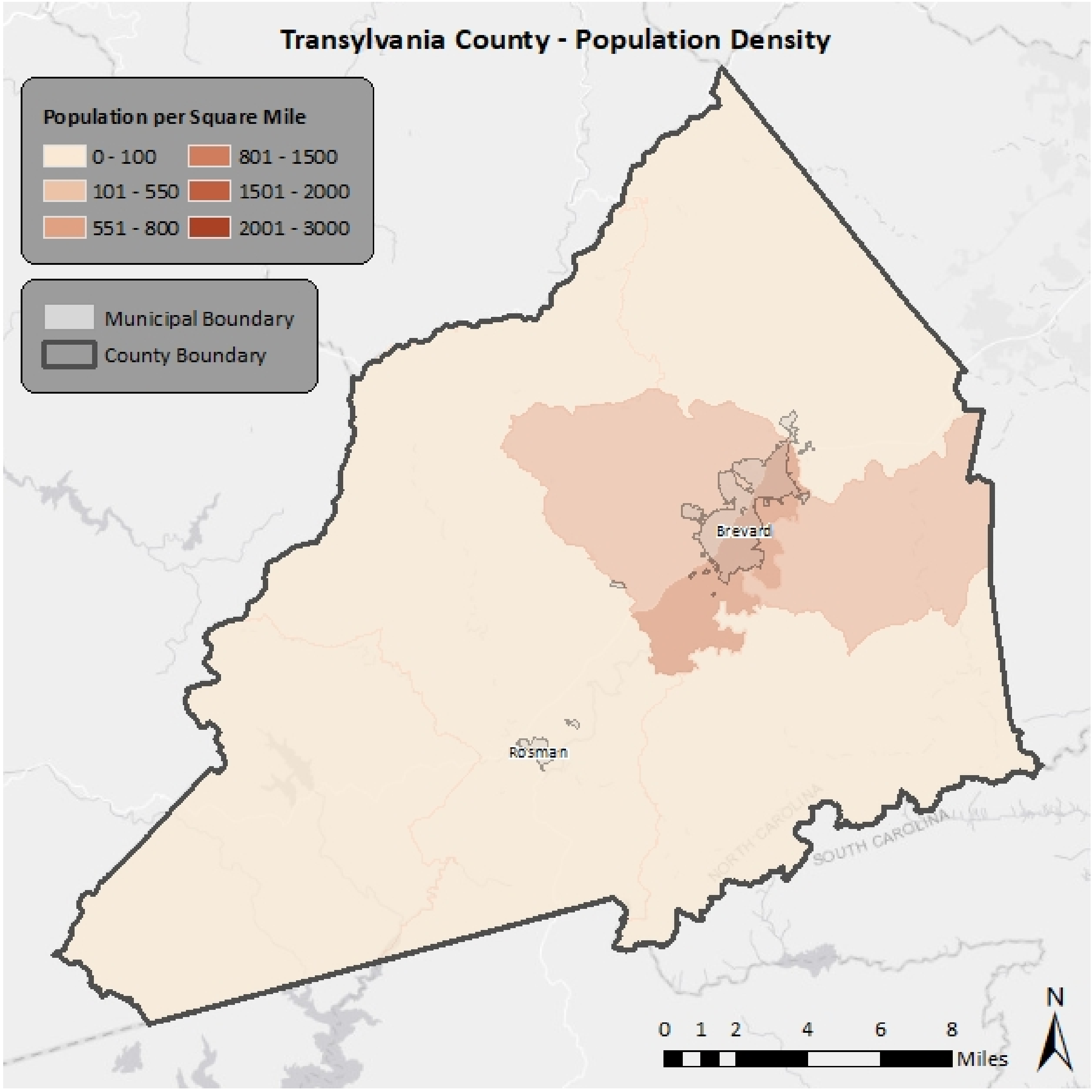
Source: U.S. Census Bureau, 2010

FIGURE 6.4: POPULATION DENSITY IN RUTHERFORD COUNTY



Source: U.S. Census Bureau, 2010

FIGURE 6.5: POPULATION DENSITY IN TRANSYLVANIA COUNTY



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
Henderson County	**56,398**	**525**	**0.93**
Flat Rock	2,171	0	0.00

Location	Total Housing Units (2017)	Units Built 2014 or Later	% Building Stock Built Post-2014
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
Polk County	**11,603**	**70**	0.60
Columbus	601	0	0.00
Saluda	526	3	0.57
Tryon	1,109	0	0.00
Unincorporated Area	9,367	67	0.72
Rutherford County	**34,181**	**166**	0.49
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
Transylvania County	**19,493**	**84**	0.43
Brevard	4,125	26	0.63
Rosman	319	2	0.63
Unincorporated Area	15,049	56	0.37
South Mountains Regional Total	**121,675**	**845**	**0.69**

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
Henderson County	**116,748**	**115,457**	**113,723**	**106,740**	**9.38%**
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%
Polk County	**20,611**	**20,518**	**20,388**	**20,510**	**0.49%**
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%
Rutherford County	**66,826**	**66,568**	**66,311**	**67,810**	**-1.45%**
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%
Transylvania County	**32,415**	**33,825**	**33,406**	**33,090**	**-2.04%**
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%
South Mountains Regional Total	**236,600**	**236,368**	**233,828**	**228,150**	**3.70%**

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

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
Henderson County	**27,549**	**48,732**	**$5,003,698**	**2,604**	**$957,422**	**686**	**$292,295**	**52,022**	**$6,253,415**
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
Polk County	**11,074**	**10,137**	**$863,723**	**738**	**$192,501**	**194**	**$85,137**	**11,069**	**$1,141,362**
Columbus	499	358	$29,927	109	$9,940	32	$5,580	499	$45,447
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

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
Unincorporated Area	8,574	8,101	$668,471	369	$163,910	103	$71,597	8,573	$903,979
Rutherford County	**37,096**	**34,997**	**$3,121,496**	**2,503**	**$903,071**	**450**	**$178,793**	**37,950**	**$4,203,359**
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
Transylvania County	**11,301**	**20,041**	**$1,366,504**	**1,113**	**$168,875**	**401**	**$71,485**	**21,555**	**$1,606,864**
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
South Mountains Regional Total	**87,020**	**113,907**	**$10,355,421**	**6,958**	**$2,221,869**	**1,731**	**$627,710**	**122,596**	**$13,205,000**

Source: NCEM Risk Management Tool

Table 6.7: Population Vulnerabilities to Hurricane Winds

Location	Elderly At Risk	Children At Risk	Total At Risk
Henderson County	**23,639**	**5,957**	**105,700**
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
Polk County	**4,962**	**925**	**20,378**
Columbus	228	43	938
Saluda	172	33	707
Tryon	621	115	2,551
Unincorporated Area	3,941	734	16,182
Rutherford County	**11,667**	**3,857**	**67,479**
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
Ruth	77	25	442
Rutherfordton	744	246	4,301

Location	Elderly At Risk	Children At Risk	Total At Risk
Spindale	750	248	4,342
Unincorporated Area	7,732	2,557	44,721
Transylvania County	**8,437**	**1,499**	**32,680**
Brevard	2,568	456	9,948
Rosman	132	24	513
Unincorporated Area	5,737	1,019	22,219
South Mountains Regional Total	**48,705**	**12,238**	**226,237**

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 TORNADOES HAZARD

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
Henderson County	**27,759**	**49,208**	**$7,033,718,797**	**2,605**	**$2,920,143,027**	**686**	**$736,961,626**	**52,499**	**$10,690,823,450**
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
Polk County	**11,147**	**10,208**	**$1,357,464,496**	**739**	**$551,302,686**	**195**	**$175,838,752**	**11,142**	**$2,084,605,932**
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
Rutherford County	**37,278**	**35,183**	**$4,096,226,618**	**2,504**	**$2,591,112,971**	**450**	**$376,334,811**	**38,137**	**$7,063,674,401**
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
Transylvania County	**11,422**	**20,274**	**$2,547,065,896**	**1,114**	**$633,327,179**	**401**	**$233,799,734**	**21,789**	**$3,414,192,809**
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
South Mountains Regional Total	**87,606**	**114,873**	**$15,034,475,807**	**6,962**	**$6,695,885,863**	**1,732**	**$1,522,934,923**	**123,567**	**$23,253,296,592**

Source: NCEM Risk Management Tool

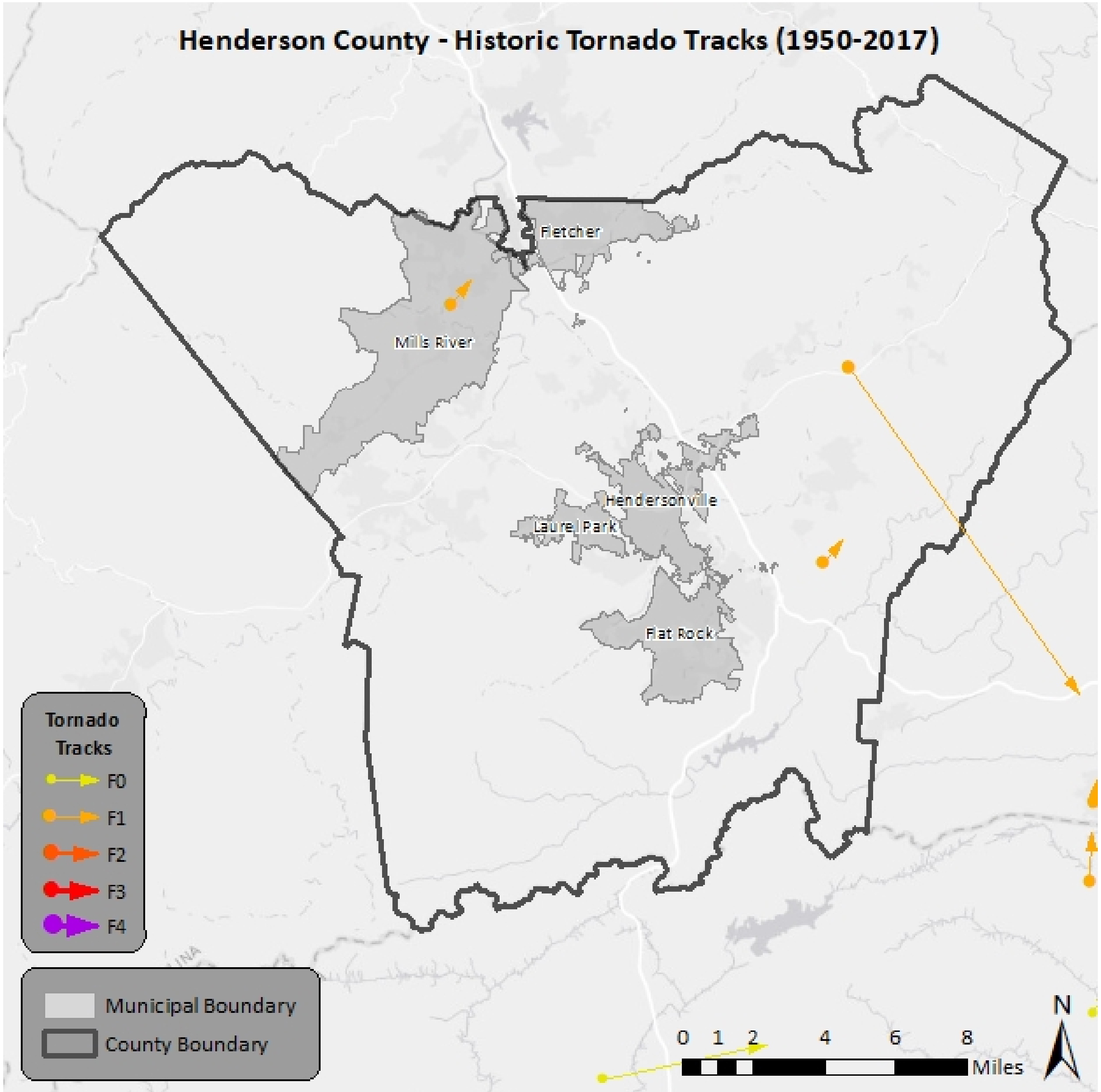
TABLE 6.9: POPULATION VULNERABILITY TO THE TORNADOES HAZARD

Location	Elderly at Risk	Children at Risk	Total at Risk
Henderson County	**23,863**	**6,013**	**106,703**
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
Polk County	**4,996**	**932**	**20,518**
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,966	739	16,285
Rutherford County	**11,726**	**3,877**	**67,820**
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
Transylvania County	**8,539**	**1,517**	**33,076**
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,794	1,029	22,441
South Mountains Regional Total	**49,124**	**12,339**	**228,117**

Source: NCEM Risk Management Tool

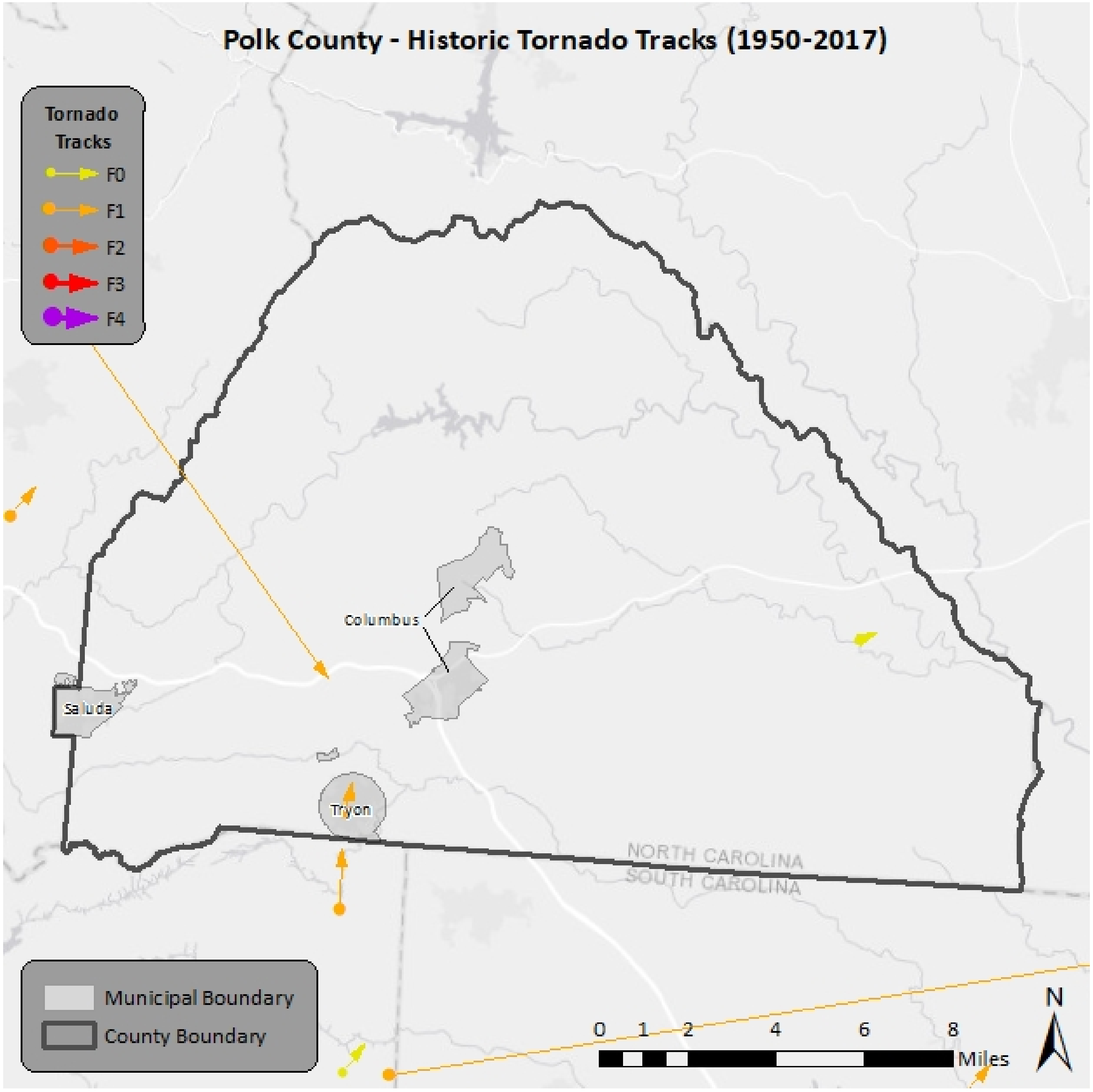
A map of historical tornado points of origin and paths can be seen below in **Figure 6.3.**

FIGURE 6.6: HISTORICAL TORNADO TRACKS IN HENDERSON COUNTY



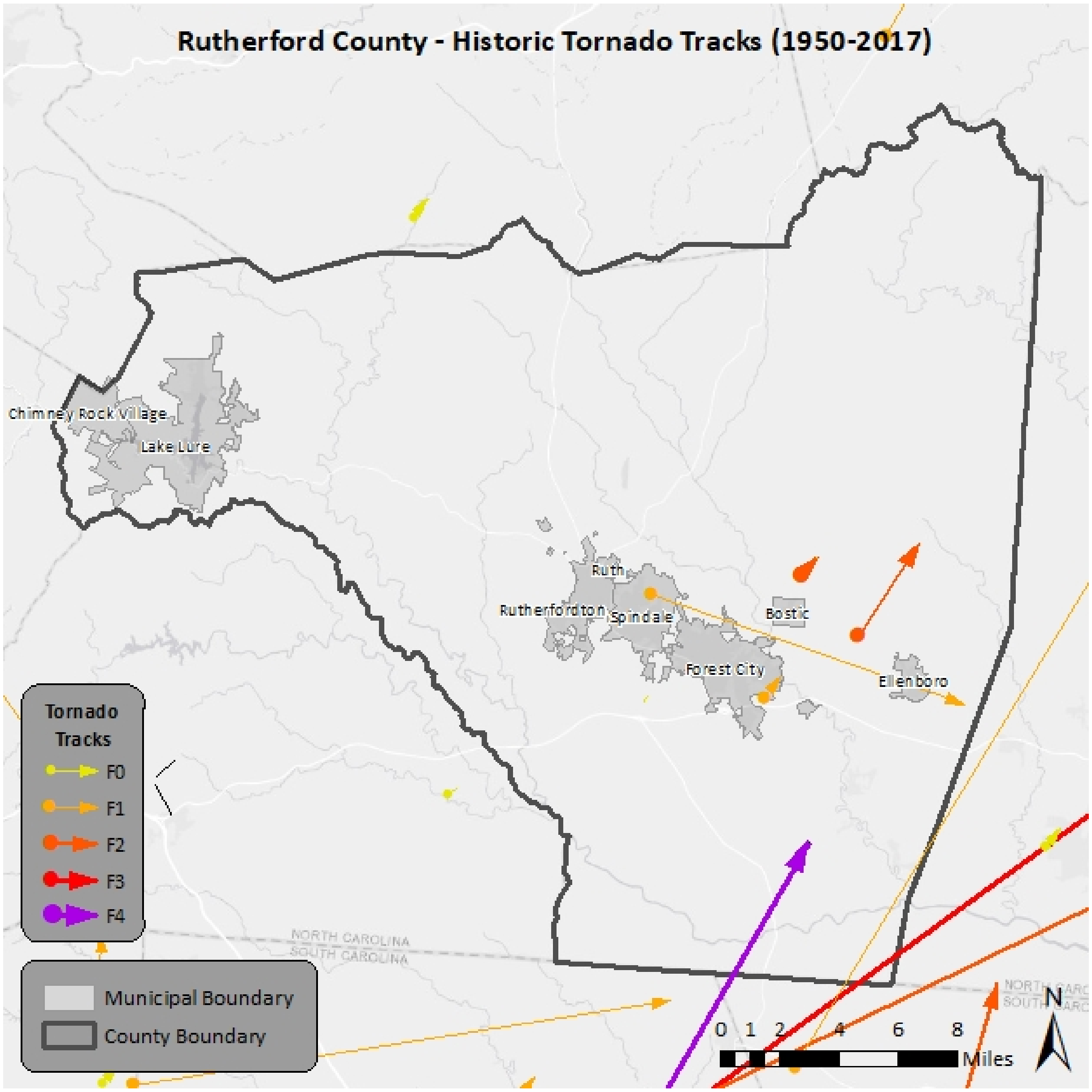
Source: NCEM Risk Management Tool

FIGURE 6.7: HISTORICAL TORNADO TRACKS IN POLK COUNTY



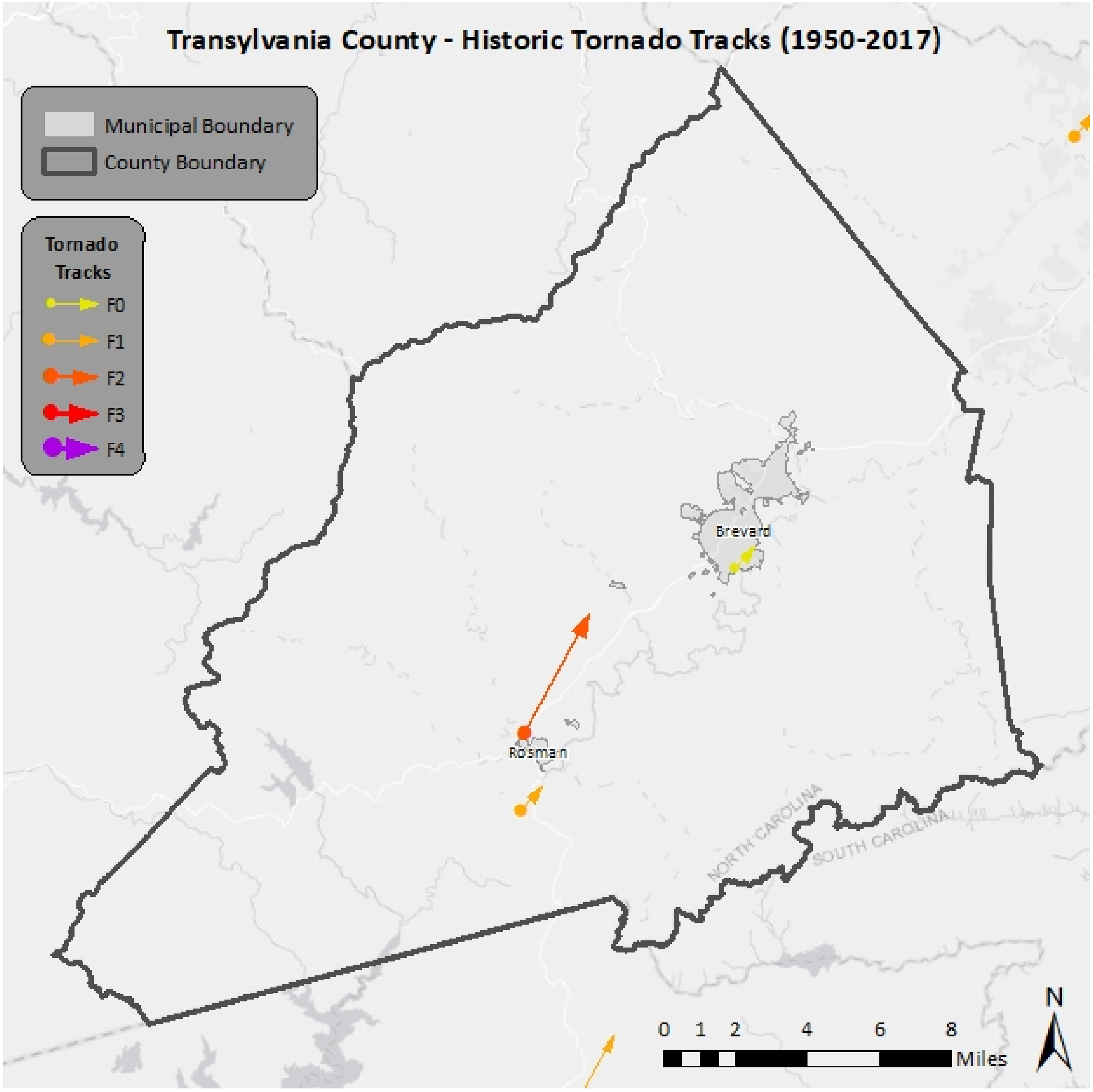
Source: NCEM Risk Management Tool

FIGURE 6.8: HISTORICAL TORNADO TRACKS IN RUTHERFORD COUNTY



Source: NCEM Risk Management Tool

FIGURE 6.9: HISTORICAL TORNADO TRACKS IN TRANSYLVANIA COUNTY



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

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
Henderson County	**27,758**	**49,203**	**$18,000,943**	**2,605**	**$4,743,326**	**686**	**$1,464,593**	**52494**	**$24,208,863**
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
Polk County	**11,125**	**10,188**	**$3,125,138**	**738**	**$961,063**	**194**	**$433,003**	**11,120**	**$4,519,203**
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
Rutherford County	**37,255**	**35,161**	**$10,637,649**	**2503**	**$4,112,474**	**450**	**$840,432**	**38,114**	**$15,590,553**
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
Transylvania County	**11,421**	**20,264**	**$5,223,062**	**1,113**	**$754,867**	**401**	**$311,362**	**21,778**	**$6,289,291**
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
South Mountains Regional Total	**87,559**	**114,816**	**$36,986,792**	**6,959**	**$10,571,730**	**1,731**	**$3,049,390**	**123,506**	**$50,607,910**

Source: NCEM Risk Management Tool

TABLE 6.11: POPULATION VULNERABILITY TO THUNDERSTORM WINDS

Location	Elderly at Risk	Children at Risk	Total at Risk
Henderson County	**23,861**	**6,012**	**106,693**
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
Polk County	**16,792**	**4,833**	**88,763**
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,956	737	16,245
Rutherford County	**11,719**	**3,875**	**67,780**
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
Transylvania County	**8,535**	**1,516**	**33,061**
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,790	1,028	22,426
South Mountains Regional Total	**60,907**	**16,236**	**296,297**

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

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
Henderson County	**27,759**	**49,208**	**$16,941,761**	**2605**	**$13,809,002**	**686**	**$3,791,487**	**52,499**	**$34,542,252**
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
Polk County	**11,147**	**10,208**	**$3,212,331**	**739**	**$2,589,208**	**195**	**$903,671**	**11,142**	**$6,705,208**
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
Rutherford County	**37,278**	**35,183**	**$9,115,408**	**2504**	**$11,467,660**	**450**	**$1,893,739**	**38,137**	**$22,476,806**
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
Transylvania County	**11,422**	**20,274**	**$6,901,705**	**1,114**	**$3,251,460**	**401**	**$1,421,547**	**21,789**	**$11,574,713**
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
South Mountains Regional Total	**87,606**	**114,873**	**$36,171,205**	**6,962**	**$31,117,330**	**1,732**	**$8,010,444**	**123,567**	**$75,298,979**

Source: NCEM Risk Management Tool

TABLE 6.13: POPULATION VULNERABILITY TO THE EARTHQUAKE HAZARD

Location	Elderly At Risk	Children At Risk	Total At Risk
Henderson County	**23,863**	**6,013**	**106,703**
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
Polk County	**4,996**	**932**	**20,518**
Columbus	228	43	938
Saluda	172	33	709
Tryon	630	117	2,586
Unincorporated Area	3,966	739	16,285
Rutherford County	**11,726**	**3,877**	**67,820**
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
Transylvania County	**8,539**	**1,517**	**33,076**
Brevard	2,613	464	10,122
Rosman	132	24	513
Unincorporated Area	5,794	1,029	22,441
South Mountains Regional Total	**49,124**	**12,339**	**228,117**

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
Henderson County	**0**	**10,338**	**0**	**7,196**	**$0**	**$1,315,342,700**
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
Polk County	**0**	**17,470**	**0**	**10,413**	**$0**	**$1,742,637,947**
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
Rutherford County	**0**	**11,706**	**0**	**7,515**	**$0**	**$607,323,288**
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
Transylvania County	**812**	**34,029**	**423**	**22,511**	**$52,435,480**	**$11,788,239,115**
Brevard	0	5,688	0	4,575	$0	$3,380,610,250
Rosman	0	0	0	0	$0	$0
Unincorporated Area	812	28,341	423	17,936	$52,435,480	$8,407,628,865
South Mountains Regional Total	**812**	**73,543**	**423**	**47,635**	**$52,435,480**	**$15,453,543,050**

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
Henderson County	**4,793**	**3,286**	**$856,697,700**	**3,526**	**2,652**	**$657,226,300**
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
Polk County	**2,357**	**1,331**	**$322,449,711**	**1,236**	**798**	**$164,643,151**
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
Rutherford County	**5,603**	**3,047**	**$663,262,427**	**1,260**	**793**	**$75,657,278**
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
Transylvania County	**4,707**	**3,418**	**$7,015,773,422**	**3,908**	**2,970**	**$6,981,774,552**
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
South Mountains Regional Total	**17,460**	**11,082**	**$8,858,183,260**	**9,930**	**7,213**	**$7,879,301,281**

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

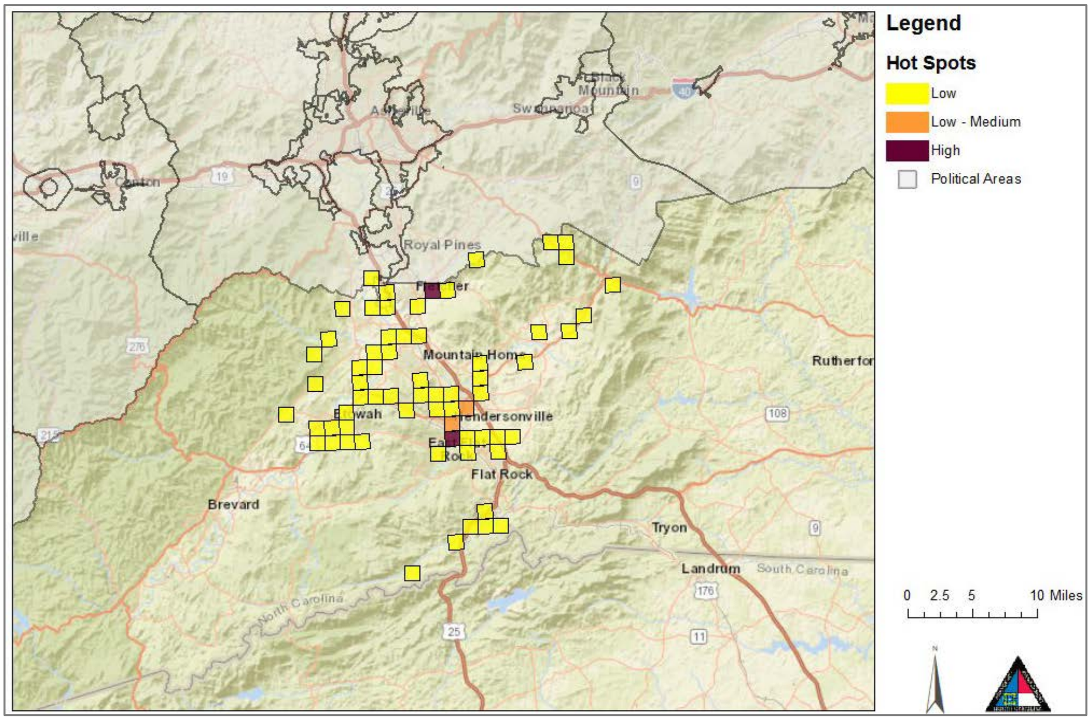
Location	Pre-Firm Buildings at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Public Buildings at Risk		Total Buildings at Risk	
		Number	Damages	Number	Damages	Number	Damages	Number	Damages
Henderson County	**378**	**485**	**$2,892,028**	**116**	**$5,098,735**	**7**	**$175,458**	**608**	**$8,166,221**
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

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
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
Polk County	**125**	**107**	**$1,038,222**	**16**	**$889,325**	**2**	**$32,241**	**125**	**$1,959,788**
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
Rutherford County	**192**	**163**	**$3,171,398**	**29**	**$532,643**	**6**	**$96,201**	**198**	**$3,800,243**
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
Transylvania County	**507**	**656**	**$5,261,252**	**58**	**$3,221,240**	**26**	**$935,582**	**740**	**$9,418,074**
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
South Mountains Regional Total	**1,202**	**1,411**	**$12,362,900**	**219**	**$9,741,943**	**41**	**$1,239,482**	**1,671**	**$23,344,326**

Source: NCEM Risk Management Tool

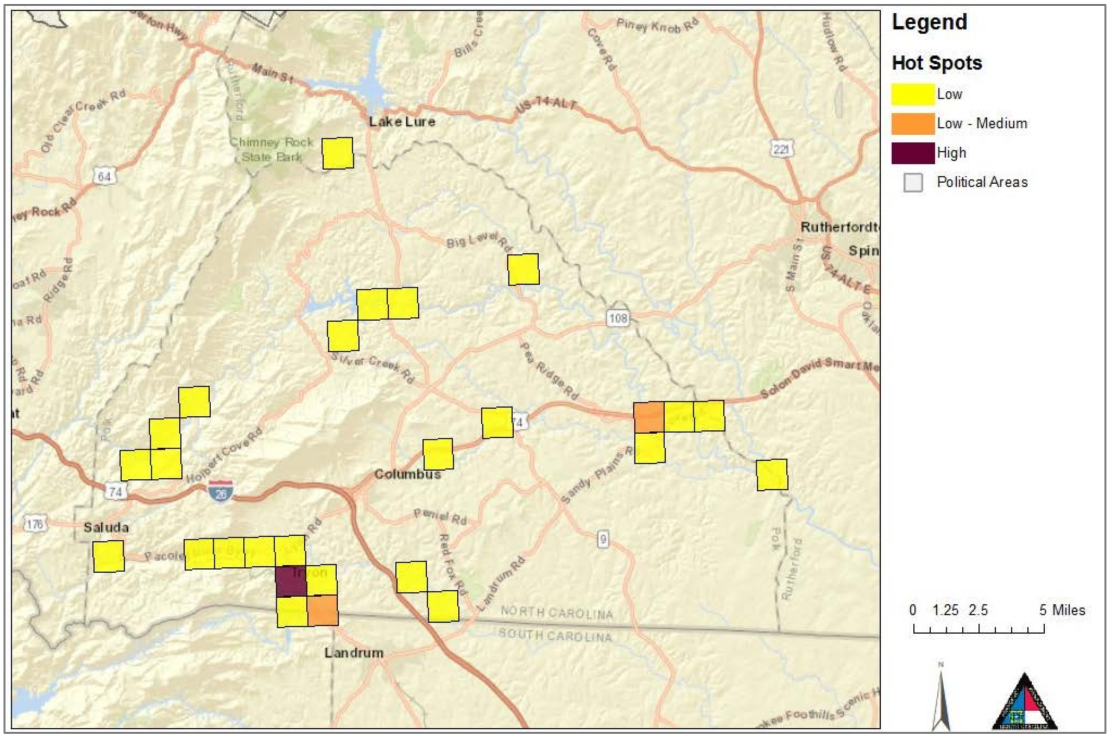
Figures 6.4-6.7 below displays visual hotspots of potential dollar losses for the flood hazard in all South Mountains counties. Based on the photo, most hot spots are in an area with low vulnerability. **Figures 6.4-6.7** provides potential dollar losses for each county.

FIGURE 6.10: POTENTIAL DOLLAR LOSSES FOR FLOODING IN HENDERSON COUNTY



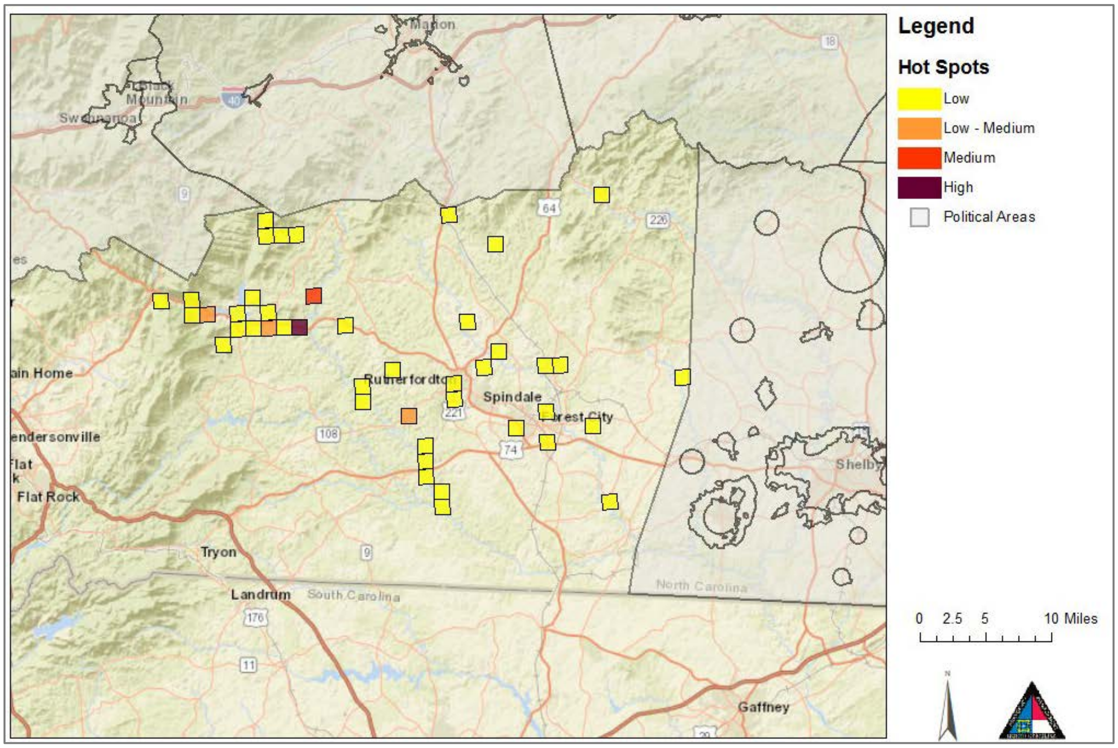
Source: NCEM Risk Management Tool

FIGURE 6.11: POTENTIAL DOLLAR LOSSES FOR FLOODING IN POLK COUNTY



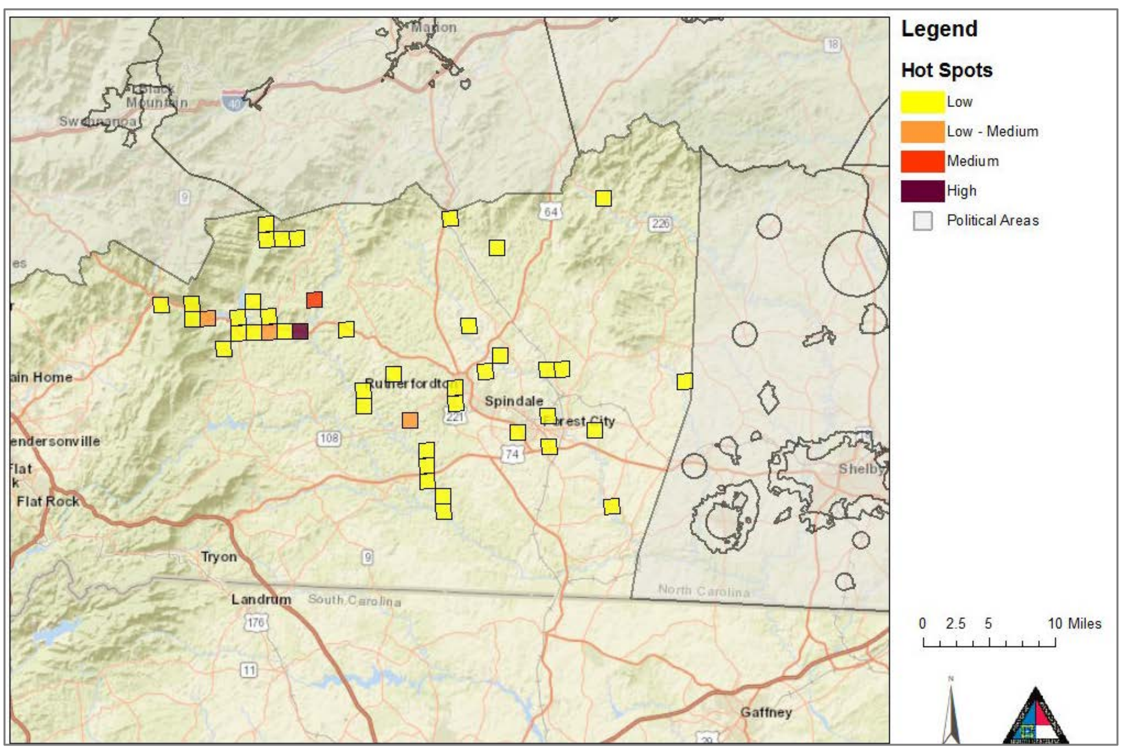
Source: NCEM Risk Management Tool

FIGURE 6.12: POTENTIAL DOLLAR LOSSES FOR FLOODING IN RUTHERFORD COUNTY



Source: NCEM Risk Management Tool

FIGURE 6.13: 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

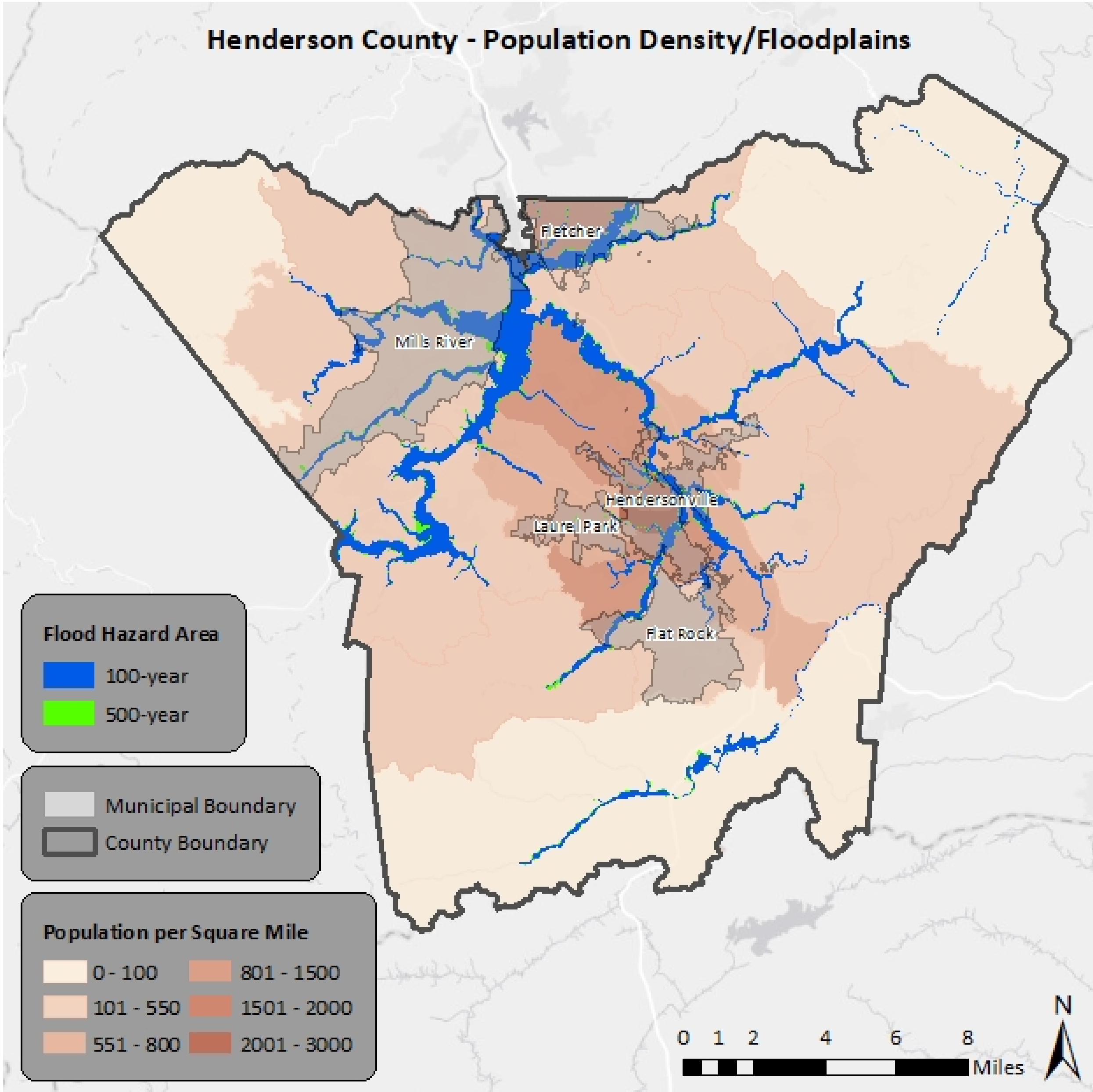
Location	Elderly at Risk	Children at Risk	Total at Risk
Henderson County	**240**	**61**	**1,075**
Flat Rock	2	0	8
Fletcher	14	4	64
Hendersonville	64	16	287
Laurel Park	0	0	0
Mills River	30	8	135
Unincorporated Area	130	33	581
Polk County	**52**	**10**	**212**
Columbus	0	0	0
Saluda	0	0	0
Tryon	16	3	65
Unincorporated Area	36	7	147
Rutherford County	**50**	**16**	**294**
Bostic	0	0	0
Chimney Rock Village	0	0	3
Ellenboro	0	0	0
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
Transylvania County	**314**	**55**	**1,217**
Brevard	200	35	773
Rosman	12	2	48
Unincorporated Area	102	18	396
South Mountains Regional Total	**656**	**142**	**2,798**

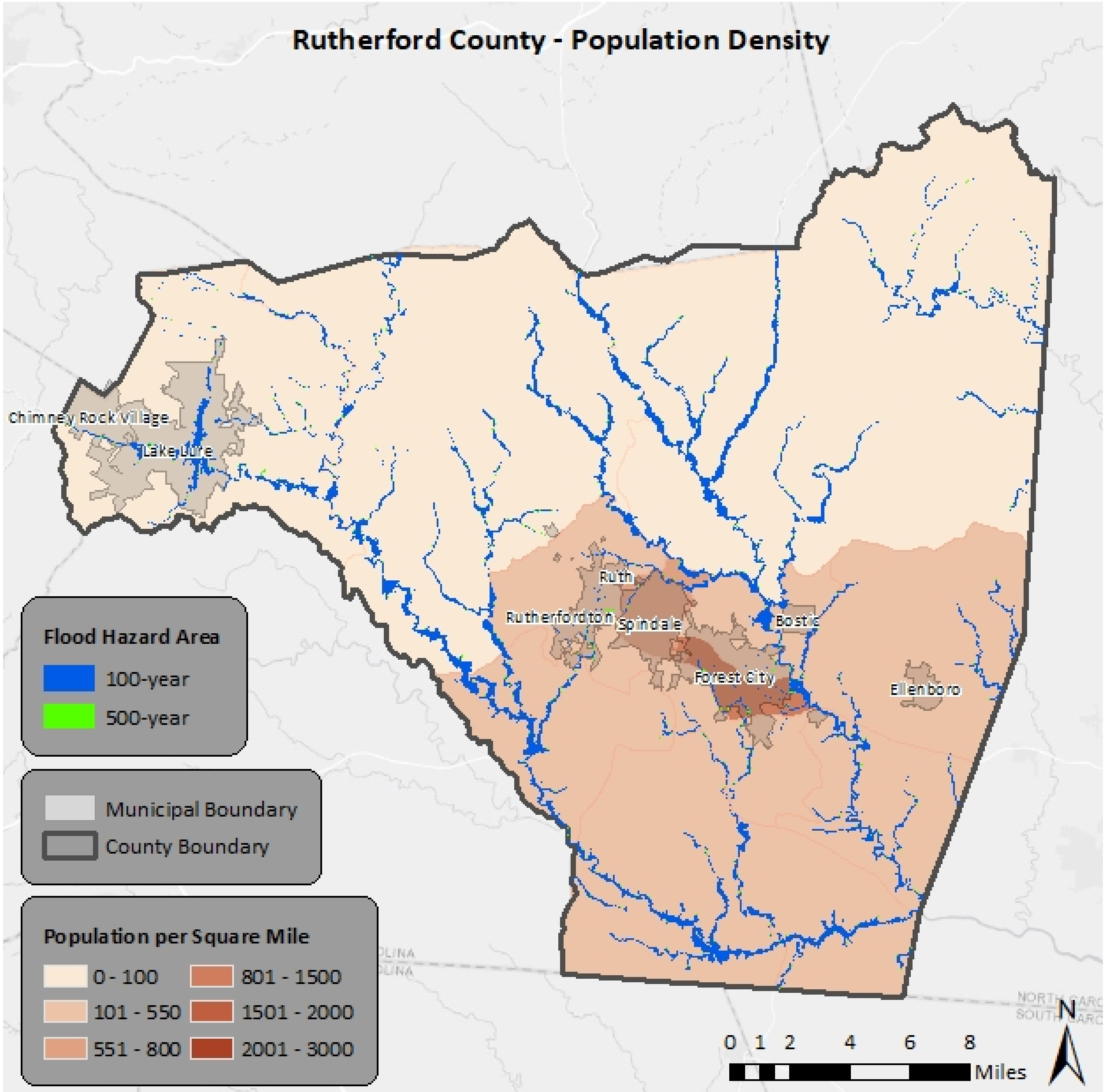
Source: NCEM Risk Management Tool

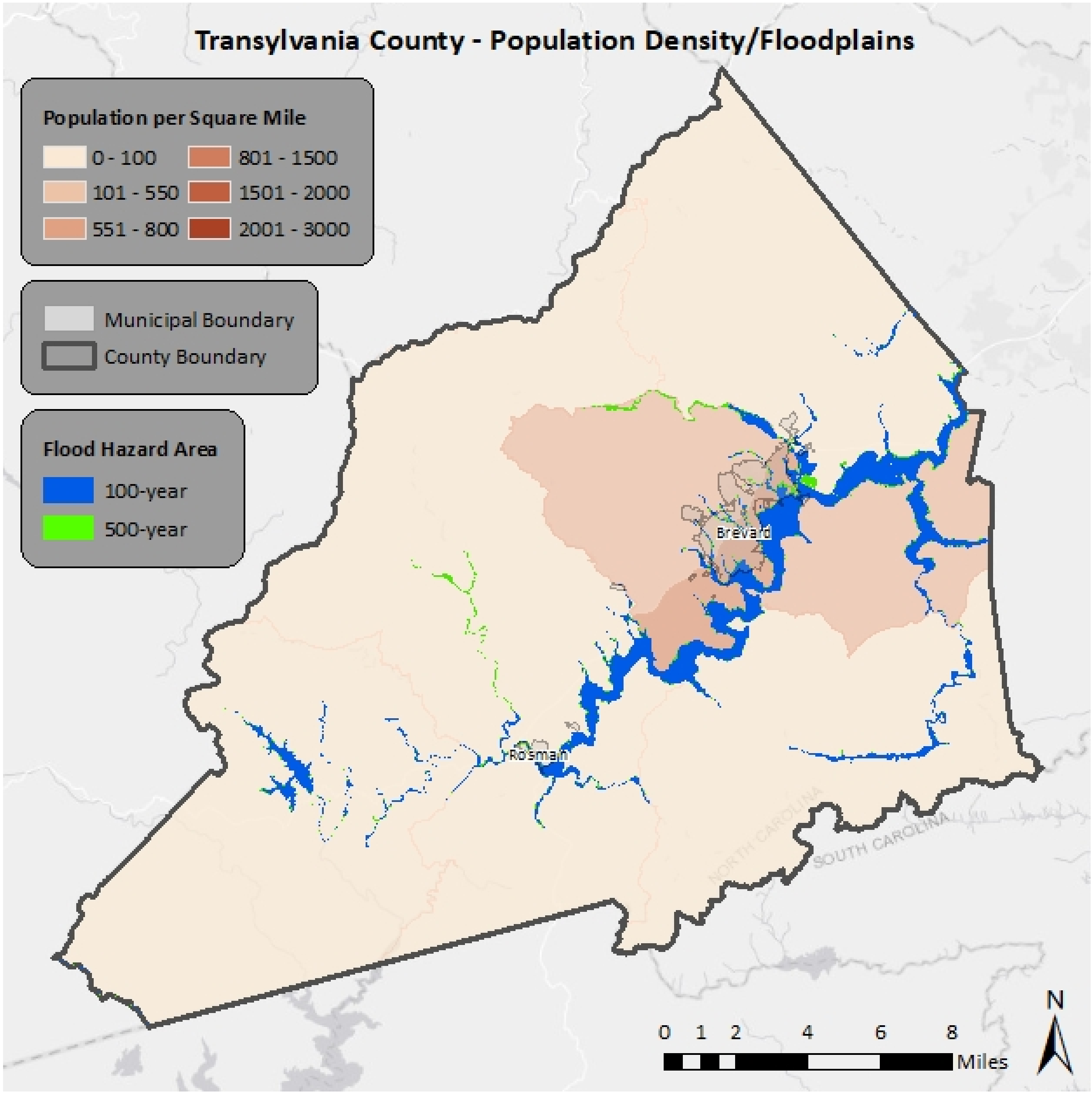
SOCIAL VULNERABILITY

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 6.14: POPULATION DENSITY NEAR FLOODPLAINS




Rutherford County - Population Density
Chimney Rock Village
Lake Lure
Ruth
Rutherfordton
Spindale
Bostic
Forest City
Ellenboro
Flood Hazard Area
100-year
500-year
Municipal Boundary
County Boundary
Population per Square Mile
0 - 100
101 - 550
551 - 800
801 - 1500
1501 - 2000
2001 - 3000
0 1 2 4 6 8
Miles
N



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
Henderson County	**18**	**70**	**$1,375,148**
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
Polk County	**1**	**2**	**$1,843,425**
Columbus	0	0	$0
Saluda	0	0	$0
Tryon	0	0	$0
Unincorporated Area	1	2	$1,843,425
Rutherford County	**6**	**15**	**$300,007**
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
Transylvania County	**5**	**13**	**$152,432**
Brevard	0	0	$0
Rosman	0	0	$0
Unincorporated Area	5	13	$152,432
South Mountains Regional Total	**30**	**100**	**$3,671,012**

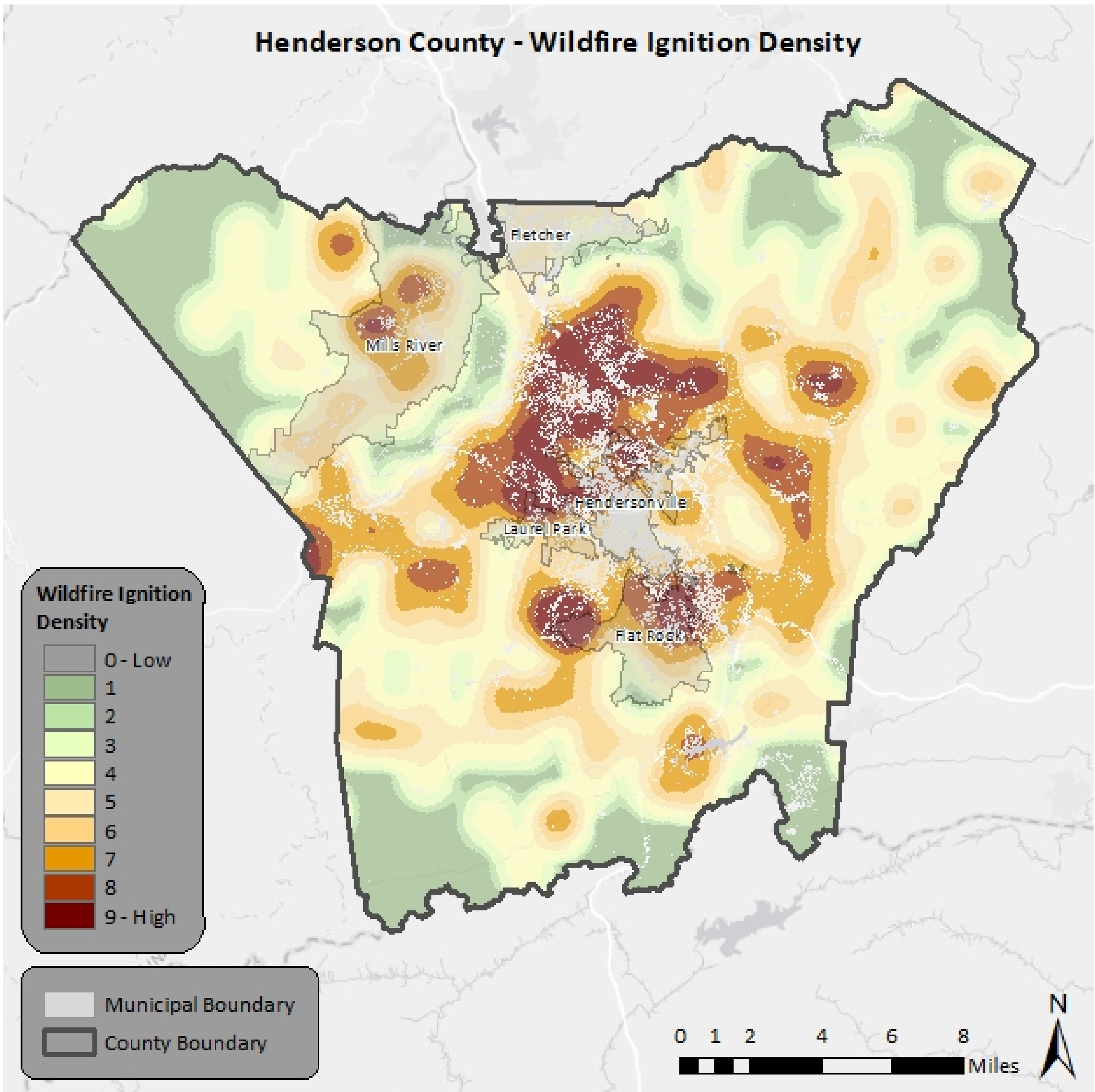
Source: National Flood Insurance Program

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.

