



Hazard Mitigation Plan Update

Smoky Mountain Region

Draft Plan — August, 2017



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SECTION 1

INTRODUCTION

This section provides a general introduction to the Smoky Mountain 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 Smoky Mountain Region is located in the western part of North Carolina and includes the counties of Cherokee, Graham, Haywood, Jackson, and Swain and the Tribal lands of the Eastern Band of Cherokee Indians. This area is vulnerable to a wide range of natural hazards such as landslides, winter storms, severe thunderstorms, and floods. It is also vulnerable to human-caused hazards, including chemical releases and hazardous material spills. These hazards threaten the life and safety of residents in the Smoky Mountain 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 the Smoky Mountain 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 community 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.

Each of the five counties participating in the update of the Smoky Country Hazard Mitigation Plan participated in the last update of the plan. The history of plan development is further described in Section 2: Planning Process. This regional plan draws from the region's previous hazard mitigation plan (2012) and from local plans and documents that incorporate 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 Smoky Mountain 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 of 2000 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 and local 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 government applying for federal mitigation grant funds. These funds primarily fall under the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) program. Grant programs include the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) program, and the Flood Mitigation Administration (FMA) program. Communities with an adopted and federally-approved hazard mitigation plan thereby become eligible for funding under these programs and are pre-positioned to receive available mitigation funds before and after the next disaster strikes.

Additionally, the Flood Insurance Reform Act of 2004 (P.L. 108-264) created two new grant programs, Severe Repetitive Loss (SRL) and Repetitive Flood Claim (RFC), and modified the existing Flood Mitigation Assistance (FMA) program. One of the requirements of this Act is that a FEMA-approved Hazard Mitigation Plan is now required if communities wish to be eligible for these FEMA mitigation programs. However, as of early 2014, these programs have been folded into a single Flood Mitigation Assistance (FMA) program.

This change was brought on by new, major federal flood insurance legislation that was passed in 2012 under the Biggert-Waters Flood Insurance Reform Act (P.L. 112-141) and the subsequent Homeowner Flood Insurance Affordability Act in 2014 which revised Biggert-Waters.

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 Smoky Mountain Regional Hazard Mitigation Plan has been prepared in coordination with FEMA Region IV and the North Carolina Division of Emergency Management (NCDEM) 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. Tribal mitigation planning requirements as defined in 44 CFR 201.7 are met in this plan and documented in the Tribal Crosswalk, also included in Appendix C.

1.2 PURPOSE

The purpose of the Smoky Mountain Regional Hazard Mitigation Plan is to:

- ◆ Merge the existing Cherokee County, Graham County, Haywood County, Jackson County, Swain County, and Eastern Band of Cherokee Indians hazard mitigation plans into one regional plan;
- ◆ Increase public awareness and education;
- ◆ Maintain grant eligibility for participating jurisdictions; and
- ◆ Maintain compliance with state and federal legislative requirements for local hazard mitigation plans.

1.3 SCOPE

The focus of the Smoky Mountain Regional Hazard Mitigation Plan is on those hazards determined to be “high” or “moderate” risks to the Smoky Mountain 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, municipalities and the Tribe 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 Cherokee, Graham, Haywood, Jackson, and Swain, as well as their incorporated jurisdictions, and the Eastern Band of Cherokee Indians’ Tribal Reservation lands. **Table 1.1** indicates the participating jurisdictions.

TABLE 1.1: PARTICIPATING JURISDICTIONS IN THE SMOKY MOUNTAIN REGIONAL HAZARD MITIGATION PLAN

Cherokee County	
Andrews	Murphy
Graham County	
Fontana Dam	Robbinsville
Lake Santeetlah	
Haywood County	

Canton	Maggie Valley
Clyde	Waynesville
Jackson County	
Dillsboro	Sylva
Forest Hills	Webster
Swain County	
Bryson City	
Eastern Band of Cherokee Indians (EBCI) Tribal Reservation lands	

1.4 AUTHORITY

The Smoky Mountain Regional Hazard Mitigation Plan has been developed in accordance with current state and federal rules and regulations governing local and Tribal hazard mitigation plans and has been adopted by each participating county, local jurisdiction and the Tribe 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 and 201.7 for Tribal planning requirements); and
- ◆ Flood Insurance Reform Act of 2012 (P.L. 112-141 and the Homeowner Flood Insurance Affordability Act.

1.5 SUMMARY OF PLAN CONTENTS

For the 2017 plan update, each section was reviewed and analyzed for update. The base of the plan remained intact but was bolstered to include new information. 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. This information was updated for the 2017 plan update to reflect the latest planning team members and process implemented for the 2017 plan update.

The **Community Profile**, located in Section 3, provides a general overview of the Smoky Mountain 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. This section was updated to include new maps and updated statistics.

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 Smoky Mountain Region. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of the Smoky Mountain Region. This section was updated to include a new review of hazards (no new hazards were added and none were removed; new hazard events that have occurred since the previous update; updated hazard profiles; and a revised vulnerability assessment inclusive of the latest parcel data, critical facilities in the participating areas. In addition, all maps were made revised to reflect current conditions where data existed.

The Risk Assessment begins by identifying hazards that threaten the Smoky Mountain 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, FEMA's Hazus^{®MH} 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 Smoky Mountain 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 Smoky Mountain Region's capacity 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 use of a Capability Assessment Review Form. It provides 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 capability assessment was revised to reflect current capabilities based on local input and research.

The *Community Profile*, *Risk Assessment*, and *Capability Assessment* collectively serve as a basis for determining the goals for the Smoky Mountain 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 Smoky Mountain 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, municipal and Tribal department or agency to locally-assigned implementation mechanisms, target completion dates, and status updates. Together, these sections are designed to make the Plan both strategic, through the identification of long-term goals, and functional, through the identification of

SECTION 1: INTRODUCTION

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 Smoky Mountain 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.

The mitigation strategy was updated by updating the goals and the action plan. The actions were updated to show progress on the 2012 actions. In addition, new actions were added to reflect local needs and vulnerabilities.

Plan Maintenance, found in Section 10, includes the measures that the jurisdictions participating in the Smoky Mountain 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. For the 2017 update, all plan maintenance procedures were reviewed with the planning team.

County-specific and tribal Annexes have been created to include specific information for each County and participating jurisdiction and the Eastern Band of Cherokee Indians. Topics covered in the annexes include community profile, risk assessment, vulnerability, and capability assessment information. The mitigation actions relevant for each particular county and their participating municipal jurisdictions are also included in the Annex. The annexes allow each participating entity to quickly locate the information contained in the plan that is most relevant for them. For the 2017 update, these were updated to reflect current information.

Lastly, the **Appendices** provide documentation including: Appendix A: Plan Adoption Resolutions; Appendix B: Planning Tools; Appendix C: Local Mitigation Plan Review Tools and Tribal Review Tool; Appendix D: Planning Process Documentation; and Appendix E: Community Rating System.

SECTION 2

PLANNING PROCESS

This section describes the planning process undertaken to develop the Smoky Mountain Regional Hazard Mitigation Plan. It consists of the following eight subsections:

- ◆ 2.1 Overview of Hazard Mitigation Planning
- ◆ 2.2 History of Hazard Mitigation Planning in the Smoky Mountain Region
- ◆ 2.3 Preparing the 2012 Plan
- ◆ 2.4 The Smoky Mountain 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

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.

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, communities that participate in mitigation planning are described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of 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 SMOKY MOUNTAIN REGION

Each of the five counties, 14 jurisdictions, and the tribe included in this Plan participated in the previous version of this plan (2012 Smoky Mountain Region Hazard Mitigation Plan). The previous version of this plan was the first regional planning effort amongst participants. Prior to the regional planning efforts, all participants had approved hazard mitigation plans in place

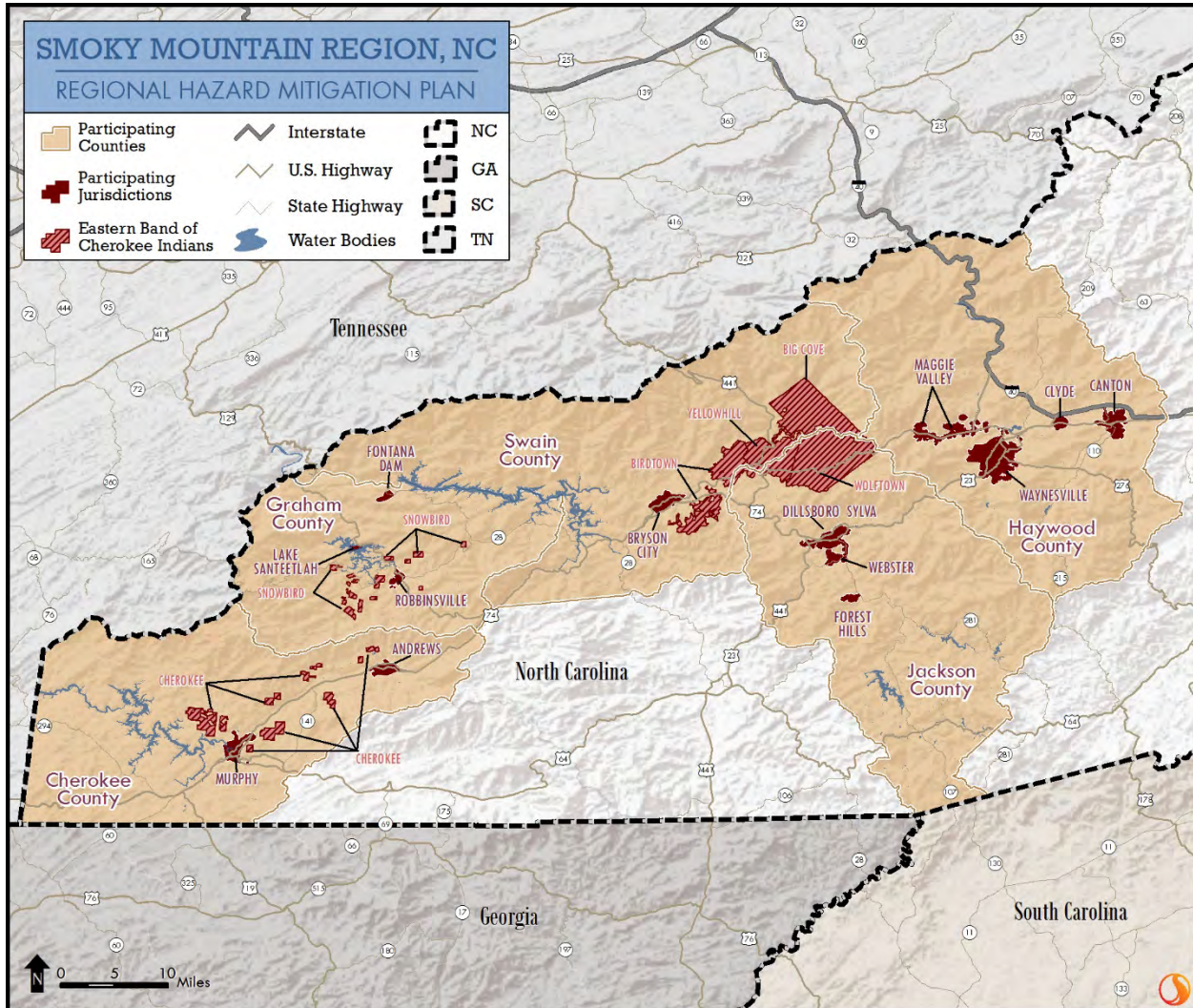
No new jurisdictions joined the 2017 planning process, and all of the jurisdictions that participated in previous planning efforts have participated in the update of this regional plan. The process of developing this version of the plan is described in more detail below. Participating jurisdictions are listed in **Table 2.1** and shown in **Figure 2.1** below.

TABLE 2.1: PARTICIPATING JURISDICTIONS IN THE SMOKY MOUNTAIN REGIONAL HAZARD MITIGATION PLAN

Cherokee County	
Andrews	Murphy
Graham County	
Fontana Dam	Robbinsville
Lake Santeetlah	
Haywood County	
Canton	Maggie Valley
Clyde	Waynesville
Jackson County	
Dillsboro	Sylva

Forest Hills	Webster
Swain County	
Bryson City	
Eastern Band of Cherokee Indians (EBCI) Tribal Reservation lands	

FIGURE 2.1: SMOKY MOUNTAIN REGION PARTICIPATING JURISDICTIONS



2.3 PREPARING THE 2017 PLAN

Hazard mitigation plans, including Tribal plans, are required to be updated every five years to remain eligible for federal mitigation funding. To simplify planning efforts for the jurisdictions in the Smoky Mountain Region, Cherokee County, Graham County, Haywood County, Jackson County, Swain County, and the Eastern Band of Cherokee Indians opted to participate in a regional planning effort. Regional planning efforts allow resources to be shared amongst the participating jurisdictions and eases the administrative duties of all of the participants by combining the five existing county plans (including their jurisdictions) and the tribe’s plan into one multi-jurisdictional plan.

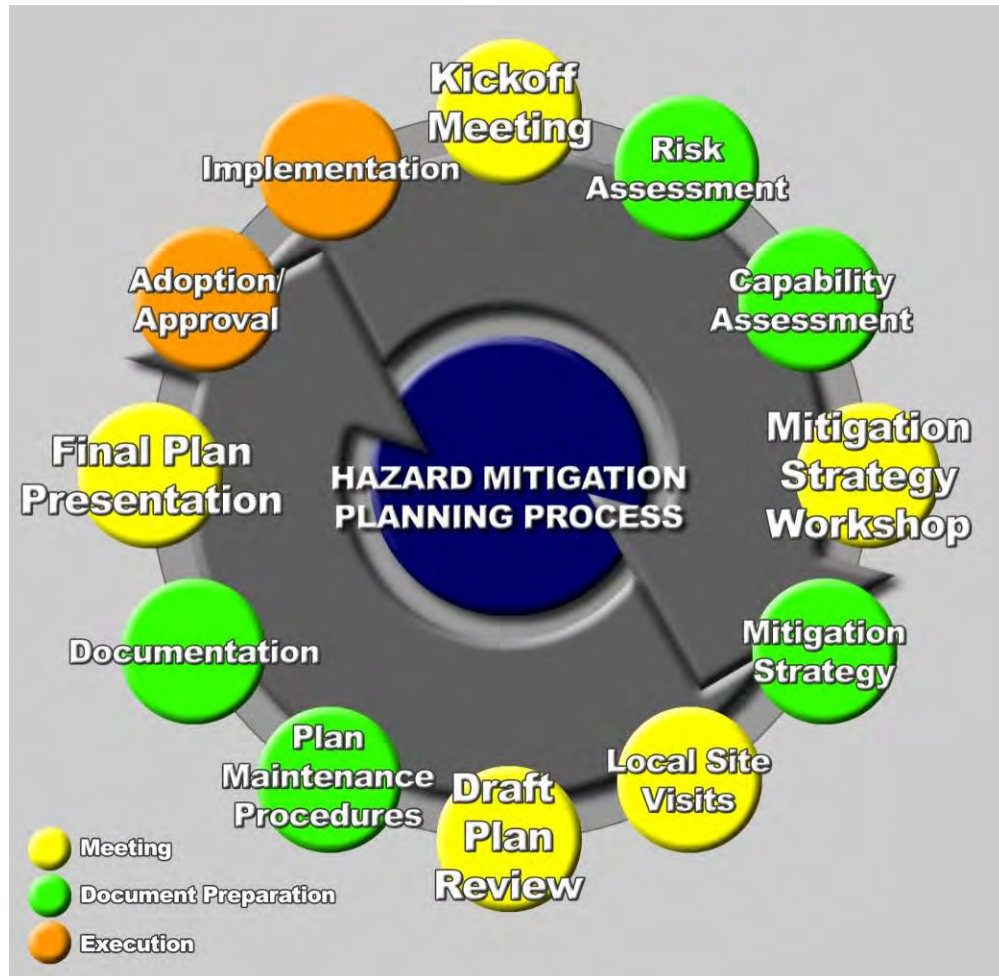
SECTION 2: PLANNING PROCESS

To prepare the 2017 *Smoky Mountain Regional Hazard Mitigation Plan*, Stantec and ESP were hired as consultants to provide professional mitigation planning services. This plan was facilitated under the direction of a professional planner. Caroline Cunningham from Stantec served as the project manager while Nathan Slaughter served as the lead planner for this project; both are members of the American Institute of Certified Planners (AICP).

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 Division of Emergency Management (NCEM) mitigation planning staff. 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. To address Tribal mitigation planning requirements, the project team relied heavily on FEMA's Tribal Multi-Hazard Mitigation Planning Guidance.

The process used to prepare this Plan included twelve major steps that were completed over the course of approximately nine months beginning in November 2016. Each of these planning steps (illustrated in **Figure 2.2**) resulted in critical work products and outcomes that collectively make up the Plan. Specific plan sections are further described in Section 1: *Introduction*.

Over the past five years, each participating jurisdiction has been actively working to implement their existing plans. This is documented in the Mitigation Action Plan through the implementation status updates for each of the Mitigation Actions. The Capability Assessment also documents changes and improvements in the capabilities of each participating jurisdiction to implement the Mitigation Strategy.

FIGURE 2.2: MITIGATION PLANNING PROCESS FOR THE SMOKY MOUNTAIN REGION

2.4 THE SMOKY MOUNTAIN REGIONAL HAZARD MITIGATION PLANNING COMMITTEE

During the initial 2012 development of the region plan, the Smoky Mountain jurisdictions (Cherokee County, Graham County, Haywood County, Jackson County, Swain County, participating jurisdiction, and the Eastern Band of Cherokee Indians) created the Smoky Mountain Regional Hazard Mitigation Planning Committee (Regional Hazard Mitigation Planning Committee or Regional Planning Committee). The Regional Hazard Mitigation Planning Committee represents a community-based planning team made up of representatives from various county and Tribal departments, municipalities, and other key stakeholders identified to serve as critical partners in the planning process. The group was reconvened for the 2017 plan update.

Beginning in November 2016, 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
- ◆ provide information that will help complete 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 development of the Mitigation Strategy, including the design and adoption of regional goal statements
- ◆ help design and propose appropriate 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 2016 *Smoky Mountain Regional Hazard Mitigation Plan*

Table 2.2 lists the members of the Regional Hazard Mitigation Planning Committee who were responsible for participating in the development of the Plan. Committee members are listed by jurisdiction.

TABLE 2.2: MEMBERS OF THE SMOKY MOUNTAIN REGIONAL HAZARD MITIGATION PLANNING COMMITTEE

NAME/TITLE	JURISDICTION / ORGANIZATION/AGENCY
<i>Cherokee County</i>	
Robin Caldwell*/EM Director	Cherokee County EMA
Nancy Curtis/Mayor	Town of Andrews
Ann Payne/Town Manager	Town of Murphy
<i>Graham County</i>	
Larry Hembree/EM Director	Graham County
Sarah Houston/Mayor	Town of Fontana
James Hager/Mayor	Lake Santeetlah
Steve Hooper/Mayor	Town of Robbinsville
<i>Haywood County</i>	
Joy Garland / Town Administrator	Town of Clyde
Nathan Clark / Planning Director	Town of Maggie Valley
Seth Hendler-Voss/Town Manager	Town of Canton
Joey Webb Sr./Fire Dept. Chief	Town of Waynesville
Greg Shuping/Haywood County EM Director	Haywood County
<i>Jackson County</i>	
Dillard, Todd / EM Director	Jackson County
Mike Fitzgerald/Mayor	Town of Dillsboro
Kolleen Begley/Mayor	Village of Forest Hills
Lynda Sossamon/Mayor	Town of Sylva
Tracy Rhodes/Mayor	Town of Webster

NAME/TITLE	JURISDICTION / ORGANIZATION/AGENCY
Swain County	
David Breedlove/EM Coordinator	Swain County
Chad Simmons/City Manager	Town of Bryson City
Eastern Band of Cherokee Indians	
Robbie Panther/EMA Coordinator	EBCI
Other	
Jimmy Ramsey/Regional Coordinator	NCEM
Trey Cash/Hazard Mitigation Planner	NCEM
Consultant Team	
Caroline Cunningham/Project Manager	Stantec
Eric Davis/Hazus Specialist	Stantec
Christina Hurley/Planner and Risk Assessment	Stantec
Nathan Slaughter/Lead Planner	ESP

*Served as the county lead during the plan development process.

2.4.1 Multi-Jurisdictional Participation

The Smoky Mountain Regional Multi-Jurisdictional Hazard Mitigation Plan includes five counties, fourteen incorporated municipalities, and one Native American tribal nation. To satisfy multi-jurisdictional participation requirements, each county and its participating jurisdictions and the Tribe were required to perform the following tasks:

- ◆ Participate in mitigation planning workshops;
- ◆ Identify completed and new mitigation projects, if applicable;
- ◆ Review the draft plan; 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 as provided in *Section 9: Mitigation Action Plans*. Each jurisdiction will adopt their Hazard Mitigation Plan separately. This provides the means for jurisdictions to monitor and update their Plan on a regular basis.

2.5 PLAN DEVELOPMENT MEETINGS

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.¹ In many cases, routine discussions and additional meetings were held by local staff to accomplish

¹ Copies of agendas, sign-in sheets, minutes, and handout materials for all meetings and workshops can be found in Appendix D.

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.

**November 29, 2016
Project Kickoff Meeting**



November 29, 2016 Kickoff Meeting

A kickoff meeting was coordinated shortly after obtaining the notice to proceed. Robin Caldwell, Regional Plan project coordinator and Caroline Cunningham, Stantec Project manager, arranged the location of the meeting and sent an electronic invite to regional committee members and other stakeholders.

Ms. Cunningham led the meeting and began by having attendees introduce themselves. The 17 attendees included representatives from various departments and local jurisdictions within each of the five counties and the EBCI of which are participating in the plan update. Ms.

Cunningham then provided an overview of the items to be discussed at the meeting and briefly reviewed each of the handouts that were distributed in the meeting packets (agenda, project description, presentation slides, public survey, and existing mitigation actions). She then defined mitigation and gave an overview of the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

Ms. Cunningham then provided information about the project. He indicated that the project is funded by a FEMA PDM grant, representatives from each County met together to hire a consultant to manage the update. Funding match requirements will be met by providing “in-kind” services.

Following the overview, Ms. Cunningham led the group in an “icebreaker” exercise to refamiliarize meeting participants to various mitigation techniques. She briefly explained 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, Ms. Cunningham stated that the results would be tabulated and shared with the group at the next meeting.

Following the icebreaker exercise, Ms. Cunningham reviewed the key objectives of the project which are to:

- ◆ Merge the five County plans and the EBCI’s plan into one regional plan;
- ◆ Complete update of existing plans to demonstrate progress and reflect current conditions;
- ◆ Increase public awareness and education;
- ◆ Maintain grant eligibility for participating jurisdictions; and
- ◆ Maintain compliance with State and Federal requirements.

Ms. Cunningham reviewed a list of the participating jurisdictions and then explained the mitigation planning process and specific tasks to be accomplished for this project, including the planning process, risk assessment, capability assessment, mitigation strategy, mitigation action plan and plan maintenance procedures. For the risk assessment portion of the process, Ms. Cunningham asked each county to designate a point person to coordinate the gathering of GIS data required for the analysis. He also reviewed the list of identified hazards and asked the committee members if they still agreed with the list of identified hazards. She also asked if there were any new hazards they wanted to consider for the plan. There were no revisions to the identified hazards.

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

Ms. Cunningham r talked through what data would need to be collected to complete the project. This includes GIS Data, Capability Assessment Revisions, Public Participation Survey, updates to existing Mitigation Actions.

Ms. Cunningham then reviewed the roles and responsibilities of Stantec, the County leads, and the participating jurisdictions. The presentation concluded with a discussion of the next steps to be taken in the project development. She encouraged meeting participants to distribute the Public Participation Survey. The next HMPT meeting was scheduled for some time in Spring of 2017 to discuss the findings of the risk and capability assessments and begin updating existing and identifying any new mitigation actions.

March 29, 2017

Second Regional Hazard Mitigation Planning Committee Meeting

Caroline Cunningham (Stantec) and Nathan Slaughter facilitated the Smoky Mountain Regional Hazard Mitigation Plan Mitigation Strategy Workshop. The purpose of the meeting was to provide an overview of hazard mitigation, plan progress to date (including risk assessment and public survey results), review jurisdiction capabilities, and update and develop mitigation actions. It began with a round-robin of introductions. Following introductions Ms. Cunningham presented a PowerPoint presentation covering the following items:

- ◆ Public Survey Results
- ◆ Risk Assessment Results
- ◆ Mitigation Strategy
- ◆ Schedule/Next Steps
- ◆ Breakout Groups/Plan Update Workshop

Public Survey Results

Ms. Cunningham presented select results from the public survey. This began with an overview of the methods used to advertise the survey and the types of devices used to complete the survey. The survey was active for approximately 3-months and received over 150 responses.

Risk Assessment Results

Next, the risk assessment results were presented. It was emphasized that the presented material was a high level approach compared to what could be found in the draft plan. Each hazard highlighted profile items such as previous occurrences, probability, potential impacts and losses.

Comments were made on the following hazards:

Flood

- ◆ Lake Santeetlah will be joining the NFIP by the time this plan is complete (all communities now it)

Erosion

- ◆ Applicable in Haywood County and especially Maggie Valley

The results of the risk assessment 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 ranking of hazards was presented and attendees were asked to review and comment on the list if anything seemed out of place with perceived risks. High ranking hazards were Winter Storm, Thunderstorm/high wind, Hailstorm, Tornado, Lightning, and Flood.

The planning team opted to move the following hazards:

- ◆ Wildfire – move from moderate to high
- ◆ HAZMAT – move to moderate (high in Haywood)

Considerations of hurricane and tornado were also made but no changes were made.

It was also determined that the PRI would be completed for each county.

Mitigation Strategy

Ms. Cunningham then gave an overview of the mitigation strategy, explaining that it includes goals, actions, and the action plan. First, the goals were presented for review. Minor changes were made to the goals to better reflect all hazards. Next, the results from the ice breaker exercise (from meeting #1) were presented. The results were as follows:

- ◆ Emergency Services \$94
- ◆ Prevention \$60
- ◆ Public Education and Awareness \$59
- ◆ Natural Resource Management \$47
- ◆ Structural Projects \$34
- ◆ Property Protection \$28

Next, Ms. Cunningham explained the 4 step process needed to complete the mitigation action plan updates:

- ◆ Review and update existing actions
- ◆ Evaluate potential hazard mitigation actions
- ◆ Develop new hazard mitigation actions
- ◆ Prioritize actions

Ms. Cunningham asked the planning team to provide a status update for their existing mitigation actions including an explanation for FEMA) by May 5, 2017. She then explained a variety of actions should be considered but all actions considered did not have to be included as actions. Potential actions could come from the public (via the public survey or the public meeting), the risk assessment, or community needs. Ms. Cunningham also explained that potential actions should be evaluated based on several factors using the “STAPLEE” approach, including:

- ◆ Social concerns
- ◆ Technical feasibility
- ◆ Administrative capabilities
- ◆ Political feasibility (public support)
- ◆ Legal authority
- ◆ Economic (cost)
- ◆ Environmental issues

Ms. Cunningham explained that the mitigation action worksheet could be used to submit potential new actions. It was emphasized that action plan should be viewed as the community’s wish list for any type of mitigation needs. Further, should a disaster event be declared or a community seek FEMA funding, FEMA will check to ensure the action is covered via the plan.

Lastly, actions should be prioritized as high, moderate, or low by considered the following:

- ◆ Effect on overall risk to life and property
- ◆ Ease of implementation
- ◆ Political and community support
- ◆ A general economic cost/benefit review
- ◆ Funding availability
- ◆ Continued compliance with the NFIP

Capability Assessment

Next, Ms. Cunningham provided an overview of the Capability Assessment. She explained that this was a FEMA requirement and meant to provide FEMA with an understanding of what capabilities are in place to implement mitigation actions. She explained that during the previous plan update, communities answered an extensive survey about capabilities. For this update, the capabilities just need to be reviewed. The Stantec team took a first look for new plans and capabilities in place, but asked that each jurisdiction verify the information.

Schedule/Next Steps

Ms. Cunningham reviewed the plan schedule, loose ends, and items needed for the plan. She emphasized that jurisdictional participation is a must for plan approval. State NCEM Planners suggested that jurisdictions with limited capability to attend meetings provide a letter making their County EMA Director their designee for the plan. The letter needs to come from a high ranking official, such as the mayor. Ms. Cunningham offered to follow-up with the state to see if an example letter is available.

Ms. Cunningham and Mr. Slaughter thanked the group for taking the time to attend and the meeting was adjourned.

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 is 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.

For the purpose of this plan, the public is defined as anyone with awareness of the planning process including those within or outside of the jurisdiction. (As noted in Annex F, The EBCI defined the “public” as tribal members, tribal employees, neighboring jurisdictions, and all other interested parties.) This includes all tribal members, neighboring jurisdictions, and other stakeholders.

The public was made aware of involved and in the development of the *Smoky Mountain Regional Hazard Mitigation Plan* using three methods: (1) public survey instruments were made available, (2) copies of draft Plan deliverables were made available for public review on county websites and at government offices, (3) plan adoption meetings. The Public was also provided two opportunities to be involved in the actual plan development at two distinct periods during the planning process: (1) during the drafting stage of the Plan via the public survey; and (2) upon completion of a final draft Plan, but prior to official plan approval and adoption.

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.

2.6.1 Public Participation Survey

The Regional Hazard Mitigation Planning 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 Smoky Mountain 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 county and jurisdiction websites (Appendix D). A total of 154 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. Comparative statistics are provided from the last survey conducted during the 2012 plan update. However, different respondents take the test, so it is not a direct comparison.

- ◆ Approximately 44 percent of survey respondents had been impacted by a disaster.
- ◆ Respondents ranked Wildland Fire as the highest threat to their neighborhood (29 percent), followed by Severe Winter/Ice Storm (19 percent), High Wind (16 percent). Interestingly, High was the considered the greatest hazard during the previous update. However, recent wildfires have impacted the area, resulting in greater awareness.
- ◆ Approximately 43 percent of respondents have taken actions to make their homes more resistant to hazards (a ten percent increase from the previous plan update) and 86 percent are interested in making their homes more resistant to hazards.
- ◆ 56 percent of respondents do not know what office to contact regarding reducing their risks to hazards. This has decline from for 63 percent during the last plan update.
- ◆ Property Protection were ranked as the most important activities for communities to pursue in reducing risks.

A copy of the survey is provided in Appendix B and a detailed summary of the survey results are provided in Appendix D.

2.6.2 Draft Plan Review

The draft plan was made available for review and comment from **September 29th to October 29, 2017**. Given the September 2017 hurricane events (Hurricanes Harvey and Irma), the plan was also reviewed by the state during the public review period to expedite submission to FEMA. Robin Caldwell served as the local point of contact to field public comments. Documentation of the draft plan posting can be found in Appendix D.

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.

The Regional Planning Committee worked to provide an opportunity for a wide range of stakeholders, including opportunity for neighboring communities (including other incorporated communities and tribal jurisdictions), agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, private entities, and others to be involved in the planning process.

In order to involve a wide range of stakeholders, the region went beyond in its local outreach efforts and broadly distributed the *Public Participation Survey*. These opportunities were provided for local officials, residents, businesses, academia, and other private interests in the Smoky Mountain Region to be involved and offer input throughout the local mitigation planning process. They survey was shared and publicized throughout the Smoky Mountain Region and beyond.

In addition, neighboring counties were notified by email of the plan update process and invited to participate in the planning process. The email was sent to county emergency management coordinators. A complete list of those emailed and a copy of the outreach email can be found in Appendix D.

Furthermore, the following activities demonstrate broad stakeholder involvement:

- Members of the planning team have the authority to regulate development through planning or code enforcement.
- A key benefit to regional planning efforts is that many neighboring communities are collaborating in the development of the plan. Neighboring jurisdictions were contacted as documented Appendix D.
- Lastly, the final draft plan was publicized on websites for stakeholder comment and review.

2.8 INCORPORATION OF THE EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

Several plans and studies have been leveraged during the development of this plan. Each section references these sources which are primarily found in Section 4 through Section 7. Types of sources leveraged included:

- Local planning documents (e.g., floodplain management ordinances, land use plans)
- Local, state, federal hazard technical information (e.g., USGS Earthquake data, Hazus-MH)
- FEMA hazard mitigation plans and planning guidance

2.9 DOCUMENTATION OF PLAN PROGRESS

Progress in hazard mitigation planning for the participating jurisdictions in the Smoky Mountain Region is documented in this plan update. Since hazard mitigation planning efforts officially began in the participating counties and tribe 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 Smoky Mountain Region. The actions that have been completed are documented in the Mitigation Action Plan found in Section 9.

In addition, community capability continues to improve with the implementation of new plans, policies and programs that help to promote hazard mitigation at the local level. The current state of local and Tribal 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 developing the Regional Hazard Mitigation Planning Committee to update the Plan and by continuing to involve the public in the hazard mitigation planning process.

SECTION 3

COMMUNITY PROFILE

This section of the Plan provides a general overview of the Smoky Mountain 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 Smoky Mountain Region is located in the southern portion of the Western North Carolina Blue Ridge Mountains. For the purposes of this plan, the Smoky Mountain Region includes Cherokee, Graham, Haywood, Jackson, and Swain Counties, the incorporated jurisdictions within these five counties, and Tribal lands of the Eastern Band of Cherokee Indians. An orientation map is provided as **Figure 3.1**.

The Smoky Mountain Region is best known as being home of the most-visited national park in the United States, the Great Smoky Mountains National Park. Each year, over 9 million people visit the park to see the diverse wildlife and waterfalls, hike, bike, fish, picnic, and camp. The Smoky Mountains are among the tallest in the Appalachian chain with elevations that range from 875 to 6,643 feet. In the park, there are 16 peaks reaching over 5,000 feet.

The Smoky Mountain Region is also a popular tourist destination for other activities such as golfing, tubing, horseback riding, and skiing. The Qualla Boundary, home of the Eastern Band of Cherokee Indians, also attracts many vacationers who come to enjoy Cherokee cultural festivals and outdoor activities, visit the Museum of the Cherokee Indian, or take a tour of the Oconaluftee Indian Village.

The total land area of each of the participating counties and the Eastern Band of Cherokee Indians is presented in **Table 3.1**.

TABLE 3.1: TOTAL LAND AREAS OF PARTICIPATING COUNTIES AND TRIBE

County	Total Land Area
Cherokee County	455 square miles
Graham County	292 square miles
Haywood County	554 square miles
Jackson County	491 square miles
Swain County	528 square miles
Eastern Band of Cherokee Indians	213 square miles*

*The Reservation is comprised of land located in Swain, Jackson, Cherokee, and Graham Counties.

Source: US Census Bureau

SECTION 3: COMMUNITY PROFILE

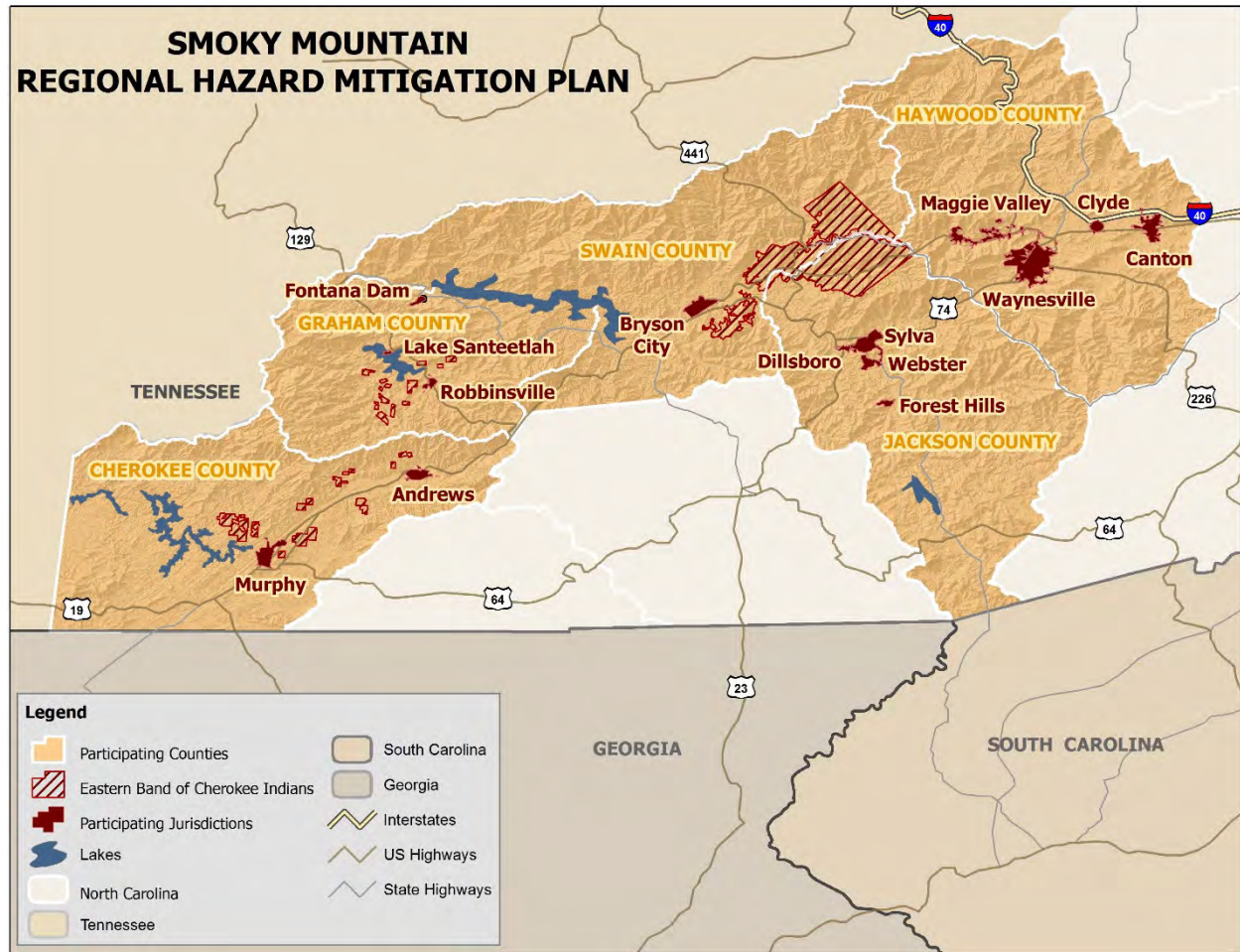
The Smoky Mountain Region enjoys a moderate climate that is characterized by mild winters and hot, humid summers; however, variation in elevation and topography can drastically affect local weather. In general, the spring months are marked by unpredictable weather and changes can occur rapidly with sunny skies yielding to snow in a just a few hours. From March through May, temperatures in the lower elevations have an average high of 61°F and an average low of 42°F. Typically, the weather is milder by mid-April and warm in May.

In the summer, afternoon showers and thunderstorms are common and average temperatures increase with afternoon highs reaching the 90s in July and August. At higher elevations, weather is much more pleasant during the summer.

September through mid-November is typified by clear skies and cooler weather that alternates between warm days and cool nights. Daytime highs are usually in the 70s and 80s during September but fall to the 50s and 60s by early November. The first frost often occurs in late September and the lows are near freezing by November. During these autumn months, there are only occasional rain showers making it the driest period of the year.

Winter in the Smoky Mountain Region is generally moderate but extremes do occur, especially at higher elevations. About half of the days from mid-November through February have high temperatures of 50°F or more and can even reach the 70s. Winter lows are usually at or below freezing but temperatures can drop to -20°F at high elevations. Snow is most common during January and February. At low elevations, snows of one inch or more occur one to five times per year; however, in the higher mountains, snow falls more frequently and up to two feet can fall at one time.

FIGURE 3.1: SMOKY MOUNTAIN REGION ORIENTATION MAP



3.2 POPULATION AND DEMOGRAPHICS

Haywood County is the largest participating county by area and it also has the largest population. Between 2010 and 2015, the majority of participating jurisdictions experienced slight population growth, however Cherokee and Graham Counties, as well as four towns did see a decline. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for each of the participating counties, jurisdictions, and Tribe (where available) are presented in **Table 3.2**.