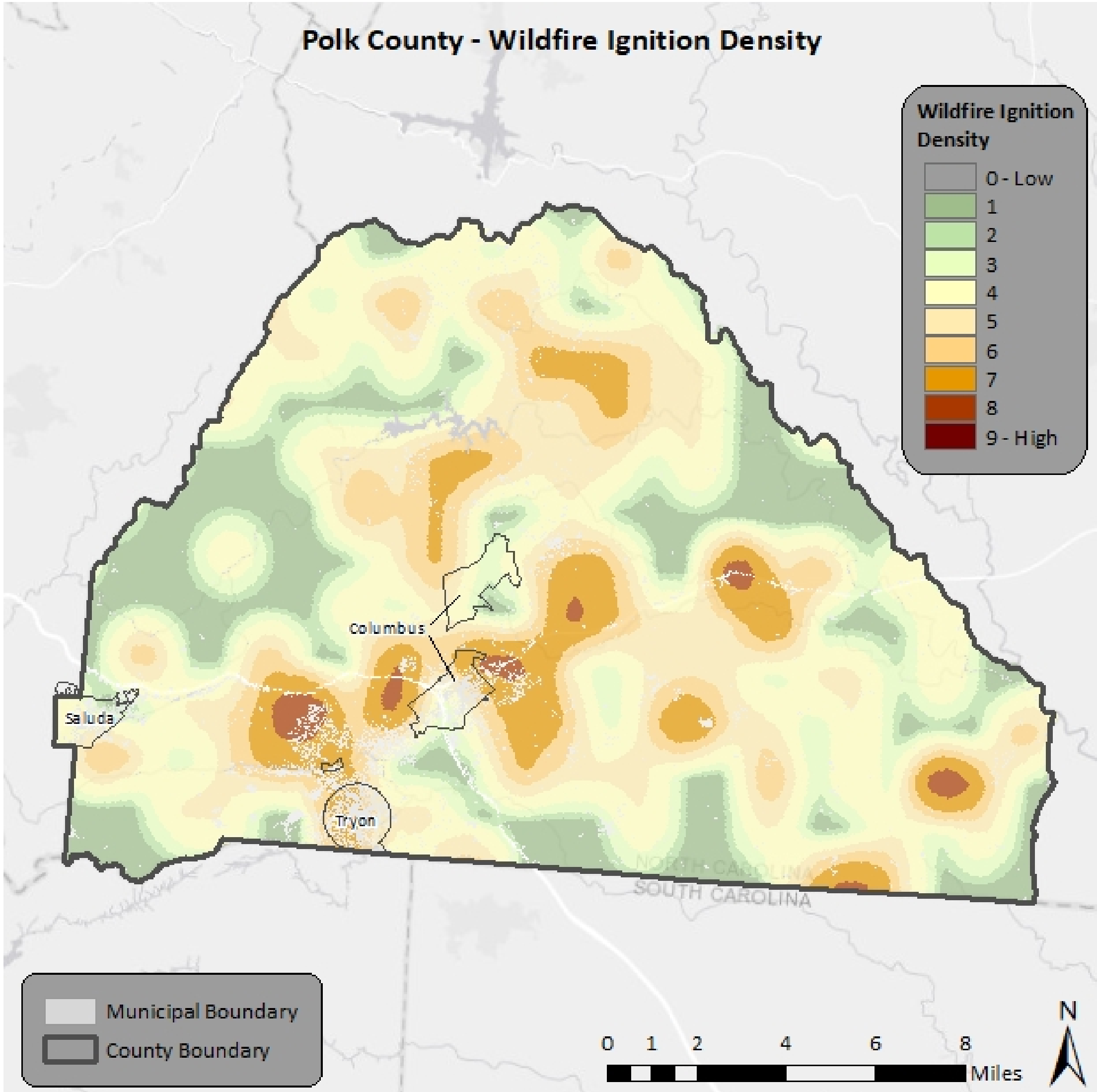
To estimate exposure to wildfire, the Wildland Urban Interface (WUI) Risk Index for the region was obtained through the Southern Wildfire Risk Assessment. The WUI uses a Response Function modeling approach and rates the potential impact of a wildfire on people and their homes. The index ranges from -1 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: WILDFIRE IGNTION DENSITY IN HENDERSON COUNTY



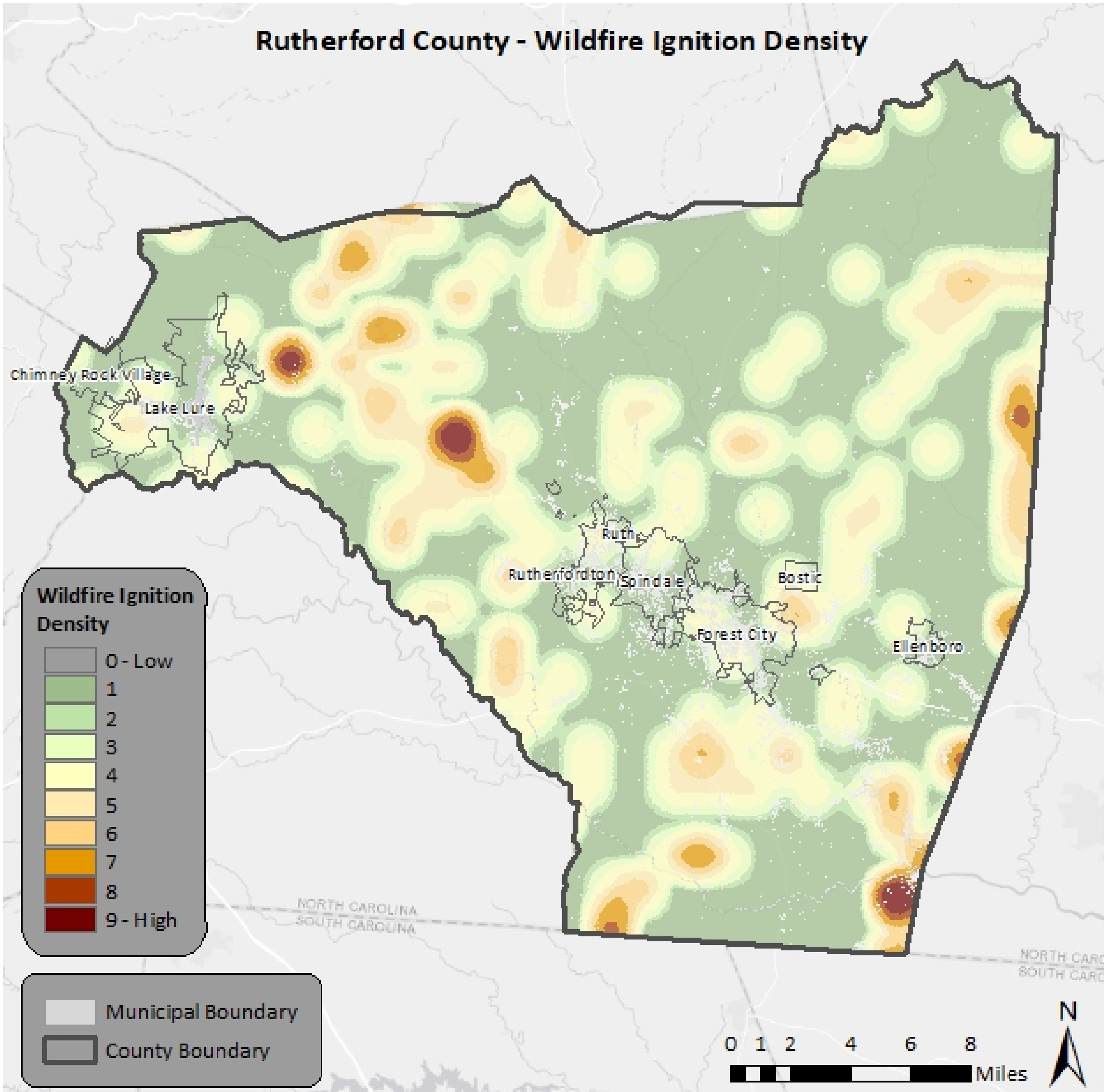
Source: Southern Wildfire Risk Assessment

FIGURE 6.9: WILDFIRE IGNTION DENSITY IN POLK COUNTY



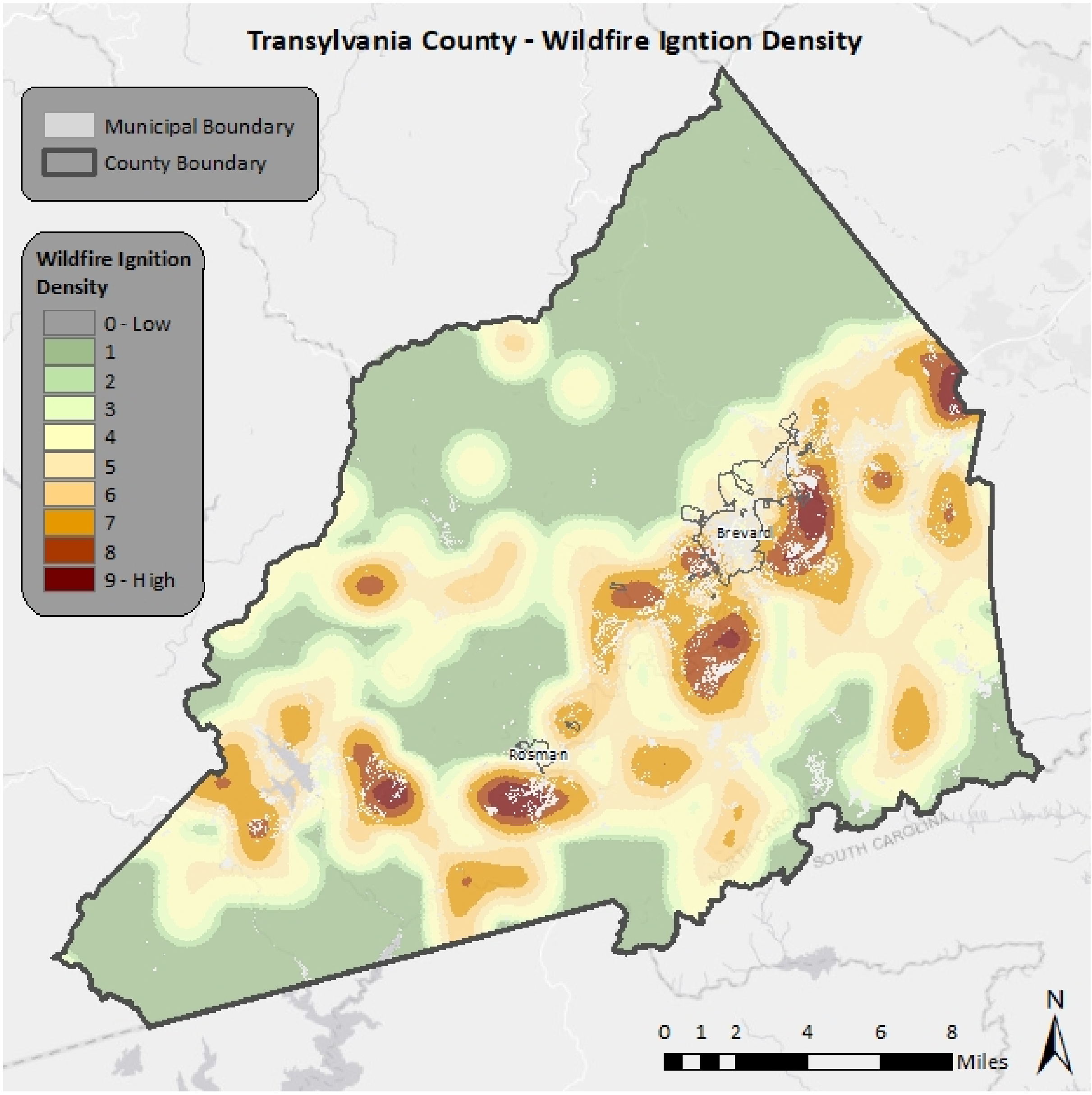
Source: Southern Wildfire Risk Assessment

FIGURE 6.9: WILDFIRE IGNTION DENSITY IN RUTHERFORD COUNTY



Source: Southern Wildfire Risk Assessment

FIGURE 6.9: WILDFIRE IGNTION DENSITY IN TRANSYLVANIA COUNTY



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
South Mountains Regional Total	**12**

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

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
Henderson County	**20,222**	**37,308**	**$6,395,632,845**	**1,426**	**$2,285,904,538**	**497**	**$1,007,988,629**	**39,231**	**$9,689,526,014**
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
Polk County	**5,309**	**4,836**	**$823,685,689**	**349**	**$348,431,318**	**122**	**$195,612,978**	**5,307**	**$1,367,729,984**
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
Rutherford County	**2,216**	**2,097**	**$321,123,037**	**128**	**$177,524,326**	**24**	**$25,757,282**	**2,249**	**$524,404,644**
Bostic	0	0	$0	0	$0	0	$0	0	$0
Chimney Rock Village	36	35	$5,804,489	1	$311,417	0	$0	36	$6,115,906
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

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
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
Transylvania County	**8,239**	**15,020**	**$2,354,210,047**	**755**	**$606,974,071**	**259**	**$290,712,373**	**16,034**	**$3,251,896,492**
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
South Mountains Regional Total	**35,986**	**59,261**	**$9,894,651,618**	**2,658**	**$3,418,834,253**	**902**	**$1,520,071,262**	**62,821**	**$14,833,557,134**

Source: NCEM Risk Management Tool

Table 6.21: Population Vulnerability to Wildfire Hazard

Location	Elderly At Risk	Children At Risk	Total At Risk
Henderson County	**17,896**	**4,509**	**80,028**
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
Polk County	**2,370**	**442**	**9,736**
Columbus	134	25	553
Saluda	81	16	334
Tryon	437	81	1,795
Unincorporated Area	1,718	320	7,054
Rutherford County	**630**	**207**	**3,641**
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
Spindale	0	0	0
Unincorporated Area	590	195	3,414
Transylvania County	**6,299**	**1,119**	**24,401**
Brevard	1,876	333	7,268
Rosman	70	13	274
Unincorporated Area	4,353	773	16,859
South Mountains Regional Total	**27,195**	**6,277**	**117,806**

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[5]. 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)[6].

[5] This type of analysis will likely yield inflated results (generally higher than what is actually reported after an actual event).
[6] Note that parcels included in the 1-mile analysis are also included in the 0.5-mile analysis.

FIGURE 6.10: TOXIC RELEASE INVENTORY (TRI) FACILITIES

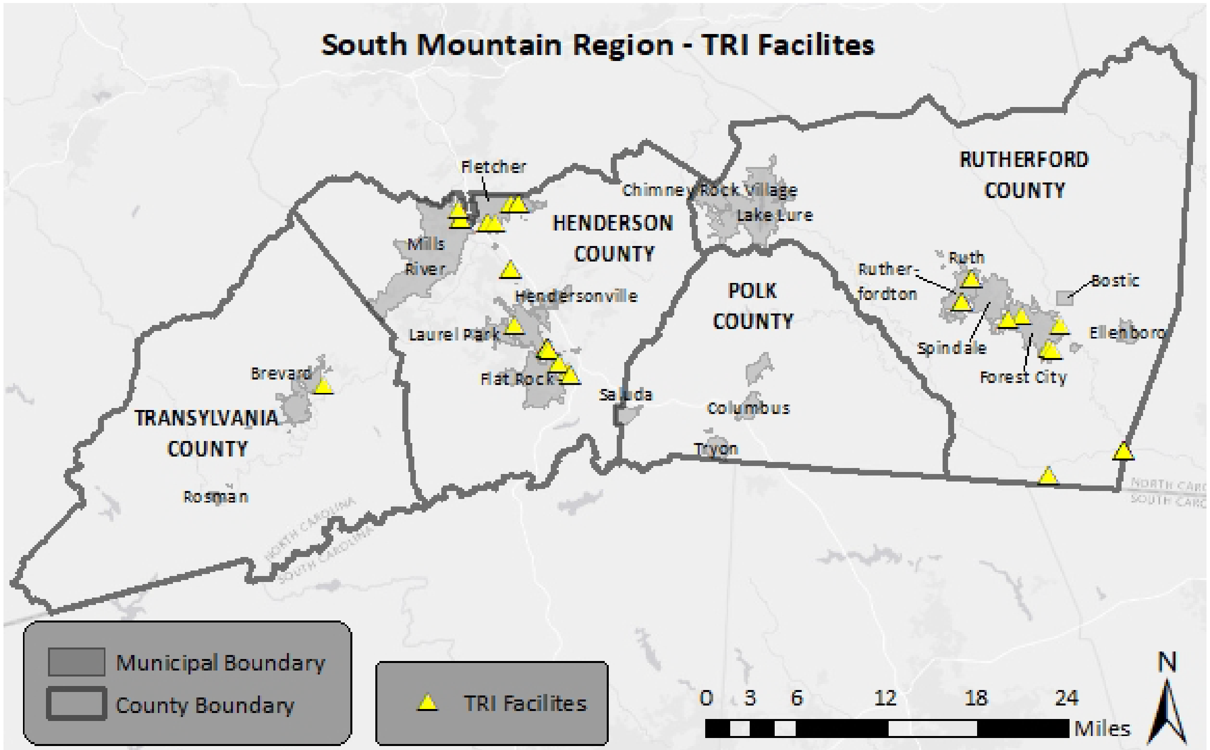


TABLE 6.22: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS SUBSTANCES (FIXED SITES)

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
Henderson County	**1,607**	**1,219**	**$306,709,600**	**5,385**	**4,280**	**$773,091,200**
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
Polk County	**0**	**0**	**$0**	**0**	**0**	**$0**
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
Rutherford County	**1,203**	**799**	**$155,362,128**	**3,072**	**2,051**	**$309,502,004**
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

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
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
Transylvania County	**0**	**0**	**$0**	**0**	**0**	**$0**
Brevard	0	0	$0	0	0	$0
Rosman	0	0	$0	0	0	$0
Unincorporated Area	0	0	$0	0	0	$0
South Mountains Regional Total	**2,810**	**2,018**	**$462,071,728**	**8,457**	**6,331**	**$1,082,593,204**

Source: EPA, Local governments

FIGURE 6.11: MOBILE HAZMAT BUFFERS IN THE SOUTH MOUNTAINS REGION

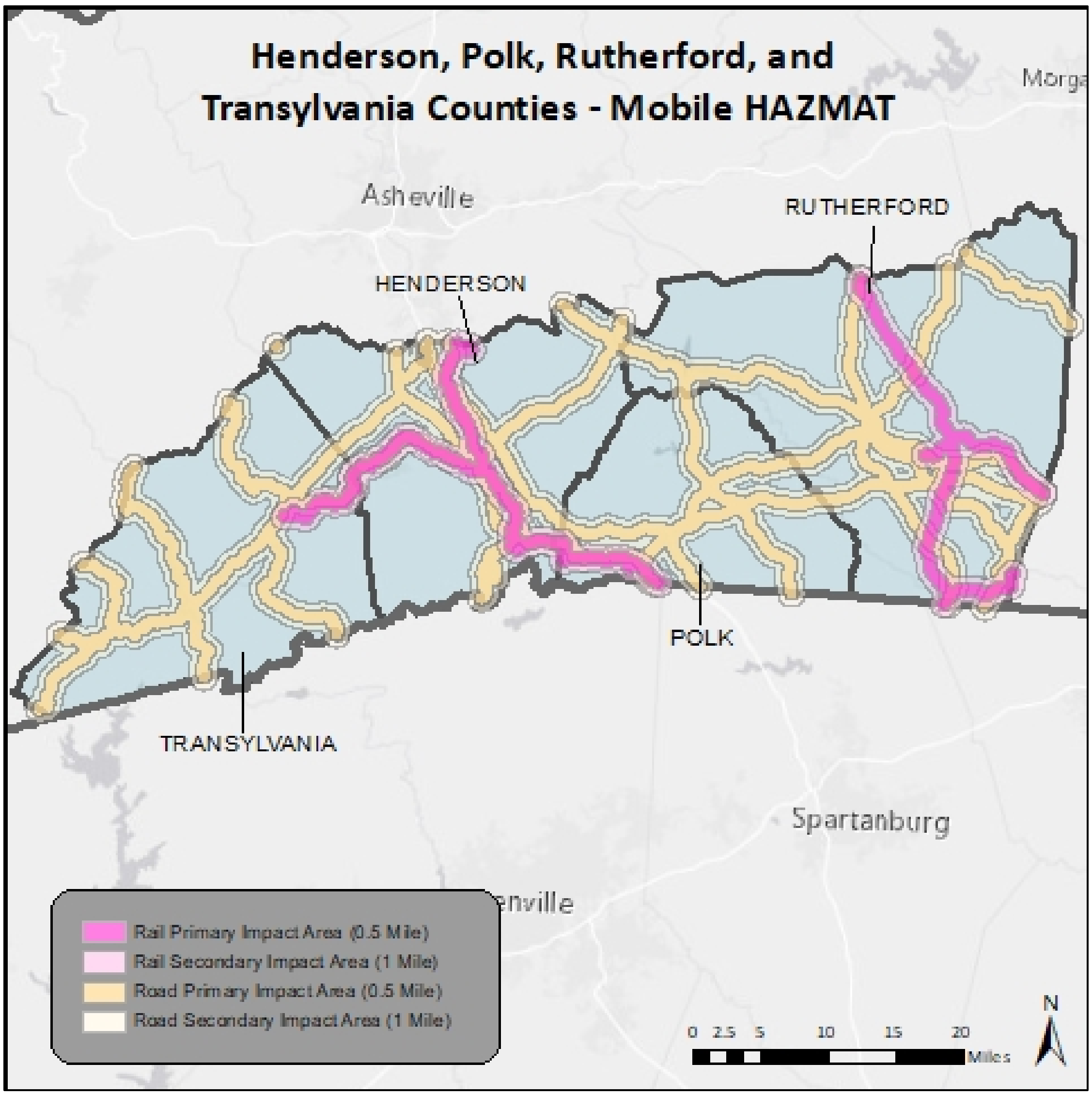


Table 6.23: Exposure of Improved Property to Hazardous Substances (Mobile Analysis – Rail)

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
Henderson County	**26,675**	**20,924**	**$3,596,933,600**	**67,655**	**47,424**	**$8,669,128,000**
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
Polk County	**2,372**	**1,715**	**$256,876,178**	**3,802**	**2,586**	**$393,509,928**
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
Rutherford County	**5,437**	**3,627**	**$333,264,430**	**11,033**	**7,430**	**$842,325,201**
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
Transylvania County	**1,783**	**1,251**	**$510,469,223**	**3,708**	**2,629**	**$885,549,831**
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
South Mountains Regional Total	**36,267**	**27,517**	**$4,697,543,431**	**86,198**	**60,069**	**$10,790,512,960**

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
Henderson County	**67,648**	**47,423**	**$8,669,411,900**	**67,663**	**47,428**	**$8,669,984,200**
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
Polk County	**17,577**	**10,470**	**$1,757,995,236**	**17,580**	**10,472**	**$1,758,155,848**
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
Rutherford County	**56,515**	**31,943**	**$3,515,047,082**	**56,546**	**31,945**	**$3,515,066,682**
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
Transylvania County	**32,517**	**20,062**	**$11,084,781,035**	**32,521**	**20,062**	**$11,084,781,035**
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
South Mountains Regional Total	**174,257**	**109,898**	**$25,027,235,253**	**174,310**	**109,907**	**$25,027,987,765**

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)
Henderson County																		
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
705 6th Av W	Medical	X	X	X	X	X	X								X	X	X	X

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)
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
Lot 4	Medical	X	X	X	X	X	X							X	X	X	X	X

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)
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
Continuing Ed Bldg	School	X	X	X	X	X	X							X	X	X	X	X

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)
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
Immaculata Catholic School	School	X	X	X	X	X	X								X	X	X	X

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)
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
Etowah FD	Fire/EMS	X	X	X	X	X	X	X							X	X	X	X

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)
Valley Hill FD 3	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Gerton FD	Fire/EMS	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
Fletcher FS 2	Fire/EMS	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
Etowah Horse Shoe 3	Fire/EMS	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
Green River FS 3	Fire/EMS	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
Valley Hill FS 2	Fire/EMS	X	X	X	X	X	X								X	X	X	X
EM HQ	Fire/EMS	X	X	X	X	X	X								X	X	X	X
Hendersonville FD	Fire/EMS	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
Valley Hill FS 4	Fire/EMS	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
Mills River FD	Fire/EMS	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
Mills River FS 3	Fire/EMS	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
EMS 2	Fire/EMS	X	X	X	X	X	X			X		X			X	X	X	X

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)
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 Landfille 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
222 Education Dr	Government	X	X	X	X	X	X								X	X	X	X

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)
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
Gym	Government	X	X	X	X	X	X								X	X	X	X

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)
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
Polk County																		
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
Polk County MS	School	X	X	X	X	X	X								X	X	X	X

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)
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
Columbus FD 2	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X

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)
Tryon FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X
Rutherford County																		
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
Masters Academy	School	X	X	X	X	X	X			X			X	X	X	X	X	X

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)
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
Chimney Rock FD	Fire/EMS	X	X	X	X	X	X			X					X	X	X	X

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)
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
Transylvania County																		
Transylvania Community Hospital, Inc.	Medical	X	X	X	X	X	X			X					X	X	X	X
Brevard PD	Police	X	X	X	X	X	X								X	X	X	X

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)
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 Toaxaway 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

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.[1] 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.

[1] 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.[2] 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,

[2] 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.

- Henderson County and the City of Hendersonville are the only participating jurisdictions that have adopted disaster recovery plans. 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 administrated 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).[3] 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
HENDERSON COUNTY†	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*	--	--	--	--	--	--
POLK COUNTY†	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
RUTHERFORD COUNTY†	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
TRANSYLVANIA COUNTY†	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

†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. Henderson County is in the process of joining 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 has a Greenway Master Plan that serves as their Open Space Master Plan. The Town of Fletcher also 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	46	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

Jurisdiction	Overall Capability Score	Overall Capability Rating
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

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[1]

[1] 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.

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

44 CFR Requirement
44 CFR Part 201.6(c)(3)(ii): 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
Henderson County	**9:3**	**23**
Flat Rock	9:8	3
Fletcher	9:9	4
Hendersonville	9:10	5
Laurel Park	9:11	3
Mills River	9:12	5
Polk County	**9:13**	**21**
Columbus	9:18	10
Saluda	9:21	13
Tryon	9:24	10
Rutherford County	**9:27**	**13**
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
Transylvania County	**9:41**	**7**
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

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.
Property Protection							
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.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Natural Resource Protection							
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
Emergency Services							
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

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.
Public Education and Awareness							
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.

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
Prevention							
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.
Public Education and Awareness Activities							
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
Prevention							
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.
Public Education and Awareness Activities							
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
Prevention							
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.
Emergency Services							
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
Natural Resource Protection							
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	This action is incomplete. The Town will continue to work with NCFS as time, staffing and funding allow
Emergency Services							
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.
Public Education and Awareness Activities							
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
Prevention							
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
Public Education and Awareness Activities							
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.

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Polk County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
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.

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.
Property Protection							
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.
Emergency Services							
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.

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 7th Day Adventist Church

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
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.

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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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.
Property Protection							
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.

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.

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.

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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 Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
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.
Property Protection							
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.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
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 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.

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
Prevention							
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.
Property Protection							
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.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
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-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.
Structural Projects							
SP-1	Complete an emergency waterline from Henderson County.	DR	High	Local Funds	Town Managers	2025	This project has not yet started.
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.

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
Prevention							
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.

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.

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.
Public Education and Awareness							
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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Town of Bostic Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
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.
Emergency Services							
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
Prevention							
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.

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
Prevention							
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.
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
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
Prevention							
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
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
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
Prevention							
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

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
PP-1	Apply for funding through the FEMA High Hazard Dam Repair Program for mitigation measures associated with high hazard dams to include: 1) Geotechnical investigation to establish data for risk analysis and development of engineering designs/solutions. 2) Build upstream dam to reduce load on existing dam 3) Property Acquisition in inundation area(s) below dam 4) Raise crest of dam to increase storage capacity 5) Add additional spillways, widen or lower existing spillways to increase discharge capacity 6) Warning systems to alert downstream areas of potential dam failure 7) Improve flow path below dam to increase conveyance capacity 8) Encourage conservation or re-forestation of upstream land to reduce runoff 9) Development of community Stormwater Management Plans for upstream communities 10) Complete an Emergency Action Plan in conjunction with NCDEQ for all High Hazard Dams in the county.	D	Moderate	Grants	Public Works	2025	New Action

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 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
Prevention							
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.
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.

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.
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 Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
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
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 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
Prevention							
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.
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
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
Prevention							
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.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Emergency Services							
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.

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Structural Projects							
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.
Public Education and Awareness							
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.

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.

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
Prevention							
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.
Emergency Services							
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.

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.

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
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
Prevention							
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
Emergency Services							
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

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**
Structural Projects							
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.
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 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.

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
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 Part201.6(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@espassociates.com.

An electronic version of this survey can be found at: https://s.surveyplanet.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@espassociates.com.

1. Where do you live?

- ❑ Unincorporated Henderson County
- ❑ Unincorporated Polk County
- ❑ Unincorporated Transylvania County
- ❑ Unincorporated Rutherford County
- ❑ Brevard
- ❑ Bostic
- ❑ Chimney Rock Village
- ❑ Columbus
- ❑ Ellenboro
- ❑ Flat Rock
- ❑ Fletcher
- ❑ Forest City
- ❑ Hendersonville
- ❑ Lake Lure
- ❑ Laurel Park
- ❑ Mills River
- ❑ Rosman
- ❑ Ruth
- ❑ Rutherfordton
- ❑ Saluda
- ❑ Spindale
- ❑ Tryon
- ❑ 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 <u>one</u> hazard you think is the *highest threat* to your neighborhood:**

- ❑ Dam / Levee Failure
- ❑ Drought
- ❑ Earthquake
- ❑ Erosion
- ❑ Extreme Heat
- ❑ Flood
- ❑ Hailstorm
- ❑ Hazardous Materials Incident
- ❑ Hurricane / Tropical Storm
- ❑ Landslide
- ❑ Lightning
- ❑ Nuclear Accident
- ❑ Thunderstorm Wind / High Wind
- ❑ Tornado
- ❑ Wildfire
- ❑ Winter Storm / Freeze

5. **Please select the <u>one</u> hazard you think is the *second-highest threat* to your neighborhood:**

- ❑ Dam / Levee Failure
- ❑ Drought
- ❑ Earthquake
- ❑ Erosion
- ❑ Extreme Heat
- ❑ Flood
- ❑ Hailstorm
- ❑ Hazardous Materials Incident
- ❑ Hurricane / Tropical Storm
- ❑ Landslide
- ❑ Lightning
- ❑ Nuclear Accident
- ❑ Thunderstorm / High Wind
- ❑ Tornado
- ❑ Wildfire
- ❑ 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
1. Prevention 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.	❑	❑	❑
2. Property Protection 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.	❑	❑	❑
3. Natural Resource Protection 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.	❑	❑	❑
4. Structural Projects 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.	❑	❑	❑
5. Emergency Services 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.	❑	❑	❑
6. Public Education and Awareness 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.	❑	❑	❑

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.

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			
OVERALL CAPABILITY			

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

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.

		MITIGATION ACTION
	Proposed Action:	
	BACKGROUND INFORMATION	
	Site and Location:	
	History of Damages:	

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	
Category:	
Priority (High, Moderate, Low):	
Estimated Cost:	
Potential Funding Sources:	
Lead Agency/Department Responsible:	
Implementation Schedule:	

COMMENTS

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
Jonathan Cannon	City of Saluda	City of Saluda	828-749-2581	citymanager@cityofsaludanc.com
James Conner	City of Saluda PD	City of Saluda	828 749 2691	chief@cityofsaludanc.com
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@hvlnc.gov
Daniel Heyman	Development Assistance City of Hendersonville	City of Hendersonville	828.697.3010	dheyman@hvlnc.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 McFalls	Henderson Co. EM		828-694-9699	Tmcfalls@hendersoncountync.gov

Name	Agency	City	Phone Number	E-mail Address
Joseph Vindigni	City of Hendersonville Fire Dept.	Hendersonville	828-697-3024	JVindigni@hvlnc.gov
Mark Biberdorf	Town of Fletcher	Fletcher	~~828~~ 828-687-3985	mbiberdorf@fletchernc.org

Name	Agency	City	Phone Number	E-mail Address
Kevin R. Shook	Transylvania County Emergency Services	155 Public Safety Way Brevard, NC 28712	828 884 3108	Kevin.shook@transylvaniacounty.or

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	jbrissie@hendersoncountync.gov
Tim McFalls	Henderson County EM	Hendersonville, NC	828-697-4728	tmcfalls@hendersoncountync.gov
Joe Vindigni	City of Hendersonville Fire Dept.	Hendersonville, NC	828-674-5608	JVindigni@hvcnc.gov
JONATHAN CANNON	CITY OF SALUDA	SALUDA NC	828-749-2581	CITYMANAGER@CITYOFSALUDANC.COM
Cathy Ruth	Polk Co.	Polk Co.	828 894 2732	planning@polknc.org
Jamie Davidson	~~Polk Co~~	Mill Spring, NC	828.894.5823	jej1972@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	Kevin.shook@transylvaniacounty.org
PATRICIA CHRISTIE	VILLAGE OF FLAT ROCK	FLAT ROCK	828-697-8100	administrator@villageofflatrock.org
KEVIN WALDRUP	HENDERSON County EMERGENCY SERVICES	HENDERSON Co	828-697-4728	Kwaldrup@hendersoncountync.gov
James Crane	Saluda PD	Saluda	828 749 2691	Chief@CityofSaludaNC.com
Frankie Hamrick	Rutherford County EM	Rutherford Co	828-287-6090	frankie.hamrick@rutherfordcountync.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@blueridgenow.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

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	rick.peterson@cherokeecountysc.com
Jackson County NC	Todd Dillard	Jackson County EM Director	todddillard@jacksonnc.org
	Mike Poston	Jackson County Planning Director	michaelposton@jacksonnc.org
Haywood County NC	Greg Shuping	Haywood County EM Director	gregory.shuping@haywoodcountync.gov
	Kris Boyd	Haywood County Development services Director	kris.boyd@haywoodcountync.gov
Buncombe County NC	Jerry VeHaun	Buncombe County EM Director	jerry.vehaun@buncombecounty.org
	Nathan Pennington	Buncombe County Planning Director	Nathan.Pennington@buncombecounty.org
McDowell County NC	William Kehler	McDowell County EM Director	william.kehler@mcdowellgov.com
	Ronald Harmon	McDowell County Planning Administrator	rharmon@mcdowellgov.com
Burke County NC	Michael Willis	Burke County ES Director	Michael.Willis@burkenc.org
Cleveland County NC	Perry David	Cleveland County EM Director	perry.davis@clevelandcounty.com
	Chris Martin	Cleveland County Senior Planner	chris.martin@clevelandcounty.com
Oconee County, SC	Scott Krein	Oconee County EM Director	skrein@oconeesc.com
		Oconee County Community Development	communitydevelopmentinfo@oconeesc.com
Pickens County, SC	Denise Wiatek	Pickens County EM Director	dkwiatek@co.pickens.sc.us
Greenville County, SC	Jim Marett	Greenville County Interim EM Director	jmarett@greenvillecounty.org
Spartanburg County, SC	Doug Bryson	Spartanburg County EM Director	dbryson@spartanburgcounty.org

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

PUBLIC SURVEY RESULTS, CONTINUED

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 13th 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.

Feel free to contact me with questions or concerns.

Jimmy Brissie, Director
Henderson County Emergency Services
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
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 Derose
Sent: Tuesday, December 11, 11:17
Subject: Thursday's South Mountains RHMP Kickoff Meeting
To: Jimmy Brissie, barledge@polknc.org, kevin.shook@transylvaniacounty.org, frankie.hamrick@rutherfordcountync.gov
Cc: Nathan Slaughter, 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

jderose@espassociates.com
919.415.2757 | Direct
252.723.9122 | Cell

Jimmy Brissie
....sent by wireless device

From:	Jimmy Brissie
To:	"Alison Alexander"; "Brian Pahle"; "Jeff Wells "; "John Connet"; "Mark Biberdorf"; "VOFR@bellsouth.net"; sfrady@hvlnc.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

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
828-697-4728 (P)
828-698-6164 (F)

From: Jamie Derose <jderose@espassociates.com>
Sent: Wednesday, January 2, 2019 2:11 PM
To: Jimmy Brissie <JBrissie@Hendersoncountync.gov>; barledge@polknc.org; Kevin Shook <Kevin.Shook@transylvaniacounty.org>; 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
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

jderose@espassociates.com
919.415.2757 | Direct
252.723.9122 | Cell

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

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
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@fletchernc.org; frankie.hamrick@rutherfordcountync.gov; btrotter@laurelpark.org; mcapps@laurelpark.org; zoning@villageofflatrock.org; tmcfalls@hendersoncounnc.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 3rd 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

jderose@espassociates.com
919.415.2757 | Direct
252.723.9122 | Cell

From:	Jimmy Brissie on behalf of Jamie DeRose
To:	mmorgan@laurelpark.org; Bobbie Trotter (btrotter@laurelpark.org); Jimmy Brissie; mcapps@laurelpark.org; Kevin Shook; Jeff Wells ; citymanager@cityofsaludanc.com; administrator@villageofflatrock.org; chief@cityofsaludanc.com; sfrady@hvlnc.gov; dheyman@hvlnc.gov; barledge@polknc.org; cruth@polknc.org; tmcfalls@hendersoncountync.org; jvindigni@hvlnc.gov; m.biberdorf@fletchernc.org; Nathan Slaughter; Ferguson, Christopher; Jamie Davidson; 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> >
Sent: Wednesday, February 13, 2019 8:14 AM
To: Jamie DeRose; Jimmy Brissie; Kevin Shook; citymanager@cityofsaludanc.com <mailto:citymanager@cityofsaludanc.com> ; 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; Ferguson, Christopher; Jamie Davidson; 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, 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/>

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; jvindigni@hvlnc.gov; Steve Wyatt; Amy Brantley; 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

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 17th, 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
828-697-4728 (P)
828-698-6164 (F)

From: Jamie DeRose <jderose@espassociates.com>
Sent: Thursday, April 4, 2019 1:45 PM
To: barledge@polknc.org; Kevin Shook <Kevin.Shook@transylvaniacounty.org>; administrator@villageofflatrock.org; Kevin Waldrup <kwaldrup@hendersoncountync.gov>; chief@cityofsaludanc.com; frankie.hamrick@rutherfordcountync.gov; john.greenway@rutherfordcountync.gov; sfrady@hvlnc.gov; dheyman@hvlnc.gov; Jimmy Brissie <jbrissie@hendersoncountync.gov>; Tim McFalls <tmcfalls@hendersoncountync.gov>; jvindigni@hvlnc.gov; citymanager@cityofsaludanc.com; planning@polknc.org; Jamie Davidson <jej1972@windstream.net>
Cc: Nathan Slaughter <nslaughter@espassociates.com>; Ferguson, Christopher <Christopher.Ferguson@ncdps.gov>; 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

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

jderose@espassociates.com
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252.723.9122 | Cell

Emergency Management

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

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

BlueRidgeNow.com
Times-News Online

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.surveyplanet.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.

BlueRidgeNow.com
Times-News Online

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

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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.surveyplanet.com/JoRVQduiP

Printer-friendly version PDF version

Contact Information

Emergency Management
P: (828) 697-4728

2529 Asheville Highway
Hendersonville, NC 28791

Hours of Operation
Monday - Friday
8:00 a.m. - 4:30 p.m.

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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!

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Link to Survey: https://s.surveyplanet.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.surveyplanet.com/JoRVQduiP

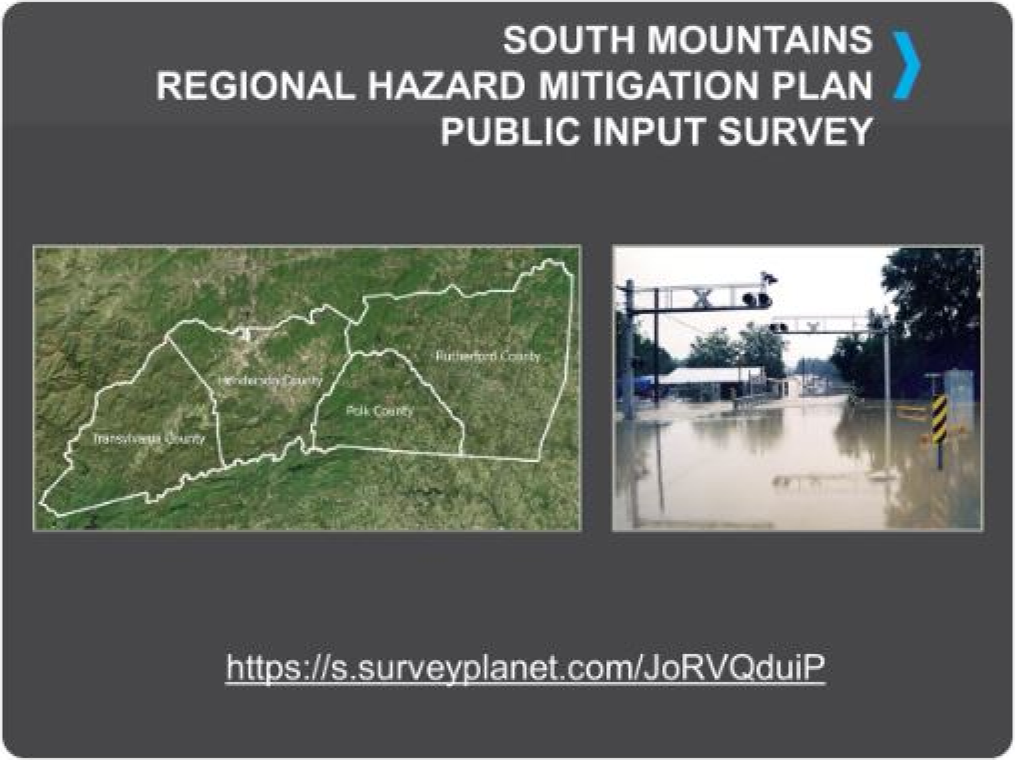
hvlnc Leaders in our area are working to become less vulnerable to natural disasters. Help by providing feedback in a short more

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. You're input is important. Take this survey to help our area with the planning process: s.surveyplanet.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.surveyplanet.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.surveyplanet.com/JoRVQduiP

HVLNC @HVL_NC

Henderson, Polk, Transylvania & Rutherford Counties along with municipalities are working together to become less vulnerable to natural disasters. You're 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.

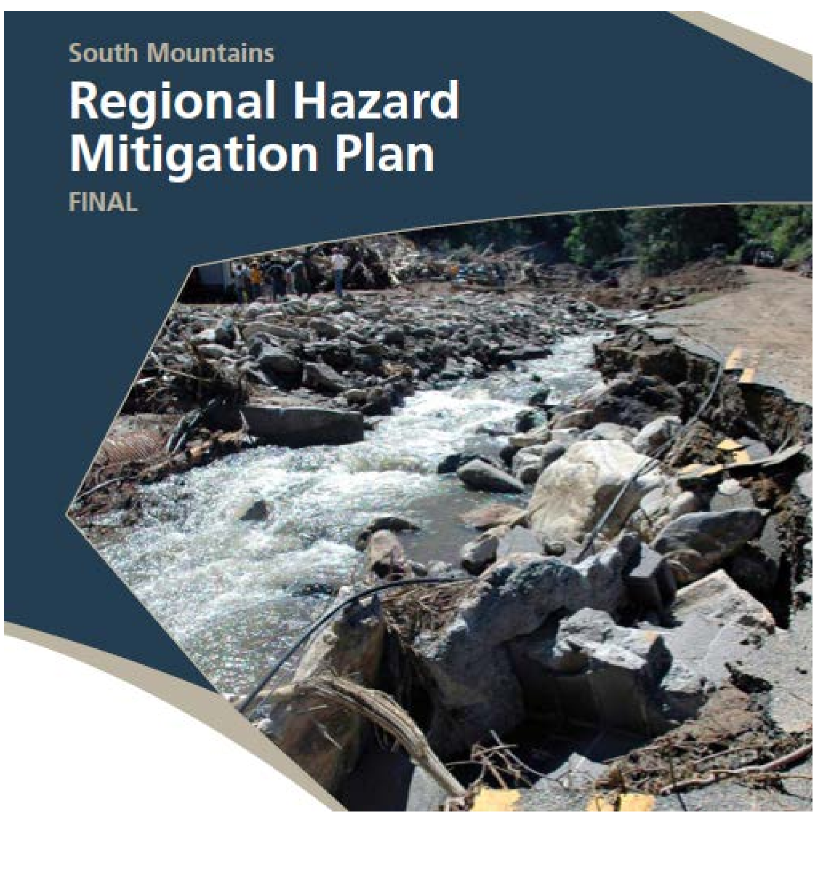
Public input and support are essential parts of this plan. In order to develop the most effective and beneficial plan possible, your input is needed! A public meeting will be held on December 13th from 6pm-7pm at the Henderson County Emergency Services Center in Hendersonville.

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

(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

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

nslaughter@espassociates.com
919.415.2726 | Direct
919.678.1070 | Office
919.244.9536 | Cell

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
Prevention							
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

Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Implementation Schedule	2020 Action Implementation Status
Property Protection							
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.
Natural Resource Protection							
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.

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.
Emergency Services							
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

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.
Public Education and Awareness							
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
Prevention							
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
Prevention							
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
Prevention							
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

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

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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
Prevention							
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
Property Protection							
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
Natural Resource Protection							
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.

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
Prevention							
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.
Property Protection							
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.

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 dame 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.

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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
Prevention							
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
Emergency Services							
ES-4	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 Activities							
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
Prevention							
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
Emergency Services							
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.
Public Education and Awareness Activities							
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.

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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
Prevention							
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
Emergency Services							
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.
Public Education and Awareness Activities							
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
Prevention							
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.

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
Prevention							
P-1	Participate in and enforce the National Flood Insurance Program.	FL	Moderate		Floodplain Administrator	Completed	The town currently participates in the NFIP.
Emergency Services							
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.

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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.
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	EM Staff	Completed	Completed 2012

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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
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	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
Prevention							
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.
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	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
Prevention							
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.
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	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
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	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
Prevention							
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.
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	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
Prevention							
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.
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	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 Commission ers	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.
Emergency Services							
ES-2	Install a new reverse 911 system	All	High	Local Funds	County communicati ons 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

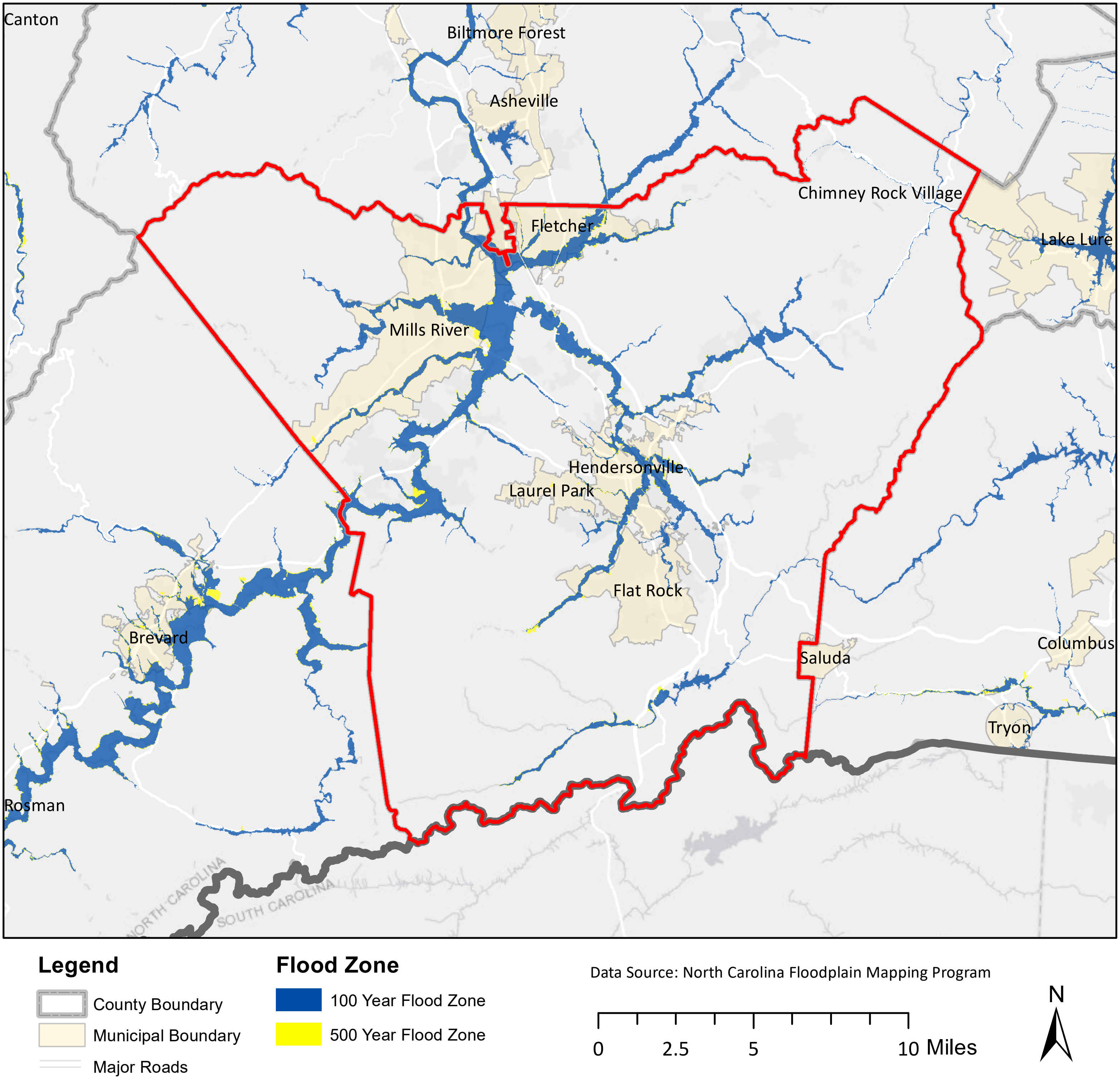
Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
P-1	Continue participation in the Community Rating System Program	FL/ER/HU/T	High	Local Funds	CRS Coordinator-Planning Department	Completed	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.
Property Protection							
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.
Natural Resource Protection							
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.

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.
Emergency Services							
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.
Structural Projects							
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.
Public Education and Awareness Activities							
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.
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 Completed Mitigation Actions

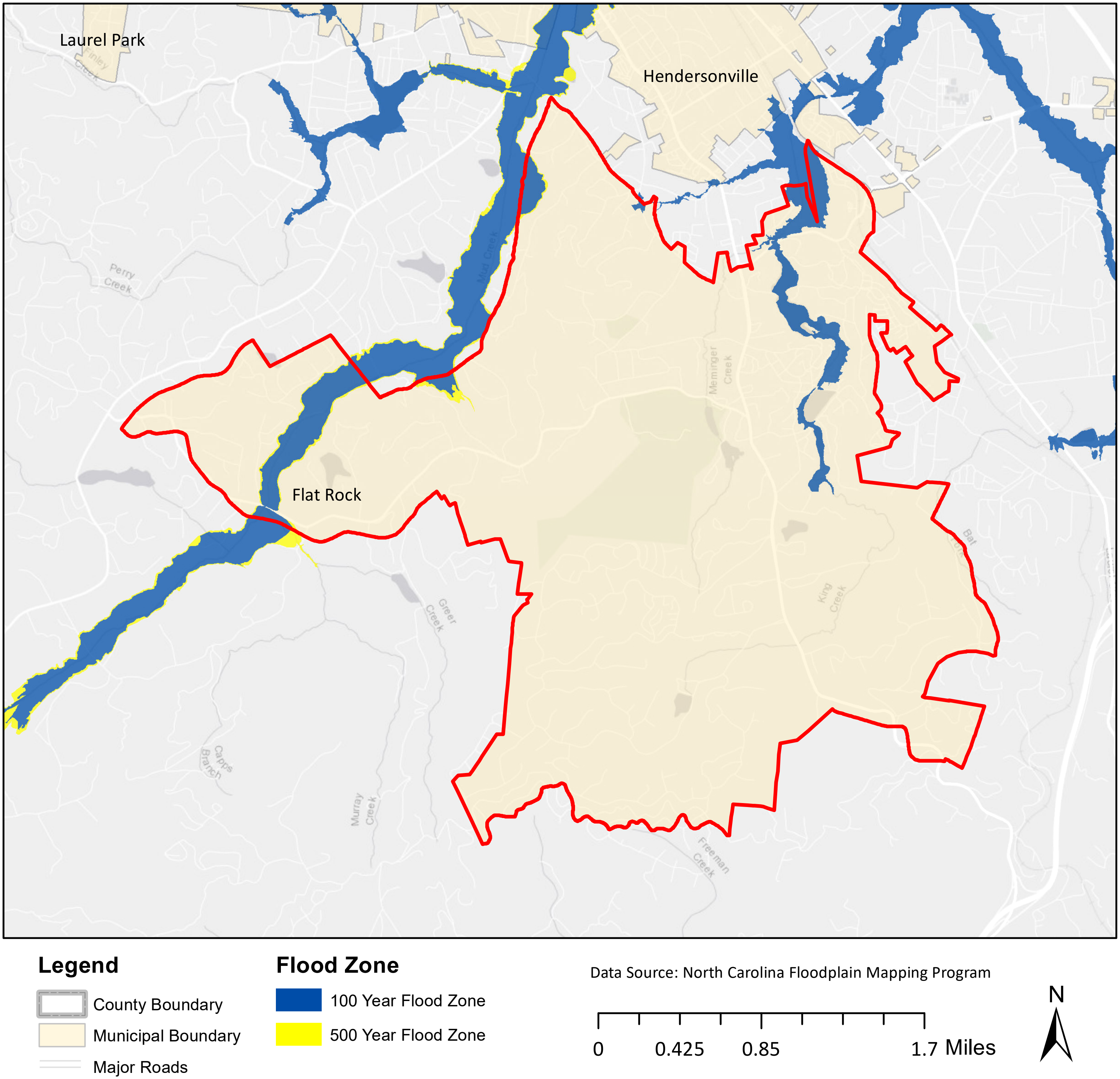
Action #	Description	Hazard(s) Addressed	Relative Priority	Funding Sources	Responsible Party	Target Completion Date	2020 Action Implementation Status
Prevention							
P-2	Develop a Storm Waste Management Plan	FL	Moderate	Local Funds	Building Inspectors	Completed	That action is in place, each new building 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.
Emergency Services							
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.
Public Education and Awareness Activities							
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

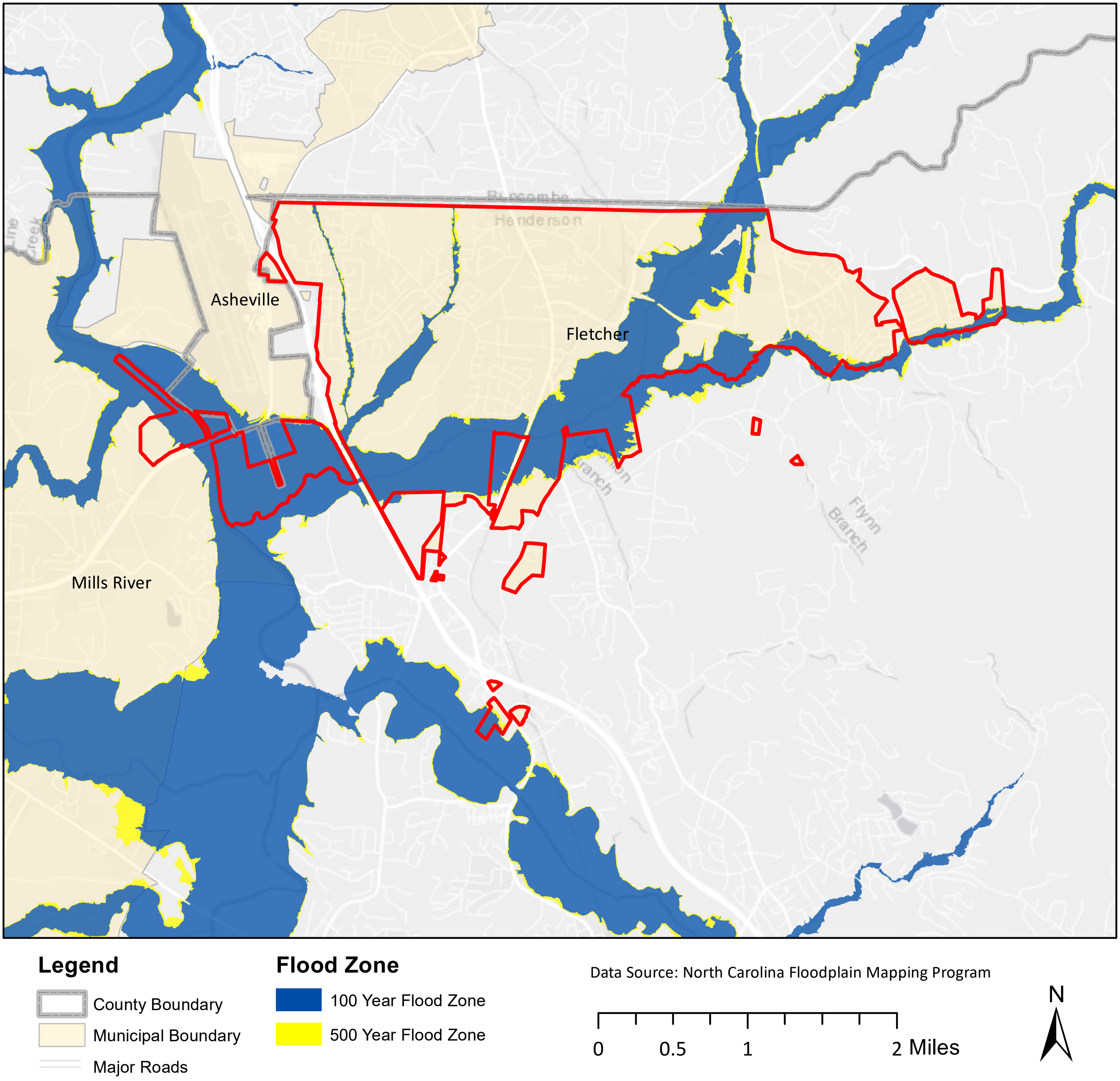


Data Source: North Carolina Floodplain Mapping Program

Flat Rock - Flood Hazard Areas

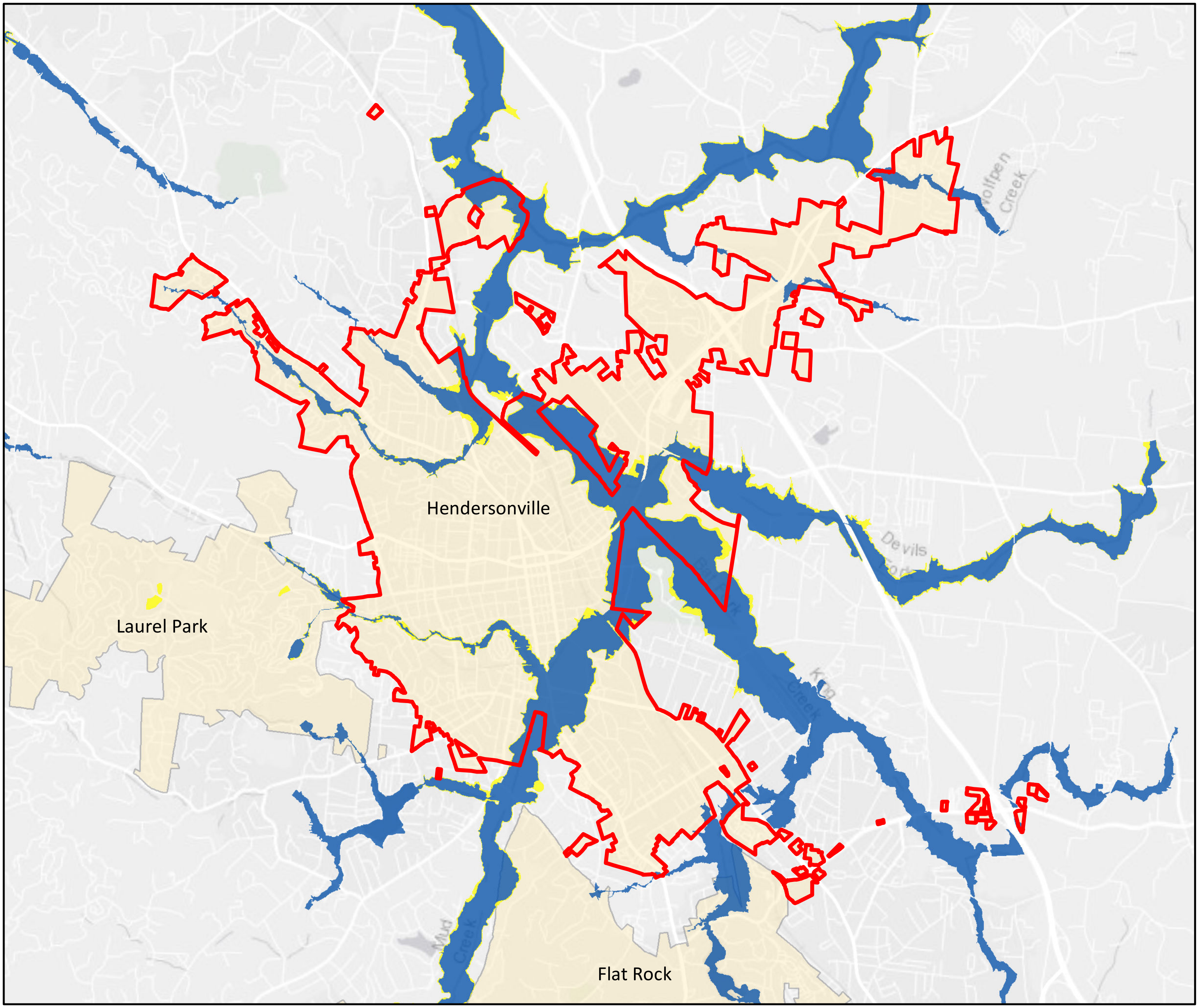


Fletcher - Flood Hazard Areas



Data Source: North Carolina Floodplain Mapping Program

Hendersonville - Flood Hazard Areas



Legend

County Boundary
Municipal Boundary
Major Roads

Flood Zone

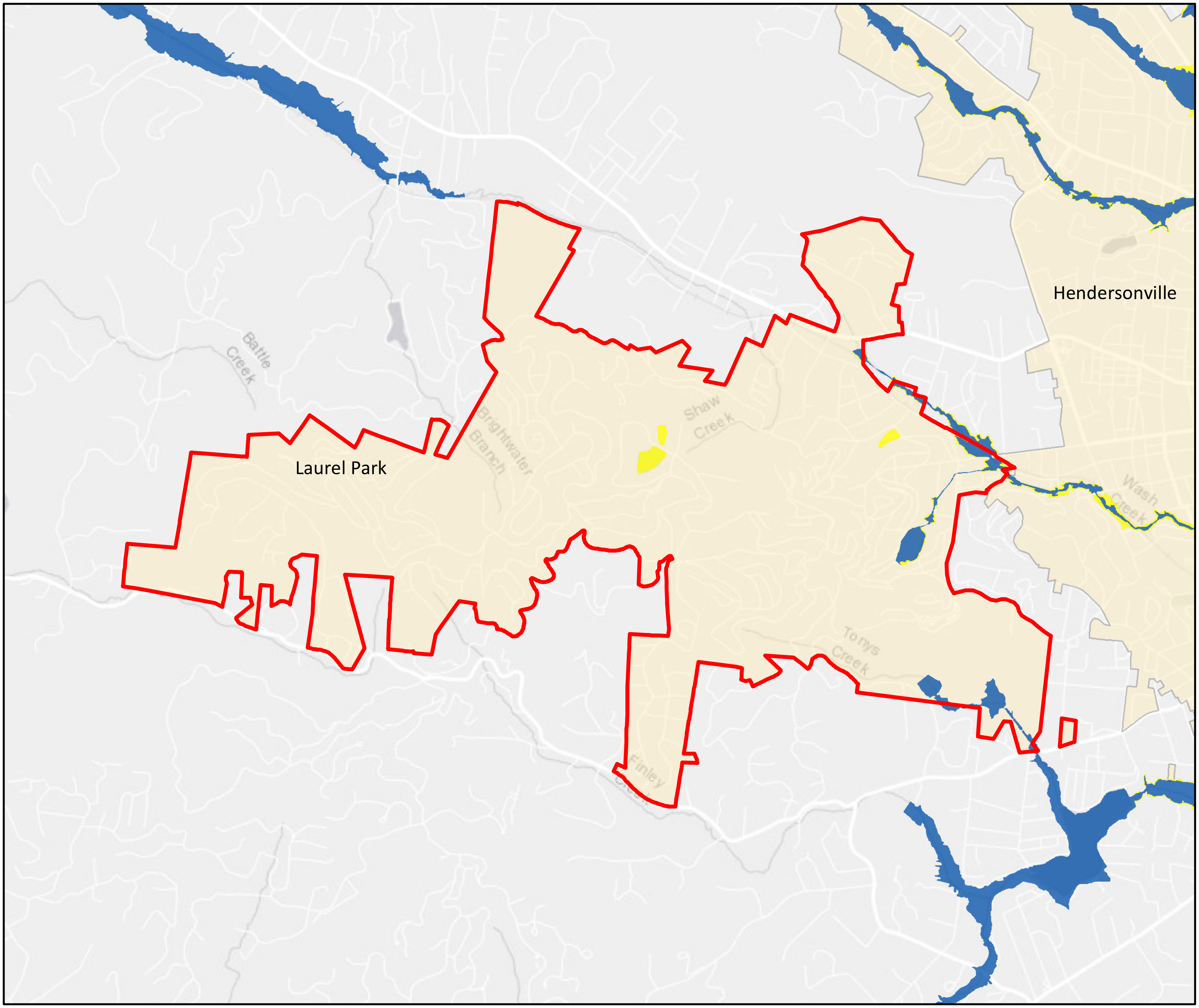
100 Year Flood Zone
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.5 1 2 Miles

N

Laurel Park - Flood Hazard Areas



Legend

County Boundary
Municipal Boundary
Major Roads

Flood Zone

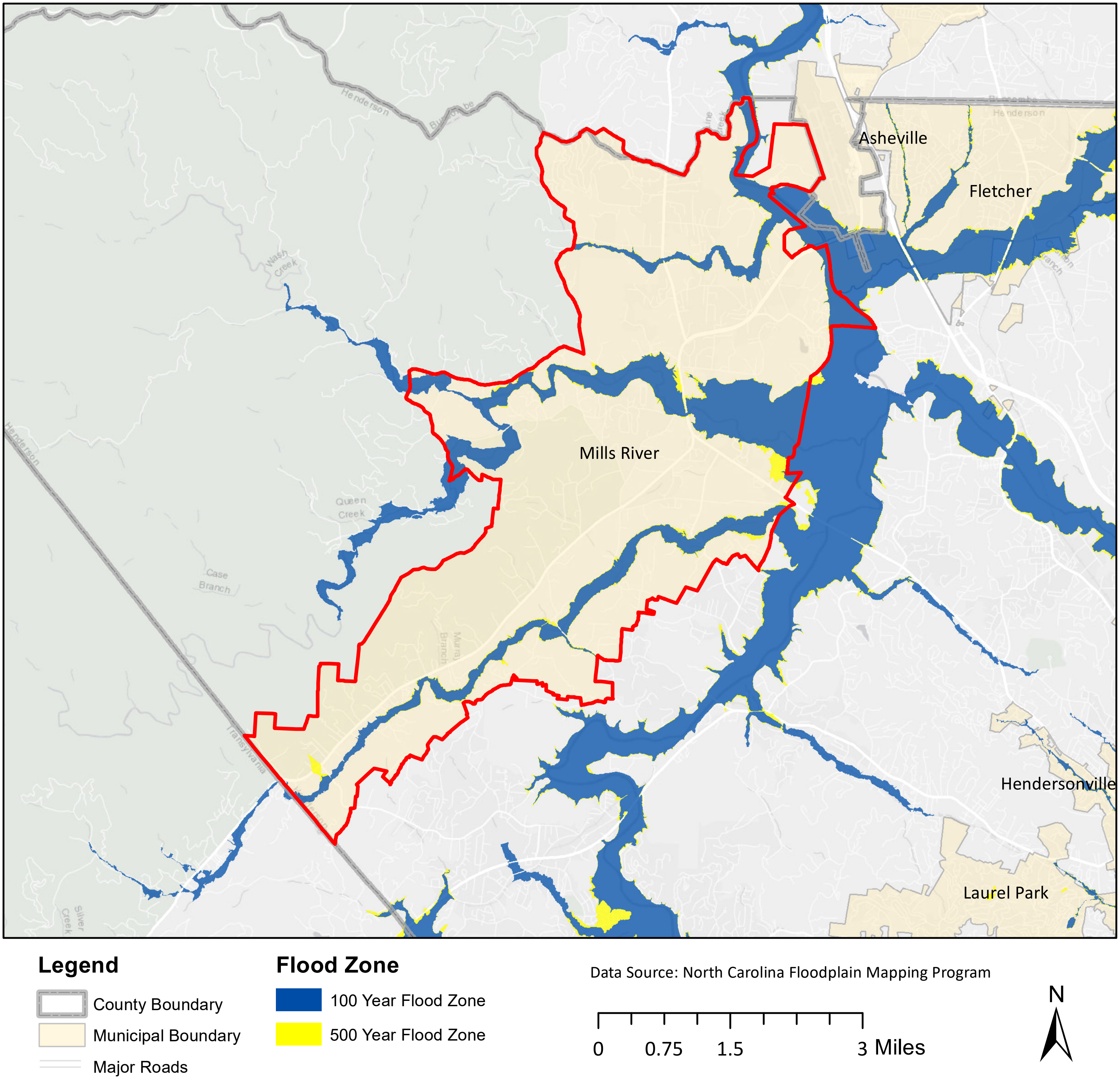
100 Year Flood Zone
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.3 0.6 1.2 Miles

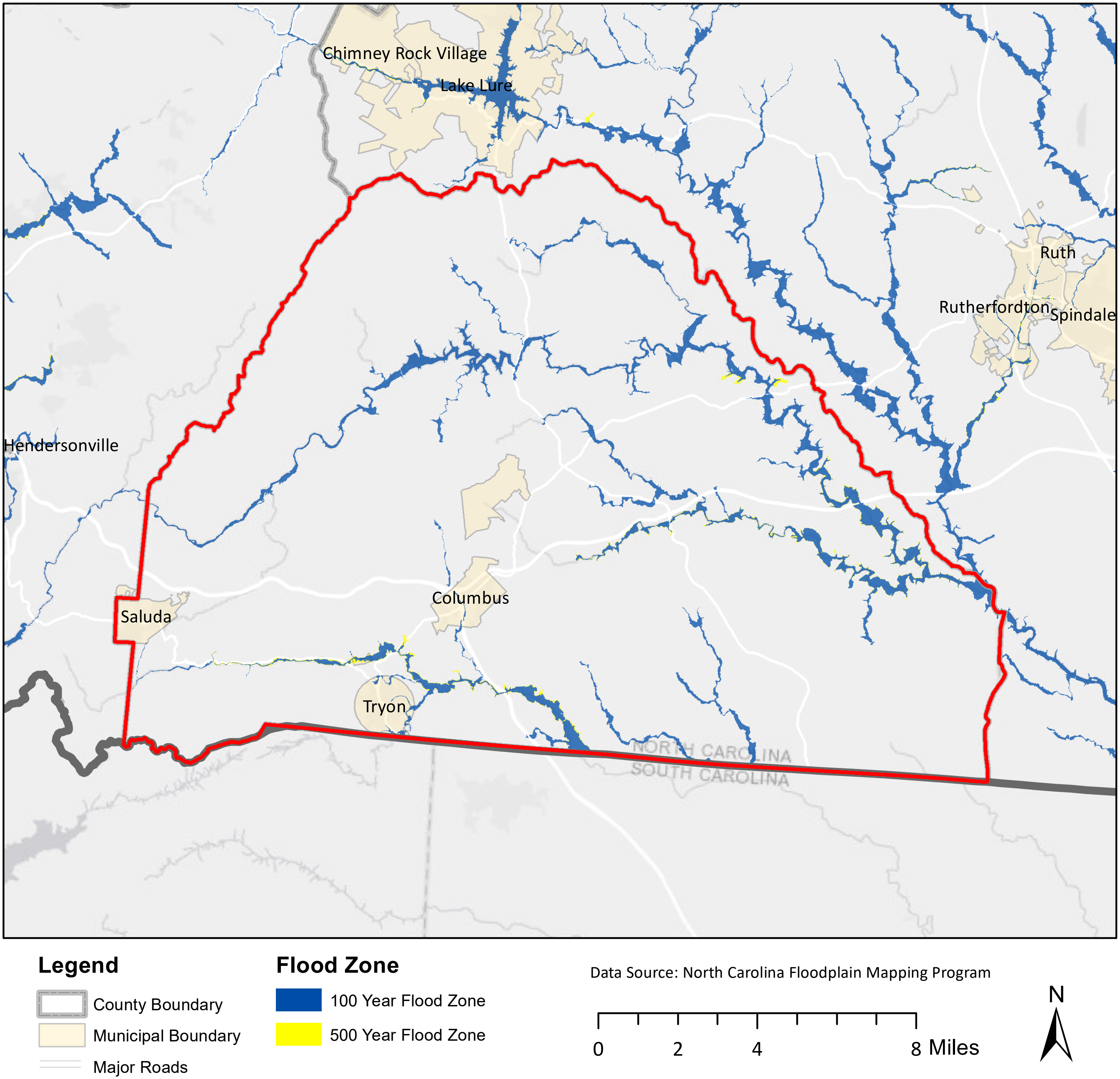
N

Mills River - Flood Hazard Areas

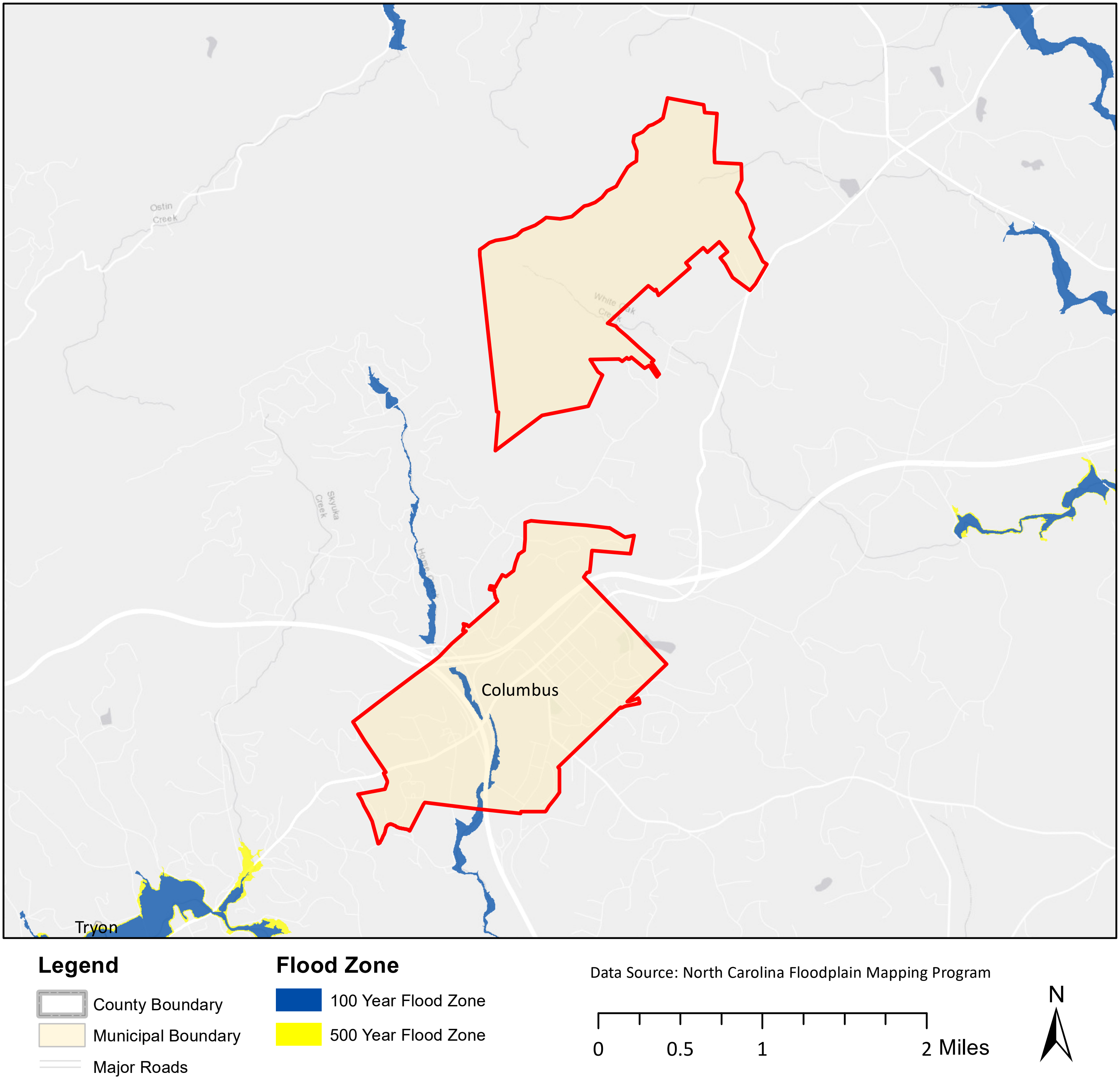


Data Source: North Carolina Floodplain Mapping Program

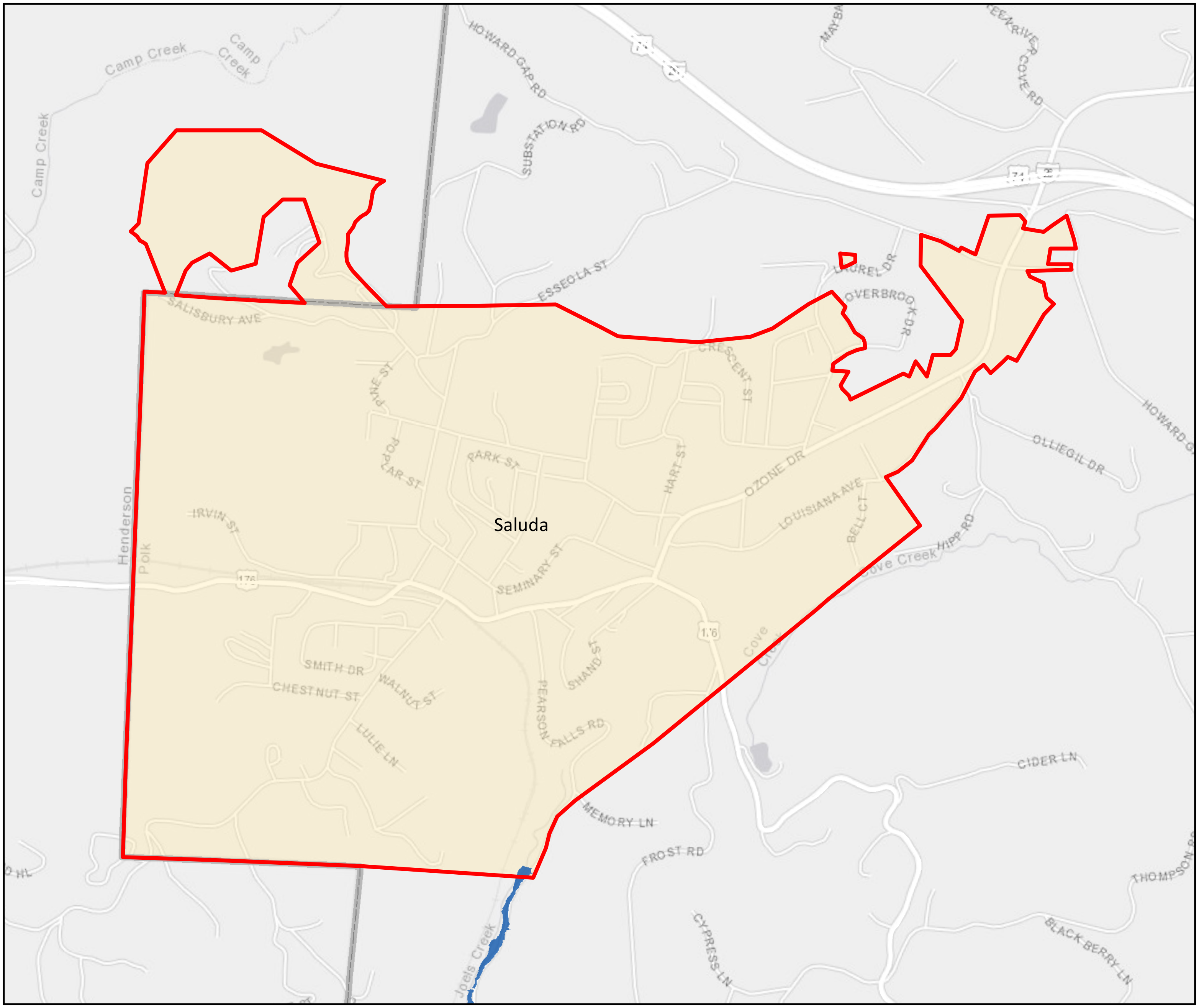
Polk County - Flood Hazard Areas



Columbus - Flood Hazard Areas



Saluda - Flood Hazard Areas



Legend

County Boundary

Municipal Boundary

Major Roads

Flood Zone

100 Year Flood Zone

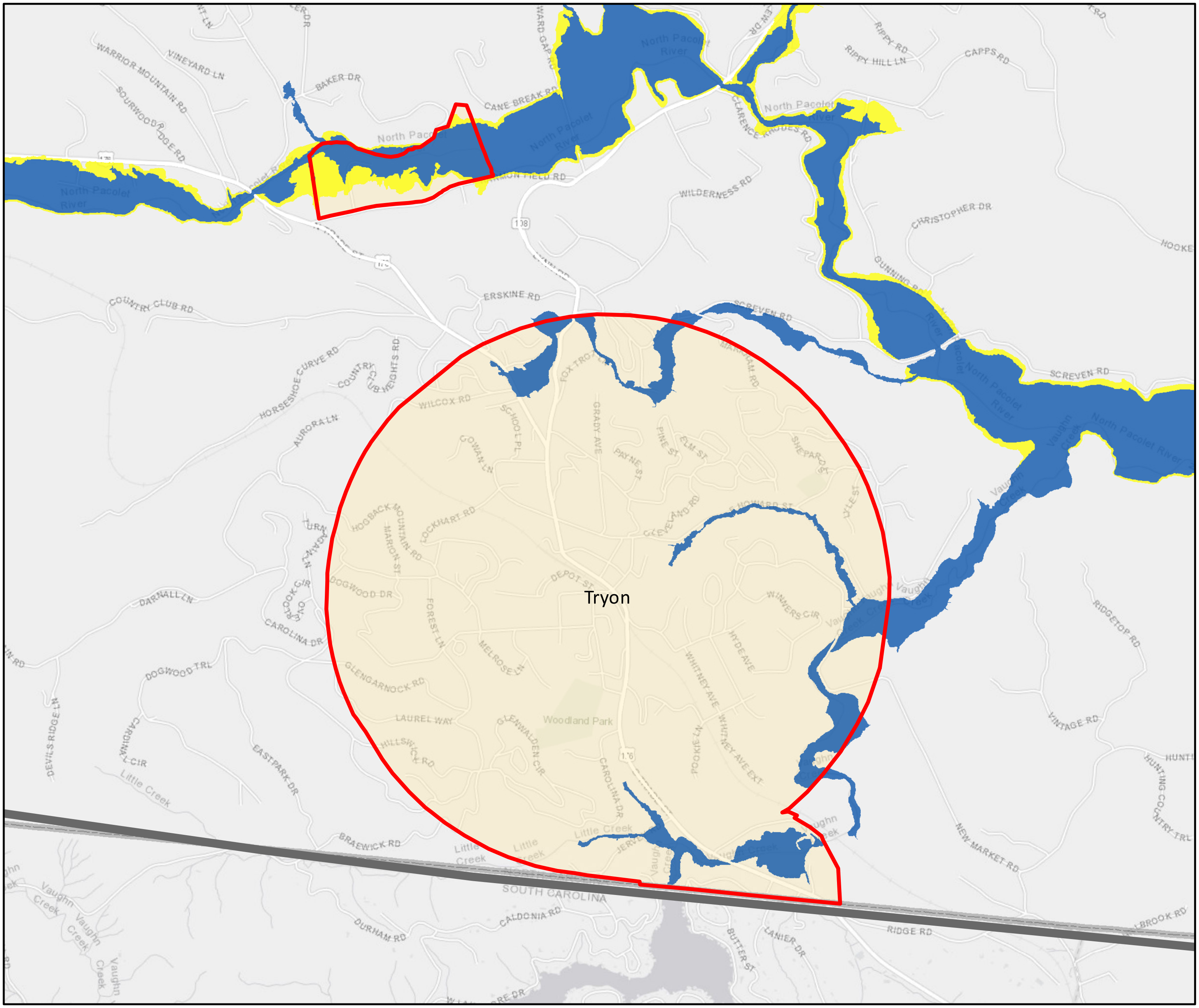
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.175 0.35 0.7 Miles

N

Tryon - Flood Hazard Areas



Legend

County Boundary
Municipal Boundary
Major Roads

Flood Zone

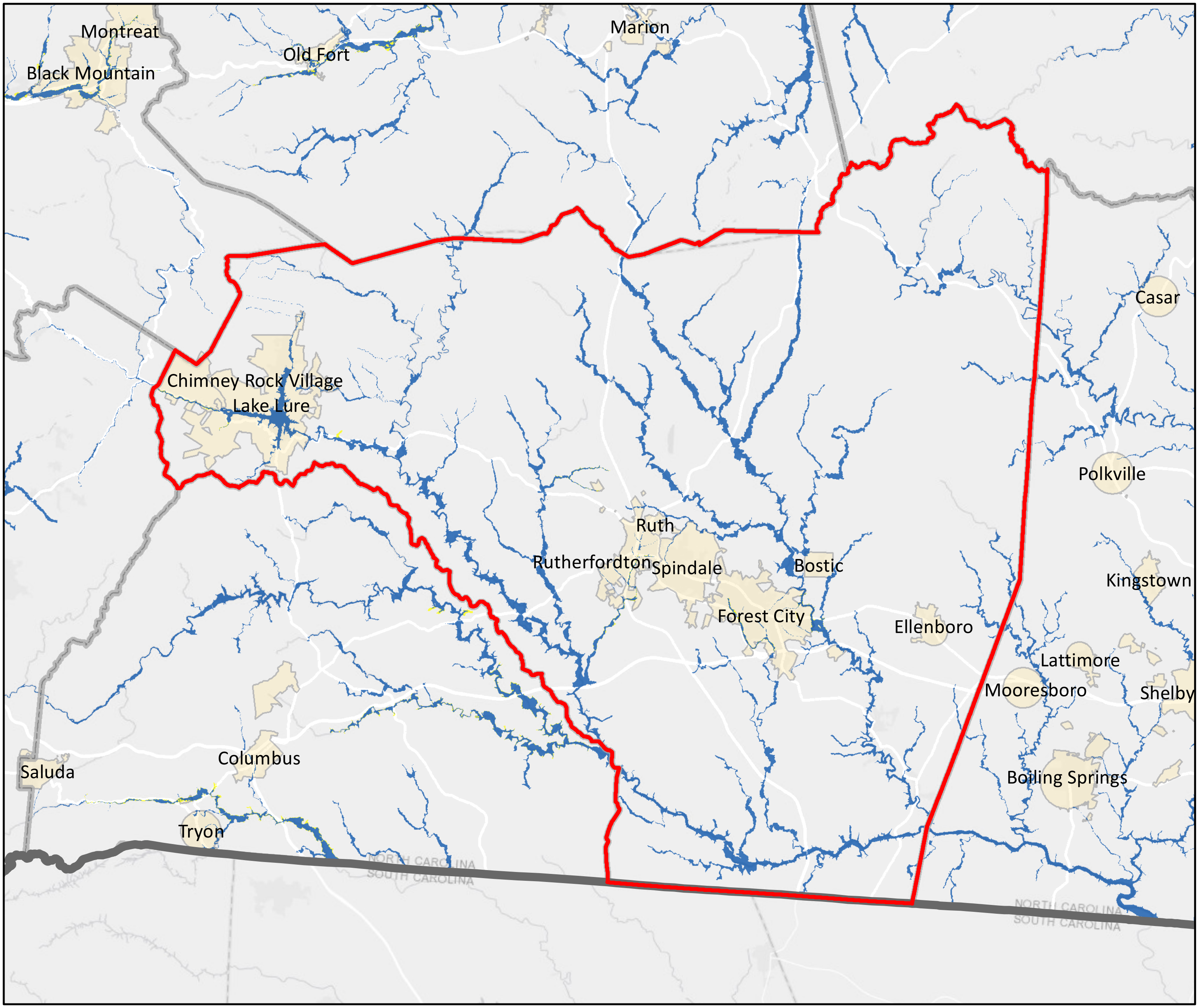
100 Year Flood Zone
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.225 0.45 0.9 Miles

N

Rutherford County - Flood Hazard Areas



Legend

County Boundary
Municipal Boundary
Major Roads

Flood Zone

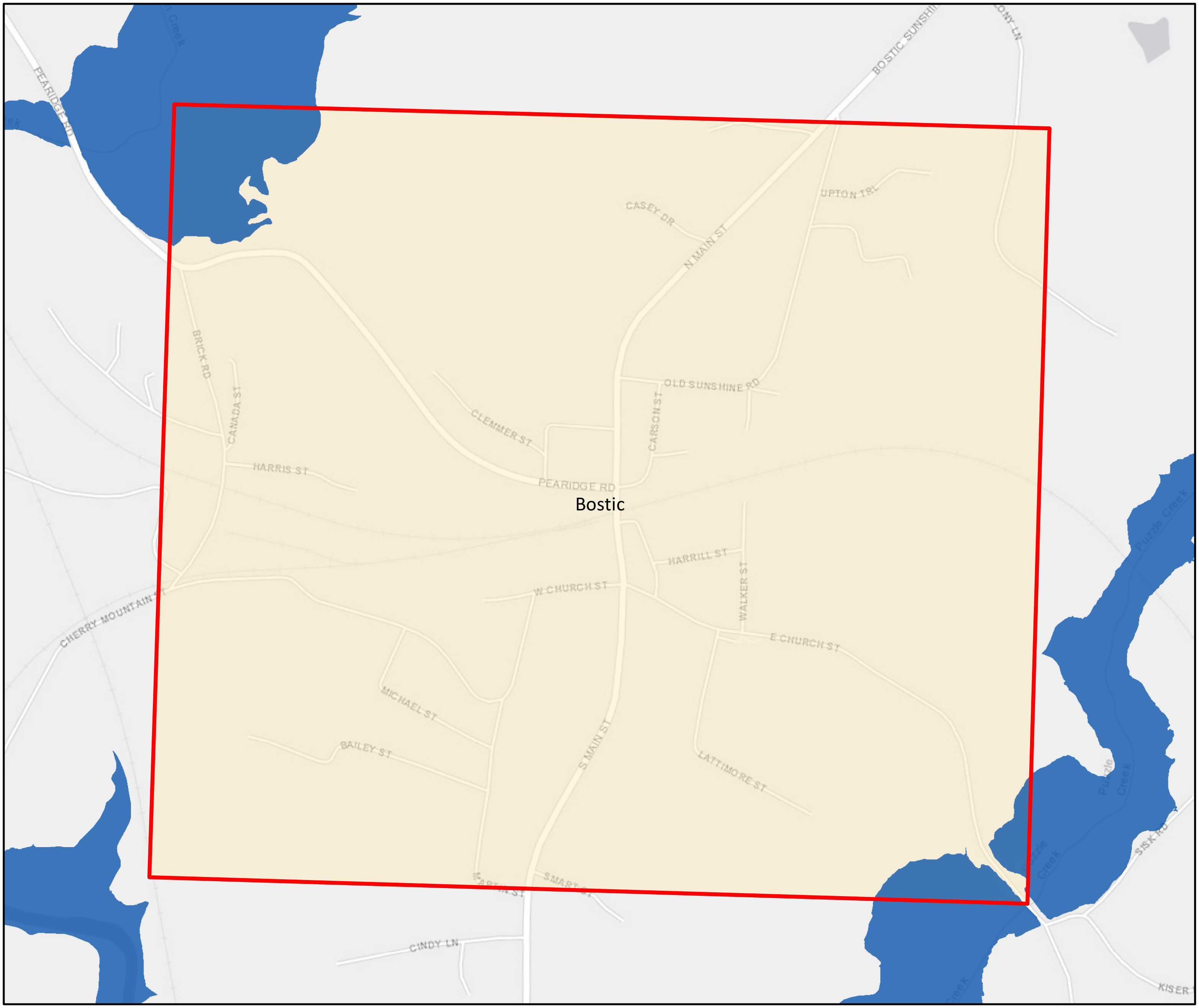
100 Year Flood Zone
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 3.25 6.5 13 Miles

N

Bostic - Flood Hazard Areas



Legend

County Boundary

Municipal Boundary

Major Roads

Flood Zone

100 Year Flood Zone

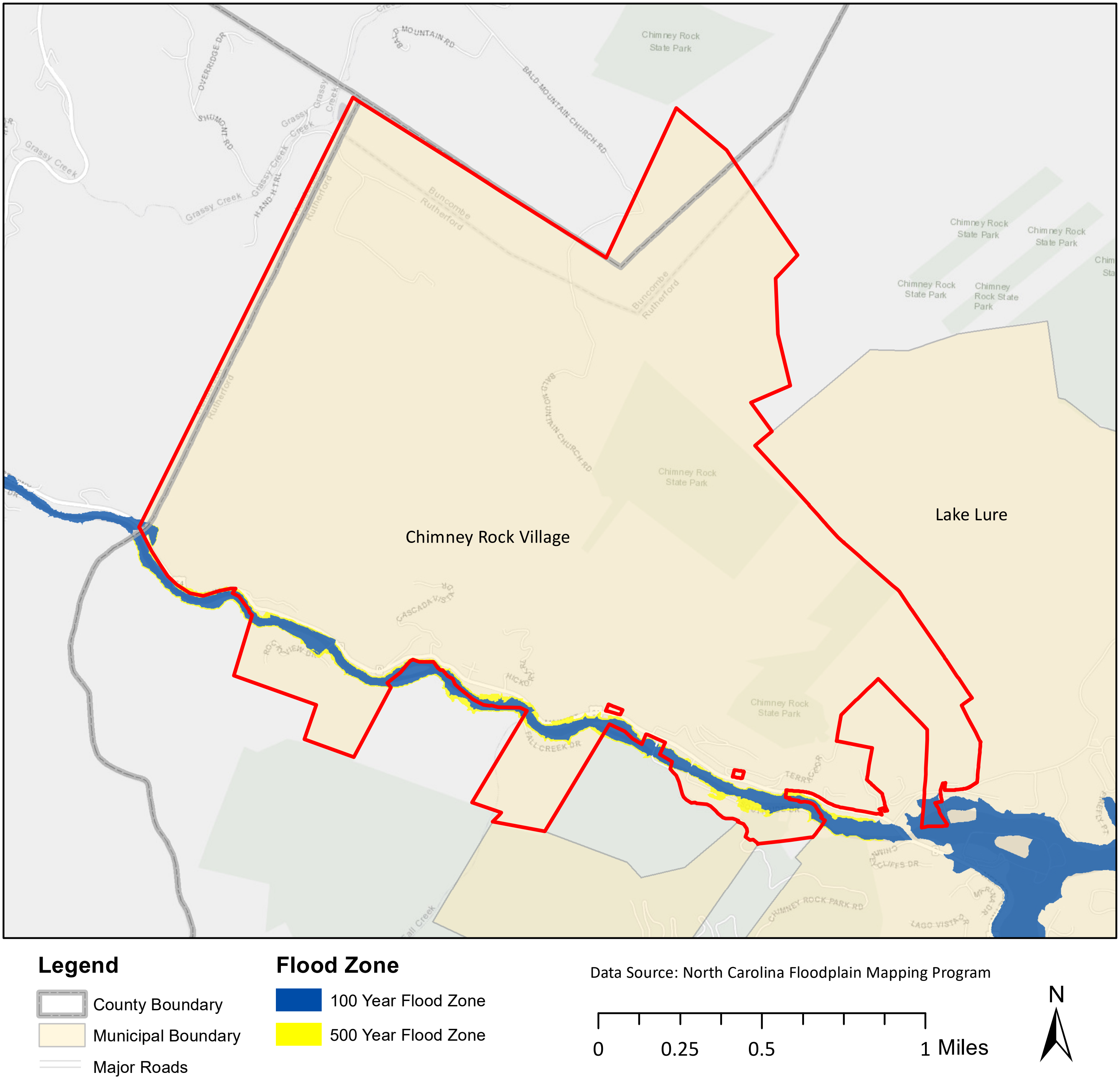
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

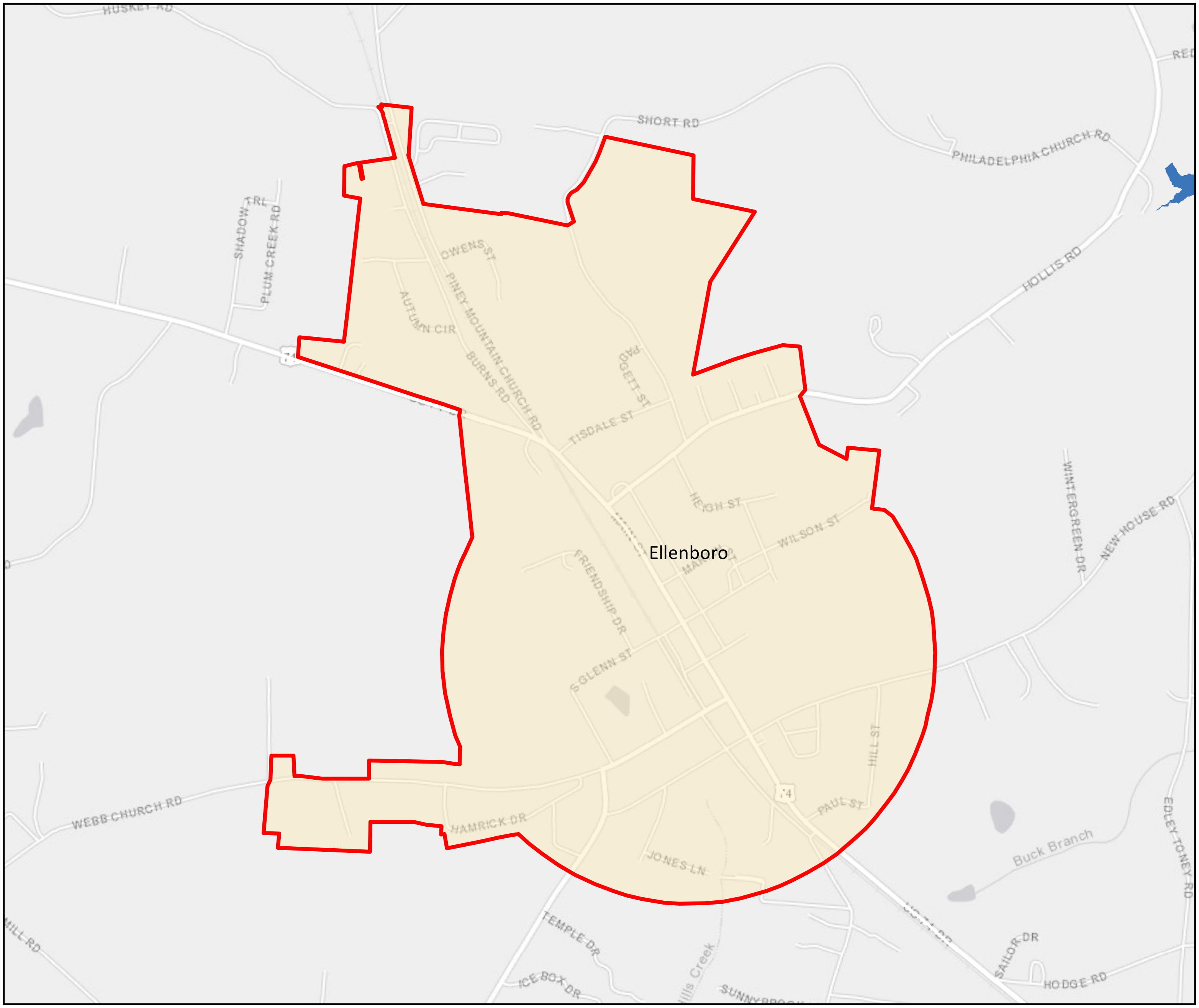
0 0.1 0.2 0.4 Miles

N

Chimney Rock Village - Flood Hazard Areas



Ellenboro - Flood Hazard Areas



Legend

- County Boundary
- Municipal Boundary
- Major Roads

Flood Zone

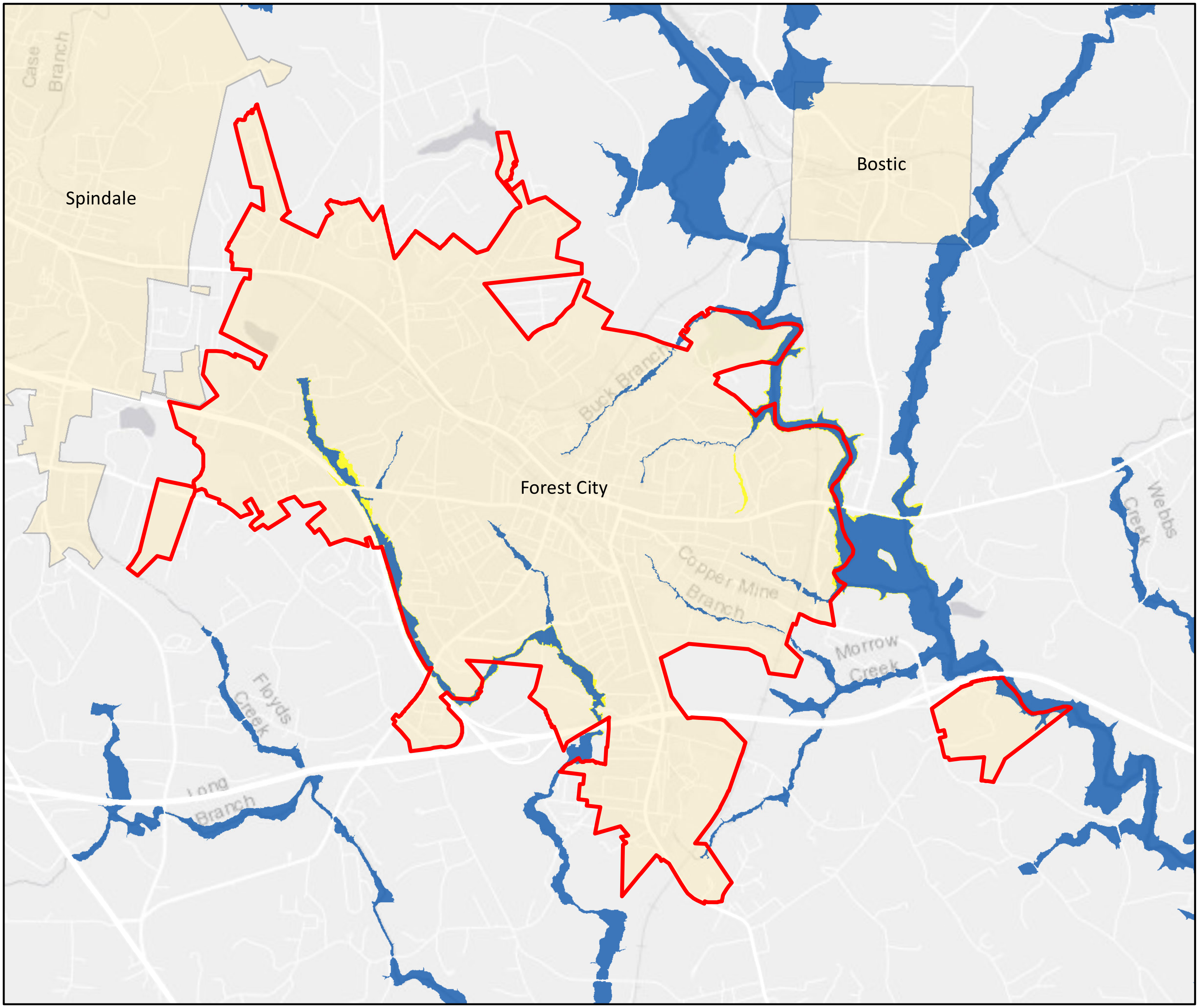
- 100 Year Flood Zone
- 500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.175 0.35 0.7 Miles

N

Forest City - Flood Hazard Areas



Legend

County Boundary

Municipal Boundary

Major Roads

Flood Zone

100 Year Flood Zone

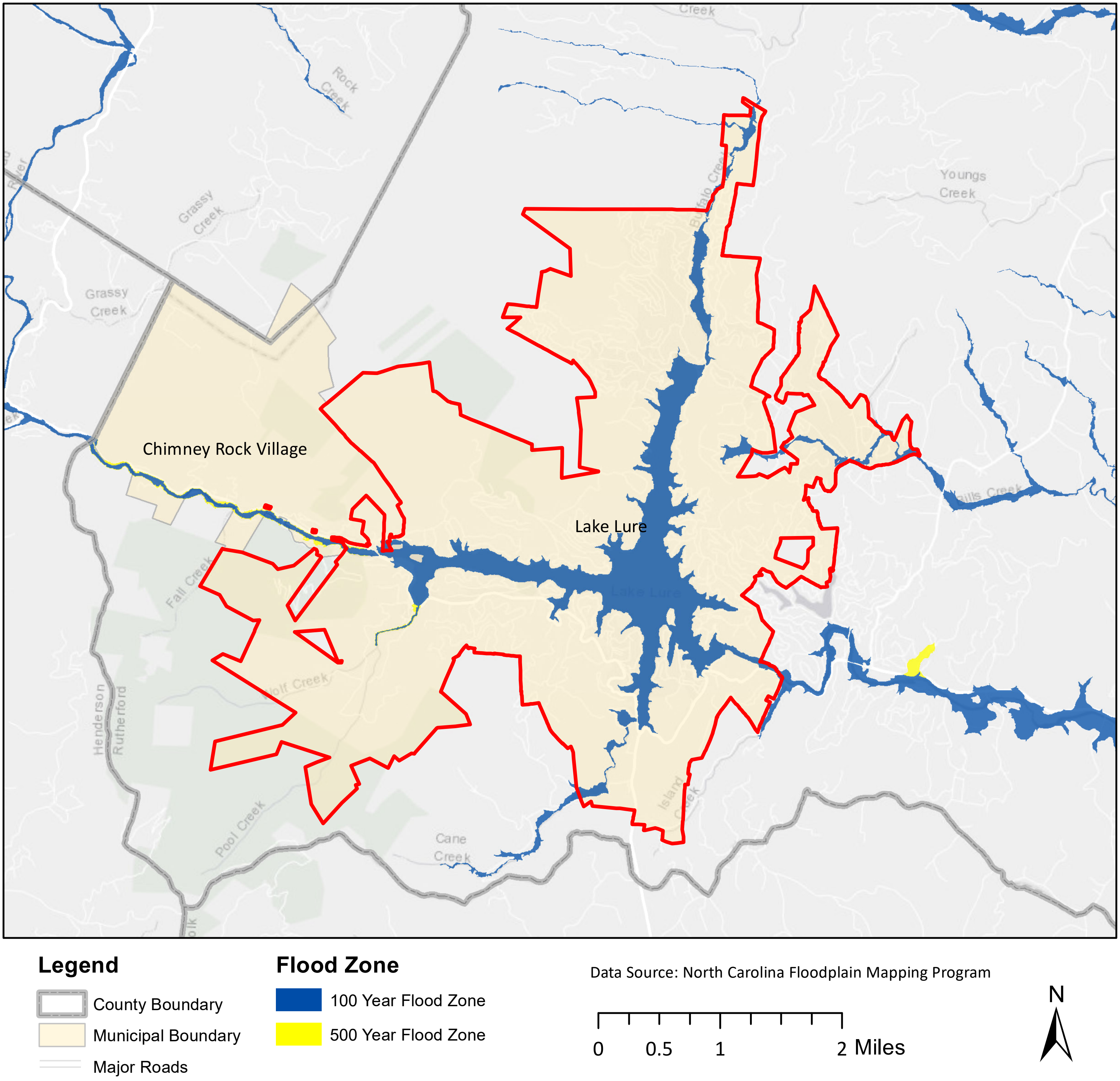
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.5 1 2 Miles

N

Lake Lure - Flood Hazard Areas



Ruth - Flood Hazard Areas

Legend

County Boundary

Municipal Boundary

Major Roads

Flood Zone

100 Year Flood Zone

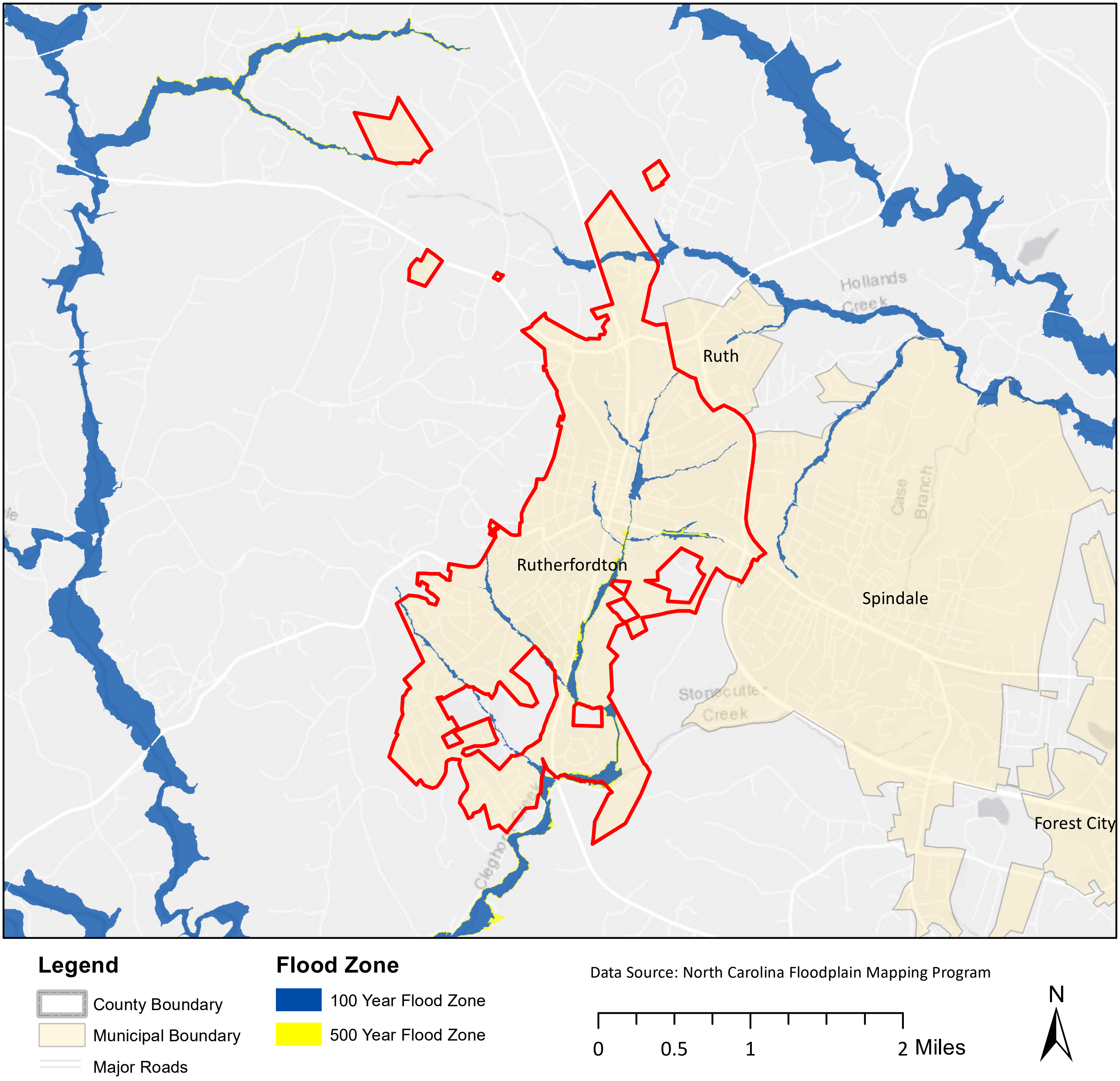
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