TABLE 3.2: POPULATION COUNTS FOR PARTICIPATING JURISDICTIONS AND TRIBE

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
CHEROKEE COUNTY	20,170	24,298	27,444	27,092	-1.3%
Town of Andrews	2,551	1,602	1,781	2,050	15.1%
Town of Murphy	1,575	1,568	1,627	2,095	28.8%
GRAHAM COUNTY	7,196	7,993	8,861	8,700	-1.8%
Town of Fontana Dam	--	--	--	--	--
Town of Lake Santeetlah	47	67	45	36	-20.0%
Town of Robbinsville	709	747	620	575	-17.0%
HAYWOOD COUNTY	46,942	54,033	59,036	59,170	0.2%
Town of Canton	3,790	4,029	4,227	4,156	-1.7%
Town of Clyde	1,041	1,324	1,223	1,311	7.2%
Town of Maggie Valley	185	607	1,150	1,533	33.3%
Town of Waynesville	6,758	9,232	9,869	9,748	-1.2%
JACKSON COUNTY	26,846	33,121	40,271	40,812	1.3%
Town of Dillsboro	95	205	232	295	27.2%
Village of Forest Hills	--	330	365	405	11.0%
Town of Sylva	1,809	2,435	2,588	2,597	0.3%
Town of Webster	410	486	363	409	12.7%
SWAIN COUNTY	11,268	12,968	13,981	14,163	1.3%
Town of Bryson City	1,145	1,411	1,424	1,748	22.8%
EASTERN BAND OF CHEROKEE INDIANS	5,968	8,092	9,018	9,796	8.6%

Source: US Census Bureau

Based on the 2015 Census, the median age of residents of the participating counties ranges from 36 to 48 years and the median age of the Tribe was 32 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 80 percent of the population in Cherokee, Graham, Haywood, and Jackson Counties. Swain County, with smaller populations of white people, had the largest proportion of American Indians. This can be attributed to the fact that the main portion of the Eastern Cherokee Reservation lies in eastern Swain County and northern Jackson County.

TABLE 3.3: DEMOGRAPHICS OF PARTICIPATING COUNTIES AND TRIBE

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
Cherokee County	93.6%	1.6%	1.8%	2.8%	2.8%
Graham County	88.6%	0.5%	7.6%	3.3%	1.5%
Haywood County	96.0%	0.9%	0.3%	2.8%	3.6%
Jackson County	83.3%	3.1%	8.8%	4.8%	5.3%
Swain County	64.6%	1.5%	26.9%	7.0%	2.4%
Eastern Band of Cherokee Indians	16.6%	0.9%	74.0 %	8.5%	5.7%

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

Source: US Census Bureau

3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

3.3.1 Housing

According to the 2010 US Census, there were 97,098 housing units in the Smoky Mountain Region, the majority of which are single family homes or mobile homes. Housing information for the five participating counties and Tribe is presented in **Table 3.4**. As shown in the table, Haywood County has a lower percentage of seasonal housing units compared to the other counties.

TABLE 3.4: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
Cherokee County	13,499	17,515	17,667	20.9%	\$142,600
Graham County	5,084	5,930	5,930	25.7%	\$120,700
Haywood County	28,640	34,954	35,086	16.2%	\$161,300
Jackson County	19,291	25,948	26,322	26.4%	\$171,900
Swain County	7,105	8,723	8,769	22.3%	\$126,700
Eastern Band of Cherokee Indians	3,194	4,028	4,310	9.2%	\$110,900

Source: US Census Bureau

3.3.2 Infrastructure

Transportation

There are several major highways that cross the Smoky Mountain Region. The Great Smoky Mountains Expressway is a four-lane divided highway that traverses west to east starting at Bryson City in Swain County, through Jackson County, to Clyde in Haywood County. The Waterfall Byway, part of US Route 64, also connects west to east starting in Cherokee County and continuing on through Jackson County. This scenic byway is known for its more than 200 waterfalls that surround the route. US Route 74 is another east-west highway that runs across the state, but it travels roughly southwest to northeast in the region

connecting the towns of Murphy, Andrews, Bryson City, Cherokee, Sylva, and Waynesville and linking all 5 counties in the Smoky Mountain Region. US Route 74 has alternating names, but it is considered the commercial backbone and main truck route of Western North Carolina. This highway briefly runs concurrent with and intersects US Route 441, a north-south highway that runs from the Georgia border, into Jackson County, and through Swain County to the Tennessee border.

The Asheville Regional/Hendersonville Airport is the largest airport in the mountains serving the Smoky Mountain 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. This airport is approximately 175 miles from Bryson City, which is roughly located in the center of the region. 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 Smoky Mountain Region is provided by one public utility, Duke Energy Progress, and several electricity cooperatives. The electricity cooperatives servicing the region include Haywood Electric Membership Corporation in Haywood County and Tri-State Electric Membership Corporation, Murphy Power Board, and Blue Ridge Mountain Electric Membership Corporation in Cherokee County.

Water and sewer service is provided by many of the towns in the Smoky Mountain Region, but generally municipal water systems are extremely limited in the mountains and private or shared wells and septic systems are considered the norm. Jackson County; the Towns of Andrews, Murphy, Lake Santeetlah, Robbinsville, Canton, Clyde, Maggie Valley, Waynesville, Dillsboro, Sylva, and Webster; and the Eastern Band of Cherokee Indians provide water and sewer service to their residents.

Community Facilities

There are a number of public buildings and community facilities located throughout the Smoky Mountain Region. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 59 fire stations, 16 police stations, and 47 public schools located within the study area. Six medical facilities are located in the Smoky Mountain Region including several hospitals, health centers, and rural clinics.

In addition to Smoky Mountain National Park, the Smoky Mountain Region contains numerous local, state, and national parks and recreation areas. These include the Nantahala National Forest, Pisgah National Forest, Joyce Kilmer Memorial Forest, Cherohala Skyway, and Blue Ridge Parkway. These facilities offer recreational opportunities to area residents and millions of visitors each year.

3.3.3 Land Use

Many areas of the Smoky Mountain 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, or lack thereof) is further discussed in *Section 7: Capability Assessment*.

3.4 EMPLOYMENT AND INDUSTRY

The early modern economy in the Smoky Mountain 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 Smoky Mountain Region have focused recent economic development efforts on cultural and natural heritage tourism. Second home development is also being considered as another way to boost the economy and promote revitalization.

According to the North Carolina Department of Commerce, Labor and Economic Analysis Division, Demand Driven Data Delivery System, in 2015, Cherokee County had an average annual employment of 7,877 workers. In 2015, Education and Health Services employed 2,221 persons (28.2 percent) of the County's workforce followed by Trade, Transportation and Utilities occupations (1,501, 19%); Leisure and Hospitality (947; 12%); Manufacturing occupations (878; 11.1%), and Construction occupations (385; 4.9%). In 2015, the median annual wage in Cherokee County was \$28,424 compared to \$32,510 for the state of North Carolina.

In 2015, Graham County had an average annual employment of 1,951 workers. In 2015, according to the North Carolina Employment Security Commission, the Education and Health Services industry employed the most people, with 21.8 percent of the workforce, followed by Construction (21.4%); Leisure and Hospitality (14.7%); Trade, Transportation, and Utilities (14.2%); and Public Administration (12.4%). In 2015, the annual median wage in Graham County was \$24,182, compared to \$32,510 for the state of North Carolina.

According to the North Carolina Employment Security Commission, Haywood County had an average annual employment of 16,737 workers in 2015. In 2015, the Education and Health Services industry was the largest employment sector with 25.5 percent of the County's workforce. The other leading industries were Trade, Transportation, and Utilities (20.5%); Leisure and Hospitality (14.9%); Manufacturing (14.1%); and Public Administration (6.6%). In 2015, the annual median wage in Haywood County was \$29,120 compared to \$32,510 for the state of North Carolina.

The North Carolina Employment Security Commission reported an annual average employment of 12,915 workers in Jackson County for 2015. In 2015, the top employment industry was Education and Health Services, making up 34.4 percent of total employment. Other major industries were Leisure and Hospitality (20.0%); Trade, Transportation, and Utilities (16.0%); and Public Administration (10.1%). In 2015, the County's annual median income was \$31,826 compared to \$32,510 for the state of North Carolina.

Swain County had a 2015 average annual employment of 9,591 workers. In 2015, according to the North Carolina Employment Security Commission, the Leisure and Hospitality industry employed 44.3 percent of the workforce followed by Public Administration (21.6%); Education and Health Services (12.3%); and Trade, Transportation, and Utilities (8.6%). In 2015, the annual median income for the County was \$25,921, compared to \$32,510 for the state of North Carolina.

SECTION 3: COMMUNITY PROFILE

Data from the US Census 2011-2015 American Community Survey indicates the Eastern Band of Cherokee has a population 16 years and over of approximately 7,191. Of that population, 3,805 people (approximately 53%) were considered to be in the labor force. Of those in the labor force, approximately 5.2% were unemployed. Of those employed, 2,026 were employed in private business and 1,310 were employed as government workers.

SECTION 4

HAZARD IDENTIFICATION

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

- ◆ 4.1 Overview
- ◆ 4.2 Description of Full Range of Hazards
- ◆ 4.3 Disaster Declarations
- ◆ 4.4 Hazard Evaluation
- ◆ 4.5 Hazard Identification Results

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 Smoky Mountain 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 Smoky Mountain Region has included a comprehensive assessment of both types of hazards.

During the 2010 development of this regional plan, an extensive hazard identification process was undertaken. The region reviewed hazards suggested under FEMA planning guidance, existing county-level plans, the North Carolina state plan, research of past disaster declarations in the region¹, and input from the planning team. Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources. During this update, the documented evaluation process was review and updated (Table 4.3). In addition, the list was cross-checked with the 2013 version of the North Carolina Hazard Mitigation Plan and reviewed at the kickoff meeting with planning team. No changes were made to the hazard list for the 2016 Plan.

Table 4.1 lists the full range of natural hazards initially identified for inclusion in the Plan and provides a brief description for each. This table includes 23 individual hazards. Some of these hazards are considered to be interrelated or cascading, but for preliminary hazard identification purposes these individual hazards are broken out separately.

Next, **Table 4.2** lists the disaster declarations in the Smoky Mountain Region.

¹ A complete list of disaster declarations for the Smoky Mountain Region can be found below in Section 4.3.

Next, **Table 4.3** 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 4.4** provides a summary of the hazard identification and evaluation process noting that 14 of the 23 initially identified hazards are considered significant enough for further evaluation through this Plan’s risk assessment (marked with a “☑”).

4.2 DESCRIPTION OF FULL RANGE OF HAZARDS

TABLE 4.1: DESCRIPTIONS OF THE FULL RANGE OF INITIALLY IDENTIFIED HAZARDS

Hazard	Description
ATMOSPHERIC HAZARDS	
Avalanche	A rapid fall or slide of a large mass of snow down a mountainside.
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. Human demands and actions have the ability to hasten or mitigate drought-related impacts on local communities.
Hailstorm	Any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant. Hail is formed when updrafts in thunderstorms carry raindrops into parts of the atmosphere where the temperatures are below freezing.
Heat Wave	A heat wave may occur when temperatures hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a “dome” of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. A heat wave combined with a drought can be very dangerous and have severe economic consequences on a community.

SECTION 4: HAZARD IDENTIFICATION

<p>Hurricane and Tropical Storm</p>	<p>Hurricanes and tropical storms 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 with a diameter averaging 10 to 30 miles across. 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. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding which can be more destructive than cyclone wind. 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 extends from June through November.</p>
<p>Lightning</p>	<p>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 thunder. On average, 73 people are killed each year by lightning strikes in the United States.</p>
<p>Nor’easter</p>	<p>Similar to hurricanes, nor’easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor’easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful. Nor’easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding.</p>
<p>Tornado</p>	<p>A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size and duration of the storm.</p>
<p>Severe Thunderstorm</p>	<p>Thunderstorms are caused by air masses of varying temperatures meeting in the atmosphere. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours. Thunderstorms may result in hail, tornadoes, or straight-line winds. Windstorms pose a threat to lives, property, and vital utilities primarily due to the effects of flying debris and can down trees and power lines.</p>

SECTION 4: HAZARD IDENTIFICATION

<p>Winter Storm and Freeze</p>	<p>Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.</p>
<p>GEOLOGIC HAZARDS</p>	
<p>Earthquake</p>	<p>A sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the surface. This movement forces the gradual building and accumulation of energy. Eventually, strain becomes so great that the energy is abruptly released, causing the shaking at the earth’s surface which we know as an earthquake. Roughly 90 percent of all earthquakes occur at the boundaries where plates meet, although it is possible for earthquakes to occur entirely within plates. 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.</p>
<p>Expansive Soils</p>	<p>Soils that will exhibit some degree of volume change with variations in moisture conditions. The most important properties affecting degree of volume change in a soil are clay mineralogy and the aqueous environment. Expansive soils will exhibit expansion caused by the intake of water and, conversely, will exhibit contraction when moisture is removed by drying. Generally speaking, they often appear sticky when wet, and are characterized by surface cracks when dry. Expansive soils become a problem when structures are built upon them without taking proper design precautions into account with regard to soil type. Cracking in walls and floors can be minor, or can be severe enough for the home to be structurally unsafe.</p>
<p>Landslide</p>	<p>The movements of a mass of rock, debris, or earth down a slope when the force of gravity pulling down the slope exceeds the strength of the earth materials that comprise to hold it in place. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high.</p>
<p>Land Subsidence</p>	<p>The gradual settling or sudden sinking of the Earth’s surface due to the subsurface movement of earth materials. Causes of land subsidence include groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost.</p>

SECTION 4: HAZARD IDENTIFICATION

Tsunami	A series of waves generated by an undersea disturbance such as an earthquake. The speed of a tsunami traveling away from its source can range from up to 500 miles per hour in deep water to approximately 20 to 30 miles per hour in shallower areas near coastlines. Tsunamis differ from regular ocean waves in that their currents travel from the water surface all the way down to the sea floor. Wave amplitudes in deep water are typically less than one meter; they are often barely detectable to the human eye. However, as they approach shore, they slow in shallower water, basically causing the waves from behind to effectively “pile up”, and wave heights to increase dramatically. As opposed to typical waves which crash at the shoreline, tsunamis bring with them a continuously flowing ‘wall of water’ with the potential to cause devastating damage in coastal areas located immediately along the shore.
Volcano	A mountain that opens downward to a reservoir of molten rock below the surface of the earth. While most mountains are created by forces pushing up the earth from below, volcanoes are different in that they are built up over time by an accumulation of their own eruptive products: lava, ash flows, and airborne ash and dust. Volcanoes erupt when pressure from gases and the molten rock beneath becomes strong enough to cause an explosion.
HYDROLOGIC HAZARDS	
Dam and Levee Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. 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 severe property damage if development exists downstream of the dam. Dam failure can result from natural events, human-induced events, or a combination of the two. The most common cause of dam failure is prolonged rainfall that produces flooding. Failures due to other natural events such as hurricanes, earthquakes or landslides are significant because there is generally little or no advance warning.
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.
Flood	The accumulation of water within a water body which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream ocean, lake or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, or shallow flooding (where shallow flooding refers to sheet flow, ponding and urban drainage).

SECTION 4: HAZARD IDENTIFICATION

<p>Storm Surge</p>	<p>A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are also dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. Storm surge arrives ahead of a storm’s actual landfall and the more intense the hurricane is, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast. Further, water rise caused by storm surge can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas.</p>
<p>OTHER HAZARDS</p>	
<p>Hazardous Materials Incident</p>	<p>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. 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.</p>
<p>Terror Threat</p>	<p>Terrorism is defined by FEMA as, “the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom.” Terrorist acts may include assassinations, kidnappings, hijackings, bomb scares and bombings, cyber attacks (computer-based), and the use of chemical, biological, nuclear and radiological weapons.</p>
<p>Wildfire</p>	<p>An uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. 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.</p>

4.3 DISASTER DECLARATIONS

Disaster declarations provide initial insight into the hazards that may impact the Smoky Mountain Regional planning area. Since 1973, twelve presidential disaster declarations have been reported in the Smoky Mountain Region. This includes six storms related to severe storms and flooding (two of which

also caused landslides and mudslides), four storms related to winter storm events, one storm related to hurricane, and one storm related to tornadoes.

TABLE 4.2: SMOKY MOUNTAIN REGION DISASTER DECLARATIONS

Year	Disaster Number	Description	Cherokee County	Graham County	Haywood County	Jackson County	Swain County	EBCI
1973	394	Severe Storms and Flooding			X	X		
1974	428	Tornadoes	X	X				
1977	542	Severe Storms and Flooding			X			
1995	1073	Severe Storms, Flooding, and High Winds	X	X	X	X	X	
1996	1087	Blizzard of 1996	X	X	X	X	X	
1996	1103	Winter Storm	X		X			
1998	1200	Severe Storms and Flooding			X			
2003	1457	Ice Storm					X	
2004	1553	Hurricane Ivan		X	X	X	X	
2010	1871	Severe Winter Storms and Flooding			X	X		X
2013	4103	Severe Storms, Flooding, Landslides, and Mudslides						X
2013	4146	Severe Storms, Flooding, Landslides, and Mudslides				X		X

4.4 HAZARD EVALUATION

TABLE 4.3: 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?
ATMOSPHERIC HAZARDS			
Avalanche	NO	<ul style="list-style-type: none"> • Review of US Forest Service National Avalanche Center web site • Review of the NC State Hazard Mitigation Plan • Review of FEMA's Multi-Hazard Identification and Risk Assessment 	<ul style="list-style-type: none"> • There is no risk of avalanche events in North Carolina. 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 produce this hazard.
Drought	YES	<ul style="list-style-type: none"> • Review of the NC State Hazard Mitigation Plan • Review of the North Carolina Drought Monitor website 	<ul style="list-style-type: none"> • Droughts are discussed in NC State Hazard Mitigation Plan as a lesser hazard. • There are reports of drought conditions in sixteen out of the last seventeen years in the Smoky Mountain Region, according to the North Carolina Drought Monitor.
Hailstorm	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Hailstorm events are discussed in the state plan under the Severe Thunderstorm hazard as a lesser hazard. • NCEI reports 217 hailstorm events (0.75 inch size hail to 2.5 inches) for the Smoky Mountain Region between 1970 and 2016. For these events, there were \$1.9 million (2017 dollars) in property damages.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Heat Wave	NO	<ul style="list-style-type: none"> • Review of NOAA NCEI Storm Events Database • Review of the North Carolina State Hazard Mitigation Plan • Review of Disaster Declarations 	<ul style="list-style-type: none"> • NCEI does not report any extreme heat event for the Smoky Mountain counties. • The NC State Hazard Mitigation Plan includes heat wave as a lesser hazard. However, the counties in the smoky mountain region have a hazard vulnerability score of zero.
Hurricane and Tropical Storm	YES	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Hurricane and tropical storm events are discussed in the state plan and are listed as a top hazard in the Mountain 1 Region which includes the Smoky Mountain counties. • NOAA historical records indicate 9 tropical storms and 19 tropical depressions have come within 75 miles of the Smoky Mountain Region since 1850. • One out of 12 disaster declarations in the Smoky Mountain Region are directly related to hurricane and tropical storm events.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Lightning	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of FEMA’s Multi-Hazard Identification and Risk Assessment • Review of NOAA NCEI Storm Events Database, NOAA lightning statistics • Review of local news sources 	<ul style="list-style-type: none"> • Lightning events are discussed in the state plan as part of the severe thunderstorm hazard. • NCEI reports 22 lightning events for the Smoky Mountain Region since 1996 (six other events were retrieved from local sources). NCEI-reported events have resulted in a recorded 1 death, 12 injuries and \$3.5 million (2017 dollars) in property damage. • Although lightning is addressed as an individual hazard in only one of the previous Smoky Mountain hazard mitigation plans, it is addressed under thunderstorms in four of the other plans. Given the damage and reported death and injuries, individual analysis is warranted.
Nor’easter	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Nor’easters are discussed in the state plan. The Mountain Region, which includes the Smoky Mountain Region, has the lowest vulnerability in the state. • NCEI does not report any nor’easter activity for the Smoky Mountain 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.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Tornado	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of FEMA’s Multi-Hazard Identification and Risk Assessment • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Tornado events are discussed in the NC State Hazard Mitigation Plan. • NCEI reports 17 tornado events in Smoky Mountain Region counties since 1973. These events have resulted in 6 deaths and have caused 38 injuries and \$150 million (2017 dollars) in property damage with the most severe being an F4.
Severe Thunderstorm	YES	<ul style="list-style-type: none"> • 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 local sources • Review of Presidential Disaster Declarations 	<ul style="list-style-type: none"> • Severe thunderstorm events are discussed in the NC State Hazard Mitigation Plan. The Mountain Region, including the Smoky Mountain counties, has the greatest vulnerability in the state. • According to the NC State Hazard Mitigation Plan, severe thunderstorm is the top hazard the Mountain 1 Region which includes the Smoky Mountain counties. • NCEI reports 580 thunderstorm wind events in the Smoky Mountain Region counties between since 1950. These events have resulted in 6 injuries and \$4.2 million (2017 dollars) in property damage.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Winter Storm and Freeze	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of FEMA’s Multi-Hazard Identification and Risk Assessment • Review of historical presidential disaster declarations. • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Severe winter storms, including snow storms and ice storms, are discussed in the state plan. They are listed as a top hazard in the Mountain 1 Region which includes the Smoky Mountain Region counties. • NCEI reports that the Smoky Mountain counties have been affected by 987 snow and ice events since 1996. These events resulted in over \$10.6 million (2017 dollars) in damages but did not cause any deaths or injuries. • Four of the region’s twelve disaster declarations were directly related to winter storm events.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
GEOLOGIC HAZARDS			
Earthquake	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of previous county and tribal hazard mitigation plans in the Smoky Mountain Region • USGS Earthquake Hazards Program web site • Review of the National Geophysical Data Center 	<ul style="list-style-type: none"> • Earthquake events are discussed in the state plan and all of the participating counties in the Smoky Mountain Region are considered to be at moderate risk to an earthquake event (no counties are high risk). • Earthquakes have occurred in and around the State of North Carolina in the past. The state is affected by the Charleston and the New Madrid (near Missouri) Fault lines which have generated a magnitude 8.0 earthquake in the last 200 years. • 82 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 Smoky Mountain Region is approximately 6%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.
Expansive Soils	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of USDA Soil Conservation Service’s Soil Survey 	<ul style="list-style-type: none"> • Expansive soils are identified in the state plan; however Mountain Region 1 does not identify expansive soils as a top hazard. • According to FEMA and USDA sources, the Smoky Mountain Region is located in an area that has a “little to no” clay swelling potential.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Landslide	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of USGS Landslide Incidence and Susceptibility Hazard Map • Review of the North Carolina Geological Survey database of historic landslides • Review of historic presidential disaster declarations 	<ul style="list-style-type: none"> • Landslide/debris flow events are discussed in the state plan, and ranked as the top hazard in the Mountain 1 Region which includes the Smoky Mountain counties. Further, the Mountain Region received the highest vulnerability score in the state. • USGS landslide hazard maps indicate “high landslide incidence” (more than 15% of the area is involved in landsliding) is found in all counties. All counties except Swain also have areas of moderate incident with high susceptibility. • Data provided by NCGS indicate 213 recorded landslide events in the Smoky Mountain Region. There were no recorded deaths or injuries but some reports of damage to houses and roads. • Two of the region’s 12 disaster declarations have been due to landslides and mudslides (associated with severe storms and flooding).
Land Subsidence	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan 	<ul style="list-style-type: none"> • The state plan delineates certain areas that are susceptible to land subsidence hazards in North Carolina; however none of these areas are located in Smoky Mountain counties. • The plan identifies the Smoky Mountain counties as having scored a zero for the land subsidence hazard.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Tsunami	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of FEMA guidance 	<ul style="list-style-type: none"> • Tsunamis are discussed in the state plan and described as a “greater” hazard for the state. However, the Mountain Region scored a zero for tsunami hazard risk. • Only one of the previous plans in the Smoky Mountain Region addresses tsunami and it is identified as being highly unlikely to occur. • 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	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of USGS Volcano Hazards Program web site 	<ul style="list-style-type: none"> • There are no active volcanoes in North Carolina. • There has not been a volcanic eruption in North Carolina in over 1 million years. • No volcanoes are located near the Smoky Mountain Region.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
HYDROLOGIC HAZARDS			
Dam and Levee Failure	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review NC dam data 	<ul style="list-style-type: none"> • Dam failure is discussed in the state plan as a hazard of concern for the Smoky Mountain Region. It is a top hazard for Mountain Region 1 which includes the Smoky Mountain counties. However, the region does not have the greatest vulnerability in the state. • Of the 169 dams reported on the NC Dam Inventory, 72 are high hazard (42%), (High hazard is defined as “where failure or mis-operation will probably cause loss of human life.”) • Two recorded dam breaches have been recorded in the region, both in Jackson County.
Erosion	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of local news and sources 	<ul style="list-style-type: none"> • Erosion is discussed under the landslide hazard in four of the six previous Smoky Mountain mitigation plans. • Coastal erosion is discussed in the state plan but only for coastal areas (there is no discussion of riverine erosion).

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Flood	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of historical disaster declarations • Review of NOAA NCEI Storm Events Database • Review of FEMA’s NFIP Community Status Book and Community Rating System (CRS) 	<ul style="list-style-type: none"> • The flood hazard is thoroughly discussed in the state plan. • Six out of twelve Presidential Disaster Declarations were flood-related and an additional two were hurricane or tropical storm-related which caused flooding issues. • NCEI reports that Smoky Mountain Region counties have been affected by 117 flood events since 1996. These events in total caused 3 reported deaths and an estimated \$44.8 million (2017 dollars) in property damages. • 11% of parcels the Smoky Mountain Region are located in an identified floodplain (100 or 500 year). • All but one of the municipalities participate in the NFIP.
Storm Surge	NO	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of NOAA NCEI Storm Events Database 	<ul style="list-style-type: none"> • Storm surge is discussed in the state plan under the hurricane hazard and indicates that the Mountain Region has zero vulnerability to storm surge. • None of the previous hazard mitigation plans in the Smoky Mountain Region address storm surge. • No historical events were reported by NCEI • Given the inland location of the Smoky Mountain Region, storm surge would not affect the area.

SECTION 4: HAZARD IDENTIFICATION

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
OTHER HAZARDS			
Hazardous Materials Incident	YES	<ul style="list-style-type: none"> • Review of EPA Toxic Release Inventory Sites • Review of historical hazardous materials incidents from the USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) 	<ul style="list-style-type: none"> • EPA reports there are 8 toxic release inventory sites in the Smoky Mountain Region • PHMSA reports 44 historic hazardous materials incidents in the Smoky Mountain Region resulting in over \$98,000 in damages (2017 dollars)
Terror Threat	NO	<ul style="list-style-type: none"> • Review of local official knowledge • Input from planning team 	<ul style="list-style-type: none"> • There are few high profiles targets in the area. • Planning team opted to not include in this plan.
Wildfire	YES	<ul style="list-style-type: none"> • Review of NC State Hazard Mitigation Plan • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of the NC Division of Forest Resources website • Review of local news and sources 	<ul style="list-style-type: none"> • Wildfires are discussed in the state plan as a “greater” hazard of concern. • The state plan lists wildfire as a top hazard in the Mountain 1 Region. • A review of SWRA data indicates that there are areas of elevated concern in the Smoky Mountain Region. • According to the North Carolina Division of Forest Resources, the Smoky Mountain Region experiences an average of 164 fires each year which burn a combined 2,487 acres. In 2016, Graham and Swain Counties experienced larger fires that resulted in almost 9,000 acres burned in each county and caused evacuations. • Wildfire hazard risks will increase as low-density development along the urban/wildland interface increases.

4.5 HAZARD IDENTIFICATION RESULTS

TABLE 4.4: SUMMARY RESULTS OF THE HAZARD IDENTIFICATION AND EVALUATION PROCESS

ATMOSPHERIC HAZARDS	GEOLOGIC HAZARDS
<input type="checkbox"/> Avalanche	<input checked="" type="checkbox"/> Earthquake
<input checked="" type="checkbox"/> Drought	<input type="checkbox"/> Expansive Soils
<input checked="" type="checkbox"/> Hailstorm	<input checked="" type="checkbox"/> Landslide
<input type="checkbox"/> Heat Wave	<input type="checkbox"/> Land Subsidence
<input checked="" type="checkbox"/> Hurricane and Tropical Storm	<input type="checkbox"/> Tsunami
<input checked="" type="checkbox"/> Lightning	<input type="checkbox"/> Volcano
<input type="checkbox"/> Nor'easter	HYDROLOGIC HAZARDS
<input checked="" type="checkbox"/> Tornado	<input checked="" type="checkbox"/> Dam and Levee Failure
<input checked="" type="checkbox"/> Severe Thunderstorm	<input checked="" type="checkbox"/> Erosion
<input checked="" type="checkbox"/> Winter Storm and Freeze	<input checked="" type="checkbox"/> Flood
	<input type="checkbox"/> Storm Surge
	OTHER HAZARDS
	<input checked="" type="checkbox"/> Hazardous Materials Incident
	<input type="checkbox"/> Terror Threat
	<input checked="" type="checkbox"/> Wildfire

= Hazard considered significant enough for further evaluation in the Smoky Mountain Region hazard risk assessment.

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 Smoky Mountain Regional Hazard Mitigation Plan. It contains the following subsections:

- ◆ 5.1 Overview
- ◆ 5.2 Study Area
- ◆ 5.3 Drought
- ◆ 5.4 Hailstorm
- ◆ 5.5 Hurricane and Tropical Storm
- ◆ 5.6 Lightning
- ◆ 5.7 Thunderstorm Wind/High Wind
- ◆ 5.8 Tornado
- ◆ 5.9 Winter Storm and Freeze
- ◆ 5.10 Earthquake
- ◆ 5.11 Landslide
- ◆ 5.12 Dam and Levee Failure
- ◆ 5.13 Erosion
- ◆ 5.14 Flood
- ◆ 5.15 Hazardous Materials Incident
- ◆ 5.16 Wildfire
- ◆ 5.17 Conclusions on Hazard Risk
- ◆ 5.18 Final Determinations

44 CFR Requirement

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

5.1 OVERVIEW

This section includes detailed hazard profiles for each of the hazards identified in the previous section (*Hazard Identification*) as significant enough for further evaluation in the Smoky Mountain Region hazard risk assessment. Each hazard profile includes a general description of the hazard, its location and extent, notable historical occurrences, and the probability of future occurrences. This section provides assesses risk through the region, including anecdotal information from the regional planning team and research and information from existing studies and data. In addition to this section, each county and the tribe have an annex which includes jurisdictional-level maps, data and analysis, as available and appropriate.

The following hazards were identified:

- ◆ **Atmospheric**
 - ◆ Drought
 - ◆ Hailstorm
 - ◆ Hurricane and Tropical Storm
 - ◆ Lightning
 - ◆ Severe Thunderstorm (including straight-line winds)
 - ◆ Tornado

- ◆ Winter Storm and Freeze
- ◆ **Geologic**
 - ◆ Earthquake
 - ◆ Landslide
- ◆ **Hydrologic**
 - ◆ Dam and Levee Failure
 - ◆ Erosion
 - ◆ Flood
- ◆ **Other**
 - ◆ Hazardous Materials Incident
 - ◆ Wildfire

Each hazard mentioned above is profiled separately to describe the hazard and potential impacts on the region. The profile for each hazard includes:

- ◆ **Hazard description:** A scientific explanation of the hazard including potential magnitude (or severity) and impacts;
- ◆ **Location:** Geographical extent of the hazard;
- ◆ **Previous occurrences:** The number of previous hazard events occurring in the Town (or surrounding area). This section also details previous events including past impacts;
- ◆ **Extent (or magnitude):** The severity of the hazard in the past and potentially severity in the future. Measures may include wind speed, wave height, or property damage, for example;
- ◆ **Probability of future events:** The likelihood of future events impacting the Town. Given that an exact probability is often difficult to quantify, this characteristic is categorized into ranges to be used in hazard profiles in accordance with the PRI described above:
 - ◆ **Unlikely:** Less than 1% annual probability
 - ◆ **Possible:** Between 1% and 10% annual probability
 - ◆ **Likely:** Between 10+% and 90% annual probability
 - ◆ **Highly Likely:** Greater than 90% annual probability
- ◆ **Vulnerability Assessment:** The vulnerability assessment will address conditions that may increase or decrease vulnerability such as topography, soil type, land use, and development trends will also be included.
- ◆ **Potential Losses:** Estimated losses will be calculated using available data and resources. Methods utilized include GIS analysis and hazard modeling where tools are available. Information such as number of structures at risk and critical facilities at risk will be analyzed.

Hazard profiles are presented in alphabetical order by hazard grouping (atmospheric, geologic, hydrologic, and other hazards).

5.2 STUDY AREA

The Smoky Mountain Region includes five counties: Cherokee, Graham, Haywood, Jackson, and Swain and one Native American tribe: Eastern Band of Cherokee Indians. **Table 5.1** provides a summary table of the participating jurisdictions within each county. In addition, **Figure 5.1** provides a base map, for reference, of the Smoky Mountain Region.

TABLE 5.1 AND FIGURE 5.1: PARTICIPATING JURISDICTIONS IN THE SMOKY MOUNTAIN REGION HAZARD MITIGATION PLAN

Cherokee County
Andrews
Murphy
Graham County
Fontana
Lake Santeetlah
Robbinsville
Haywood County
Canton
Clyde
Maggie Valley
Waynesville
Jackson County
Dillsboro
Forest Hills
Sylva
Webster
Swain County
Bryson City
Eastern Band of Cherokee Indians

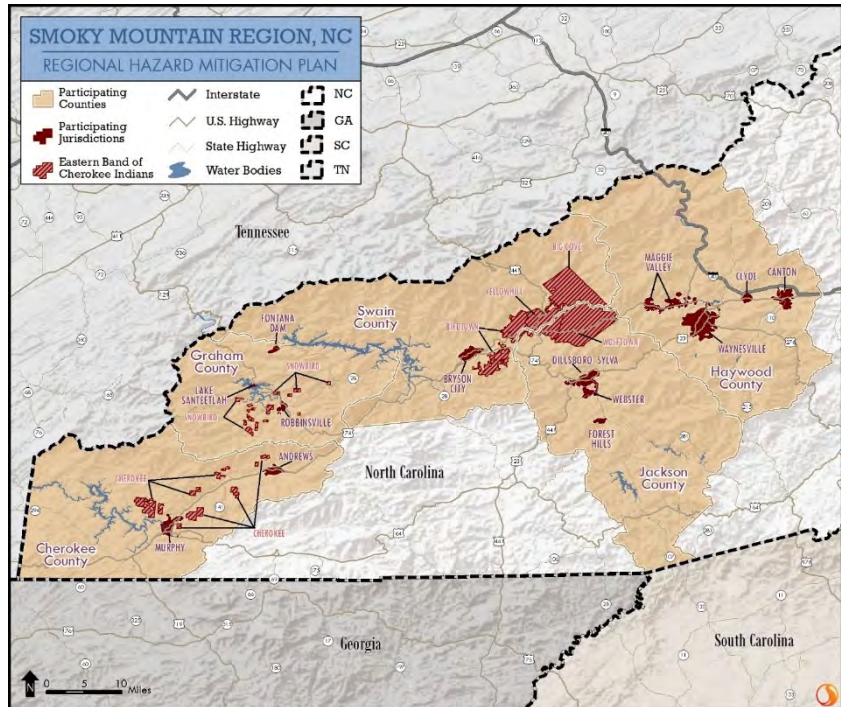


Table 5.2 lists each significant hazard for the Smoky Mountain Region and identifies whether or not it has been determined to be a specific hazard of concern for the fourteen municipal jurisdictions, each of the five county’s unincorporated areas, and the Eastern Band of Cherokee Indians. This is based on the best available data and information from the Smoky Mountain Regional Hazard Mitigation Planning Committee. (● = hazard of concern)

TABLE 5.2: SUMMARY OF IDENTIFIED HAZARD EVENTS IN THE SMOKY MOUNTAIN REGION

Jurisdiction	Atmospheric							Geologic		Hydrologic			Other	
	Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm	Earthquake	Landslide	Dam and Levee	Erosion	Flood	HAZMAT	Wildfire
Cherokee County														
Andrews	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Murphy	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Jurisdiction	Atmospheric							Geologic		Hydrologic			Other	
	Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm	Earthquake	Landslide	Dam and Levee	Erosion	Flood	HAZMAT	Wildfire
Graham County														
Fontana	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Lake Santeetlah	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Robbinsville	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unincorporated Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Haywood County														
Canton	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Clyde	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Maggie Valley	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Waynesville	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unincorporated Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Jackson County														
Dillsboro	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Forest Hills	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Sylva	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Webster	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unincorporated Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Swain County														
Bryson City	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unincorporated Area	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Eastern Band of Cherokee Indians														
Eastern Cherokee Reservation	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Atmospheric Hazards

5.3 DROUGHT

5.3.1 Background

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, usually a season or more in length. High temperatures, high winds, and low humidity over extended periods of time can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts.

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: NOAA National Centers for Environmental Information¹

Droughts are slow-onset hazards, but, over time, can have very damaging effects 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.

5.3.2 Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries; thus, the entire planning area is at risk to drought. Furthermore, it is assumed that the Smoky Mountain Region would be generally uniformly exposed to drought, making the spatial extent potentially widespread. It is also notable that drought conditions typically do not cause significant damage to the built environment.

5.3.3 Historical Occurrences

Data from the North Carolina Drought Management Advisory Council was used to ascertain historical drought events in the Smoky Mountain Region. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

¹ National Centers for Environmental Information (2017). "Definition of Drought." *National Oceanic and Atmospheric Administration*. Retrieved from <https://www.ncdc.noaa.gov/monitoring-references/dyk/drought-definition>

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

According to the North Carolina Drought Monitor, at least one or more of the counties in the Smoky Mountain Region has had drought occurrences in sixteen of the last seventeen years (2000-2016) (**Table 5.4**). In addition, **Table 5.5** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE 5.4: SUMMARY OF DROUGHT CONDITIONS IN THE SMOKY MOUNTAIN REGION

Location	Number Years with Drought Occurrences	Number Years with Exceptional Drought Occurrences
Cherokee County	16	3
Graham County	16	3
Haywood County	16	3
Jackson County	16	5
Swain County	16	4

*EBCI has land in each of the participating counties with a majority in Jackson and Swain Counties.