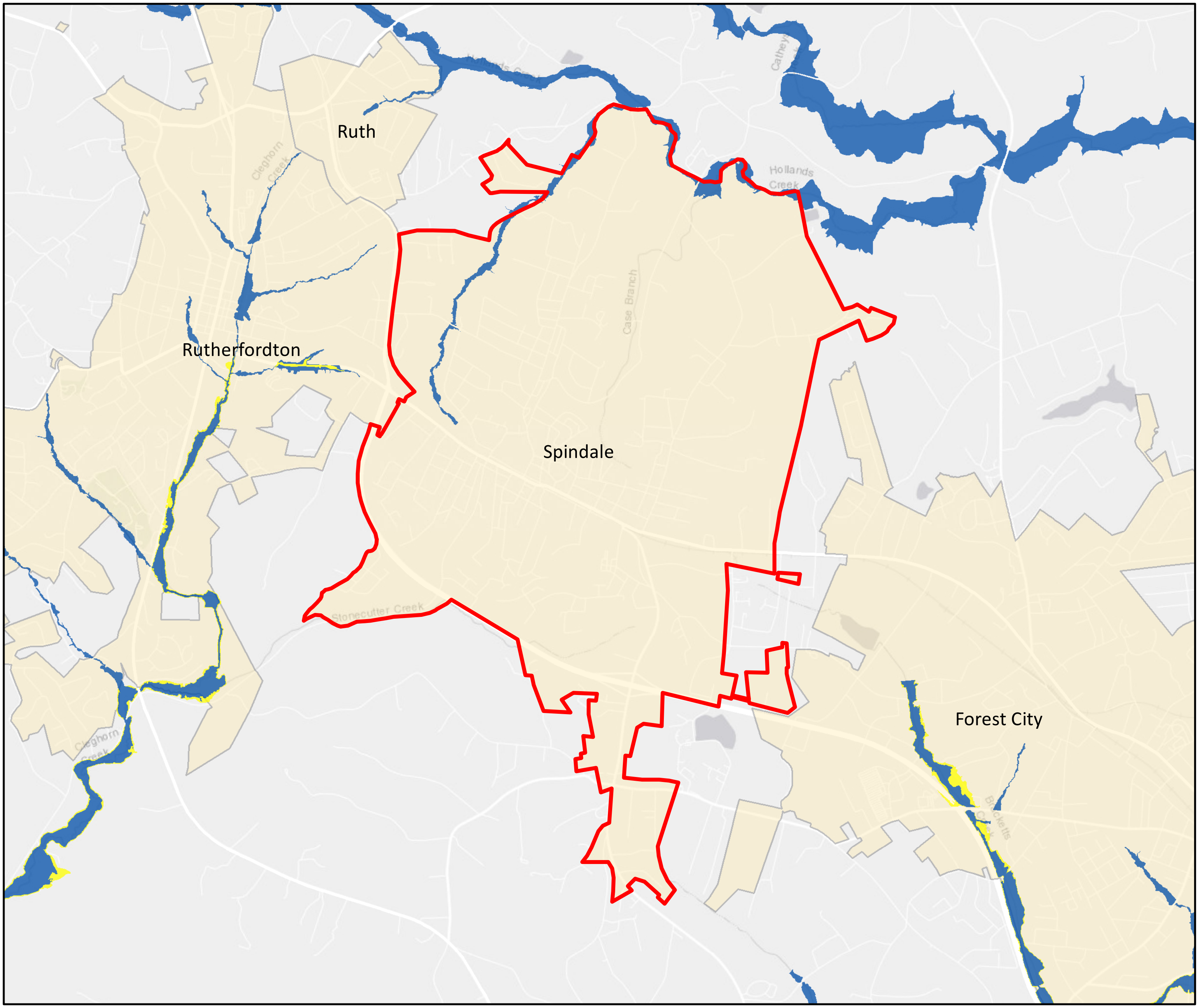
0 0.075 0.15 0.3 Miles

N

Rutherfordton - Flood Hazard Areas



Spindale - Flood Hazard Areas



Legend

County Boundary
Municipal Boundary
Major Roads

Flood Zone

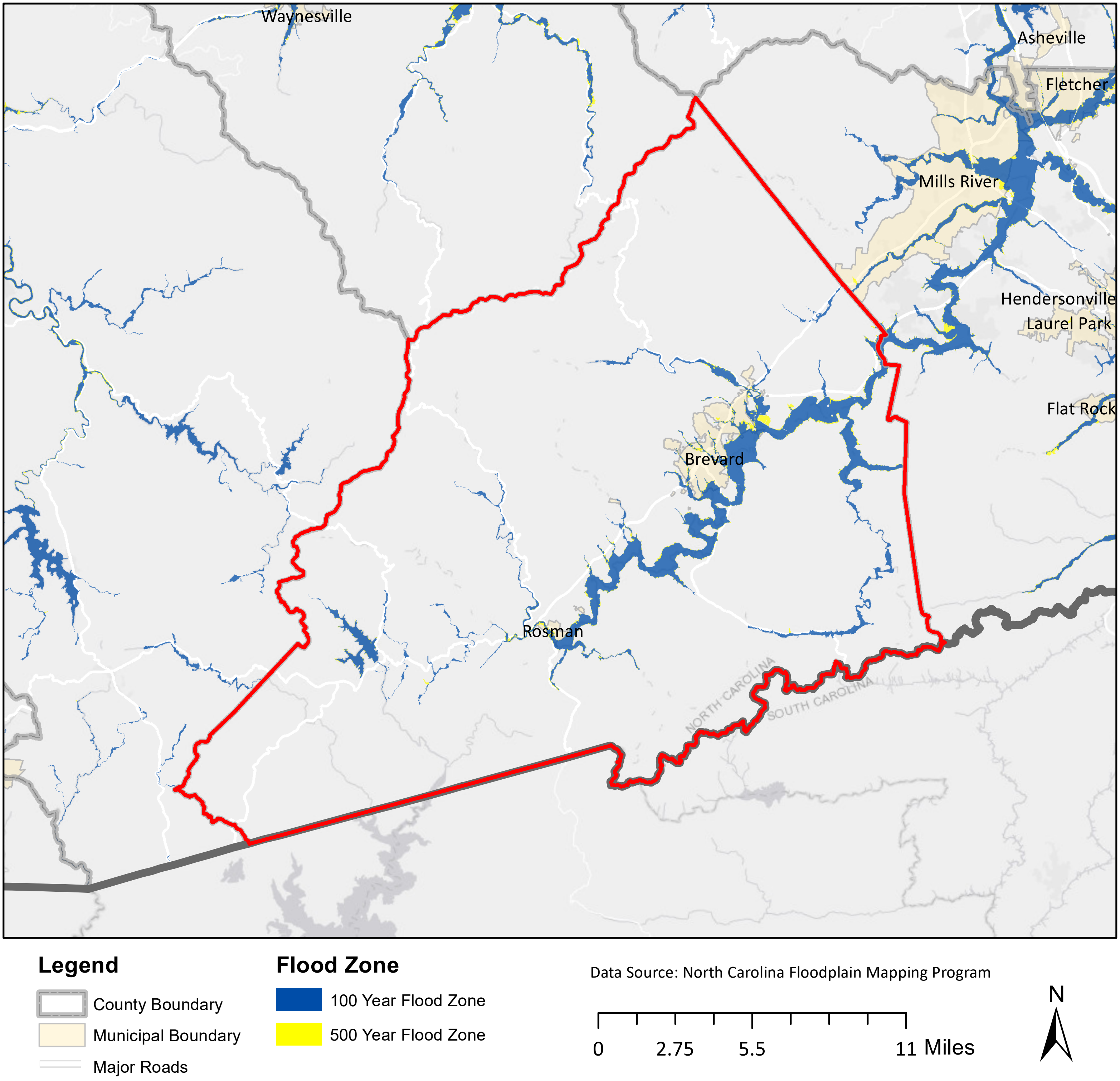
100 Year Flood Zone
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

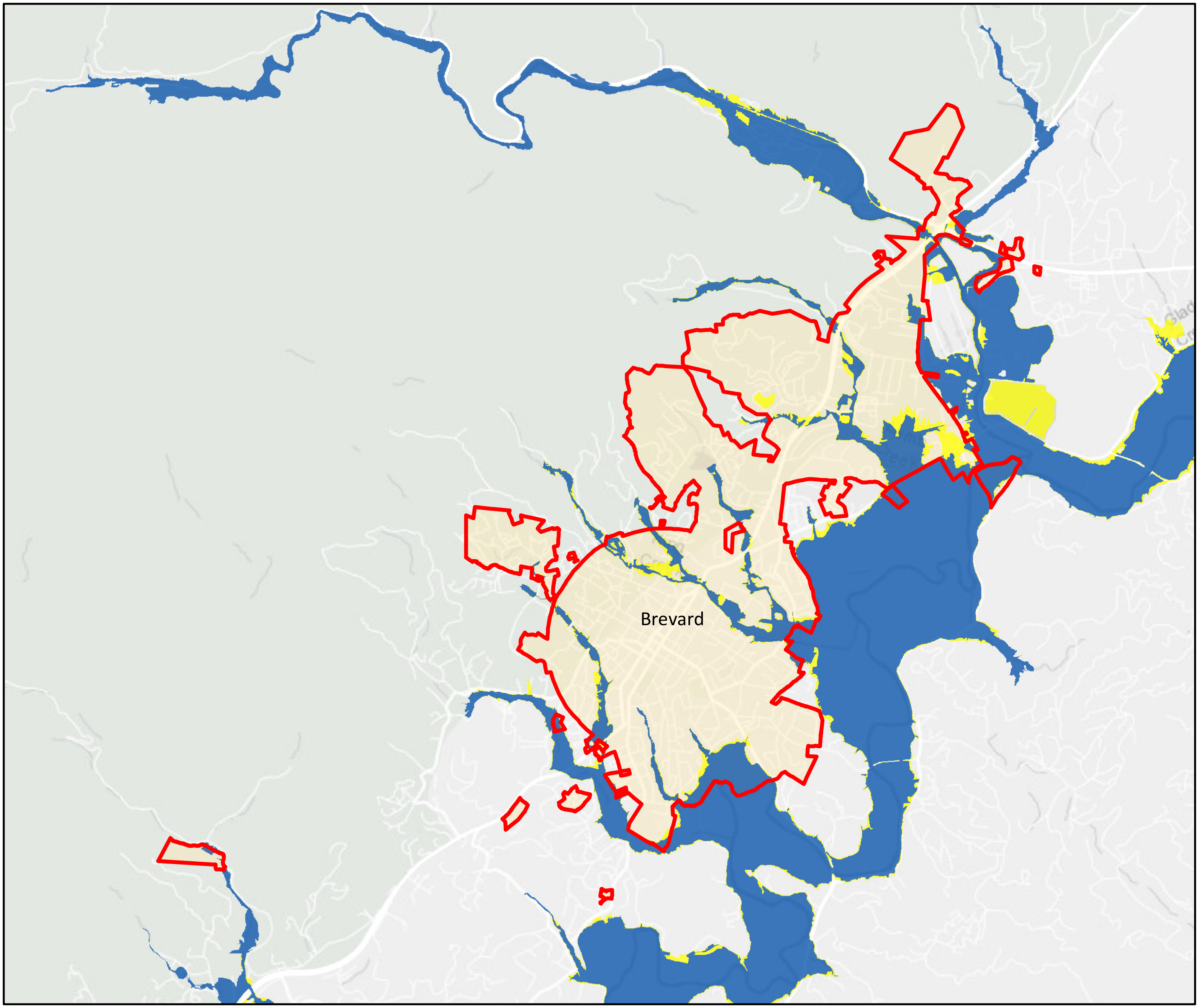
0 0.425 0.85 1.7 Miles

N

Transylvania County - Flood Hazard Areas



Brevard - Flood Hazard Areas



Legend

County Boundary

Municipal Boundary

Major Roads

Flood Zone

100 Year Flood Zone

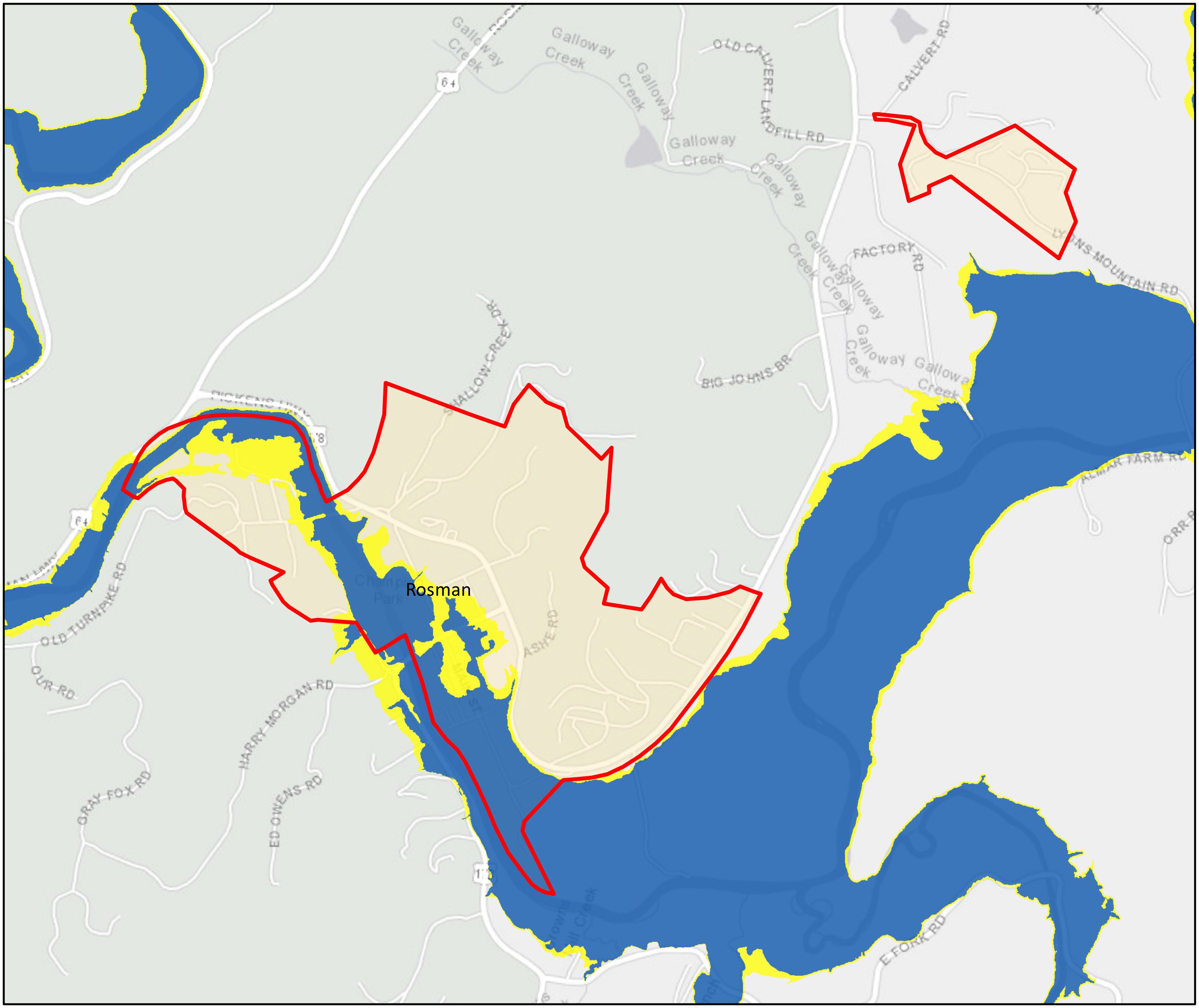
500 Year Flood Zone

Data Source: North Carolina Floodplain Mapping Program

0 0.5 1 2 Miles

N

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

0 0.15 0.3 0.6 Miles

N

Appendix G: NCEI Storm Event Data

This section of the Plan includes the historic storm event data as reported to the National Centers for Environmental Information.

- G.1 – Cold/Wind Chill
- G.2 – Drought
- G.3 – Flood
- G.4 – Hail
- G.5 – Heavy Rain
- G.6 – Heavy Snow
- G.7 – High Wind
- G.8 – Ice Storm
- G.9 – Lightning
- G.10 – Sleet
- G.11 – Tornado
- G.12 – Thunderstorm
- G.13 – Winter Storm

TABLE G.1: COLD/WIND CHILL EVENTS (2000-2019)

Date	Description
Henderson County	
3/8/1996	Record cold was at least partially responsible for the deaths of two mountain residents. A homeless man died in Hendersonville and an elderly man in Transylvania county wandered from his home and died from hypothermia.
3/15/1997	A woman in Hendersonville succumbed partly from the cold weather when she was locked outside a home overnight.
4/1/1997	Several cold snaps following the relatively warm late winter caused temperatures to dip well into the 20s at times yielding substantial damage to the apple crop and perhaps other crops.
1/7/2017	Gusty northwest winds ushering in an arctic air mass to the southern Appalachians combined with a snow packed ground to produce frigid temperatures and low wind chill values across the North Carolina mountains on the night of the 7th through the morning of the 8th. By daybreak on the 8th, air temperatures were in the single digits and lower teens across the mountain's valleys, while the high peaks and ridge tops saw temperatures below 0. Valley wind chill values ranged from around 0 to -10 across the southern and central mountains, and from -5 to -15 from the French Broad Valley north. The high peaks and ridge tops likely saw wind chill values of -30 or lower at times. Although temperatures warmed slightly and winds abated during the day, conditions remained unseasonably cold across the mountains for a couple of days. Even some valley locations did not warm above freezing until the afternoon of the 10th.
3/16/2017	The 2017 growing season began early across western North Carolina, due to an unusually warm February and early March that saw average temperatures of almost 10 degrees above normal. An episode of cold arctic high pressure in the middle of March led to a hard freeze on the morning of the 16th, when low temperatures in the lower to mid-20s were reported. This caused significant damage to berry, wheat, apple, and peach crops. While subsequent days of freezing temperatures caused further damage, the vast majority of the damage occurred on the 16th.
1/1/2018	A large area of arctic high pressure slowly settled in over western North Carolina in the wake of a cold front that pushed through the area on 12/30, resulting in an extended period of unusually cold weather across the region. By the morning of the 1st, wind chill values of 0 to -15 were common in the mountain valleys and northern foothills, while high elevation wind chills as low as -40 were reported. These trends repeated during most nights and early morning hours through the 7th, when low temperatures were typically in the lower teens and single digits. Meanwhile, daytime temperatures remained at or below freezing in most areas through the week, with the few areas that did reach the melting level only staying there for a couple of hours during the afternoon.
1/17/2018	A cold arctic air mass built into western North Carolina on the heels of gusty northwest winds developing west of a storm system moving up the Southeast coast. The gusty winds and cold air passing over a fresh snowpack resulted in low wind chills across much of the high terrain and portions of the foothills. Wind chill values from 0 to -10 were common in elevations above 1500 feet or so. Meanwhile, wind chill values of -20 to -30 were measured above about 4000 feet.
1/20/2019	Gusty northwest winds developing in the wake of an arctic cold front ushered in a very cold air mass into the North Carolina mountains throughout the 20th and remained in place into the 21st. Wind chill values as of -5 to -10 occurred across the valleys the morning of the 21st, while values as low as -20 were reported across the high elevations throughout the night of the 20th and through much of the 21st. Meanwhile, air temperatures remained below freezing for more than 48 hours (from late morning of the 20th until the afternoon of the 22nd) in all areas except for the lowest valleys of far southwest North Carolina.
Polk County	
1/7/2015	A strong arctic cold front moved through the western Carolinas during the morning and afternoon of the 7th, bringing gusty winds and very cold air to the Piedmont and foothills. By late evening, sustained winds of 5 to 15 mph combined with air temperatures in the teens to yield wind chill values near 0. Although winds gradually diminished overnight, air temperatures fell to around 10 degrees in many areas by daybreak, and wind chills of 0 to 5 above lingered until temperatures began warming during late morning. However, temperatures remained at or below freezing in many areas throughout the 8th. Record daily lows were set in the Charlotte area on the morning of the 8th.
2/18/2015	A strong arctic cold front blasted through the southern Appalachians and adjacent foothills during the afternoon and evening of the 18th, bringing strong winds and bitterly cold air to the region. By mid-evening, sustained winds of 10

	to 25 mph combined with air temperatures in the single digits and teens to yield wind chill values in the 0 to -10 range in the valleys. By daybreak on the 19th, air temperatures in the valleys were near 0 while the high elevations were well below 0. Wind chill values during this time ranged from -5 to -20 across the valleys, while stronger winds and colder temperatures likely yielded values as low as -50 across the high elevations of the Smokies and Balsams. The low wind chills continued throughout the 19th, as air temperatures failed to warm above the mid-20s in even the lowest valleys, and the high elevations remained within a few degrees either side of 0. Wind chills remained no higher than the single digits across most of the area until late morning on the 20th.
2/19/2015	A strong arctic cold front blasted through the western Carolinas during the afternoon and evening of the 18th, bringing strong winds and very cold air to the region. Overnight, sustained winds of 5 to 15 mph combined with air temperatures in the teens to yield wind chill values around 0 by daybreak on the 19th. Although winds diminished, air temperatures failed to warm above the 20s throughout the 19th, while record lows between 0 and 10 above were recorded the morning of the 20th.
3/16/2017	The 2017 growing season began early across western North Carolina, due to an unusually warm February and early March that saw average temperatures of almost 10 degrees above normal. An episode of cold arctic high pressure in the middle of March led to a hard freeze on the morning of the 16th, when low temperatures in the lower to mid-20s were reported. This caused significant damage to berry, wheat, apple, and peach crops. While subsequent days of freezing temperatures caused further damage, the vast majority of the damage occurred on the 16th.
1/17/2018	A cold arctic air mass built into western North Carolina on the heels of gusty northwest winds developing west of a storm system moving up the Southeast coast. The gusty winds and cold air passing over a fresh snowpack resulted in low wind chills across much of the high terrain and portions of the foothills. Wind chill values from 0 to -10 were common in elevations above 1500 feet or so. Meanwhile, wind chill values of -20 to -30 were measured above about 4000 feet.
Rutherford County	
1/7/2015	A strong arctic cold front moved through the western Carolinas during the morning and afternoon of the 7th, bringing gusty winds and very cold air to the Piedmont and foothills. By late evening, sustained winds of 5 to 15 mph combined with air temperatures in the teens to yield wind chill values near 0. Although winds gradually diminished overnight, air temperatures fell to around 10 degrees in many areas by daybreak, and wind chills of 0 to 5 above lingered until temperatures began warming during late morning. However, temperatures remained at or below freezing in many areas throughout the 8th. Record daily lows were set in the Charlotte area on the morning of the 8th.
2/18/2015	A strong arctic cold front blasted through the southern Appalachians and adjacent foothills during the afternoon and evening of the 18th, bringing strong winds and bitterly cold air to the region. By mid-evening, sustained winds of 10 to 25 mph combined with air temperatures in the single digits and teens to yield wind chill values in the 0 to -10 range in the valleys. By daybreak on the 19th, air temperatures in the valleys were near 0 while the high elevations were well below 0. Wind chill values during this time ranged from -5 to -20 across the valleys, while stronger winds and colder temperatures likely yielded values as low as -50 across the high elevations of the Smokies and Balsams. The low wind chills continued throughout the 19th, as air temperatures failed to warm above the mid-20s in even the lowest valleys, and the high elevations remained within a few degrees either side of 0. Wind chills remained no higher than the single digits across most of the area until late morning on the 20th.
2/19/2015	A strong arctic cold front blasted through the western Carolinas during the afternoon and evening of the 18th, bringing strong winds and very cold air to the region. Overnight, sustained winds of 5 to 15 mph combined with air temperatures in the teens to yield wind chill values around 0 by daybreak on the 19th. Although winds diminished, air temperatures failed to warm above the 20s throughout the 19th, while record lows between 0 and 10 above were recorded the morning of the 20th.
3/16/2017	The 2017 growing season began early across western North Carolina, due to an unusually warm February and early March that saw average temperatures of almost 10 degrees above normal. An episode of cold arctic high pressure in the middle of March led to a hard freeze on the morning of the 16th, when low temperatures in the lower to mid 20s were reported. This caused significant damage to berry, wheat, apple, and peach crops. While subsequent days of freezing temperatures caused further damage, the vast majority of the damage occurred on the 16th.
1/17/2018	A cold arctic air mass built into western North Carolina on the heels of gusty northwest winds developing west of a storm system moving up the Southeast coast. The gusty winds and cold air passing over a fresh snowpack resulted in low wind chills across much of the high terrain and portions of the foothills. Wind chill values from 0 to -10 were

	common in elevations above 1500 feet or so. Meanwhile, wind chill values of -20 to -30 were measured above about 4000 feet.
Transylvania County	
3/8/1996	Record cold was at least partially responsible for the deaths of two mountain residents. A homeless man died in Hendersonville and an elderly man in Transylvania county wandered from his home and died from hypothermia.
4/1/1997	Several cold snaps following the relatively warm late winter caused temperatures to dip well into the 20s at times yielding substantial damage to the apple crop and perhaps other crops.
1/7/2015	An arctic cold front moved through the southern Appalachians and adjacent foothills during the morning and afternoon of the 7th, bringing strong winds and very cold air to the region. By late evening, sustained winds of 10 to 20 mph combined with air temperatures in the teens to yield wind chill values in the 0 to -5 range in the valleys. By daybreak on the 8th, air temperatures in the valleys were near 0 while the high elevations were well below 0. Wind chill values during this time ranged from 0 to -15 across the valleys, while stronger winds and colder temperatures likely yielded values as low as -50 across the high elevations of the Smokies and Balsams. The very low wind chills abated throughout the 8th, as temperatures warmed and winds diminished. However, air temperatures remained below freezing throughout the 8th.
2/18/2015	A strong arctic cold front blasted through the southern Appalachians and adjacent foothills during the afternoon and evening of the 18th, bringing strong winds and bitterly cold air to the region. By mid-evening, sustained winds of 10 to 25 mph combined with air temperatures in the single digits and teens to yield wind chill values in the 0 to -10 range in the valleys. By daybreak on the 19th, air temperatures in the valleys were near 0 while the high elevations were well below 0. Wind chill values during this time ranged from -5 to -20 across the valleys, while stronger winds and colder temperatures likely yielded values as low as -50 across the high elevations of the Smokies and Balsams. The low wind chills continued throughout the 19th, as air temperatures failed to warm above the mid-20s in even the lowest valleys, and the high elevations remained within a few degrees either side of 0. Wind chills remained no higher than the single digits across most of the area until late morning on the 20th.
1/7/2017	Gusty northwest winds ushering in an arctic air mass to the southern Appalachians combined with a snow packed ground to produce frigid temperatures and low wind chill values across the North Carolina mountains on the night of the 7th through the morning of the 8th. By daybreak on the 8th, air temperatures were in the single digits and lower teens across the mountain's valleys, while the high peaks and ridge tops saw temperatures below 0. Valley wind chill values ranged from around 0 to -10 across the southern and central mountains, and from -5 to -15 from the French Broad Valley north. The high peaks and ridge tops likely saw wind chill values of -30 or lower at times. Although temperatures warmed slightly and winds abated during the day, conditions remained unseasonably cold across the mountains for a couple of days. Even some valley locations did not warm above freezing until the afternoon of the 10th.
1/1/2018	A large area of arctic high pressure slowly settled in over western North Carolina in the wake of a cold front that pushed through the area on 12/30, resulting in an extended period of unusually cold weather across the region. By the morning of the 1st, wind chill values of 0 to -15 were common in the mountain valleys and northern foothills, while high elevation wind chills as low as -40 were reported. These trends repeated during most nights and early morning hours through the 7th, when low temperatures were typically in the lower teens and single digits. Meanwhile, daytime temperatures remained at or below freezing in most areas through the week, with the few areas that did reach the melting level only staying there for a couple of hours during the afternoon.
1/17/2018	A cold arctic air mass built into western North Carolina on the heels of gusty northwest winds developing west of a storm system moving up the Southeast coast. The gusty winds and cold air passing over a fresh snowpack resulted in low wind chills across much of the high terrain and portions of the foothills. Wind chill values from 0 to -10 were common in elevations above 1500 feet or so. Meanwhile, wind chill values of -20 to -30 were measured above about 4000 feet.
1/20/2019	Gusty northwest winds developing in the wake of an arctic cold front ushered in a very cold air mass into the North Carolina mountains throughout the 20th and remained in place into the 21st. Wind chill values as of -5 to -10 occurred across the valleys the morning of the 21st, while values as low as -20 were reported across the high elevations throughout the night of the 20th and through much of the 21st. Meanwhile, air temperatures remained below freezing for more than 48 hours (from late morning of the 20th until the afternoon of the 22nd) in all areas except for the lowest valleys of far southwest North Carolina.

1/29/2019	An arctic cold front swept through the North Carolina mountains during the afternoon of the 29th, followed by a reinforcing front on the 30th. This led to an extended period of very cold weather and low wind chill across the high elevations. Temperatures remained in the single digits and teens throughout this time, with gusty northwest winds resulting in wind chill values of -5 to -15 across much of the area. Meanwhile, wind chills as low as -30 were reported on the high peaks and ridge tops above 5500 ft. Temperatures and wind speeds finally began to moderate by late morning on the 31st.
3/5/2019	Unseasonably cold air combined with gusty northwest winds in the wake of a cold front to produce very low wind chills in the high elevations of the North Carolina mountains during the night of the 5th into the morning of the 6th. Air temperatures in the teens and winds gusting to 20 to 30 mph generally produced wind chill values of -5 to -10 in areas above 3500 feet. However, locations above 5000 feet, where air temperatures dropped to as low as 0 and where winds gusted to 40 mph or higher, saw wind chills as low as -30.

TABLE G.2: DROUGHT EVENTS (2000-2019)

Date	Description
7/1/1998	Dry weather continued through much of the month of July, affecting crops during the critical part of the growing season. Corn and other vegetables sustained the most damage, but a dollar amount was not available at the time of this writing.
10/1/1998	The drought which began during the summer continued through October. The only significant rainfall during the month occurred on the 7-8th. Cities and counties began to restrict water usage and streamflows for several mountain locations were reduced to the lowest seen in 50 years.
11/1/1998	Dry weather persisted into the late fall with rainfall deficits between 5 and 10 inches. This affected late season crops and caused water shortages. Water usage restrictions were initiated in many communities.
8/1/1999	The drought worsened during the month of August as high evaporation rates and little rainfall occurred. The most severe conditions by the end of the month had developed in the foothills and piedmont. Water restrictions began in several communities, and for some, the first time in memory. Hay and late crops dried up in many counties. Ponds and wells began to dry up as well, affecting homeowners, farmers, and businesses such as nurseries. In addition, boaters were running aground on recreational lakes due to low water levels.
9/1/1999	Rainfall continued to be scarce across much of western North Carolina through the month of September, prolonging the drought conditions which existed all summer. However, some areas in the piedmont picked up some rain from the remnants of Hurricane Dennis early in the month and from Hurricane Floyd itself two weeks later. Although this rain brought some relief, more wells ran dry and many more areas began mandatory water restrictions.
10/1/1999	The return of some rainfall as well as lower evaporation rates due to the change of seasons, resulted in the drought easing somewhat. Drought classifications were lowered in some cases, and some places lifted water restrictions. However, the drought had not ended by the end of the month.
8/1/2000	The 2 year drought was reaching a critical stage by late summer. Many 80 to 100 foot wells were going dry. Area lakes were at record low levels causing property damage to docks, boats, etc.
9/1/2000	Overall, drought conditions continued across western North Carolina despite some locations receiving near their month's average rainfall. Low stream flow and municipal water supply remained the largest issues with many towns and cities enacting water restrictions. Citizens were quoted as saying this is the driest they have ever seen it. Despite the drought conditions, impact on crops seemed to be minimal.
10/1/2000	Effects of the drought intensified as many areas received absolutely no rain during the month, setting records for the longest stretch without measurable rainfall in several locations. Wells and mountain streams continued to dry up and lake levels continued to drop. Many communities were forced to start more stringent water conservation measures.
11/1/2000	The long-term drought continued to affect the region. Rainfall during the month was near or slightly above normal, but this had little effect on the ground water levels. Numerous wells dried up during the fall, and well borers and drillers could not keep up with the demand. Large lakes reported record low levels and some communities continued or initiated water control measures.
2/1/2001	The long term drought's impact became more severe, even during the winter, as water levels in lakes dropped and stream flow on rivers reached the lowest in memory. More and more communities began water restrictions and started preparing for a busy fire weather season.
3/1/2001	Despite beneficial rain during March, the drought continued to grip most of the area. Severe water restrictions were implemented in parts of the North Carolina piedmont, where reservoir had dropped to all-time low levels. In Concord, food establishments were asked to use paper and plastic products to conserve water.
4/1/2001	Some relief to the long-term drought occurred at mid-month, but for the most part, the rainfall deficit for the three-year period actually grew larger by the end of April. Mandatory water restrictions continued at a few mountain locations, with voluntary water restrictions urged at many others. Numerous wells went dry during April.
5/1/2001	Unprecedented drought conditions continued. Some rivers and lakes reached record-low levels. Well-drilling companies in the North Carolina piedmont were recording twice as much business as usual.
8/1/2001	The effects of the long-term drought became more severe, especially in the North Carolina piedmont. Critical water conditions were beginning to concern officials and residents of Charlotte.
11/1/2001	

12/1/2001	Very little active weather during December signaled that the drought was still present - and becoming critically important to more and more people. The Charlotte area recorded an all-time record dry calendar year with just 26.23 inches of rainfall during 2001. Records have been kept in the area since 1878. Many communities initiated either mandatory or voluntary water restrictions. At Kings Mountain, NC - a new pump was required at Lake Moss because the water level dropped below 2 of the 3 existing pumps. Record low ground water supplies, lake levels, and stream flows were reported across all of Western North Carolina.
8/1/2002	The water supply situation reached crisis levels in some communities, as the effects of the long term drought continued to plague western North Carolina. Particularly hard hit were several Piedmont communities along the Interstate 77 corridor. The city of Shelby was forced to buy water from surrounding communities and even from private companies and citizens. In Statesville, emergency construction of wells and a dam was necessary to prevent the city from running out of water, as the South Yadkin River reached historically low levels. Water levels on area lakes were as much as 10 feet below full pond. Most of the larger towns and cities along the I-77 corridor had imposed mandatory water restrictions by the end of the month, including the Charlotte metro area.
5/1/2007	The effects of an extended period of dry weather were exacerbated by an abnormally dry May, with many locations reporting one of the driest Mays in recorded history. By the end of May, many climatological stations were reporting yearly rainfall deficits as high as 10 inches. The result was severe to extreme drought conditions across much of western North Carolina by the end of the month. Water restrictions were implemented in some counties across extreme western North Carolina. The very dry conditions added to agriculture hardships caused by a hard freeze and widespread damaging winds in April.
6/1/2007	Despite an increase in thunderstorm activity, drought conditions persisted across much of western North Carolina. The persistent drought continued to cause hardships to agricultural interests that were still recuperating from the April freeze. Dollar values for the drought damage should be included in either the August or September Storm Data for this region.
7/1/2007	Drought conditions persisted across much of western North Carolina during July. By the end of July, voluntary water restrictions were instituted in almost all North Carolina counties along and west of I-77. Some mandatory restrictions were introduced in Union County, NC. Agricultural interests continued to be especially hard hit. The absence of rain negatively affected the hay crop, creating concern for the loss of livestock. Dollar values for the drought damage should be included in either the August or September Storm Data for this region.
8/1/2007	Severe to extreme drought conditions persisted across much of western North Carolina during August. By the end of the month, voluntary water restrictions continued in almost all North Carolina counties along and west of I-77. Stream flows and groundwater levels approached record low levels. Water levels on some reservoirs decreased by as much as 1 foot every 10 days. Agricultural interests continued to be especially hard hit, and the North Carolina governor requested federal disaster aid by the end of the month. Dollar values for the drought should be included in either the September or October Storm Data for this region.
9/1/2007	Extreme drought conditions persisted across western North Carolina through September, as the region experienced another month of well-below normal precipitation. By the end of the month, most locations were running a yearly rainfall deficit of 11-17 inches. Stream flows and groundwater levels were near record low levels, with many streams running at 5 percent or less of normal flow. Water levels on area reservoirs were some of the lowest in recorded history. Agricultural interests continued to be especially hard hit. Farmers continued to struggle to feed livestock due to a lack of hay and poor pasture conditions, forcing many cattle to be sold or slaughtered. Agricultural and other losses attributed to the drought are estimated to be in the hundreds of millions of dollars. County-based losses for the growing season will be included in next month's Storm Data.
10/1/2007	Unusually dry weather continued across western North Carolina through October. Although a soaking rain near the end of the month resulted in near-normal monthly precipitation for the mountains, the piedmont saw another month of well-below normal rainfall. Most areas were on pace to break yearly rainfall deficit records. By the end of the month, exceptional drought conditions were reported across the majority of the area. Water flow on area streams continued at 3 to 6 percent of normal, while lake levels remained at near-record lows. Although most cities and towns were requesting voluntary water restrictions be observed, mandatory restrictions were ordered in quite a few communities. In some areas, the water situation was becoming dire, with Monroe, NC officials reporting that water supplies would be exhausted by early 2008 if significant rain did not occur. Also, private wells were beginning to dry up in many areas. Agriculture continued to be severely impacted by the drought. As of this writing, county by county dollar estimates of drought damage have not been made available.

11/1/2007	November provided no relief from the effects of the long term drought. In fact, another month of well-below normal rainfall made an already dire situation even worse. Many locations remained on pace to set annual records for rainfall deficit. By the end of the month, the vast majority of the region was experiencing exceptional drought conditions. Streamflow on area rivers remained extremely low, generally less than 10 percent of normal. Meanwhile, lakes continued to gradually fall toward record low levels.
12/1/2007	The latter half of December saw a transition to a wetter pattern across the southeast. Most observing stations in western North Carolina|reported above normal monthly rainfall for the first time since January 2007. However, this was not enough to put much of a dent in the long-term drought as extreme to exceptional drought conditions persisted into the New Year. Although the increase in rainfall did allow for some recharge of area streams, many were still running at less than 25 percent of normal flow at the end of the month.
1/1/2008	January saw a return to dry weather across western North Carolina.|Most observing stations across the region reported a rainfall deficit of 1 to 2 inches during the month, resulting in another month of exceptional drought conditions across most of the area. Water levels on area lakes remained within a foot or two of record low stages. However, rivers and streams remained somewhat recharged from the December rains, with streamflow on most waterways running 25 to 75 percent of normal.
6/1/2008	Although near normal rainfall was observed across much of the area during the late winter and early spring, another period of abnormally dry weather in May and June exacerbated severe to extreme drought conditions over the western Carolinas and northeast Georgia. Much of the area saw less than 2 inches of rain during this period of time. By the end of the month, much of the mountains and foothills of western North Carolina were running 10 inches below normal annual rainfall. Total rainfall deficits since the beginning of 2007 were around 20 inches or more in the hardest hit areas. By the end of the month, flow on almost all major streams was running less than 10 percent of normal. Many area crops suffered.
7/1/2008	Unusually dry weather continued through the month of July, with severe to extreme drought conditions persisting across the area. Afternoon and evening thunderstorms provided some degree of relief across portions of the North Carolina piedmont, but locations across Upstate South Carolina and extreme western North Carolina reported annual rainfall deficits of nearly 11 inches by the end of the month. Mandatory water restrictions were instituted across much of the North Carolina foothills. Water well levels began to descend below record low levels, most of which were recorded during the 1999-2002 drought. The vast majority of major streams across the area continued to run 1-10 percent of normal flow. Agriculture continued to be hard hit, with some areas reporting a 100 percent loss of the corn crop.
8/1/2008	Dry weather persisted across much of the area for most of August, although portions of the North Carolina Piedmont began to see relief from the dry conditions early in the month, due to an increase in daily thunderstorm activity. Elsewhere, exceptional drought conditions persisted and even expanded slightly westward to cover more of far western North Carolina and northeast Georgia. During the early part of the month, flows on most of the major streams across the area were running at record low levels, with the French Broad River setting a minimum flow record that had stood for almost 100 years. Only a handful of streams were running at more than 1 to 7 percent of normal. Groundwater levels were 2-5 feet below normal. Significant agricultural impacts persisted, with losses to summer crops, including hay, estimated at 30%. The dry weather also affected the livestock industry, due to shortages of pasture crops necessary for feeding.||By the end of the month, Tropical Storm Fay had dropped up to 11 inches of rainfall across the area, providing some relief from the drought conditions, especially across the North Carolina Piedmont.
9/1/2008	The heavy rain brought by Tropical Storm Fay in late August provided some relief to the drought conditions across the area. This was particularly true across the North Carolina piedmont, where improving conditions were aided by normal September rainfall. However, another dry month resulted in a persistence of extreme to exceptional drought conditions across the North Carolina mountains and foothills. Voluntary water restrictions remained widespread during the month. A few communities held onto mandatory restrictions early in the month, but many of these were lifted by the end of the month. Well water remained near record low levels in many areas, while lake levels persisted well below normal stages. Rainfall from Fay resulted in some improvement in streamflows, although most rivers and major streams remained at less than 25 percent of normal, with many still running at less than 10 percent of normal. By the end of the month, government officials had requested a federal disaster declaration for most of the counties in the area, due to crop damages.

10/1/2008	Another abnormally dry month resulted in a persistence of severe to exceptional drought conditions over much of the mountains and foothills of North Carolina. Some slight improvement was observed in well water levels, but they remained near record lows. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions. Meanwhile, severe crop losses resulted in a federal disaster declaration for much of the larger agricultural communities across the area.
11/1/2008	Another month of below normal rainfall resulted in a persistence of severe to exceptional drought conditions over much of western North Carolina through November. In fact, drought conditions actually worsened in some areas, with portions of the central North Carolina mountains deteriorating to exceptional drought conditions late in the month. Slight improvements in well water levels continued across the area. Most rivers and major streams continued to flow at less than 10 percent of normal. Voluntary water restrictions continued in most areas, with a few areas continuing to institute mandatory restrictions.
11/1/2016	Abnormally dry weather that began early in 2016 and continued through the spring, summer, and early fall resulted in establishment of extreme to exceptional drought conditions across the across the southern and central mountains and southern foothills of North Carolina by November. Total rainfall deficits for the period from July until the end of November were as much as 18 inches below normal, while annual rainfall deficits were two feet or more below normal. The drought conditions worsened farther to the southwest across the state. Drought conditions were exacerbated by an unusually warm late summer and early fall, when it is not unusual to see temperatures 10 to 15 degrees above normal. Stream flows and reservoir levels were well below normal across the area, while the very dry vegetation resulted in volatile wildfire conditions. A strong cold front brought much needed rainfall to the area during the last couple of days of the month, spelling the start of a wetter period that brought an end to the more extreme drought conditions.

TABLE G.3: FLOOD EVENTS (2000-2019)

Location	Date	Description
Henderson County		
Unincorporated Area	1/19/1996	An extremely strong cold front, preceeded by heavy rain all day, moved through the mountains, foothills and piedmont during the night. Heavy rain and flooding accompanied the storm system. Several inches of rain fell across the mountains during the day. At Rosman, the French Broad River flooded causing some evacuations in the downtown area.
Unincorporated Area	1/26/1996	Prolonged rain became heavier following the ice. the rain increased into the night when some thunderstorms moved in from the west. Rainfall became excessive, more then 3 and 4 inches in some cases, causing flooding to begin by mid evening. At Asheville the flooding caused a wall to collapse onto several parked cars causing extensive damage. Numerous roads were closed around the mountains and foothills. Several major rivers flooded including the French Broad and the Oconoluftee. Evacuations were required in several counties because of flooding. In this event the flooding was not severe in the northern mountains.
Unincorporated Area	2/22/2003	An extended period of rainl that resulted in to 2 to 3 inches of rainfall caused portions of the French Broad River to flood from Hendersonville to East Flat Rock. Several roads were flooded near the river.
Unincorporated Area	4/10/2003	Rising water levels along the French Broad River resulted in flooding of a boat dock and a parking lot near Fletcher.
Unincorporated Area	2/6/2004	Flooding along the French Broad continued downstream to affect lowland areas in Henderson County to just south of Asheville.
Unincorporated Area	6/14/2004	An evening of heavy rainfall caused flooding to develop along the Broad River. At least one road was closed due to high water.
Unincorporated Area	9/7/2004	The remnants of Hurricane Frances brought very heavy rainfall to western North Carolina on the 7th and 8th, resulting in widespread severe flooding across the mountains and foothills. Flooding first developed in Transylvania County, as the Little River overflowed its banks during the afternoon. Shortly thereafter, flooding developed along Shaws Creek in Henderson County, and in the Cruso community of Haywood County. As moderate to heavy rainfall continued into the evening hours, flooding gradually worsened and expanded across the area. By the early morning hours of the 8th, flooding was widespread and severe across much of the area, with most creeks and streams in flood. Major flooding developed along the French Broad River, which reached a near-record stage of 25 feet at Blantyre, and 21 feet in Canton. In Haywood County, flooding along the Pigeon River was described as the worst in over 60 years. Hundreds of homes and businesses were damaged or destroyed across the area, necessitating a number of evacuations and rescues. Clyde and Canton endured the brunt of this damage. Numerous roads and bridges were washed out as well.
Unincorporated Area	9/17/2004	Flooding began shortly after midnight across portions of the southern mountains and foothills. Henderson County experienced the most severe flooding, as numerous homes were damaged by flood waters, with damaged homes from the combination of the Ivan and Frances floods numbering in the hundreds. Residents described the small stream flooding experienced in Henderson County as the worst seen in many years. Numerous roads were blocked by high water, including highways 64, 280, and 25. The situation was much less serious in Polk County, although flooding did develop along the Pacolet River and several of its tributaries, as well as some creeks in the Columbus area.
Unincorporated Area	7/7/2005	Several road closures due to high water, mainly in the Hendersonville area, including Blackwell Dr, Fruitland Rd, South Main, Airport Rd, and at least 4 others. A portion of highway 25 was closed north of Hendersonville. Jeffress Rd was also flooded in the Mills River area.
HENDERSONVILLE	7/3/2001	A couple of roads flooded in low places, with a few cars stranded in 4 to 5 feet of water.
BAT CAVE	6/26/2006	Flooding continued along the Rocky Broad River through mid-afternoon.

Location	Date	Description
MILLS RIVER	9/20/2009	Although flash flooding ended across the area around sunrise, persistent moderate to heavy rainfall caused high water conditions to persist in central Henderson County through the morning hours. Flooding also expanded to areas near Mills River, as Butler Bridge Rd was closed about 8 miles northwest of Hendersonville. In addition to the flooding, saturated soil resulted in quite a few fallen trees and isolated small landslides.
MILLS RIVER	9/21/2009	An extended period of moderate to heavy rain resulted in flooding along the Mills River. Portions of South Mills River Rd and River Loop Rd were covered in water. Also, flooding began on the French Broad River near Etowah around this time, covering portions of highway 64, Pleasant Grove Rd, and Willow Rd with water. A total of 35 roads in Henderson and Transylvania Counties were blocked by flood waters. River flooding continued until the evening hours on the 24th.
MILLS RIVER	11/11/2009	Although heavy rain began to taper off during the morning, flooding persisted along a few smaller streams into the late morning in response to 4 to 6 inches of storm total rainfall. In addition, minor flooding developed briefly in spots along the French Broad River.
MILLS RIVER	1/24/2010	Significant urban flooding developed on the Cabarrus side of Kannapolis, with numerous roads closed due to high water. Affected roads included Verona, Fairview, Eddleman, South Little Texas, Pine, and Trinity Church Rd. Evacuations became necessary on Pine St and Verona St.
ETOWAH	2/6/2010	The French Broad River exceeded flood stage at Blantyre early on the 6th, and remained in flood until the afternoon of the 7th.
FLETCHER	11/30/2010	Although heavy rainfall began to diminish during the evening, persistent moderate rain combined with runoff to allow flooding to continue across Henderson County into the overnight hours. Mud Creek and Bat Fork Creek remained in flood throughout the overnight hours as water worked its way down the French Broad River from Transylvania County. Flood waters on the river progressed as far north as Fletcher, which exceeded flood stage during the afternoon of the 1st. Stream flooding continued into the morning hours of December 1st, and the French Broad River remained in flood until the morning hours of the 3rd.
FLETCHER	12/1/2010	Although heavy rainfall began to diminish during the evening, persistent moderate rain combined with runoff to allow flooding to continue across Henderson County into the early morning hours of the 1st. Mud Creek and Bat Fork Creek remained in flood throughout the overnight hours as water worked its way down the French Broad River from Transylvania County. Flood waters on the river progressed as far north as Fletcher, which exceeded flood stage during the afternoon of the 1st. The French Broad River remained in flood until the morning hours of the 3rd.
DRUID HILLS	3/6/2011	Although heavy rain tapered off during mid-morning, stream gauges indicated high|water conditions persisted through the afternoon in the Hendersonville area.
ETOWAH	3/6/2011	Runoff from heavy rainfall over Transylvania County resulted in flooding along the French Broad River in the Etowah area with minor flooding of several roads near the river. The river flooding persisted into the 7th and 8th, with the French Broad cresting at 17.9 feet at Blantyre early on the 7th.
DRUID HILLS	3/9/2011	Although heavy rain was tapering off during the afternoon, stream gauges indicated high water conditions persisted through the evening in the Hendersonville area.
ETOWAH	3/9/2011	Runoff from heavy rainfall over Transylvania County resulted in flooding along the French Broad River in the Etowah area. Just like three days before, several roads near the river were flooded. The flooding persisted into the 10th and 11th, with the French Broad at Blantyre cresting at 17.2 feet late on the 10th.
ETOWAH	1/17/2013	The middle reaches of the French Broad River in Henderson County remained in flood for around 2 days as runoff from heavy rain worked it's way through the river system. This resulted in flooded roads and bottom land close to the river.
ETOWAH	1/31/2013	The middle reaches of the French Broad River in Henderson County remained in flood for almost 2 days as runoff from heavy rain worked it's way through the river system. This resulted in flooded roads and bottom land close to the river.

Location	Date	Description
SMYTH	5/5/2013	A long duration of moderate to heavy rain caused several creeks in central Henderson County to go into flood by the mid-morning hours of the 5th. Mud Creek flooded Balfour Road near the Hendersonville water treatment plant. Fruitland Road was flooded by Clear Creek near the intersection of Lancaster Road. Flooding was reported in many parts of Hendersonville as Mud Creek went above flood stage around 10 am. Flooded roads in town included South King Street, East Caswell Street and White Street. Old Airport Road was flooded by Cane Creek in Fletcher, though the flooding took several hours longer to develop in the northern part of the county.
MILLS RIVER	5/5/2013	Flooding developed on several roads in the Mills River Community by the mid-afternoon hours of the 5th. Flooded roads included Butler Bridge Road, Warlick Road, and Jeffress Road. Mills River also flooded North Mills River Rd by the late evening hours. Butler Bridge was flooded by the French Broad River, but may have been affected by a stream initially. Some roads in the north and west part of the county were flooded well into the next day and beyond as the French Broad River rose to a level of 19.29 feet by the afternoon hours of the 6th and only slowly receded thereafter.
FLETCHER	7/3/2013	The county communication center reported that Jackson Creek had flooded and closed Jackson Road near the intersection of Howard Gap Road. Etowah School Road was flooded by Gash Creek near the intersection of Drexel School Road. Also, Warlick Road was flooded by Boylston Creek not far from the intersection of Turnpike Road.
LAUREL PARK	10/14/2014	Although heavy rain tapered off by late evening, flooding continued along the Mud Creek and Clear Creek basins into the early morning hours. In addition, minor flooding developed along the French Broad River near the Transylvania County during the afternoon of the 15th.
LAUREL PARK	11/23/2014	An automated rain gage on Mud Creek rose above flood stage after 3 to 4 inches of rain fell over several hours. Water covered portions of South King St and South Grove St, as well as South Center Plaza and the intersection of Highway 176 and 25.
VALLEY HILL	10/3/2015	Heavy rain ended, but flooding continued in the Mud Creek basin, with water moving downstream and flooding Balfour Rd through the afternoon and early evening. Some flooding also developed along Bat Fork at Airport Rd.
LAUREL PARK	11/18/2015	After as much as three inches of rain fell over central Henderson County in 24 hours, a stream gauge on Mud Creek near downtown Hendersonville exceeded its established flood stage. This indicated several roads flooded near the intersection of Spartanburg Highway and S Main St.
FLAT ROCK	10/23/2017	Multiple stream gauges indicated flooding developed over portions of central and northern Henderson County after 4-6 inches of rain fell across the county throughout the 23rd. Affected streams included, but were not limited to Mud Creek and Bat Fork Creek in the Hendersonville area and the Rocky Broad River and Cane Creek in the northern part of the county. Roads impacted included the intersection of South Church St and South King St, as well as Airport Rd and Dana Rd in the Hendersonville area; Mills Gap Rd in Fletcher, as well as other fields and low spots along these creeks.
LAUREL PARK	5/16/2018	Stream gauge and county comms reported flooding developed along Mud Creek after 3 to 6 inches of rain fell across Henderson County in about 18 hours. Impacted roads included an access road at the intersection of S Church St and S Main St and Kanuga Rd at Erkwood Dr.
BAT CAVE	5/29/2018	A stream gauge on the Rocky Broad River at Bat Cave indicated the river exceeded its established flood stage, flooding campgrounds and some secondary roads.
VALLEY HILL	12/28/2018	Stream gauges and county comms reported small stream flooding across central and northern Henderson Counties after 4.5 to 5.5 inches of rain fell across the county in about 24 hours. A gauge on Mud Creek near Hendersonville indicated flooding of parking lots and side streets on the south side of downtown Hendersonville, near the intersection of South Church St and South King St. In Fletcher, Cane Creek flooded parts of Howard Gap Rd and Hendersonville Rd.
Polk County		
MT VLY	9/20/2009	Although rain rates diminished during mid-morning, flooding persisted in the Green River Cove Rd area through the remainder of the morning, with evacuations becoming necessary. In

Location	Date	Description
		addition to the flooding, saturated soil resulted in quite a few fallen trees and isolated small landslides.
PEA RIDGE	5/5/2013	Most of the flooding with this duration rain event occurred as a result of rises along the Green River in the northeast part of the county. Several roads that cross or run near the Green River were flooded, including Ken Miller Road, John Watson Road and Abrams Moore Road. Roads within the Green River Highlands subdivision were flooded as well. An NWS employee who lives in the south-central part of the county measured 5.11 inches of rain for the event.
MELROSE	12/29/2015	Although heavy rain tapered off across Polk County shortly after midnight, runoff from the earlier rainfall caused flooding to persist across the area through the pre-dawn hours.
SALUDA	5/19/2018	Although heavy rain ended across western Polk County late in the evening on the 18th, high water conditions persisted across the Saluda and Green River area through the overnight and much of the daylight hours on the 19th before the water finally receded.
SUNNY VIEW	12/28/2018	Emergency manager reported flooding along the Green River and some of its tributaries resulted in several road closures in locations around Lake Adger and point downstream. 3 to 4.5 inches of rain fell in the basin in about 24 hours.
Rutherford County		
RUTHERFORDTON	7/4/2001	
CHIMNEY ROCK	5/5/2013	Campgrounds were evacuated and high water was reported on several roads between Bat Cave and Lake Lure starting a little after 8 am on the 5th.
ROCK SPGS	5/5/2013	Flooding developed along the upper reaches of the Broad River starting during the evening hours of the 5th, lasting through the afternoon hours of the 6th. Flooded roads included Thompson Lake Road and Coxe Road at Cleghorn Mill Road, among others.
CHIMNEY ROCK	5/29/2018	A stream gauge on the Rocky Broad River at Bat Cave indicated moderate flooding developed along the river through the Hickory Nut Gorge. Several side roads and a few homes off of Highway 64 were flooded. In addition, there were multiple small slope failures in Chimney Rock State Park, one of which collapsed a retaining wall along the edge of the main parking lot. Total rainfall amounts of 7-10 inches occurred in the area from the 29th through the 30th.
CHIMNEY ROCK	10/11/2018	Although heavy rain ended across Rutherford County during the morning, flooding continued along the Rocky Broad River in the Chimney Rock area into the afternoon.
Transylvania County		
Unincorporated Area	1/19/1996	An extremely strong cold front, preceeded by heavy rain all day, moved through the mountains, foothills and piedmont during the night. Heavy rain and flooding accompanied the storm system. Several inches of rain fell across the mountains during the day. At Rosman, the French Broad River flooded causing some evacuations in the downtown area.
Unincorporated Area	1/26/1996	Prolonged rain became heavier following the ice. the rain increased into the night when some thunderstorms moved in from the west. Rainfall became excessive, more then 3 and 4 inches in some cases, causing flooding to begin by mid evening. At Asheville the flooding caused a wall to collapse onto several parked cars causing extensive damage. Numerous roads were closed around the mountains and foothills. Several major rivers flooded including the French Broad and the Oconoluftee. Evacuations were required in several counties because of flooding. In this event the flooding was not severe in the northern mountains.
Unincorporated Area	9/28/1996	
Unincorporated Area	11/19/2003	The French Broad River flooded several roads near Rosman. Other streams and creeks flooded in the same general area, and the French Broad eventually increased to a level that required evacuation of apartments and houses along the river.
Unincorporated Area	2/6/2004	After an extended period of heavy rainfall, the French Broad River gradually rose and overflowed its banks near Rosman, flooding some low lying spots around town. Flooding eventually developed downstream at Blantyre.

Location	Date	Description
Unincorporated Area	9/7/2004	The remnants of Hurricane Frances brought very heavy rainfall to western North Carolina on the 7th and 8th, resulting in widespread severe flooding across the mountains and foothills. Flooding first developed in Transylvania County, as the Little River overflowed its banks during the afternoon. Shortly thereafter, flooding developed along Shaws Creek in Henderson County, and in the Cruso community of Haywood County. As moderate to heavy rainfall continued into the evening hours, flooding gradually worsened and expanded across the area. By the early morning hours of the 8th, flooding was widespread and severe across much of the area, with most creeks and streams in flood. Major flooding developed along the French Broad River, which reached a near-record stage of 25 feet at Blantyre, and 21 feet in Canton. In Haywood County, flooding along the Pigeon River was described as the worst in over 60 years. Hundreds of homes and businesses were damaged or destroyed across the area, necessitating a number of evacuations and rescues. Clyde and Canton endured the brunt of this damage. Numerous roads and bridges were washed out as well.
Unincorporated Area	9/16/2004	Flooding began across the county around midnight, as Rosman was evacuated when the French Broad River began to flood. Overnight, flooding spread across much of the remainder of the county, with evacuations required in the Duckworth and Pisgah Forest areas. Numerous roads were closed due to flood damage, including portions of highway 276, which were closed for several days.
Unincorporated Area	12/23/2004	The Davidson River left its banks for a couple of hours following heavy rainfall of 4 to 6 inches overnight.
Unincorporated Area	6/12/2005	Flooding developed first along the Davidson River in Pisgah National Forest, forcing a road closure. A section of highway 64 was closed near Sapphire. Other road closures included Richland Creek Rd in Lake Toxaway.
Unincorporated Area	11/29/2005	Davidson River came out of its banks and flooded roads in the Pisgah National Forest. There was also street flooding reported in the Rosman area, and a rock slide blocked highway 215 near the Blue Ridge Parkway.
ROSMAN	3/4/2008	Flooding continued near the headwaters of the French Broad River for a few hours after heavy rainfall ended.
JOHN ROCK	9/20/2009	Although flash flooding ended across the area around sunrise, persistent moderate to heavy rainfall caused high water conditions to persist in the French Broad valley through the morning hours. In addition to the flooding, several small mudslides occurred and quite a few trees fell in the saturated soil.
ECUSTA	9/21/2009	Flooding developed near the headwaters of the French Broad River which covered Main St in Rosman with about a foot of water. Water also entered an apartment building. Also, the Davidson River flooded near Brevard, flooding a portion of Davidson River Rd and Wilson Rd. Turkey Creek flooded Deavor Rd in Pisgah Forest. A total of 35 roads in Henderson and Transylvania Counties were blocked by flood water.
BLANTYRE	11/11/2009	Several roads were closed in the Brevard area, apparently due to flooding along creeks and streams that backed up due to a combination of heavy rain and flooding along the French Broad River. Closed roads included Green Rd to the southwest of Brevard, and Cascade Lake Rd and Wilson Rd on the southeast side of town.
ECUSTA	1/24/2010	Although heavy rain ended across the county by midnight, runoff from the day's heavy rainfall resulted in a continuation of high water, while new flooding developed along the French Broad River in the eastern portion of the county during this time. River flooding persisted until late on the 27th. Major flooding was observed briefly at the Blantyre river gauge.
ECUSTA	11/30/2010	Although the heavy rainfall began to abate during the mid-evening, run-off from the previous heavy rain, combined with persistent moderate rain, caused flooding to continue. Floodwaters also progressed downstream along the French Broad River, and its tributaries, including the Little River and the Davidson River through the overnight hours. It was estimated that as many as 50 roads were closed or water-covered at the height of the flooding. Stream flooding ended early on the morning of December 1st, though river flooding lasted until the morning of the

Location	Date	Description
		3rd. Rainfall totals ranged up to 9 inches at Lake Toxaway, with many observers reporting 6 or more inches in and around Brevard.
ECUSTA	12/1/2010	Although the heavy rainfall began to abate during the mid-evening hours of November 30th, run-off from the previous heavy rain, combined with persistent moderate rain, caused flooding to continue. Floodwaters also progressed downstream along the French Broad River, and its tributaries, including the Little River and the Davidson River through the overnight hours. It was estimated that as many as 50 roads were closed or water-covered at the height of the flooding. Stream flooding ended early on the morning of December 1st, though river flooding lasted until the morning of the 3rd. Rainfall totals ranged up to 9 inches at Lake Toxaway, with many observers reporting 6 or more inches in and around Brevard.
SELICA	3/6/2011	Although heavy rain began to diminish, stream gauges indicated high water conditions persisted on the French Broad River and its tributaries in the eastern part of the county into the afternoon. River flooding persisted into the 7th and 8th, cresting at 17.9 feet at Blantyre early on the 7th.
PENROSE	3/9/2011	Although heavy rain began to diminish, stream gauges indicated high water conditions persisted on the French Broad River and its tributaries in the eastern part of the county into the evening and overnight. River flooding persisted into the 10th and 11th, with the French Broad at Blantyre cresting at 17.2 feet on the 10th.
CALHOUN	4/16/2011	Although heavy rain tapered off during the late morning, high water conditions continued along the Little River into the afternoon.
BLANTYRE	4/16/2011	Flooding developed along the French Broad River near Blantyre during the early afternoon, flooding several roads along the river until 3 pm. Flooding persisted along the river until the 18th.
BLANTYRE	11/28/2011	Streams began to recede during that late evening hours after heavy rain ended. However, flooding continued along the French Broad River and Little River through the day on the 29th.
PISGAH FOREST	1/17/2013	The middle reaches of the French Broad River in Transylvania County remained in flood for around 2 days as runoff from heavy rain worked it's way through the river system. This resulted in flooded roads and bottom land close to the river.
PISGAH FOREST	1/31/2013	The middle reaches of the French Broad River in Transylvania County remained in flood for almost 2 days as runoff from heavy rain worked it's way through the river system. This resulted in flooded roads and bottom land close to the river.
CHERRYFIELD	5/5/2013	Several inches of rain fell across Transylvania county, mainly on the 5th. Most of the resulting flooding occurred along the French Broad River or as a result of backwater effects of streams flowing into the river. Among the effects of the heavy rain, the Little River flooded parts of Cascade Lake Road north of Merrill Rd near Crab Creek. Hannah Ford Rd and Island Ford Rd were flooded by the French Broad River. Barclay Rd was flooded by the French Broad River 2 miles south of Brevard. Crab Creek Road was flooded by the French Broad River just southeast of Penrose. The French Broad at Blantyre rose above flood stage around 3 pm on the 5th, crested at 19.3 feet at 545 pm on the 6th, and fell below flood stage at 730 pm on the 8th.
GRANGE	11/23/2014	A stream gauge on the Little River indicated the river rose above flood stage, flooding a portion of Cascade Lake Rd.
GRANGE	10/3/2015	After as much as 5 inches of rain fell over several hours, a stream gauge on the Little River exceeded flood stage early afternoon on the 3rd and remained in flood through much of the overnight. A portion of Cascade Lake Rd was flooded in the Dupont Forest area.
CALHOUN	10/28/2015	After 3 to 5 inches of rain fell across eastern Transylvania County in about a 24 hour period, a stream gauge on the Little River exceeded established flood stage, indicating a portion of Cascade Lake Rd was covered with water.
ROSMAN	11/18/2015	After as much as 3 inches of rain fell in about 24 hours over eastern Transylvania County, while more than 4 inches fell across the western part of the county, stream gauges indicated minor flooding developed along the Little River, as well as near the headwaters of the French Broad

Location	Date	Description
		River. A portion of Cascade Lake Road was flooded by the Little River near Penrose, while some roads were flooded by the French Broad in the Rosman area, including Main St.
DAVIDSON RIVER	12/24/2015	Although heavy rain began to taper off across Transylvania County during the afternoon, runoff from the rainfall resulted in persistent flooding along the Davidson River and Little River into the evening, with portions of Cascade Lake Rd, Davidson River Rd, Wilson Rd, and Deavor Rd under water.
ROSMAN	12/29/2015	Although heavy rain tapered off across Transylvania County during the pre-dawn hours, runoff resulted in flooding continuing along upper portions of the French Broad River, as well as some of its smaller tributaries through the late morning hours. River flooding also developed along the French Broad near the Henderson County line during this time, and persisted for several days.
POWELLTOWN	10/23/2017	Stream gauges indicated flooding developed along the upper French Broad basin after moderate to heavy rain falling throughout the 23rd resulted in 4 to 7 inches of total rainfall. A gauge on the French Broad River at Rosman exceeded the established flood stage, flooding several roads in and around Rosman. The Davidson River flooded in the Pisgah Forest area, impacting Davidson River Rd and Wilson Rd. The Little River also exceeded flood stage and affected Cascade Lake Rd in the eastern part of the county.
CALHOUN	1/11/2018	A stream gauge on the Little River in eastern Transylvania County exceeded its established flood stage and remained in minor flood conditions for almost 24 hours. The main impact was to lowlands along the stream and to Cascade Lake Rd, which was covered by flood water in spots. Total rainfall of 4 to 5 inches fell over the basin in around 24 hours. Minor river flooding also developed along the French Broad River near Blantyre and persisted for a couple of days.
CALHOUN	2/11/2018	A stream gauge on the Little River near Penrose exceeded its established flood stage after more than 2 inches of rain fell across the basin in less than 12 hours. Total rainfall of 3 to 5 inches fell across the area on the 11th and 12th and the river stayed above flood stage for almost 24 hours. Minor river flooding also occurred along the French Broad River near Blantyre from the 11th through the 14th.
GRANGE	5/16/2018	County comms reported and stream gauges indicated flooding developed along the Little River and near the headwaters of the French Broad River after moderate to heavy rain produced widespread 3 to 6-inch rainfall amounts in about 12 hours. The Little River flooded Cascade Lake Rd at Merrill Rd, while the French Broad washed out part of Wilson Rd and also flooded portions of Hannah Ford and Island Ford Rd.
CALHOUN	5/17/2018	Less than 18 hours after an earlier flood event ended along the Little River, a stream gauge exceeded its established flood stage once again after another round of heavy rain and remained in minor flood conditions for almost 24 hours. The main impact was to lowlands along the stream and to Cascade Lake Rd, which was covered by more than a foot of water in spots. Total rainfall in the basin was 2 to 3 inches from the 17th through early on the 18th. The long duration of the flooding was partly due to backwater affects from the French Broad River, which remained in moderate flood stage near Blantyre for much of this time frame.
CALHOUN	5/29/2018	A stream gauge on the Little River exceeded its established flood stage and remained in minor flood conditions for more than 48 hours. The main impact was to lowlands along the stream and to Cascade Lake Rd, which was covered by more than a foot of water in spots. Total rainfall from of around 5 inches fell uniformly over the basin from the 29th through the 30th. The long duration of the flooding was partly due to backwater affects from the French Broad River, where moderate flooding was occurring near Blantyre for much of this time frame.
ROSMAN	12/28/2018	Stream gauges near the headwaters of the French Broad River as well as multiple tributaries, including Davidson River and Little River, exceeded their established flood stages after 4 to 6 inches of rain fell throughout the basin from the afternoon of the 27th through the 28th. The French Broad River flooded portions of Hannah Ford Rd and Island Ford Rd, as well as Depot St and Highway 276 in Rosman. Davidson River flooded Davidson River Rd and Wilson Rd in Pisgah Forest. Little River also flooded Merrill Lane. While flood waters receded on most

Location	Date	Description
		streams by late on the 28th, flooding persisted on the Little River for another day, while river flooding continued on the French Broad downstream of Brevard and Pisgah Forest until January 1st.
CALHOUN	2/21/2019	A stream gauge on the Little River exceeded its established flood stage around midnight on the 21st and remained in minor flood conditions until the afternoon of the 23rd. The main impact was to lowlands along the stream and to Cascade Lake Rd, which was covered by more than a foot of water in spots. Total rainfall of 3 to 4 inches fell throughout the basin in a 24 to 36 hour period. The long duration of the flooding was partly due to backwater affects from the French Broad River, where minor flooding was occurring near Blantyre for much of this time frame (and continued into the 26th).

TABLE G.5: HAIL EVENTS (2000-2019)

Location	Date	Size	Description
Henderson County			
Unincorporated Area	7/23/1963	2	
Unincorporated Area	5/14/1966	1.5	
Unincorporated Area	6/28/1974	0.75	
Unincorporated Area	5/17/1982	0.75	
Unincorporated Area	5/30/1982	1	
Unincorporated Area	7/13/1985	1.75	
Unincorporated Area	7/13/1985	1.75	
Unincorporated Area	9/8/1985	0.75	
Unincorporated Area	5/1/1987	0.75	
Unincorporated Area	6/3/1987	1.25	
Unincorporated Area	5/16/1988	0.75	
Unincorporated Area	6/18/1988	0.75	
Unincorporated Area	7/10/1988	0.75	
Unincorporated Area	7/15/1988	1.75	
Unincorporated Area	7/26/1989	0.75	
Unincorporated Area	11/15/1989	1.25	
Unincorporated Area	8/21/1990	0.75	
Hendersonville	3/31/1993	0.88	
S Portion	3/31/1993	0.75	
Hendersonville	5/13/1993	0.88	
HENDERSONVILLE	3/19/1996	0.75	A marginally severe thunderstorm caused large hail.
HENDERSONVILLE	8/24/1996	0.75	
FLETCHER	6/2/1997	1	Severe weather carried over from the morning in the foothills and into the piedmont, and developed in the mountains. Large hail caused much (although unknown dollar amounts) damage. The storms were quite slow moving, especially around Asheville and near Hendersonville, and caused hail for some time. In the city of Shelby, a man was struck and injured by lightning while mowing.
FLAT ROCK	7/4/1997	1.75	Large hail occurred on the Henderson/Polk county line.

Location	Date	Size	Description
MILLS RIVER	7/9/1997	1.75	Isolated severe thunderstorms produced large hail ranging from golf ball to tennis ball size. A house was flooded in Mills River. A microburst in Rutherford College blew 12 to 14 roofs of flea market buildings.
HENDERSONVILLE	9/11/1997	0.75	Unusually cold temperatures aloft enabled a couple of thunderstorms that developed across the mountains in the early to middle afternoon to become severe. Large hail fell on Sugar Mountain in Avery county and accumulated to a depth of 2 inches. Large hail also fell in abundance in Henderson county, covering I-26 for some time near Flat Rock and Hendersonville. Extensive damage occurred to the apple crop which was near it peak. Other field crops were severely damaged or destroyed and a couple of car dealerships sustained damage as well.
BAT CAVE	4/3/1998	1	A strong spring storm system moved northeast through the Tennessee Valley on the 3rd. A couple thunderstorms along the occluded front that passed across the mountains became severe and produced hail up to quarter size. Other severe thunderstorms developed along a thermal-moisture boundary in the piedmont and produced hail up to 2 inches in diameter.
ASHEVILLE	5/7/1998	1	Supercell thunderstorms developed in a highly sheared atmosphere in eastern Tennessee then moved east across the mountains, foothills and western piedmont of North Carolina. These long-lived, cyclic supercells produced a considerable amount of large hail and some damaging winds in the mountains.
HENDERSONVILLE	6/24/1998	1.75	Multi-cell thunderstorms again developed in the early evening and moved south across the southern mountains and piedmont. A few became severe and produced large hail up to golf ball size, as well as damaging winds. Wind damage was confined to downed trees and power lines. The hardest hit area was northeast of Brevard where roads were blocked.
DANA, MILLS RIVER	5/13/1999	0.88	Scattered thunderstorms developed during the afternoon and evening of the 13th and a few pulsed to severe levels. In Henderson county, golf ball size hail covered Highway 280 and a large tree fell onto a house in Hendersonville, causing significant damage to the house and outdoor furniture. There was a public report of a sighting of a very weak tornado that appeared to make a brief touchdown, but caused no damage, north of Marion.
GERTON	8/20/1999	1.75	An isolated severe thunderstorm produced golf ball size hail in two counties.
GERTON, HENDERSONVILLE	5/13/2000	1	Thunderstorms developed in the mountains in the early afternoon with several becoming severe a few hours later. Other severe thunderstorms moved into or developed in the foothills and piedmont during the early evening. Hail up to the size of walnuts and some wind damage occurred in the mountains and foothills.
HENDERSONVILLE	5/24/2001	0.75	
BAT CAVE	6/4/2001	0.75	Public report of dime-sized hail.
HENDERSONVILLE	6/4/2001	0.88	Fire department reported nickel-sized hail in Hendersonville.
FLETCHER	5/2/2003	1	
HENDERSONVILLE	5/2/2003	1	
HENDERSONVILLE	5/3/2003	0.75	
FRUITLAND	5/3/2003	0.75	
FLETCHER	5/3/2003	1.5	Hail was reported across much of the western half of the county, and was responsible for major damage to the county's apple crop.
BAT CAVE	5/15/2003	1.5	Hail broke some light fixtures at the post office.
ASHEVILLE RGNL ARPT	7/16/2003	0.75	
ETOWAH	7/18/2003	0.75	Large hail caused damage to vehicles.

Location	Date	Size	Description
MILLS RIVER	8/22/2003	0.75	
HENDERSONVILLE	6/6/2005	0.88	
HENDERSONVILLE	6/20/2005	0.75	
HENDERSONVILLE	4/3/2006	0.88	
HENDERSONVILLE	4/19/2006	0.75	Hail reported near the intersection of Sugarloaf Rd and Ridge Rd.
FLETCHER	4/19/2006	0.75	
HENDERSONVILLE	6/11/2006	0.75	Penny hail reported near the border with Polk.
HENDERSONVILLE	6/23/2006	0.88	
MOUNTAIN HOME	7/4/2006	0.88	
MILLS RIVER	7/4/2006	0.75	
HENDERSONVILLE	7/15/2006	0.88	Nickel size hail on the Polk County line.
MOUNTAIN HOME	7/21/2006	0.75	
HENDERSONVILLE	7/22/2006	0.75	Reported near Flat Rock.
ETOWAH	8/30/2006	1	Numerous trees blown down, including some 70 foot pine trees, centered around the area near the intersection of Cummings Cove Rd and Big Willow Rd. Nickel to quarter size hail was also reported.
HENDERSONVILLE	8/30/2006	1	
HENDERSONVILLE	10/11/2006	1	Reported on the Polk/Henderson County line.
HENDERSONVILLE	5/3/2007	0.75	Isolated severe thunderstorms affected the French Broad Valley during the afternoon hours.
FLETCHER	6/24/2007	0.88	Reported near the intersection of Youngs Gap Rd and Burney Mountain Rd on the Buncombe County line.
ETOWAH	7/27/2007	0.75	Reported Watagnee Trail.
FLETCHER	8/24/2007	0.75	Several severe storms affected western North Carolina during the afternoon hours.
HENDERSONVILLE	8/26/2007	1	Quarter size hail near exit 49 on I-26.
MILLS RIVER	6/22/2008	0.75	Reported near the Mount Pisgah campground.
EAST FLAT ROCK	6/27/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
MOUNTAIN HOME	7/6/2008	0.75	Several severe storms affected western North Carolina during the afternoon hours.
EAST FLAT ROCK, HENDERSONVILLE, DANA	7/7/2008	0.88	Hail was reported at Blue Ridge Community College.
MILLS RIVER	7/8/2008	1	Several severe storms affected western North Carolina during the afternoon and evening hours.
GOODLUCK	9/30/2008	0.88	Hail was reported near the intersection of Youngs Gap Rd and Lindsey Loop. Large hail also caused significant damage to the apple crop in the area around Saint Pauls Rd and Old Clear Creek Rd.
FLETCHER	4/24/2009	0.75	Large hail was reported in the upper French Broad Valley.
DANA	6/8/2009	0.88	Airmass thunderstorms produced a few areas of large hail and damaging winds over the North Carolina Mountains during the late afternoon and evening hours. There was also an isolated instance of flash flooding.
MILLS RIVER	6/10/2009	1.75	Golf ball size hail was reported in areas from Mills River to Mountain Home.
ETOWAH	7/25/2009	0.75	A few thunderstorms developed over the upper French Broad Valley during the evening hours. One storm produced large hail.

Location	Date	Size	Description
HOOPERS CREEK	9/9/2009	1	A persistent upper low triggered thunderstorms over the North Carolina mountains and foothills during the early morning hours of the 9th. A few of the storms produced large hail. Thunderstorms redeveloped in this same area early in the afternoon and more severe weather was reported.
BLUE RIDGE	9/9/2009	1.75	The large hail caused significant damage to apple crops in this part of Henderson County.
EDNEYVILLE	9/9/2009	1	Hail up to size of quarters fell near Edneyville.
LEAD	5/6/2010	1	A few thunderstorms developed over western North Carolina mountains during the early evening hours as a weak cold front moved into the region. Some of the thunderstorms produced large hail.
VALLEY HILL	5/6/2010	1	Marble to quarter size hail was reported on Crab Creek Rd, about 4.5 miles southwest of Hendersonville.
VALLEY HILL	5/6/2010	0.75	A few thunderstorms developed over western North Carolina mountains during the early evening hours as a weak cold front moved into the region. Some of the thunderstorms produced large hail.
VALLEY HILL	5/6/2010	0.88	This was the third report of hail at this spotter's house for the day.
MILLS RIVER	5/28/2010	1	Quarter size hail was reported in Mills River and up to 2 miles west of town.
MILLS RIVER	4/9/2011	0.88	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow-moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately, the supercells were a little elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
MILLS RIVER	5/12/2011	0.75	Scattered airmass thunderstorms developed over the North Carolina mountains during the afternoon hours. A few of the storms produced large hail.
ETOWAH	6/2/2011	1	Scattered thunderstorms developed across the North Carolina Mountains starting in the early afternoon hours. The storms moved across the southern foothills and piedmont, tracking a little to the north of a weak cold front. Several of the storms produced large hail.
BOWMAN BLUFF	6/2/2011	0.88	Scattered thunderstorms developed across the North Carolina Mountains starting in the early afternoon hours. The storms moved across the southern foothills and piedmont, tracking a little to the north of a weak cold front. Several of the storms produced large hail.
HENDERSONVILLE	6/2/2011	0.75	Small hail was reported over much of the west side of Hendersonville.
SMYTH	6/2/2011	1.75	Several reports were received of hail up to golf ball size falling from Mountain Home to the northeast side of Hendersonville.
VALLEY HILL	6/9/2011	1	Nickel to quarter size hail fell near the Valley Hill FD.
CAROLINA HILLS	6/10/2011	0.75	Dime size hail was reported on Pattys Chapel Rd.
BOWMAN BLUFF	6/12/2011	0.88	Nickel size hail fell in the Jeter Mountain area.
DRUID HILLS	9/2/2011	0.75	While the wind shear was fairly weak over western North Carolina, a very unstable atmosphere and hot temperatures resulted in scattered thunderstorm activity over the region. A few of the storms produced areas of damaging straight-line winds and even some large hail as they drifted slowly to the south.
HOLLY SPGS	4/3/2012	1	Nickel to quarter size hail fell near the intersection of highway 280 and Hunters Ridge Rd.
MILLS RIVER	4/5/2012	0.75	Thunderstorms developed over the mountains during the afternoon hours. A couple of the storms produced hail up to the size of quarters.
FLAT ROCK	4/26/2012	1	Quarter size hail was reported on Little River Rd.

Location	Date	Size	Description
HENDERSONVILLE	4/26/2012	0.88	Thunderstorms developed during the afternoon along an outflow boundary from an MCS that crossed the region earlier in the day. The afternoon and evening storms produced large hail and some straight-line wind damage.
MILLS RIVER	4/26/2012	1.75	Multiple public reports of quarter size to golf ball size hail were received from the Mills River and Fletcher areas.
EDNEYVILLE	4/26/2012	0.75	Thunderstorms developed during the afternoon along an outflow boundary from an MCS that crossed the region earlier in the day. The afternoon and evening storms produced large hail and some straight-line wind damage.
MILLS RIVER	5/1/2012	0.75	Thunderstorms developed over the North Carolina mountains during the afternoon hours. Several of the storms produced hail.
FLETCHER	5/1/2012	2.5	Tennis ball size hail caused severe damage to at least one vehicle near the intersection of highway 25 and I-26.
FLETCHER	5/1/2012	1.75	Golf ball size hail damaged vehicles near Fletcher. Quarter size hail also fell along a path from Fletcher to 3 miles east of town.
EDNEYVILLE	5/1/2012	0.88	Thunderstorms developed over the North Carolina mountains during the afternoon hours. Several of the storms produced hail.
ETOWAH	7/1/2012	1	After a day where temperatures rose to record levels, including 104 degrees at the Charlotte Douglas International Airport, numerous severe storms developed over western North Carolina during the afternoon and evening hours. The wind shear was fairly weak, but there was considerable instability. This allowed some of the storms to organize into small bowing clusters, though the dominant mode was pulse severe.
DANA	8/22/2012	0.75	Scattered thunderstorms developed along the Blue Ridge Mountains and drifted slowly to the southwest. The storms produced heavy rain and some lightning damage.
TUXEDO	4/29/2014	1	Spotter reported quarter size hail near Tuxedo.
EAST FLAT ROCK	4/29/2014	0.88	Public reported hail up to nickel size that lasted a few minutes.
ETOWAH	5/27/2014	0.88	Public reported nickel size hail.
ETOWAH	6/13/2014	1	Spotter reported quarter size hail.
HORSE SHOE	6/19/2014	0.75	Public reported 3/4-inch hail.
FIVE PTS	6/19/2014	0.88	Spotter reported dime to nickel size hail.
FLAT ROCK	6/19/2014	1	Public reported a lot of hail up to quarter size on the north side of town.
HORSE SHOE	6/20/2014	0.75	Public reported 3/4-inch size hail fell between Etowah and Horse Shoe.
BARKER HGTS	8/21/2014	0.75	Public reported brief 3/4-inch hail.
GERTON	5/11/2015	1	Spotter reported quarter size hail.
MILLS RIVER	6/2/2015	0.75	Public reported dime to penny size hail in the Mills River area.
BRICKTON	6/21/2015	1	Public reported quarter size hail on I-26 at the Henderson/Buncombe County line.
SMYTH	7/6/2016	1	Spotter reported marble to quarter size hail.
HILLGIRT	7/30/2016	0.75	Public reported (via Social Media) 3/4-inch hail.
HILLGIRT	5/19/2017	1	Spotter reported quarter size hail on Heritage Circle.
LEAD	5/19/2017	1	Public reported quarter size hail off Pinnacle Mountain Rd.
LEAD	5/19/2017	0.88	Public reported nickel size hail along Pinnacle Falls Ln.
UPWARD	5/19/2017	1	Public reported quarter size hail.
TUXEDO	6/13/2017	0.88	FD reported nickel size hail.
HENDERSONVILLE	7/8/2017	1.75	Public reported up to golf ball size hail.
BOWMAN BLUFF	7/18/2017	1	Public reported quarter size hail off Cummings Rd.

Location	Date	Size	Description
RUGBY	6/3/2018	1	Public reported quarter size hail at Highway 191 and North Rugby Rd.
MILLS RIVER	6/20/2018	0.75	Public reported (via Social Media) 3/4-inch hail in the Mills River area.
OTTANOLA	7/21/2018	2	Spotter reported two-inch diameter hail on Sugarloaf Mountain Rd.
BOWMAN BLUFF	8/21/2019	0.88	Public reported up to nickel size hail at a golf course off Cummings Rd.
Polk County			
Unincorporated Area	6/5/1970	1.5	
Unincorporated Area	6/4/1985	2.75	
Unincorporated Area	6/5/1985	0.88	
Unincorporated Area	6/5/1985	1.75	
Unincorporated Area	6/7/1985	1	
Unincorporated Area	7/10/1985	1	
Unincorporated Area	7/10/1985	1	
Unincorporated Area	7/16/1985	0.75	
Unincorporated Area	5/1/1987	0.75	
Unincorporated Area	5/17/1988	1.75	
Unincorporated Area	6/18/1988	0.75	
Unincorporated Area	6/5/1989	0.75	
Unincorporated Area	5/1/1990	1	
Saluda	3/31/1993	0.75	
SALUDA	6/24/1996	1	
COLUMBUS	6/2/1997	0.75	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
TRYON	6/14/1997	0.88	Severe thunderstorms blew down trees and power lines in Henderson county and caused large hail near the South Carolina border in Polk county. The most damage occurred around Shelby where trees were blown down in 15 locations near town. At least one tree fell on a vehicle and another fell on a house.

Location	Date	Size	Description
SALUDA, COLUMBUS	7/4/1997	1.75	Severe thunderstorms moved into the mountains from Tennessee in the early evening on the Fourth, before moving into or redeveloping in the foothills and western piedmont later in the evening. Damaging winds raked much of western North Carolina, downing trees and power lines, and a few reports of hail as large a golf balls were reported. Several counties reported trees and power lines down countywide, often blocking roads and damaging homes and/or vehicles. Outflow from the storms propagated southeast into the Charlotte metro area before midnight, producing gusty winds between 35 and 45 mph for a short period of time. Dollar amounts for much of the damage were not available at the time of this writing.
COLUMBUS	5/3/1998	0.75	A severe thunderstorm downed a few trees on the southeast side of Charlotte during the afternoon. Other isolated severe thunderstorms downed a of couple trees in Avery county and produced dime size hail in Polk county in the early and late evening.
COLUMBUS	8/20/1999	1.75	An isolated severe thunderstorm produced golf ball size hail in two counties.
TRYON	5/13/2000	0.75	Thunderstorms developed in the mountains in the early afternoon with several becoming severe a few hours later. Other severe thunderstorms moved into or developed in the foothills and piedmont during the early evening. Hail up to the size of walnuts and some wind damage occurred in the mountains and foothills. Several trees were blown down near Fairview. In Cleveland county, 1.5 foot diameter trees were blown down in Belwood, and a number of structures were damaged in Polkville. Just west of Lincolnton several trees and power lines were downed, some on mobile homes. Lightning from the storm in Lincolnton knocked out power to the 911 center. Numerous trees and power lines were downed and a couple of storage buildings were blown over northeast of Gastonia. In Dallas, a trailer park sustained damage to a storage building, 3 young Bradford pear trees, underpinning, a power meter, and heavy doghouse. Mecklenburg county police reported 7 to 10 trees downed north of Charlotte. Considerable damage occurred in Cabarrus county with numerous trees blown down through the northern and central parts of Concord. Winds were estimated as high as 70 mph in western Cabarrus county due to a significant amount of downed trees, with many on houses and some blocking roads. Crews had to work most of the night to clear trees and restore power. A deputy said he observed a tornado touch down, lift, and touch down again before ending as a waterspout over Coddle Creek Reservoir. However, there was not enough evidence to confirm the event as a tornado.
MILL SPG	6/25/2001	1	Quarter-sized hail observed in Mill Spring.
SALUDA	7/5/2001	0.75	Trained spotter reported dime-sized hail.
COLUMBUS	3/16/2002	0.88	The hail caused several traffic accidents in the Columbus area.
COLUMBUS	5/2/2003	0.75	
COLUMBUS	5/15/2003	1	
TRYON	7/5/2005	0.75	
TRYON	4/3/2006	0.75	
MILL SPG	4/19/2006	0.75	
COLUMBUS	5/20/2006	0.88	
SALUDA	7/15/2006	0.88	
SALUDA	10/11/2006	1	Reported on the Polk/Henderson County line.
COLUMBUS	4/19/2007	0.88	Nickel size hail reported at the intersection of highway 9 and Landrum Rd.
COLUMBUS	4/19/2007	0.88	A few severe thunderstorms developed over the mountains and western foothills of North Carolina during the afternoon hours.

Location	Date	Size	Description
SALUDA	4/26/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
SALUDA	6/27/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
COLUMBUS	6/27/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
BEULAH	7/6/2008	0.75	Hail was reported on Toney Rd.
SUNNY VIEW	9/30/2008	0.88	Hail was reported in the Sunny View community.
MILL SPG	9/30/2008	1	A strong cold front triggered several severe storms over western North Carolina during the afternoon and evening hours.
SUNNY VIEW	6/9/2009	0.88	Widely scattered multicell storms produced a few areas of wind damage and large hail over western North Carolina.
MC GINNIS XRDS	7/28/2009	0.75	An old mesoscale convective vortex spawned numerous showers and thunderstorms over western North Carolina. A few of the storms produced large hail and damaging winds. Severe urban flooding developed during the evening hours on the south side of Charlotte.
MC GINNIS XRDS	8/27/2009	0.75	A spotter reported penny size hail and measured a wind gust of 56 MPH.
COLUMBUS	9/9/2009	0.88	Penny to nickel size hail was reported near the intersection of highway 74 and I-26 on the west side of the town of Columbus.
MELVIN HILL	5/28/2010	0.75	A weak upper low triggered numerous thunderstorms over western North Carolina. Several of the storms produced damaging wind and large hail.
TRYON	10/26/2010	1	Scattered supercell thunderstorms developed over the western Carolinas and northeast Georgia as strong wind shear and moderate instability overspread the region ahead of a strong cold front. A number of tornadoes were spawned by the storms. Two strong tornadoes affected the western piedmont and foothills of North Carolina.
BEULAH	5/11/2011	1	Scattered thunderstorms developed over the North Carolina mountains during the afternoon hours. Some of the storms produced hail as they drifted to the south.
BEULAH	5/26/2011	0.75	Numerous showers and thunderstorms affected the western Carolinas and northeast Georgia during the afternoon and evening hours. Some of the thunderstorms were severe, producing large hail and damaging straight line wind.
SUNNY VIEW	6/2/2011	1	Quarter size hail fell at Lake Adger Rd and Coopers Gap Rd.
COLLINSVILLE	6/16/2011	0.75	An isolated thunderstorm developed over the southern North Carolina foothills. The storm produced a little small hail.
SUNNY VIEW	5/1/2012	0.75	Thunderstorms developed over the North Carolina mountains during the afternoon hours. Several of the storms produced hail.
SUNNY VIEW	5/1/2012	1.75	Hail up to golf ball size destroyed crops just south of the Rutherford County line.
SUNNY VIEW	5/1/2012	0.75	A second round of penny size hail fell along highway 9.
SUNNY VIEW	5/1/2012	0.75	Yet a third round of penny size hail was reported on highway 9.
SALUDA	7/18/2012	1	Quarter size hail was reported near mile marker 60 on I-26.
SUNNY VIEW	5/22/2013	1	Quarter size hail fell along highway 9 in the Sunny View community.
SUNNY VIEW	5/22/2013	0.75	The relative of an NWS employee reported penny size inch hail on highway 9 at the Rutherford County line.
MILL SPG	8/23/2013	0.75	Hail up to the size of pennies was reported in the Mill Spring community.
COLLINSVILLE	6/8/2014	1	Public reported quarter size hail on the state line southwest of Green Creek.
SANDY PLAINS	8/12/2014	0.75	Public reported 3/4 inch hail.

Location	Date	Size	Description
COLLINSVILLE	8/5/2015	0.88	HAM radio operator reported nickel size hail on Highway 9 near the South Carolina border.
MELVIN HILL	5/1/2016	1	Public reported quarter size hail in the Green Creek community.
COLUMBUS	5/31/2016	1	Public reported quarter size hail via social media.
COLUMBUS	5/31/2016	0.75	Public reported 3/4 inch hail via social media.
SALUDA	3/1/2017	0.75	Spotter reported 3/4 inch hail.
SALUDA	6/15/2017	0.75	Spotter reported 3/4 inch hail in the Saluda area.
COLUMBUS	5/10/2018	0.75	Public reported penny sized hail along Highway 108 just east of Columbus.
MILL SPG	5/10/2018	1	EM reported quarter size hail in the Mill Spring area as multiple strong to severe storms trained over Polk County.
MILL SPG	5/10/2018	1.75	EM reported quarter size hail in the Mill Spring area as multiple strong to severe storms trained over Polk County. Public reported quarter to golf ball size hail on Highway 74.
SANDY PLAINS	5/10/2018	0.75	Public reported an extended period of up to 3/4 inch hail as multiple strong to severe storms trained over Polk County.
BEULAH	5/10/2018	0.75	Former NWS employee reported penny size hail.
RODDY STORE	5/10/2018	1	Public reported quarter size hail as multiple strong to severe storms trained over Polk County.
Rutherford County			
Unincorporated Area	6/25/1979	1.75	
Unincorporated Area	6/4/1985	0.75	
Unincorporated Area	6/5/1985	1.75	
Unincorporated Area	6/5/1985	1.75	
Unincorporated Area	7/10/1985	1	
Unincorporated Area	5/17/1988	0.75	
Unincorporated Area	7/26/1989	0.75	
Unincorporated Area	5/1/1990	1.75	
Unincorporated Area	5/1/1990	1	
Rutherfordton	3/31/1993	0.75	
Bostic	5/13/1993	0.88	
Rutherfordton	5/13/1993	0.88	
RUTHERFORDTON	5/29/1996	0.88	
RUTHERFORDTON	6/2/1997	2	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one

Location	Date	Size	Description
			car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
FOREST CITY	6/2/1997	2	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
FOREST CITY	6/2/1997	0.75	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
SUNSHINE	6/2/1997	0.75	Severe weather carried over from the morning in the foothills and into the piedmont, and developed in the mountains. Large hail caused much (although unknown dollar amounts) damage. The storms were quite slow moving, especially around Asheville and near Hendersonville, and caused hail for some time. In the city of Shelby, a man was struck and injured by lightning while mowing.
THERMAL CITY, GILKEY, UNION MILLS	5/26/1998	0.88	Mutli-cell thunderstorms developed in a hot and humid airmass just ahead of a cold front sagging south across North Carolina during the evening of the 26th. Several storms became severe and produced widespread hail and wind damage. Hail and wind lasted 15-20 minutes at some locations. Numerous trees and power lines were downed, some on homes, and numerous power outages occurred. In the town of Gilkey, in Rutherford county, a storage building was blown into the woods. Four homes were damaged by fallen trees in Union Mills and windows were blown out.
CHIMNEY ROCK, LAKE LURE	5/13/2000	1	Thunderstorms developed in the mountains in the early afternoon with several becoming severe a few hours later. Other severe thunderstorms moved into or developed in the foothills and piedmont during the early evening. Hail up to the size of walnuts and some wind damage occurred in the mountains and foothills.
RUTHERFORDTON	6/25/2001	1	Numerous trees and power lines down, with several reports of quarter-sized hail, along a path from Rutherfordton to Forest City. A tree fell across a truck in Chase.
HENRIETTA	3/16/2002	0.75	
FOREST CITY	5/7/2002	0.75	

Location	Date	Size	Description
FOREST CITY	7/3/2002	0.75	
RUTHERFORDTON	7/4/2002	0.75	
SUNSHINE	7/4/2002	0.75	
RUTHERFORDTON	4/29/2003	1.5	
SPINDALE	4/29/2003	1	
LAKE LURE	5/2/2003	0.75	
RUTHERFORDTON, ELLENBORO	5/3/2003	1.75	
LAKE LURE	5/15/2003	0.75	Numerous vehicles were damaged.
THERMAL CITY, BOSTIC, SUNSHINE	7/12/2003	1	
LAKE LURE	5/8/2004	0.75	
ELLENBORO	5/9/2004	0.75	
RUTHERFORDTON	6/12/2004	1	
FOREST CITY	6/19/2005	0.75	
RUTHERFORDTON	7/5/2005	0.75	
RUTHERFORDTON, HENRIETTA	4/3/2006	0.75	
FOREST CITY	5/13/2006	0.75	
RUTHERFORDTON	5/20/2006	0.75	
SUNSHINE	5/26/2006	0.75	
FOREST CITY	6/12/2006	1	
RUTHERFORDTON	7/21/2006	0.75	
FOREST CITY	4/19/2007	0.75	Reported of off highway 221 in the Harris area.
SUNSHINE	6/12/2007	0.75	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
SUNSHINE	6/14/2007	0.88	Scattered severe storms affected western North Carolina during the afternoon and early evening hours.
FOREST CITY	6/16/2007	0.75	Scattered severe storms developed over the Foothills and western Piedmont of North Carolina during the afternoon hours.
FOREST CITY	6/24/2007	0.75	Reported on Jack McKinney Rd in the Harris community.
ALEXANDER MILLS	6/27/2007	0.75	Several severe storms affected western North Carolina during the afternoon and evening hours.
SUNSHINE	8/23/2007	1.75	Severe severe storms affected western North Carolina during the evening hours.
RUTHERFORDTON	5/20/2008	0.88	Several clusters of severe thunderstorms developed over western North Carolina during the afternoon and evening hours ahead of a cold front.
LAKE LURE	6/26/2008	0.75	Hail was reported at the Lake Lure Marina.
CLIFFSIDE	7/21/2008	0.75	Several severe storms affected western North Carolina during the afternoon and evening hours.
FOREST CITY	7/22/2008	0.75	Several severe storms affected western North Carolina during the afternoon and evening hours.
UREE	9/30/2008	0.75	Hail reported on highway 64 west of Green Hill.
CAROLEEN	9/30/2008	0.75	Hail was reported along Middle Street in Caroleen.
HARRIS	9/30/2008	1	Reported on Howard Cole Rd.

Location	Date	Size	Description
ALEXANDER MILLS	9/30/2008	0.75	Hail was reported on Big Allen Rd in the Danieltown area.
CLIFFSIDE JCT	9/30/2008	0.75	Hail was reported near the intersection of highway 120 and Family Dr.
CHIMNEY ROCK	6/9/2009	1.5	The largest hail fell on the northwest side of Lake Lure. In town, hail up to the size of pennies was reported.
RUTHERFORDTON	6/18/2009	1.75	A swath of hail, up to the size of golf balls, fell from Rutherfordton to Harris Hanrietta Rd about 11 miles southeast of town.
RUTHERFORDTON	7/23/2009	0.75	Scattered thunderstorms developed over the North Carolina Foothills. A few of the storms produced large hail and wind damage.
ALEXANDER MILLS	9/9/2009	1.75	Golf ball size hail was reported on Bethany Church Rd on the southwest side of Forest City.
RUTHERFORDTON	5/28/2010	1	Hail up to quarter size was reported near the intersection of Coxe Rd and Baber Rd.
RUTHERFORDTON	5/28/2010	1	A weak upper low triggered numerous thunderstorms over western North Carolina. Several of the storms produced damaging wind and large hail.
GILKEY	6/28/2010	1	Quarter size hail was reported on Piney Knob Rd.
ELLENBORO	7/26/2010	0.75	Numerous showers and thunderstorms developed over the western Carolinas ahead of a cold front. Most of the severe weather affected South Carolina and Georgia, but a fair number of pulse severe storms also affected the mountains and foothills of North Carolina.
ROCK SPGS	8/5/2010	1	Quarter size hail fell at the River Creek Campground.
GILKEY	4/9/2011	1.75	Thunderstorms initiated over the mountains of North Carolina during the afternoon hours. As the afternoon progressed, several supercell thunderstorms developed which tracked southeast across the foothills and piedmont along a slow moving surface cold front. With unusually steep lapse rates over the region, several of the storms produced large hail. Fortunately the supercells were a little elevated in nature, and only one, brief, weak tornado developed. Still, hail ranging up to the size of a softballs did quite a bit of damage over the region.
GILKEY	4/9/2011	1.75	Hail up to golf ball size hail damaged the gutters and smashed the windshield of a car at a spotter's house about 4 miles northwest of Rutherfordton. Golf ball size hail was reported into Rutherfordton as well.
ELLENBORO	4/9/2011	2	Two inch diameter hail fell along highway 74 about 2 miles southwest of Ellenboro.
FOREST CITY	4/9/2011	1.25	Quarter to half dollar size hail fell from Forest City to the Ellenboro area.
ELLENBORO	5/11/2011	0.88	Scattered thunderstorms developed over the North Carolina mountains during the afternoon hours. Some of the storms produced hail as they drifted to the south.
ELLENBORO	5/11/2011	0.75	Scattered thunderstorms developed over the North Carolina mountains during the afternoon hours. Some of the storms produced hail as they drifted to the south.
WHITEHOUSE	5/13/2011	1.5	Ping pong ball size hail was reported just south of the McDowell County line.
HOLLIS	5/13/2011	1	Quarter size hail fell along Jonestown Rd.
WHITEHOUSE	5/23/2011	0.75	Isolated thunderstorms developed along the lee trough over the North Carolina foothills during the afternoon hours. The storms mainly produced large hail, including a report of tennis ball size hailstones.
HOLLIS	5/23/2011	1	Isolated thunderstorms developed along the lee trough over the North Carolina foothills during the afternoon hours. The storms mainly produced large hail, including a report of tennis ball size hailstones.
HOLLIS	5/23/2011	1	Quarter size hail was reported near the Cleveland County line.
WHITEHOUSE	6/2/2011	1	Quarter size hail fell in the vicinity of the Shingle Hollow community.
FOREST CITY	6/2/2011	1	Scattered thunderstorms developed across the North Carolina Mountains starting in the early afternoon hours. The storms moved across the southern foothills and

Location	Date	Size	Description
			piedmont, tracking a little to the north of a weak cold front. Several of the storms produced large hail.
ROCK SPGS	6/5/2011	1	Penny to quarter size hail was reported at River Creek campground.
WHITEHOUSE	6/12/2011	0.75	Dime size hail was reported near Shingle Hollow.
SPINDALE	6/26/2011	0.88	An isolated thunderstorm produced wind damage over the southern foothills of North Carolina.
WHITEHOUSE	6/27/2011	0.75	Scattered thunderstorms developed during the afternoon hours along the North Carolina Blue Ridge. One of the storms produced wind damage is it moved into the foothills.
CLIFFSIDE JCT	9/2/2011	1	While the wind shear was fairly weak over western North Carolina, a very unstable atmosphere and hot temperatures resulted in scattered thunderstorm activity over the region. A few of the storms produced areas of damaging straight-line winds and even some large hail as they drifted slowly to the south.
LAKE LURE	4/26/2012	1	Quarter size hail fell about 4 miles northwest of Shingle Hollow.
ROCK SPGS	5/1/2012	1	Quarter size hail fell at River Creek campground.
RUTHERFORDTON	5/1/2012	1	Thunderstorms developed over the North Carolina mountains during the afternoon hours. Several of the storms produced hail.
RUTHERFORDTON	6/24/2012	1	Scattered storms developed over western North Carolina during the late afternoon hours, and a couple of those briefly became severe.
GILKEY	9/28/2012	0.75	Scattered thunderstorms developed over western North Carolina along a weak cold front. Most of the storms remained below severe limits, though there was one report of large hail.
LAKE LURE	7/25/2013	1.75	Golf ball size hail fell in the Shingle Hollow community and quarter size hail in the Green Hill community.
GILKEY	8/1/2013	1	Quarter size hail was reported in the Green Hill community.
CHIMNEY ROCK	5/25/2014	0.88	Park Service Employee reported up to nickel size hail at Chimney Rock State Park.
LAKE LURE	5/25/2014	1	Public reported up to quarter size hail in the Lake Lure area.
WHITEHOUSE	6/16/2014	1	Spotter reported dime to quarter size hail.
CAROLEEN	6/19/2014	0.88	FD reported quarter size hail.
WHITEHOUSE	6/20/2014	1	Spotter reported dime to quarter size hail that lasted a few minutes.
UREE	7/27/2014	0.75	Public reported 3/4 inch hail near the intersection of Redbird Dr and Pheasant St.
WHITEHOUSE	6/19/2015	0.88	FD reported dime to nickel size hail.
UNION MILLS	9/10/2015	1	Public reported quarter size hail.
SUNSHINE	5/1/2016	1.75	Public reported up to golf ball size hail.
ELLENBORO	7/23/2017	1	Public reported quarter size hail in the Ellenboro area.
HARRIS SPICERS ARPT	6/1/2018	0.75	Public reported pea to penny size hail.
FOREST CITY	7/21/2018	1.75	County comms and the public (via Social Media) reported quarter to golf ball size hail in the Shiloh community and in the Harris area.
CLIFFSIDE	8/1/2019	0.75	Fire dept reported brief 3/4 inch hail.
THERMAL CITY	8/21/2019	1	Public reported hail as large as quarters.
Transylvania County			
Unincorporated Area	5/15/1970	1	
Unincorporated Area	4/3/1974	0.75	

Location	Date	Size	Description
Unincorporated Area	6/7/1985	0.75	
Unincorporated Area	7/9/1985	1	
Unincorporated Area	7/9/1985	1	
Unincorporated Area	6/24/1986	2.75	
Unincorporated Area	5/1/1987	0.75	
Unincorporated Area	5/14/1988	0.75	
Unincorporated Area	6/24/1988	0.75	
Unincorporated Area	6/25/1988	0.75	
Unincorporated Area	5/2/1990	1	
Unincorporated Area	5/2/1990	1	
Unincorporated Area	7/2/1991	1	
Lake Toxaway	3/31/1993	1.75	
Pisgah Forest	3/31/1993	0.75	
Pisgah Forest	6/9/1995	0.75	
LAKE TOXAWAY	3/15/1996	0.75	
BREVARD	4/20/1996	0.75	
LAKE TOXAWAY	5/24/1996	0.75	
COUNTYWIDE	7/4/1997	1.25	Severe thunderstorms moved into the mountains from Tennessee in the early evening on the Fourth, before moving into or redeveloping in the foothills and western piedmont later in the evening. Damaging winds raked much of western North Carolina, downing trees and power lines, and a few reports of hail as large a golf balls were reported. Several counties reported trees and power lines down countywide, often blocking roads and damaging homes and/or vehicles.
LAKE TOXAWAY	1/8/1998	1	Thunderstorms developed in response to an upper level cold pool that moved across western North Carolina in the wake of the powerful storm earlier in the day. Several of the storms became severe, dropping large hail in a few mountain counties as well as portions of the western piedmont. The hail accumulated to a depth of 1 to 2 inches at Lake Toxaway, in Transylvania county.
BREVARD	5/27/1998	1	A frontal boundary in the area again provided the focus for thunderstorm development during the afternoon of the 27th. Many storms became severe across western North Carolina and produced hail ranging in size between dimes and quarters. Severe straight-line winds downed numerous trees and power lines, some on houses, in Sylva and Brevard.
ROSMAN	5/19/2001	0.75	General public reported dime-sized hail at Rosman, while police in Brevard estimated winds there at severe strength just moments later.
CONNESTEE	4/17/2002	0.75	Hail to the size of dimes associated with slow-moving thunderstorms accumulated to depths of 1.5 to 3 feet along some roads and at a golf course.
ROSMAN	7/1/2002	1.25	Several vehicles received damage.

Location	Date	Size	Description
LAKE TOXAWAY	6/11/2003	0.75	
BREVARD	8/8/2003	0.75	
BALSAM GROVE	5/10/2005	0.75	
BREVARD	6/20/2005	0.75	Reported at Pisgah Forest.
BREVARD	6/20/2005	0.88	
BREVARD	6/20/2005	0.5	Mainly pea size hail fell for about 30 minutes and accumulated to a depth of 3 incehs in the Penrose area. The hail was still on the ground the next day. County reported damage to apple crops. There was a rumor of golfball size hail in this area as well, but this could not be confirmed.
BREVARD	8/4/2005	0.75	
PENROSE	4/3/2006	0.75	
BREVARD	4/19/2006	0.75	
BREVARD	4/19/2006	0.88	
ROSMAN	5/20/2006	0.88	
ROSMAN	5/25/2006	0.75	Hail covered the ground.
BALSAM GROVE	5/28/2006	0.75	
CEDAR MTN	6/11/2006	0.75	Hail covered the ground.
BREVARD	7/1/2006	0.75	
LAKE TOXAWAY	7/2/2006	0.75	
BALSAM GROVE	7/4/2006	0.88	
ROSMAN	8/10/2006	0.75	
BREVARD	5/11/2007	0.75	Reported at the USFS Cradle of Forestry.
PENROSE	6/12/2007	0.75	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
BREVARD	6/12/2007	1	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
PISGAH FOREST	6/12/2007	0.75	Scattered severe storms developed over western North Carolina for a second day in a row. The storms mainly produced large hail.
ROSMAN	6/23/2007	1	Isolated severe storms developed during the evening hours over the Mountains and western Foothills of North Carolina.
BREVARD	5/9/2008	1.75	Severe storms developed over western North Carolina during the evening hours and produced large hail.
BREVARD	5/9/2008	0.75	Severe storms developed over western North Carolina during the evening hours and produced large hail.
BREVARD	6/10/2008	0.75	Scattered severe storms affected western North Carolina during the afternoon and evening hours.
BALSAM GROVE	7/21/2008	0.88	Nickel size hail was reported on highway 215.
GRANGE	6/9/2009	0.88	Widely scattered multicell storms produced a few areas of wind damage and large hail over western North Carolina.
GRANGE	6/16/2009	0.88	Hail was reported on Cascade Lakes Rd.
OAKLAND	7/27/2009	0.75	Hail was reported on highway 64.
CEDAR MTN	9/9/2009	1	A persistent upper low triggered thunderstorms over the North Carolina mountains and foothills during the early morning hours of the 9th. A few of the storms produced large hail. Thunderstorms redeveloped in this same area early in the afternoon and more severe weather was reported.

Location	Date	Size	Description
PENROSE	5/6/2010	0.75	A few thunderstorms developed over western North Carolina mountains during the early evening hours as a weak cold front moved into the region. Some of the thunderstorms produced large hail.
GRANGE	5/6/2010	1.25	Hail was reported at the Cascade Lake Recreation area.
BOHAYNEE	5/15/2010	1	Hail up to the size of quarters fell from Cash Rd to Whitewater Church Rd about 3 miles south of Sapphire. The hail accumulated to a depth of 3 inches.
POWELLTOWN	6/15/2010	0.75	Thunderstorms erupted in the lee trough over the North Carolina foothills during the early afternoon hours. The storms produced areas of damaging straight-line winds and large hail over much of the foothills and western piedmont.
REID	6/15/2010	0.75	Thunderstorms erupted in the lee trough over the North Carolina foothills during the early afternoon hours. The storms produced areas of damaging straight-line winds and large hail over much of the foothills and western piedmont.
PENROSE	7/25/2010	0.75	Dime size hail was reported off of highway 276.
POWELLTOWN	4/28/2011	0.88	An historic tornado outbreak affected areas from the Deep South to the Mid-Atlantic states April 27-28. A strong tornado touched down in Rabun County late on the 27th, with additional tornadoes affecting the North Carolina foothills during the early morning hours of the 28th. At least three supercell thunderstorms crossed the western Carolinas and northeast Georgia during this time. A greater number of supercells and tornadoes affected areas to the west of the Appalachians. Scattered areas of straight line wind damage and large hail also accompanied the storms.
QUEBEC	5/11/2011	0.88	Nickel size hail was reported about 3 miles east of Lake Toxaway.
NORTH BREVARD	5/11/2011	0.88	Scattered thunderstorms developed over the North Carolina mountains during the afternoon hours. Some of the storms produced hail as they drifted to the south.
SEESHORE	5/11/2011	1	Scattered thunderstorms developed over the North Carolina mountains during the afternoon hours. Some of the storms produced hail as they drifted to the south.
ECUSTA	5/12/2011	1.75	Golf ball size hail was reported at the Davidson River campground.
POWELLTOWN	5/12/2011	1	Scattered airmass thunderstorms developed over the North Carolina mountains during the afternoon hours. A few of the storms produced large hail.
SEGA LAKE	6/2/2011	0.75	Scattered thunderstorms developed across the North Carolina Mountains starting in the early afternoon hours. The storms moved across the southern foothills and piedmont, tracking a little to the north of a weak cold front. Several of the storms produced large hail.
ECUSTA	6/2/2011	0.75	Penny size hail fell near the intersection of highway 64 and highway 280.
NORTH BREVARD	6/9/2011	1	Numerous thunderstorms again developed over western North Carolina as an unseasonably hot airmass persisted across the region. The storms produced both large hail and damaging winds.
BALSAM GROVE	6/21/2011	0.75	Numerous pulse-type thunderstorms developed over the North Carolina mountains during the early afternoon hours. The storms spread eastward as the afternoon progressed. Some of the storms produced large hail and damaging wind. A more organized area of thunderstorms moved across the Charlotte metro area during the late evening hours.
JOHN ROCK	6/21/2011	0.75	Numerous pulse-type thunderstorms developed over the North Carolina mountains during the early afternoon hours. The storms spread eastward as the afternoon progressed. Some of the storms produced large hail and damaging wind. A more organized area of thunderstorms moved across the Charlotte metro area during the late evening hours.
NORTH BREVARD	3/15/2012	1	Hail up to quarter size hail fell in Brevard. On the east side of town, the hail was several inches deep in places and covered roads.
POWELLTOWN	3/24/2012	1	Hail up to the size of quarters covered the ground.