Source: North Carolina Drought Monitor

TABLE 5.5: HISTORICAL DROUGHT OCCURRENCES IN THE SMOKY MOUNTAIN REGION

	Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
	Cherokee County	Graham County	Haywood County	Jackson County	Swain County
2000	EXTREME (up to 7 weeks)	EXTREME (up to 4 weeks)	EXCEPTIONAL (up to 1 weeks)	EXCEPTIONAL (up to 1 weeks)	EXCEPTIONAL
2001	EXTREME (up to 3 weeks)	EXTREME (up to 3 weeks)	EXTREME (up to 19 weeks)	EXTREME (up to 19 weeks)	EXTREME (up to 8 weeks)
2002	EXTREME (up to 2 weeks)	EXTREME (up to 2 weeks)	EXTREME (up to 7 weeks)	EXCEPTIONAL (up to 1 weeks)	EXTREME (up to 4 weeks)
2003	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)
2004	ABNORMAL (up to 9 weeks)	ABNORMAL (up to 5 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 7 weeks)
2005	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 13 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 10 weeks)	ABNORMAL (up to 13 weeks)
2006	MODERATE (up to 14 weeks)	MODERATE (up to 14 weeks)	SEVERE (up to 1 weeks)	SEVERE (up to 1 weeks)	SEVERE (up to 1 weeks)
2007	EXCEPTIONAL (up to 19 weeks)	EXCEPTIONAL (up to 17 weeks)	EXCEPTIONAL (up to 19 weeks)	EXCEPTIONAL (up to 19 weeks)	EXCEPTIONAL (up to 19 weeks)
2008	EXCEPTIONAL (up to 21 weeks)	EXCEPTIONAL (up to 10 weeks)	EXCEPTIONAL (up to 13 weeks)	EXCEPTIONAL (up to 21 weeks)	EXCEPTIONAL (up to 12 weeks)
2009	SEVERE (up to 7 weeks)	SEVERE (up to 6 weeks)	SEVERE (up to 9 weeks)	EXTREME (up to 3 weeks)	SEVERE (up to 7 weeks)
2010	MODERATE (up to 8 weeks)	MODERATE (up to 10 weeks)	MODERATE (up to 7 weeks)	MODERATE (up to 10 weeks)	MODERATE (up to 10 weeks)
2011	MODERATE (up to 1 week)	MODERATE (up to 1 week)	ABNORMAL (up to 21 weeks)	SEVERE (up to 1 weeks)	MODERATE (up to 3 weeks)
2012	SEVERE (up to 1 week)	ABNORMAL (up to 14 weeks)	MODERATE (up to 4 weeks)	MODERATE (up to 10 weeks)	ABNORMAL (up to 9 weeks)
2013	ABNORMAL (up to 2 weeks)	ABNORMAL (up to 2 weeks)	ABNORMAL (up to 3 weeks)	ABNORMAL (up to 2 weeks)	ABNORMAL (up to 2 weeks)
2014	ABNORMAL (up to 19 weeks)	ABNORMAL (up to 15 weeks)	ABNORMAL (up to 16 weeks)	ABNORMAL (up to 5 weeks)	ABNORMAL (up to 14 weeks)
2015	ABNORMAL (up to 26 weeks)	ABNORMAL (up to 27 weeks)	SEVERE (up to 1 weeks)	SEVERE (up to 1 weeks)	MODERATE (up to 6 weeks)
2016	EXCEPTIONAL (up to 4 weeks)	EXCEPTIONAL (up to 4 weeks)	EXTREME (up to 4 weeks)	EXCEPTIONAL (up to 3 weeks)	EXCEPTIONAL (up to 3 weeks)

Source: North Carolina Drought Monitor

Eastern Band of Cherokee Indians

According to the tribal point of contact, drought plagued the region from 1998 to 2002. This period saw rainfall levels well below normal and caused communities to institute water restrictions. Furthermore, the EBCI “Environmental Health Profile and Priority Projection” dated April 16, 2001 notes a serious drought in the 1930’s and conditions of drought in 1985 and 1986. While the U.S. Drought Monitor does not report conditions specific to the tribal areas, the tribe does have reservation lands in all counties except Haywood. The majority of tribal land is in Swain and Jackson Counties. Thus, U.S. Drought Monitor results can be used to deduct previous drought conditions in tribal areas.

Notable Drought Occurrences Throughout the Region

2016

Beginning in April 2016, all five counties as reported (and assumedly reservation lands) began having abnormal levels of drought. Drought continued to build throughout the year, severe drought levels by the first week of October. By mid-November, each county—besides Haywood County—maintained levels of exceptional drought for at least two-to-four weeks. These droughts also contributed to a severe band of wildfires in the area.

5.3.4 Extent

Extent of drought can be defined in terms of the Drought Monitor classifications. The most severe level of drought according to the U.S. Drought Monitor is “Exceptional” (D4). Drought has ranged from “Abnormal” (D0) to “Exceptional” (D4) in the Smoky Mountain Region. Each county in the planning area has experienced a state of “Exceptional” drought.

5.3.5 Probability of Future Occurrences

According to the North Carolina Drought Monitor’s historical data, sixteen of the last seventeen years has resulted in drought in one or more counties in the Smoky Mountain Region, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered “highly likely” (greater than 90% annual probability). Historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions. County-specific probabilities can be found in the respective annexes.

5.4 HAILSTORM

5.4.1 Background

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.

Hailstone size can range a great deal in size from 5 millimeters (mm) – approximately pea-sized – to greater than 100 mm – approximately melon-sized. Hailstones are categorized using the TORRO Hailstorm Intensity Scale (**Table 5.6**). Hailstone size descriptions are in **Table 5.7**.

TABLE 5.6: TORRO HAILSTORM INTENSITY SCALE (IN MILLIMETERS)

	INTENSITY CATEGORY	TYPICAL HAIL DIAMETER	PROBABLE KINETIC ENERGY, J-M ²	TYPICAL DAMAGE IMPACTS	SIZE CODE
H0	Hard Hail	5	0-20	No damage	1
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops	1-3
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation	1-4
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored	2-5
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage	3-6
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries	4-7
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted	5-8
H7	Destructive	50-75		Severe roof damage, risk of serious injuries	6-9
H8	Destructive	60-90		Severe damage to multiple roof types (including sheet and metal); damage aircraft bodywork	7-10
H9	Super Hailstorms	75-100		Extensive structural damage (including concrete and wooden walls). Risk of severe or even fatal injuries to persons caught in the open	8-10
H10	Super Hailstorms	>100		Extensive structural damage (including destruction of wooden houses and damage to brick-built homes). Risk of severe or even fatal injuries to persons caught in the open	9-10

TABLE 5.7: TORRO HAILSTORM SIZE CODE DESCRIPTIONS

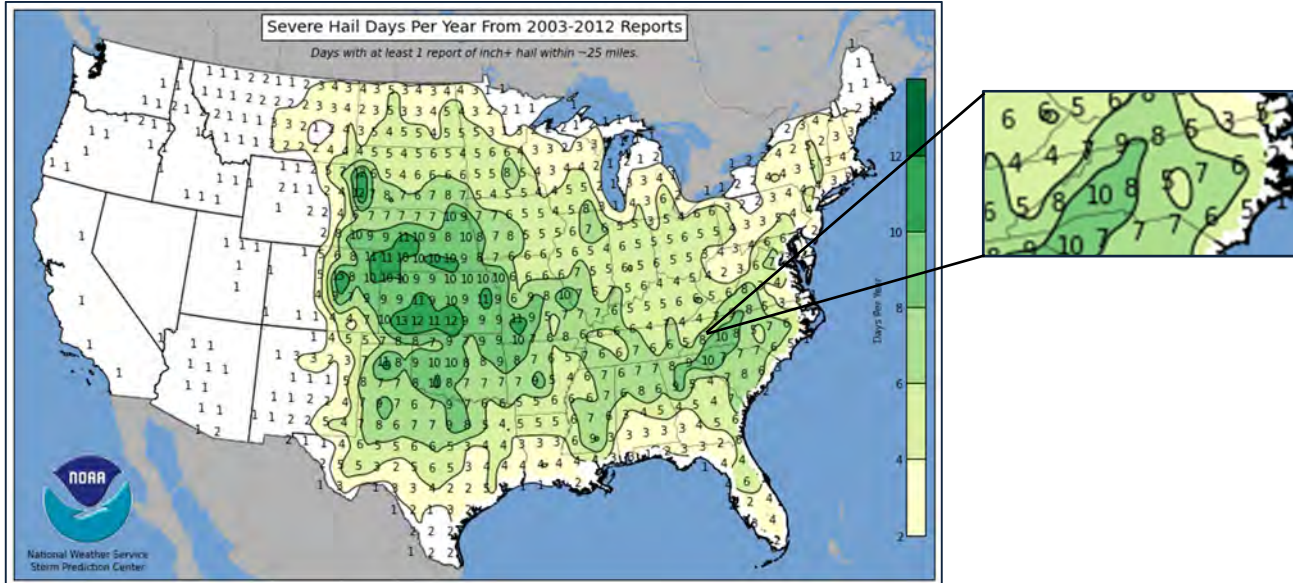
SIZE CODES	DIAMETER	RELATIONAL SIZE
0	5-9	Pea
1	9-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

Hail annually causes more than \$1 billion in damage to property and crops. It damages buildings and homes by perforating holes in roofs and shingles, breaking windows and denting siding, and damages automobiles by denting panels and breaking windows. Hail rarely causes any deaths; however, several dozen people are injured each year in the United States.

5.4.2 Location

Hailstorms frequently accompany thunderstorms, so their locations and spatial extents coincide. It is assumed the Smoky Mountain Region is uniformly exposed to severe thunderstorms; therefore, all areas of the region are equally exposed to hailstorms. Additionally, according to the National Weather Service, the Smoky Mountain Region is located in an area of the United States that receives an average of eight to ten days per year with hail events (see **Figure 5.2** below).

FIGURE 5.2: UNITED STATES AVERAGE NUMBER OF DAYS PER YEAR WITH SEVERE HAIL EVENTS



5.4.3 Historical Occurrences

National Centers for Environmental Information’s (NCEI) Storm Events Database, reported 217 hailstorm events in the Smoky Mountain Region between 1970 and 2016. **Table 5.8** is a summary of the hail events in the Smoky Mountain Region. **Table 5.9** provides detailed information about of these events. Events occurring on tribal lands are presented in bold. In all, these hail occurrences resulted in over \$1.9 million (2017 dollars) in property damages, most of which were reported in Jackson County. Hail ranged in diameter from 0.75 inches to 3.0 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 as reports are typically limited to public reports and absent of private insurance claim reporting. Furthermore, high losses in Jackson 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. **Figure 5.3** presents the location and size of hail events in the Smoky Mountain Region.

TABLE 5.8: SUMMARY OF HAIL OCCURRENCES IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)
CHEROKEE COUNTY	51	\$15,580
Andrews	9	\$0

SECTION 5: HAZARD PROFILES

Location	Number of Occurrences	Property Damage (2017 Dollars)
Murphy	14	\$0
Unincorporated Area	28	\$15,580
GRAHAM COUNTY	32	\$0
Fontana	1	\$0
Lake Santeetlah	0	\$0
Robbinsville	17	\$0
Unincorporated Area	14	\$0
HAYWOOD COUNTY	58	\$73,427
Canton	10	\$73,427
Clyde	3	\$0
Maggie Valley	3	\$0
Waynesville	19	\$0
Unincorporated Area	23	\$0
JACKSON COUNTY	57	\$1,811,068
Dillsboro	1	\$0
Forest Hills	0	\$0
Sylva	11	\$1,811,068
Webster	2	\$0
Unincorporated Area	43	\$0
SWAIN COUNTY	19	\$0
Bryson City	10	\$0
Unincorporated Area	9	\$0
EASTERN BAND OF CHEROKEE INDIANS	4	\$0
SMOKY MOUNTAIN REGION TOTAL	217	\$1,900,074

Source: National Centers for Environmental Information

TABLE 5.9: HISTORICAL HAIL OCCURRENCES IN THE SMOKY MOUNTAIN REGION

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
CHEROKEE COUNTY				
Cherokee County	5/31/1981	1.50	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	3/15/1989	0.75	0/0	\$0
Cherokee County	5/20/1989	1.75	0/0	\$0
Cherokee County	6/2/1989	0.75	0/0	\$0
Cherokee County	4/9/1991	0.75	0/0	\$0
Cherokee County	3/19/1992	1.25	0/0	\$0
Murphy	3/31/1993	1.75	0/0	\$0
Murphy	3/31/1993	0.88	0/0	\$0
Murphy	8/25/1993	1.00	0/0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
CHEROKEE COUNTY				
Cherokee County	5/15/1994	1.75	0/0	\$0
Hayesville	5/14/1995	0.75	0/0	\$0
Andrews	8/19/1995	0.75	0/0	\$0
Murphy	1/5/1997	0.75	0/0	\$0
Countywide	1/24/1997	1.00	0/0	\$0
Murphy	1/24/1997	1.00	0/0	\$0
Murphy and Andrews	3/29/1997	0.75	0/0	\$0
Andrews	4/21/1997	0.75	0/0	\$0
Ranger	6/21/1997	1.75	0/0	\$0
Andrews	11/30/1997	1.25	0/0	\$0
Andrews	11/30/1997	1.25	0/0	\$0
Ranger	1/8/1998	0.75	0/0	\$0
Andrews	1/8/1998	0.75	0/0	\$0
Marble	2/17/1998	1.00	0/0	\$0
Hiwassee Dam	4/8/1998	1.00	0/0	\$0
Andrews	4/8/1998	0.75	0/0	\$0
Murphy	5/7/1998	1.00	0/0	\$0
Andrews Murphy Airport	9/6/1998	1.00	0/0	\$0
Murphy	5/7/1999	1.75	0/0	\$0
Violet	6/25/2001	0.75	0/0	\$0
Marble	4/28/2002	1.00	0/0	\$7,790
Peachtree	4/28/2002	1.75	0/0	\$7,790
Hiwassee Dam	5/2/2002	1.75	0/0	\$0
Marble	6/4/2002	0.88	0/0	\$0
Andrews	7/22/2002	0.75	0/0	\$0
Murphy	4/30/2003	0.75	0/0	\$0
Murphy	6/6/2005	1.75	0/0	\$0
Murphy	4/19/2006	0.88	0/0	\$0
Marble	4/21/2006	1.25	0/0	\$0
Andrews	5/20/2006	0.75	0/0	\$0
Andrews	5/20/2006	1.00	0/0	\$0
Hiwassee Dam	5/20/2006	0.88	0/0	\$0
Murphy	5/21/2006	0.75	0/0	\$0
Valleytown	5/20/2008	0.75	0/0	\$0
McGeetown	8/2/2008	1.00	0/0	\$0
Murphy	3/28/2010	1.25	0/0	\$0
Murphy	3/28/2010	1.25	0/0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
CHEROKEE COUNTY				
Persimmon Creek	3/31/2012	1.00	0/0	\$0
Murphy	4/26/2012	1.00	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
GRAHAM COUNTY				
Graham County	4/3/1974	3.00	0/0	\$0
Graham County	4/9/1991	0.75	0/0	\$0
Robbinsville	2/21/1993	1.75	0/0	\$0
Robbinsville	3/31/1993	0.75	0/0	\$0
Robbinsville	4/15/1993	0.88	0/0	\$0
Robbinsville	11/11/1995	0.75	0/0	\$0
Robbinsville	6/24/1996	0.75	0/0	\$0
Tapoco	3/29/1997	1.75	0/0	\$0
Tapoco	7/4/1997	1.25	0/0	\$0
Robbinsville	7/4/1997	1.25	0/0	\$0
Robbinsville	2/17/1998	0.75	0/0	\$0
Fontana	4/3/1998	0.75	0/0	\$0
Tuskegee	4/16/1998	1.00	0/0	\$0
Tapoco	4/16/1998	1.75	0/0	\$0
Stecoah	4/16/1998	1.00	0/0	\$0
Robbinsville	5/7/1998	1.00	0/0	\$0
Robbinsville	5/7/1999	0.75	0/0	\$0
Robbinsville	6/14/2001	0.75	0/0	\$0
Stecoah	7/8/2001	0.75	0/0	\$0
Stecoah	6/4/2002	0.88	0/0	\$0
Robbinsville	6/20/2002	1.75	0/0	\$0
Robbinsville	5/2/2003	0.75	0/0	\$0
Stecoah	5/15/2003	1.25	0/0	\$0
Robbinsville	7/14/2004	0.75	0/0	\$0
Robbinsville	5/20/2008	0.75	0/0	\$0
Bear Creek	5/8/2009	0.88	0/0	\$0
Rhymers Ferry	5/8/2009	1.00	0/0	\$0
Milltown	6/11/2009	0.75	0/0	\$0
Robbinsville	9/27/2010	0.75	0/0	\$0
Tulula	6/8/2011	1.00	0/0	\$0
Robbinsville	4/26/2012	0.75	0/0	\$0
Robbinsville	5/22/2013	1.00	0/0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
HAYWOOD COUNTY				
Haywood County	1/13/1972	1.00	0/0	\$0
Haywood County	7/10/1985	1.75	0/0	\$0
Cove Creek	2/21/1993	0.75	0/0	\$0
Waynesville	5/18/1995	0.75	0/0	\$0
Maggie Valley	7/28/1997	1.00	0/0	\$0
Waynesville	1/8/1998	1.00	0/0	\$0
Waynesville	4/16/1998	0.88	0/0	\$0
Waynesville	5/6/1999	0.88	0/0	\$0
Maggie Valley	5/3/2000	0.75	0/0	\$0
Waynesville	5/3/2000	0.75	0/0	\$0
Canton	6/26/2000	1.75	0/0	\$0
Cruso	6/3/2002	0.75	0/0	\$0
Canton	6/4/2002	1.00	0/0	\$0
Waynesville	6/4/2002	1.75	0/0	\$0
Waynesville	6/4/2002	0.75	0/0	\$0
Cruso	5/2/2003	0.75	0/0	\$0
Waynesville	8/26/2003	1.00	0/0	\$0
Waynesville	4/12/2004	0.75	0/0	\$0
Clyde	5/8/2004	0.88	0/0	\$0
Canton	5/8/2004	1.00	0/0	\$73,427
Hazelwood	8/2/2004	1.25	0/0	\$0
Canton	6/18/2005	0.75	0/0	\$0
Waynesville	6/18/2005	1.00	0/0	\$0
Waynesville	6/18/2005	0.88	0/0	\$0
Waynesville	4/3/2006	1.75	0/0	\$0
Bethel	4/3/2006	1.00	0/0	\$0
Waynesville	4/3/2006	0.88	0/0	\$0
Canton	4/3/2006	0.75	0/0	\$0
Waynesville	4/8/2006	0.88	0/0	\$0
Maggie Valley	5/30/2006	1.75	0/0	\$0
Waynesville	6/22/2006	0.88	0/0	\$0
Cruso	8/4/2006	0.75	0/0	\$0
Waynesville	8/6/2006	0.88	0/0	\$0
Cruso	6/12/2007	1.00	0/0	\$0
Clyde	6/27/2007	0.75	0/0	\$0
Canton	6/28/2007	1.00	0/0	\$0
Waynesville	5/9/2008	1.00	0/0	\$0
Canton	6/9/2008	0.75	0/0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
HAYWOOD COUNTY				
Canton	6/9/2008	0.75	0/0	\$0
Waynesville	6/9/2008	0.88	0/0	\$0
Waynesville	5/9/2009	0.75	0/0	\$0
Shelton Laurel	5/14/2009	0.88	0/0	\$0
Cove	6/2/2009	0.75	0/0	\$0
Crabtree	4/9/2011	0.75	0/0	\$0
Beaverdam	4/9/2011	1.75	0/0	\$0
Suttontown	4/3/2012	1.00	0/0	\$0
West Canton	4/3/2012	1.00	0/0	\$0
Beaverdam	4/3/2012	1.00	0/0	\$0
Cruso	5/2/2012	1.00	0/0	\$0
Clyde	7/1/2012	1.25	0/0	\$0
Pines Creek	7/1/2012	1.00	0/0	\$0
Canton	7/30/2012	1.00	0/0	\$0
Canton	8/8/2012	0.88	0/0	\$0
West Canton	8/12/2013	1.00	0/0	\$0
Cruso	6/19/2014	1.00	0/0	\$0
Hyatt Creek	7/27/2014	1.75	0/0	\$0
Bethel	7/13/2016	0.75	0/0	\$0
Bethel	7/13/2016	1.00	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
JACKSON COUNTY				
Jackson County	6/7/1985	1.00	0/0	\$0
Jackson County	3/15/1989	0.75	0/0	\$0
Cashiers	3/31/1993	1.75	0/0	\$0
Sylva	4/15/1993	1.00	0/0	\$0
Sylva	8/25/1993	0.75	0/0	\$0
Jackson County	5/18/1995	1.75	0/0	\$0
Sylva	5/24/1996	1.50	0/0	\$0
Cullowhee	5/24/1996	0.75	0/0	\$0
Savannah	5/24/1996	1.75	0/0	\$0
Sylva	5/24/1996	1.75	0/0	\$1,811,068
Cullowhee	5/26/1996	1.50	0/0	\$0
Balsam	4/16/1998	1.00	0/0	\$0
Sylva	5/27/1998	1.00	0/0	\$0
Cullowhee	5/6/1999	0.75	0/0	\$0

SECTION 5: HAZARD PROFILES

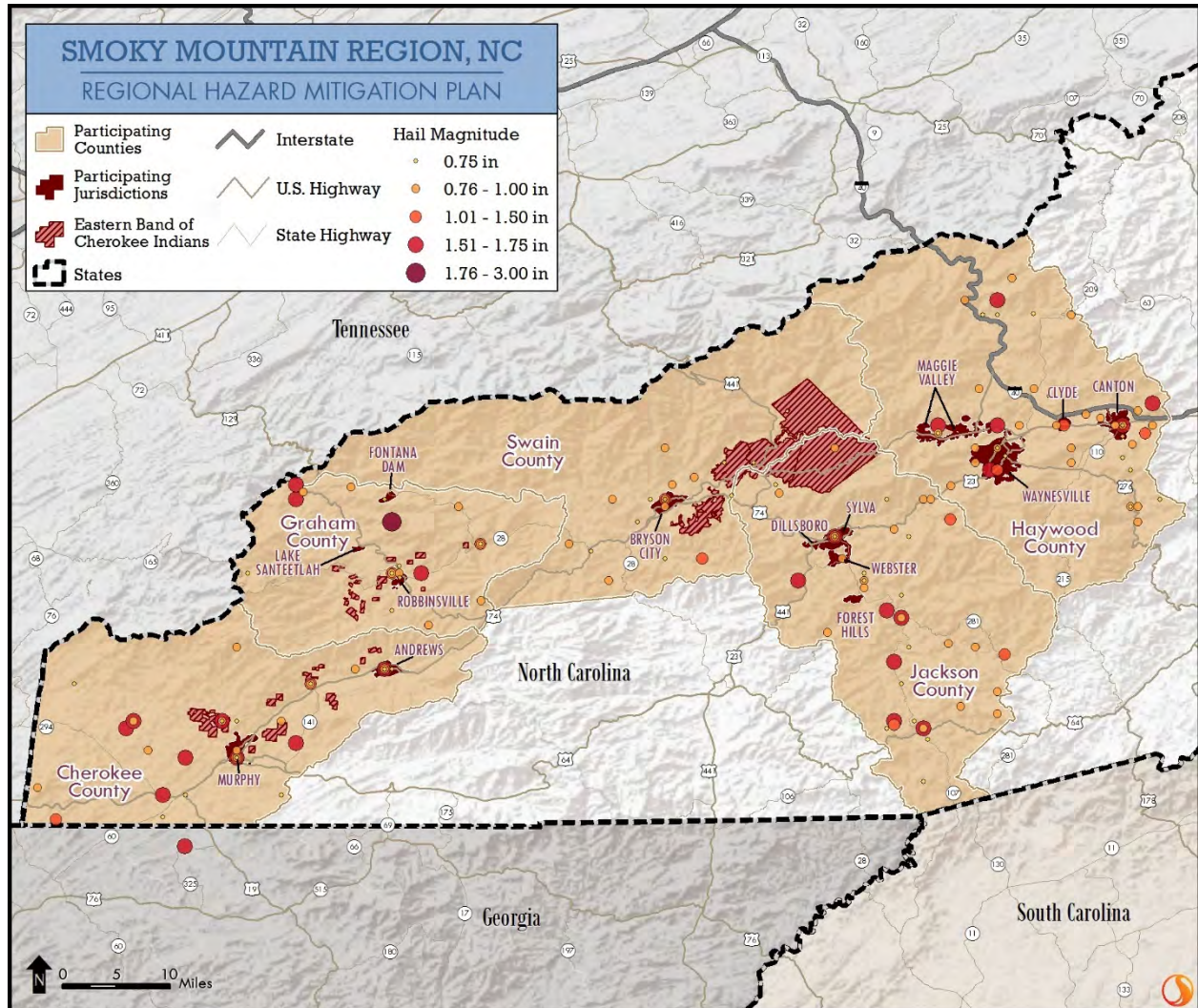
Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
JACKSON COUNTY				
Sylva	12/16/2000	0.88	0/0	\$0
Balsam	6/4/2002	1.00	0/0	\$0
Glenville	7/1/2002	0.75	0/0	\$0
Sylva	4/30/2003	0.75	0/0	\$0
Sylva	8/26/2003	0.75	0/0	\$0
Tuckasegee	5/8/2004	1.75	0/0	\$0
Cullowhee	5/8/2004	1.00	0/0	\$0
Cashiers	3/27/2005	0.88	0/0	\$0
Sylva	4/12/2005	0.88	0/0	\$0
Cullowhee	6/20/2005	0.75	0/0	\$0
Wolf Mountain	4/3/2006	1.00	0/0	\$0
Sylva	4/8/2006	0.75	0/0	\$0
Cullowhee	4/19/2006	1.00	0/0	\$0
Cullowhee	4/19/2006	1.75	0/0	\$0
Cashiers	4/20/2006	0.75	0/0	\$0
Wolf Mountain	5/20/2006	1.00	0/0	\$0
Sylva	5/30/2006	0.75	0/0	\$0
Cullowhee	6/12/2007	0.75	0/0	\$0
Cashiers	6/22/2008	0.75	0/0	\$0
Cashiers	6/22/2008	0.75	0/0	\$0
Cashiers	7/21/2008	0.75	0/0	\$0
Wilmot	5/8/2009	0.75	0/0	\$0
Dicks Creek	5/8/2009	1.00	0/0	\$0
Balsam	5/8/2009	1.50	0/0	\$0
Dillsboro	5/16/2009	0.75	0/0	\$0
Big Ridge	6/2/2009	0.88	0/0	\$0
Balsam	5/11/2011	0.88	0/0	\$0
Wolf Mountain	6/1/2011	1.25	0/0	\$0
Cullowhee	6/6/2011	1.00	0/0	\$0
Pumpkintown	6/6/2011	0.88	0/0	\$0
Cullowhee	6/8/2011	0.75	0/0	\$0
Webster	6/8/2011	1.00	0/0	\$0
Rock Bridge	6/9/2011	1.00	0/0	\$0
Glenville	3/2/2012	1.75	0/0	\$0
Tuckasegee	4/3/2012	0.75	0/0	\$0
Tuckasegee	4/3/2012	1.00	0/0	\$0
Bessie	4/26/2012	1.75	0/0	\$0
Bessie	4/26/2012	1.50	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
JACKSON COUNTY				
Cashiers	7/1/2012	1.00	0/0	\$0
Willits	7/5/2012	1.00	0/0	\$0
Balsam	6/19/2014	0.88	0/0	\$0
Wilmot	7/8/2016	0.88	0/0	\$0
Webster	7/8/2016	1.00	0/0	\$0
SWAIN COUNTY				
Bryson City	4/16/1998	1.00	0/0	\$0
Bryson City	5/7/1999	0.75	0/0	\$0
Bryson City	6/4/2002	0.75	0/0	\$0
Cherokee	6/20/2002	0.75	0/0	\$0
Bryson City	7/2/2002	0.75	0/0	\$0
Cherokee	7/22/2002	0.75	0/0	\$0
Bryson City	2/21/2005	0.88	0/0	\$0
Cherokee	4/19/2006	0.75	0/0	\$0
Alarka	5/20/2008	0.75	0/0	\$0
Bryson City	6/9/2008	0.75	0/0	\$0
Bryson City	6/18/2011	0.88	0/0	\$0
Proctor	6/24/2011	1.00	0/0	\$0
Needmore	4/3/2012	0.88	0/0	\$0
Almond	4/3/2012	0.75	0/0	\$0
Bryson City	4/26/2012	1.25	0/0	\$0
Bryson City	4/26/2012	0.88	0/0	\$0
Ela	5/22/2013	1.00	0/0	\$0
Almond	7/14/2015	1.00	0/0	\$0
Bryson City	9/5/2015	1.00	0/0	\$0

Eastern Band of Cherokee Indians

A map of the hail events reported to NCEI (below) shows four historical hail events on EBCI land, which occurred in either Jackson or Swain County. These events are shown in bold in the table above. These events did not result in losses, injuries, or fatalities. No additional information on historical hail events for EBCI was available in the previous hazard mitigation plan, web sources, or local newspapers.

FIGURE 5.3 HAIL EVENTS IN THE SMOKY MOUNTAIN REGION



5.4.4 Extent

According to the TORRO Scale, hailstones can exceed 100 mm (3.9 inches) in diameter, known as super hail. The largest hailstone reported in the Smoky Mountain Region occurred on April 3, 1974 in Graham County, measuring 3 inches in diameter. However, there have been thirty reports of 1.75 inch hailstones throughout the region. Hailstones of this size are considered destructive and can damage vehicle bodywork, dent aircrafts, and pit holes in bricks.

Extent can also be measured in terms of damage and human impacts (including loss of life and injuries). The greatest amount of damage reported from a single hail event was over \$1,800,000 (2017 dollars). However, costlier events are possible.

5.4.5 Probability of Future Occurrences

A total of 217 events are recorded in the NCEI's Storm Events Database between 1970 and 2016, meaning hail has occurred at an average of 4.7 events annually. Based on this information, it is assumed hail is highly likely (greater than 90% annual chance) to impact the Smoky Mountain Region each year.

County-specific probabilities can be found in the respective appendices. Future hail events can be expected to continue to cause minor damage to property and vehicles throughout the region.

5.5 HURRICANE AND TROPICAL STORM

5.5.1 Background

Hurricanes and tropical storms 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. Most 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 5.10**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.






TABLE 5.10: SAFFIR-SIMPSON HURRICANE WIND SCALE

Category	Maximum Sustained Wind Speed (MPH)
1	74–95
2	96–110
3	111–129
4	130–156
5	157 +

Source: National Hurricane Center (2012)

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, 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 5.11** 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 5.11: HURRICANE DAMAGE CLASSIFICATIONS

Storm 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

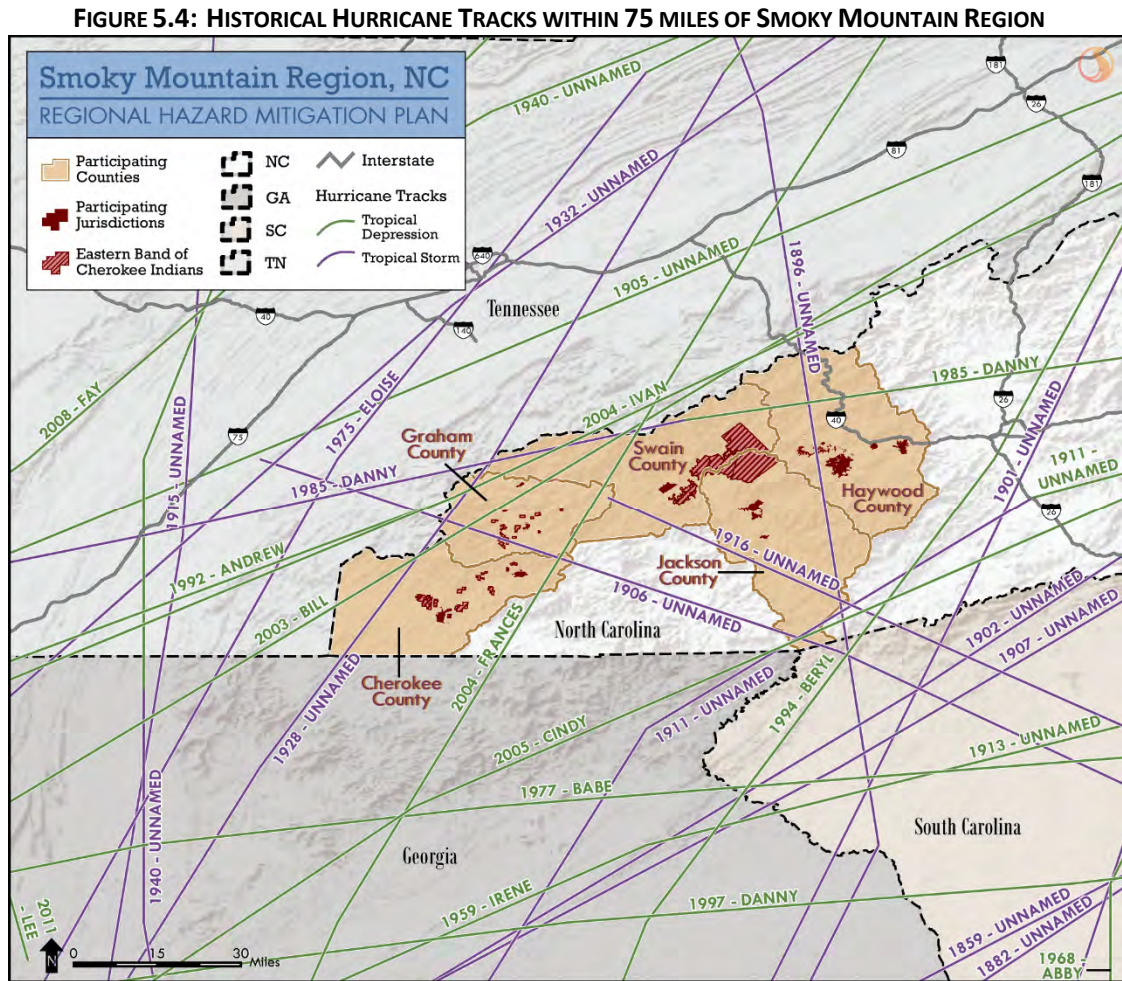
Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States. While coastal areas are most directly exposed to the brunt of landfalling storms, their impact is often felt hundreds of miles inland and they can affect the Smoky Mountain Region. All areas in the Smoky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

5.5.3 Historical Occurrences

According to the National Hurricane Center’s historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of the Smoky Mountain Region between 1850 and 2015 (latest data available). This includes nine tropical storms and nineteen tropical depressions.²

² 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

Of the recorded storm events, one tropical storm traversed directly through the Smoky Mountain Region as shown in **Figure 5.4**. **Table 5.12** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region), and Category of the storm based on the Saffir-Simpson Scale.



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

TABLE 5.12: HISTORICAL STORM TRACKS WITHIN 75 MILES OF SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category in Smoky Mountain region
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category in Smoky Mountain region
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
10/9/1959	Irene	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

NCEI-reported Events

The NCEI reported only one event associated with a hurricane or tropical storm in the Smoky Mountain Region between 1950 and 2016. This storm was a tropical depression recorded in Cherokee County on September 16, 2004. The storm resulted in \$15,000 (2017 dollars) of property damage and numerous trees and power lines were reported down across the county. Although not stated in the NCEI event description, this event is presumed to be Ivan based on the date and storm category. However, as shown in the table above, additional events have impacted the region.

Disaster Declarations

Federal records also indicate that three disaster declarations were made in 2003 (Hurricane Isabel), 2004 (Tropical Storm Frances), and 2004 (Hurricane Ivan) for the region.³ A number of hurricanes and tropical storms have caused tremendous, widespread damage to the state that have not impacted the region. Examples include Hurricane Hugo (1989) Hurricane Matthew (2016).

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

³ 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 – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports more than 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

5.5.4 Extent

Extent of hurricane hazards can be defined by hurricane category and wind speed. The strongest event reported within 75 miles of the Smoky Mountain region was a 52-mile per hour tropical storm. However, due to the region's proximity to the Atlantic Coast, stronger events are possible.

Additionally, given the regional nature of the hazard, all areas are equally exposed to this hazard. However, when the region is impacted, damages could be severe, threatening lives and property throughout the planning area.

5.5.5 Probability of Future Occurrences

A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of the Smoky Mountain Region between 1851 and 2015 resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of "likely" (between 10 and 90% annual probability) was assigned.

5.6 LIGHTNING

5.6.1 Background

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

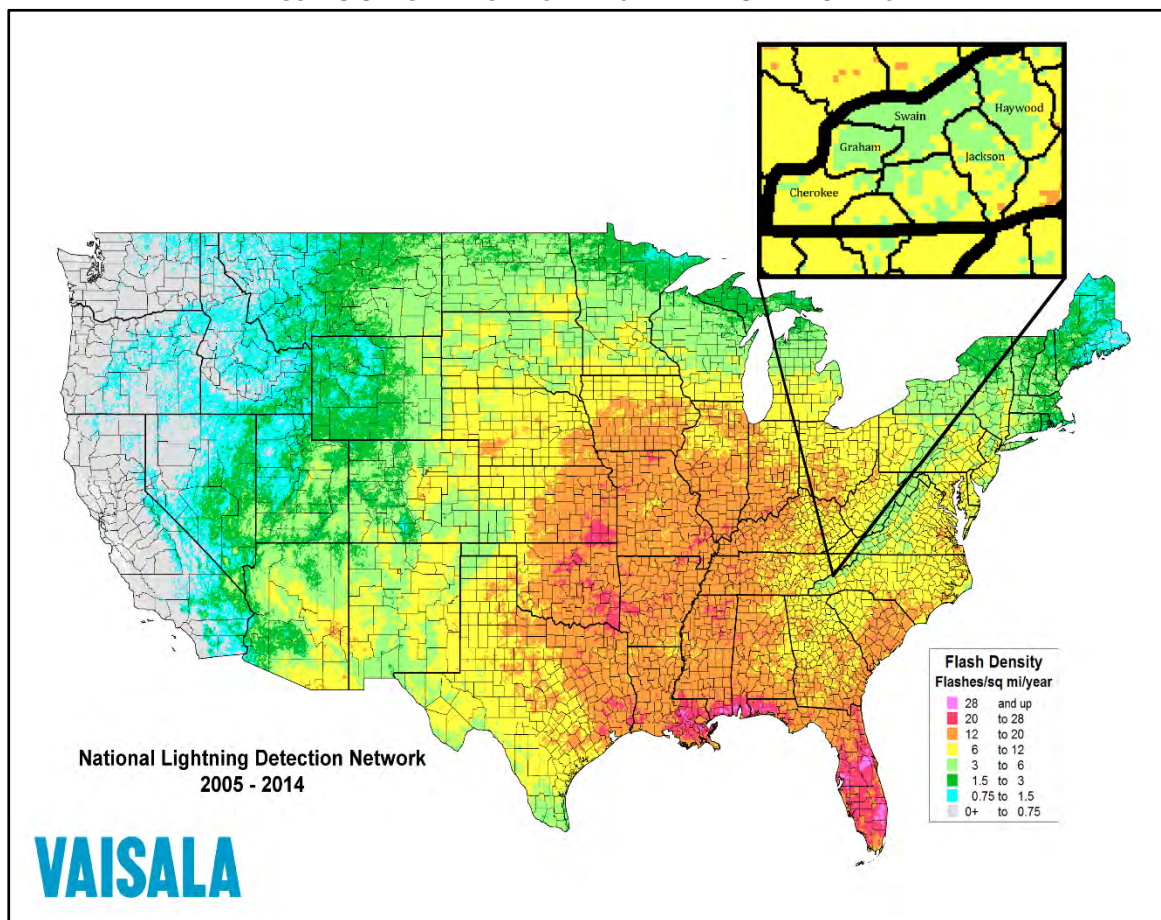
surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning may also strike outside of heavy rain and might occur as far as 10 miles away 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 can 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.

5.6.2 Location

Lightning occurs randomly, therefore it is impossible to predict where and with what frequency it will strike. It is assumed that all the Smoky Mountain Region is uniformly exposed to lightning. Vaisala, Inc.'s U.S. National Lightning Detection Network (NLDN) compiled lightning flash data from 2005 to 2014 to show lightning flash frequency per square mile per year; see **Figure 5.5**. The Smoky Mountain Region experiences an average of 3 to 12 flashes per square mile per year. Graham, Swain, Haywood, and Jackson Counties appear to be on the lower end of that range (3 to 6 flashes), while Cherokee County appears on the upper end (6 to 12 flashes).

FIGURE 5.5: LIGHTNING FLASH DENSITY IN THE UNITED STATES



Source: Vaisala U.S. National Lightning Detection Network

5.6.3 Historical Occurrences

There has been a total of 28 recorded lightning events in the Smoky Mountain Region since 1987. The NCEI has been recording lightning events since 1996 in the Storm Events database. Twenty-two of the total events in the region were retrieved from the NCEI's database over a 20-year period (1996-2016). Five events were retrieved from the EBCI's Fire Management Plan, while another was reported in an EBCI local newspaper (details below).

The 22 events reported by the NCEI resulted in over \$3.5 million (2017 dollars) in damages, as listed in summary **Table 5.11**. Furthermore, lightning caused one fatality and twelve injuries throughout the Smoky Mountain Region. Detailed information on historical lightning events can be found in **Table 5.12**.

It is certain that more than 28 lightning events have impacted the Region. Many of the reported events are those that caused damage. Therefore, it should be expected damages are likely much higher for this hazard than what is reported.

TABLE 5.11: SUMMARY OF LIGHTNING OCCURRENCES IN SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)
CHEROKEE COUNTY	0	\$0
Andrews	0	\$0
Murphy	0	\$0
Unincorporated Area	0	\$0
GRAHAM COUNTY	1	\$0
Fontana	0	\$0
Lake Santeetlah	0	\$0
Robbinsville	1	\$0
Unincorporated Area	0	\$0
HAYWOOD COUNTY	5	\$161,766
Canton	3	\$147,080
Clyde	0	\$0
Maggie Valley	1	\$14,685
Waynesville	0	\$0
Unincorporated Area	1	\$0
JACKSON COUNTY	15	\$3,251,691
Dillsboro	1	\$11,941
Forest Hills	0	\$0
Sylva	2	\$38,798
Webster	0	\$0
Unincorporated Area	12	\$3,200,952
SWAIN COUNTY	1	\$115,927
Bryson City	0	\$0

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Unincorporated Area	1	\$115,927
EASTERN BAND OF CHEROKEE INDIANS	6	-
SMOKY MOUNTAIN REGION TOTAL	28	\$3,529,384

Source: NCEI Storm Events Database, EBCI 2001 Fire Management Plan, Cherokee One Feather

TABLE 5.12: HISTORICAL LIGHTNING OCCURRENCES IN SMOKY MOUNTAIN REGION

Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY				
No data available for Cherokee County in Storm Events Database				
Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY				
Robbinsville	5/5/1999	0/0	\$0	Intense lightning in Robbinsville knocked out the Graham county 911 system for the entire day.
Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY				
Canton	12/16/2000	0/0	\$1,653	Lightning struck a tree and then a house, causing some property damage.
Maggie Valley	5/8/2004	0/0	\$14,685	Lightning ignited a house fire.
Canton	5/19/2005	0/0	\$2,852	Lightning struck a building, resulting in some windows being blown out.
Canton	7/19/2005	0/0	\$142,576	Lightning struck a home, igniting a fire which destroyed the structure.
Big East Fork	6/22/2012	0/2	\$0	A father and son were injured by lightning while camping in the Graveyard Fields area along the Blue Ridge Parkway.
Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY				
Cashiers	6/14/1997	0/0	\$0	Two houses were struck by lightning during the early morning of the 14th. Both houses suffered total losses.
Big Ridge	7/3/1999	0/7	\$0	A lightning strike caused injuries to 7 people at a campground, including burns to 3 people.
Cashiers	8/8/1999	1/2	\$0	Lightning struck 3 people hiking at Whiteside Cliffs near the Macon county line and South Carolina state line, and at an elevation of 4900 feet. A teenage boy died and the two others were injured.
Cashiers	7/3/2001	0/0	\$160,471	Lightning struck an unoccupied house, resulting in a fire that destroyed the structure and all its contents.
Cashiers	7/2/2002	0/1	\$0	A man in a hottub was struck by lightning.

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Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY				
Cullowhee	5/8/2004	0/0	\$0	Lightning caused widespread power outages.
Sylva	6/27/2005	0/0	\$7,129	Lightning sparked a fire out an outbuilding on Cowee Ridge. The structure was destroyed.
Cashiers	6/27/2005	0/0	\$285,152	Lightning sparked a house fire, causing extensive damage to the structure and its contents.
Cullowhee	5/6/2009	0/0	\$63,339	Lightning ignited a fire at a home in the Bariwood Community, causing significant damage.
Sylva	5/16/2009	0/0	\$31,669	Lightning ignited a fire at a garage housing two vintage vehicles on Thorn Hill Rd.
Grimeshawes	5/15/2010	0/0	\$184,481	Lightning ignited a fire at a condominium complex on Turning Leaf Lane. Two units were heavily damaged and two more received minor damage.
Big Ridge	4/25/2011	0/0	\$1,074,647	Lightning struck a house in the Glenridge area, igniting a fire that completely destroyed the home.
Bessie	4/27/2011	0/0	\$1,194,052	Lightning struck a home in the Finley Forest area, igniting a fire that destroyed the home.
Dillsboro	12/21/2011	0/0	\$238,810	Lightning started a fire at a home on Bright Mountain Rd, destroying the structure.
Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY				
Whittier	5/29/2012	0/0	\$115,927	Lightning started a fire at a home on Conley Mountain Association Rd. The home was destroyed.
Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS				
No data available for EBCI in Storm Events Database				

Source: NCEI Storm Events Database

Eastern Band of Cherokee Indians

Information on historical lightning occurrences was found in the EBCI Fire Management Plan and the local newspaper, *Cherokee One Feather*. The 2001 EBCI Fire Management Plan lists five lightning strikes occurred over a 10-year period from 1986 to 1997, causing fires that burned 33.5 acres. The *Cherokee One Feather* also reported that storms with high winds and lightning caused massive power outages on June 15, 2011. After an extensive news and internet search, no recent reports (occurring since the last plan update) of damaging lightning strikes were found.

5.6.4 Extent

The Smoky Mountain Region receives 3 to 12 lightning flashes per square mile per year (**Figure 5.5**). However, not all these flashes result in lightning strikes. Lightning extent can also be measured in terms of damages. The greatest amount of damage reported from a single event was \$1,194,052 (2017 dollars), though costlier events are possible and likely have occurred in the past (particularly due to structure fires). Further, fatalities have occurred with this hazard and are possible in the future.

5.6.5 Probability of Future Occurrences

The NCEI Storm Events Database reported 22 events between 1996 and 2016, resulting in an average of more than one event each year for the last 20 years. From combined sources, total of 28 events were reported between 1987 and 2016, resulting in an average annual occurrence rate of 97-percent for that period. It is likely the data is not inclusive of all events in the area. Lightning flashes and strikes are an annual occurrence, though all events may not result in damage. Therefore, the lightning hazard was assigned a probability of “highly likely” (greater than 90% annual chance). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the region.

5.7 THUNDERSTORM WIND/HIGH WIND

5.7.1 Background

Thunderstorms can produce a variety of accompanying hazards including wind (discussed here), hail, and lightning. Although thunderstorms generally affect a small area, they are very dangerous and may cause substantial property damage.

Three conditions must 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 Smoky Mountain 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

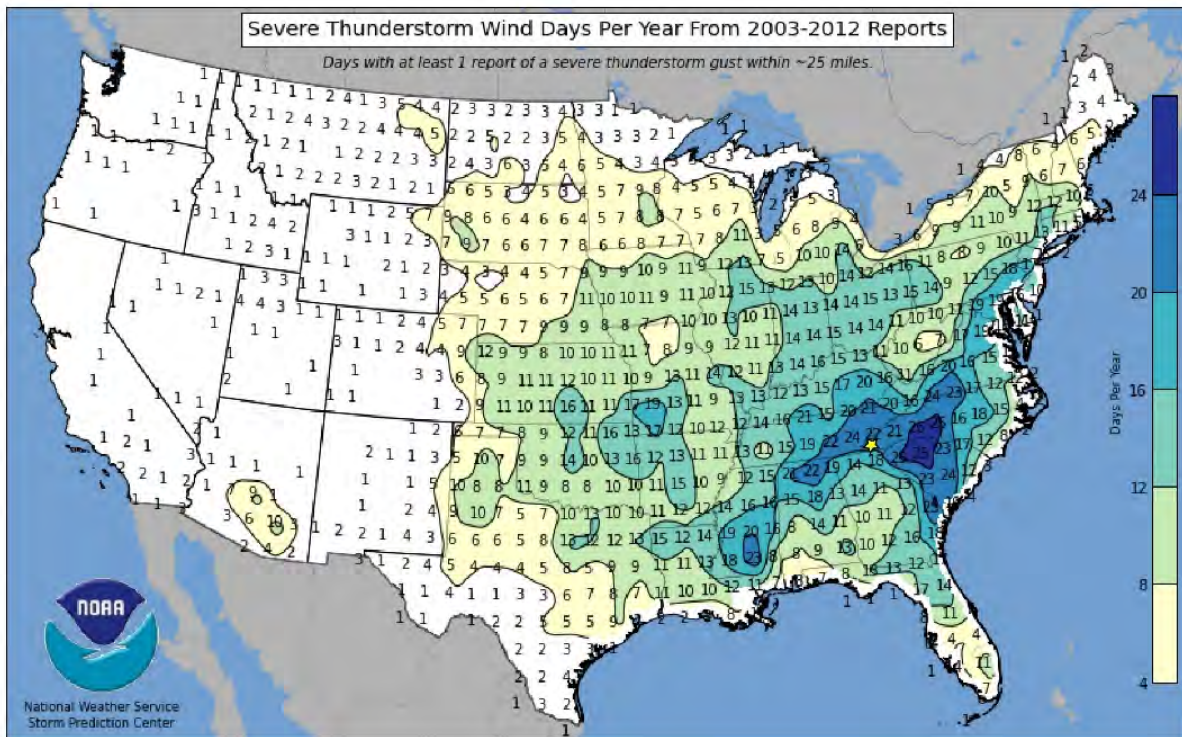
through the Ohio Valley. This creates a tight pressure gradient across the region, resulting in high winds which increase with elevation. It is common for gusts of 30 to 60 miles per hour during the winter months.

Downbursts are also possible with thunderstorm events. Such events are an excessive burst of wind more than 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.”

5.7.2 Location

A 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. According to the National Weather Service, there are 20 to 24 days per year where at least one severe thunderstorm gust is reported within 25 miles of the Smoky Mountain Region (see **Figure 5.6** below).

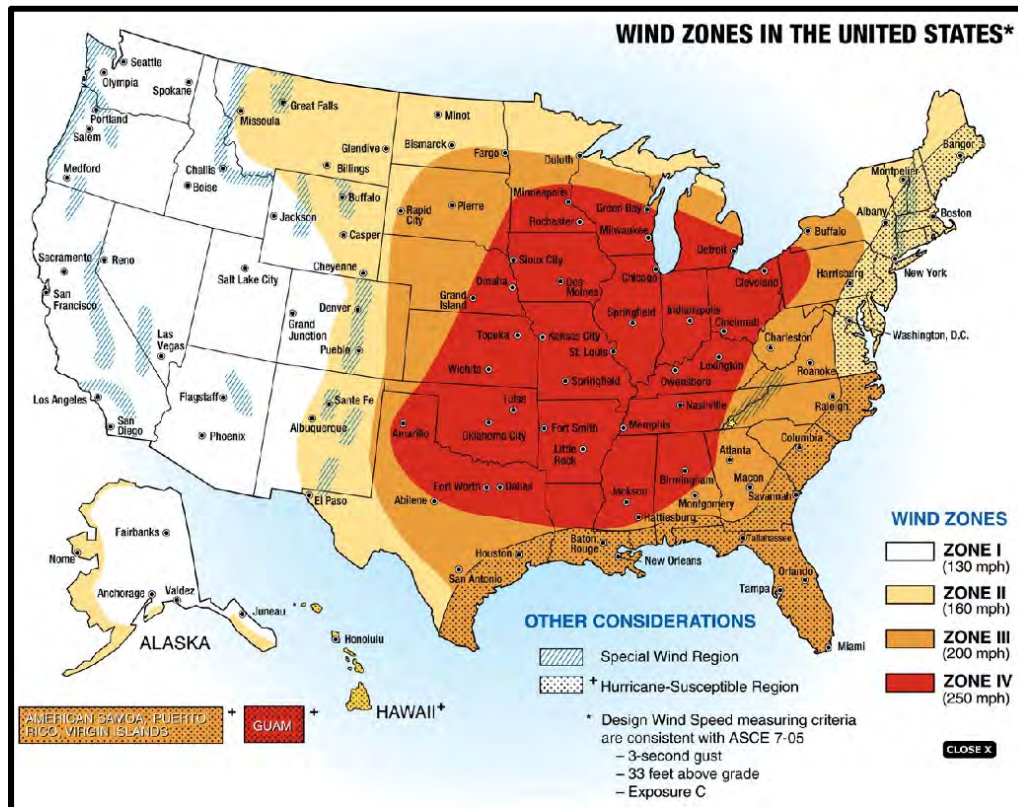
FIGURE 5.6: UNITED STATES AVERAGE NUMBER OF DAYS PER YEAR WITH SEVERE THUNDERSTORM WIND



The map in **Figure 5.7** from the Federal Emergency Management Agency illustrates wind zones in the United States. The Smoky Mountain Region is in Wind Zone III, where speeds can reach up to 200 miles per hour (in 3-second gusts). This area is also considered a “Special Wind Region.” FEMA defines a Special Wind Region as an area where records or experience indicate basic wind speeds are higher than normal. These regions generally consist of mountainous terrain, gorges, and other special topographic features.

Also, the Smoky Mountain Region typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that the Smoky Mountain Region has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

FIGURE 5.7: UNITED STATES WIND ZONE MAP



5.7.3 Historical Occurrences

Severe storms resulted in six disaster declarations for one or more counties in the Smoky Mountain Region in 1973, 1977, 1995, 1998, and 2013.⁴ The NCEI Storm Events Database reports three different types of wind events: High Wind events, Strong Wind events, and Thunderstorm Wind events. Thunderstorm wind events have been recorded since 1950, while high wind and strong wind events have been recorded since 1996. There have been 143 high wind events (1996 – 2016), 28 strong wind events (1996 – 2016), and 409 thunderstorm wind events (1950 – 2016), totaling 580 wind events since 1950 in the Smoky Mountain Region.

⁴ These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional thunderstorm events have occurred in the Smoky Mountain Region. As additional local data becomes available, this hazard profile will be amended.

These events caused nearly \$4.2 million in property damages and almost \$15 thousand in crop damages (2017 dollars). There were reports of six injuries and one fatality. **Table 5.13** and **Table 5.14** summarize this information. **Table 5.15** presents detailed high wind, strong wind, and thunderstorm wind event reports including date, magnitude, and associated damages for each event.⁵

TABLE 5.13: SUMMARY OF HIGH WIND/STRONG WIND OCCURRENCES IN SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Cherokee County	10	\$119,165	\$14,876
Graham County	24	\$733,467	\$0
Haywood County	74	\$794,947	\$0
Jackson County	74	\$1,803,814	\$0
Swain County	27	\$743,879	\$0
Eastern Band of Cherokee Indians*	-	-	-
SMOKY MOUNTAIN REGION TOTAL	171	\$4,195,271	\$14,876

Source: NCEI Storm Events Database

*High wind/strong wind events are reported at the county level and therefore any events affected EBCI are accounted for in the county totals.

TABLE 5.14: SUMMARY OF THUNDERSTORM (WIND) OCCURRENCES IN SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
CHEROKEE COUNTY	132	\$1,033,629	\$71,651
Andrews	10	\$150,964	\$30,098
Murphy	55	\$534,637	\$0
Unincorporated Area	67	\$348,028	\$41,553
GRAHAM COUNTY	72	\$74,803	\$0
Fontana	8	\$0	\$0
Lake Santeetlah	2	\$0	\$0
Robbinsville	28	\$68,750	\$0
Unincorporated Area	34	\$6,053	\$0
HAYWOOD COUNTY	58	\$282,477	\$0
Canton	7	\$11,269	\$0
Clyde	3	\$0	\$0
Maggie Valley	13	\$90,553	\$0
Waynesville	14	\$180,656	\$0
Unincorporated Area	21	\$0	\$0
JACKSON COUNTY	85	\$804,942	\$0
Dillsboro	2	\$18,652	\$0
Forest Hills	0	\$0	\$0
Sylva	22	\$297,174	\$0
Webster	3	\$0	\$15,580
Unincorporated Area	58	\$473,536	\$0

SECTION 5: HAZARD PROFILES

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
SWAIN COUNTY	54	\$56,087	\$0
Bryson City	24	\$15,580	\$0
Unincorporated Area	30	\$40,507	\$0
EASTERN BAND OF CHEROKEE INDIANS	8	\$22,512	
SMOKY MOUNTAIN REGION TOTAL	409	\$2,274,449	\$71,651

TABLE 5.15: HISTORICAL THUNDERSTORM (WIND) OCCURRENCES IN SMOKY MOUNTAIN REGION

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Cherokee Co.	7/9/1965	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/25/1966	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/24/1970	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/2/1974	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	12/15/1974	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	2/18/1976	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	2/18/1976	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/5/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/6/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/6/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/7/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/15/1987	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/20/1989	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/1/1990	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/9/1991	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	7/3/1992	Thunderstorm Wind	--	0/0	\$0	--
Northern	2/21/1993	Thunderstorm Wind	--	0/0	\$0	--
Murphy	4/15/1993	Thunderstorm Wind	--	0/0	\$0	--
Murphy	8/25/1993	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/14/1994	Thunderstorm Wind	--	0/0	\$0	--
Nr Andrews	5/14/1995	Thunderstorm Wind	--	0/0	\$0	--
Marble	8/19/1995	Thunderstorm Wind	--	0/0	\$9,326	Several trees were blown down.
Murphy	5/25/1996	Thunderstorm Wind	51	0/0	\$0	--
Andrews	6/7/1996	Thunderstorm Wind	--	0/0	\$3,622	Several trees were downed.
Murphy	8/19/1996	Thunderstorm Wind	--	0/0	\$0	--
Andrews	7/4/1997	Thunderstorm Wind	--	0/0	\$35,409	Large trees and powerlines blown down.
Cherokee Co.	4/3/1998	Thunderstorm Wind	--	0/0	\$17,433	Trees and powerlines down countywide.
Murphy	6/4/1998	Thunderstorm Wind	--	0/0	\$0	--
Andrews Murphy Airport	9/6/1998	Thunderstorm Wind	--	0/0	\$12,203	Plane blown over.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Cherokee Co.	5/7/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees and power lines down.
Cherokee Co.	7/5/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees down.
Andrews	7/6/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees down on Highway 19
Murphy	7/29/1999	Thunderstorm Wind	--	0/0	\$6,810	Trees down.
Cherokee Co.	2/13/2000	Thunderstorm Wind	--	0/0	\$0	--
Marble	2/13/2000	Thunderstorm Wind	--	0/0	\$16,528	Power lines down.
Cherokee Co.	3/19/2000	High Wind	60	0/0	\$0	Widespread 30-40 mph winds with gusts to 60 mph in the higher elevations.
Cherokee Co.	11/9/2000	Thunderstorm Wind	--	0/0	\$0	--
Violet	6/25/2001	Thunderstorm Wind	--	0/0	\$0	--
Hiwassee Dam	7/3/2001	Thunderstorm Wind	--	0/0	\$0	--
Ranger	7/4/2001	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	10/25/2001	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	11/29/2001	High Wind	--	0/0	\$32,094	Strong winds uprooted trees and downed power lines.
Murphy	5/2/2002	Thunderstorm Wind	--	0/0	\$38,949	Mobile home blown into road and trees down throughout county.
Murphy	5/13/2002	Thunderstorm Wind	--	0/0	\$15,580	Trees reported down west of Murphy
Murphy	6/4/2002	Thunderstorm Wind	--	0/0	\$15,580	Trees reported down in Murphy.
Unaka	6/20/2002	Thunderstorm Wind	--	0/0	\$15,580	Two trees were reported down in Unaka.
Murphy	7/30/2002	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	11/11/2002	Thunderstorm Wind	--	0/0	\$23,370	Several trees reported down countywide.
Hiwassee Dam	5/5/2003	Thunderstorm Wind	60	0/0	\$7,563	A few trees downed at Hiwassee Dam.
Oak Park	6/11/2003	Thunderstorm Wind	55	0/0	\$27,227	Several trees and power lines down across the west portion of the county.
Hiwassee Dam	6/11/2003	Thunderstorm Wind	55	0/0	\$9,076	Two large trees were reported down on highway 294 in the Hiwassee Dam area.
Ranger	7/13/2003	Thunderstorm Wind	60	0/0	\$0	--
Andrews	7/16/2003	Thunderstorm Wind	60	0/0	\$0	--
Murphy	8/15/2003	Thunderstorm Wind	60	0/0	\$0	--
Cherokee Co.	11/18/2003	Thunderstorm Wind	70	0/0	\$30,252	Numerous trees were downed countywide.
Murphy	5/22/2004	Thunderstorm Wind	60	0/0	\$22,028	Several trees were reported down on power lines four miles west northwest of Murphy.
Murphy	5/31/2004	Thunderstorm Wind	65	0/0	\$29,371	Numerous trees were down countywide.
Murphy	6/12/2004	Thunderstorm Wind	65	0/0	\$7,343	Trees down on power lines at Bear Paw Village
Murphy	6/12/2004	Thunderstorm Wind	60	0/0	\$2,937	Tree down on Duke Lodge Road
Murphy	7/5/2004	Thunderstorm Wind	60	0/0	\$29,371	Trees downed across the county.
Andrews	7/12/2004	Thunderstorm Wind	60	0/0	\$1,469	A tree down at Junaluska and Andrews.
Murphy	7/13/2004	Thunderstorm Wind	60	0/0	\$22,028	Trees down in eastern and western sections of the county around 1245 am EDT on 07/14.
Hiwassee Dam	7/14/2004	Thunderstorm Wind	60	0/0	\$14,685	Several trees were reported down in the Hiwassee Dam area.

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Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Murphy	7/26/2004	Thunderstorm Wind	60	0/0	\$2,937	A tree was reported down on Country Walk Road.
Murphy	7/26/2004	Thunderstorm Wind	60	0/0	\$2,937	A tree was reported down on Harshaw Road.
Cherokee Co.	12/22/2004	High Wind	45	0/0	\$0	--
Murphy	2/21/2005	Thunderstorm Wind	65	0/0	\$4,277	Numerous trees down countywide
Murphy	6/6/2005	Thunderstorm Wind	65	0/0	\$21,386	Numerous trees down countywide.
Andrews	8/3/2005	Thunderstorm Wind	60	0/0	\$21,386	A few trees reported down in Andrews area.
Murphy	8/4/2005	Thunderstorm Wind	60	0/0	\$14,258	Several trees down near Murphy
Cherokee Co.	4/8/2006	Thunderstorm Wind	60	0/0	\$13,842	Several trees and powerlines down across the eastern third of the county.
Murphy	5/20/2006	Thunderstorm Wind	60	0/0	\$27,685	Several trees and power lines were reported down one mile west of Murphy.
Murphy	5/20/2006	Thunderstorm Wind	60	0/0	\$16,611	A few trees were reported down on power lines two miles east of Murphy.
Marble	5/27/2006	Thunderstorm Wind	60	0/0	\$8,305	A few trees were reported down in Marble.
Andrews	6/23/2006	Thunderstorm Wind	60	0/0	\$16,611	Several trees and powerlines down.
Murphy	7/4/2006	Thunderstorm Wind	65	0/0	\$34,606	Several trees and powerlines were reported down across the county with a concentration noted in the western part of the county.
Murphy	7/4/2006	Thunderstorm Wind	60	0/0	\$20,764	Several trees reported down in the National Forest west and northwest of Murphy.
Murphy	7/13/2006	Thunderstorm Wind	60	0/0	\$24,916	Several trees and powerlines reported down across the southern third of the county.
Cherokee Co.	7/21/2006	Thunderstorm Wind	60	0/0	\$41,527	Numerous trees down across the county.
Murphy	8/15/2006	Thunderstorm Wind	55	0/0	\$4,153	Two trees down near Murphy.
Murphy	9/23/2006	Thunderstorm Wind	60	0/0	\$13,842	A few trees down on a private road.
Murphy	9/28/2006	Thunderstorm Wind	60	0/0	\$27,685	Numerous trees were reported down across the western third of the county.
Cherokee Co.	10/17/2006	High Wind	65	0/0	\$34,606	Numerous trees and powerlines down across the highest elevations.
Cherokee Co.	12/1/2006	Strong Wind	40	0/0	\$13,842	A few trees down countywide.
Cherokee Co.	2/25/2007	High Wind	60	0/0	\$20,159	Numerous trees down at higher elevations.
Andrews	6/25/2007	Thunderstorm Wind	55	0/0	\$10,751	Winds downed a tree at Andrews and numerous powerlines countywide.
Marble	1/30/2008	Thunderstorm Wind	55	0/0	\$0	--
Ogreeta	4/11/2008	Thunderstorm Wind	60	0/0	\$6,524	Three trees downed by thunderstorm winds near the Hiwassee Dam.
Valleytown	5/20/2008	Thunderstorm Wind	60	0/0	\$0	--
Rhodo	5/20/2008	Thunderstorm Wind	55	0/0	\$0	--
Valleytown	6/28/2008	Thunderstorm Wind	52	0/0	\$6,524	A large tree downed on powerlines.
Postell	6/28/2008	Thunderstorm Wind	50	0/0	\$1,305	A tree downed on Candy Mountain Road west of Murphy.
Ogreeta	6/28/2008	Thunderstorm Wind	50	0/0	\$1,305	A tree downed at Hiwassee Dam.
Murphy	7/6/2008	Thunderstorm Wind	55	0/0	\$0	--
Murphy	7/21/2008	Thunderstorm Wind	55	0/0	\$0	--
Murphy	7/22/2008	Thunderstorm Wind	55	0/0	\$0	--

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Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Holhouse	7/28/2008	Thunderstorm Wind	55	0/0	\$0	--
Mission	7/28/2008	Thunderstorm Wind	55	0/0	\$0	--
Johnsonville	8/2/2008	Thunderstorm Wind	50	0/0	\$2,610	A tree downed by thunderstorm winds in the western portions of the county.
Murphy	6/11/2009	Thunderstorm Wind	55	0/0	\$10,134	A trained spotter reported several trees downed by thunderstorm winds in Murphy.
Murphy	6/17/2009	Thunderstorm Wind	52	0/0	\$6,334	A few trees downed by thunderstorm winds.
Murphy	6/17/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Ranger	6/21/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Murphy	6/21/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Hiwassee Dam	6/28/2009	Thunderstorm Wind	52	0/0	\$6,334	One tree and several powerlines downed by thunderstorm winds northwest of Murphy.
Sunny Point	6/28/2009	Thunderstorm Wind	50	0/0	\$2,534	One tree downed southwest of Murphy.
Cherokee Co.	12/9/2009	High Wind	60	0/0	\$12,668	Several trees downed countywide.
Marble	6/25/2010	Thunderstorm Wind	50	0/0	\$2,460	One tree downed by thunderstorm winds.
Hiwassee Dam	7/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Murphy	8/13/2010	Thunderstorm Wind	55	0/0	\$12,299	Numerous trees downed by thunderstorm winds across the western half of the county.
Andrews	10/25/2010	Thunderstorm Wind	60	0/0	\$12,299	Trees and powerlines downed by thunderstorm winds along with numerous tree limbs down around Andrews.
Cherokee Co.	11/30/2010	High Wind	50	0/0	\$0	--
Murphy	2/25/2011	Thunderstorm Wind	50	0/0	\$9,552	One tree downed on Harshaw Road and several trees downed on US 19 by thunderstorm wind near Murphy.
Culberson	3/26/2011	Thunderstorm Wind	50	0/0	\$0	--
Hothouse	6/9/2011	Thunderstorm Wind	50	0/0	\$5,970	A few trees downed by thunderstorm winds 3 miles northwest of Hothouse.
Andrews	6/15/2011	Thunderstorm Wind	60	0/0	\$23,881	Numerous trees and powerlines downed by thunderstorm wind in Andrews.
Hiwassee Dam	6/18/2011	Thunderstorm Wind	55	0/0	\$11,941	Several trees downed by thunderstorm wind at the Hiwassee Dam.
Murphy	6/18/2011	Thunderstorm Wind	55	0/0	\$11,941	Several trees downed 6 miles southwest of Murphy in the Ranger area.
Murphy	6/19/2011	Thunderstorm Wind	55	0/0	\$17,911	Several trees and powerlines downed by thunderstorm wind countywide.
Murphy	8/3/2011	Thunderstorm Wind	50	0/0	\$5,970	A tree downed on powerlines near the Pleasant Valley community.
Murphy	8/3/2011	Thunderstorm Wind	50	0/0	\$5,970	A tree downed powerlines by thunderstorm wind at the intersection of Morgan Hill Road and Martins Creek Road near Murphy.
Murphy	8/8/2011	Thunderstorm Wind	60	0/0	\$17,911	Many trees and powerlines downed by thunderstorm wind near Murphy.
Murphy	7/31/2012	Thunderstorm Wind	50	0/0	\$0	--
Murphy	8/1/2012	Thunderstorm Wind	50	0/0	\$3,478	Several trees were downed in Murphy.
Cherokee Co.	12/20/2012	High Wind	50	0/0	\$5,796	At least 2 or 3 trees downed countywide.
Cherokee Co.	1/17/2013	High Wind	52	0/0	\$0	--
Murphy	6/5/2013	Thunderstorm Wind	52	0/0	\$5,628	Several trees downed across the county.

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Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Murphy	6/8/2014	Thunderstorm Wind	50	0/0	\$10,927	Five trees downed in Murphy.
Murphy	6/10/2014	Thunderstorm Wind	50	0/0	\$5,464	Several trees were downed in Murphy.
Bates Creek	7/8/2014	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/8/2014	Thunderstorm Wind	50	0/0	\$0	--
Murphy	6/8/2015	Thunderstorm Wind	50	0/0	\$0	--
Valleytown	6/8/2015	Thunderstorm Wind	50	0/0	\$0	--
Murphy	6/26/2015	Thunderstorm Wind	50	0/0	\$0	--
Grape Creek	7/11/2015	Thunderstorm Wind	50	0/0	\$0	--
Slow Creek	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Valleytown	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Slow Creek	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/6/2016	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Ogreeta	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	5/1/1990	Thunderstorm Wind	--	0/0	\$0	--
Robbinsville	2/21/1993	Thunderstorm Wind	--	0/0	\$0	--
West Portion	8/20/1993	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	5/15/1994	Thunderstorm Wind	--	0/0	\$0	--
Robbinsville	5/14/1995	Thunderstorm Wind	--	0/0	\$0	--
Snowbird	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	5/19/1995	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	1/18/1996	High Wind	--	0/0	\$0	--
Robbinsville	6/24/1996	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	9/16/1996	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/23/1996	High Wind	50	0/0	\$0	--
Stecoah	11/8/1996	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	1/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	3/3/1997	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/4/1997	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	7/4/1997	Thunderstorm Wind	50	0/3	\$0	--
Robbinsville	7/4/1997	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	1/7/1998	High Wind	50	0/0	\$0	--
Fontana Village	5/21/1998	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/10/1998	Strong Wind	--	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	1/23/1999	High Wind	50	0/0	\$0	--
Graham Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Robbinsville	6/10/1999	Thunderstorm Wind	55	0/0	\$0	--
Graham Co.	2/13/2000	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Graham Co.	3/6/2001	High Wind	55	0/0	\$0	--
Fontana Village	7/9/2001	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/13/2001	High Wind	50	0/0	\$0	--
Robbinsville	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	10/24/2001	Thunderstorm Wind	50	0/0	\$16,047	Trees and power lines countywide. The squall line reached Robbinsville, before 1 am. At least two of the trees fell onto automobiles.
Stecoah	10/25/2001	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/29/2001	High Wind	50	0/0	\$0	--
Graham Co.	2/4/2002	High Wind	50	0/0	\$0	--
Stecoah	5/2/2002	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	5/2/2002	Thunderstorm Wind	60	0/0	\$46,739	Trees and powerlines were downed, causing widespread power outages. A tree was blown onto a house, resulting in damage.
Robbinsville	5/13/2002	Thunderstorm Wind	50	0/0	\$1,558	Trees and powerlines were blown down.
Robbinsville	6/20/2002	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Graham Co.	11/11/2002	Thunderstorm Wind	55	0/0	\$3,116	Trees were blown down and power outages occurred across the county.
Graham Co.	2/4/2003	High Wind	60	0/0	\$0	--
Robbinsville	5/2/2003	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/14/2003	High Wind	50	0/0	\$1,513	Trees and power lines were blown down.
Graham Co.	3/5/2004	High Wind	50	0/0	\$1,469	Showers and weak thunderstorms moving across the region brought some of the stronger winds to the surface, causing some trees and power lines to fall. Some power outages occurred.
Graham Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Robbinsville	5/31/2004	Thunderstorm Wind	55	0/0	\$4,406	Trees and power lines were blown down.
Tapoco	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Stecoah	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Robbinsville	7/5/2004	Thunderstorm Wind	55	0/0	\$0	--
Fontana Village	7/13/2004	Thunderstorm Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.
Graham Co.	12/23/2004	High Wind	50	0/0	\$7,343	In Graham County, a garage was blown down in the Sweetwater district. In Madison County, a large sign was blown onto a pickup truck along I-26. Trees were also downed. The strongest winds occurred just before daybreak.
Graham Co.	2/21/2005	Thunderstorm Wind	60	0/0	\$0	--
Robbinsville	5/20/2005	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	6/6/2005	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	8/30/2005	High Wind	50	0/0	\$7,129	As the remnants of hurricane Katrina moved across middle and west Tennessee, high winds developed over the mountains of North Carolina. Numerous trees and power lines were blown down, with damage being most concentrated in the southwest mountains, and in Avery County of the northern mountains. At least 2 trees fell on and damaged structures.
Fontana Village	4/8/2006	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	4/21/2006	Thunderstorm Wind	60	0/0	\$0	--
Robbinsville	5/13/2006	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	7/21/2006	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	12/1/2006	High Wind	55	0/0	\$0	--
Graham Co.	4/15/2007	High Wind	55	0/0	\$0	--
Graham Co.	4/16/2007	High Wind	60	0/0	\$671,958	A widespread damaging high wind event developed during the day of the 16th. However, this 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.
Robbinsville	1/30/2008	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	3/4/2008	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Bear Creek	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Tulula	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Sweetgum	2/11/2009	Thunderstorm Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Cheoah	4/10/2009	Thunderstorm Wind	50	0/0	\$0	--
Brock	5/8/2009	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	6/17/2009	Thunderstorm Wind	55	0/0	\$0	--
Graham Co.	12/9/2009	High Wind	55	0/0	\$0	--
Milltown	7/26/2010	Thunderstorm Wind	50	0/0	\$0	--
Brock	8/5/2010	Thunderstorm Wind	50	0/0	\$0	--
Santeetlah	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Tapoco	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Stecoah	6/7/2011	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	6/15/2011	Thunderstorm Wind	65	0/0	\$0	--
Yellow Creek	6/18/2011	Thunderstorm Wind	55	0/0	\$0	--
Cheoah	6/19/2011	Thunderstorm Wind	50	0/0	\$0	--
Santeetlah	6/19/2011	Thunderstorm Wind	50	0/0	\$0	--
Yellow Creek	8/3/2011	Thunderstorm Wind	50	0/0	\$0	--
Tulula	8/8/2011	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	7/1/2012	Thunderstorm Wind	50	0/0	\$0	--
Stecoah	7/5/2012	Thunderstorm Wind	55	0/0	\$0	--
Milltown	7/31/2012	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	12/26/2012	High Wind	50	0/0	\$0	--
Milltown	1/30/2013	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	2/21/2014	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	5/22/2014	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/14/2015	Thunderstorm Wind	55	0/0	\$0	--
Tapoco	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	1/11/1963	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	6/27/1966	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	8/22/1968	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	4/2/1970	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/25/1975	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	3/21/1978	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	6/5/1985	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/12/1988	Thunderstorm Wind	60	0/0	\$0	--
Waynesville	4/15/1993	Thunderstorm Wind	--	0/0	\$98,428	Trees were blown down, some atop houses.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Canton	9/1/1993	Thunderstorm Wind	43	0/0	\$9,843	A narrowly channeled wind gust estimated at 50 mph knocked over a 71,500 pound empty railroad boxcar. The boxcar was facing upwind between two large buildings with a wide open freight door when the wind knocked it over.
Waynesville	5/14/1995	Thunderstorm Wind	--	0/0	\$55,955	Sheriff reported trees down with one car destroyed and one house damaged.
Lake Junaluska	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Waynesville	8/19/1995	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/18/1996	High Wind	--	0/0	\$0	--
Maggie Valley	4/20/1996	Thunderstorm Wind	--	0/0	\$90,553	--
Waynesville	4/20/1996	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	5/27/1996	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	12/17/1996	High Wind	50	0/0	\$27,166	High gradient winds caused some damage - mostly scattered trees and power lines were downed. In Haywood county trees were blown onto homes in Canton and Waynesville, and a shed was destroyed - the motorcycle inside was severely damaged.
Maggie Valley	7/28/1997	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/3/1998	High Wind	--	0/0	\$24,912	High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.
Maggie Valley	6/22/1998	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	7/20/1998	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Haywood Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Waynesville	5/6/1999	Thunderstorm Wind	52	0/0	\$0	--
Haywood Co.	11/2/1999	High Wind	55	0/0	\$0	--
Haywood Co.	3/28/2000	High Wind	50	0/0	\$0	--
Haywood Co.	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Haywood Co.	12/16/2000	High Wind	55	0/0	\$0	--
Haywood Co.	3/6/2001	High Wind	55	0/0	\$0	--
Haywood Co.	3/20/2001	High Wind	55	0/0	\$0	--
Maggie Valley	6/22/2001	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/8/2001	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	10/13/2001	High Wind	50	0/0	\$0	--
Waynesville	10/25/2001	Thunderstorm Wind	50	0/0	\$8,024	The top was blown out of a large tree, resulting in damage to a car and a house.
Haywood Co.	11/29/2001	High Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Canton	1/24/2002	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/4/2002	High Wind	50	0/0	\$0	--
Waynesville	3/17/2002	Thunderstorm Wind	50	0/0	\$3,116	Several trees were blown down in and around Waynesville. Some were blown onto power lines, resulting in outages
Maggie Valley	5/2/2002	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	6/4/2002	Thunderstorm Wind	50	0/0	\$7,790	Several trees were blown down. One fell on an automobile.
Haywood Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	9/27/2002	High Wind	50	0/0	\$0	--
Haywood Co.	11/17/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	11/22/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	11/30/2002	High Wind	50	0/0	\$0	--
Waynesville	5/2/2003	Thunderstorm Wind	50	0/0	\$1,513	A few trees and power lines were blown down.
Haywood Co.	10/14/2003	High Wind	50	0/0	\$1,513	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.
Haywood Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Clyde	5/8/2004	Thunderstorm Wind	52	0/0	\$0	--
Lake Junaluska	5/31/2004	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	5/31/2004	Thunderstorm Wind	55	0/0	\$4,406	Numerous trees were snapped off or blown down. Numerous power lines were blown down.
Haywood Co.	7/5/2004	High Wind	55	0/0	\$1,469	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.
Lake Junaluska	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/6/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/9/2004	Thunderstorm Wind	52	0/0	\$0	--
Lake Junaluska	8/2/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	8/2/2004	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	9/17/2004	High Wind	50	0/0	\$14,685	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.
Haywood Co.	12/1/2004	High Wind	50	0/0	\$0	--
Haywood Co.	1/22/2005	High Wind	60	0/0	\$0	--
Waynesville	2/21/2005	Thunderstorm Wind	60	0/0	\$1,426	High winds blew down several tall pine trees in the Laurel Ridge area of Waynesville. Some of the trees fell on a vehicle and a home, causing minimal damage.
Haywood Co.	4/2/2005	High Wind	60	0/0	\$7,129	Numerous trees, power poles, and power lines were blown down, resulting in widespread power outages.
Canton	5/19/2005	Thunderstorm Wind	50	0/0	\$1,426	Part of a tin roof off a barn.
Haywood Co.	8/30/2005	High Wind	50	0/0	\$0	--
Haywood Co.	1/14/2006	High Wind	60	0/0	\$0	--
Maggie Valley	4/3/2007	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	4/15/2007	High Wind	55	0/0	\$0	--
Haywood Co.	4/16/2007	High Wind	60	0/0	\$671,958	A widespread wind event caused thousands of trees to fall 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.
Haywood Co.	2/10/2008	High Wind	55	0/0	\$0	--
Haywood Co.	5/11/2008	High Wind	60	0/0	\$0	--
Pines Creek	7/8/2008	Thunderstorm Wind	50	0/0	\$0	--
Clyde	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Cove Creek	6/10/2009	Thunderstorm Wind	50	0/0	\$0	--
Morning Star	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	12/9/2009	High Wind	55	0/0	\$0	--
Cove	6/14/2010	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Maggie Valley	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Lake Junaluska	4/11/2011	Thunderstorm Wind	50	0/0	\$0	--
Nellie	6/15/2011	Thunderstorm Wind	60	0/0	\$0	--
Waterville	2/29/2012	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	4/26/2012	Thunderstorm Wind	55	0/0	\$0	--
Clyde	7/6/2012	Thunderstorm Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Cove Creek	7/6/2012	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	6/13/2013	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	7/20/2013	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/24/2016	High Wind	50	0/0	\$0	--
Haywood Co.	4/3/2016	Strong Wind	40	0/0	\$2,060	Spotter reported a large limb down fell on and significantly damaged a vehicle 2 NW Waynesville.