Location	Date	Size	Description
SAPPHIRE	4/26/2012	0.88	Thunderstorms developed during the afternoon along an outflow boundary from an MCS that crossed the region earlier in the day. The afternoon and evening storms produced large hail and some straight-line wind damage.
OAKLAND	5/1/2012	0.88	Nickel size hail at Gorges State Park.
JOHN ROCK	5/2/2012	0.88	Up to nickel size hail was reported at the Pisgah Inn on the Blue Ridge Parkway.
ROSMAN	7/9/2012	0.88	Scattered thunderstorms developed along a southward moving cold front during the afternoon hours. A few of the thunderstorms caused wind damage and dropped large hail.
OAKLAND	8/8/2012	0.75	Penny size hail was reported in Gorges State Park.
LAKE TOXAWAY	4/11/2013	1	Hail up to the size of quarters fell in the Lake Toxaway area.
BALSAM GROVE	5/20/2013	1	Up to quarter size hail was reported in the Balsam Grove area.
BALSAM GROVE	5/20/2013	0.75	Penny size hail was reported on Pari Drive.
LAKE TOXAWAY	5/20/2013	1	Quarter size hail was reported at Gorges State Park.
SEGA LAKE	6/19/2014	0.75	Spotter reported pea size to 3/4 inch hail.
PENROSE	8/20/2014	0.75	Spotter reported penny size hail between Little River and Penrose.
REID	9/20/2017	0.75	Spotter reported 3/4 inch hail in the Lake Toxaway area.
OAKLAND	9/20/2017	1	Public reported up to quarter size hail in the Burlingame community.
BREVARD	4/9/2019	1.25	Public reported (via Social Media) larger than quarter size hail in Brevard.

TABLE G.6: HEAVY RAIN EVENTS (2000-2019)

Location	Date	Description
Henderson County		
COUNTYWIDE	11/25/1999	A strong storm system moving through the southeastern U.S. caused locally heavy rain (up to 7 inches in a small part of the mountains) and gusty winds. The result was standing water on highways and roads, some minor flooding of small streams, and several downed trees. There were numerous traffic accidents during this part of the holiday weekend as a result of the rain. The Davidson and French Broad Rivers flooded slightly in Transylvania county, causing some brief road closures.
HENDERSONVILLE	6/15/2003	Heavy rain resulted in over 40 gallons of wastewater flowing into Sandy Creek.
COUNTYWIDE	9/22/2003	A large storm system produced very heavy rainfall across the southern mountains of North Carolina during the early evening, which resulted in some urban and small stream flooding across the area. More significant flooding developed in Transylvania County after 7 pm.
BAT CAVE	8/22/2012	Highway 64/74 was briefly closed with a small mud slide covering one lane to a depth of 6 to 10 inches.
Polk County		
COLUMBUS	6/28/2005	A mudslide was reported on Holbert Cove Rd and a culvert was washed out on Skyuka Mountain Rd.
SALUDA	6/26/2006	Very heavy rainfall of 6 to 8 inches caused mainly nuisance flooding across the southern part of the county. Some roads received minor flooding due to poor drainage, but no known stream flooding occurred. In addition, several small landslides developed across the county, with the most significant affecting a portion of highway 176 near Saluda.
COLUMBUS	1/25/2010	Poor drainage resulted in water entering a building in downtown Columbus after 3 to 4 inches of rain fell in about an 18-hour period.
VALHALLA	5/28/2018	EM reported two broadcast journalists were killed when a tree fell on their vehicle as they were driving on Highway 176. The tree fell due to saturated ground from the more than one foot of rain that fell over western Polk County during the latter half of May.
Rutherford County		
SUNSHINE	7/4/2002	A portion of Missionary Plantation Rd was washed out.
LAKE LURE	8/22/2003	Heavy rain caused a mudslide to develop.
LAKE LURE	6/14/2004	A prolonged period of heavy rain combined with gusty winds to cause several trees to fall.
LAKE LURE	8/26/2008	Heavy rain caused a mudslide to develop on a hillside that had been cleared for construction. Water and debris entered a business at the bottom of the hill, causing some damage.
RUTH	11/11/2009	Water entered the basement of a home on North Main St, apparently due to flooding caused by poor drainage after 3 to 5 inches of rain fell over an extended period.
Transylvania County		
COUNTYWIDE	11/25/1999	A strong storm system moving through the southeastern U.S. caused locally heavy rain (up to 7 inches in a small part of the mountains) and gusty winds. The result was standing water on highways and roads, some minor flooding of small streams, and several downed trees. There were numerous traffic accidents during this part of the holiday weekend as a result of the rain. The Davidson and French Broad Rivers flooded slightly in Transylvania county, causing some brief road closures.
COUNTYWIDE	9/22/2003	A large storm system produced very heavy rainfall across the southern mountains of North Carolina during the early evening, which resulted in some urban and small stream flooding across the area. More significant flooding developed in Transylvania County after 7 pm.
EAST FORK	11/28/2011	East Fork River Rd was partially flooded near the East Fork Baptist Church.

TABLE G.7: HEAVY SNOW EVENTS (2000-2019)

Date	Description
Henderson County	
12/18/1996	Heavy snow accumulated 3 to 5 inches with 6 inches at high elevations in the mountains.
1/10/1997	Heavy snow fell in the mountains resulting in accumulations of 3 to 6 inches. Over 200 car wrecks were reported in western North Carolina during the snow. Icy roads the next morning contributed to many accidents with one indirect fatality near Statesville, well away from the high accumulations of precipitation.
12/29/1997	Snow began during the day of the 29th and lasted well into the 30th as a strong storm system moved northeast through the Carolinas. Snowfall ranged from 2-6 inches in the lower elevations, to generally 4-12 inches in the higher elevations. Some of the highest peaks ended up with between 15 and 23 inches.
12/30/1997	Widespread, wind-blown heavy snow developed as a strong storm system intensified in the northeastern U.S. and directed cold, moist air in a strong northwest flow, into the mountains. By the evening of the 31st, 4-6 inches of new snow accumulated basically along and south of Interstate 40, with over 12 inches common north of there. Very windy conditions accompanied the heavy snow, creating near blizzard conditions at times, especially at elevations above 3000 feet. Snow depths in the highest elevations due to the snow of the past three days were near 3 feet.
1/27/1998	A deep cut-off low drifted across western North Carolina, drawing abundant moisture into air just cold enough to support snow. A heavy wet snow began in the pre-dawn hours on the 28th and moved north across the mountains. Snow accumulated quickly during the day, before tapering to a light snow in the evening. Light snow continued into the following morning, especially north of Asheville. Snowfall totals ranged from 4 to 8 inches at lower elevations to between 1 and 3 feet at high elevations. To make matters worse, strong winds combined with the snow to create near blizzard conditions at times in the higher elevations. Tens of thousands of people were without power for up to 3 days as numerous trees and power lines were downed. Thousands of motorists were stranded on roads and highways. Interstate 40 through the mountains was closed for several hours and the National Guard had to be called in to rescue people stranded on the highway.
1/31/1999	Portions of the central and southern mountains received a more prolonged period of moderate to heavy wet snow, mixed at times with sleet and freezing rain, which accumulated to between 4 and 6 inches by early evening. Light snow continued in some places until midnight.
1/22/2000	A cold dome of arctic high pressure centered over the Mid-Atlantic States provided very cold and dry air to western North Carolina. Meanwhile, weak low pressure moved east along a frontal boundary stalled across the Gulf Coast States to the Georgia coast. Abundant moisture flowed north into the sub-freezing air over western North Carolina, resulting in light snow as early as the afternoon on the 22nd. Snow became heavy by mid-afternoon across the mountains and by evening across the foothills and piedmont. A general 4 to 7-inch snowfall occurred in the mountains with as much as 10 inches reported in Jackson county. Generally, 4 to 6 inches of snow fell across the foothills and piedmont, with a local maximum of 7 inches in western Lincoln county. Rowan county failed to meet heavy snow criteria with accumulations of up to 3 inches. Freezing rain and sleet mixed with the snow for a short time before the precipitation ended, and for the most part, caused little additional problems. The one exception was across southern Union county where freezing rain lasted all night and through much of the morning on the 23rd. Ice accumulations reached damaging levels there around 3 am, causing a large number of trees and power lines to fall throughout the morning. This in turn, resulted in widespread power outages.
4/8/2000	A cold and moist northwest flow behind a cold front produced light snow across the mountains. Accumulations were generally a dusting to one inch, but the highest mountains north of Asheville received 2 to 3 inches.
11/19/2000	Light to moderate snow started in the mountains and spread southeast, lasting through the day. Generally, 1 to 3 inches of snow fell, but some higher elevations of the central and southern mountains reported more than 4 inches.
12/3/2000	A developing surface cyclone off the Carolina Coast spread abundant moisture into western North Carolina, which was still mired in a cold, winter-like temperature regime. The result was another

Date	Description
	widespread snowfall. Accumulations ranged from a dusting in the northern foothills to more than 6 inches in western Macon County and 5 inches in Henderson County. Most accumulations were in the 1 to 3-inch range.
12/17/2000	A dynamic system affected western North Carolina during the 16th and 17th, bringing a variety of weather to the region, from freezing rain in mountain valleys to large hail and damaging winds across much of the region
12/19/2000	The latest in a sprightly succession of Arctic cold fronts crossed the region on the 18th and 19th. Abundant low-level moisture and an upper level disturbance riding over the new surge of cold air provided the ingredients for the latest round of snow. The heaviest snow accumulations, in general, were north and west of Asheville, especially near the Tennessee border. The northern half of Mitchell County recorded 5 to 6 inches of new snow...as did the higher-terrain Highlands/Cashiers area of southern Jackson and Transylvania counties in the southern mountains. Buncombe, Transylvania and Macon counties each reported numerous 4 inch accumulations, with most other mountain locations reporting between 1 and 3 inches. Foothill locations, especially those closest to the mountains, racked up some impressive totals as well, with Marion and Morganton each reporting 2 to 3 inches. Farther east, in the northwest piedmont, accumulations were limited to less than 2 inches. More than 200 traffic accidents were reported from the region due to the wintry weather.
1/1/2001	Light snow fell on and off through the afternoon, increased in intensity about 3 pm in the west, and during the early evening in the eastern mountain counties. Though accumulations were light, hundreds of auto accidents resulted. Most accidents in Henderson County were between 3 pm and 6 pm.
3/20/2001	Low pressure developed off the South Carolina coast and steadily strengthened as it moved northward across the coastal waters of North Carolina, the Virginia tidewater and eventually out to sea. Rapid strengthening occurred as a strong upper level disturbance rotated around an upper low that was crossing the southeast states. As the cyclone strengthened, abundant moisture was wrapped around the storm and thrown back against the higher terrain of the Carolinas, resulting in high winds and very heavy snow. The heaviest snow accumulations were in far western North Carolina.
1/3/2002	Snow continued during the early morning hours on the 3rd and finally added up to heavy snowfall accumulations across this portion of the North Carolina mountains. Snowfall amounts ranged from 3 to 6 inches across the area by noon.
2/3/2002	Light snow fell from late afternoon into late evening, resulting in 1 to 2.5 inches accumulations in some areas, and a few slick roads.
12/4/2002	Snow began falling around sunrise across the mountains of North Carolina, and had accumulated to 3 to 6 inches by evening.
1/16/2003	Light snow began across the mountains of North Carolina during the afternoon of the 16th, and gradually intensified with time. By early morning of the 17th, 4 to 8 inches of snow had accumulated. As much as a foot was reported on some of the highest peaks.
2/6/2003	Light snow began falling across the western mountains of North Carolina during the afternoon of the 6th, and gradually increased in intensity and coverage during the evening and overnight hours. General snowfall amounts of 4 to 5 inches were reported in the major valleys. However, accumulations of up to 8 inches occurred in the highest elevations along the Tennessee border.
4/10/2003	Light snow began across the North Carolina mountains during the early morning hours of the 10th, but due to a warm ground, accumulations were confined to the highest elevations through 8 AM. However, the snow intensified dramatically during the middle and late part of the morning, and by early afternoon, 2-4 inches had accumulated in valley locations near the Blue Ridge. In the higher elevations, 4 to 6 inch totals were common, while 8 to 12 inches accumulated on some of the highest peaks along the Tennessee border. The heavy, wet snow caused numerous trees and power lines to fall, and power outages were widespread.
1/25/2004	Light snow developed early in the morning across the mountains, foothills, and northern piedmont of North Carolina. The snow intensified throughout the morning and afternoon, and by early evening 3 to 5 inches had accumulated across much of the area. Accumulations as high as 8 inches occurred in mountainous areas along the Tennessee border.

Date	Description
2/26/2004	Snow intensity increased during the late morning across the North Carolina mountains, and continued through the afternoon. Total accumulations of 3 to 5 inches occurred, but much of it melted rapidly.
2/28/2005	The wet snow became heavier across the mountains and northern foothills during the early morning hours on the 28th. Most locations below 3000 feet changed back to rain before the precipitation ended. A quick 3 to 7 inches of snow accumulated across much of this area. Isolated heavier totals up to 13 inches occurred along the Blue Ridge, north of I-40, while the lower elevations of the foothills generally received only 1 to 3 inches.
2/1/2007	Light to moderate snow developed across the North Carolina mountains during the pre-dawn hours. The snow became heavy at times toward sunrise. By mid-morning, as much as 3 inches of snow had accumulated across the area. Snow, heavy at times continued across the portions of the southern and central mountains through the morning hours, with most locations reporting heavy snowfall totals by mid-morning. Total accumulations ranged from 2 to 4 inches across the area.
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas. Snowfall intensity began to increase during the mid and late evening. Snow continued to fall during the early morning hours across the southern mountains and foothills, and total accumulations of 2-4 inches were reached across much of the area shortly after midnight.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley. The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
2/12/2010	As low pressure tracked along the northern Gulf Coast, light snow developed during the late afternoon across the southern North Carolina mountains. The snow gradually increased in intensity through the remainder of the afternoon and into the early evening. Numerous traffic accidents occurred during the evening rush. Snow, heavy at times, continued through the evening, with heavy accumulations reached in most areas. The snow ended a little before midnight. Total accumulations averaged around 3 inches.
3/2/2010	Snow began to fall during the pre-dawn across the mountains of the western Carolinas. After sunrise, snow became moderate to heavy at times, resulting in accumulations of 1 to 4 inches across most of the area by late morning. Snow, heavy at times, continued into the afternoon across the mountains, with heavy accumulations realized in most areas by early afternoon. By early evening, total snowfall ranged from 4 to 8 inches across the area, with localized amounts as high as 10 inches, especially in the higher elevations.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This

Date	Description
	added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precip may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills counties.
12/8/2018	A mixture of rain and snow developed across the North Carolina mountains during the afternoon of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, widespread storm total accumulations of 10-15 inches were reported. Locally higher amounts also occurred, with some locations near the South Carolina border seeing around 20 inches. Meanwhile, warm air filtering into the lower elevations of the Tuckasegee River Valley resulted in a transition to rain during the morning of the 9th, and total accumulations there were only in the 2 to 4 inch range.
Polk County	
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas. Snowfall intensity began to increase during the mid and late evening. Snow continued to fall during the early morning hours across the southern mountains and foothills, and total accumulations of 2-4 inches were reached across much of the area shortly after midnight.
3/1/2009	Rain changed to snow across the southwest foothills of North Carolina during the late afternoon. The snow became heavy at times, particularly along the I-85 corridor. By mid-evening, 1-4 inches of accumulation was reported across much of the area. Snow, heavy at times, and accompanied by occasional lightning, continued into the evening hours. By the time the snow tapered off, accumulations of 3-6 inches were common across the area. However, localized amounts of up to 8 inches were reported along the I-85 corridor. The heavy wet snow, combined with gusty winds, caused quite a few trees and power lines to fall, resulting in numerous power outages. Some customers were without power for several days. One tree fell on and damaged a home in Gaffney. In addition, there were numerous traffic accidents.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the southeast cost on the 30th. As the low passed well south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow became heavy during the evening, and quickly accumulated to yield heavy snowfall totals. Total accumulations ranged from 5-9 inches across much of the northern mountains, foothills and western piedmont of North Carolina, as well as in a small part of the South Carolina mountains. A 55-year-old man died of exposure after falling in the snow in Gastonia (indirect). The precipitation changed to freezing rain and sleet near the end of the event, resulting in light accumulations of ice.
2/12/2010	As low pressure tracked along the northern Gulf Coast, light snow developed during the late afternoon across the southern North Carolina mountains. The snow gradually increased in intensity through the remainder of the afternoon and into the early evening. Numerous traffic accidents occurred during the evening rush. Snow, heavy at times, continued through the evening, with heavy accumulations reached in most areas. The snow ended a little before midnight. Total accumulations averaged around 3 inches.

Date	Description
12/25/2010	A developing coastal storm system brought light to moderate snow to the foothills and northwest piedmont of North Carolina starting late on Christmas morning. By mid-afternoon, most locations enjoyed a rare white Christmas, with 1 to 4 inches of snow reported. Snow, heavy at times, continued until around midnight. Snow was mixed with rain at times over the southern foothills and northwest piedmont. By the time snow tapered off to flurries and light snow showers early on the 26th, snowfall totals ranged from 5 to 9 inches across the northern foothills, with 4 to 7 inches over the southern foothills and northwest piedmont.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread northward across the foothills and western piedmont of North Carolina during the early morning hours. The heavy snow accumulated quickly, and by sunrise parts of the southwest foothills and piedmont had received 4 inches of snow. The snow was lighter across the northern most foothills and piedmont, where only an inch or two of snow had fallen by mid-morning. The snow became lighter during the day, but continued to accumulate. By early afternoon, snowfall totals ranged from around 7 inches over the southern foothill and southwest piedmont locations, to around 3 inches over the northern most parts of the foothills and piedmont. During the afternoon, precipitation changed to light to moderate freezing rain, which continued into the evening hours. This added as much as a tenth to a quarter inch of ice to the heavy snowfall totals, resulting in sporadic power outages, particularly in the Charlotte metro area. Persistent cold air resulted in only gradual improvement in road conditions, with some businesses and schools remaining closed for several days.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread western North Carolina throughout the 6th. While precipitation initially fell as rain and sleet across the foothills and Piedmont, it changed to snow fairly quickly. The snow was light at first, and even ended briefly before beginning again late in the evening. Snow, heavy at times continued across the area through the overnight. By the time the heavier snowfall rates tapered off shortly after sunrise, total accumulations ranged from 3 to 5 inches in the valleys of the far southwest mountains, to 6 to 8 inches across the remainder of the area. Locally higher amounts of 9 inches or more were reported, mainly in the high elevations, and in the far northern foothills and Piedmont.
1/17/2018	As a strengthening upper level disturbance and associated cold front approached the region from the Tennessee Valley, light precipitation developed across portions of the Piedmont and foothills of North Carolina during the early morning hours. While the precipitation started as rain or a rain/snow mix in most areas, a transition to snow had occurred in most locations by sunrise. As the snow band moved east throughout the morning, snowfall rates increased, with heavy snowfall accumulations reported by early afternoon. By the time the snow tapered off to flurries, total accumulation ranged from 3 to 6 inches across much of the area.
12/8/2018	A mixture of rain and snow developed across the mountains and southern foothills of North Carolina during the afternoon and evening of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, total accumulations ranged from 6 to 10 inches across much of the area. Locally higher occurred closer to the higher elevations.
Rutherford County	
2/1/2007	Light to moderate snow developed across the North Carolina mountains during the pre-dawn hours. The snow became heavy at times toward sunrise. By mid-morning, as much as 3 inches of snow had

Date	Description
	accumulated across the area. Snow, heavy at times continued across the portions of the southern and central mountains through the morning hours, with most locations reporting heavy snowfall totals by mid-morning. Total accumulations ranged from 2 to 4 inches across the area.
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas. Snowfall intensity began to increase during the mid and late evening. Snow continued to fall during the early morning hours across the southern mountains and foothills, and total accumulations of 2-4 inches were reached across much of the area shortly after midnight.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley. The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
2/12/2010	As low pressure tracked along the northern Gulf Coast, light snow developed during the late afternoon across the southern North Carolina mountains. The snow gradually increased in intensity through the remainder of the afternoon and into the early evening. Numerous traffic accidents occurred during the evening rush. Snow, heavy at times, continued through the evening, with heavy accumulations reached in most areas. The snow ended a little before midnight. Total accumulations averaged around 3 inches.
3/2/2010	Snow began to fall around sunrise across the North Carolina mountains along the Blue Ridge escarpment. Snow became moderate to heavy at times during the late morning and early afternoon, resulting in accumulations of 1 to 4 inches across most of the area. Snow, heavy at times, continued into the afternoon across the Blue Ridge, with heavy accumulations realized in most areas by mid-afternoon. By early evening, total snowfall ranged from 3 to 6 inches. Localized snowfall amounts as high as 10 inches occurred, especially in the higher elevations along the escarpment.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
3/6/2014	An intensifying cyclone off the Southeast coast and cold air damming combined to produce heavy snow and occasional sleet along and near the eastern Blue Ridge escarpment. Rain mixed with sleet developed across the Blue Ridge mountains and North Carolina foothills during the evening, then changed to mainly sleet in most areas. Up to a quarter inch of sleet accumulated during the late evening and early morning hours. Precipitation then changed mostly to rain in most areas, before transitioning to snow during the

Date	Description
	pre-dawn hours of the 7th. As heavy snow continued to fall across the foothills and Blue Ridge mountains in North Carolina throughout the morning, heavy accumulations of snow became common. The region of heavy snowfall accumulation was confined to a very narrow corridor along the Blue Ridge south of I-40, but became more widespread across the northern mountains and foothills. Total snowfall accumulation generally ranged from 4-6 inches in these areas, with locally higher amounts reported in some high elevation locations near the Blue Ridge. This was in addition to the quarter inch or so of sleet that fell earlier in the morning. Meanwhile, accumulations were quite a bit lower in the areas of the northern mountains adjacent to the Tennessee border. The snow changed back to rain in most areas before ending late in the morning.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precip may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills counties.
12/8/2018	A mixture of rain and snow developed across the North Carolina mountains during the afternoon of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, widespread storm total accumulations of 10-15 inches were reported. Locally higher amounts also occurred, with some locations near the South Carolina border seeing around 20 inches. Meanwhile, warm air filtering into the lower elevations of the Tuckasegee River Valley resulted in a transition to rain during the morning of the 9th, and total accumulations there were only in the 2 to 4 inch range.
Transylvania County	
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas and northeast Georgia. Snowfall intensity began to increase during the mid and late evening.|Snow continued to fall across the central and northern mountains, and much of the foothills of North Carolina, during the early morning hours. Total accumulations of 2-5 inches were reached across the area during the pre-dawn hours. Some amounts as high as 8 inches were reported in the higher elevations. Snow changed briefly to sleet and freezing rain before ending across the foothills.
3/1/2009	Rain changed to snow across the southwest foothills of North Carolina during the late afternoon. The snow became heavy at times, particularly along the I-85 corridor. By mid-evening, 1-4 inches of accumulation was reported across much of the area. Snow, heavy at times, and accompanied by occasional lightning, continued into the evening hours. By the time the snow tapered off, accumulations of 3-6 inches were common across the area. However, localized amounts of up to 8 inches were reported along the I-85 corridor. The heavy wet snow, combined with gusty winds, caused quite a few trees and power lines to fall, resulting in numerous power outages. Some customers were without power for several days. One tree fell on and damaged a home in Gaffney. In addition, there were numerous traffic accidents.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the southeast cost on the 30th. As the low passed well south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow became heavy during the evening, and quickly accumulated to yield heavy snowfall totals. Total accumulations ranged from 5-9 inches across much of the northern mountains, foothills and western piedmont of North Carolina, as well as in a small part of the

Date	Description
	South Carolina mountains. A 55-year-old man died of exposure after falling in the snow in Gastonia (indirect). The precipitation changed to freezing rain and sleet near the end of the event, resulting in light accumulations of ice.
12/25/2010	A developing coastal storm system brought light to moderate snow to the foothills and northwest piedmont of North Carolina starting late on Christmas morning. By mid-afternoon, most locations enjoyed a rare white Christmas, with 1 to 4 inches of snow reported. Snow, heavy at times, continued until around midnight. Snow was mixed with rain at times over the southern foothills and northwest piedmont. By the time snow tapered off to flurries and light snow showers early on the 26th, snowfall totals ranged from 5 to 9 inches across the northern foothills, with 4 to 7 inches over the southern foothills and northwest piedmont.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread northward across the foothills and western piedmont of North Carolina during the early morning hours. The heavy snow accumulated quickly, and by sunrise parts of the southwest foothills and piedmont had received 4 inches of snow. The snow was lighter across the northern most foothills and piedmont, where only an inch or two of snow had fallen by mid-morning. The snow became lighter during the day, but continued to accumulate. By early afternoon, snowfall totals ranged from around 7 inches over the southern foothill and southwest piedmont locations, to around 3 inches over the northern most parts of the foothills and piedmont. During the afternoon, precipitation changed to light to moderate freezing rain, which continued into the evening hours. This added as much as a tenth to a quarter inch of ice to the heavy snowfall totals, resulting in sporadic power outages, particularly in the Charlotte metro area. Persistent cold air resulted in only gradual improvement in road conditions, with some businesses and schools remaining closed for several days.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread western North Carolina throughout the 6th. While precipitation initially fell as rain and sleet across the foothills and Piedmont, it changed to snow fairly quickly. The snow was light at first, and even ended briefly before beginning again late in the evening. Snow, heavy at times continued across the area through the overnight. By the time the heavier snowfall rates tapered off shortly after sunrise, total accumulations ranged from 3 to 5 inches in the valleys of the far southwest mountains, to 6 to 8 inches across the remainder of the area. Locally higher amounts of 9 inches or more were reported, mainly in the high elevations, and in the far northern foothills and Piedmont.
1/17/2018	As a strengthening upper level disturbance and associated cold front approached the region from the Tennessee Valley, light precipitation developed across portions of the Piedmont and foothills of North Carolina during the early morning hours. While the precipitation started as rain or a rain/snow mix in most areas, a transition to snow had occurred in most locations by sunrise. As the snow band moved east throughout the morning, snowfall rates increased, with heavy snowfall accumulations reported by early afternoon. By the time the snow tapered off to flurries, total accumulation ranged from 3 to 6 inches across much of the area.
12/8/2018	A mixture of rain and snow developed across the mountains and southern foothills of North Carolina during the afternoon and evening of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, total accumulations ranged from 6 to 10 inches across much of the area. Locally higher occurred closer to the higher elevations.

Date	Description
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas and northeast Georgia. Snowfall intensity began to increase during the mid and late evening.|Snow continued to fall across the central and northern mountains, and much of the foothills of North Carolina, during the early morning hours. Total accumulations of 2-5 inches were reached across the area during the pre-dawn hours. Some amounts as high as 8 inches were reported in the higher elevations. Snow changed briefly to sleet and freezing rain before ending across the foothills.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley. The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
2/12/2010	As low pressure tracked along the northern Gulf Coast, light snow developed during the late afternoon across the southern North Carolina mountains. The snow gradually increased in intensity through the remainder of the afternoon and into the early evening. Numerous traffic accidents occurred during the evening rush. Snow, heavy at times, continued through the evening, with heavy accumulations reached in most areas. The snow ended a little before midnight. Total accumulations averaged around 3 inches.
3/2/2010	Snow began to fall around sunrise across the North Carolina mountains along the Blue Ridge escarpment. Snow became moderate to heavy at times during the late morning and early afternoon, resulting in accumulations of 1 to 4 inches across most of the area. Snow, heavy at times, continued into the afternoon across the Blue Ridge, with heavy accumulations realized in most areas by mid-afternoon. By early evening, total snowfall ranged from 3 to 6 inches. Localized snowfall amounts as high as 10 inches occurred, especially in the higher elevations along the escarpment.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
3/6/2014	An intensifying cyclone off the Southeast coast and cold air damming combined to produce heavy snow and occasional sleet along and near the eastern Blue Ridge escarpment. Rain mixed with sleet developed across the Blue Ridge mountains and North Carolina foothills during the evening, then changed to mainly sleet in most areas. Up to a quarter inch of sleet accumulated during the late evening and early morning hours. Precipitation then changed mostly to rain in most areas, before transitioning to snow during the pre-dawn hours of the 7th. As heavy snow continued to fall across the foothills and Blue Ridge mountains

Date	Description
	in North Carolina throughout the morning, heavy accumulations of snow became common. The region of heavy snowfall accumulation was confined to a very narrow corridor along the Blue Ridge south of I-40, but became more widespread across the northern mountains and foothills. Total snowfall accumulation generally ranged from 4-6 inches in these areas, with locally higher amounts reported in some high elevation locations near the Blue Ridge. This was in addition to the quarter inch or so of sleet that fell earlier in the morning. Meanwhile, accumulations were quite a bit lower in the areas of the northern mountains adjacent to the Tennessee border. The snow changed back to rain in most areas before ending late in the morning.
1/22/2016	An area of low pressure spread light snow into the mountains and foothills of North Carolina by around midnight on the 22nd. The snow continued through the early morning hours, gradually increasing in intensity. By mid-morning, amounts ranged from 2-4 inches across the foothills to 3-5 inches across the mountains, with locally higher amounts, especially in the high elevations near the Blue Ridge. Road conditions deteriorated quickly around sunrise, resulting in many traffic accidents. Moderate to heavy snow continued into the afternoon, gradually tapering off during the evening. The snow briefly changed to sleet before ending across the foothills. By the time the snow tapered off, accumulations ranged from 4-8 inches across the low elevations of the foothills, to 8-14 inches across the mountains. Locally higher amounts occurred, especially on the high peaks near the Blue Ridge, where several feet were reported.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precip may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills counties.
12/8/2018	A mixture of rain and snow developed across the mountains and southern foothills of North Carolina during the afternoon and evening of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, total accumulations ranged from 6 to 10 inches across much of the area. Locally higher occurred closer to the higher elevations.
12/18/1996	Heavy snow accumulated 3 to 5 inches with 6 inches at high elevations in the mountains.
1/10/1997	Heavy snow fell in the mountains resulting in accumulations of 3 to 6 inches. The highest totals were reported from Graham and Jackson counties. Over 200 car wrecks were reported in western North Carolina during the snow. Icy roads the next morning contributed to many accidents with one indirect fatality near Statesville, well away from the high accumulations of precipitation.
12/29/1997	Snow began during the day of the 29th and lasted well into the 30th as a strong storm system moved northeast through the Carolinas. Snowfall ranged from 2-6 inches in the lower elevations, to generally 4-12 inches in the higher elevations. Some of the highest peaks ended up with between 15 and 23 inches.
12/30/1997	Widespread, wind-blown heavy snow developed as a strong storm system intensified in the northeastern U.S. and directed cold, moist air in a strong northwest flow, into the mountains. By the evening of the 31st, 4-6 inches of new snow accumulated basically along and south of Interstate 40, with over 12 inches common north of there. Very windy conditions accompanied the heavy snow, creating near blizzard conditions at times, especially at elevations above 3000 feet. Snow depths in the highest elevations due to the snow of the past three days were near 3 feet.
1/18/1998	Snow fell across mainly the high elevations of the mountains and northern foothills. The snow began lightly, accumulating at least 1-3 inches across the entire area by the early morning of the 19th. However, several high elevation locations began to receive heavy snow by midnight. Before the snow ended at 6 am on the 19th, some of these locations had between 4 and 7 inches.
1/27/1998	A deep cut-off low drifted across western North Carolina, drawing abundant moisture into air just cold enough to support snow. A heavy wet snow began in the pre-dawn hours on the 28th and moved north across the mountains. Snow accumulated quickly during the day, before tapering to a light snow in the evening. Light snow continued into the following morning, especially north of Asheville. Snowfall totals ranged from 4 to 8 inches at lower elevations to between 1 and 3 feet at high elevations. To make matters

Date	Description
	worse, strong winds combined with the snow to create near blizzard conditions at times in the higher elevations. Tens of thousands of people were without power for up to 3 days as numerous trees and power lines were downed. Thousands of motorists were stranded on roads and highways. Interstate 40 through the mountains was closed for several hours and the National Guard had to be called in to rescue people stranded on the highway.
3/26/1999	A deep cold core low pressure center in the mid and upper levels of the atmosphere moved slowly across the Southern Appalachians during the day, triggering heavy snow accompanied by thunder at times. Most areas received 2 to 4 inches of heavy wet snow. However, a small area consisting of Swain, northern Jackson, northern Haywood and Madison counties received between 4 and 10 inches of snow. The heavy snow ended for most of the counties around 1 pm. Although Buncombe and Yancey counties continued to experience the heavy snow until around 5 pm.
1/20/2000	A cold front crossed the mountains overnight, and low pressure formed along the front in the foothills by morning. Cold air was already in place across the region, so precipitation fell in the form of snow. By noon on the 20th, 3 to 6 inches of snow had fallen from Madison to Avery counties. Elsewhere across the central mountains, northern foothills and northwest piedmont, 1 to 3 inches of snow fell. There were isolated reports of 4 inches from the highest peaks in Swain and Haywood counties. The combination of snow and wind in the wake of the front caused some trees to fall, especially in Caldwell county. One tree fell across a mobile home and caused $24K in damage. Several other trees fell across roads.
1/22/2000	A cold dome of arctic high pressure centered over the Mid-Atlantic States provided very cold and dry air to western North Carolina. Meanwhile, weak low pressure moved east along a frontal boundary stalled across the Gulf Coast States to the Georgia coast. Abundant moisture flowed north into the sub-freezing air over western North Carolina, resulting in light snow as early as the afternoon on the 22nd. Snow became heavy by mid-afternoon across the mountains and by evening across the foothills and piedmont. A general 4 to 7 inch snowfall occurred in the mountains with as much as 10 inches reported in Jackson county. Generally 4 to 6 inches of snow fell across the foothills and piedmont, with a local maximum of 7 inches in western Lincoln county. Rowan county failed to meet heavy snow criteria with accumulations of up to 3 inches. Freezing rain and sleet mixed with the snow for a short time before the precipitation ended, and for the most part, caused little additional problems. The one exception was across southern Union county where freezing rain lasted all night and through much of the morning on the 23rd. Ice accumulations reached damaging levels there around 3 am, causing a large number of trees and power lines to fall throughout the morning. This in turn, resulted in widespread power outages.
4/8/2000	A cold and moist northwest flow behind a cold front produced light snow across the mountains. Accumulations were generally a dusting to one inch, but the highest mountains north of Asheville received 2 to 3 inches.
11/19/2000	Light to moderate snow started in the mountains and spread southeast, lasting through the day. Generally 1 to 3 inches of snow fell, but some higher elevations of the central and southern mountains reported more than 4 inches.
12/17/2000	A dynamic system affected western North Carolina during the 16th and 17th, bringing a variety of weather to the region, from freezing rain in mountain valleys to large hail and damaging winds across much of the region. A number of meteorological factors came together to produce such interesting atmospheric phenomena: a very strong cold front that would eventually usher in the coldest air in nearly two years into the state, strong mid-level and upper-level jets, a potent upper level disturbance, a temporary surge of warm, moist air into the region and the antecedent cold air trapped in lower valleys of the higher terrain in the mountains. Heavy rain, with embedded thunderstorms, crossed the region from late morning through the afternoon on the 16th. Cold air trapped in some valleys of the northern mountains never completely scoured out, resulting in a light glaze south and west of Newland. Just as surface temperatures rose above freezing in the northern mountains, thunderstorms pushed out ahead of the strong front, with numerous small hail

Date	Description
	reports. Nickel-sized hail was reported 8 miles north of Sylva in Jackson County. As the front, and attendant pressure gradient, pushed its way into western North Carolina, winds increased into the 50 to 60 mph range, resulting in numerous downed trees and power lines. Nearly every county in the mountains reported some wind damage. The high winds eventually affected the foothills and piedmont. In Charlotte, numerous trees were downed and furniture was blown off porches. An unsturdy building in Spencer collapsed. In the wake of the frontal passage, much colder air invaded the region, and as another shortwave affected the region on the 17th, a wide swath of 1 to 3 inch snow blanketed the higher terrain. Flurries were reported as far east as Hickory and Gastonia.
12/19/2000	The latest in a sprightly succession of Arctic cold fronts crossed the region on the 18th and 19th. Abundant low level moisture and an upper level disturbance riding over the new surge of cold air provided the ingredients for the latest round of snow. The heaviest snow accumulations, in general, were north and west of Asheville, especially near the Tennessee border. The northern half of Mitchell County recorded 5 to 6 inches of new snow...as did the higher-terrain Highlands/Cashiers area of southern Jackson and Transylvania counties in the southern mountains. Buncombe, Transylvania and Macon counties each reported numerous 4 inch accumulations, with most other mountain locations reporting between 1 and 3 inches. Foothill locations, especially those closest to the mountains, racked up some impressive totals as well, with Marion and Morganton each reporting 2 to 3 inches. Farther east, in the northwest piedmont, accumulations were limited to less than 2 inches. More than 200 traffic accidents were reported from the region due to the wintry weather.
1/1/2001	A powerful upper level disturbance interacted with left-over cold air and abundant low level moisture to wring out snow showers across the North Carolina mountains from midday New Years Day through the early morning hours on the 2nd. Highest accumulations were in Haywood County, with several reports of 3 inch accumulations.
3/20/2001	Low pressure developed off the South Carolina coast and steadily strengthened as it moved northward across the coastal waters of North Carolina, the Virginia tidewater and eventually out to sea. Rapid strengthening occurred as a strong upper level disturbance rotated around an upper low that was crossing the southeast states. As the cyclone strengthened, abundant moisture was wrapped around the storm and thrown back against the higher terrain of the Carolinas, resulting in high winds and very heavy snow. The heaviest snow accumulations were in far western North Carolina.
1/3/2002	Snow continued during the early morning hours on the 3rd and finally added up to heavy snowfall accumulations across this portion of the North Carolina mountains. Snowfall amounts ranged from 3 to 6 inches across the area by noon.
2/3/2002	Light snow fell from late afternoon into late evening, resulting in 1 to 2.5 inches accumulations in some areas, and a few slick roads.
1/16/2003	Light snow began across the mountains of North Carolina during the afternoon of the 16th, and gradually intensified with time. By early morning of the 17th, 4 to 8 inches of snow had accumulated. As much as a foot was reported on some of the highest peaks.
2/6/2003	Light snow began falling across the western mountains of North Carolina during the afternoon of the 6th, and gradually increased in intensity and coverage during the evening and overnight hours. General snowfall amounts of 4 to 5 inches were reported in the major valleys. However, accumulations of up to 8 inches occurred in the highest elevations along the Tennessee border.
4/10/2003	Light snow began across the North Carolina mountains during the early morning hours of the 10th, but due to a warm ground, accumulations were confined to the highest elevations through 8 AM. However, the snow intensified dramatically during the middle and late part of the morning, and by early afternoon, 2-4 inches had accumulated in valley locations near the Blue Ridge. In the higher elevations, 4 to 6-inch totals were common, while 8 to 12 inches accumulated on some of the highest peaks along the Tennessee

Date	Description
	border. The heavy, wet snow caused numerous trees and power lines to fall, and power outages were widespread.
1/25/2004	Light snow developed early in the morning across the mountains, foothills, and northern piedmont of North Carolina. The snow intensified throughout the morning and afternoon, and by early evening 3 to 5 inches had accumulated across much of the area. Accumulations as high as 8 inches occurred in mountainous areas along the Tennessee border.
2/26/2004	Snow intensity increased during the late morning across the North Carolina mountains, and continued through the afternoon. Total accumulations of 3 to 5 inches occurred, but much of it melted rapidly.
2/28/2005	The wet snow became heavier across the mountains and northern foothills during the early morning hours on the 28th. Most locations below 3000 feet changed back to rain before the precipitation ended. A quick 3 to 7 inches of snow accumulated across much of this area. Isolated heavier totals up to 13 inches occurred along the Blue Ridge, north of I-40, while the lower elevations of the foothills generally received only 1 to 3 inches.
2/1/2007	Light to moderate snow developed across the North Carolina mountains during the pre-dawn hours. The snow became heavy at times toward sunrise. By mid-morning, as much as 3 inches of snow had accumulated across the area. Snow, heavy at times continued across the portions of the southern and central mountains through the morning hours, with most locations reporting heavy snowfall totals by mid-morning. Total accumulations ranged from 2 to 4 inches across the area.
1/16/2008	Light snow began during the early evening hours across the southern mountains and foothills of the western Carolinas. Snowfall intensity began to increase during the mid and late evening. Snow continued to fall during the early morning hours across the southern mountains and foothills, and total accumulations of 2-4 inches were reached across much of the area shortly after midnight.
1/29/2010	Low pressure tracked across southern Georgia during the night of the 29th, and then off the Southeast cost on the 30th. As the low passed so far south of the region, most of the precipitation fell as snow, though other precipitation types mixed in toward the end. ||Snow, heavy at times began across the southern and central mountains during the late afternoon, and began to quickly accumulate. By early evening, some areas had picked up 4 inches of snowfall. Heavy snow continued most of the night. The precipitation changed over to sleet and freezing rain before ending, but only trace amounts of ice occurred. Total accumulations ranged from 4-8 inches across the Tennessee border counties, to more than a foot in the upper French Broad Valley. The heavy wet snow caused numerous trees to fall, especially in the interior and southwest valleys, resulting in fairly widespread power outages.
2/12/2010	As low pressure tracked along the northern Gulf Coast, light snow developed during the late afternoon across the southern North Carolina mountains. The snow gradually increased in intensity through the remainder of the afternoon and into the early evening. Numerous traffic accidents occurred during the evening rush. Snow, heavy at times, continued through the evening, with heavy accumulations reached in most areas. The snow ended a little before midnight. Total accumulations averaged around 3 inches.
3/2/2010	Snow began to fall during the pre-dawn across the mountains of the western Carolinas. After sunrise, snow became moderate to heavy at times, resulting in accumulations of 1 to 4 inches across most of the area by late morning. Snow, heavy at times, continued into the afternoon across the mountains, with heavy accumulations realized in most areas by early afternoon. By early evening, total snowfall ranged from 4 to 8 inches across the area, with localized amounts as high as 10 inches, especially in the higher elevations.
12/12/2010	Moderate to heavy snow developed ahead of a cold front over the central and southern mountains during the late evening and early morning hours. The snow continued through the morning hours with many areas seeing accumulations of 3 to 6 inches. Although snow generally ended in most areas by late morning of the 12th, snow showers developing within northwest flow behind the front resulted in additional accumulations across the higher elevations along the Tennessee border. By the time these snow showers tapered off on the morning of the 14th, some of these areas had more than a foot of snow. Very gusty winds and cold temperatures resulted in wind chill values below 0 in many areas during the overnight and early morning hours.
12/25/2010	A developing coastal storm system brought light to moderate snow, with occasional heavy bursts to the mountains beginning around sunrise on Christmas, and continuing through the morning. Snow, heavy at

Date	Description
	times, continued through the afternoon across the central and southern mountains. By Christmas evening, most locations had 6 to 10 inches of fresh snowpack. Although snow ended in most areas during the evening of the 25th, a strong northwest flow resulted in development of numerous snow showers along the Tennessee border on the 26th through the 27th. Many of these snow showers managed to add to snowfall totals, mainly in the higher elevations of the Nantahala Mountains and the Balsams, where total accumulations of more than a foot became common. Very gusty winds and cold temperatures resulted in wind chill values less than 0 and considerable blowing and drifting of snow, mainly in the high elevations.
1/10/2011	Moderate to heavy snow associated with a Gulf Coast storm system spread from south to north across the mountains of western North Carolina during the nighttime hours. Heavy snow accumulations of up to 4 inches were reported over the southern mountains by as early as 4 am. Heavy snow accumulations were not reported over the northern mountains until mid-morning. The snow became lighter around sunrise, but continued to accumulate through the morning. By early afternoon, snowfall totals ranged from 7 to 10 inches over the southern and central mountains and 3 to 6 inches over the northern mountains. During early afternoon, precipitation changed to light freezing rain and continued into the evening hours. This added as much as a tenth of an inch of ice to the heavy snowfall totals. Persistent cold temperatures ensured that many roads remained snow-packed or ice covered for several days. Some schools and businesses remained closed for as much as 5 days.
1/6/2017	As an area of surface low pressure moved northeast along the Gulf and Southeast coasts, moisture overspread the southern Appalachians throughout the 6th. Although the precipitation may have started as rain in the lower valleys, it primarily fell as snow. It was initially light in most areas, but became heavy during mid-to-late evening, continuing into the overnight. By the time the heavier snowfall rates tapered off around sunrise, total accumulations ranged from 5 to 7 inches. Locally higher amounts of as much as 10 were observed across the higher elevations of the foothills' counties.
12/8/2018	A mixture of rain and snow developed across the North Carolina mountains during the afternoon of the 8th, transitioning to all snow in most areas by early evening. The snow became heavy at times during the evening into the overnight. By the time the snow tapered off during the morning of the 9th, widespread storm total accumulations of 10-15 inches were reported. Locally higher amounts also occurred, with some locations near the South Carolina border seeing around 20 inches. Meanwhile, warm air filtering into the lower elevations of the Tuckasegee River Valley resulted in a transition to rain during the morning of the 9th, and total accumulations there were only in the 2 to 4-inch range.

TABLE G.8: HIGH WIND EVENTS (2000-2019)

Date	Description
	Henderson County
1/18/1996	An extremely strong cold front, preceded by heavy rain all day, moved through the mountains, foothills, and piedmont during the night. High winds affected the mountains first and then the foothills and piedmont as the front swept through. Prefrontal southeast winds were extremely high in the mountains with Flat Top mountain reporting gusts to 72 knots during the early evening. This was the highest wind in 20 years of record. Numerous trees and power lines were blown down in western North Carolina with a large number of power outages as a result. The gradient wind caused considerable damage in the foothills and piedmont as the front moved through.
9/15/1999	A tight pressure gradient between powerful Hurricane Floyd across eastern North Carolina and strong high pressure over the Ohio Valley and Great Lakes pulled cooler and very dry air south across the mountains and foothills of North Carolina on strong north winds. Henderson and Transylvania counties were particularly hard hit as winds gusting over 50 mph at times downed numerous trees and power lines - some on homes and vehicles. A person was injured in a car while driving near Zirconia when a tree fell on the vehicle. A large tent providing shelter at a fair in Henderson county was damaged. Numerous brush fires that started were fanned by the high winds. The Asheville Regional airport reported winds sustained at 45 mph with gusts to 54 mph around 9 am EST on the 16th. The wind abated in the mountains around noon.
11/2/1999	A strong storm system moved northeast through the Tennessee River Valley early on the 2nd. Strong southwest winds ahead of the system reached damaging levels and blew down trees and power lines in several locations. Some traffic accidents occurred when drivers ran cars into downed trees in the road. Later in the day, after the cold front passed, a gusty northwest wind blew a few trees down along the Blue Ridge Parkway 3 miles southeast of Spruce Pine.
4/8/2000	High winds following a cold front blew down a number of trees and power lines. Scattered power outages occurred as well.
4/8/2000	High winds following a cold front blew down a number of trees and power lines. Scattered power outages occurred as well.
2/16/2001	A strong cold front crossed the region on the 16th, accompanied by gusty winds. Persistent high gradient winds following the frontal passage resulted in downed trees and power lines. Some of the resulting power outages were long-lived, and there was even some structural damage reported.
3/6/2001	
3/20/2001	
10/13/2001	A strong pressure gradient developed across the mountains as a cold front crossed the region, followed by strong cold advection into the mountains. A 50-knot low level jet contributed to the high winds, the effects of which were enhanced by valley channeling.
11/29/2001	
2/4/2002	High winds starting picking up during the late morning, and by noon reached damaging levels in some areas. Scattered to numerous trees and power lines were blown down, depending on the county. Some structural damage resulted - mostly from trees falling on vehicles and buildings. After a brief respite around sunset, the wind picked up again to damaging levels during mid and late evening.
3/10/2002	Strong winds following a cold front reached damaging levels in a few locations. Most damage was limited to downed trees and power lines, which blocked roads for a while in some areas.
9/27/2002	Winds associated with Isidore increased in the early morning hours across the North Carolina mountains, resulting in more widespread damage to trees and power lines. Widespread power outages were reported. Numerous roads were blocked by fallen trees, and a church tent was blown down and destroyed in Brevard.
12/13/2002	Damaging winds were caused by a gravity wave as it propagated out of upstate South Carolina, and across the southern mountains and foothills of North Carolina. Numerous trees and power lines were blown down, and roads and highways were blocked in Asheville and Hendersonville. Power outages lasted for much of the day across portions of Buncombe County.
1/23/2003	High winds resulted in numerous trees and power lines being blown down across the mountains and foothills. In Mars Hill, the roof of a store was badly damaged. In Columbus, store signs were blown out.