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Jackson Co.	6/23/1969	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	6/7/1971	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	4/4/1989	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	5/27/1989	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	7/30/1991	Thunderstorm Wind	--	0/0	\$0	--
Sylva	8/25/1993	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	5/18/1995	Thunderstorm Wind	--	0/1	\$149,213	Microburst demolished two mobile homes and damaged seven other homes.
Sylva/Dillsboro	5/18/1995	Thunderstorm Wind	--	0/0	\$18,652	Trees and power lines down. One mobile home damaged
Sylva	9/10/1995	Thunderstorm Wind	--	0/0	\$55,955	A tree fell on top of a house.
Sylva	9/11/1995	Thunderstorm Wind	--	0/0	\$74,606	A large tree was knocked down on the roof of St. John's Episcopal Church on Jackson Street.
Southern Jackson Co.	4/8/1996	High Wind	--	0/0	\$0	--
Cashiers	4/20/1996	Thunderstorm Wind	--	0/0	\$45,277	--
Cullowhee	5/26/1996	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	5/26/1996	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	11/8/1996	Strong Wind	45	0/0	\$0	--
Southern Jackson Co.	11/8/1996	Strong Wind	45	0/0	\$0	--
Northern Jackson Co.	12/17/1996	High Wind	50	0/0	\$0	--
Jackson Co.	1/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	6/14/1997	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	7/4/1997	Thunderstorm Wind	50	0/1	\$0	--
Cashiers	7/28/1997	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	1/7/1998	High Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	1/7/1998	High Wind	50	0/0	\$0	--
Northern Jackson Co.	2/3/1998	High Wind	--	0/0	\$24,912	A strong slow-moving winter storm moved from the Gulf of Mexico north through the Carolinas on the 3rd and 4th, bringing with it heavy rain, snow and high winds. Snow accumulated between 1 and 3 inches across the higher elevations of the mountains by early afternoon on the 3rd. Newland, Beech Mountain and Jonas Ridge had 4 inches of snow by early evening. Mount Mitchell ended up with 20 inches of snow. Roads were icy across the higher elevations and contributed to some wrecks. Heavy rain in Candler early in the morning caused a mobile home to collapse, destroying its' contents. Flooding developed across portions of the mountains during the afternoon as creeks overflowed, covering roads in many areas. High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.
Southern Jackson Co.	2/3/1998	High Wind	--	0/0	\$24,912	A strong slow-moving winter storm moved from the Gulf of Mexico north through the Carolinas on the 3rd and 4th, bringing with it heavy rain, snow and high winds. Snow accumulated between 1 and 3 inches across the higher elevations of the mountains by early afternoon on the 3rd. Newland, Beech Mountain and Jonas Ridge had 4 inches of snow by early evening. Mount Mitchell ended up with 20 inches of snow. Roads were icy across the higher elevations and contributed to some wrecks. Heavy rain in Candler early in the morning caused a mobile home to collapse, destroying its' contents. Flooding developed across portions of the mountains during the afternoon as creeks overflowed, covering roads in many areas. High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.
Sylva Jackson Co.	5/27/1998	Thunderstorm Wind	50	0/0	\$0	--
Sylva Jackson Co.	6/2/1998	Thunderstorm Wind	50	0/0	\$0	--
Sylva	6/19/1998	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	6/21/1998	Thunderstorm Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Southern Jackson Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Cullowhee	5/6/1999	Thunderstorm Wind	60	0/0	\$85,122	Two lines of strong and severe thunderstorms moved across the mountains during the early morning hours, causing a considerable amount of wind damage. One severe thunderstorm spawned a weak tornado in the city of Asheville around sunrise. Along the 2 mile damage path, 500 trees were downed, many on homes and vehicles. A garage was destroyed, roofs were blown partially off a couple buildings, a school roof was damaged, and some condos were condemned from tree damage. Elsewhere in the mountains, damaging thunderstorm winds of nearly 70 mph at times blew numerous trees down, many on houses and cars. A few thousand people were left without power. In addition to damaging wind, a few reports of dime to quarter size hail were received. Intense lightning in Robbinsville knocked out the Graham Co. 911 system for the entire day, and wind gusts near 55 mph blew numerous small limbs onto power lines which resulted in additional power outages across the Co..
Balsam	5/6/1999	Thunderstorm Wind	60	0/0	\$0	--
Savannah	5/6/1999	Thunderstorm Wind	60	0/0	\$0	--
Balsam	5/7/1999	Thunderstorm Wind	50	0/0	\$0	--
Wolf Mountain	7/6/1999	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	11/2/1999	High Wind	55	0/0	\$0	--
Southern Jackson Co.	3/19/2000	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/19/2000	High Wind	55	0/0	\$0	--
Sylva	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Southern Jackson Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	12/16/2000	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/16/2000	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/6/2001	High Wind	55	0/0	\$0	--
Southern Jackson Co.	3/6/2001	High Wind	55	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	3/20/2001	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/20/2001	High Wind	55	0/0	\$0	--
Sylva	6/22/2001	Thunderstorm Wind	50	0/0	\$0	--
Sylva	8/11/2001	Thunderstorm Wind	55	0/0	\$0	--
Southern Jackson Co.	10/13/2001	High Wind	50	0/0	\$0	--
Northern Jackson Co.	10/13/2001	High Wind	50	0/0	\$0	--
Cashiers	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Sylva	10/25/2001	Thunderstorm Wind	60	0/0	\$160,471	Winds blew down 30 to 40 trees at a small theme park and zoo. The trees crushed cages and caused other damage.
Cullowhee	10/25/2001	Thunderstorm Wind	60	0/0	\$160,471	Trees and power lines were blown down across the Co. as a squall line raced across the higher terrain of North Carolina. A small plane tied down at the Jackson Co. airport was flipped and heavily damaged. Some trees fell onto roads. Trees were also blown down at Western Carolina University and in the Fairview area. A large amount of hail was also reported, but no size was known. About 4500 customers lost power.
Southern Jackson Co.	11/24/2001	High Wind	50	0/0	\$0	--
Northern Jackson Co.	2/4/2002	High Wind	50	0/0	\$0	--
Southern Jackson Co.	2/4/2002	High Wind	50	0/0	\$0	--
Webster	3/17/2002	Thunderstorm Wind	65	0/0	\$15,580	The roof was torn off of a manufactured home and blown 250 feet into another home along Caney Fork 3 ESE of Cullowhee. In addition, trees were reported down in Webster, and several power lines were blown down in Cullowhee.
Sylva	5/2/2002	Thunderstorm Wind	60	0/0	\$4,674	Trees and powerlines were blown down in the Dills Creek area, resulting in power outages.
Jackson Co.	5/13/2002	Thunderstorm Wind	50	0/0	\$4,674	Trees and powerlines were blown down.
Cashiers	6/4/2002	Thunderstorm Wind	50	0/0	\$0	--
Jackson Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Jackson Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Jackson Co.	9/27/2002	High Wind	50	0/0	\$0	--
Jackson Co.	9/27/2002	High Wind	50	0/0	\$0	--
Jackson Co.	12/13/2002	High Wind	65	0/0	\$0	--
Northern Jackson Co.	1/23/2003	High Wind	60	0/0	\$1,513	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.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	1/23/2003	High Wind	60	0/0	\$1,513	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.
Jackson Co.	2/4/2003	High Wind	60	0/0	\$0	--
Jackson Co.	2/4/2003	High Wind	60	0/0	\$0	--
Cullowhee	5/2/2003	Thunderstorm Wind	50	0/0	\$7,563	A few trees were blown down at Western Carolina University.
Cashiers	7/5/2003	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	10/14/2003	High Wind	50	0/0	\$1,513	High winds developed ahead of a cold front and blew down numerous trees and power lines across the southwest mountains of North Carolina.
Northern Jackson Co.	10/14/2003	High Wind	50	0/0	\$1,513	High winds developed ahead of a cold front and blew down numerous trees and power lines across the southwest mountains of North Carolina.
Northern Jackson Co.	11/18/2003	High Wind	50	0/0	\$756	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.
Southern Jackson Co.	11/18/2003	High Wind	50	0/0	\$756	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.
Northern Jackson Co.	3/7/2004	High Wind	50	0/0	\$4,406	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.
Southern Jackson Co.	3/7/2004	High Wind	50	0/0	\$2,937	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.
Sylva	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Sylva	6/22/2004	Thunderstorm Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	7/5/2004	High Wind	55	0/0	\$734	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.
Northern Jackson Co.	7/5/2004	High Wind	55	0/0	\$734	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.
Sylva	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Sylva	7/25/2004	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	8/20/2004	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	9/7/2004	High Wind	50	0/0	\$14,685	High winds associated with the remnants of Hurricane Frances produced widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
Southern Jackson Co.	9/7/2004	High Wind	50	0/0	\$14,685	High winds associated with the remnants of Hurricane Frances produced widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
Southern Jackson Co.	9/16/2004	High Wind	55	0/0	\$220,280	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 Co..
Northern Jackson Co.	9/16/2004	High Wind	55	0/0	\$73,427	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 Co..
Northern Jackson Co.	9/17/2004	High Wind	50	0/0	\$0	--
Southern Jackson Co.	9/17/2004	High Wind	50	0/0	\$0	--
Southern Jackson Co.	12/1/2004	High Wind	50	0/0	\$0	--
Northern Jackson Co.	1/22/2005	High Wind	60	0/0	\$0	--
Southern Jackson Co.	1/22/2005	High Wind	60	0/0	\$0	--
Southern Jackson Co.	8/30/2005	High Wind	50	0/0	\$0	--
Northern Jackson Co.	8/30/2005	High Wind	50	0/0	\$0	--
Southern Jackson Co.	1/14/2006	High Wind	60	0/0	\$0	--
Southern Jackson Co.	1/25/2006	High Wind	55	0/0	\$0	--
Northern Jackson Co.	1/25/2006	High Wind	55	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Sylva	4/3/2006	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	6/23/2006	Thunderstorm Wind	50	0/0	\$0	--
Sylva	7/21/2006	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	10/11/2006	Thunderstorm Wind	55	0/0	\$0	--
Southern Jackson Co.	11/15/2006	High Wind	50	0/0	\$0	--
Northern Jackson Co.	11/15/2006	High Wind	50	0/0	\$0	--
Northern Jackson Co.	12/1/2006	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/1/2006	High Wind	55	0/0	\$0	--
Sylva	4/3/2007	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	4/15/2007	High Wind	70	0/0	\$0	--
Southern Jackson Co.	4/16/2007	High Wind	60	0/0	\$671,958	<p>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 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 construction site. Five homes were damaged by fallen trees in Lincoln Co., NC alone. Three homes were damaged in Iredell Co. and in In Catawba Co., 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.</p>

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Northern Jackson Co.	4/16/2007	High Wind	60	0/0	\$671,958	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 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 construction site. Five homes were damaged by fallen trees in Lincoln Co., NC alone. Three homes were damaged in Iredell Co. and in Catawba Co., 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.
Cullowhee	8/24/2007	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	1/30/2008	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	5/11/2008	High Wind	60	0/0	\$0	--
Southern Jackson Co.	5/11/2008	High Wind	60	0/0	\$0	--
Sylva	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--
Webster	7/21/2008	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	12/31/2008	High Wind	50	0/0	\$0	--
Southern Jackson Co.	12/31/2008	Strong Wind	40	0/0	\$32,619	A large tree fell on a home near Cashiers.
Cullowhee	6/11/2009	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	6/17/2009	Strong Wind	40	0/0	\$38,003	A tree was blown down on a trailer on Cope Creek Rd.
Sylva	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--
Beta	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--
Grimeshawes	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--
Webster	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Gay	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	12/9/2009	High Wind	55	0/0	\$0	--
Northern Jackson Co.	12/9/2009	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/25/2009	High Wind	50	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Dillsboro	5/28/2010	Thunderstorm Wind	50	0/0	\$0	--
Grimeshawes	5/28/2010	Thunderstorm Wind	55	0/0	\$0	--
Speedwell	6/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Sylva	9/22/2010	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Norton	10/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	2/28/2011	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	4/4/2011	Thunderstorm Wind	60	0/0	\$0	--
Cashiers	4/27/2011	Thunderstorm Wind	55	0/0	\$0	--
Cashiers	4/27/2011	Thunderstorm Wind	55	0/0	\$0	--
Cullowhee	6/8/2011	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	6/15/2011	Thunderstorm Wind	65	0/0	\$0	--
Norton	6/19/2011	Thunderstorm Wind	60	0/0	\$0	--
Dicks Creek	7/5/2012	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--
Sylva	6/13/2013	Thunderstorm Wind	50	0/0	\$0	--
Sylva	2/21/2014	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	4/28/2014	Thunderstorm Wind	50	0/0	\$0	--
Balsam	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	6/17/2015	Thunderstorm Wind	55	0/0	\$10,609	Law enforcement reported numerous trees and power lines down near the Western Carolina University campus. The campus library and a couple of homes received minor roof damage from fallen trees.
Dicks Creek	6/24/2015	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	8/14/2015	Thunderstorm Wind	50	0/0	\$10,609	Four large pine trees were blown down, with one falling on a garage.
Greens Creek	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--
SWAIN COUNTY						
Swain Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	5/26/1989	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	8/21/1990	Thunderstorm Wind	--	0/0	\$0	--
Fontana	4/15/1993	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	1/18/1996	High Wind	--	0/0	\$0	--
Bryson City	4/20/1996	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	12/17/1996	High Wind	50	0/0	\$0	--
Whittier	1/5/1997	Thunderstorm Wind	52	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	3/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/4/1997	Thunderstorm Wind	50	0/1	\$0	--
Swain Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Swain Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Bryson City	5/6/1999	Thunderstorm Wind	50	0/0	\$0	--
Wesser	5/7/1999	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/13/2000	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Swain Co.	12/16/2000	High Wind	55	0/0	\$0	--
Swain Co.	3/6/2001	High Wind	55	0/0	\$0	--
Bryson City	7/9/2001	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	10/13/2001	High Wind	50	0/0	\$0	--
Bryson City	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	10/25/2001	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	11/24/2001	High Wind	50	0/0	\$0	--
Swain Co.	11/29/2001	High Wind	50	0/0	\$0	--
Lauada	1/24/2002	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/4/2002	High Wind	50	0/0	\$0	--
Bryson City	5/2/2002	Thunderstorm Wind	60	0/0	\$0	--
Smokemont	5/2/2002	Thunderstorm Wind	60	0/0	\$38,949	Numerous trees were downed. A tree and a power pole were blown down onto a house.
Bryson City	5/13/2002	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	7/2/2002	Thunderstorm Wind	60	0/0	\$15,580	Numerous trees were blown down. The roof of a commercial building received damage.
Swain Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Swain Co.	9/27/2002	High Wind	50	0/0	\$0	--
Nantahala	11/11/2002	Thunderstorm Wind	50	0/0	\$1,558	Trees were downed in Nantahala gorge. Scattered tree damage reported countywide.
Swain Co.	2/4/2003	High Wind	60	0/0	\$0	--
Needmore	5/2/2003	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/10/2003	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	10/14/2003	High Wind	50	0/0	\$1,513	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.
Swain Co.	11/18/2003	High Wind	50	0/0	\$4,538	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Alarka	5/31/2004	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/14/2004	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.
Swain Co.	9/17/2004	High Wind	50	0/0	\$14,685	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.
Swain Co.	12/1/2004	High Wind	50	0/0	\$0	--
Swain Co.	1/22/2005	High Wind	50	0/0	\$0	--
Swain Co.	8/30/2005	High Wind	50	0/0	\$7,129	As the remnants of hurricane Katrina moved across middle and west Tennessee, high winds developed over the mountains of North Carolina. Numerous trees and power lines were blown down, with damage being most concentrated in the southwest mountains, and in Avery County of the northern mountains. At least 2 trees fell on and damaged structures.
Swain Co.	1/25/2006	High Wind	55	0/0	\$0	--
Bryson City	4/8/2006	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/21/2006	Thunderstorm Wind	55	0/0	\$0	--
Swain Co.	4/15/2007	High Wind	55	0/0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	4/16/2007	High Wind	60	0/0	\$671,958	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.
Bryson City	7/19/2007	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	8/21/2007	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/21/2008	Thunderstorm Wind	50	0/0	\$0	--
Proctor	6/11/2009	Thunderstorm Wind	55	0/0	\$0	--
Swain Co.	12/9/2009	High Wind	55	0/0	\$0	--
Ela	7/26/2010	Thunderstorm Wind	50	0/0	\$0	--
Unahala	7/31/2010	Thunderstorm Wind	50	0/0	\$0	--
Almond	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Almond	2/28/2011	Thunderstorm Wind	50	0/0	\$0	--
Almond	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Proctor	6/15/2011	Thunderstorm Wind	60	0/0	\$0	--
Wesser	4/26/2012	Thunderstorm Wind	55	0/0	\$0	--
Ravensford	7/5/2012	Thunderstorm Wind	50	0/0	\$0	--
Solola Valley	7/5/2012	Thunderstorm Wind	60	0/0	\$0	--
Roundhill	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--
Almond	5/21/2013	Thunderstorm Wind	50	0/0	\$0	--
Hewitt	6/10/2014	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	6/10/2014	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/24/2016	High Wind	50	0/0	\$0	--
Unahala	6/26/2016	Thunderstorm Wind	50	0/0	\$0	--
Proctor	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Proctor	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS						
Snowbird	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Cherokee	5/27/1996	Thunderstorm Wind	50	0/0	\$0	--
Cherokee	6/20/2002	Thunderstorm Wind	55	0/0	\$15,580	A few trees were blown down, some onto homes.
Cherokee	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Cherokee	4/3/2006	Thunderstorm Wind	50	0/0	\$0	--
Cherokee	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Birdtown	6/22/2011	Thunderstorm Wind	50	0/0	\$0	--
Birdtown	7/27/2014	Thunderstorm Wind	50	1/0	\$5,464	Broadcast media reported a 53-year-old man was extricated from his vehicle then later died from injuries suffered after a tree fell on his vehicle as he was traveling along Old Number 4/Jess Nations Rd. Other trees were reported down in the area as well.

Eastern Band of Cherokee Indians

Several records of wind damage on reservation lands were found in local newspapers, including *Cherokee One Feather* and *Macon County News*. These events included:

- ◆ December 8-9, 2009: Heavy rains and high winds on the evening of December 8 and morning of December 9 caused parts of the Oconaluftee River to flood. The storm also caused downed trees and a mudslide in the Big Cove area. A windspeed of 101 mph was recorded at the Cove Mountain Air Quality Station. (*Source: Cherokee One Feather*)
- ◆ April 4-5, 2011: A severe weather system caused widespread power outages and significant structural damage in the mountain region. Sixty to seventy mile-per-hour wind gusts and rain uprooted large trees and downed electric poles and power lines. Duke Energy estimated that more than 18,000 customers were without power in the area, mostly in Swain and Jackson Counties. Cherokee on the Qualla Boundary was also left almost entirely without power, after a bulk power line was severed. (*Source: Macon County News*)
- ◆ June 15, 2011: Storms with high winds and lightning moved through the area causing power outages throughout Jackson and Swain Counties. Duke Energy estimates 18,000 homes were without power. Snapped limbs and downed trees caused damages. There were no major injuries or fatalities that EBCI Emergency Management was aware of following the event. (*Source: Cherokee One Feather*)
- ◆ July 5, 2012: A severe thunderstorm with high winds moved through the area, causing downed trees and debris. The Great Smoky Mountains National Park confirmed two fatalities and several other injuries. (*Source: Cherokee One Feather*)
- ◆ Undated (reported July 16, 2012): Severe thunderstorms caused damage in Swain and Jackson Counties. Some farms and ranches suffered severe damage, and were eligible to receive Federal assistance for restoration measures. (*Source: Cherokee One Feather*)

5.7.4 Extent

Thunderstorm wind extent is measured in terms of wind speed. Approximately 80-percent of wind events had gusts 50-miles per hour or greater in the region. The highest sustained wind reported in the Smoky

Mountain Region was 70-miles per hour in Southern Jackson County (April 2007). However, stronger gusts are possible. Extent can also be measured in terms damages and human impacts (including injuries and loss of life). The greatest amount of damage associated with one thunderstorm wind event was \$671,958, but costlier events are possible. Further, fatalities and injuries have occurred with this hazard and are possible in the future. The thunderstorm wind extent for each participating county and the EBCI is detailed in each jurisdictions' respective annex.

5.7.5 Probability of Future Occurrences

The NCEI Storm Events Database reported a total of 580 high wind, strong wind, and thunderstorm wind events over 66 years (1950-2016). This is results an average of nearly nine events per year . Additionally, it is likely many events have gone unreported. Therefore, thunderstorm wind events were assigned a probability of “highly likely” (greater than 90-percent annual chance).

5.8 TORNADO

5.8.1 Background

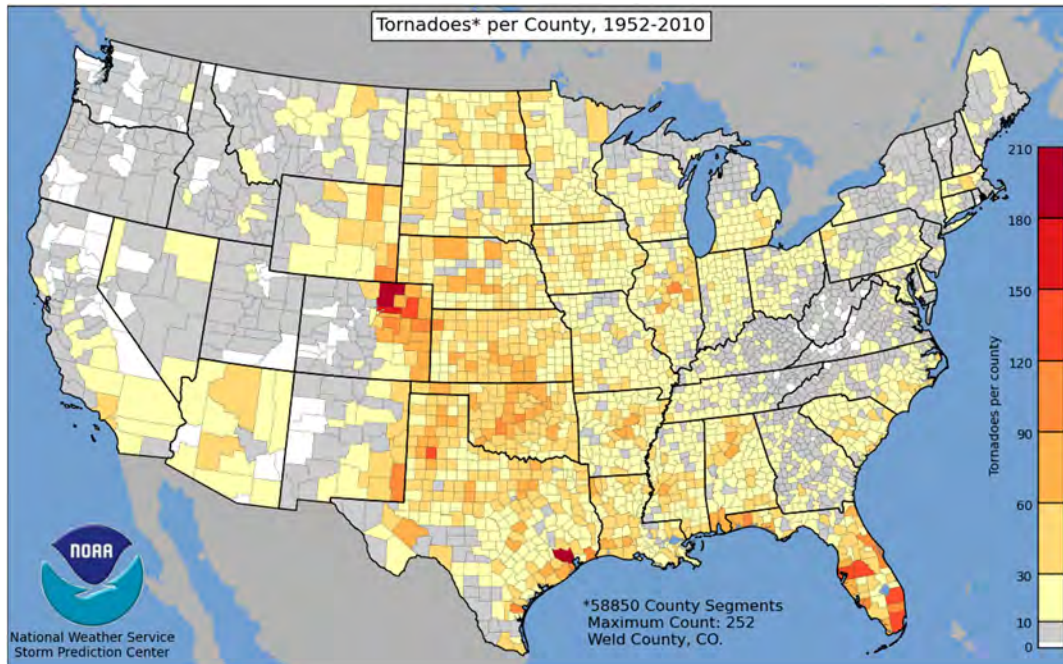
A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air 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. The National Weather Service states 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 can cause extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries.⁶ 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 5.8** shows tornado activity per county in the United States based on the number of recorded tornadoes between 1952 and 2010.⁷

⁶ NOAA, 2009.

⁷ http://www.weather.gov/images/hgx/swa/2013_graphs/tornadoes_county.png

FIGURE 5.8: TORNADO ACTIVITY PER COUNTY IN THE UNITED STATES



Source: National Weather Service Storm Prediction Center

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). Tornadoic 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 5.16**). Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale (**Table 5.17**).

TABLE 5.16: THE FUJITA SCALE (EFFECTIVE PRIOR TO 2005)

F-SCALE NUMBER	INTENSITY	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 to 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.

F-SCALE NUMBER	INTENSITY	WIND SPEED	TYPE OF DAMAGE DONE
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: NOAA Storm Prediction Center ^{8,9}

TABLE 5.17 THE ENHANCED FUJITA SCALE (EFFECTIVE 2005 AND LATER)

EF-SCALE NUMBER	INTENSITY PHRASE	3 SECOND GUST	TYPE OF DAMAGE DONE
EF0	GALE	65–85 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110 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.
EF2	SIGNIFICANT	111–135 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200 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.

Source: NOAA Storm Prediction Center

5.8.2 Location

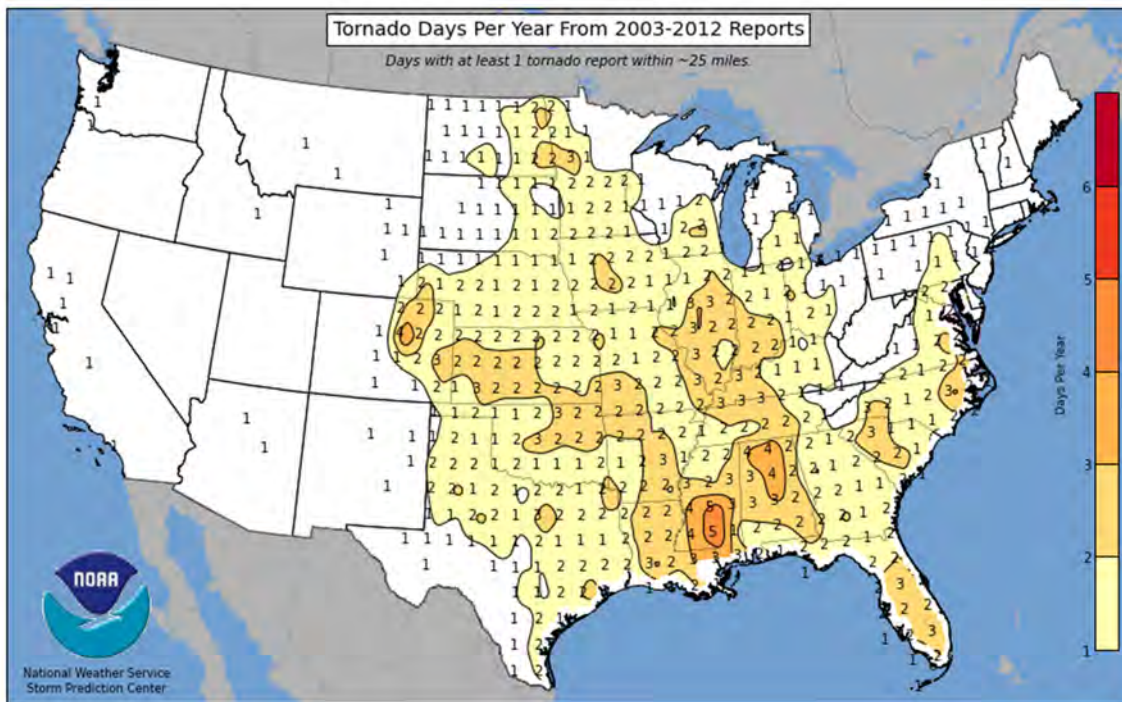
Tornadoes occur throughout the state of North Carolina, and thus in the Smoky Mountain Region. Tornadoes typically impact a relatively small area, but damage may be extensive. Event locations are completely random and it is not possible to predict areas that are more susceptible to tornado strikes over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

⁸ Storm Prediction Center, National Oceanic and Atmospheric Administration. Retrieved May 4, 2017. Available at <http://www.spc.noaa.gov/faq/tornado/ef-scale.html>

⁹ F6 is not always included but has been used to describe extremely strong tornadoes that far surpass F5 levels. Storm Prediction Center, National Oceanic and Atmospheric Administration. Retrieved February 4, 2014. Available at <http://www.spc.noaa.gov/faq/tornado/ef-scale.html>

Additionally, the map below from the National Weather Service (**Figure 5.9**) shows there are zero to two days per year where a tornado is reported within 25 miles of the Smoky Mountain Region based on data from 2003-2012.

FIGURE 5.9: UNITED STATES AVERAGE NUMBER OF TORNADOES REPORTED ANNUALLY



Source: NWS Storm Prediction Center

5.8.3 Historical Occurrences

Tornadoes are a rare occurrence in such a mountainous area. However, they have and do occur in the Smoky Mountain Region. According to the NCEI, there have been a total of 17 recorded tornado events in the Smoky Mountain Region since 1973 (**Table 5.18**), resulting in over \$150 million (2017 dollars) in property damages. In addition, 6 deaths and 38 injuries were reported. Details of tornado events are located in **Table 5.19**. 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 39 years. Further, the reported damages from the NCEI are not inclusive of private claims. Tornado tracks and locations in the Smoky Mountain Region is located in **Figure 5.10**.

TABLE 5.18: SUMMARY OF TORNADO OCCURRENCES IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)
CHEROKEE COUNTY	8	\$147,081,126
Andrews	0	\$0
Murphy	0	\$0
Unincorporated Area	8	\$147,081,126
GRAHAM COUNTY	1	\$1,441,933

SECTION 5: HAZARD PROFILES

Location	Number of Occurrences	Property Damage (2017 Dollars)
Fontana	0	\$0
Lake Santeetlah	0	\$0
Robbinsville	0	\$0
Unincorporated Area	1	\$1,441,933
HAYWOOD COUNTY	2	\$1,250,737
Canton	0	\$0
Clyde	0	\$0
Maggie Valley	0	\$0
Waynesville	0	\$0
Unincorporated Area	2	\$1,250,737
JACKSON COUNTY	3	\$1,310,021
Dillsboro	0	\$0
Forest Hills	0	\$0
Sylva	0	\$0
Webster	0	\$0
Unincorporated Area	3	\$1,310,021
SWAIN COUNTY	3	\$1,265,157
Bryson City	0	\$0
Unincorporated Area	3	\$1,265,157
EASTERN BAND OF CHEROKEE INDIANS*	2	-
SMOKY MOUNTAIN REGION TOTAL	17	\$152,348,973

*Tornado Data for the EBCI was pulled from the previous Tribal Hazard Mitigation Plan

Source: NCEI Storm Events Database

TABLE 5.19: HISTORICAL TORNADO EVENTS IN THE SMOKY MOUNTAIN REGION

Location	Date	Magnitude	Death/Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY					
Cherokee Co.	4/2/1974	F1	0/0	\$144,193	n/a
Cherokee Co	4/3/1974	F1	0/0	\$0	n/a
Cherokee Co	4/3/1974	F4	4/26	\$144,193,281	n/a
Cherokee Co	4/4/1974	F0	0/0	\$144,193	n/a
Cherokee Co	9/21/1979	F0	0/0	\$98,001	n/a
Cherokee Co	4/16/1991	F0	0/0	\$52,162	More than 200 trees were twisted and blown down, and the roof of an elementary school was damaged.
Wolf Creek	5/7/1998	F1	0/0	\$130,747	The tornadic thunderstorm moved east out of Polk County Tennessee into Cherokee County. It damaged several houses and a campground before finally dissipating.

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY					
Postell	3/2/2012	EF2	0/0	\$2,318,548	An EF-2 tornado with maximum wind speeds around 120 mph produced a damage path 21.5 miles long and 400 yards wide. The tornado track extended across almost the entire county and damaged the northern part of Murphy. The storm destroyed five homes and five businesses. The number of structures affected totaled one hundred eighteen. In Murphy, a Feed Store and two rows of commercial storage units were destroyed. Also, a shopping strip with a Sherwin-Williams store suffered heavy damage. Surprisingly there were no injuries reported despite the heavy damage and long track.

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY					
Graham Co.	4/3/1974	F2	2/11	\$1,441,933	n/a

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY					
Haywood Co.	2/18/1976	F1	0/0	\$1,250,737	Tornado touched down near Lake Junaluska, damaging some houses and trees.
Mt. Sterling	6/13/2013	EF1	0/1	\$0	An NWS storm survey found part of an EF1 tornado track in the Big Creek area of the Great Smoky Mountains National Park. An area of extensive tree damage was found about 3.5 miles up the Big Creek trail from its terminus at Big Creek Campground. This was near the end of the damage path, about 15 miles north northwest of Maggie Valley. Hundreds of small trees were snapped 10 to 20 feet above ground level, and dozens of large trees were uprooted along a 0.5-mile section of the trail. Although the rugged terrain prevented a complete survey, the survey team observed a concentrated path of additional significant tree damage along a ridge about 1 mile west of Big Creek and 1 mile east of Low Gap. Discussions with a National Park Service maintenance crew and with a survey team from the University of North Carolina at Asheville indicated that the tornado either developed near or crossed the state line along the crest of the Smokies near Low Gap. A hiker was injured by a fallen tree on Low Gap Trail and required airlifting when he was discovered the next day. This was the first non-F/EF0 tornado ever documented on the NC side of the park.

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY					
Jackson County	3/12/1975	F0	0/0	\$1,320	Tornado touched down less than two minutes near Sylva; slight damage.
Jackson County	6/28/1976	F2	0/0	\$1,250,737	n/a

SECTION 5: HAZARD PROFILES

Location	Date	Magnitude	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY					
Erastus	3/2/2012	EFO	0/0	\$57,964	An NWS storm survey found the path of a weak tornado in the Lake Glenville area. The tornado began along Pine Creek Rd about halfway between the Macon County line and the Lake. It traveled east southeast from there, crossing North Norton Rd and Woods Mountain Trail. Multiple trees were uprooted and snapped and a few homes and one church received minor roof damage. The tornado then crossed the lake and affected Glenshore Dr snapping and uprooting more trees and causing a tree to fall on a home, damaging the roof. The damage path ended there, at the shore of Lake Glenville.

Location	Date	Magnitude	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY					
Swain County	4/3/1974	F2	0/0	\$14,419	n/a
Swain County	2/18/1976	F1	0/0	\$1,250,737	n/a
Solola Valley	3/2/2012	EFO	0/0	\$0	A NWS Storm Survey found a short damage path of a weak tornado in a remote section of the Great Smoky Mountains. Several small trees were snapped and a large tree uprooted along the 100-yard path.

On March 2, 2012, an F2 tornado devastated a corridor across Cherokee County near the Tennessee boarder. The Town of Murphy was hardest hit and damage was reported in 5 additional communities. Cherokee County reported 5 homes and 5 businesses were destroyed, 37 homes and 20 businesses had major damage, and 40 homes and 21 businesses suffered minor damage.

On April 3, 1974, an F4 tornado impacted Cherokee County, including the Town of Murphy. According to NCEI, the tornado resulted in 4 fatalities and 26 injuries, and caused \$144 million in property damage. On the same date, Graham County experienced an F2 tornado that resulted in 2 fatalities, 11 injuries, and \$1.4 million in property damage. The National Weather Service reports that these tornadoes were part of the largest outbreak of tornadoes in the nation’s history, referred to by meteorologists as the Super Outbreak, in which 148 tornadoes swept across 13 states in an estimated 24 hours.¹⁰

Eastern Band of Cherokee Indians-

According to the previous hazard mitigation plan, two tornadoes reportedly touched down on the reservation lands; although, there is no indication of where these events occurred or what damage they caused. *Cherokee One Feather* also reported a severe storm and a tornado caused severe damage in Swain and Jackson County in August 2011.

Additionally, the following tornado events were reported by the Tornado History Project to have paths that traveled on lands neighboring EBCI and may have also impacted the reservation:

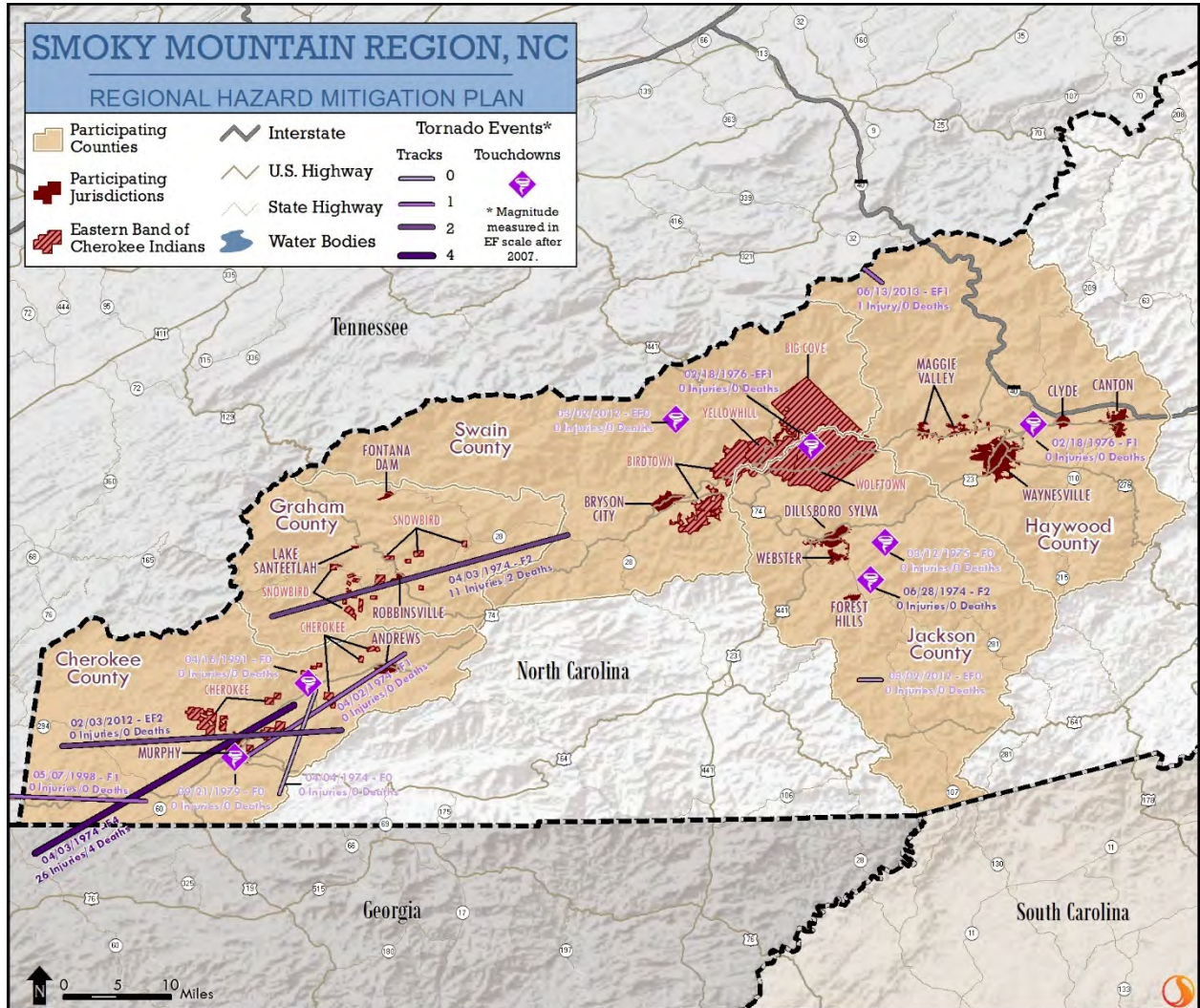
- ◆ April 2, 1974, 12:01 AM: F1, 0 deaths, 1 injuries (near Murphy)

¹⁰ https://www.weather.gov/ind/april3_1974tor

- ◆ April 3, 1974, 6:05 PM: F2, 3 deaths, 11 injuries (near Robbinsville)
- ◆ April 3, 1974, 7:20 PM: F4, 4 deaths, 26 injuries (near Murphy)
- ◆ April 4, 1974, 7:00 AM: F0, 0 deaths, 0 injuries (between Murphy and Robbinsville)

After an extensive search of local news sources, no records of tornadoes occurring since the last plan update were found.