Date	Description
10/14/2003	High winds developed just ahead of and behind a cold front across the mountains and foothills of North Carolina. Numerous trees and power lines were blown down.
11/13/2003	High winds developed behind a cold front across the mountains and foothills of North Carolina. Sustained winds of 40 mph developed during the pre-dawn hours, and persisted for much of the day, especially in the highest elevations. Numerous trees were blown down. Along the Blue Ridge Parkway in Buncombe County, the Craggy Gardens visitors' center was heavily damaged.
3/7/2004	Strong winds developed across the mountains just ahead of and along a strong cold front. Numerous trees and power lines were blown down. Weak thunderstorms may have contributed to the high winds across the northern mountains, but damage extended to areas far away from those affected by the storms.
7/5/2004	A small area of high winds developed across the mountains and the higher terrain of the foothills in the wake of a thunderstorm complex. Numerous trees and power lines were blown down.
9/7/2004	High winds associated with the remnants of Hurricane Frances produced fairly widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
9/16/2004	High winds developed across the mountains, as the remnants of Hurricane Ivan moved just west of the area. Locations near the southern exposure of the Blue Ridge were the hardest hit, with major damage occurring in and around Highlands, Cashiers, Brevard, and southern Henderson County. Thousands of trees were blown down, including 90,000 apple trees in Henderson County. Numerous trees fell on structures and vehicles. A 55-year-old man was killed shortly after midnight near Hendersonville, when a tree fell through his house. Hundreds of structures in Henderson County were damaged by fallen trees and debris. A woman in Highlands was injured when a tree limb hit her in the head.
9/17/2004	As the remnants of Ivan retreated toward the mid-Atlantic region, high pressure building in behind the circulation caused a resurgence of strong winds across the mountains and foothills. This resulted in additional tree and power line damage.
12/1/2004	The counties reported damage from high winds, mainly trees and power lines, with some structural damage possible, mainly from falling trees.
1/22/2005	High winds developed across the mountains behind a strong cold front that swept through the region during the evening. Numerous trees were blown down. There were scattered power outages throughout the mountains.
4/2/2005	High winds developed across the mountains and foothills during the evening, and continued through the overnight hours before subsiding during the late morning of the 3rd. Numerous trees, power poles, and power lines were blown down, resulting in fairly widespread power outages. The northern foothill counties appeared to the hardest hit. In McDowell County, several homes and vehicles were damaged by falling trees. In Caldwell County, the roof of the County office building was damaged in Lenoir, and at least two homes were damaged by falling trees in the northern part of the county.
1/14/2006	Strong winds developed behind a cold front across the mountains and foothills of North Carolina during the late morning, and continued through the remainder of the day. There was widespread damage to trees and power lines, with quite a few power outages. The hardest hit areas were along and near the Blue Ridge south of I-40. There were tens of thousands of power outages, 14,000 in Henderson County alone. The area around Lake Lure was especially hard hit, with numerous trees and lines down.
12/1/2006	Numerous trees were blown down, mainly near the Blue Ridge escarpment during the mid and late morning. Some of the trees fell on power lines, resulting in outages.
4/15/2007	Very strong winds developed in areas along and near the Blue Ridge during the early evening of the 15th, and continued through the early morning hours of the 16th. A 66-mph gust was recorded at Asheville Regional Airport during the evening. However, winds likely gusted to 70-80 mph at times in other areas. Widespread damage occurred to trees and power lines, with widespread power outages reported. Some trees fell on homes, vehicles, and roads. Three injuries occurred in the Hendersonville area due to the wind: a tree fell on a mobile home in Hendersonville, injuring two occupants. Also, a utility worker was injured when high winds knocked him from the power pole he was working on.
4/16/2007	After abating somewhat in the early morning hours, there was a resurgence in damaging winds across the Blue Ridge Mountains and surrounding areas during the daylight hours. Thousands of trees and numerous power lines fell across the area, with many trees falling on roads and damaging homes and vehicles. A 59-year-old man was killed when the vehicle he was driving on Turnpike Rd near Mills River was crushed by a fallen tree. In Saluda, a

Date	Description
	75-year-old man was critically injured when a tree fell on his car. He died several days later. A utility worker was also seriously injured in in the Hickory Grove area of Polk County, when a falling tree pinned him to his vehicle. At the height of the event, about 30,000 customers were without power in Henderson County alone, with power outages numbering in the hundreds of thousands across the area as a whole. Some customers remained without power until the 19th.
2/10/2008	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees. Twenty-two homes were damaged by fallen trees in the town of Lake Lure in Rutherford County alone.
12/31/2008	High winds developed near the Blue Ridge around sunrise, peaking in the mid to late morning, before tapering off during the afternoon. Numerous trees and power lines were blown down, with some scattered power outages.
12/9/2009	After a period of heavy rain that left the ground saturated, strong winds developed behind a cold front during the late morning hours over the North Carolina mountains. The combination of very windy conditions and wet ground resulted in numerous fallen trees, which brought down power lines and damaged homes and cars.
2/11/2012	Strong winds developed across the upper French Broad Valley and along parts of the eastern escarpment of the Blue Ridge as northwest flow developed across the region. The winds blew down numerous trees and power lines in McDowell County, with at least one tree falling on a vehicle. Multiple business signs were blown in Marion. Parts of western Rutherford County and Henderson County were also affected by damaging winds.
10/29/2012	As ï¿½ï¿½ï¿½superstorm Sandyï¿½ï¿½ï¿½ approached the northeast coast, strong northwest winds developed across the North Carolina mountains during the early morning of the 29th and continued throughout the day. The strongest winds developed across the upper French Broad Valley and the Green River Gorge area, where numerous trees fell during the day.
12/21/2012	Although gusty northwest winds were observed across much of the mountains beginning during the evening of the 20th, with a few trees blown down through the morning of the 21st, stronger winds developed during the afternoon of the 21st. A scattering of downed trees occurred through the afternoon, with a few power outages reported. However, the strongest winds occurred during the overnight hours. Numerous trees were blown down on the night of the 21st and early on the 22nd, with most of the damage occurring within a few miles of the Blue Ridge escarpment. Multiple trees fell on structures, especially in Buncombe and Henderson counties. Trees falling on power lines also resulted in quite a few power outages.
3/29/2014	Strong northwest winds developed across the mountains and portions of the foothills behind a cold front late on the 29th, with the strongest winds affecting locations along and near the eastern escarpment of the Blue Ridge. The winds gusted to over 60 mph at times (a peak gust of 62 mph was measured by the ASOS at the Asheville Regional Airport at around 730 AM). Gusts in excess of 80 mph likely occurred across the higher elevations. Numerous trees were blown down in these areas. Sporadic minor damage was reported to roofs across the area and a downed power lines resulted in scattered power outages, especially across the mid/upper French Broad Valley and surrounding locations. A few trees fell on homes as well. The strong winds continued through much of the 30th before tapering off by mid-evening.
2/24/2016	Very strong west/northwest winds developed across the mountains of southwest North Carolina, northeast Georgia, and Upstate South Carolina behind a cold front during the morning, and continued through the afternoon and into the evening before diminishing. Numerous trees were blown down across the area, some of which fell on and took down power lines, resulting in scattered power outages.
9/11/2017	As Tropical Storm Irma moved north/northwest across the Florida Panhandle and southwest Georgia, strong winds developed over the mountains of southwest North Carolina. Although gusts only occasionally exceeded 50 mph in most locations, the prolonged nature of the event, combined with saturated soils resulting from heavy rainfall resulted in many trees falling on roads, power lines, vehicles, and structures. Many were without power for a day or more. While the most significant damage was confined to these areas, there were also reports of

Date	Description
	significant tree damage across much of the remainder of the North Carolina mountains above 4000 feet or so, where winds likely gusted in excess of 60 mph fairly frequently.
3/2/2018	As low pressure strengthened rapidly off the Mid-Atlantic and Northeast coast, strong northwest winds developed across the North Carolina mountains early on the 2nd, with the most intense winds observed from around sunrise into the early afternoon. Numerous trees were blown down across the area, with quite a few power outages reported. Some sporadic structural damage occurred, mainly due to falling trees and large limbs.
1/20/2019	Northwest winds in the wake of a strong cold front increased after sunrise and became damaging across the middle French Broad Valley and across the higher elevations of Rutherford and McDowell counties. Numerous trees and power lines were blown down in this area, with some minor structural damage also reported. The winds began to diminish during the afternoon.
Polk County	
12/1/2006	Numerous trees were blown down, mainly near the Blue Ridge escarpment during the mid and late morning. Some of the trees fell on power lines, resulting in outages.
4/15/2007	Very strong winds developed in areas along and near the Blue Ridge during the early evening of the 15th, and continued through the early morning hours of the 16th. A 66-mph gust was recorded at Asheville Regional Airport during the evening. However, winds likely gusted to 70-80 mph at times in other areas. Widespread damage occurred to trees and power lines, with widespread power outages reported. Some trees fell on homes, vehicles, and roads. Three injuries occurred in the Hendersonville area due to the wind: a tree fell on a mobile home in Hendersonville, injuring two occupants. Also, a utility worker was injured when high winds knocked him from the power pole he was working on.
4/16/2007	After an intense, but relatively brief high wind event affected the mountains and foothills on the evening of the 15th, another widespread damaging high wind event developed during the day of the 16th. However, this particular event included much of the piedmont. Thousands of trees fell across the area, resulting in widespread power outages. Numerous trees fell on roads, homes, and vehicles. The Blue Ridge mountains and the foothills received the brunt of the strongest winds.
2/10/2008	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees. Twenty-two homes were damaged by fallen trees in the town of Lake Lure in Rutherford County alone.
5/12/2008	Strong winds developed during the early morning hours behind a cold front over the North Carolina mountains just to the east of the Blue Ridge. Several trees and power lines were blown down, some onto houses.
10/29/2012	As ï¿½ï¿½ï¿½superstorm Sandyï¿½ï¿½ï¿½ approached the northeast coast, strong northwest winds developed across the North Carolina mountains during the early morning of the 29th and continued throughout the day. The strongest winds developed across the upper French Broad Valley and the Green River Gorge area, where numerous trees fell during the day.
10/29/2012	As ï¿½ï¿½ï¿½superstorm Sandyï¿½ï¿½ï¿½ approached the northeast coast, strong northwest winds developed across the North Carolina mountains during the early morning of the 29th and continued throughout the day. The strongest winds developed across the upper French Broad Valley and the Green River Gorge area, where numerous trees fell during the day.
12/21/2012	Although gusty northwest winds were observed across the foothills beginning during the evening of the 20th, with a few trees blown down through the 21st, the strongest winds developed during the evening and overnight hours of the 21st. Numerous trees were blown down on the night of the 21st and early on the 22nd, with most of the damage occurring within a few miles of the Blue Ridge escarpment. Trees falling on power lines also resulted in quite a few power outages.
3/29/2014	Strong northwest winds developed across the mountains and portions of the foothills behind a cold front late on the 29th, with the strongest winds affecting locations along and near the eastern escarpment of the Blue Ridge. The winds gusted to over 60 mph at times (a peak gust of 62 mph was measured by the ASOS at the Asheville

Date	Description
	Regional Airport at around 730 AM). Gusts in excess of 80 mph likely occurred across the higher elevations. Numerous trees were blown down in these areas. Sporadic minor damage was reported to roofs across the area and a downed power lines resulted in scattered power outages, especially across the mid/upper French Broad Valley and surrounding locations. A few trees fell on homes as well. The strong winds continued through much of the 30th before tapering off by mid-evening.
9/11/2017	As Tropical Storm Irma moved north/northwest across the Florida Panhandle and southwest Georgia, strong winds developed over the mountains of southwest North Carolina. Although gusts only occasionally exceeded 50 mph in most locations, the prolonged nature of the event, combined with saturated soils resulting from heavy rainfall resulted in many trees falling on roads, power lines, vehicles, and structures. Many were without power for a day or more. While the most significant damage was confined to these areas, there were also reports of significant tree damage across much of the remainder of the North Carolina mountains above 4000 feet or so, where winds likely gusted in excess of 60 mph fairly frequently.
Rutherford County	
12/1/2006	Numerous trees were blown down, mainly near the Blue Ridge escarpment during the mid and late morning. Some of the trees fell on power lines, resulting in outages.
4/15/2007	Very strong winds developed in areas along and near the Blue Ridge during the early evening of the 15th, and continued through the early morning hours of the 16th. A 66-mph gust was recorded at Asheville Regional Airport during the evening. However, winds likely gusted to 70-80 mph at times in other areas. Widespread damage occurred to trees and power lines, with widespread power outages reported. Some trees fell on homes, vehicles, and roads. Three injuries occurred in the Hendersonville area due to the wind: a tree fell on a mobile home in Hendersonville, injuring two occupants. Also, a utility worker was injured when high winds knocked him from the power pole he was working on.
4/16/2007	After an intense, but relatively brief high wind event affected the mountains and foothills on the evening of the 15th, another widespread damaging high wind event developed during the day of the 16th. However, this particular event included much of the piedmont. Thousands of trees fell across the area, resulting in widespread power outages. Numerous trees fell on roads, homes, and vehicles. The Blue Ridge mountains and the foothills received the brunt of the strongest winds.
2/10/2008	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees. Twenty-two homes were damaged by fallen trees in the town of Lake Lure in Rutherford County alone.
5/12/2008	Strong winds developed during the early morning hours behind a cold front over the North Carolina mountains just to the east of the Blue Ridge. Several trees and power lines were blown down, some onto houses.
1/7/2009	Strong winds developed around noon along the I-85 corridor and persisted through the afternoon. Numerous trees were blown onto roads and power lines, resulting in quite a few power outages across the area. Some trees fell on automobiles, and one tree fell on a trailer in the Gaffney area, causing significant damage. Wet ground resulting from heavy rain during the preceding days likely contributed to the tree damage.
12/9/2009	After a period of heavy rain that left the ground saturated, strong winds developed behind a cold front during the late morning hours over the North Carolina mountains. The combination of very windy conditions and wet ground resulted in numerous fallen trees, which brought down power lines and damaged homes and cars.
2/10/2010	Strong west and northwest winds developed during the afternoon over the foothills and northwest piedmont in the wake of a cold front. Numerous trees and power lines were downed throughout the afternoon and early evening. A tree fell through a mobile home in Lenoir. Another tree fell on a home 5 SW Marion. A tree fell and power lines fell on a moving vehicle in Salisbury, briefly trapping the occupants. One person was injured by flying debris at a construction site in Lenoir.
2/10/2010	Strong west and northwest winds developed during the afternoon over the foothills and northwest piedmont in the wake of a cold front. Numerous trees and power lines were downed throughout the afternoon and early

Date	Description
	evening. A tree fell through a mobile home in Lenoir. Another tree fell on a home 5 SW Marion. A tree fell and power lines fell on a moving vehicle in Salisbury, briefly trapping the occupants. One person was injured by flying debris at a construction site in Lenoir.
2/11/2012	Strong winds developed across the upper French Broad Valley and along parts of the eastern escarpment of the Blue Ridge as northwest flow developed across the region. The winds blew down numerous trees and power lines in McDowell County, with at least one tree falling on a vehicle. Multiple business signs were blown in Marion. Parts of western Rutherford County and Henderson County were also affected by damaging winds.
12/21/2012	Although gusty northwest winds were observed across the foothills beginning during the evening of the 20th, with a few trees blown down through the 21st, the strongest winds developed during the evening and overnight hours of the 21st. Numerous trees were blown down on the night of the 21st and early on the 22nd, with most of the damage occurring within a few miles of the Blue Ridge escarpment. Trees falling on power lines also resulted in quite a few power outages.
3/29/2014	Strong northwest winds developed across the mountains and portions of the foothills behind a cold front late on the 29th, with the strongest winds affecting locations along and near the eastern escarpment of the Blue Ridge. The winds gusted to over 60 mph at times (a peak gust of 62 mph was measured by the ASOS at the Asheville Regional Airport at around 730 AM). Gusts in excess of 80 mph likely occurred across the higher elevations. Numerous trees were blown down in these areas. Sporadic minor damage was reported to roofs across the area and a downed power lines resulted in scattered power outages, especially across the mid/upper French Broad Valley and surrounding locations. A few trees fell on homes as well. The strong winds continued through much of the 30th before tapering off by mid-evening.
4/2/2016	Strong northwest winds developed across the mountains and northern foothills in the wake of an arctic cold front around midnight and continued through the overnight hours. Numerous trees were blown down across the area, along with some power lines. One tree fell on a camping trailer in Steele Creek Park in northwest Burke County, resulting in injury to an occupant. Another tree fell on a car in the Lake Lure area of Rutherford County.
9/11/2017	As Tropical Storm Irma moved north/northwest across the Florida Panhandle and southwest Georgia, strong winds developed over the mountains of southwest North Carolina. Although gusts only occasionally exceeded 50 mph in most locations, the prolonged nature of the event, combined with saturated soils resulting from heavy rainfall resulted in many trees falling on roads, power lines, vehicles, and structures. Many were without power for a day or more. While the most significant damage was confined to these areas, there were also reports of significant tree damage across much of the remainder of the North Carolina mountains above 4000 feet or so, where winds likely gusted in excess of 60 mph fairly frequently.
3/2/2018	As low pressure strengthened rapidly off the Mid-Atlantic and Northeast coast, strong northwest winds developed across the North Carolina mountains early on the 2nd, with the most intense winds observed from around sunrise into the early afternoon. Numerous trees were blown down across the area, with quite a few power outages reported. Some sporadic structural damage occurred, mainly due to falling trees and large limbs.
1/20/2019	Northwest winds in the wake of a strong cold front increased after sunrise and became damaging across the middle French Broad Valley and across the higher elevations of Rutherford and McDowell counties. Numerous trees and power lines were blown down in this area, with some minor structural damage also reported. The winds began to diminish during the afternoon.
Transylvania County	
1/7/1998	High winds caused trees to fall on 6 houses, shingles blown off roofs, and destruction of storage buildings.
9/15/1999	A tight pressure gradient between powerful Hurricane Floyd across eastern North Carolina and strong high pressure over the Ohio Valley and Great Lakes pulled cooler and very dry air south across the mountains and foothills of North Carolina on strong north winds. Henderson and Transylvania counties were particularly hard hit as winds gusting over 50 mph at times downed numerous trees and power lines - some on homes and vehicles.
11/2/1999	A strong storm system moved northeast through the Tennessee River Valley early on the 2nd. Strong southwest winds ahead of the system reached damaging levels and blew down trees and power lines in several locations. Some traffic accidents occurred when drivers ran cars into downed trees in the road. Later in the day, after the cold front passed, a gusty northwest wind blew a few trees down along the Blue Ridge Parkway 3 miles southeast of Spruce Pine.

Date	Description
2/16/2001	A strong cold front crossed the region on the 16th, accompanied by gusty winds. Persistent high gradient winds following the frontal passage resulted in downed trees and power lines. Some of the resulting power outages were long-lived, and there was even some structural damage reported.
3/6/2001	
3/20/2001	
11/29/2001	High winds developed overnight as a strong low-level jet, boosted by weak convection, brought damaging wind gusts to the surface. Damaging winds started in a few counties late in the evening, peaking between midnight and 6 am in most locations. Damage was mostly limited to downed trees and power lines, with resulting power outages, but in Madison County, a barn was blown into the road near Laurel.
2/4/2002	High winds starting picking up during the late morning, and by noon reached damaging levels in some areas. Scattered to numerous trees and power lines were blown down, depending on the county. Some structural damage resulted - mostly from trees falling on vehicles and buildings. After a brief respite around sunset, the wind picked up again to damaging levels during mid and late evening.
9/27/2002	Winds associated with Isidore increased in the early morning hours across the North Carolina mountains, resulting in more widespread damage to trees and power lines. Widespread power outages were reported. Numerous roads were blocked by fallen trees, and a church tent was blown down and destroyed in Brevard.
1/23/2003	High winds resulted in numerous trees and power lines being blown down across the mountains and foothills. In Mars Hill, the roof of a store was badly damaged. In Columbus, store signs were blown out.
10/14/2003	High winds developed just ahead of and behind a cold front across the mountains and foothills of North Carolina. Numerous trees and power lines were blown down.
11/13/2003	High winds developed behind a cold front across the mountains and foothills of North Carolina. Sustained winds of 40 mph developed during the pre-dawn hours, and persisted for much of the day, especially in the highest elevations. Numerous trees were blown down. Along the Blue Ridge Parkway in Buncombe County, the Craggy Gardens visitors' center was heavily damaged.
3/7/2004	Strong winds developed across the mountains just ahead of and along a strong cold front. Numerous trees and power lines were blown down. Weak thunderstorms may have contributed to the high winds across the northern mountains, but damage extended to areas far away from those affected by the storms.
7/5/2004	A small area of high winds developed across the mountains and the higher terrain of the foothills in the wake of a thunderstorm complex. Numerous trees and power lines were blown down.
9/7/2004	High winds associated with the remnants of Hurricane Frances produced fairly widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
9/16/2004	High winds developed across the mountains, as the remnants of Hurricane Ivan moved just west of the area. Locations near the southern exposure of the Blue Ridge were the hardest hit, with major damage occurring in and around Highlands, Cashiers, Brevard, and southern Henderson County. Thousands of trees were blown down, including 90,000 apple trees in Henderson County. Numerous trees fell on structures and vehicles. A 55-year-old man was killed shortly after midnight near Hendersonville, when a tree fell through his house. Hundreds of structures in Henderson County were damaged by fallen trees and debris. A woman in Highlands was injured when a tree limb hit her in the head.
9/17/2004	As the remnants of Ivan retreated toward the mid-Atlantic region, high pressure building in behind the circulation caused a resurgence of strong winds across the mountains and foothills. This resulted in additional tree and power line damage.
1/22/2005	
4/2/2005	High winds developed across the mountains and foothills during the evening, and continued through the overnight hours before subsiding during the late morning of the 3rd. Numerous trees, power poles, and power lines were blown down, resulting in fairly widespread power outages. The northern foothill counties appeared to the hardest hit. In McDowell County, several homes and vehicles were damaged by falling trees. In Caldwell County, the roof of the County office building was damaged in Lenoir, and at least two homes were damaged by falling trees in the northern part of the county.
1/14/2006	Strong winds developed behind a cold front across the mountains and foothills of North Carolina during the late morning, and continued through the remainder of the day. There was widespread damage to trees and power

Date	Description
	lines, with quite a few power outages. The hardest hit areas were along and near the Blue Ridge south of I-40. There were tens of thousands of power outages, 14,000 in Henderson County alone. The area around Lake Lure was especially hard hit, with numerous trees and lines down.
11/15/2006	Strong southerly winds developed ahead of a cold front, blowing down numerous trees and power lines across portions of the central and southern mountains during the evening and overnight hours on the 15th and 16th.
12/1/2006	Numerous trees were blown down, mainly near the Blue Ridge escarpment during the mid and late morning. Some of the trees fell on power lines, resulting in outages.
4/15/2007	Very strong winds developed in areas along and near the Blue Ridge during the early evening of the 15th, and continued through the early morning hours of the 16th. A 66-mph gust was recorded at Asheville Regional Airport during the evening. However, winds likely gusted to 70-80 mph at times in other areas. Widespread damage occurred to trees and power lines, with widespread power outages reported. Some trees fell on homes, vehicles, and roads. Three injuries occurred in the Hendersonville area due to the wind: a tree fell on a mobile home in Hendersonville, injuring two occupants. Also, a utility worker was injured when high winds knocked him from the power pole he was working on.
4/16/2007	After an intense, but relatively brief high wind event affected the mountains and foothills on the evening of the 15th, another widespread damaging high wind event developed during the day of the 16th. However, this particular event included much of the piedmont. Thousands of trees fell across the area, resulting in widespread power outages. Numerous trees fell on roads, homes, and vehicles. The Blue Ridge mountains and the foothills received the brunt of the strongest winds. In Highlands, NC, two homes were heavily damaged by fallen trees, while approximately 100 homes received minor to moderate damage. A tree fell on and severely damaged a home in Otto, NC. Two businesses received significant roof damage in Cashiers, NC. Three construction workers were injured in Mount Holly when an inflatable structure collapsed at a constructions site. Five homes were damaged by fallen trees in Lincoln County, NC alone. Three homes were damaged in Iredell County and in In Catawba County, a 30-foot brick wall on top of a building in Newton was blown down, while sections of a metal roof were torn off a business in Viewmont.
2/10/2008	As the polar vortex dropped into New England, an unusually tight gradient developed over the western Carolinas and Northeast Georgia. This gradient, combined with afternoon heating, helped to mix down areas of strong winds. Areas along and east of the Blue Ridge were hardest hit, with numerous trees reported down, some across roads and on homes. The gusty winds combined with ongoing drought conditions to produce numerous brush fires across the area during the afternoon.
5/11/2008	Strong winds developed behind a cold front over the North Carolina mountains. Numerous trees and power lines were blown down across the region. Several structures were damaged by fallen trees.
12/9/2009	After a period of heavy rain that left the ground saturated, strong winds developed behind a cold front during the late morning hours over the North Carolina mountains. The combination of very windy conditions and wet ground resulted in numerous fallen trees, which brought down power lines and damaged homes and cars.
2/24/2016	Very strong west/northwest winds developed across the mountains of southwest North Carolina, northeast Georgia, and Upstate South Carolina behind a cold front during the morning, and continued through the afternoon and into the evening before diminishing. Numerous trees were blown down across the area, some of which fell on and took down power lines, resulting in scattered power outages.
9/11/2017	As Tropical Storm Irma moved north/northwest across the Florida Panhandle and southwest Georgia, strong winds developed over the mountains of southwest North Carolina. Although gusts only occasionally exceeded 50 mph in most locations, the prolonged nature of the event, combined with saturated soils resulting from heavy rainfall resulted in many trees falling on roads, power lines, vehicles, and structures. Many were without power for a day or more. While the most significant damage was confined to these areas, there were also reports of significant tree damage across much of the remainder of the North Carolina mountains above 4000 feet or so, where winds likely gusted in excess of 60 mph fairly frequently.
3/2/2018	As low pressure strengthened rapidly off the Mid-Atlantic and Northeast coast, strong northwest winds developed across the North Carolina mountains early on the 2nd, with the most intense winds observed from around sunrise into the early afternoon. Numerous trees were blown down across the area, with quite a few power outages reported. Some sporadic structural damage occurred, mainly due to falling trees and large limbs.

Date	Description
2/24/2019	Strong west to northwest winds developed across the northern mountains of North Carolina in the wake of a cold front. Although winds became very gusty immediately after the cold front passed during the afternoon, the damaging winds primarily occurred during the evening and overnight hours, when many trees and power lines were blown down. Multiple outbuildings were also damaged or blown over and at least one tree fell on a structure in Old Fort.

TABLE G.9: ICE STORM EVENTS (2000-2019)

Date	Description
Henderson County	
1/26/1996	Rain moved in while cold air was still trapped. Significant freezing rain resulted with numerous traffic accidents reported across the entire area. Ice accumulations neared ice storm" conditions in the foothills and northern mountains. The freezing temperatures persisted into the evening as the rain became quite heavy. Many roads were closed for a period."
1/9/1997	
12/24/1998	Freezing rain accumulated to damaging levels around midnight and by morning there were numerous power outages reported due to downed trees and power lines. Road problems were mostly limited to bridges and overpasses.
1/2/1999	A strong winter storm moved from the southern Plains into the Tennessee Valley and collided with strong arctic high pressure nosing south into the western Carolinas. Sleet and freezing rain were the main precipitation types during the afternoon and evening on the 2nd. Sleet became very heavy along and north of Interstate 40 where 4 to 6 inches accumulated. Sleet accumulated to between 1 and 2 inches south of Interstate 40 before changing to freezing rain. Numerous traffic accidents occurred across western North Carolina and there was one fatality (indirect) on Interstate 26 in Polk county. A boat house in Alexander county collapsed under the weight of the sleet. A cooperative observer in Rutherford county estimated damage in his area to be $55K, but official damage estimates for the entire region were not available at the time of this writing.
1/29/2000	Weakening low pressure in the Ohio River Valley, developing low pressure along the Gulf Coast and cold, arctic air in place across the Carolinas resulted in a wintry mess across western North Carolina. This was the last in a series of 5 winter storms that wreaked havoc on western North Carolina in an 11 day span. The ice storm in the mountains consisted mainly of a couple inches of sleet. However, the combined accumulation of the mixture of sleet and snow was generally 2 to 3 inches. Some freezing rain mixed in during the morning of the 30th. Across the foothills and piedmont, precipitation which briefly began as some light sleet and snow, turned quickly to freezing rain. The freezing rain was heavy enough across the southern piedmont, including the Charlotte area, to result in a 1/4 to 1/2 inch glaze. Scattered power outages resulted, with Gaston county reporting 2500 people without power. The entire Duke Power system reported 77,000 people without power.
12/14/2003	Freezing rain began during the early morning hours, and ice accretion of around 1/2 inch had occurred by noon. Numerous trees and power lines fell under the weight of the ice.
2/2/2004	Freezing rain fell during the evening and overnight hours. Ice accretion caused some trees and large limbs to fall. Some trees fell on power lines, causing scattered outages. Sleet was mixed with the freezing rain at times, especially in McDowell County.
2/6/2004	Freezing rain increased in intensity overnight across the foothills and southern mountains. By morning, ice accretion was responsible for numerous fallen trees, as well as widespread power outages.
2/3/2005	Scattered damage to trees and power lines began to occur across the mountains during the pre-dawn hours, and continued into mid-morning, as freezing rain fell.
12/9/2005	As freezing rain continued to fall through the early morning hours, ice accretion became significant enough to cause widespread damage to trees and power lines across Henderson County. The lingering ice caused numerous traffic accidents during rush hour on the morning of the 9th. At least one fatal accident (indirect) occurred near Etowah.
12/15/2005	
2/1/2008	Freezing rain continued through the early morning hours of the 1st in areas along the Blue Ridge. Ice accumulations of up to 1/2 inch occurred, resulting to significant damage to trees and power lines. Power outages were widespread from Brevard to Hendersonville. Sleet mixed in with the freezing rain, resulting in up to 2 inches of sleet accumulation in the Northern Mountains. Precipitation actually began during the evening of January 31st, but ice storm criteria were not met until the early morning hours of February 1st.
2/26/2013	Rain and freezing rain began across the southern mountains shortly after midnight and continued through the pre-dawn hours. Many locations saw mainly rain. However, cold air locked in near the escarpment

Date	Description
	resulted in an all-freezing rain event there. By the time temperatures warmed above freezing during late morning, up to a half inch of ice had accumulated within a few miles of the continental divide. Meanwhile, locations farther away from the Blue Ridge saw only trace amounts of ice. There were scattered downed trees and power lines, resulting in quite a number of power outages, especially in McDowell and Henderson counties.
11/25/2013	Light rain changed to freezing rain around midnight across southeast Blue Ridge areas, with freezing rain continuing off and on through the overnight. Precipitation became heavy at times just prior to sunrise and lasted through mid-morning before changing over to rain. Heavy ice accumulations were reported in the Saluda grade area of Polk County, and across eastern and southern Henderson County. Total ice accumulation of just over 1/4 inch was reported in these areas, which downed several trees and power lines.
2/15/2016	Very light freezing rain, freezing drizzle, and freezing mist developed across the Blue Ridge of western North Carolina during late morning, in assocation with low pressure developing along a warm front across the Gulf Coast states/Tennesse Valley. Owing to about a week of unseasonably cold weather, the precipitation froze to surfaces very quickly, and roads became very slick, resulting in numerous traffic accidents. The freezing rain rates increased during the evening, and moderate to heavy freezing rain continued through the overnight hours. By the pre-dawn hours of the 16th, total ice accretion ranged from one-quarter to one-half inch across the area. This resulted in quite a few trees and power lines, with at least scattered power outages reported.
1/12/2019	Moist air flowing over a wedge of cold air banked against the eastern slopes of the Appalachians resulted in precipitation development across the Blue Ridge and surrounding areas beginning during the evening of the 12th. The atmosphere quickly cooled to or below freezing near the escarpment and out across the lower elevations of the foothills and far northwest Piedmont. This resulted in much of the precipitation falling as freezing rain in these areas. The freezing rain continued through the overnight across the Blue Ridge and surrounding areas before tapering off around daybreak on the 13th. Total ice accretion of one quarter to one half inch was reported, with the heaviest amounts being across the foothills and immediately along the Blue Ridge escarpment. Scattered downed trees and power outages were reported throughout the area.
Polk County	
2/1/2008	Freezing rain continued through the early morning hours of the 1st in areas along the Blue Ridge. Ice accumulations of up to 1/2 inch occurred, resulting to significant damage to trees and power lines. Power outages were widespread from Brevard to Hendersonville. Sleet mixed in with the freezing rain, resulting in up to 2 inches of sleet accumulation in the Northern Mountains. Precipitation actually began during the evening of January 31st, but ice storm criteria were not met until the early morning hours of February 1st.
2/26/2013	Rain and freezing rain began across the southern mountains shortly after midnight and continued through the pre-dawn hours. Many locations saw mainly rain. However, cold air locked in near the escarpment resulted in an all-freezing rain event there. By the time temperatures warmed above freezing during late morning, up to a half inch of ice had accumulated within a few miles of the continental divide. Meanwhile, locations farther away from the Blue Ridge saw only trace amounts of ice. There were scattered downed trees and power lines, resulting in quite a number of power outages, especially in McDowell and Henderson counties.
11/25/2013	Light rain changed to freezing rain around midnight across southeast Blue Ridge areas, with freezing rain continuing off and on through the overnight. Precipitation became heavy at times just prior to sunrise and lasted through mid-morning before changing over to rain. Heavy ice accumulations were reported in the Saluda grade area of Polk County, and across eastern and southern Henderson County. Total ice accumulation of just over 1/4 inch was reported in these areas, which downed several trees and power lines.
2/15/2016	Very light freezing rain, freezing drizzle, and freezing mist developed across the Blue Ridge of western North Carolina during late morning, in assocation with low pressure developing along a warm front across the Gulf Coast states/Tennesse Valley. Owing to about a week of unseasonably cold weather, the precipitation froze to surfaces very quickly, and roads became very slick, resulting in numerous traffic

Date	Description
	accidents. The freezing rain rates increased during the evening, and moderate to heavy freezing rain continued through the overnight hours. By the pre-dawn hours of the 16th, total ice accretion ranged from one-quarter to one-half inch across the area. This resulted in quite a few trees and power lines, with at least scattered power outages reported.
Rutherford County	
2/1/2008	Freezing rain continued through the early morning hours of the 1st in areas along the Blue Ridge. Ice accumulations of up to 1/2 inch occurred, resulting to significant damage to trees and power lines. Power outages were widespread from Brevard to Hendersonville. Sleet mixed in with the freezing rain, resulting in up to 2 inches of sleet accumulation in the Northern Mountains. Precipitation actually began during the evening of January 31st, but ice storm criteria were not met until the early morning hours of February 1st.
2/26/2013	Rain and freezing rain began across the southern mountains shortly after midnight and continued through the pre-dawn hours. Many locations saw mainly rain. However, cold air locked in near the escarpment resulted in an all-freezing rain event there. By the time temperatures warmed above freezing during late morning, up to a half inch of ice had accumulated within a few miles of the continental divide. Meanwhile, locations farther away from the Blue Ridge saw only trace amounts of ice. There were scattered downed trees and power lines, resulting in quite a number of power outages, especially in McDowell and Henderson counties.
2/15/2016	Very light freezing rain, freezing drizzle, and freezing mist developed across the Blue Ridge of western North Carolina during late morning, in assocation with low pressure developing along a warm front across the Gulf Coast states/Tennesse Valley. Owing to about a week of unseasonably cold weather, the precipitation froze to surfaces very quickly, and roads became very slick, resulting in numerous traffic accidents. The freezing rain rates increased during the evening, and moderate to heavy freezing rain continued through the overnight hours. By the pre-dawn hours of the 16th, total ice accretion ranged from one-quarter to one-half inch across the area. This resulted in quite a few trees and power lines, with at least scattered power outages reported.
1/12/2019	Moist air flowing over a wedge of cold air banked against the eastern slopes of the Appalachians resulted in precipitation development across the Blue Ridge and surrounding areas beginning during the evening of the 12th. The atmosphere quickly cooled to or below freezing near the escarpment and out across the lower elevations of the foothills and far northwest Piedmont. This resulted in much of the precipitation falling as freezing rain in these areas. The freezing rain continued through the overnight across the Blue Ridge and surrounding areas before tapering off around daybreak on the 13th. Total ice accretion of one quarter to one half inch was reported, with the heaviest amounts being across the foothills and immediately along the Blue Ridge escarpment. Scattered downed trees and power outages were reported throughout the area.
Transylvania County	
1/9/1997	
1/29/2000	Weakening low pressure in the Ohio River Valley, developing low pressure along the Gulf Coast and cold, arctic air in place across the Carolinas resulted in a wintry mess across western North Carolina. This was the last in a series of 5 winter storms that wreaked havoc on western North Carolina in an 11 day span. The ice storm in the mountains consisted mainly of a couple inches of sleet. However, the combined accumulation of the mixture of sleet and snow was generally 2 to 3 inches. Some freezing rain mixed in during the morning of the 30th. Across the foothills and piedmont, precipitation which briefly began as some light sleet and snow, turned quickly to freezing rain. The freezing rain was heavy enough across the southern piedmont, including the Charlotte area, to result in a 1/4 to 1/2 inch glaze. Scattered power outages resulted, with Gaston county reporting 2500 people without power. The entire Duke Power system reported 77,000 people without power.
12/4/2002	Freezing rain began over the extreme southern mountains of North Carolina during the early afternoon on the 4th, and had spread into the southwest piedmont by mid afternoon. Resultant damage due to ice accumulation began during the mid-to-late afternoon. The intensity of the freezing rain increased after midnight, and by sunrise on the 5th, devastating ice accumulations of 1/2 to 1 1/2 inches were observed.

Date	Description
	The hardest hit area was Charlotte metro. Hundreds of thousands lost power, and the outages lasted for as long as 2 weeks in some areas.
2/3/2005	Scattered damage to trees and power lines began to occur across the mountains during the pre-dawn hours, and continued into mid-morning, as freezing rain fell.
12/15/2005	Ice accretion began to cause damage across the southern mountains and foothills of North Carolina just prior to sunrise. By late morning, the ice storm had become quite serious, as thousands of trees fell across the area, and power outages were widespread. Numerous trees and large limbs fell on and damaged homes and vehicles. It was estimated that three-quarters of Henderson County residents lost power. Most who lost power were without it for at least 24 hours. In some areas, it took as much as 5 days to restore electricity. Despite the devastation, road problems were few and far between, as temperatures hovered right around freezing for most of the event. Duke Power estimated costs for overtime and line repair at 72 million dollars for the event, though these costs are not reflected in the property damage values for the event above. In Henderson County, 2 deaths (indirect) occurred as a result of the ice storm. A woman died of carbon monoxide poisoning after running a generator in a garage. A man died of carbon monoxide poisoning due to a malfunctioning gas stove.
2/1/2008	Freezing rain continued through the early morning hours of the 1st in areas along the Blue Ridge. Ice accumulations of up to 1/2 inch occurred, resulting to significant damage to trees and power lines. Power outages were widespread from Brevard to Hendersonville. Sleet mixed in with the freezing rain, resulting in up to 2 inches of sleet accumulation in the Northern Mountains. Precipitation actually began during the evening of January 31st, but ice storm criteria were not met until the early morning hours of February 1st.
1/12/2019	Moist air flowing over a wedge of cold air banked against the eastern slopes of the Appalachians resulted in precipitation development across the Blue Ridge and surrounding areas beginning during the evening of the 12th. The atmosphere quickly cooled to or below freezing near the escarpment and out across the lower elevations of the foothills and far northwest Piedmont. This resulted in much of the precipitation falling as freezing rain in these areas. The freezing rain continued through the overnight across the Blue Ridge and surrounding areas before tapering off around daybreak on the 13th. Total ice accretion of one quarter to one half inch was reported, with the heaviest amounts being across the foothills and immediately along the Blue Ridge escarpment. Scattered downed trees and power outages were reported throughout the area.

TABLE G.10: LIGHTNING EVENTS (2000-2019)

Location	Date	Description
Hendersom County		
TUXEDO	6/14/1996	
EDNEYVILLE	7/14/1996	
HORSE SHOE	8/13/1998	Lightning struck a house and caused a roof fire.
TUXEDO	2/12/2000	A lightning bolt from a morning thunderstorm struck a power line, then traveled into a two story home and ignited a blaze which completely destroyed the home and its contents.
HENDERSONVILLE	7/18/2003	Lightning ignited a house fire.
HENDERSONVILLE	6/27/2005	Lightning ignited a house fire near the Laurel Park Shopping center. The fire destroyed much of the roof.
HENDERSONVILLE	4/27/2006	Lightning struck a house, blowing out one of the walls.
VALLEY HILL	5/8/2009	Lightning struck a home on Kanuga Rd, igniting a fire in the attic.
FRUITLAND	5/28/2009	Lightning struck a home on Good View Dr, igniting a fire that rendered the home unlivable. Location is approximate.
SMYTH	6/6/2011	Lightning started a fire at a barn, destroying the structure.
FRUITLAND	6/21/2011	Lightning struck a mobile home on McMinn Woods Dr, starting a fire that damaged one room of the home.
BRIGHTWATER	7/5/2011	Lightning struck a home on Solomon Circle, igniting a fire that destroyed most of the home. One person received minor injuries from the lightning.
GOODLUCK	7/5/2011	Lightning struck a home on Locust Grove Rd, igniting a fire that caused some minor damage.
BRIGHTWATER	1/11/2012	Lightning struck a home on Nimbus Lane, starting a fire that destroyed the structure.
VALLEY HILL	4/5/2012	Lightning struck a gas line at a home on Kanuga Forest Dr, causing an explosion that collapsed the exterior walls and igniting a fire that completely destroyed the structure.
BLUE RIDGE	8/22/2012	Lightning struck a tree that fell on and heavily damaged a home on Toone Town Terrace. An occupant was briefly trapped inside.
MILLS RIVER	6/27/2016	Spotter reported lightning struck near a home on Chestnut Ridge Rd, igniting a structure fire.
DRUID HILLS	8/17/2016	A radio station took a direct lightning hit, causing major damage to equipment both outside and inside the station. A nearby barn was also struck by lightning about the same time, igniting a fire that burned it down.
Polk County		
TRYON	7/14/1996	A few trees were blown down in a severe thunderstorm. Storms in and near the mountains caused a great deal of lightning, some of which apparently started fires.
TRYON	6/2/1997	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
SALUDA	8/24/2002	Lightning ignited a fire, destroying a house and much of its contents.
MILL SPG	7/21/2006	Four children and 2 adults were injured when lightning struck their tent.
MC GINNIS XRDS	8/20/2014	FD reported lightning struck a house and ignited a fire on Chesnee Highway.

COLLINSVILLE	7/4/2019	Emergency manager reported lightning caused a structure fire at a home on Jackson Grove Rd.
Rutherford County		
UNION MILLS	7/16/1997	Severe thunderstorms developed mainly in the foothills of North Carolina during the afternoon. Damaging winds up to 75 mph downed trees and power lines. U.S. Highway 74 in Henderson county was blocked for 2 hours due to a large oak tree that fell across the road. Another large tree in Cleveland county fell onto 2 pickup trucks, totalling them. Three houses were damaged by fallen trees, a car was damaged by a collapsed convenience store canopy and trees blocked roads near Indian Trail. Power outages were scattered across the region, some due to lightning. Up to 4300 people were without power in Union county.
ELLENBORO	7/16/1997	A mobile home was destroyed by lightning in Union Mills and a home severely damaged by lightning in Ellenboro. Damage estimates are unknown.
ALEXANDER MILLS	8/20/1999	A line of strong to severe thunderstorms moved west to east across western North Carolina during the early morning hours on the 20th. A very severe thunderstorm produced a long narrow path of wind damage across northern Yancey county. Numerous trees were downed, one on a car, a barn was destroyed and crops were flattened by the wind. There was also significant hail damage to crops. A public report of a roaring noise associated with the wind led some to believe it was a tornado. However, there was not enough evidence to classify the event as such. Trees were also downed in a few other counties and there were a few reports of dime to quarter size hail.
FOREST CITY	7/31/2000	Strong, nearly stationary thunderstorms dumped excessive rain and produced damaging lightning strikes and gusty winds over and near Forest City during the early morning hours. An estimated 5 inches of rain fell in the area causing urban flooding to begin around midnight. Soon after though, numerous creeks flooded, washing away parts of several streets and roads. One lightning strike cause a fire which burned an outbuilding. Some trees were downed from a combination of the heavy rain, wind and lightning.
BOSTIC	6/15/2001	Lightning earlier in the afternoon struck a tree and later caused it to fall across a barn.
GILKEY	4/17/2002	Lightning struck a tree and entered a nearby house, causing a fire. The fire burned a large part of the house.
LAKE LURE	7/4/2002	Lightning caused fires at 6 buildings.
CHIMNEY ROCK	7/18/2003	A person was injured when he was struck by lightning.
RUTHERFORDTON	7/21/2003	A lightning strike ignited a fire at a barn, destroying the barn and its contents.
FOREST CITY	7/31/2003	A man was injured when he was struck by lightning. Lightning also ignited several structure fires in the area, one of which caused significant damage.
BOSTIC	7/31/2003	Lightning sparked several fires.
LAKE LURE	5/8/2004	Lightning ignited several fires and downed some power lines.
RUTHERFORDTON	6/27/2005	Tree trees snapped off by lightning.
CLIFFSIDE	7/9/2009	Lightning struck and injured 5 workers at a power plant near Cliffside. Although most of the injuries were minor, two people were transported to the hospital.
ELLENBORO	4/6/2017	Newspaper reported lightning struck a home in Ellenboro, igniting a fire that caused significant damage.
Transylvania County		
BREVARD	6/4/1999	Lightning was suspected to have started a fire in a home about 12 hours after the actual strike. The home and its contents were destroyed.
BREVARD	7/27/1999	A severe thunderstorm downed several trees and power lines. In addition, a great amount of cloud to ground lightning was produced, which resulted in 3 injuries. One person was injured while in the basement, touching a water heater. Another injury occurred while talking on the phone.
BREVARD	6/6/2002	Lightning ignited a few fires.

SAPPHIRE	8/10/2003	A man was injured in Gorges State Park when the stream he was swimming in was struck by lightning.
CONNESTEE	7/11/2004	Lightning struck a house, igniting a fire which destroyed the house and its contents.
CEDAR MTN	7/6/2008	Lightning ignited a fire which destroyed most of a house on Fox Tower Rd.
DAVIDSON RIVER	8/20/2009	Lightning ignited a fire at a home on Wilson Rd, about two miles east northeast of Brevard, causing damage to the roof and attic.
OAKLAND	5/15/2010	Lightning ignited a fire at a business on highway 64, causing significant damage to a portion of the building. Although the fire was contained, lightning apparently struck this location again at 11:30 pm that evening, causing another fire which destroyed the remainder of the building.
BLANTYRE	2/28/2011	A lightning strike damaged a home on Sandrock Trail.
BREVARD	4/20/2011	Lightning struck a tree at Brevard College, causing minor injuries to two people standing nearby.
DAVIDSON RIVER	5/3/2011	A tree fell after being struck by lightning, damaging a home and destroying an outbuilding in the Williamson Creek area.
NORTH BREVARD	6/13/2012	Lighting started a fire in the basement of a home on Pine Mountain Trail, causing some minor damage before being extinguished by a burst water line.
BLANTYRE	7/19/2016	Media reported a trailer transporting horses was struck by lightning on Turkey Pen Rd. One horse was killed and the trailer severely damaged.

TABLE G.11: SLEET EVENTS (2000-2019)

Date	Description
Henderson County	
1/8/1997	
12/23/1998	Freezing rain and sleet developed early Wednesday morning and persisted through the morning of Christmas Eve. These areas would receive enough glaze by Christmas Eve morning to cause damage.
3/9/1999	Light snow and sleet fell during the morning, associated with a strong low-pressure area moving north through the Mississippi River Valley. Accumulations by noon ranged between 1 and 3 inches. Some light freezing rain mixed in from time to time as well.
2/22/2001	Cold, dry air plunged south over western North Carolina following the passage of a cold front the day before. Moisture return began almost immediately thereafter, ahead of an advancing storm system from the Gulf Coast region, and as an upper level disturbance approached the area, precipitation became widespread. Air was cold enough in the mountains to support mostly snow, while in the foothills and piedmont, the dry air in the lower levels of the atmosphere created ideal conditions for a sleet/snow mixture. In the mountains, thundersnow occurred.
Transylvania County	
1/8/1997	
12/23/1998	Freezing rain and some sleet developed early Wednesday morning and persisted through the morning of Christmas Eve. Some areas later received enough glaze to cause damage.
3/9/1999	Light snow and sleet fell during the morning, associated with a strong low-pressure area moving north through the Mississippi River Valley. Accumulations by noon ranged between 1 and 3 inches. Some light freezing rain mixed in from time to time as well.

TABLE G.12: TORNADO EVENTS (2000-2019)

Location	Date	Description
Henderson County		
Unincorporated Area	10/17/1975	
Unincorporated Area	2/18/1976	
Unincorporated Area	8/17/1977	
Polk County		
Unincorporated Area	8/17/1977	
RODDY STORE	10/26/2010	This tornado touched down in the Sandy Plains Rd area just north of White Oak Creek, breaking off the tops of several trees and some large branches. The tornado then skipped east northeast, snapping and uprooting a small but concentrated area of trees in the Coxe Rd area. One large tree fell on a home on Coxe Rd before the tornado lifted.
TRYON	10/8/2017	NWS storm survey found an area of tornado damage in downtown Tryon. This tornado developed from the same storm that produced a tornado just over the state line in the Lake Lanier area of northern Greenville County. The tornado touched down on Melrose Ave, a block west of Pacolet St and continued moving to the north-northeast with continuous damage for a distance of less than a mile. Hundreds of trees were snapped or uprooted, homes had damaged shingles and siding, damaged roofs, while other homes and vehicles were damaged by falling trees. One company had 6 generators damaged with one 2400 pound generated moved 30 feet. The tornado lifted just north of the downtown area.
Rutherford County		
Unincorporated Area	5/27/1973	
Unincorporated Area	5/18/1975	
Unincorporated Area	5/18/1975	
Unincorporated Area	5/5/1989	
RUTHERFORDTON	5/24/2000	A few thunderstorms crossed the mountains, then exploded and quickly became large supercells as they moved into the foothills late in the afternoon. The most damaging of the supercells developed in northern McDowell county and became severe along the Burke/McDowell county line near Lake James, dropping baseball size hail. This severe storm tracked southeast along the county border, producing golf ball to softball size hail all the way to the Rutherford county line. In addition to the very large hail, this supercell was able to generate a few weak (F0) tornadoes. The first tornado briefly touched down near Bridgewater and blew windows out of a house. It may also have been responsible for wind damage at a nearby mobile home park where 15 to 25 mobile homes sustained damage from both wind and hail. The second tornado developed in extreme eastern McDowell county and blew down trees across Interstate 40 before crossing into Burke county. Several motorists on Interstate 40 sighted the tornado and had their vehicles damaged by softball size hail. A resident in extreme southwest Burke county, near the Rutherford county line measured a 94-mph gust of wind as the parent supercell moved overhead. A damage survey team did not find any tornadic damage in the vicinity but suspected this may have been the actual mesocyclone on the ground. There was extensive hail damage to homes, vehicles and plants from softball size hail that was seen bounding" down the hillside. The third tornado developed near South Mountain State Park in northeast Rutherford county and blew down

		numerous trees in the vicinity of the park. This storm went on to produce nickel to baseball size hail in Cleveland county.
FOREST CITY	7/7/2005	This tornado moved into far southern Rutherford County from Spartanburg County in the Jonas Rd area. The metal roof was torn off a barn just across the state line. Otherwise, damage was mainly confined to snapped off an uprooted tree, some of which fell on homes. Near the end of the track, a mobile home was lifted and dropped 50-100 feet from its original position, resulting in severe damage.
FOREST CITY	10/26/2010	This tornado began just southwest of Crowe Dairy Rd, where the tops of several trees were blown out. The tornado intensified as it moved northeast, blowing the porch off a home and scattering debris as far as 50 yards. In addition, part of the roof was lifted off an attached garage and doors were blown in on a shed at this location.
ELLENBORO	1/11/2012	A tornado damage path began near the Ellenboro community, just northeast of the intersection of Pinehurst Rd and Bridge Rd. The track was relatively weak and intermittent for the first mile or so, as it crossed into a wooded area before emerging on Tiney Rd near the Corinth community. The aluminum siding and some roofing was peeled off a shed at this location. The intermittent path continued to the northeast, before becoming more concentrated in the area near Piney Mountain Rd and Piney Mountain Church Rd. The tornado reached its peak intensity as it moved roughly parallel to Piney Mountain Rd, crossing W E Padgett Rd toward Walls Church Rd. Several homes received minor to major damage in this area, while two mobile homes were completely destroyed. Ten people were injured, one seriously. Several outbuildings were also destroyed, while numerous trees and power lines were felled. The tornado began to weaken as it continued northeast, crossing Walls Church Rd and Dycus Rd before lifting just north of Salem Church Rd. The tornado was the first winter tornado in Rutherford County recorded history, and the first significant tornado (F2/EF2 and stronger) to affect the county since 1989.
CLIFFSIDE	10/23/2017	This tornado moved into Rutherford County from Cherokee County, SC near the intersection of Camp Ferry Rd and State Line Rd. The tornado moved northeast, initially paralleling Highway 221A (just to its west). In addition to the uprooting and snapping of numerous trees, some structural damage occurred in the |Cliffside area, with windows blown out of a school while trees fell on several structures. The tornado crossed Highway 221A in the vicinity of the Broad River, then roughly paralleled Highway 120 to the Cleveland County line. Some of the most significant damage occurred in the vicinity of the intersection of Highways 120 and 74, where a camper was overturned and a man was thrown 15-20 yards with no significant injuries. Overhead doors also collapsed at a warehouse building at this location.
ELLENBORO	6/8/2019	Media released drone footage of multiple downed trees around a home on Webb Rd. The trees were arranged in a distinct convergent/rotational pattern, indicating tornado damage.
Transylvania County		
Unincorporated Area	4/3/1974	
Unincorporated Area	1/10/1975	
Unincorporated Area	6/20/1984	

Source: NOAA, NCEI

TABLE G.13: THUNDERSTORM WIND EVENTS (1990-2019)

Location	Date	Description
	Henderson County	
Unincorporated Area	4/20/1991	
Unincorporated Area	8/27/1992	
Balfour	6/26/1995	Mobile home destroyed by falling trees.
Fletcher	8/11/1995	Trees and power lines down.
HENDERSONVILLE	5/26/1996	Slow moving severe thunderstorms pounded a small area in the mountains. Walnut size hail was reported in Cullowhee and numerous trees and power lines were downed. Residents were convinced that a tornado hit. In Hendersonville downed trees and power lines blocked streets.
HENDERSONVILLE	7/7/1996	The wind blew 3 large oak trees onto a home. Also, 1700 customers were without power as a result of wind damage.
ETOWAH	8/24/1996	
FLETCHER	2/21/1997	
ETOWAH	2/21/1997	
HENDERSONVILLE	6/14/1997	Severe thunderstorms blew down trees and power lines in Henderson county and caused large hail near the South Carolina border in Polk county. The most damage occurred around Shelby where trees were blown down in 15 locations near town. At least one tree fell on a vehicle and another fell on a house.
ETOWAH	7/4/1997	Severe thunderstorms moved into the mountains from Tennessee in the early evening on the Fourth, before moving into or redeveloping in the foothills and western piedmont later in the evening. Damaging winds raked much of western North Carolina, downing trees and power lines, and a few reports of hail as large a golf balls were reported. Several counties reported trees and power lines down countywide, often blocking roads and damaging homes and/or vehicles. Outflow from the storms propagated southeast into the Charlotte metro area before midnight, producing gusty winds between 35 and 45 mph for a short period of time. Dollar amounts for much of the damage were not available at the time of this writing.
HENDERSONVILLE	7/4/1997	A man suffered a head injury when a tree fell on him.
BAT CAVE	7/16/1997	Severe thunderstorms developed mainly in the foothills of North Carolina during the afternoon. Damaging winds up to 75 mph downed trees and power lines. U.S. Highway 74 in Henderson county was blocked for 2 hours due to a large oak tree that fell across the road. Another large tree in Cleveland county fell onto 2 pickup trucks, totaling them. Three houses were damaged by fallen trees, a car was damaged by a collapsed convenience store canopy and trees blocked roads near Indian Trail. Power outages were scattered across the region, some due to lightning. Up to 4300 people were without power in Union county.
ETOWAH	6/22/1998	Multi-cell thunderstorms moved across the mountains and into the foothills during the evening hours. Some of the storms became severe and produced mainly wind damage. Winds were estimated as high as 75 mph in Rutherford county early in the evening, resulting in downed trees damaging several homes and a barn destroyed. A National Weather Service co-operative observer measured a 63-mph wind gust on Flat Top Mountain. A tree fell on a house in west Asheville as well as in Hickory. Elsewhere, scattered trees and some power lines were downed.
HENDERSONVILLE	6/24/1998	Multi-cell thunderstorms again developed in the early evening and moved south across the southern mountains and piedmont. A few became severe and produced large hail up to golf ball size, as well as damaging winds. Wind damage was confined to downed trees and power lines. The hardest hit area was northeast of Brevard where roads were blocked.

Location	Date	Description
MILLS RIVER	1/23/1999	Unseasonably warm, moist air and strong winds through a deep layer of the atmosphere combined to produce a line of thunderstorms along a cold front advancing east across North Carolina. Some of these storms became severe, bringing damaging wind speeds to the surface in some of the southern and central mountain counties. Wind speeds were reported in the 60 to 70 mph range with a measured gust recorded on Flat Top Mountain (elev. 4320 ft) to 78 mph. A 9-mile-long damage path through Mills River and northern Henderson county was initially 100 yards wide, then narrowed to between 25 and 50 yards. Numerous trees and power lines were downed.
HENDERSONVILLE	5/13/1999	Scattered thunderstorms developed during the afternoon and evening of the 13th and a few pulsed to severe levels. In Henderson county, golf ball size hail covered Highway 280 and a large tree fell onto a house in Hendersonville, causing significant damage to the house and outdoor furniture. Dime to golf ball size hail was reported in Union county along with a measured wind gust to 85 mph. Quarter size hail was reported late in the evening in Avery county. There was a public report of a sighting of a very weak tornado that appeared to make a brief touchdown, but caused no damage, north of Marion. Due to insufficient data in support of this report, an official tornado event will not be entered..
LAUREL PARK	8/10/2000	Numerous trees were blown down countywide, but especially in the western half. A 250 year old tree fell and damaged 2 vehicles.
HENDERSONVILLE	8/18/2000	Several trees were blown down on Hebron Road.
HENDERSONVILLE	5/22/2001	Trees down on Shepherd Street.
HENDERSONVILLE	7/8/2001	Trained spotter measured a wind gust at Hoopers Creek.
HENDERSONVILLE	7/8/2001	Numerous trees and power lines down. Some trees fell on houses. Over 7000 homes lost power during the storm and remained without power for much of the night.
HENDERSONVILLE	8/10/2001	Severe thunderstorm winds brought down at least two trees in the city. One fell across a mobile home, injuring the occupants inside.
MILLS RIVER	5/2/2002	Some trees were blown down.
HENDERSONVILLE	8/24/2002	Several trees and powerlines were blown down.
HENDERSONVILLE	11/11/2002	Several trees were blown down.
FLETCHER	5/2/2003	Some trees were blown down.
HENDERSONVILLE	5/2/2003	Numerous trees were blown down.
ASHEVILLE RGNL ARPT	7/16/2003	
HENDERSONVILLE	7/18/2003	Several trees were blown down, including two on 4th Avenue.
ASHEVILLE RGNL ARPT	7/21/2003	Numerous power lines and trees were blown down, including nine Bradford Pear trees at a golf course.
EDNEYVILLE	5/20/2005	Trees down along highway 64. Trees were also reported down around Sugarloaf Mountain.
ETOWAH	5/20/2005	Trees down along highway 64.
DANA	8/14/2005	Several trees blown down.
HENDERSONVILLE	6/11/2006	A tree was blown down onto power lines just north of town, with 2 other small trees down in the same area.
BAT CAVE	6/23/2006	Trees and lines down.
MOUNTAIN HOME	7/4/2006	Numerous tree limbs blown down and a large swing set overturned
MILLS RIVER	7/21/2006	Trees and power lines down.
MOUNTAIN HOME	7/21/2006	Trees and power lines down.
ETOWAH	8/30/2006	Numerous trees blown down, including some 70-foot pine trees, centered around the area near the intersection of Cummings Cove Rd and Big Willow Rd. Nickel to quarter size hail was also reported.

Location	Date	Description
HENDERSONVILLE	9/28/2006	Trees blown down on power lines.
EDNEYVILLE	10/11/2006	Several trees blown down.
MILLS RIVER	6/25/2007	Large tree limbs blown down, which took down some power lines.
FLETCHER	7/10/2007	Trees down on Justice St and Wiltshire Ct. One tree fell on and damaged a house on Justice St. Also, 7 doors were blown out of the Fletcher FD building.
HENDERSONVILLE	8/26/2007	Several trees blown down near exit 49 off of I-26, including trees blocking parts of N Main St and upper Ridgewood Bvd, and a tree on a car on Oak St. Also, several large limbs took down power lines.
HENDERSONVILLE	3/4/2008	Numerous trees blown down across the county.
ETOWAH	6/27/2008	Several large tree limbs and power lines were blown down.
EAST FLAT ROCK	6/28/2008	Numerous trees were blown down.
HENDERSONVILLE	7/7/2008	Several trees blown down around Flat Rock and vicinity.
MILLS RIVER	6/10/2009	A tree fell on a home on Amywood Lane in Mills River. Trees were also blown down in Mountain Home.
OTTANOLA	6/10/2009	Trees were blown down from Slick Rock Rd to Sugarloaf Mountain.
FLETCHER	6/18/2009	Several trees were blown down from Fletcher to Hendersonville.
ETOWAH	6/18/2009	Several trees were blown down.
DANA	7/27/2009	Trees were blown down on Deep Gap Rd.
EDNEYVILLE	8/5/2009	Several trees were blown down in the Old Clear Creek Rd. area.
UPWARD	6/25/2010	A tree was blown down near the intersection of I-26 and Upward Rd.
DANA	6/25/2010	A tree was blown down near the intersection of Deep Gap Rd and Deep Gap Loop Rd.
MILLS RIVER	7/11/2010	Numerous trees were blown down in the Mills River area extending from about 4 miles west northwest of Mills River along North Mills River Road, to River Loop Road, to Turnpike Rd, ending about 2 miles southeast of Mills River along Ladson Rd.
RUGBY	7/17/2010	About two dozen trees were blown down on South Rugby Rd.
BRIGHTWATER	7/18/2010	Several large tree limbs were blown down about 3 miles west of Hendersonville and a tree was blown down On Lakeside Dr near Willow Rd.
ETOWAH	10/25/2010	Numerous trees were blown down across the county.
ETOWAH	4/4/2011	Dozens of trees were blown down around a golf course on the north side of Etowah. Other trees and power lines were blown down sporadically toward the Hendersonville area.
HORACE	4/28/2011	Trees and power lines were blown down.
CAROLINA HILLS	6/10/2011	A tree was blown down on Pattys Chapel Rd with another blown down on Asheville Highway in Fletcher.
LAUREL PARK	6/12/2011	Multiple trees were blown down in and around Hendersonville, mainly on the south side of town. One tree fell on a house on Whitted St.
ETOWAH	6/15/2011	Multiple trees were blown down in the Etowah area.
MILLS RIVER	6/18/2011	Multiple trees were blown down from Mills River, across the north side of Hendersonville, to the Dana community, to East Flat Rock. One tree fell on a vehicle on Shady Bottom Rd in Mills River.
GERTON	6/21/2011	A few trees were blown down in the northeast part of the county, including on Bearwallow Mountain and near Bat Cave.
HORACE	6/21/2011	A tree was blown down along Lamb Mountain Rd, about 6 miles south southwest of Bat Cave.
MILLS RIVER	6/22/2011	A tree blew down and blocked highway 191 in Mills River. There were also power lines blown down on Rugby Rd and power lines down on Naples Rd, both a few miles east of Mills River.
ETOWAH	7/4/2012	Trees were blown down in Etowah and surrounding areas.