FIGURE 5.10: TORNADO EVENTS IN THE SMOKY MOUNTAIN REGION



5.8.4 Extent

Tornado extent can be determined by tornado magnitude (Fujita Scale and Enhanced Fujita Scale). The most severe tornado on record to impact the Smoky Mountain Region was an F4 (devastating tornado with wind speeds between 207-260 mph) in Cherokee County (near Murphy, NC in 1974). However, events of greater magnitudes are possible.

Extent of tornadoes can also be measured in terms of damage and human impacts (including loss of life and injuries). The greatest amount of damage reported from a single tornado was over \$144 million (2017 dollars) in Cherokee County. However, costlier events are possible. Further, fatalities and injuries have occurred with this hazard and are possible in the future.

5.8.5 Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the region. Furthermore, the mountainous terrain of the region makes tornadoes a rare occurrence. Based on 17 tornadoes reported in the last 43 years (1973-2016) there was an annual occurrence rate of 40-percent for that period. Based on the historic rate of occurrence, the tornado hazard was assigned a probability of “likely” (between 10-90% annual chance). While most of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should the Smoky Mountain Region experience a direct tornado strike.

5.9 WINTER STORM AND FREEZE

5.9.1 Background

A winter storm is an event in which varieties of precipitation are formed that only occur at low temperatures, such as snow, sleet, freezing rain, or ice. Snow storms generally occur with the clash of different types of air masses, with differences in temperature, moisture, and pressure; specifically, when warm moist air interacts with cold dry air. Snow storms that produce a lot of snow require an outside source of moisture, such as the Gulf of Mexico or the Atlantic Ocean.

- **Heavy Snow:**
A heavy snow storm is any winter storm that produces six inches or more of snow within a 48-hour period or less.
- **Blizzard:**
A blizzard is a severe snow storm with winds more than 35 mph and visibility of less than a 1/4 mile for more than 3 hours.
- **Ice Storm, Sleet, and Freezing Rain:**
An ice storm is defined as a storm with significant amounts of freezing rain and is a result of warm air in between two layers of cold air. 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.

A winter storm 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 of the winter storm elements – snow, freezing 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.

5.9.2 Location

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 Smoky Mountain Region is accustomed to severe winter weather conditions and frequently receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire region has uniform exposure to a winter storm.

5.9.3 Historical Occurrences

Winter weather has resulted in four disaster declarations in the Smoky Mountain Region. This includes the Blizzard of 1996, one subsequent 1996 winter storm, and an ice storm in 2003, and a severe winter storm in 2010.¹¹ The NCEI Storm Events Database reports a total of 987 recorded winter storm events, including heavy snow, ice, and winter storm, in the Smoky Mountain Region since 1996 (**Table 5.20**). These events resulted in nearly \$4.7 million in property damages and approximately \$5.9 million in crop damages (2017 dollars) in damages. Those events with reported damages and fatalities are presented in **Table 5.21**.¹² It is likely that additional events from impacted the planning area. Further, the damages reported from these events are typically not reflective of private homeowner claims.

TABLE 5.20: SUMMARY OF WINTER STORM EVENTS IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Cherokee County	29	\$1,811	\$0
Graham County	190	\$0	\$1,343,916
Haywood County	239	\$0	\$2,687,833
Jackson County	313	\$4,673,902	\$537,567
Swain County	216	\$0	\$1,343,916
Eastern Band of Cherokee Indians*	10	-	-

¹¹ 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*.

¹² The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

SECTION 5: HAZARD PROFILES

SMOKY MOUNTAIN REGION TOTAL	997	\$4,675,713	\$5,913,232
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**EBCI has land in each of the participating counties with a majority being in Jackson and Swain Counties; thus, the tribe was likely impacted by these events. The number of events reported for EBCI is not all inclusive. Additionally, the number of storms listed in this table are from sources other than the NCEI, and are described in further detail below.*

Source: NCEI Storm Events Database

TABLE 5.21: HISTORICAL WINTER STORM IMPACTS IN THE SMOKY MOUNTAIN REGION

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
CHEROKEE COUNTY					
Cherokee County	3/19/1996	Heavy Snow	0/0	\$1,811	\$0
Cherokee County	1/10/1997	Winter Storm	0/0	\$0	\$0
Cherokee County	12/30/1997	Winter Storm	0/0	\$0	\$0
Cherokee County	12/22/1998	Ice Storm	0/0	\$0	\$0
Cherokee County	12/2/2000	Winter Storm	0/0	\$0	\$0
Cherokee County	12/18/2000	Winter Storm	0/0	\$0	\$0
Cherokee County	1/1/2001	Winter Storm	0/0	\$0	\$0
Cherokee County	1/20/2001	Winter Storm	0/0	\$0	\$0
Cherokee County	3/20/2001	Winter Storm	0/0	\$0	\$0
Cherokee County	1/5/2002	Winter Storm	0/0	\$0	\$0
Cherokee County	1/5/2003	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/16/2003	Winter Storm	0/0	\$0	\$0
Cherokee County	1/9/2004	Winter Storm	0/0	\$0	\$0
Cherokee County	1/29/2005	Ice Storm	0/0	\$0	\$0
Cherokee County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/1/2007	Winter Weather	0/0	\$0	\$0
Cherokee County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	2/13/2014	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/26/2015	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/8/2016	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/12/2016	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	1/6/1996	Winter Storm	0/0	\$0	\$0
Graham County	1/11/1996	Winter Storm	0/0	\$0	\$0
Graham County	1/26/1996	Ice Storm	0/0	\$0	\$0
Graham County	2/1/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/7/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/11/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Graham County	2/16/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Graham County	11/9/1996	Winter Weather	0/0	\$0	\$0
Graham County	11/10/1996	Winter Weather	0/0	\$0	\$0
Graham County	1/9/1997	Ice Storm	0/0	\$0	\$0
Graham County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Graham County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Graham County	12/5/1997	Winter Weather	0/0	\$0	\$0
Graham County	12/27/1997	Winter Weather	0/0	\$0	\$0
Graham County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Graham County	1/18/1998	Winter Weather	0/0	\$0	\$0
Graham County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Graham County	3/2/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/10/1998	Heavy Snow	0/0	\$0	\$0
Graham County	3/11/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/11/1998	Heavy Snow	0/0	\$0	\$0
Graham County	12/17/1998	Winter Weather	0/0	\$0	\$0
Graham County	2/13/1999	Winter Weather	0/0	\$0	\$0
Graham County	2/24/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/15/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Graham County	12/24/1999	Winter Weather	0/0	\$0	\$0
Graham County	1/16/2000	Winter Weather	0/0	\$0	\$0
Graham County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/29/2000	Ice Storm	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Graham County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Graham County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Graham County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/1/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Graham County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Graham County	2/3/2002	Heavy Snow	0/0	\$0	\$0
Graham County	2/6/2002	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Graham County	12/4/2002	Winter Weather	0/0	\$0	\$0
Graham County	12/22/2002	Winter Weather	0/0	\$0	\$0
Graham County	1/6/2003	Winter Weather	0/0	\$0	\$0
Graham County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Graham County	1/19/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/6/2003	Heavy Snow	0/0	\$0	\$0
Graham County	2/9/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/18/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/23/2003	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2003	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Graham County	3/30/2003	Winter Weather	0/0	\$0	\$0
Graham County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Graham County	11/28/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/3/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/5/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Graham County	1/9/2004	Winter Weather	0/0	\$0	\$0
Graham County	1/27/2004	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	2/7/2004	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2004	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2004	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2004	Winter Weather	0/0	\$0	\$0
Graham County	4/13/2004	Winter Weather	0/0	\$0	\$0
Graham County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Graham County	12/14/2004	Winter Weather	0/0	\$0	\$0
Graham County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Graham County	1/22/2005	Winter Weather	0/0	\$0	\$0
Graham County	2/10/2005	Winter Weather	0/0	\$0	\$0
Graham County	2/28/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/1/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/8/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/11/2005	Winter Weather	0/0	\$0	\$0
Graham County	4/2/2005	Winter Weather	0/0	\$0	\$0
Graham County	4/23/2005	Winter Weather	0/0	\$0	\$0
Graham County	11/21/2005	Winter Weather	0/0	\$0	\$0
Graham County	12/26/2005	Winter Weather	0/0	\$0	\$0
Graham County	1/14/2006	Heavy Snow	0/0	\$0	\$0
Graham County	1/30/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/8/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/9/2006	Heavy Snow	0/0	\$0	\$0
Graham County	2/11/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Graham County	2/18/2006	Winter Weather	0/0	\$0	\$0
Graham County	3/22/2006	Winter Weather	0/0	\$0	\$0
Graham County	11/19/2006	Winter Weather	0/0	\$0	\$0
Graham County	12/7/2006	Winter Weather	0/0	\$0	\$0
Graham County	12/26/2006	Heavy Snow	0/0	\$0	\$0
Graham County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Graham County	1/21/2007	Winter Weather	0/0	\$0	\$0
Graham County	1/28/2007	Winter Weather	0/0	\$0	\$0
Graham County	2/1/2007	Heavy Snow	0/0	\$0	\$0
Graham County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Graham County	4/8/2007	Frost/Freeze	0/0	\$0	\$1,343,916
Graham County	1/1/2008	Winter Weather	0/0	\$0	\$0
Graham County	1/22/2008	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2008	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	10/27/2008	Winter Weather	0/0	\$0	\$0
Graham County	11/21/2008	Winter Weather	0/0	\$0	\$0
Graham County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Graham County	1/8/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/13/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/17/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Graham County	2/2/2009	Winter Weather	0/0	\$0	\$0
Graham County	3/1/2009	Winter Weather	0/0	\$0	\$0
Graham County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Graham County	10/17/2009	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2009	Winter Storm	0/0	\$0	\$0
Graham County	1/2/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/9/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Graham County	2/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/10/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Graham County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Graham County	3/3/2010	Winter Weather	0/0	\$0	\$0
Graham County	3/22/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Graham County	12/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Graham County	1/5/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Graham County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Graham County	1/24/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/26/2011	Winter Weather	0/0	\$0	\$0
Graham County	2/9/2011	Winter Weather	0/0	\$0	\$0
Graham County	3/6/2011	Winter Weather	0/0	\$0	\$0
Graham County	3/11/2011	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	11/29/2011	Winter Weather	0/0	\$0	\$0
Graham County	12/7/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/2/2012	Winter Weather	0/0	\$0	\$0
Graham County	10/29/2012	Winter Weather	0/0	\$0	\$0
Graham County	11/5/2012	Winter Weather	0/0	\$0	\$0
Graham County	12/29/2012	Winter Weather	0/0	\$0	\$0
Graham County	1/17/2013	Winter Weather	0/0	\$0	\$0
Graham County	2/1/2013	Winter Weather	0/0	\$0	\$0
Graham County	2/2/2013	Winter Weather	0/0	\$0	\$0
Graham County	2/19/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/2/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/5/2013	Winter Storm	0/0	\$0	\$0
Graham County	3/20/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/25/2013	Winter Storm	0/0	\$0	\$0
Graham County	11/26/2013	Winter Weather	0/0	\$0	\$0
Graham County	1/2/2014	Winter Weather	0/0	\$0	\$0
Graham County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Graham County	1/21/2014	Heavy Snow	0/0	\$0	\$0
Graham County	1/28/2014	Winter Weather	0/0	\$0	\$0
Graham County	2/10/2014	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2014	Winter Storm	0/0	\$0	\$0
Graham County	3/24/2014	Winter Weather	0/0	\$0	\$0
Graham County	3/29/2014	Winter Weather	0/0	\$0	\$0
Graham County	10/31/2014	Winter Weather	0/0	\$0	\$0
Graham County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Graham County	11/26/2014	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Graham County	1/26/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/16/2015	Winter Storm	0/0	\$0	\$0
Graham County	2/18/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Graham County	2/20/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/23/2015	Winter Storm	0/0	\$0	\$0
Graham County	2/25/2015	Winter Storm	0/0	\$0	\$0
Graham County	3/27/2015	Winter Weather	0/0	\$0	\$0
Graham County	1/20/2016	Winter Weather	0/0	\$0	\$0
Graham County	1/22/2016	Winter Storm	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	2/8/2016	Winter Weather	0/0	\$0	\$0
Graham County	3/20/2016	Winter Weather	0/0	\$0	\$0
Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/6/1996	Winter Storm	0/0	\$0	\$0
Haywood County	1/11/1996	Winter Storm	0/0	\$0	\$0
Haywood County	1/26/1996	Ice Storm	0/0	\$0	\$0
Haywood County	2/1/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/1996	Ice Storm	0/0	\$0	\$0
Haywood County	2/7/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	2/16/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	3/8/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	3/20/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	4/1/1996	Winter Weather	0/0	\$0	\$0
Haywood County	4/8/1996	Winter Weather	0/0	\$0	\$0
Haywood County	11/9/1996	Winter Weather	0/0	\$0	\$0
Haywood County	11/10/1996	Winter Weather	0/0	\$0	\$0
Haywood County	12/5/1996	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/1997	Ice Storm	0/0	\$0	\$0
Haywood County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Haywood County	12/5/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/8/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/27/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	1/18/1998	Winter Weather	0/0	\$0	\$0
Haywood County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Haywood County	2/3/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/2/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/10/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/1998	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	4/10/1998	Winter Weather	0/0	\$0	\$0
Haywood County	12/17/1998	Winter Weather	0/0	\$0	\$0
Haywood County	2/19/1999	Winter Weather	0/0	\$0	\$0
Haywood County	2/24/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/3/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/3/1999	Heavy Snow	0/0	\$0	\$0
Haywood County	3/15/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Haywood County	4/29/1999	Winter Weather	0/0	\$0	\$0
Haywood County	11/2/1999	Winter Weather	0/0	\$0	\$0
Haywood County	12/24/1999	Winter Weather	0/0	\$0	\$0
Haywood County	1/4/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2000	Winter Weather	0/0	\$0	\$0
Haywood County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/29/2000	Ice Storm	0/0	\$0	\$0
Haywood County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	4/8/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	12/3/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/13/2000	Winter Weather	0/0	\$0	\$0
Haywood County	12/17/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/1/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/6/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/15/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	2/6/2002	Winter Weather	0/0	\$0	\$0
Haywood County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	11/17/2002	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	11/22/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	12/4/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	12/14/2002	Winter Weather	0/0	\$0	\$0
Haywood County	12/22/2002	Winter Weather	0/0	\$0	\$0
Haywood County	12/25/2002	Winter Weather	0/0	\$0	\$0
Haywood County	1/6/2003	Winter Weather	0/0	\$0	\$0
Haywood County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/19/2003	Winter Weather	0/0	\$0	\$0
Haywood County	1/23/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/26/2003	Winter Weather	0/0	\$0	\$0
Haywood County	2/6/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	2/9/2003	Winter Weather	0/0	\$0	\$0
Haywood County	2/23/2003	Winter Weather	0/0	\$0	\$0
Haywood County	3/30/2003	Winter Weather	0/0	\$0	\$0
Haywood County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	3/30/2003	Winter Weather	0/0	\$0	\$0
Haywood County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	11/28/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/3/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/4/2003	Winter Storm	0/0	\$0	\$0
Haywood County	12/5/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/10/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/9/2004	Winter Weather	0/0	\$0	\$0
Haywood County	1/27/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/5/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/7/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	2/12/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	2/26/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	3/30/2004	Winter Weather	0/0	\$0	\$0
Haywood County	4/13/2004	Winter Weather	0/0	\$0	\$0
Haywood County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	12/14/2004	Winter Weather	0/0	\$0	\$0
Haywood County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2005	Winter Weather	0/0	\$0	\$0
Haywood County	1/22/2005	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	2/2/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/27/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/28/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/8/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/17/2005	Winter Weather	0/0	\$0	\$0
Haywood County	4/2/2005	Winter Weather	0/0	\$0	\$0
Haywood County	4/2/2005	Heavy Snow	0/0	\$0	\$0
Haywood County	4/23/2005	Winter Weather	0/0	\$0	\$0
Haywood County	11/21/2005	Winter Weather	0/0	\$0	\$0
Haywood County	11/21/2005	Winter Storm	0/0	\$0	\$0
Haywood County	12/3/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/8/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/15/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/26/2005	Winter Weather	0/0	\$0	\$0
Haywood County	1/14/2006	Winter Weather	0/0	\$0	\$0
Haywood County	1/30/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/8/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Haywood County	2/18/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/20/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/22/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/25/2006	Heavy Snow	0/0	\$0	\$0
Haywood County	11/19/2006	Winter Weather	0/0	\$0	\$0
Haywood County	12/7/2006	Winter Weather	0/0	\$0	\$0
Haywood County	12/26/2006	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	1/21/2007	Winter Weather	0/0	\$0	\$0
Haywood County	1/28/2007	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2007	Winter Weather	0/0	\$0	\$0
Haywood County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	4/6/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	4/8/2007	Frost/Freeze	0/0	\$0	\$2,687,833
Haywood County	1/1/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2008	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/19/2008	Winter Weather	0/0	\$0	\$0
Haywood County	1/31/2008	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2008	Winter Weather	0/0	\$0	\$0
Haywood County	2/26/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	10/27/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/16/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/18/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/21/2008	Winter Weather	0/0	\$0	\$0
Haywood County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	1/8/2009	Winter Weather	0/0	\$0	\$0
Haywood County	1/13/2009	Winter Weather	0/0	\$0	\$0
Haywood County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Haywood County	2/2/2009	Winter Storm	0/0	\$0	\$0
Haywood County	2/22/2009	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2009	Winter Storm	0/0	\$0	\$0
Haywood County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Haywood County	10/17/2009	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2009	Winter Storm	0/0	\$0	\$0
Haywood County	12/30/2009	Winter Weather	0/0	\$0	\$0
Haywood County	1/2/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/12/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	2/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	3/3/2010	Winter Weather	0/0	\$0	\$0
Haywood County	3/22/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	12/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/25/2010	Heavy Snow	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/5/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Haywood County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Haywood County	1/11/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/24/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/26/2011	Winter Weather	0/0	\$0	\$0
Haywood County	2/9/2011	Winter Weather	0/0	\$0	\$0
Haywood County	3/6/2011	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/2011	Winter Weather	0/0	\$0	\$0
Haywood County	11/29/2011	Winter Weather	0/0	\$0	\$0
Haywood County	12/7/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/2/2012	Winter Weather	0/0	\$0	\$0
Haywood County	10/29/2012	Winter Storm	0/0	\$0	\$0
Haywood County	11/5/2012	Winter Weather	0/0	\$0	\$0
Haywood County	12/29/2012	Winter Weather	0/0	\$0	\$0
Haywood County	1/17/2013	Heavy Snow	0/0	\$0	\$0
Haywood County	1/25/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/19/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/27/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/5/2013	Winter Storm	0/0	\$0	\$0
Haywood County	3/20/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/25/2013	Winter Storm	0/0	\$0	\$0
Haywood County	4/4/2013	Winter Weather	0/0	\$0	\$0
Haywood County	11/25/2013	Winter Weather	0/0	\$0	\$0
Haywood County	11/26/2013	Heavy Snow	0/0	\$0	\$0
Haywood County	1/2/2014	Winter Storm	0/0	\$0	\$0
Haywood County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	1/15/2014	Winter Weather	0/0	\$0	\$0
Haywood County	1/21/2014	Heavy Snow	0/0	\$0	\$0
Haywood County	1/28/2014	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2014	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/2014	Winter Storm	0/0	\$0	\$0
Haywood County	3/6/2014	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	3/24/2014	Winter Weather	0/0	\$0	\$0
Haywood County	3/29/2014	Winter Weather	0/0	\$0	\$0
Haywood County	10/31/2014	Winter Weather	0/0	\$0	\$0
Haywood County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Haywood County	11/26/2014	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2015	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	1/26/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/16/2015	Winter Storm	0/0	\$0	\$0
Haywood County	2/18/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/18/2015	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	2/23/2015	Winter Storm	0/0	\$0	\$0
Haywood County	2/25/2015	Winter Storm	0/0	\$0	\$0
Haywood County	3/27/2015	Winter Weather	0/0	\$0	\$0
Haywood County	1/20/2016	Winter Weather	0/0	\$0	\$0
Haywood County	1/22/2016	Winter Storm	0/0	\$0	\$0
Haywood County	2/8/2016	Winter Weather	0/0	\$0	\$0
Haywood County	3/20/2016	Winter Weather	0/0	\$0	\$0
Haywood County	5/5/2016	Winter Weather	0/0	\$0	\$0

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	2/1/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/1/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/7/1996	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/7/1996	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/11/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/12/1996	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/16/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/1996	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/18/1996	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/18/1996	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/9/1997	Ice Storm	0/0	\$0	\$0
Southern Jackson	1/9/1997	Ice Storm	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	1/10/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/10/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/13/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	12/8/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/27/1997	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/27/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/29/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/29/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/30/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/30/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/18/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/18/1998	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/18/1998	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/27/1998	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/27/1998	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/2/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/11/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/10/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/17/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/31/1999	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/31/1999	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/13/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/9/1999	Winter Storm	0/0	\$0	\$0
Northern Jackson	3/26/1999	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/26/1999	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/29/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/24/1999	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	1/16/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/16/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/20/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/22/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/22/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/26/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/29/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/29/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/8/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	11/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	11/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	12/13/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/13/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/17/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/17/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/1/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/1/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/8/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/20/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/6/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/6/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/20/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/20/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/3/2002	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/6/2002	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/3/2002	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/6/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/6/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2002	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/4/2002	Ice Storm	0/0	\$4,673,902	\$0
Northern Jackson	12/14/2002	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/22/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/22/2002	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	12/25/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/6/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/16/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/16/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/19/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/19/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/6/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/6/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/9/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/9/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/30/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/30/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/10/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/10/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	11/28/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/28/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/3/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/3/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2003	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/4/2003	Winter Storm	0/0	\$0	\$0
Northern Jackson	12/5/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/5/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/10/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/18/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/18/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/18/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/19/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/25/2004	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/2/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/5/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/7/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/7/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/12/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2004	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	2/15/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2004	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/26/2004	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/30/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/30/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/13/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/13/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/14/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/14/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/19/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/19/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/22/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/27/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/27/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/28/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/1/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/8/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/17/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/17/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/2/2005	Heavy Snow	0/0	\$0	\$0
Southern Jackson	4/2/2005	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/23/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/21/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/21/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/3/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/3/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/15/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/14/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/14/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/30/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/8/2006	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/8/2006	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	2/11/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2006	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/11/2006	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/18/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/22/2006	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/22/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/7/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/9/2007	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/9/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/21/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/21/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/1/2007	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/1/2007	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/17/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/17/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/6/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/8/2007	Frost/Freeze	0/0	\$0	\$268,783
Southern Jackson	4/8/2007	Frost/Freeze	0/0	\$0	\$268,783
Northern Jackson	1/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/16/2008	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/16/2008	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/19/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/19/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/22/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/22/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/31/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/31/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/1/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/27/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/27/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/21/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/1/2008	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	1/13/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/17/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/18/2009	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/19/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/2/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/22/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/1/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/1/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/7/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/12/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/18/2009	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/18/2009	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/30/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/30/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/29/2010	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/29/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/4/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/4/2010	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/10/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/12/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/15/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/15/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/2/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/22/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/22/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/12/2010	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/12/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/15/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/15/2010	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	12/25/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/25/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/7/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/10/2011	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/10/2011	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/11/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/24/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/24/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/26/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/9/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/9/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/6/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/29/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/29/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2012	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/2/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/29/2012	Winter Storm	0/0	\$0	\$0
Southern Jackson	10/29/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/5/2012	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/5/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/17/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/25/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/25/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/1/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/2/2013	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/19/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/19/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/2/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/5/2013	Winter Storm	0/0	\$0	\$0
Southern Jackson	3/6/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/20/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/25/2013	Winter Storm	0/0	\$0	\$0
Northern Jackson	11/26/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2014	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	1/21/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/28/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/28/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/10/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2014	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/12/2014	Winter Storm	0/0	\$0	\$0
Northern Jackson	3/24/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/31/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/31/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/1/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/1/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/26/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	1/13/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/26/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/2015	Winter Storm	0/0	\$0	\$0
Southern Jackson	2/16/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/18/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	2/23/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/23/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/25/2015	Winter Storm	0/0	\$0	\$0
Southern Jackson	2/25/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	1/20/2016	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/20/2016	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/22/2016	Winter Storm	0/0	\$0	\$0
Northern Jackson	1/22/2016	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/8/2016	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/3/2016	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/20/2016	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/6/1996	Winter Storm	0/0	\$0	\$0
Swain County	1/11/1996	Winter Storm	0/0	\$0	\$0
Swain County	1/26/1996	Ice Storm	0/0	\$0	\$0
Swain County	2/1/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/2/1996	Ice Storm	0/0	\$0	\$0
Swain County	2/7/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/11/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Swain County	2/16/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Swain County	3/8/1996	Heavy Snow	0/0	\$0	\$0
Swain County	3/20/1996	Heavy Snow	0/0	\$0	\$0
Swain County	4/1/1996	Winter Weather	0/0	\$0	\$0
Swain County	4/8/1996	Winter Weather	0/0	\$0	\$0
Swain County	11/9/1996	Winter Weather	0/0	\$0	\$0
Swain County	11/10/1996	Winter Weather	0/0	\$0	\$0
Swain County	12/5/1996	Winter Weather	0/0	\$0	\$0
Swain County	1/9/1997	Ice Storm	0/0	\$0	\$0
Swain County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Swain County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Swain County	12/5/1997	Winter Weather	0/0	\$0	\$0
Swain County	12/27/1997	Heavy Snow	0/0	\$0	\$0
Swain County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Swain County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Swain County	1/18/1998	Winter Weather	0/0	\$0	\$0
Swain County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Swain County	3/2/1998	Winter Weather	0/0	\$0	\$0
Swain County	3/10/1998	Winter Weather	0/0	\$0	\$0
Swain County	2/13/1999	Heavy Snow	0/0	\$0	\$0
Swain County	2/19/1999	Winter Weather	0/0	\$0	\$0
Swain County	2/24/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/3/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/3/1999	Heavy Snow	0/0	\$0	\$0
Swain County	3/9/1999	Winter Storm	0/0	\$0	\$0
Swain County	3/15/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Swain County	11/2/1999	Winter Weather	0/0	\$0	\$0
Swain County	12/24/1999	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/4/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/16/2000	Winter Weather	0/0	\$0	\$0
Swain County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/29/2000	Ice Storm	0/0	\$0	\$0
Swain County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Swain County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Swain County	4/8/2000	Heavy Snow	0/0	\$0	\$0
Swain County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Swain County	12/3/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/17/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/1/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/6/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/15/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Swain County	2/3/2002	Heavy Snow	0/0	\$0	\$0
Swain County	2/6/2002	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Swain County	12/4/2002	Winter Weather	0/0	\$0	\$0
Swain County	12/22/2002	Winter Weather	0/0	\$0	\$0
Swain County	12/25/2002	Winter Weather	0/0	\$0	\$0
Swain County	1/6/2003	Winter Weather	0/0	\$0	\$0
Swain County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/19/2003	Winter Weather	0/0	\$0	\$0
Swain County	1/23/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/26/2003	Winter Weather	0/0	\$0	\$0
Swain County	2/6/2003	Heavy Snow	0/0	\$0	\$0
Swain County	2/9/2003	Winter Weather	0/0	\$0	\$0
Swain County	2/23/2003	Winter Weather	0/0	\$0	\$0
Swain County	3/30/2003	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Swain County	3/30/2003	Winter Weather	0/0	\$0	\$0
Swain County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Swain County	11/28/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/3/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/4/2003	Winter Storm	0/0	\$0	\$0
Swain County	12/5/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/10/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/17/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/9/2004	Winter Weather	0/0	\$0	\$0
Swain County	1/27/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/2/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/7/2004	Heavy Snow	0/0	\$0	\$0
Swain County	2/12/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2004	Heavy Snow	0/0	\$0	\$0
Swain County	3/30/2004	Winter Weather	0/0	\$0	\$0
Swain County	4/13/2004	Winter Weather	0/0	\$0	\$0
Swain County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Swain County	12/14/2004	Winter Weather	0/0	\$0	\$0
Swain County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Swain County	1/22/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/27/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/28/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/8/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/11/2005	Winter Weather	0/0	\$0	\$0
Swain County	4/2/2005	Winter Weather	0/0	\$0	\$0
Swain County	4/23/2005	Winter Weather	0/0	\$0	\$0
Swain County	11/21/2005	Winter Weather	0/0	\$0	\$0
Swain County	12/26/2005	Winter Weather	0/0	\$0	\$0
Swain County	1/14/2006	Winter Weather	0/0	\$0	\$0
Swain County	1/30/2006	Winter Weather	0/0	\$0	\$0
Swain County	2/8/2006	Winter Weather	0/0	\$0	\$0
Swain County	2/9/2006	Heavy Snow	0/0	\$0	\$0
Swain County	2/11/2006	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Swain County	2/18/2006	Winter Weather	0/0	\$0	\$0
Swain County	3/22/2006	Winter Weather	0/0	\$0	\$0
Swain County	11/19/2006	Winter Weather	0/0	\$0	\$0
Swain County	12/7/2006	Winter Weather	0/0	\$0	\$0
Swain County	12/26/2006	Winter Weather	0/0	\$0	\$0
Swain County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Swain County	1/21/2007	Winter Weather	0/0	\$0	\$0
Swain County	1/28/2007	Winter Weather	0/0	\$0	\$0
Swain County	2/1/2007	Heavy Snow	0/0	\$0	\$0
Swain County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Swain County	4/6/2007	Winter Weather	0/0	\$0	\$0
Swain County	4/8/2007	Frost/Freeze	0/0	\$0	\$1,343,916
Swain County	1/1/2008	Winter Weather	0/0	\$0	\$0
Swain County	1/22/2008	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2008	Heavy Snow	0/0	\$0	\$0
Swain County	10/27/2008	Winter Weather	0/0	\$0	\$0
Swain County	11/16/2008	Winter Weather	0/0	\$0	\$0
Swain County	11/21/2008	Winter Weather	0/0	\$0	\$0
Swain County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Swain County	1/8/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/13/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/17/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Swain County	2/2/2009	Winter Weather	0/0	\$0	\$0
Swain County	2/22/2009	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2009	Winter Weather	0/0	\$0	\$0
Swain County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Swain County	10/17/2009	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2009	Winter Storm	0/0	\$0	\$0
Swain County	1/2/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/9/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/12/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Swain County	2/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2010	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	2/12/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/15/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/15/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Swain County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Swain County	3/3/2010	Winter Weather	0/0	\$0	\$0
Swain County	3/22/2010	Winter Weather	0/0	\$0	\$0
Swain County	11/5/2010	Heavy Snow	0/0	\$0	\$0
Swain County	12/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Swain County	12/15/2010	Winter Weather	0/0	\$0	\$0
Swain County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Swain County	1/5/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Swain County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Swain County	1/11/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/24/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/26/2011	Winter Weather	0/0	\$0	\$0
Swain County	2/9/2011	Winter Weather	0/0	\$0	\$0
Swain County	3/6/2011	Winter Weather	0/0	\$0	\$0
Swain County	3/11/2011	Winter Weather	0/0	\$0	\$0
Swain County	11/29/2011	Winter Weather	0/0	\$0	\$0
Swain County	12/7/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/2/2012	Winter Weather	0/0	\$0	\$0
Swain County	2/11/2012	Winter Weather	0/0	\$0	\$0
Swain County	10/29/2012	Winter Storm	0/0	\$0	\$0
Swain County	11/5/2012	Winter Weather	0/0	\$0	\$0
Swain County	12/29/2012	Winter Weather	0/0	\$0	\$0
Swain County	1/17/2013	Winter Weather	0/0	\$0	\$0
Swain County	1/25/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/1/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/2/2013	Heavy Snow	0/0	\$0	\$0
Swain County	2/15/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/19/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/27/2013	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2013	Winter Weather	0/0	\$0	\$0
Swain County	3/5/2013	Winter Storm	0/0	\$0	\$0
Swain County	3/20/2013	Winter Weather	0/0	\$0	\$0

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	3/25/2013	Winter Storm	0/0	\$0	\$0
Swain County	11/26/2013	Winter Weather	0/0	\$0	\$0
Swain County	1/2/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Swain County	1/21/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/28/2014	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2014	Winter Weather	0/0	\$0	\$0
Swain County	2/12/2014	Winter Storm	0/0	\$0	\$0
Swain County	3/24/2014	Winter Weather	0/0	\$0	\$0
Swain County	3/29/2014	Winter Weather	0/0	\$0	\$0
Swain County	10/31/2014	Winter Weather	0/0	\$0	\$0
Swain County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Swain County	11/26/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Swain County	1/26/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/16/2015	Winter Storm	0/0	\$0	\$0
Swain County	2/18/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Swain County	2/20/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/23/2015	Winter Storm	0/0	\$0	\$0
Swain County	2/25/2015	Winter Storm	0/0	\$0	\$0
Swain County	3/27/2015	Winter Weather	0/0	\$0	\$0
Swain County	1/20/2016	Winter Weather	0/0	\$0	\$0
Swain County	1/22/2016	Winter Storm	0/0	\$0	\$0
Swain County	2/8/2016	Winter Weather	0/0	\$0	\$0
Swain County	3/20/2016	Winter Weather	0/0	\$0	\$0
Swain County	5/5/2016	Winter Weather	0/0	\$0	\$0

There have been several severe winter weather events in the Smoky Mountain Region. The text below describes one 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.

Winter storms throughout the planning area have several negative externalities including hypothermia, 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.

Eastern Band of Cherokee Indians

Ten winter storm events were reported in the previous tribal mitigation plan. However, given the numbers of the surrounding counties, many more events have impacted the reservation lands. The most memorable storms in recent history have been the ice storms of 1994, 1996, and 2003.

Cherokee One Feather reported two additional winter storm events for EBCI:

- ◆ January 30, 2010: A severe winter storm brought snow and ice to the area, downed trees, and left thousands without power.
- ◆ January 7-12, 2011: More than a foot of snow fell in the Cherokee area causing the closure of Cherokee Central Schools and the EBCI.
- ◆ January 20-22, 2016: Winter Storm Jonas resulted in several inches to over one foot of snowfall in the area, causing EBCI governmental programs to close. Duke Energy reported 4,500 outages in Swain and Jackson Counties.

5.9.4 Extent

The severity of the winter storm or blizzard can be measured in terms of amount of snow or ice accumulation, loss of human life and animal life, or by economic costs imposed by property and infrastructure loss.

The greatest amount of snowfall in the Smoky Mountain Region was 24 inches. Additionally, the National Weather Service states snowfall up to two-feet has been known to occur during a single storm at higher elevations.¹³ Ice accumulation of 1.5 inches was reported for one event in Swain County. However, greater amounts of snowfall or ice accumulation are possible.

The greatest amount of property damage associated with any one event was almost \$4.7 million, and there was nearly \$6 million in crop damages (2017 dollars) across all five counties due to a Frost/ Freeze event in April 2007. Further, fatalities and injuries have occurred with this hazard and are possible in the future.

5.9.5 Probability of Future Occurrences

Winter storm events will remain a regular occurrence in the Smoky Mountain Region due to location and elevation. According to historical information, the Smoky Mountain Region experiences an average of seventeen winter storm events each year. Therefore, this hazard was assigned a probability of “highly likely” (greater than 90% annual chance).

¹³ <https://www.nps.gov/grsm/planyourvisit/weather.htm>

Geologic Hazards

5.10 EARTHQUAKE

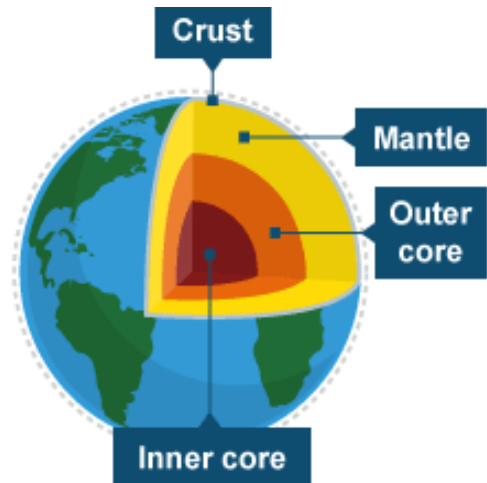
5.10.1 Background

To understand the nature of earthquakes, the composition of the earth must be explored. The earth is made up of four major layers and several sub layers (Refer to **Figure 5.11**): 1) a solid inner core, 2) a liquid outer core, 3) a semi-molten mantle, and 4) the rocky crust (the thin outermost layer of the earth).¹⁴ The upper portion of the mantle combined with the crust forms the lithosphere. This area is susceptible to fractures and can be thought of as a shell. The lithosphere breaks up into large slabs, known as tectonic plates. The tectonic plates are the areas where earthquakes occur.¹⁵

There are approximately twelve major plates and several dozen more minor plates on the earth's crust, as shown in **Figure 5.12**. Plates are regions of the crust that continually move over the mantle. The plate boundaries are areas where plates meet, where earthquakes occur when plates grind past each other, dive under each other, or spread apart. Most earthquakes are caused by the release of stresses accumulated as a result of the sudden displacement of rock in the Earth's crust along opposing plates. The areas bordering the Pacific Plate, also known as the "Pacific Ring of Fire", are at a particularly high risk since most of the largest earthquake events of the last century took place in the region.

Earthquakes can affect hundreds of thousands of square miles, as a result, cause damage to property measured in the tens of billions of dollars, result in loss of life, injury to hundreds of thousands of people, and disrupt the social and economic functioning of the affected area. The point where an earthquake starts is termed the focus or hypocenter and may be many miles to several hundred miles deep within the earth. The point at the surface directly above the focus is called the earthquake's epicenter. Earthquakes are measured in terms of their magnitude and intensity.

FIGURE 5:11 THE EARTH'S STRUCTURE AND PLATE MOVEMENT

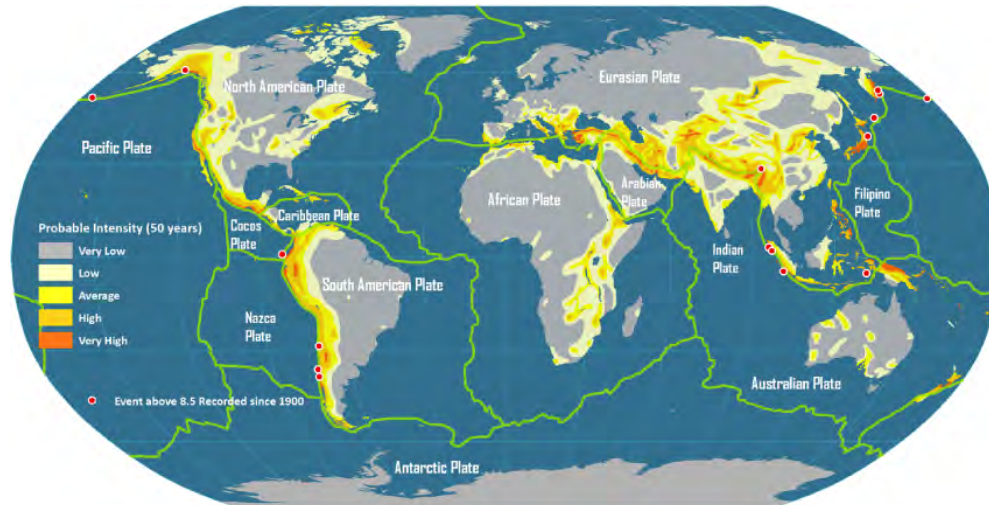


Source: British Broadcasting Corporation,

¹⁴ The Earth's structure and plate movement. (2014). British Broadcasting Corporation. Retrieved December 11, 2014 from http://www.bbc.co.uk/bitesize/ks3/geography/physical_processes/plate_tectonics/revision/2/

¹⁵ Kafka, Alan L. (2014). Why Does the Earth Quake in New England? Boston College. Retrieved December 11, 2014 from http://aki.bc.edu/why_quakes.html.

FIGURE 5.12 GLOBAL PLATE TECTONICS AND SEISMIC ACTIVITY

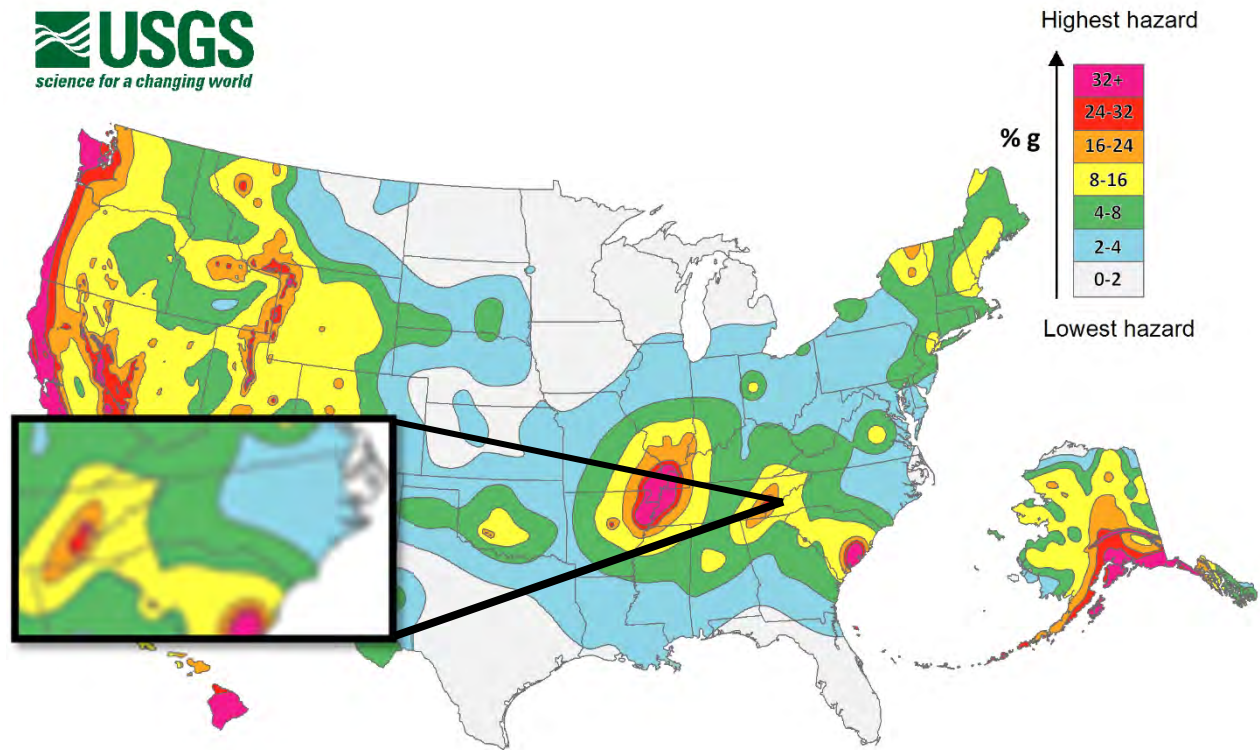


Source: *The Geography of Transport Systems*

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.

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 5.13** shows relative seismic risk for the United States.

FIGURE 5.13: UNITED STATES EARTHQUAKE HAZARD MAP



Source: United States Geological Survey

Earthquake 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 5.22**). 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. Beginning in 2002, the USGS began using Moment Magnitude as the preferred measure of magnitude for all USGS earthquakes greater than magnitude 3.5. This was primarily due to the fact the Richter Scale has an upper bound, so large earthquakes were difficult to measure. Moment Magnitude also has a scale, but no instrument is used to measure it. Instead, factors such as the distance the earthquake travels, the area of the fault, and land that was displaced (also known as “slip”) are used to measure moment magnitude. **Table 5.23** shows the Moment Magnitude Scale.

TABLE 5.22: RICHTER SCALE

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
<3.5	Generally not felt, but recorded.
3.5 - 5.4	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 5.23: MOMENT MAGNITUDE SCALE

SCALE VALUES	EARTHQUAKE EFFECTS
<3.5	Very weak; unlikely to be felt
3.5 - 5.4	Generally felt; rarely causes damage
5.4 - 6.0	Will not cause damage to well-designed buildings; will damage poorly designed ones
6.1 - 6.9	Considered a "major earthquake" that causes a lot of damage
7.0 - 7.9	Large and destructive earthquake that can destroy large cities
8 or >	Large and destructive earthquake that can destroy large cities

Source: Federal Emergency Management Agency

Earthquake 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 5.24**.

TABLE 5.24: MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES

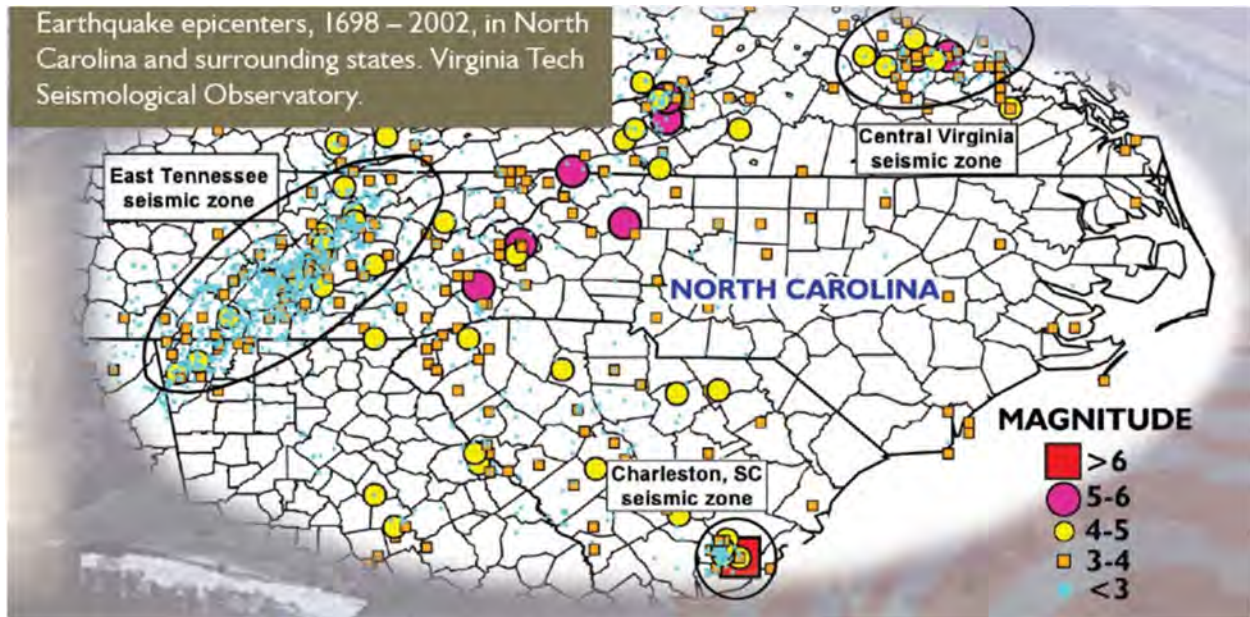
SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER MAGNITUDE
I	INSTRUMENTAL	Detected only on seismographs.	
II	FEEBLE	Some people feel it.	< 4.2
III	SLIGHT	Felt by people resting; like a truck rumbling by.	
IV	MODERATE	Felt by people walking.	
V	SLIGHTLY STRONG	Sleepers awake; church bells ring.	< 4.8
VI	STRONG	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	VERY STRONG	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	DESTRUCTIVE	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	RUINOUS	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	DISASTROUS	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	VERY DISASTROUS	Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards.	< 8.1
XII	CATASTROPHIC	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Source: Federal Emergency Management Agency

5.10.2 Location

According to **Figure 5.13**, the western and southeast regions of North Carolina are most vulnerable to a damaging earthquake. Both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee can affect North Carolina. Both 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 5.14** is a map showing geological and seismic information for North Carolina.

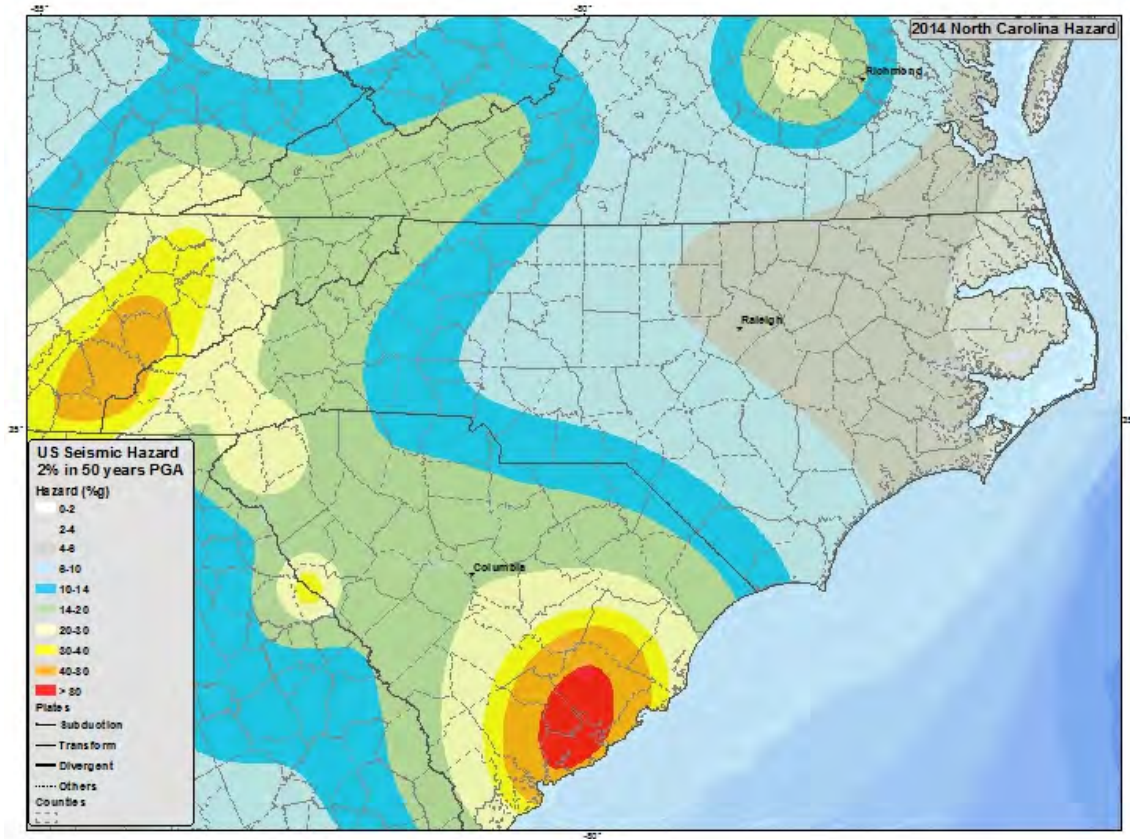
FIGURE 5.14: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure 5.15 shows the intensity level associated with the Smoky Mountain Region, based on the national USGS map of peak acceleration with 2-percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. This map shows all the Smoky Mountain Region within an approximate zone of 14 to 50 %g peak ground acceleration. This indicates that the region exists within an area of moderate seismic risk.

FIGURE 5.15: PEAK ACCELERATION WITH 2-PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2014

5.10.3 Historical Occurrences

At least 82 earthquakes are known to have affected the Smoky Mountain Region since 1874. The strongest of these measured a VII on the Modified Mercalli Intensity (MMI) scale. **Table 5.25** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table 5.26** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁶

TABLE 5.25: SUMMARY OF SEISMIC ACTIVITY IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Cherokee County	24	V (slightly strong)	< 4.8
Andrews	8	IV	
Murphy	16	V	
Graham County	18	V (slightly strong)	< 4.8
Fontana	6	V	

¹⁶ Due to reporting mechanisms, not all earthquake events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported

SECTION 5: HAZARD PROFILES

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Lake Santeetlah	-	-	
Robbinsville	12	V	
Haywood County	19	VII (very strong)	< 6.1
Canton	5	V	
Clyde	3	V	
Maggie Valley	-	-	
Waynesville	11	VII	
Jackson County	14	V (slightly strong)	< 4.8
Dillsboro	3	V	
Forest Hills	-	-	
Sylva	8	V	
Webster	3	V	
Swain County	7	V (slightly strong)	< 4.8
Bryson City	7	V	
Eastern Band of Cherokee Indians*	-	-	-
SMOKY MOUNTAIN REGION TOTAL	82	VII	< 6.1

* Although no earthquakes are reported for tribal lands, many of the reported earthquakes for counties in the Smoky Mountain Region would also be felt on reservation lands.

Source: National Geophysical Data Center

TABLE 5.26: SIGNIFICANT SEISMIC EVENTS IN THE SMOKY MOUNTAIN REGION (1638-1985)

Location	Date	MMI (magnitude)
CHEROKEE COUNTY		
Murphy	11/16/1877	V
Andrews	2/21/1916	IV
Murphy	10/18/1916	II
Murphy	10/20/1924	II
Murphy	11/3/1928	III
Andrews	1/1/1935	III
Murphy	1/1/1935	IV
Murphy	1/1/1936	III
Murphy	3/31/1938	IV
Murphy	1/2/1954	IV
Andrews	9/7/1956	III
Andrews	7/2/1957	IV
Murphy	7/2/1957	V
Andrews	11/24/1957	IV
Murphy	11/24/1957	IV
Andrews	7/13/1969	IV
Murphy	7/13/1969	IV
Murphy	11/20/1969	III

SECTION 5: HAZARD PROFILES

Location	Date	MMI (magnitude)
Andrews	11/30/1973	IV
Murphy	11/30/1973	V
Murphy	7/27/1977	III
Andrews	8/13/1979	IV
Murphy	8/13/1979	V
Murphy	7/27/1980	IV

Location	Date	MMI (magnitude)
GRAHAM COUNTY		
Robbinsville	1/25/1933	III
Robbinsville	1/1/1935	IV
Robbinsville	1/2/1954	IV
Fontana	9/7/1956	IV
Robbinsville	9/7/1956	V
Robbinsville	9/7/1956	II
Fontana	11/24/1957	V
Robbinsville	11/24/1957	IV
Robbinsville	11/9/1968	IV
Robbinsville	7/13/1969	III
Robbinsville	7/13/1969	III
Fontana	9/12/1973	IV
Fontana	11/30/1973	V
Robbinsville	11/30/1973	V
Robbinsville	8/13/1979	IV
Robbinsville	7/27/1980	IV
Fontana	9/24/1982	IV
Fontana	9/24/1982	IV
Robbinsville	1/25/1933	III
Robbinsville	1/1/1935	IV
Robbinsville	1/2/1954	IV
Fontana	9/7/1956	IV
Robbinsville	9/7/1956	V
Robbinsville	9/7/1956	II

Location	Date	MMI (magnitude)
HAYWOOD COUNTY		
Waynesville	9/1/1886	VII
Waynesville	11/3/1928	III
Canton	1/2/1954	IV
Waynesville	1/2/1954	IV
Canton	7/2/1957	V
Clyde	7/2/1957	V

SECTION 5: HAZARD PROFILES

Location	Date	MMI (magnitude)
HAYWOOD COUNTY		
Waynesville	7/2/1957	V
Clyde	11/24/1957	IV
Waynesville	11/24/1957	V
Waynesville	11/9/1968	IV
Waynesville	7/13/1969	III
Waynesville	11/20/1969	IV
Canton	11/30/1973	IV
Clyde	11/30/1973	III
Waynesville	11/30/1973	IV
Waynesville	5/16/1974	II
Canton	8/26/1979	III
Waynesville	8/26/1979	IV
Canton	7/27/1980	III
Location	Date	MMI (magnitude)
JACKSON COUNTY		
Sylva	9/7/1956	III
Dillsboro	11/24/1957	V
Sylva	11/24/1957	V
Webster	11/24/1957	V
Sylva	11/9/1968	IV
Sylva	11/20/1969	IV
Sylva	12/13/1969	III
Sylva	10/9/1971	III
Dillsboro	11/30/1973	IV
Sylva	11/30/1973	IV
Webster	11/30/1973	V
Dillsboro	8/26/1979	IV
Sylva	8/26/1979	V
Webster	8/26/1979	IV
Sylva	12/13/1969	III
Sylva	10/9/1971	III
Dillsboro	11/30/1973	IV
Sylva	11/30/1973	IV
Webster	11/30/1973	V
Location	Date	MMI (magnitude)
JACKSON COUNTY		
Bryson City	11/3/1928	V
Bryson City	1/1/1935	IV

Location	Date	MMI (magnitude)
JACKSON COUNTY		
Bryson City	9/7/1956	III
Bryson City	11/24/1957	V
Bryson City	11/20/1969	III
Bryson City	11/30/1973	IV
Bryson City	7/27/1980	IV
Location	Date	MMI (magnitude)
EASTERN BAND OF CHEROKEE INDIANS		
No earthquake incidents reported for EBCL.		

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting the Smoky Mountain Region, a list of 22 earthquakes that have caused damage throughout North Carolina is presented below in **Table 5.27**.

In addition to those included in **Table 5.27**, the Skyland Earthquake of February 21, 1916, caused damage to the region. It had a magnitude of 5.5. Damage occurred in Skyland, Waynesville, Tryon, and Forest City. Chimney tops were dislodged, and many windowpanes were broken. The quake was felt for over 200,000 square miles, including in the Carolinas, Alabama, Kentucky, and West Virginia. It is also known as the Waynesville earthquake, although the epicenter was closer to Skyland, NC.¹⁷

TABLE 5.27: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

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

¹⁷ <http://www.wncvitalityindex.org/geology/faults-and-earthquakes>

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

*This event is accounted for in the Smoky Mountain occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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)

5.10.4 Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The greatest earthquake epicenter recorded in the Smoky Mountain Region was in 1886 in Waynesville (Haywood County), which had a magnitude around 6.1 and an intensity of VII. The strongest earthquake to impact the Smoky Mountain Region occurred in 1811 in northeastern Arkansas, which had an 8.5 magnitude and an intensity of X. However, in North Carolina, it had an intensity of VI. Stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Another way to measure extent is by using percent-g, which is used as a way of estimating locational risk. **Figure 5.15** above illustrates this risk displaying a 20 to 50 %-g for various locations in the region.

5.10.5 Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting the Smoky Mountain Region is unlikely. In fact, earthquake probably in general is difficult to estimate. However, a total of 82 earthquakes occurring in the Smoky Mountain Region over 347 years results in a historic annual occurrence rate of approximately one event every four years. Based on the historic occurrence rate, the earthquake hazard was assigned an annual probability of “likely” (between 10 to 90% annual chance). It should be noted that the historic rate only considers events occurring within the Smoky Mountain Region, and that it is possible for earthquake events to impact the region even if they occur outside of it (see **Table 5.27** for examples). It is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the region.

5.11 LANDSLIDE

5.11.1 Background

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation driven by gravity. Both natural and human-induced changes in the environment can trigger landslides. These changes can include 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 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 larger 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.

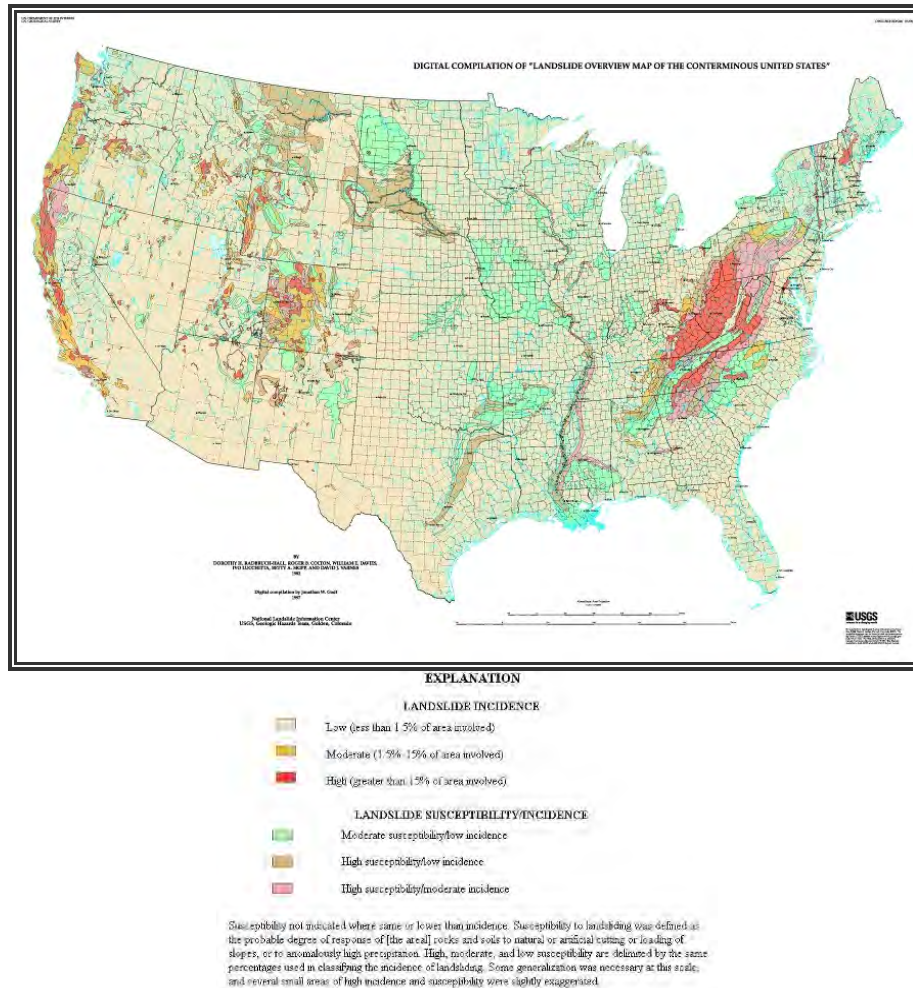
Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved 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 nearly \$6.5 billion (2017 dollars) in damage and between 25 and 50 deaths in the United States.¹⁸ **Figure 5.16** delineates areas where large numbers of landslides have occurred and areas that are susceptible to landsliding in the conterminous United States.¹⁹

¹⁸ United States Geological Survey (USGS). United States Department of the Interior. “Landslide Hazards – A National Threat.” 2005.

¹⁹ 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.

FIGURE 5.16: LANDSLIDE OVERVIEW MAP OF THE CONTERMINOUS UNITED STATES



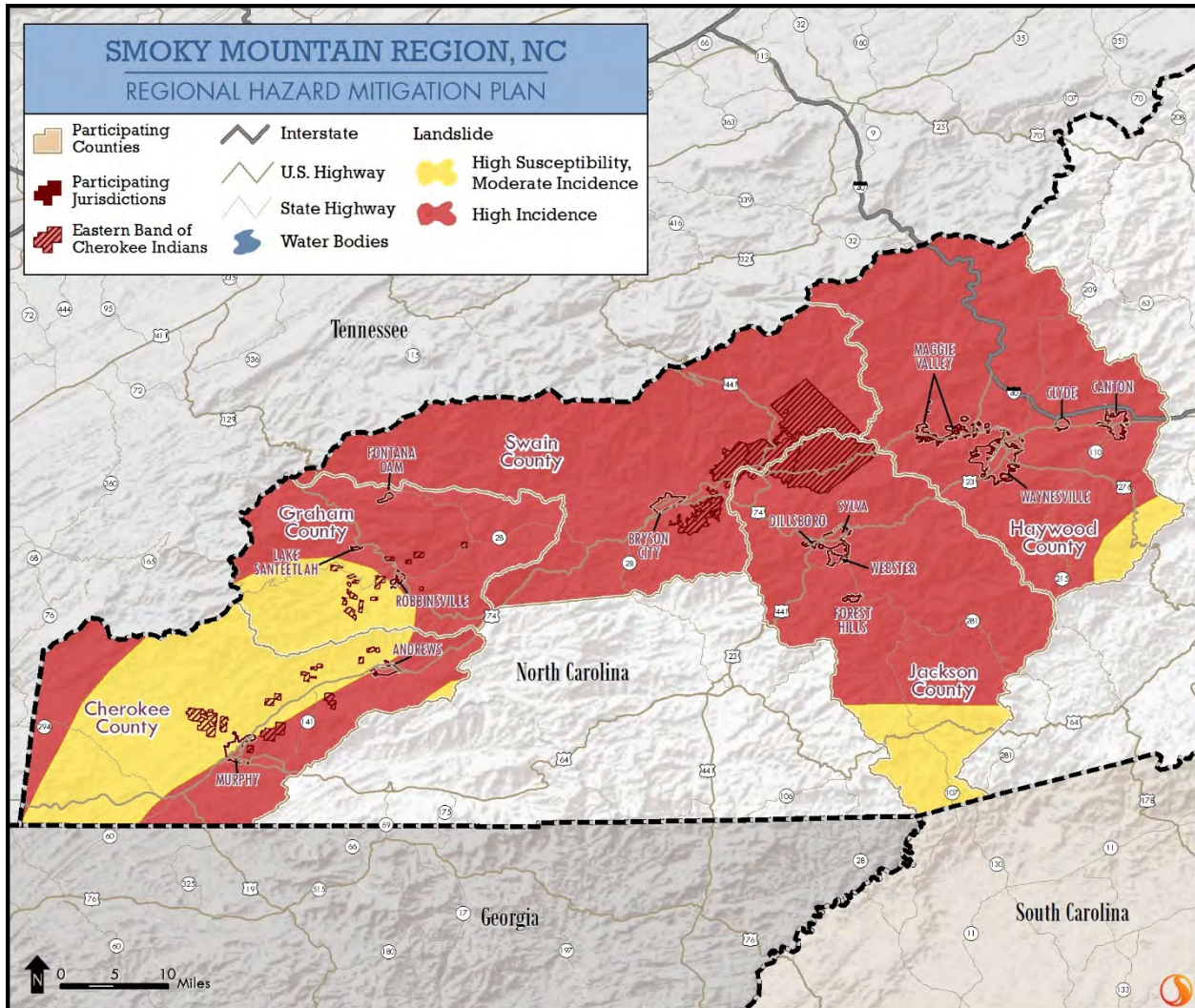
Source: USGS

5.11.2 Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Smoky Mountain Region.

Figure 5.17 below shows high incidence (more than 15% of the area is involved in landsliding) in most of the Smoky Mountain Region, across all five counties. The remaining portion of the region is classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding), which is mainly in Cherokee and smaller parts of Graham, Jackson, and Haywood Counties.

FIGURE 5.17: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF THE SMOKY MOUNTAIN REGION



5.11.3 Historical Occurrences

Steep topography throughout the Smoky Mountain Region makes the planning area susceptible to landslides. Most landslides are caused by heavy rainfall in the area. Building on steep slopes can also contribute to risk. **Table 5.28** presents a summary of historic landslide occurrence events as provided by the North Carolina Geological Survey.²⁰ The locations of the landslide events presented in these tables are presented in **Figure 5.18**. Some incidence mapping has also been conducted throughout the western portion of North Carolina though it is not complete. Therefore, it should be noted that many more incidents than those reported are likely to have occurred in the Smoky Mountain Region.

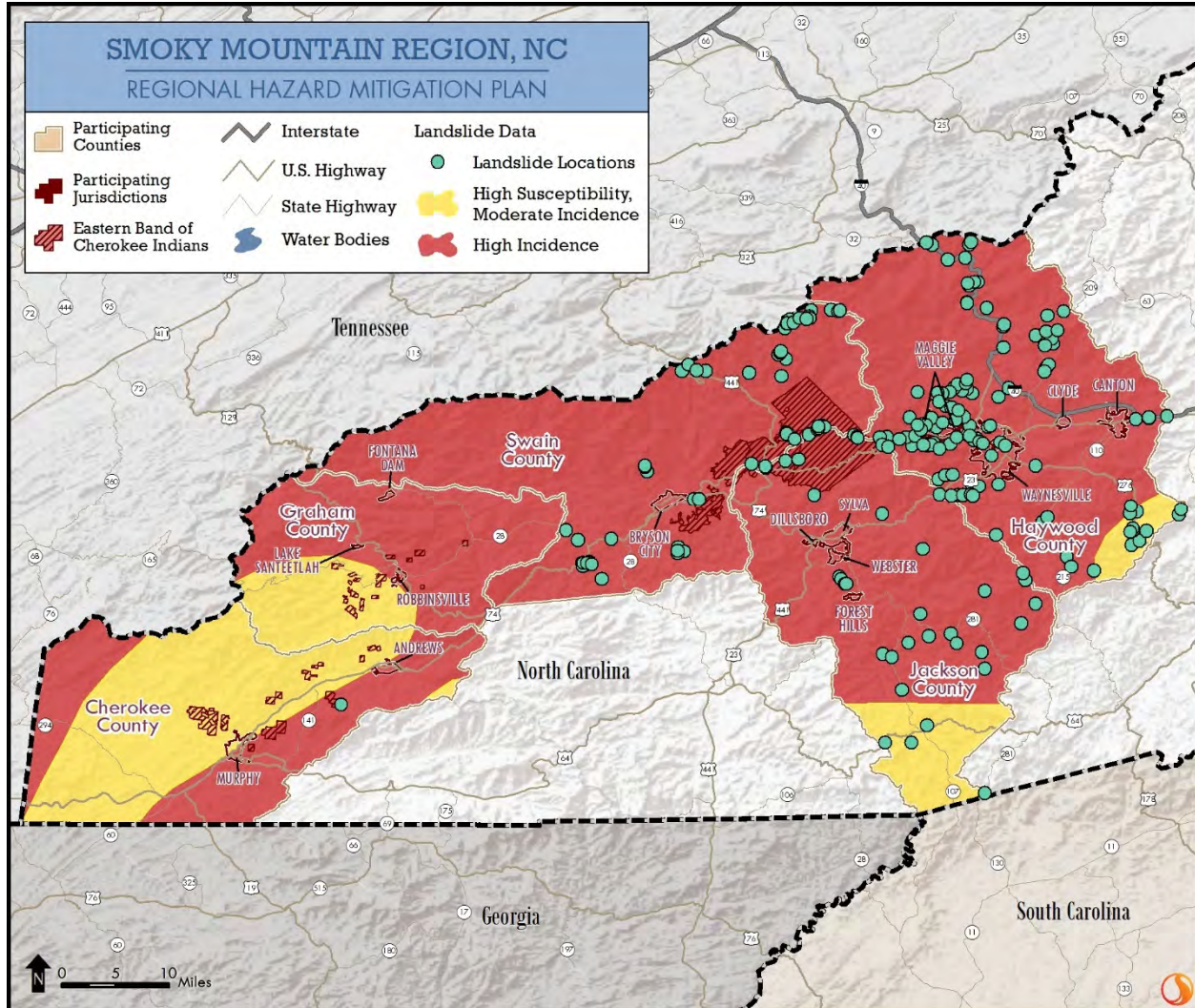
²⁰ It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

TABLE 5.28: SUMMARY OF LANDSLIDE ACTIVITY IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences
Cherokee County	1
Andrews	-
Murphy	-
Unincorporated Area	1
Graham County	-
Fontana	-
Lake Santeetlah	-
Robbinsville	-
Unincorporated Area	-
Haywood County	121
Canton	-
Clyde	-
Maggie Valley	5
Waynesville	2
Unincorporated Area	114
Jackson County	28
Dillsboro	-
Forest Hills	-
Sylva	-
Webster	-
Unincorporated Area	28
Swain County	58
Bryson City	-
Unincorporated Area	58
Eastern Band of Cherokee Indians	5
SMOKY MOUNTAIN REGION TOTAL	213

Source: North Carolina Geological Survey

FIGURE 5.18: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN THE SMOKY MOUNTAIN REGION



Source: North Carolina Geological Survey

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

Cherokee County

These incidents are reported above, but the following list shows an exact location and date of historic landslides in Cherokee County and its municipalities:

- ◆ 3/01 US64 - 1.6 miles east of Murphy
- ◆ 3/94 SR 1331 - Hangingdog Rd 6.0 miles north of Murphy
- ◆ 4/92 US64 - 0.5 miles east of Murphy
- ◆ 4/94 US74 - Bypass Murphy (near Bulldog Dr)
- ◆ 1/77 19/129 North (Red Marble Rd)
- ◆ 1/77 SR 1314 (near Violet)
- ◆ 4/75 SR 1375 Bluff Rd

- ◆ 5/72 SR 1314 Between Hiwassee Dam and Violet
- ◆ 10/74 SR 1331 Blackwell Gap

Eastern Band of Cherokee Indians

The Eastern Band of Cherokee Indians reported damages of \$1.2 million in May 2003 due to landslides. One single event caused over \$500,000 in damages. In May 2013, a Disaster Declaration was declared for the Eastern Band of Cherokee Indians for severe flooding, landslides, and mudslides. This was the first Disaster Declaration to be issued to a tribal nation. Public assistance grants for the declaration reached almost \$3.4 million. Another Disaster Declaration, involving Jackson County and EBCL, was made in fall of 2013 for landslides and mudslides associated with severe storms and flooding.

Graham County

Landslides reported due to the 1994 floods that caused damages to roads and one structure. The 2004 heavy rains also caused landslides. NCDEM classification suggests that a landslide having minor effect on the county is highly likely to occur. The County reports an average of 2 landslides every 10 years.

Haywood County

Landslides are listed as one of the top three threats to the county. Landslides are reported with hurricane and flooding events. The North Carolina Geological Survey's landslide database describes a landslide event from December 11, 2003 that destroyed a house and killed one person.

Jackson County

There is no serious history of landslides in Jackson County though some incidents have been reported including the landslides resulting from the May 2003 heavy rains. Jackson County has also established an Erosion Department which is managed by a professional engineer. Public information is also provided via the County website. NCDEM classification suggests that the probability of a landslide event having a minor effect on the county is highly likely to occur. Disaster Declaration including Jackson County was made in fall of 2013 for landslides and mudslides associated with severe storms and flooding.

Swain County

There is no serious history of landslides in Swain County though some incidents have been reported. NCDEM classification suggests that the probability of a landslide event having a minor effect on the county is highly likely to occur.

Additionally, event narratives in the North Carolina Geological Survey's landslide database indicate many events that destroyed or damaged houses, significant damages to roads, and several events that threatened human lives. Landslide cannot also result in road closures.

5.11.4 Extent

Landslide extent can be measured in several different ways. Extent can be defined using the USGS Landslide Susceptibility Index. Most areas of the Smoky Mountain Region are identified as high incidence (more than 15% of the area is involved in landsliding) areas in the USGS landslide data. Additionally, portions of the study area in Cherokee, Graham, Haywood, and Jackson Counties are classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding).

Extent can also be measured in terms of size (i.e. length/width of landslide or tonnage of debris generated). The greatest event reported by the NC Geological survey measured 6,700-feet by 8,700-feet and occurred in Jackson County.

Landslide Extent can also be measured by damages and human impacts. One event causing \$1.2 million was reported by the Eastern Band of Cherokee Indians; however costlier events can occur. Landslides have also resulted in fatalities and serious threats to human lives, and these impacts are possible in the future.

5.11.5 Probability of Future Occurrences

Based on historical information and the USGS susceptibility index, historic annual rate of landslide occurrence in the Smoky Mountain Region approximately six events per year, based on 240 events reported between 1966 and 2006. Therefore, the landslide hazard was assigned an annual probability of “highly likely” (greater than 90-percent annual chance). It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas in the Smoky Mountain Region have greater risk than others, given factors such as steepness on slope and modification of slopes.

Hydrologic Hazards

5.12 DAM AND LEVEE FAILURE

5.12.1 Background

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, most 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 can cause 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.

5.12.2 Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table 5.29** explains these classifications.

TABLE 5.29: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

The North Carolina Division of Energy, Mineral, and Land Resources lists 169 dams in the Smoky Mountain Region.²¹ Figure 5.19 shows the dam location and the corresponding hazard ranking for each. Of these dams, 72 are classified as high hazard potential. These high hazard dams are summarized by county in Table 5.30 and listed in Table 5.31.