Location	Date	Description
LAUREL PARK	7/17/2012	Multiple trees and power lines were blown down on 4th Ave W near North Washington St.
BRIGHTWATER	7/27/2012	Numerous trees were blown down across the Hendersonville area. At least seven roads had trees across them. A tree fell on a home on Dana Rd about 1.5 miles north of downtown.
TUXEDO	8/2/2012	Multiple trees were blown down on highway 25 south of Hendersonville and Flat Rock.
HORSE SHOE	8/9/2012	Multiple trees were blown down about 2 miles south southwest of Mills River. A tree was also blown down on South Mills River Rd 2 miles west of town.
HORACE	8/14/2012	A tree was blown down on Summer Road near the Polk County line.
FLETCHER	6/7/2013	Several trees were blown down around Fletcher.
HORSE SHOE	8/12/2013	Multiple trees were blown down on the southwest side of the Mills River community, including on Ray Hill Rd, Turnpike Rd and on Schoolhouse Rd.
GERTON	9/1/2013	Multiple trees and power lines were blown down in the Gerton community.
EDNEYVILLE	9/1/2013	Numerous trees were blown down in the Edneyville area.
GERTON	9/1/2013	A thunderstorm knocked down trees and power lines in the Gerton community, about 20 minutes after another thunderstorm caused wind damage in the same area.
ETOWAH	5/27/2014	County comms reported multiple trees blown down on the south side of Etowah, including on Eade Rd and Pleasant Grove Rd.
ETOWAH	6/20/2014	FD reported multiple trees and power lines blown from between Etowah and Horse Shoe to the southern end of the county.
HOOPERS CREEK	7/27/2014	Law enforcement reported a tree and powerline blown down near Apple Blossom Park Dr (2 ENE Fletcher). County comms reported several trees and power lines down in Mountain Home area.
TUXEDO	9/2/2014	FD reported two trees blown down on Highway 176.
RUGBY	6/2/2015	County comms reported two trees blown down along Rugby Rd.
RUGBY	6/26/2015	County comms reported trees blown down on Rugby Rd.
MOUNTAIN HOME	7/13/2015	County comms reported multiple trees blown down in the Etowah and Mountain Home communities.
MILLS RIVER	7/14/2015	County comms reported multiple trees blown down in the Mills River area.
ETOWAH	8/4/2015	Public reported several dozen trees blown down throughout the Etowah community.
BOWMAN BLUFF	7/14/2016	Spotter reported a few trees blown down on Fairway Noll Rd.
TUXEDO	7/21/2016	County comms reported numerous trees and power lines blown down along Green River Rd.
UPWARD	5/19/2017	Public reported two trees blown down near Dana.
HOLLY SPGS	5/27/2017	County comms reported multiple trees blown down throughout Henderson County.
HENDERSONVILLE	6/13/2017	County comms reported trees blown down in the vicinity of Laurel Park.
EAST FLAT ROCK	6/13/2017	FD reported at least 2 trees blown down with one tree down across Highway 25 and blocking traffic.
VALLEY HILL	7/15/2017	County comms reported a few trees blown down in the Valley Hill area.
LEAD	7/15/2017	County comms reported a few trees blown down in the Green River area.
HOOPERS CREEK	7/23/2017	FD reported multiple trees blown down east of Fletcher.
MILLS RIVER	6/3/2018	Spotter reported multiple large trees blown down along Highway 191 near Mills River, with one tree down on a house.
BARKER HGTS	6/3/2018	County comms reported numerous trees blown down from the east side of Hendersonville to the Dana area.
MILLS RIVER	6/26/2018	County comms reported multiple trees blown down in the Mills River area.
FLETCHER	6/26/2018	County comms reported multiple trees blown down in the Fletcher area.
LEAD	4/14/2019	Public reported a chimney blown off and partial roof damage to a home on Tall Oak Acres.

Location	Date	Description
BOWMAN BLUFF	4/19/2019	County comms reported trees and power lines blown down on River Rd in Etowah and other trees down closer to Hendersonville.
BOWMAN BLUFF	8/21/2019	Public reported three trees blown down at a golf course off Cummings Rd.
MOUNTAIN HOME	10/31/2019	Public reported (via Social Media) a large tree limb blown down through a truck windshield on Naples Rd.
Polk County		
Unincorporated Area	6/9/1990	
Unincorporated Area	8/21/1990	
Unincorporated Area	5/15/1994	Strong thunderstorm winds blew down trees and power lines.
MILL SPG	6/24/1996	
MILL SPG	8/21/1996	Downburst winds caused a fair amount of damage around Collettsville where tin was ripped off roofs, trees and power lines were blown down and signs were destroyed. In Mill Spring some power poles and trees were downed.
COLUMBUS	7/4/1997	Two people were injured by tent poles that were sent hurtling through the air by severe thunderstorm winds. Power loss to 35,000 customers also occurred.
MILL SPG	7/28/1997	Thunderstorms developed in a very warm and unstable atmosphere during the afternoon. Several storms became severe and produced damaging straight line winds for the most part. A few reports of large hail were also received. Most of the damage took the form of downed trees and power lines. However, roofs were partially blown off a mobile home in Rutherford county and a building in Mt. Holly in Gaston county. A tree fell on a trailer in Haywood county and dime size hail fell for 10 minutes in Marshall.
COLUMBUS	7/11/2000	Scattered thunderstorms rumbled in the foothills, with a couple becoming severe during the late evening. A roof was blown off a trailer in the Green Creek community east of Columbus and shingles were blown off roofs in Shelby. Otherwise, numerous trees and power lines were blown down causing power outages.
TRYON	7/11/2000	Scattered thunderstorms rumbled in the foothills, with a couple becoming severe during the late evening. A roof was blown off a trailer in the Green Creek community east of Columbus and shingles were blown off roofs in Shelby. Otherwise, numerous trees and power lines were blown down causing power outages.
COLUMBUS	8/24/2000	An isolated slow-moving severe thunderstorm produced a couple areas of straight-line damaging winds. Power lines were blown down west of Columbus and trees and power lines were downed in the city.
COLUMBUS	8/24/2000	An isolated slow-moving severe thunderstorm produced a couple areas of straight-line damaging winds. Power lines were blown down west of Columbus and trees and power lines were downed in the city.
COUNTYWIDE	5/21/2001	At least 11 trees were blown down county-wide by a morning severe thunderstorm.
COLUMBUS	6/13/2001	Sheriff's department reported numerous trees and power lines down. Between 10 and 20 trees were blown onto Interstate 26. A public report of a roof being torn off a building at a country club was also received.
BEULAH	7/8/2001	Trees down along N.C. 9 near Mill Spring. Stop signs were blown down near Beulah.
COUNTYWIDE	5/13/2002	A few trees were blown down.
COLUMBUS	7/4/2002	A few trees and powerlines were blown down.
SALUDA	9/14/2002	Some trees were blown down.
SUNNY VIEW	9/14/2002	Some trees were blown down.
COLUMBUS	11/11/2002	Several trees were blown down.

Location	Date	Description
COLUMBUS	5/2/2003	Numerous trees and power lines were blown down. A tree fell on a porch, resulting in significant damage.
COUNTYWIDE	6/27/2003	Several trees were blown down.
TRYON	8/22/2003	A tree and some power lines were blown down.
COLUMBUS	5/30/2004	Numerous trees and power lines were blown down.
MILL SPG	6/12/2004	Several trees were blown down.
COUNTYWIDE	6/6/2005	Numerous trees down across the county.
TRYON	6/27/2005	Trees down on highway 176 between Tryon and Saluda.
COLUMBUS	7/28/2005	Trees down in the Collinsville Rd area.
COLUMBUS	4/19/2006	Trees reported split by the wind.
COLUMBUS	6/11/2006	Numerous trees blown down in the Sunny View community.
COLUMBUS	6/23/2006	Large tree limbs blown down in the Green Creek area.
TRYON	7/15/2006	Four trees blown down in Tryon.
TRYON	9/28/2006	Two trees took down power lines on highway 108 in the Lynn community, knocking out power to a large portion of Tryon.
TRYON	8/21/2007	A couple of trees and power lines blown down.
TRYON	3/4/2008	A few trees blown down.
COLUMBUS	3/4/2008	A few trees blown down across the county.
MILL SPG	6/27/2008	Trees were blown down along Wilson Rd.
COLUMBUS	7/6/2008	A tree was blown down on highway 74 near Columbus, and another tree was downed on Fox Mountain Rd.
SUNNY VIEW	5/28/2009	Trees and large tree limbs were blown down along highway 9 near the Sunnyview community, over to the Rutherford County line.
SUNNY VIEW	6/9/2009	Large tree limbs were blown down.
MILL SPG	6/9/2009	A tree was blown down along highway 9 north of Mill Spring, and another tree was downed near the intersection of highway 108 and Toney Rd.
SUNNY VIEW	6/10/2009	Large tree limbs were blown down along highway 9 in the Sunnyview community.
SUNNY VIEW	6/11/2009	Large tree limbs were blown down along highway 9 near the Sunnyview community.
MILL SPG	7/23/2009	Two trees were blown down in the Mill Spring community.
MC GINNIS XRDS	7/28/2009	Trees were blown down on Poors Ford Rd.
SANDY PLAINS	8/5/2009	Several trees were blown down just off highway 9.
SALUDA	6/15/2010	A couple trees were blown down in the Saluda area.
MILL SPG	6/16/2010	Multiple trees were blown down between highway 108 and highway 9.
SUNNY VIEW	7/18/2010	A couple trees were blown down in the Big Level Rd.
VALHALLA	9/27/2010	Numerous trees and large limbs were blown down in and around Tryon, especially in the Harmon Field Rd, highway 176 area. Two homes were damaged by falling trees and several roads were blocked.
SALUDA	4/4/2011	Numerous trees were blown down across the county, with the Tryon area being the hardest hit. Numerous trees fell on roads, and at least one tree fell on a vehicle in Tryon.
TRYON	5/26/2011	Multiple trees were blown down in the Tryon area.
MELROSE	6/18/2011	Trees were blown down on power lines on Howard Gap Rd and on I-26 at mile marker 62. Two more trees fell along highway 108 near Harmon Field Rd.
VALHALLA	8/14/2011	Trees were blown down on Walcott Farm Lane and on Hunting Country Rd. Trees were also blown down on Lanrum Rd and Collinsville Rd to the southeast of Columbus.

Location	Date	Description
MILL SPG	7/1/2012	Multiple trees were blown down to the north of Mill Spring.
COLUMBUS	7/9/2012	Two trees were snapped and two large limbs blown down along I-26 between mile marker 69 and 70.
MT VLY	7/27/2012	County reported trees blown down on Holbert Cove Rd.
MELVIN HILL	7/27/2012	Three trees were blown down in the Green Creek community.
MILL SPG	8/14/2012	A small tree was blown down just outside the reception area for Bright's Creek Golf and Equestrian Community.
COLLINSVILLE	9/3/2012	A tree was blown down on Phillips Rd about 6.5 miles southeast of Columbus.
MELVIN HILL	9/3/2012	A tree was blown down on Coxe Rd in the Green Creek community.
TRYON	1/30/2013	Multiple trees were blown down in the Tryon area.
MELVIN HILL	1/30/2013	Multiple trees were blown down in the Green Creek community.
TRYON	5/22/2013	Trees were blown down on North Trade St.
COLLINSVILLE	5/22/2013	A tree was blown down on Landrum Rd. Several large limbs were blown down nearby on Woody Circle.
COLLINSVILLE	6/9/2013	Trees were blown down on Collinsville Rd and John Weaver Rd in the Green Creek community.
COLUMBUS	7/12/2013	A few trees were blown down from Tryon to the Green Creek community.
COLUMBUS	8/23/2013	Multiple trees were blown down on a home on Red Fox Rd, about 5 miles east northeast of Tryon. A tree was blown down on power lines on Golf Course Rd near Landrum Rd. A fell on a home Collinsville Rd, about 6 miles east southeast of Columbus. A shed was also flipped in the area.
COLLINSVILLE	9/12/2013	Multiple trees were blown down near South Phillips Rd and Bee Hive Rd.
MC GINNIS XRDS	8/20/2014	FD reported multiple trees and power lines blown down along Chesnee Highway, from just east of the center of the Green Creek community to the Rutherford County line.
TRYON	6/16/2015	EM reported 6 to 8 trees blown down in extreme southern Polk County near the intersection of Hunting Country Rd and Red Barn Rd.
BEULAH	6/19/2015	County comms reported multiple trees blown down east of Mill Spring, including along Polk Central Ln, John Shehan Rd, and Moore Rd.
MT VLY	7/8/2015	Public reported multiple trees and power lines blown down.
MILL SPG	7/21/2015	County comms reported a tree blown down just south of Mill Spring and another tree down on Medford Rd.
TRYON	7/21/2015	County comms reported a tree blown down on S River Rd and another tree down on Carriage Way.
MC GINNIS XRDS	8/5/2015	HAM radio operator reported numerous trees blown down in the Green Creek area, from Melvin Hill Rd near the South Carolina border, across Chesnee Rd, to Mcmurray Rd and Stacey Rd near the Rutherford County line.
VALHALLA	7/8/2016	Public reported (via Social Media) trees blown down on Miller Mountain Rd.
COLLINSVILLE	7/1/2017	County comms reported numerous trees blown down on Landrum Rd.
MELVIN HILL	7/8/2017	FD reported multiple trees and some power lines blown down in the Green Creek area, centered around Green Creek Drive.
MILL SPG	5/10/2018	EM reported several trees blown down in the Mill Spring area.
TRYON	5/10/2018	EM reported multiple trees blown down along I-26, with one on a tractor-trailer.
SUNNY VIEW	6/27/2018	County comms reported multiple trees down near the Rutherford County line including on Polk County Line Rd and Rock Springs Rd.
COLUMBUS	6/27/2018	County comms and the public reported numerous trees blown down in the area around Fox Mountain Rd, Smith Dairy Rd, and Huntview Ln.

Location	Date	Description
TRYON, MT VALLEY	4/14/2019	EM reported numerous trees blown down across the county. One tree fell on a mobile home causing significant damaged in the Mill Spring area.
COLUMBUS	7/4/2019	Emergency manager reported numerous trees blown down in central Polk County, including the Columbus area. Trees fell on two homes on Red Fox Road near Columbus.
Rutherford County		
Unincorporated Area	2/10/1990	
Unincorporated Area	7/24/1991	
Unincorporated Area	6/8/1992	
Rutherfordton	8/16/1994	Trees and power lines were blown down. One mobile home was blown onto its side.
Rutherfordton	5/10/1995	Trees fell on two automobiles.
Rutherfordton	6/9/1995	Trees down in numerous areas of the county.
Northeastern Rutherfo	6/10/1995	Numerous trees down.
RUTHERFORDTON	5/25/1996	A severe thunderstorm developed in the foothills and drifted southwest. It caused large hail in McDowell county and blew down trees in Rutherford county.
HARRIS	6/8/1996	
RUTHERFORDTON	6/13/1996	A powerful severe thunderstorm blew down numerous trees in town. Some fell on cars, destroying one and damaging many others. Other trees fell on houses and some structural wind damage to buildings was reported. Lightning destroyed one steer near Statesville.
UNION MILLS	8/28/1996	A severe thunderstorm moving from the north blew down a few trees.
UNION MILLS	6/2/1997	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.
RUTHERFORDTON	7/4/1997	Severe thunderstorms moved into the mountains from Tennessee in the early evening on the Fourth, before moving into or redeveloping in the foothills and western piedmont later in the evening. Damaging winds raked much of western North Carolina, downing trees and power lines, and a few reports of hail as large a golf balls were reported. Several counties reported trees and power lines down countywide, often blocking roads and damaging homes and/or vehicles. Outflow from the storms propagated southeast into the Charlotte metro area before midnight, producing gusty winds between 35 and 45 mph for a short period of time. Dollar amounts for much of the damage were not available at the time of this writing.
CHIMNEY ROCK	7/16/1997	Severe thunderstorms developed mainly in the foothills of North Carolina during the afternoon. Damaging winds up to 75 mph downed trees and power lines. U.S. Highway 74 in Henderson county was blocked for 2 hours due to a large oak tree that fell across the road. Another large tree in Cleveland county fell onto 2 pickup trucks, totaling them. Three houses were damaged by fallen trees, a car was damaged by a collapsed convenience store canopy and trees blocked roads near Indian Trail. Power outages were scattered across the region, some due to lightning. Up to 4300 people were without power in Union county.

Location	Date	Description
RUTHERFORDTON, FOREST CITY	7/28/1997	Thunderstorms developed in a very warm and unstable atmosphere during the afternoon. Several storms became severe and produced damaging straight line winds for the most part. A few reports of large hail were also received. Most of the damage took the form of downed trees and power lines. However, roofs were partially blown off a mobile home in Rutherford county and a building in Mt. Holly in Gaston county. A tree fell on a trailer in Haywood county and dime size hail fell for 10 minutes in Marshall.
RUTHERFORDTON	8/5/1997	Powerful severe thunderstorms caused widespread damage across the eastern half of Rutherford county and in southern Cleveland county as they moved east southeast. Especially hard hit were the areas near and east of Forest City and near Boiling Springs. Macrobursts with embedded microbursts downed hundreds of trees which fell on many homes and businesses. Roads and streets were blocked for much of the night. A roof was partially blown off of a manufacturing plant at Caroleen, and at Boiling Springs the roof of a house collapsed and a barn was blown down.
CAROLEEN, FOREST CITY	8/5/1997	Powerful severe thunderstorms caused widespread damage across the eastern half of Rutherford county and in southern Cleveland county as they moved east southeast. Especially hard hit were the areas near and east of Forest City and near Boiling Springs. Macrobursts with embedded microbursts downed hundreds of trees which fell on many homes and businesses. Roads and streets were blocked for much of the night. A roof was partially blown off of a manufacturing plant at Caroleen, and at Boiling Springs the roof of a house collapsed and a barn was blown down.
GILKEY, UNION MILLS	5/26/1998	Multi-cell thunderstorms developed in a hot and humid airmass just ahead of a cold front sagging south across North Carolina during the evening of the 26th. Several storms became severe and produced widespread hail and wind damage. Hail and wind lasted 15-20 minutes at some locations. Numerous trees and power lines were downed, some on homes, and numerous power outages occurred. In the town of Gilkey, in Rutherford county, a storage building was blown into the woods. Four homes were damaged by fallen trees in Union Mills and windows were blown out.
FOREST CITY, ELLENBORO	6/22/1998	Multi-cell thunderstorms moved across the mountains and into the foothills during the evening hours. Some of the storms became severe and produced mainly wind damage. Winds were estimated as high as 75 mph in Rutherford county early in the evening, resulting in downed trees damaging several homes and a barn destroyed. A National Weather Service co-operative observer measured a 63 mph wind gust on Flat Top Mountain. A tree fell on a house in west Asheville as well as in Hickory. Elsewhere, scattered trees and some power lines were downed.
RUTHERFORDTON	7/4/1998	Straight-line winds from a severe thunderstorm moved from Rutherfordton to Forest City, downing trees and power lines. Part of a porch was blown off and never found. Another severe thunderstorm downed several trees just east of downtown Charlotte.
CLIFFSIDE	7/23/1998	Trees were blown down by an isolated severe thunderstorm.
RUTHERFORDTON	7/7/1999	Severe thunderstorms across the foothills of North Carolina produced damaging wind gusts which downed trees and power lines. In the northwest piedmont, trees were downed across Hwys 158 and 801. A large tree fell across a mobile home in Hillsdale. Lightning strikes started fires which destroyed a house roof in Statesville, damaged a house in Kings Creek, and damaged several structures across Catawba county. Excessive rain in northern Burke county caused a flash flood which covered many roads at the base of the mountains.
RUTHERFORDTON	8/23/1999	Clusters of thunderstorms developed during the late afternoon in the foothills of North Carolina. One became severe, producing damaging wind which downed trees and power lines from the Lake Lure area to just north of Rutherfordton. Some fires were started due to the downed power lines. Brown Mountain Beach Campground reported damaging winds and large hail, and trees and power lines were downed near Valmead.
LAKE LURE	8/23/1999	Clusters of thunderstorms developed during the late afternoon in the foothills of North Carolina. One became severe, producing damaging wind which downed trees and power lines

Location	Date	Description
		from the Lake Lure area to just north of Rutherfordton. Some fires were started due to the downed power lines. Brown Mountain Beach Campground reported damaging winds and large hail, and trees and power lines were downed near Valmead.
SPINDALE	8/4/2000	A severe thunderstorm uprooted trees along a 3 to 4 mile stretch of Hwy 108 near the Polk county line. Several trees were downed at Fox Haven Plantation and one large tree fell on a house and two vehicles.
RUTHERFORDTON	8/10/2000	Numerous trees were blown down.
RUTHERFORDTON	8/18/2000	Numerous trees and power lines were downed across the county, but especially along this path. In Forest City, many trees and power lines fell on cars and houses. In Spindale, there were 16 separate reports of downed trees. There were 4200 people left without power in the county.
ELLENBORO	5/21/2001	Trees and power lines down in Ellenboro.
FOREST CITY	5/21/2001	Large limbs torn off trees.
FOREST CITY	6/14/2001	Numerous trees and power lines blown down between Forest City and Sandy Mush, including at Bostic and Cliffside. At a local park in Forest City, a tent was split in two by the wind and portable toilets were blown over. Trees fell on a car and a truck.
RUTHERFORDTON	6/25/2001	
LAKE LURE	7/4/2001	Numerous trees and power lines knocked down.
RUTHERFORDTON	7/4/2001	Numerous trees and power lines blown down between Rutherfordton and Forest City. Power poles were snapped in half. Urban flooding occurred, closing three streets. A car was trapped under downed power lines. Some trees were blown onto houses.
LAKE LURE	7/8/2001	Trees blown down.
RUTHERFORDTON	7/8/2001	Numerous trees blown down onto roads and streets. Power lines down countywide.
LAKE LURE	4/17/2002	A few trees were blown down.
RUTHERFORDTON	4/17/2002	Trees were reported down in the Mt. Vernon community.
CHIMNEY ROCK	5/2/2002	Several trees were blown down.
LAKE LURE	5/2/2002	Some trees were blown down.
FOREST CITY	5/2/2002	Numerous trees and powerlines were blown down.
BOSTIC	5/7/2002	A few trees were blown down.
RUTHERFORDTON	5/13/2002	Numerous trees and powerlines were blown down, some onto vehicles and homes.
RUTHERFORDTON	6/6/2002	Numerous trees were blown down.
FOREST CITY	7/1/2002	Trees were blown down along Newton Cole Rd.
CAROLEEN	7/2/2002	Numerous trees were blown down. Two people were injured on the morning of the 3rd, when a large tree damaged by the storm fell.
FOREST CITY	7/3/2002	Numerous trees and powerlines were blown down. One tree fell on a house. A vehicle collided with a tree that had fallen on Highway 120.
RUTHERFORDTON	7/4/2002	Hundreds of trees and powerlines were blown down across the county. Some trees fell on homes. Some homes received minor roof damage from the wind.
HARRIS	8/24/2002	Numerous trees were blown down. Some blocked roads.
FOREST CITY	11/11/2002	Numerous trees and power lines were blown down in and near Forest City.
LAKE LURE	5/2/2003	Trees and power lines were blown down.
UNION MILLS	5/2/2003	Widespread tree and power line damage occurred in areas from Union Mills, to Rutherfordton, to Spindale. Especially hard hit was Rutherfordton, where some homes and buildings received significant damage.
RUTHERFORDTON	5/3/2003	Numerous trees and power lines were blown down.

Location	Date	Description
RUTHERFORDTON	5/3/2003	Numerous trees and power lines were blown down. Some trees fell on and damaged structures. A portion of a roof was blown off of one building.
ELLENBORO	5/3/2003	Numerous trees and power lines were blown down from Ellenboro to the Cleveland County line.
LAKE LURE	5/15/2003	A microburst blew down numerous hardwood trees in a 25,000 square yard area.
UNION MILLS	6/8/2003	Some trees were blown down.
RUTHERFORDTON	6/15/2003	Some trees and power lines were blown down.
BOSTIC	7/12/2003	Some trees were blown down.
THERMAL CITY	7/12/2003	Large tree limbs were blown down.
SUNSHINE	7/12/2003	Trees and power lines were blown down.
UNION MILLS	7/12/2003	Some trees were blown down.
RUTHERFORDTON	7/16/2003	Trees were blown down.
BOSTIC	7/31/2003	Several trees were blown down.
FOREST CITY	8/4/2003	Numerous trees, large tree limbs, and power lines were blown down.
LAKE LURE	8/22/2003	Numerous trees were blown down.
BOSTIC	5/9/2004	Trees were blown down.
RUTHERFORDTON	5/30/2004	Numerous trees and power lines were blown down. Power outages were widespread in several communities.
CHIMNEY ROCK	6/12/2004	A few trees were blown down.
RUTHERFORDTON	6/12/2004	Trees were blown down along Bostic-Sunshine Rd.
HARRIS	6/12/2004	Trees and power lines were blown down. Power outages were widespread in the area.
HARRIS	6/12/2004	Trees and power lines were blown down in the Sandy Mush area.
LAKE LURE	7/10/2004	Numerous trees were blown down around Bills Creek Rd.
FOREST CITY	6/19/2005	Trees down near Forest City, some on roads and houses, and power lines down on highway 221 south of Rutherfordton.
FOREST CITY	6/27/2005	Trees also down in Spindale around the same time.
RUTHERFORDTON	7/5/2005	Seven trees blown down.
ELLENBORO	7/7/2005	Trees and power lines down.
HARRIS	7/28/2005	A tree and power line down.
FOREST CITY	8/14/2005	Quite a few large trees blown down, especially on Cherry Mountain Rd. One tree fell on a home, causing minor damage. Another tree fell on a vehicle and other trees fell on power lines.
RUTHERFORDTON	6/11/2006	Two small trees blown down on highway 108 near the Polk County line.
LAKE LURE	6/22/2006	Several trees blown down in the Lake Lure area.
FOREST CITY	6/22/2006	Several trees down east of Forest City and a tree down off of highway 74 near Sandymush.
SPINDALE	7/21/2006	Trees down in Green Hill, Spindale, and Bostic.
RUTHERFORDTON	8/3/2006	Top of a tree blown out on Union Rd and another tree down on Pleasant Hill Rd.
RUTHERFORDTON	10/11/2006	Trees down on Big Island Rd.
FOREST CITY	10/11/2006	Trees down in the Ellenboro area.
RUTHERFORDTON	6/8/2007	Several trees blown down in the Rutherfordton area and around Main St in Spindale.
FOREST CITY	6/16/2007	Four trees blown down.
CLIFFSIDE	6/24/2007	Trees blown down along Camp Ferry Rd.

Location	Date	Description
RUTHERFORDTON	8/21/2007	Numerous trees blown down in the northwest part of the county. Trees and power lines were blown down on Main St in Spindale. Trees were also blown down on South Mitchell St in Rutherfordton.
SUNSHINE	8/23/2007	Numerous trees blown down in and around the Sunshine community.
ELLENBORO	8/24/2007	Trees blown down on highway 74 and on highway 120 in the Ellenboro area.
FOREST CITY	8/25/2007	Trees blown down in the Caroleen and Sandy Mush area.
RUTHERFORDTON	3/4/2008	Numerous trees, power lines, and power poles blown down from the Green Hill area to Rutherfordton, to the Sunshine community. At least one tree fell on a home near Rutherfordton.
RUTHERFORDTON	5/20/2008	Large tree limbs were blown down.
LAKE LURE	6/27/2008	Multiple trees and power lines were blown down and some power poles snapped from the Lake Lure area to the Shingle Hollow area.
CLIFFSIDE	7/21/2008	Trees were blown down.
SPINDALE	7/31/2008	A tree was blown down on Thunder Rd in Rutherfordton and another tree down on Cherry Mountain St in Forest City.
RUTHERFORDTON	8/2/2008	Numerous trees were blown down by two thunderstorms across the northern part of the county.
HARRIS	4/10/2009	Trees were blown down in the Harris community.
GILKEY	5/9/2009	Trees were blown down in the Gilkey community.
CHIMNEY ROCK	6/9/2009	Several trees were blown down in and around Lake Lure.
BOSTIC	6/15/2009	Several trees were blown down across town.
RUTHERFORDTON	6/18/2009	Large tree limbs and signs were blown down on highway 221 near the highway 74 junction in town. A scattering of trees was blown down along highway 221 from Rutherfordton south to Harris Hanrietta Rd.
FOREST CITY	7/23/2009	Five trees were blown down across the city.
LAKE LURE	5/16/2010	Several trees were blown down along highway 64/74 in the Lake Lure area.
LAKE LURE	6/22/2010	Trees and power lines were blown down in the Lake Lure area.
BOSTIC	7/18/2010	Numerous trees were blown down in the town of Bostic.
HOLLIS	8/5/2010	Trees were blown down on highway 226.
RUTHERFORDTON	8/5/2010	Several trees were blown down from Rutherfordton to Spindale to Forest City.
FOREST CITY	10/25/2010	A few trees and power lines were blown down in and around Forest City.
FOREST CITY	11/16/2010	A couple trees were blown down near West Main Dr.
RUTHERFORDTON	4/4/2011	Trees were blown down across the north side of the county. One tree fell on a man on Hudlow Rd, about 6 miles north of Rutherfordton.
HARRIS	4/4/2011	Numerous trees were blown down in extreme southern sections of the county near Cliffside. A roof was blown off a mobile home near the intersection of Ferry Rd and Goode's Creek Church Rd about 3 miles west of Cliffside.
WHITEHOUSE	5/10/2011	Numerous trees were blown down across the county, some of which fell on homes and vehicles. A large tree fell on a mobile home on Spurlin Rd in Ellenboro, killing two 18-year-old twin sisters.
FOREST CITY	5/10/2011	Numerous trees were blown down in the southern part of the county. Some trees fell on homes and vehicles. In addition, a part of a high-tension line tower was blown down off Rabbit Moffit Rd, near the South Carolina line.
UREE	5/23/2011	A few trees were blown down in the Bills Creek area.
UREE	5/26/2011	Numerous trees were blown down across the western part of the county, with Lake Lure being the hardest hit.

Location	Date	Description
RUTH	5/26/2011	Trees were blown down in the Rutherfordton area.
ROCK SPGS	6/5/2011	Trees were blown down east of Lake Lure, near the Green Hill community.
GILKEY	6/9/2011	A tree was blown down on Sarah Lee Rd.
UNION MILLS	6/9/2011	A tree was blown down in the Union Mills area.
SUNSHINE	6/12/2011	A couple trees were blown down in the northeast part of the county.
ALEXANDER MILLS	6/22/2011	Multiple trees were blown down from Forest City to Ellenboro.
FOREST CITY	6/26/2011	Multiple trees were blown down around Forest City.
RUTHERFORDTON	6/26/2011	Multiple trees were blown down along highway 221 south of Rutherfordton.
GILKEY	7/13/2011	Multiple trees were blown down on Painters Gap Rd.
SPINDALE	7/31/2011	Numerous trees were blown down from Rutherfordton to Spindale to Forest City. Multiple trees fell on homes and vehicles, particularly in the Spindale area. A barn was damaged on Whiteside Rd in Rutherfordton.
SUNSHINE	9/2/2011	Numerous trees were blown down in the eastern part of the county from the Sunshine community south to Forest City.
CHIMNEY ROCK	5/15/2012	Trees were blown down on Boys Camp Rd.
CLIFFSIDE	6/12/2012	A large tree was blown down near the intersection of Pea Ridge Rd and highway 221. Multiple additional trees were blown down nearby along highway 120 north of Cliffside.
UREE	7/3/2012	Multiple large tree limbs were blown down, a tree was snapped and several anchored tents were blown away at a campground about 4 miles east of Lake Lure. Other trees were blown down along highway 64/74 between Rutherfordton and Lake Lure and about a half dozen trees down on Sid Sims Rd.
UREE	7/4/2012	Large tree limbs were blown down about 3 miles northeast of Lake Lure.
ROCK SPGS	7/4/2012	A few trees were blown down in the Riverbend area about 5 miles east of Lake Lure.
LAKE LURE	7/5/2012	Multiple trees were blown down in the Lake Lure area.
LAKE LURE	7/5/2012	Three trees were blown down in the Lake Lure area.
UNION MILLS	7/19/2012	A tree was blown down in the Union Mills community and another was blown down in the Cane Creek area.
RUTHERFORDTON	7/23/2012	A few trees were blown down on the northwest side of town.
RUTHERFORDTON	7/23/2012	A few trees were blown down in the Cleghorn Plantation area.
AVONDALE	8/9/2012	Numerous trees were blown down across eastern portions of the county.
GILKEY	9/8/2012	A couple trees were blown down on Rucker Rd.
RUTHERFORDTON	5/22/2013	Multiple trees were blown down across the central part of the county.
CLIFFSIDE	6/25/2013	Trees and power lines were blown down off Duke Power Rd.
LAKE LURE	7/6/2013	A couple trees were blown down on highway 64 near Lake Lure.
RUTHERFORDTON ARPT	7/12/2013	Multiple trees were blown down across the central and western part of the county, from the north side of Rutherfordton, to between Forest City and Rutherfordton, to just south of Rutherfordton. One fallen tree ruptured a gas line on Oscar Justice Rd.
HARRIS	7/12/2013	Trees were blown down on Big Island Rd about 9 miles south southeast of Rutherfordton.
SUNSHINE	7/17/2013	Numerous trees were blown down in the northeast part of the county.
ELLENBORO	7/17/2013	Multiple trees were blown down in the Ellenboro and Bostic areas.
ALEXANDER MILLS	7/28/2013	At least two trees were blown down on Rollins Rd.
GILKEY	8/1/2013	Several trees were blown down in the Green Hill community. One large tree fell on a vehicle traveling along highway 64/74 near Green Hill, destroying the vehicle and causing serious

Location	Date	Description
		injuries to the two occupants. The 66-year-old male driver died from his injuries several days later.
WHITEHOUSE	8/31/2013	A tree was blown down on Cove Rd, about 10 miles northwest of Rutherfordton. Another tree was blown down nearby on Owens Chapel Rd near Union Mills.
RUTHERFORDTON	1/11/2014	A tree blown down on East 2nd St in Rutherfordton.
BOSTIC	1/11/2014	A tree was blown down on Pea Ridge Rd at Whitesides Rd.
SUNSHINE	6/19/2014	County comms reported multiple trees and power lines blown down in the area between Bostic and the Sunshine community.
SUNSHINE	7/2/2014	FD reported two trees blown down in the Golden Valley community.
UREE	7/27/2014	Public reported a tree blown down near Lake Lure Dam (1.5 ESE Lake Lure) and another tree down on power lines near the intersection of Pheasant St and Redbird Dr (2.5 ESE). A spotter reported a tree blown down on a house in the Green Hill community, and trees blown down on Thunder Rd (2 S Rutherfordton).
HARRIS	7/27/2014	Spotter reported multiple trees and power lines blown down on Poors Ford Rd.
HARRIS SPICERS ARPT	8/20/2014	FD reported multiple trees down along Airport/County Line Rd along the Polk County line.
FOREST CITY	7/20/2015	County comms reported multiple trees blown down at Butler Rd and Hazelwood Dr.
ALEXANDER MILLS	7/21/2015	County comms reported numerous trees and power lines blown down in the southern part of Rutherford County.
HARRIS	8/5/2015	Public reported numerous tree limbs, with a few large limbs blown down on Dewitt Owens Rd.
RUTHERFORDTON	9/10/2015	FD reported multiple trees blown down across downtown Rutherfordton.
CLIFFSIDE	9/11/2015	County comms reported trees blown down on Hines Rd.
HARRIS SPICERS ARPT	2/24/2016	County comms reported multiple trees blown down across the southeast part of the county.
UNION MILLS	5/1/2016	County comms reported numerous trees blown down in the northeast part of the county.
RUTHERFORDTON	6/14/2016	County comms reported multiple trees blown down across Rutherfordton.
HOLLIS	7/3/2016	County comms reported multiple trees blown down on Stroud Rd.
FOREST CITY	7/8/2016	Spotter reported a large portion of the entrance overhang to a department store on Allendale Dr was blown off. Newspaper reported multiple trees and power lines blown down in the nearby Forest Hills neighborhood.
RUTHERFORDTON	7/17/2016	County comms reported multiple trees blown down south of Rutherfordton.
LAKE LURE	7/18/2016	County comms reported multiple trees blown down in the Hickory Nut Gorge.
GILKEY	7/22/2016	County comms reported numerous trees and power lines blown down along Cove Rd.
FOREST CITY	7/31/2016	Newspaper reported a tree was blown down on a home and a vehicle on Conner St.
ALEXANDER MILLS	3/1/2017	EM reported trees blown down on Oak St. Public reported (via social media) damage to the roof of a car dealership.
CHIMNEY ROCK	5/27/2017	County comms reported multiple trees blown down throughout the county, with the highest concentration of damage in the Lake Lure area.
ELLENBORO	7/15/2017	County comms reported a couple of trees blown down in the Ellenboro area.
UREE	7/23/2017	County comms reported numerous trees and power lines blown down from the Lake Lure area, across Shingle Hollow, to near Rutherfordton. A tree was blown down on a house near Rutherfordton.
GILKEY	9/1/2017	FD reported a few trees blown down north of Thermal City.
LAKE LURE	10/8/2017	FD reported numerous trees blown down in the Lake Lure area in association with a thunderstorm. However, the EM also reported additional sporadic trees fell with strong prevailing winds throughout the day.

Location	Date	Description
HENRIETTA	4/15/2018	County comms reported a tree blown down on a power line in the Henrietta area and another tree down on a power line near the Cleveland County line west of Mooresboro.
FOREST CITY	5/10/2018	Media reported numerous trees blown down, with some blocking Roads between Forest City and Ellenboro.
RUTHERFORDTON	5/31/2018	County comms reported a tree and power lines blown down on Chimney Rock Rd and a tree down on Highway 108.
ROCK SPGS	5/31/2018	County comms reported multiple trees blown down on Rock Springs Church Rd.
HARRIS	6/1/2018	County comms reported a few trees blown down on Jack McKinney Rd near Highway 221.
RUTH	6/3/2018	County comms reported multiple trees blown down in Rutherfordton, with additional trees down on Pea Ridge Rd in Bostic and on Piney Mountain Church Rd near Ellenboro.
RUTH	6/26/2018	County comms reported multiple trees blown down on West St and Main St.
HENRIETTA	6/26/2018	County comms reported numerous trees and power lines blown down in the Henrietta and Cliffside areas.
HARRIS SPICERS ARPT	6/27/2018	Public reported trees uprooted on Hogan Rd near Highway 221.
CHIMNEY ROCK	7/6/2018	County comms reported numerous trees blown down near Lake Lure.
BOSTIC	7/6/2018	County comms reported numerous trees blown down in the Bostic area.
ROCK SPGS	7/11/2018	FD reported a few trees and at least one power line blown down on Clark Road.
GILKEY	7/21/2018	County comms reported trees and power lines blown down in the Green Hill area.
RUTHERFORDTON	7/21/2018	County comms reported trees and power lines blown down near Rutherfordton and also across the southern part of the county.
ROCK SPGS	4/14/2019	Law enforcement reported numerous trees and power lines blown down across the county.
CHIMNEY ROCK	7/4/2019	County comms reported numerous trees blown down in the Chimney Rock area.
CHIMNEY ROCK	7/31/2019	County comms reported multiple trees blown down in the Rumbling Ridge area.
CHIMNEY ROCK	7/31/2019	County comms reported multiple trees blown down in the Boys Camp Rd area.
RUTHERFORDTON	8/10/2019	Fire dept reported multiple trees blown down in the Rutherfordton and Spindale area, including on Fairforest Dr and on Polar St.
ALEXANDER MILLS	10/31/2019	County comms reported several trees blown down across the southern part of Rutherford County, with a tree on a power line that sparked a fire on Rock Corner Rd near Forest City.
Transylvania County		
Unincorporated Area	9/17/1991	
Unincorporated Area	8/27/1992	
BREVARD	4/20/1996	
PISGAH FOREST	2/21/1997	
CONNESTEE	6/2/1997	Severe thunderstorms moved in from Upstate South Carolina during the early morning hours becoming more widespread across portions of western North Carolina. Large and damaging hail occurred in many locations, and a number of places were affected by two or three different storms. The hail caused extensive damage and the dollar total will no doubt end up in the millions for both property and crop damage. The counties which were hit hardest were McDowell and Rutherford. At one car dealership in Marion the damage reached $500 thousand quickly. At least one insurance company set up a disaster center to process claims involving many cars and roofs which were hail damaged. Only one downburst was known to have occurred and resulted in trees downed across Highway 221 north of Rutherfordton. At Tryon, an historic house and contents including some antiques, burned to the ground. Lightning at Newton struck several residences, causing fire damage.

Location	Date	Description
COUNTYWIDE	7/4/1997	Severe thunderstorms moved into the mountains from Tennessee in the early evening on the Fourth, before moving into or redeveloping in the foothills and western piedmont later in the evening. Damaging winds raked much of western North Carolina, downing trees and power lines, and a few reports of hail as large a golf balls were reported. Several counties reported trees and power lines down countywide, often blocking roads and damaging homes and/or vehicles. Outflow from the storms propagated southeast into the Charlotte metro area before midnight, producing gusty winds between 35 and 45 mph for a short period of time. Dollar amounts for much of the damage were not available at the time of this writing.
BREVARD	5/27/1998	A frontal boundary in the area again provided the focus for thunderstorm development during the afternoon of the 27th. Many storms became severe across western North Carolina and produced hail ranging in size between dimes and quarters. Severe straight-line winds downed numerous trees and power lines, some on houses, in Sylva and Brevard. A few cars were damaged as well. Several trees and power lines were downed in Cornelius later in the afternoon. Lightning struck an apartment in Hickory and caused an attic fire.
BREVARD	6/19/1998	A line of thunderstorms strengthened and bowed out across Jackson and Transylvania counties. Severe straight line winds downed trees in Sylva, and trees and power lines were downed on Hwy 215 near Balsam Grove.
BREVARD	6/24/1998	Multi-cell thunderstorms again developed in the early evening and moved south across the southern mountains and piedmont. A few became severe and produced large hail up to golf ball size, as well as damaging winds. Wind damage was confined to downed trees and power lines. The hardest hit area was northeast of Brevard where roads were blocked.
BREVARD	6/24/1998	Multi-cell thunderstorms again developed in the early evening and moved south across the southern mountains and piedmont. A few became severe and produced large hail up to golf ball size, as well as damaging winds. Wind damage was confined to downed trees and power lines. The hardest hit area was northeast of Brevard where roads were blocked.
BREVARD	1/23/1999	Unseasonably warm, moist air and strong winds through a deep layer of the atmosphere combined to produce a line of thunderstorms along a cold front advancing east across North Carolina. Some of these storms became severe, bringing damaging wind speeds to the surface in some of the southern and central mountain counties. Wind speeds were reported in the 60 to 70 mph range with a measured gust recorded on Flat Top Mountain (elev. 4320 ft) to 78 mph. A 9-mile-long damage path through Mills River and northern Henderson county was initially 100 yards wide, then narrowed to between 25 and 50 yards. Numerous trees and power lines were downed. A tree fell on a home in Brevard causing substantial damage.
BREVARD	7/27/1999	A severe thunderstorm downed several trees and power lines. In addition, a great amount of cloud to ground lightning was produced, which resulted in 3 injuries. One person was injured while in the basement, touching a water heater. Another injury occurred while talking on the phone.
BREVARD	8/10/2000	Trees and power lines were blown down all over the city.
BREVARD	5/19/2001	
LITTLE RIVER	6/14/2001	Trees blown down.
BREVARD	8/23/2001	Several trees blown down in town. Marble-sized hail (1/2 inch) also observed.
BREVARD	6/6/2002	Some small trees and live branches were blown down.
BREVARD	8/18/2002	Some trees and powerlines were blown down.
BREVARD	11/11/2002	A number of tree and power lines were blown down.
LAKE TOXAWAY	5/2/2003	Numerous trees were blown down.
BREVARD	5/2/2003	Numerous trees were blown down.
LAKE TOXAWAY	6/11/2003	Some trees were blown down.
BREVARD	7/16/2003	Numerous trees and power lines were blown down.

Location	Date	Description
BREVARD	7/18/2003	Trees were blown down.
BREVARD	8/8/2003	Some trees were blown down.
ROSMAN	6/6/2005	Several trees blown down.
BREVARD	8/4/2005	Trees down on highway 276 south of Brevard.
ROSMAN	4/22/2006	Trees down on Indian Camp Mountain Rd.
BREVARD	6/22/2006	Trees down north of Pisgah Forest
BALSAM GROVE	8/4/2006	A few trees blown down.
ROSMAN	9/28/2006	A Bradford pear tree snapped off on Calvert Rd, and several 2 to 3-inch diameter limbs blown down on Old Rosman Highway.
ROSMAN	6/23/2007	Two large trees blown down on Hannah Ford Rd.
LAKE TOXAWAY	5/20/2008	Trees blown down in the Sapphire and Lake Toxaway area.
GRANGE	5/20/2008	Trees blown down in the Little River area.
BALSAM GROVE	7/21/2008	Trees were blown down on highway 215.
BREVARD ARPT	7/29/2008	A tree was blown down on Wilson Rd and a tree was blown onto power lines on highway 276 southeast of town.
SAPPHIRE	6/17/2009	Trees were blown down on Whisper Lake Dr.
GRANGE	6/25/2010	Numerous trees were blown down between the Connestee and Little River communities.
BALSAM GROVE	10/25/2010	Multiple trees and power lines were blown down across the county.
SELICA	2/28/2011	A tractor trailer was blown over and greenhouses were damaged at a plant nursery on Hannah Ford Rd.
LAKE TOXAWAY	4/4/2011	Numerous trees and power lines were blown down across the county, with at least one tree on a house.
SAPPHIRE	4/28/2011	Law enforcement reported trees blown down in the Sapphire area with all three severe thunderstorms that moved across the region during the late night and early morning hours.
GRANGE	4/28/2011	Trees and power lines were blown down in the Little River area.
BALSAM GROVE	6/15/2011	Multiple trees, power lines, and power poles were blown down across the county. In Brevard, trees were blown down on homes on South Caldwell St and Merrill Loop, with significant damage occurring to both homes.
JOHN ROCK	6/21/2011	Several trees were blown down on highway 276 through Pisgah National Forest.
OAKLAND	7/4/2011	A few large tree limbs were blown down west of Lake Toxaway. A church building under construction was heavily damaged in town as well.
CONNESTEE	8/20/2011	Large tree limbs and power lines were blown down on Island Ford Rd.
BALSAM GROVE	3/2/2012	Scattered trees were blown down as a supercell thunderstorm moved across the northern part of the county.
BREVARD	7/1/2012	Multiple trees were blown down in the Brevard area.
GRANGE	7/1/2012	A second severe thunderstorm moving over eastern Transylvania County blew down multiple trees in the Little River area.
BREVARD ARPT	7/5/2012	Large tree limbs were blown down on North Country Club Rd.
BALSAM GROVE	7/5/2012	A small tree and several large limbs were blown down along highway 215.
REID	1/30/2013	Multiple trees were blown down across the county as a line of heavy rain showers with embedded thunderstorms moved over the region.
ROSMAN	6/13/2014	County comms reported multiple trees and power lines blown down.
BREVARD ARPT	7/8/2014	FD reported a few trees and power lines blown down near Becky Mountain.
CEDAR MTN	6/8/2015	County comms reported trees and power lines blown down in the Cedar Mountain area, and at least one tree down in the Little River community (3 N).

Location	Date	Description
CONNESTEE	7/8/2016	Public reported a few trees blown down along Highway 276 south of Brevard.
BALSAM GROVE	3/21/2017	County comms reported a few trees blown down on power lines from the Balsam Grove area to Brevard.
QUEBEC	5/27/2017	County comms reported multiple trees and large limbs blown down on Wildwood Drive.
CALVERT	6/16/2018	FD reported a tree blown down on Highway 64 near Old Rosman Highway and power lines down on Highway 64 in Rosman.
LAKE TOXAWAY	6/25/2018	County comms reported numerous trees and power lines blown down throughout the county.
ROSMAN	6/17/2019	County comms reported multiple trees and power lines down along Diamond Creek Road and vicinity and multiple lines down along Highway 178 south of Rosman.
LAKE TOXAWAY	6/22/2019	County comms reported trees blown down across roads in the vicinity of Lake Toxaway.
JOHN ROCK	6/22/2019	County comms reported trees blown down across roads in the Pisgah National Forest.
CALHOUN	7/6/2019	County comms reported trees and power lines down on Hart Rd at Everett Rd. Time estimated from radar.
LAKE TOXAWAY	8/1/2019	Fire dept reported large tree limbs blown down across Blue Ridge Road.
PENROSE	8/19/2019	County comms reported a few trees blown down in the Penrose area.
BALSAM GROVE	10/31/2019	County comms reported multiple trees blown down near Balsam Grove.

TABLE G.14: WINTER STORM EVENTS (1996-2019)

Location	Date	Description
Henderson County	1/6/1996	Snow began early in the morning and by mid-day had reached heavy criteria over part of the mountains with accumulations exceeding 6 inches in some areas. Remaining mountain locations picked up heavy snow accumulations a bit later in the afternoon. At the start of the storm the snow was very wet and accumulations caused power outages in some places. The heavy snow continued through the night and into the next day. Accumulations in the mountains ranged from 4 to 12 inches over the central and southern mountains with 18 to 30 inches in the northern mountains. Brutally cold conditions followed the snow with very windy conditions reported. Blizzard conditions may have been reached in some areas. Extreme cold followed the storm in much of the mountains with wind chills of 20 to 30 below zero.
Henderson County	1/11/1996	The second snowstorm within a week caused more excitement in North Carolina. Up to a foot of snow was reported in some of the mountains with most mountain and foothill locations receiving 3 to 6 inches. In the piedmont, there was more of a mixture of ice with minimal ice storm conditions reported in and around the Charlotte area. There were some power outages and numerous traffic accidents.
Henderson & Transylvania County	2/13/1997	
Henderson County	2/16/2003	A light freezing rain developed along the Blue Ridge during the morning hours, and began to intensify during the afternoon. By mid-afternoon, a quarter of an inch of glaze had accumulated across much of the area. The precipitation transitioned to mainly sleet during the late afternoon, and by mid-evening, around an inch of sleet had accumulated on top of the glaze of ice. Numerous traffic accidents and road closures resulted from the precipitation.
Transylvania County	12/4/2003	Heavy snow and sleet began during the early morning hours across the North Carolina mountains, and by late afternoon had accumulated to 3 to 4 inches across much of the area. Some slopes with an eastern exposure had up to 5 inches.
Henderson & Transylvania County	1/29/2005	After light precipitation fell for much of the overnight hours, snowfall intensity increased around sunrise, and continued through the morning, before changing to a mixture during the afternoon. Total snowfall across the area ranged from 2 to 4 inches. A trace of sleet and freezing rain fell on top of that during the afternoon and evening hours.
Polk & Rutherford County	2/1/2007	Light snow began around sunrise across the southern piedmont and foothills of North Carolina. The precipitation became heavy at times during mid-morning before mixing with sleet and freezing rain. By late morning, up to 3 inches of snow had accumulated across the area, while some locations received light accumulations of sleet. A mix of sleet and freezing rain continued across the southern foothills through early afternoon. By late morning, up an eighth of an inch of ice and as much as a half inch of sleet had accumulated on top of 2-3 inches of snow. By early afternoon, most of the precipitation had transitioned to rain.
All Counties	3/1/2009	Rain changed to snow across portions of the southern and central mountains, generally in locations from the Balsams to areas north and east, and continued through the afternoon. The snow became heavy at times, and quickly accumulated to 1-4 inches by early evening. Locally higher amounts were reported in the higher elevations of the Balsams and Newfound Mountains. Snow, heavy at times continued into the evening hours. By the time the snow tapered off, accumulations of 2-5 inches were common across the area. However, locally higher amounts occurred, especially in the higher elevations, where up to 10 inches were reported. The heavy wet snow, combined with gusty winds, caused some trees to fall and isolated power outages.
All Counties	12/18/2009	A strengthening area of low pressure moved out of the Gulf of Mexico, across southern Georgia, and then up the southeast coast. As the low passed south of the region, snow became heavy across the foothills and piedmont during the afternoon, and continued to fall heavily throughout the afternoon and evening. Snowfall rates of 1-2 inches per hour became common over the

Location	Date	Description
		foothills. The heavy, wet snow combined with gusty winds to cause a few trees and power lines to fall. Scattered power outages were reported. ||Total accumulations over the foothills ranged from 4-6 inches in the lower elevations near the piedmont to as much as 14 inches closer to the Blue Ridge. Over the piedmont, the snow mixed with rain and sleet at times, which cut down on the amount of accumulation, especially in areas closer to the I-85 corridor. Total accumulations ranged from 2 inches near the I-85 corridor, to 6 or 7 inches in areas along and north of I-40.||After the storm ended, continuous melting and refreezing of ice and snow resulted in several mornings of treacherous driving across the area, with numerous accidents reported.
All Counties	2/4/2010	As low pressure moved across the deep south, snow, mixed with sleet, developed over the southern mountains during the late afternoon hours. The precipitation fell heavily at times, and up to 4 inches of snow accumulated across the area by early evening. Snow continued to fall overnight, but became mixed with or changed to sleet around midnight. Total sleet and snow accumulations of 2 to 5 inches occurred across the area by sunrise. By mid-morning of the 5th, precipitation changed to freezing rain, with damaging ice accumulations occurring. Total ice accretion in excess of 1/2 inch occurred along the Blue Ridge, resulting in widespread damage to trees and power lines, and widespread power outages along the southeastern escarpment. Ice accretion diminished rapidly north and west of the Blue Ridge.
Rutherford County	2/12/2010	Light snow developed during the evening rush across portions of the Carolina piedmont and southern foothills. The snow intensified through the evening, and began to quickly accumulate. By mid-evening, 1 to 3 inches of snowfall had occurred across the area. Numerous traffic accidents resulted, particularly in the Charlotte metro area. The snow continued until around midnight, with total accumulations of 2 to 4 inches across the area.
All Counties	2/12/2014	A Miller type-A low pressure system moved up along the South Carolina coast bringing widespread heavy snow and sleet to the Blue Ridge Mountains of North Carolina. Most areas saw snow and sleet accumulation of 3-5 inches.
All Counties	2/16/2015	Snow and sleet overspread portions of the North Carolina foothills and Piedmont during the afternoon. Precipitation changed quickly to sleet in most areas, before mixing with freezing rain from southwest to northeast during the late afternoon and early evening. Sleet and freezing caused deteriorating road conditions by late evening, when heavy accumulations of sleet and/or freezing rain were reported across much of the area. Most locations saw around a half inch to an inch of sleet, along with around a tenth of an inch of ice accretion. However, areas south of I-85 saw more in the way of freezing rain, with up to a quarter inch of ice accretion reported in addition to light sleet accumulations. Scattered power outages were therefore more concentrated there. Roads became very treacherous and impassable in many areas until melting began on the afternoon of the 17th.
Transylvania County	2/23/2015	Light snow associated with a wave of low pressure overspread the southern Appalachians by late evening of the 23rd, and continued into the overnight. Snow, heavy at times, continued into the pre-dawn hours, when heavy snow accumulations were reported across much of the area. Total accumulations were generally in the 3 to 5-inch range, with locally higher amounts reported in the high elevations. The snow tapered off shortly after sunrise.
All Counties	2/25/2015	After the significant snowfall that fell across portions of the North Carolina mountains on the morning of the 24th, an area of low pressure moving along the Gulf Coast spread yet another round of snow across the southern Appalachians and adjacent foothills during the evening of the 25th. The snow was heavy at times, and quickly accumulated, with occasional mixed rain undercutting the totals a bit across the southern foothills. Many areas reported heavy accumulations by late evening. By the time the snow tapered off during the early morning of the 26th, total accumulations ranged from 4 to 6 inches, with locally higher amounts across the mountains. Across the foothills, where snow occasionally mixed with or changed to rain along the Highway 74 corridor, accumulations ranged from 2 to 5 inches.
Transylvania County	1/22/2016	Light snow developed around midnight across the southwest mountains of North Carolina in association with an area of low pressure. The snow became moderate to heavy at times during the

Location	Date	Description
		pre-dawn hours. By sunrise, accumulations of 2-6 inches were common across the area. Warm air began filtering into the valleys from the southwest through the morning, and by late morning, most of the Little Tennessee Valley and surrounding valleys south of the Smokies had transitioned to rain. Total accumulations ranged from 2-5 inches in the far southwest valleys, to more than a foot across the high elevations and the upper French Broad Valley, where the cold air remained in place through the day.
All Counties	12/8/2017	As moisture associated with developing and strengthening low pressure over the northeast Gulf of Mexico overspread the western Carolinas, rain and snow developed over the southern foothills and northwest Piedmont of North Carolina, becoming all snow by early afternoon. As moderate to occasionally heavy snow continued across the area, heavy snowfall accumulations were reported by early evening. By the time the snow tapered off to flurries and light snow showers around midnight, total accumulations ranged from 3 to 5 inches across the area. Rain and sleet mixing in with the snow during the evening likely undercut these totals a bit, especially south of I-40. While occasional flurries and light snow showers produced locally light additional accumulations into the overnight and early daylight hours of the 9th, the accumulating snow ended in most areas by late evening on the 8th.

Source: NOAA, NCEI