TABLE 5.30: SUMMARY OF HIGH HAZARD DAM LOCATIONS

Location	Number of High Hazard Dams	Number of Intermediate Hazard Dams	Number of Low Hazard Dams
Cherokee County	11	7	24
Graham County	7	0	4
Haywood County	17	2	10
Jackson County	28	19	22
Swain County	9	4	5
EBCI	0	0	0
Smoky Mountain Region Total	72	32	65

²¹ The February 8, 2012 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 5.19: SMOKY MOUNTAIN REGION DAM LOCATION AND HAZARD RANKING

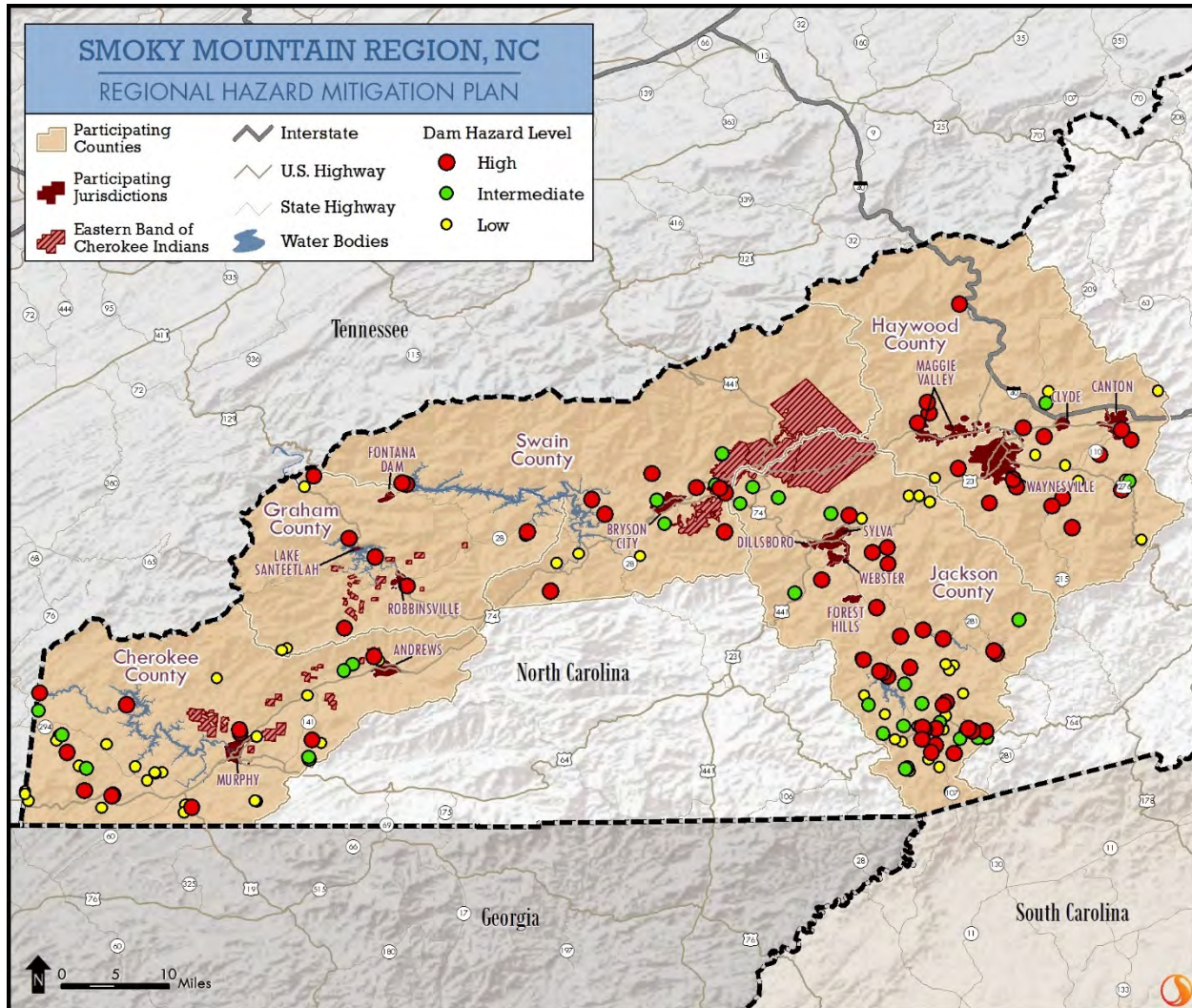


TABLE 5.31: SMOKY MOUNTAIN REGION HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
CHEROKEE COUNTY				
Andrews Water Supply Dam	High	40.0	1,500	Local Government
Appalachia Lake Dam	High	-	69,360	Federal
Greenbriar Development LLC Dam	High	-	-	-
Hiawassee Lake Dam	High	-	434,000	Federal
Hideaway Mountain Lake Dam	High	0.5	5	Private
Pied Piper Dam Lower	High	4.0	65	Private
Pied Piper Dam Upper	High	2.0	18	Private
Senecal Dam	High	0.1	1	Private
Skomp Dam	High	4.0	44.0	Private
Tanglewood Forest Dam Lower	High	8.0	100	Private

SECTION 5: HAZARD PROFILES

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
Upper Tanglewood Dam	High	2.0	25	Private
GRAHAM COUNTY				
Fontana Lake Dam	High	-	587,328	Federal
Fontana/Emergency Spillway Dam	High	-	587,328	Federal
Mission Ready Dam	High	-	250	Private
Phillips Dam	High	2.4	22	Private
Robert Mosely Dam	High	1.8	29	Private
Santeetlah Dam	High	2,800.0	271,320	Utility
Tobacco Branch Dam	High	5.0	48	Private
HAYWOOD COUNTY				
Barrett Pond Dam	High	0.7	7	Private
Boland Pond Dam	High	0.2	1	Private
Broyhill Children's Home Pond Dam	High	2.0	36	Private
Cameron Dam	High	0.3	3	Private
Camp Daniel Boone Lake Dam	High	4.0	87	Private
Cataloochee Ranch Dam	High	0.5	5	Private
Cataloochee Ski Slope Dam	High	0.7	15	Private
Fishers Lake Dam	High	1.0	6	Private
Hardin Dam	High	1.2	7	Private
Harvey Dam	High	0.4	3	Private
Lake Jane Dam	High	3.0	22	Private
Lake Junaluska Dam	High	195.0	7,720	Private
Lake Logan Dam	High	90.0	2,400	Private
Lipham Dam	High	2.5	-	Private
Smoky Mountain Sanctuary POA Dam	High	0.4	16	Private
Walters Dam	High	-	30,000	Utility
Waynesville Water Supply Dam	High	76.4	3,660	Local Government
JACKSON COUNTY				
Bear Creek Dam	High	-	34,711	Utility
Breedlove Dam	High	1.0	8	Private
Cashiers Lake Dam	High	24.0	0	Private
Cedar Cliff Dam	High	-	7,000	Utility
Connelly Dam	High	-	-	Private
East Fork Dam	High	-	906	Utility
Fairfield Lake Dam	High	183.0	3,015	Private
Fradley Cove Estates	High	2.3	31	Private
Hampton Lake Dam	High	14.7	280	Private
Hanks Dam	High	15.0	125	Private
Hefner Dam	High	-	-	Private
Hodge Dam	High	0.6	5	Private
Hogback Dam	High	23.0	391	Private
Lancewood Dam	High	2.5	20	Private
Laurel Lake Dam	High	3.5	50	Private
Mcguire Lake Dam	High	2.6	45	Private
Moody Bridge Partners Dam	High	-	-	Private
Pine Creek Dam	High	1.0	8	Private
Sapphire Valley Golf Course Dam	High	1.7	15	Private

SECTION 5: HAZARD PROFILES

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
JACKSON COUNTY				
Silver Springs Dam	High	7.4	65	Private
Stigler Dam	High	1.2	0	Private
Thorpe Lake Dam #1	High	-	70,800	Utility
Thorpe Lake Dam #2	High	-	70,800	Utility
Town of Sylva Water Supply	High	1.5	17	Local Government
Trout Lake Dam	High	7.5	82	Private
Tuckasegee Lake Dam	High	-	183	Utility
Wolf Creek Lake Dam	High	-	14,361	Utility
Wolf Lake	High	3.0	37	Private

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
SWAIN COUNTY				
Bryson City Water Supply Dam	High	2.0	78	Local Government
Bryson Dam	High	43.0	530	Utility
Cheoah Valley Dam	High	5.0	96	Private
Crimmins Dam	High	-	1	Private
Frischholz Dam	High	0.7	5	Private
Lott Dam	High	0.3	3	Private
Schmehl Dam	High	0	14	Private
Whitney Dam	High	0.7	10	Private
Widenhouse Dam	High	0.5	7	Private

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
EASTERN BAND OF CHEROKEE INDIANS				
No dams reported for EBCI.				

Source: North Carolina Division of Land Resources, 2012

(Taken from previous Graham County hazard mitigation plan.) The most significant dam in Graham County is the Fontana Dam. At 480 feet in height, it is the highest concrete dam east of the Rocky Mountains. Built in three years’ time at a cost of \$74.7 million, the Fontana dam became operational as a hydro-electric dam starting in January 1945. The Fontana Dam has three electrical generating units with a peak capacity of 250,000 kilowatts. The dam is 2,365 feet in length and 376 feet thick at its base. Lake Fontana is 11,685 acres in size and has 240 miles of shoreline. The Lake Fontana reservoir has a flood-storage capacity of 513,965 acre-feet. The dam is a Tennessee Valley Authority dam and is monitored and maintained for safety. Other significant dams in Graham County include the Tapoco (Cheoah) Dam and the Lake Santeetlah Dam.

(Taken from previous Swain County hazard mitigation plan.) There are three river basins within Swain County. Swain County has one Tennessee Valley Authority reservoir. If this dam were to fail, the economic impact to Swain County would be substantial and could affect the entire far western section of Swain County. There are eight Duke Power reservoirs located in Jackson and Macon County. If seven of these dams were to fail, the economic impact to Swain County would also be substantial and would severely impact Bryson City. The remaining dam located in Macon County would have a severe impact on the Nantahala Gorge. This dam failure would result in the most impact of life and property within Swain County. Based on historical information as well as dam failure inundation maps, we estimate that flood waters from a dam failure would never exceed 30 feet above the 0.2-percent annual chance floodplain.

It should also be noted that dam regulations for classifying dams was recently changed. Thus, generally more dams are classified as high hazard.

5.12.3 Historical Occurrences

Two dam breaches were reported in Jackson County, though no additional information was available. In addition, several breach scenarios in the area could be catastrophic.

5.12.4 Extent

Dam Failure extent is defined using the North Carolina Division of Land Resources criteria discussed above (Table 5.29). Of the 169 dams in the Smoky Mountain Region, 72 are classified as high-hazard.

5.12.5 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.

5.13 EROSION

5.13.1 Background

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 fine sand are most susceptible to erosion. As the clay and organic content of these soils increases, the potential for erosion decreases. Well-drained and well-graded gravels and gravel-sand mixtures are the least likely to erode. Coarse gravel soils are highly permeable and have a good capacity for absorption, which can prevent or delay the amount of surface runoff. Vegetative cover can be very helpful in controlling erosion by shielding the soil surface from falling rain, absorbing water from the soil, and slowing the velocity of runoff. Runoff is also affected by the topography of the area including size, shape, and slope. The greater the slope length and gradient, the more potential an area has for erosion.

Climate can affect the amount of runoff, especially the frequency, intensity, and duration of rainfall and storms. When rainstorms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature and rainfall amounts define the period of highest erosion risk of the year.

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

5.13.2 Location

Erosion in the Smoky Mountain Region is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Smoky Mountain soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the Smoky Mountain Region, particularly along the banks of rivers and streams, but it is not an extreme threat to any of the participating counties and jurisdictions. Haywood County, especially Maggie Valley, were reported by the planning committee as areas of concern.

5.13.3 Historical Occurrences

Several sources were vetted to identify areas of erosion in the Smoky Mountain 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.

Prior to joining the regional planning effort, erosion was not addressed in the previous Cherokee County and Graham County hazard mitigation plans. Haywood County, Jackson County, and Swain County recognized erosion as a hazard and include mitigation actions to address the hazard. The Eastern Band of Cherokee Indians identified erosion as a significant hazard. An erosion control project was completed by ECBI in 1995 to address road washout.

5.13.4 Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs. Data was not available to show the exact erosion rate for areas in the Smoky Mountain Region, such as feet per year (a measure of extent), that is occurring in the planning area. Erosion typically happens slowly over time but may be accelerated by fast moving and/or high water levels in rivers or creeks. In the most severe situations, erosion will result in the bank of a stream of river receding or collapsing.

5.13.5 Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for the Smoky Mountain Region, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent annually). 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*.

5.14 FLOOD

5.14.1 Background

Flooding is a frequent, dangerous, and costly hazard. Globally, it accounts for 40 percent of all natural disasters and results in an average of over 6,500 deaths annually. In the U.S., flooding results in an average of 89 deaths annually. Nearly 90 percent of all presidential disaster declarations result from natural events where flooding was a major component.

Flooding is the most common environmental hazard, due to the widespread geographical distribution of valleys and coastal areas, and the population density in these areas. The severity of a flooding event is typically determined by a combination of several major factors, including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface. Both of these flooding events can be brought on by severe (heavy) rain. There are several types of flooding which are presented below:

- **Flash Flooding:**
Flash floods occur within a few minutes or hours of heavy amounts of rainfall and is capable of destroying buildings, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides and landslides. Most flash flooding is caused by slow-moving thunderstorms or repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding often occurs in mountainous areas, it is also common in urban centers where much of the ground is covered by impervious surfaces.
- **Sheet Flooding:**
Sheet flooding is a condition where storm water runoff forms a sheet of water to a depth of six inches or more. Sheet flooding and ponding are often found in areas where there are no clearly defined channels and the path of flooding is unpredictable. This type of flooding is more common to occur in flat areas. Most floodplains are adjacent to streams or oceans, although almost any area can flood under the right conditions where water may accumulate.
- **Urban Flooding:**
Urban flooding is usually caused by heavy rain over a short period of time. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Since sidewalks and roads are non-absorbent, water flows down the surface of the streets, and is then dumped directly into sewers. In fact, roads and buildings generate more runoff than tropical forestland. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small but intense rainfall events. Urbanization increases runoff two to six times over what would occur on natural terrain. As a consequence, high volume of water can turn parking lots into lakes, flooding basements and businesses, and cause lakes to form in roads where drainage is poor or overwhelmed.

Urban flooding occurs where there has been development within stream floodplains. This is partly a result of the use of waterways for transportation purposes in earlier times. Sites adjacent to rivers and coastal inlets provided convenient places to ship and receive commodities. The price of this accessibility has increased flooding in the ensuing urban areas. Urbanization intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land, and occasionally, overwhelming sewer systems.

- **Riverine Flooding:**

Periodic flooding of lands adjacent to non-tidal rivers and streams (known as the floodplain) is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal watercourse, some of the above-normal stream flows onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of a stream or river. The recurrence interval of a flood is defined as the average time interval measured in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

In addition to flooding types, there are several types of floodplains. All the flood types described above may occur within a floodplain. However, the flooding may not occur in a designated floodplain.

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.

The U.S. Army Corp of Engineers and Federal Emergency Management Agency (FEMA) have a role in defining floodplain. The U.S. Army Corps of Engineers calls a 100-year flood an Intermediate Regional Flood, while a Standard Project flood describes a major flood that could be expected to occur from a combination of severe meteorological and hydrologic conditions. Most dam and flood-related structures have been designed to meet 100-year flood conditions. FEMA develops digital Flood Insurance Rate Maps (DFIRMs) to indicate areas in the U.S. where mandatory flood insurance requirement applies (the 100-year flood). They are also used for planning purposes to identify hazard areas. In 2010, updated DFIRMs were published by FEMA for the Smoky Mountain Region in support of the National Flood Insurance Program designating zones according to potential risk and impact due to flooding. Although an all-inclusive description of FEMA flood zones is not included in this document, brief descriptions of the zones appearing on the FIRMs for the county are as follows:

- **Zone A, AE:**

Zone A is the flood insurance rate zone that corresponds to the 1.0-percent annual chance floodplains (ACF) determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFEs) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zones AE is the flood insurance rate zone that corresponds to the 1.0-percent ACFs determined in the Flood Insurance Study (FIS) by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

- **0.2-Percent Annual Chance Floodplain:**

This area corresponds to the 0.2-percent ACF areas (or 500-year).

- **Zones B, C, and X:**

Zones B, C, and X are the flood insurance rate zones that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than one foot,

areas of 100-year stream flooding where the contributing drainage area is less than one square mile, or areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone. Typically, B and X (shaded) are moderate flood hazard areas, while C or Zone X (unshaded) or minimal flood hazards areas. Note: shade zone X is used in place of Zone B on new maps, and unshaded Zone X is used in place of Zone C on new maps. It should be noted that flooding is possible outside of any defined flood zone. In fact, areas subject to flash flooding are often not captured on the maps. In addition, the flood event may be more severe than the 100-year or 500-year flood zones. In this case, water would go beyond these anticipated areas. Further, development can also alter where water goes in terms of the amount of drainage capability and where water travels. Areas that have not flood historically should not be considered immune from such an event.

5.14.2 Location

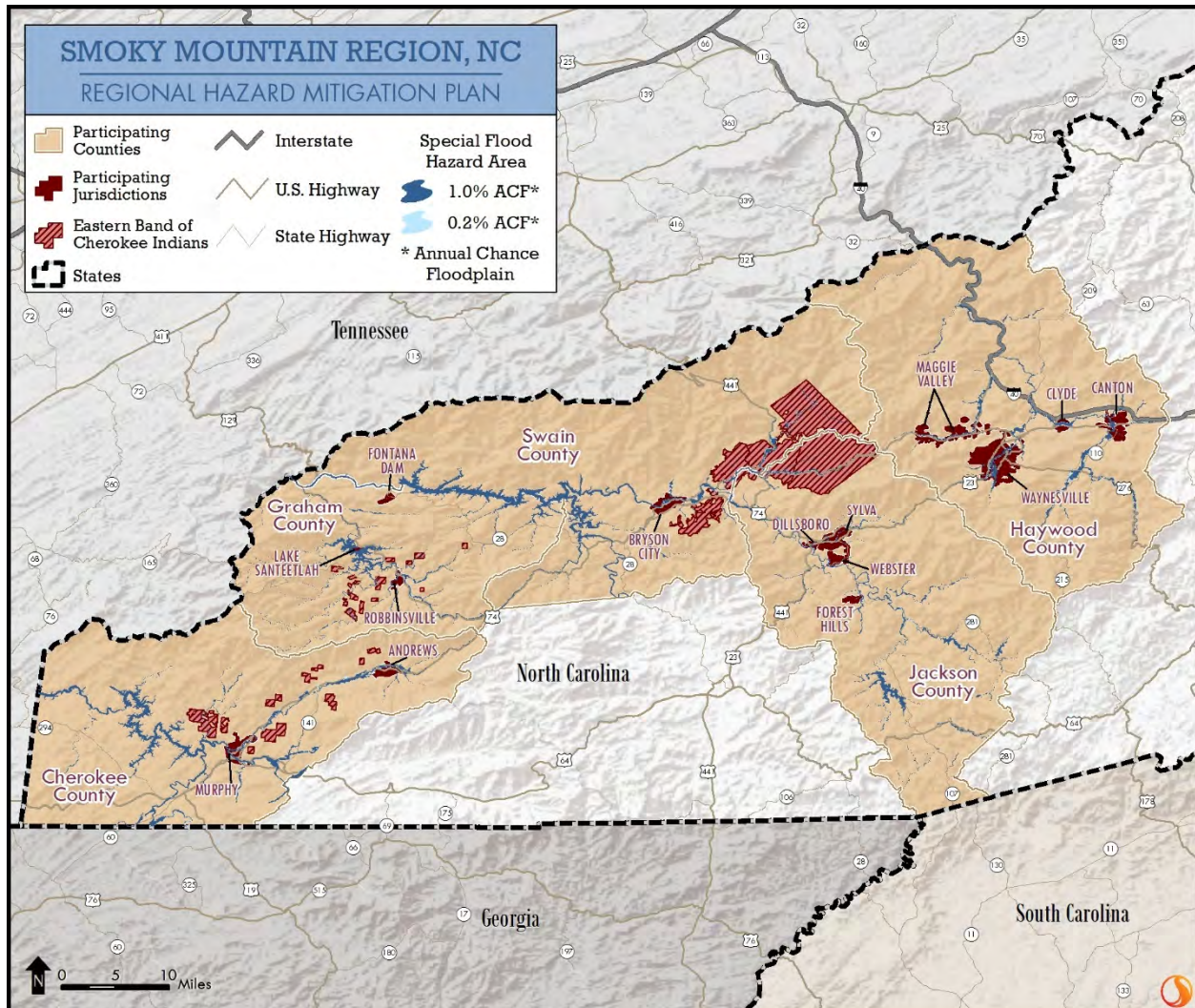
Location of flooding can be defined using FEMA's DFIRM hazard maps for the Smoky Mountain Region. These maps indicate both 1.0-percent ACF and 0.2-percent ACF areas. GIS analysis shows of the 2,357 square miles comprising the Smoky Mountain Region (including the area of Cherokee County, Graham County, Haywood County, Jackson County, Swain County, and Eastern Band of Cherokee Indian reservation lands), there are over 47 square miles of land in 1.0-percent ACF areas (Zone A and Zone AE), over nine square miles of land in the floodway, and approximately four miles of land in 0.2-percent ACF areas (Zone X). Combined, there are approximately 60 square miles of land in floodplain areas in the Smoky Mountain Region. The floodplain area totals and DFIRM effective dates for each county and the EBCI are presented below in **Table 5.32**.

TABLE 5.32: SUMMARY OF FLOODPLAIN AREAS IN THE SMOKY MOUNTAIN REGION (SQUARE MILES)

Location	DFIRM Date	Floodway	1.0% ACF	0.2% ACF	Total
Cherokee County	April 19, 2010	2.75	7.63	0.84	11.22
Graham County	April 19, 2010	0.25	15.04	0.17	15.46
Haywood County	April 3, 2012	2.98	8.38	1.36	12.73
Jackson County	April 19, 2010	1.70	9.43	0.89	12.03
Swain County	April 19, 2010	0.91	4.97	0.35	6.23
Eastern Band of Cherokee Indians	April 19, 2010	0.77	1.89	0.47	3.13
SMOKY MOUNTAIN REGION TOTAL		9.37	47.35	4.08	60.79

These flood zone values account for 2.6-percent of the total land area in the Smoky Mountain 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 5.20** illustrates the location and extent of currently mapped special flood hazard areas for the Smoky Mountain Region based on best available FEMA DFIRM data.

FIGURE 5.20: SPECIAL FLOOD HAZARD AREAS IN THE SMOKY MOUNTAIN REGION



Source: Federal Emergency Management Agency

Additional, more detailed county-level and jurisdiction-level maps can be found in the annexes.

5.14.3 Historical Occurrences

Information from the NCEI Storm Events Database was used to ascertain historical flood events. The NCEI reported a total of 117 events throughout the Smoky Mountain Region since 1996.²² A summary of these events is presented in **Table 5.33**. These events accounted for over \$44.8 million (2017 dollars) in property damages and nearly \$3 million in crop damages throughout the region.²¹ Specific information on flood events for each county, including date, type of flooding, and deaths and injuries, can be found in **Table 5.34**. It is likely that additional events have occurred. Further, the damages reported are typically not inclusive of the private insurance claims.

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

TABLE 5.33: SUMMARY OF FLOOD OCCURRENCES IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
CHEROKEE COUNTY	15	\$2,600,376	\$0
Andrews	1	\$0	\$0
Murphy	6	\$16,482.15	\$0
Unincorporated Area	8	\$2,583,894	\$0
GRAHAM COUNTY	10	\$558,777	\$0
Fontana	1	\$0	\$0
Lake Santeetlah	0	\$0	\$0
Robbinsville	1	\$0	\$0
Unincorporated Area	8	\$558,777	\$0
HAYWOOD COUNTY	29	\$35,065,221	\$2,937,067
Canton	1	\$0	\$0
Clyde	1	\$0	\$0
Maggie Valley	3	\$23,185	\$0
Waynesville	7	\$965,992	\$0
Unincorporated Area	17	\$34,076,044	\$2,937,067
JACKSON COUNTY	38	\$1,417,562	\$20,559
Dillsboro	1	\$0	\$0
Forest Hills	0	\$0	\$0
Sylva	7	\$220,383	\$0
Webster	0	\$0	\$0
Unincorporated Area	30	\$1,339,400	\$20,559
SWAIN COUNTY	20	\$1,069,421	\$17,622
Bryson City	8	\$96,721.05	\$0
Unincorporated Area	12	\$972,699	\$17,622
EASTERN BAND OF CHEROKEE	5	\$3,993,377	\$0
SMOKY MOUNTAIN REGION TOTAL	117	\$44,846,955	\$2,975,249

Source: NOAA National Centers Environmental Information

TABLE 5.34: HISTORICAL FLOOD EVENTS IN THE SMOKY MOUNTAIN REGION

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Murphy	6/16/1996	Flash Flood	0/0	\$3,622	\$0	Two feet of water flooded Hwy 64 after about 2 inches of rain fell within an hour.
Tomotla & Murphy	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Suit	6/28/1997	Flash Flood	0/0	\$26,557	\$0	Two private bridges (driveways) washed away and one heavily damaged on Crow Street in Suit. Also, 3 to 4 inches of water in the Easy Storage on Hwy 294 near Oak Grove Road.
Cherokee Co.	1/7/1998	Flood	0/0	\$0	\$0	--
Cherokee Co.	1/7/1998	Flash Flood	0/0	\$0	\$0	--
Andrews	5/7/1999	Flood	0/0	\$0	\$0	--
Murphy	7/7/1999	Flood	0/0	\$0	\$0	--
Murphy	6/4/2002	Flash Flood	0/0	\$0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Countywide	5/6/2003	Flash Flood	0/0	\$2,556,277	\$0	Creeks out of banks, low spots flooded, and roads closed countywide. Tiles, private bridges washed out.
Cherokee Co.	7/16/2003	Flash Flood	0/0	\$0	\$0	--
Murphy	9/21/2009	Flood	0/0	\$0	\$0	--
Texana	9/26/2009	Flood	0/0	\$0	\$0	--
Murphy	1/15/2013	Flood	0/0	\$2,251	\$0	Many roads closed due to flooding.
Murphy	12/2/2015	Flood	0/0	\$10,609	\$0	Peace Valley KOA Campground near Murphy was evacuated.
Tomotla	12/2/2015	Flood	0/0	\$1,061	\$0	Several homes had flooded basements along the banks of the Hiwassee and Valley Rivers. Several road closures. One person was evacuated from their home. One business along the Hiwassee River flooded.
Murphy	6/16/1996	Flash Flood	0/0	\$3,622	\$0	Two feet of water flooded highway 64 after a little over two inches of rain fell in about an hour.

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
GRAHAM COUNTY						
Robbinsville	9/24/1997	Flash Flood	0/0	\$0	\$0	--
Fontana Village	2/22/2003	Flash Flood	0/0	\$0	\$0	--
Graham Co.	5/5/2003	Flood	0/0	\$0	\$0	--
Graham Co.	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Flooding from overnight rainfall worsened during the morning hours, as numerous thunderstorms produced intense rainfall rates. By late afternoon, 24-hour rainfall totals averaged around 6 inches across the county. The result was numerous washed out or submerged bridges, as well as widespread rock and mud slides.
Graham Co.	5/7/2003	Flash Flood	0/0	\$378,147	\$0	Another round of heavy rain-producing thunderstorms caused a second consecutive day of flash flooding across the county. Several roads were closed due to flooded creeks and streams, as well as due to rock and mud slides. Portions of highways 28 and 129 were closed. Rock and mudslides caused some homes and trailers to be swept away. Yellow Creek flooded several homes. Numerous bridges were washed out.
Graham Co.	5/7/2003	Flood	0/0	\$0	\$0	--
Graham Co.	7/1/2003	Flood	0/0	\$0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	9/16/2004	Flood	0/0	\$29,371	\$0	In response to persistent moderate to heavy rainfall associated with the remnants of Hurricane Ivan, severe flooding developed across the mountains for the second time in 9 days. Flooding first developed across the southwest mountains, when several small streams and creeks overflowed their banks, including Toot Hollow Creek near Bryson City. Several rescues were required during the evening in Macon County, as creeks and streams began to threaten homes. Overnight, flooding became more widespread, with Macon County enduring the worst of it. The Little Tennessee River overflowed its banks during the early morning of the 17th, and continued to flood through much of the day. The river flooded an industrial park in Macon County, causing extensive damage. In Swain County, 500,000 gallons of raw sewage and numerous natural gas tanks were swept down the river. Hundreds of structures were damaged or destroyed, and several private bridges were swept away. Portions of highways 105, 64, and 28 were all closed in Macon County, some due to major damage that was estimated to take several months to repair. In addition, a trout farm lost 60,000 pounds of fish.
Graham Co.	11/24/2004	Flood	0/0	\$0	\$0	--
Tapoco	1/7/2009	Flash Flood	0/0	\$0	\$0	--
HAYWOOD COUNTY						
Haywood Co.	1/18/1996	Flood	0/0	\$0	\$0	--
Haywood Co.	1/26/1996	Flood	0/0	\$0	\$0	--
Cruso	11/8/1996	Flash Flood	0/0	\$0	\$0	--
Southern Half	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Maggie Valley	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Cruso	3/14/1997	Flash Flood	0/0	\$0	\$0	--
Maggie Valley	7/28/1997	Flash Flood	0/0	\$0	\$0	--
Waynesville	1/7/1998	Flash Flood	0/0	\$885,223	\$0	Excessive rain caused creeks and streams to rise well out of their banks. This combined with the enormous amounts of run-off to cause numerous roads and bridges to be covered in water or washed out. The Blue Ridge Parkway in Haywood county sustained considerable damage.
Haywood Co.	2/3/1998	Flash Flood	0/0	\$0	\$0	--
Cove Creek	6/4/2002	Flash Flood	0/0	\$0	\$0	--
Haywood Co.	5/6/2003	Flood	0/0	\$0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Central Portion	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Numerous creeks and larger stream flooded along the highway 74 corridor from Clyde to Waynesville to Balsam Gap, and further north to the Maggie Valley area. In Clyde, a mudslide caused a house on a slope to slide off its foundation, effectively destroying the home. A sinkhole also developed near Lake Junaluska.
Hepco	7/9/2003	Flash Flood	0/0	\$0	\$0	--
Haywood Co.	11/19/2003	Flood	0/0	\$0	\$0	--
Cove Creek	5/31/2004	Flash Flood	0/0	\$146,853	\$0	Two severe thunderstorms moved in succession across central Haywood County, producing 3 to 5 inches of rain in just over an hour in the Cove Creek area. This excessive rainfall caused Cove Creek to expand from its typical width of 3 to 5 feet and depth of 2 feet to a width of 75 to 100 feet and depth of 10 to 12 feet. Several private bridges and roads or driveways were washed out.
Waynesville	6/12/2004	Flash Flood	0/0	\$0	\$0	--
Canton	7/9/2004	Flash Flood	0/0	\$0	\$0	--
Waynesville	7/10/2004	Flash Flood	0/0	\$0	\$0	--
Waynesville	7/25/2004	Flash Flood	0/0	\$7,343	\$0	A mud slide caused damage to the Saunook fire station. Allen's Creek overflowed its banks, flooding the Valleybrook trailer park.
Waynesville	7/26/2004	Flash Flood	0/0	\$73,427	\$0	Heavy rainfall produced by strong thunderstorms resulted in several creeks reaching or exceeding bankful in the Waynesville and Maggie Valley areas. Flooded creeks included Hyatt, Richley, Jonathan, and Allen Creeks. Several roads and bridges were covered with water. Evacuations were required at Pride Resort due to flooding along Jonathan Creek. A house was reportedly damaged by a mud slide.
Haywood Co.	9/7/2004	Flood	0/0	\$11,748,270	\$2,937,067	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.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	9/16/2004	Flood	3/0	\$22,028,006	\$0	After an extended period of moderate to heavy rainfall, flooding developed first across the western part of the county, when several secondary roads became covered with water. During the overnight hours, flooding overspread the county, affecting most valley communities, which endured the second devastating flood event in just 9 days. Severe flooding developed first along Allens and Hyatt Creeks, followed by another round of severe flooding along the Pigeon River, which reached a record of 23 feet in Canton. A 69-year-old woman died when she attempted to drive her vehicle through the flooded river in Canton. A 27-year-old woman and her 4-year-old son were also killed during the evening of the 18th, when the woman attempted to drive her SUV through the flooded Pigeon River which was flowing over a Forest Service road off of I-40. Numerous businesses and hundreds of homes were damaged or destroyed by flood water or landslides. The river washed out a large portion of interstate 40 near the Tennessee border. Numerous other roads and highways were damaged in places, including highways 209, 215, 19, and 276
Waynesville	6/12/2005	Flash Flood	0/0	\$0	\$0	--
Waynesville	8/22/2005	Flash Flood	0/0	\$0	\$0	--
Clyde	8/26/2008	Flash Flood	0/0	\$0	\$0	--
Maggie	7/19/2012	Flash Flood	0/0	\$23,185	\$0	A small, stationary convective cell dropped about 4.5 inches of rain across the Indian Creek basin in about an hour's time. This resulted in a highly localized flash flood that damaged parts of Indian Creek Road, isolating 12 homes for a period of time. Water entered the basements of a few homes. The flooded stream washed out sections of the asphalt road and deposited boulders on it. Several small slope failures/landslides also occurred in the headwaters of the basin.
Saunook	1/15/2013	Flood	0/0	\$0	\$0	--
Cruso	1/30/2013	Flash Flood	0/0	\$1,126	\$0	Prolonged moderate to heavy rain caused Richland Creek to leave its banks and flood some local roads in the Waynesville area, including Water Street off of Dellwood Road. Water was up to the foundations of a couple buildings at this location. The creek also flooded the Frisbee golf course at the Waynesville Recreation Center. Tri Lakes Drive was flooded by Jonathan Creek near Maggie Valley. A couple small mudslides were also reported in the Maggie Valley area.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Ironduff	12/24/2015	Flash Flood	0/0	\$530	\$0	After as much as 3 inches of rain fell across Haywood County in about 24 hours, public reported flash flooding developed on Long Branch in the Lake Junaluska area, with Hyder Mountain Rd flooded and impassable.

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
North Portion	1/18/1996	Flood	0/0	\$0	\$0	--
North Portion	1/26/1996	Flood	0/0	\$0	\$0	--
Sylva	4/29/1996	Flash Flood	0/0	\$0	\$0	--
Pumpkintown	6/19/1996	Flash Flood	0/0	\$0	\$0	--
North Portion	9/28/1996	Flood	0/0	\$0	\$0	--
Sylva	2/28/1997	Flash Flood	0/0	\$0	\$0	--
East Of Sylva	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Cashiers	7/23/1997	Flash Flood	0/0	\$0	\$0	--
South Portion	6/21/1998	Flash Flood	0/0	\$0	\$0	--
Sylva	8/7/2001	Flash Flood	0/0	\$0	\$0	--
South Portion	5/6/2003	Flood	0/0	\$0	\$0	--
North Portion	5/6/2003	Flood	0/0	\$0	\$0	--
North Portion	5/6/2003	Flash Flood	0/0	\$75,629	\$0	Numerous thunderstorms producing very heavy rainfall resulted in rapid rises and flash flooding along creeks and streams in area in and around the Cherokee Indian Reservation. Most creeks around the reservation flooded. The high water caused damage to numerous homes. Many bridges and campgrounds were washed away. Several rock slides and mudslides resulted in closure of major highways as well as side roads.
North Portion	5/7/2003	Flash Flood	0/0	\$151,259	\$0	Flash flooding developed for the second consecutive morning across northern portions of the county, as thunderstorms repeatedly moved over the same areas and produced intense rainfall rates. Particularly hard hit were areas from the Cherokee Indian Reservation to Dillsboro. Numerous creeks and streams overflowed their banks and flooded adjacent roadways. Mudslides also developed and caused some roads to be closed. Numerous bridges were washed out.
South Portion	5/7/2003	Flood	0/0	\$0	\$0	--
North Portion	5/7/2003	Flood	0/0	\$0	\$0	--
Cashiers	9/1/2003	Flash Flood	0/0	\$0	\$0	--
South Portion	11/19/2003	Flood	0/0	\$0	\$0	--
Cullowhee	5/8/2004	Flash Flood	0/0	\$0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
Cashiers	5/22/2004	Flash Flood	0/0	\$29,371	\$0	Slow-moving thunderstorms resulted in severe urban flooding, with 4 businesses receiving some water damage in the downtown area. Several roads were also barricaded.
Sylva	7/25/2004	Flash Flood	0/0	\$146,853	\$0	Strong thunderstorms produced very heavy rainfall in the Sylva area for several hours, resulting in a major flash flood event. Severe flooding occurred on numerous creeks and streams, including Cope Creek, Blantons Branch, Scotts Creek, and Cane Creek. Numerous roads were flooded, with some completely washed out.
South Portion	9/7/2004	Flood	0/0	\$146,853	\$10,280	<p>Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.</p>
North Portion	9/7/2004	Flood	0/0	\$146,853	\$10,280	<p>Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.</p>

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
North Portion	9/16/2004	Flood	0/0	\$367,133	\$0	After an extended period of moderate to heavy rainfall, flooding began in Jackson County during the late evening. Cope Creek was the first stream to flood, and evacuations became necessary along the creek. Evacuations also occurred along the Tuckasegee River, as flooding became quite severe overnight, exceeding the magnitude of the flood associated with Frances only 9 days earlier. Severe flooding also occurred along Scotts Creek, Caney Fork, and Cullowhee Creek. Scotts Creek covered Front Street in Dillsboro with 3 to 4 feet of water. Several landslides occurred, one of which destroyed several storage units at Lake Glenville. Large sections of some roads were washed out by slides or flood water, including portions of highways 19A, 281, 64, and 107, all of which were closed for long periods.
South Portion	9/16/2004	Flood	0/0	\$367,133	\$0	After an extended period of moderate to heavy rainfall, flooding began in Jackson County during the late evening. Cope Creek was the first stream to flood, and evacuations became necessary along the creek. Evacuations also occurred along the Tuckasegee River, as flooding became quite severe overnight, exceeding the magnitude of the flood associated with Frances only 9 days earlier. Severe flooding also occurred along Scotts Creek, Caney Fork, and Cullowhee Creek. Scotts Creek covered Front Street in Dillsboro with 3 to 4 feet of water. Several landslides occurred, one of which destroyed several storage units at Lake Glenville. Large sections of some roads were washed out by slides or flood water, including portions of highways 19A, 281, 64, and 107, all of which were closed for long periods.
North Portion	6/12/2005	Flood	0/0	\$0	\$0	--
South Portion	6/12/2005	Flood	0/0	\$0	\$0	--
Cullowhee	6/20/2005	Flash Flood	0/0	\$0	\$0	--
Tuckasegee	7/20/2005	Flash Flood	0/0	\$0	\$0	--
Sylva	8/22/2005	Flash Flood	0/0	\$0	\$0	--
Sylva	7/26/2007	Flash Flood	0/0	\$67,196	\$0	Flooding developed along Cripple Creek in the Balsam area, with floodwater entering several homes along the creek. Also, Arrowood Rd was flooded just off highway 74.
East Laport	8/26/2008	Flash Flood	0/0	\$0	\$0	--

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
Sylva	5/16/2009	Flash Flood	0/0	\$6,334	\$0	Flooding along Allen Branch caused water to damage the underpinnings of some mobile homes along Tequila Heights (1 NE). Also, water from Cope Creek entered some apartment buildings and a business on Bridge St.
Addie	9/21/2009	Flood	0/0	\$0	\$0	--
Wilmot	1/15/2013	Flood	0/0	\$0	\$0	--
Dillsboro	1/15/2013	Flood	0/0	\$0	\$0	--
Barkers Creek	12/24/2015	Flash Flood	0/0	\$2,122	\$0	Newspaper reported flash flooding developed across portions of central Jackson County after more than 5 inches of rain fell in over 24 hours. Multiple tributaries of the Tuckasegee River overflowed their banks in the Tuckasegee and Cullowhee areas. Closed roads included Barkers Creek Rd, Caney Fork Rd, Wayehutta Rd, and Johns Creek Rd, which were all flooded by streams of the same names. Cullowhee Mountain Rd was also flooded by Cullowhee Creek and Old Settlement Rd was flooded by a small tributary to the Tuckasegee.
Tuckasegee	12/29/2015	Flood	0/0	\$53,045	\$0	After more than 3 inches of rain fell over just a few hours in the headwaters of the Tuckasegee basin, Emergency manager reported flooding developed along the West Fork of the river during the early morning hours. Several trailers were inundated with water from the stream near the intersection of Highway 107 and Fred Smith Rd. Multiple evacuations became necessary near this location.
SWAIN COUNTY						
Swain County	1/26/1996	Flood	0/0	\$0	\$0	--
Smokemont	9/24/1997	Flash Flood	0/0	\$0	\$0	--
Swain County	1/7/1998	Flash Flood	0/0	\$0	\$0	--
Bryson City	4/4/2000	Flash Flood	0/0	\$0	\$0	--
Swain County	5/5/2003	Flood	0/0	\$0	\$0	--
East Portion	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Numerous thunderstorms producing very heavy rainfall resulted in rapid rises and flash flooding along creeks and streams in area in and around the Cherokee Indian Reservation. Most creeks around the reservation flooded. The high water caused damage to numerous homes. Many bridges and campgrounds were washed away. Several rock slides and mudslides resulted in closure of major highways as well as side roads.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
SWAIN COUNTY						
South Portion	5/7/2003	Flash Flood	0/0	\$453,777	\$0	For the second day in a row, flash flooding developed across southern portions of the county after a series of thunderstorms produced very heavy rainfall. Some of the same campgrounds that flooded on the 6th flooded again on the morning of the 7th. Mud and rock slides developed, causing some houses and trailers to be swept away. A portion of highway 19 was also washed away.
Swain County	5/7/2003	Flood	0/0	\$0	\$0	--
Swain County	11/19/2003	Flood	0/0	\$0	\$0	--
Swain County	9/7/2004	Flood	0/0	\$0	\$17,622	Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.
Swain County	9/16/2004	Flood	0/0	\$367,133	\$0	In response to persistent moderate to heavy rainfall associated with the remnants of Hurricane Ivan, severe flooding developed across the mountains for the second time in 9 days. Flooding first developed across the southwest mountains, when several small streams and creeks overflowed their banks, including Toot Hollow Creek near Bryson City. Several rescues were required during the evening in Macon County, as creeks and streams began to threaten homes. Flooding became more widespread, with Macon County enduring the worst of it. The Little Tennessee River overflowed its banks during the early morning of the 17th, and continued to flood through much of the day. The river flooded an industrial park in Macon County, causing extensive damage. In Swain County, 500,000 gallons of raw sewage and numerous natural gas tanks were swept down the river. Hundreds of structures were damaged or destroyed, and several private bridges were swept away. Portions of highways 105, 64, and 28 were all closed in Macon County, some due to major damage that was estimated to take several months to repair. In addition, a trout farm lost 60,000 pounds of fish.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
SWAIN COUNTY						
Bryson City	6/9/2005	Flash Flood	0/0	\$28,515	\$0	A very small, but persistent rain shower produced 5 inches of rain in 2 hours, resulting in flash flooding in a small area in the Wesser community. Wesser Creek flooded near its confluence with the Nantahala River, covering several roads with water. Water entered several homes in this area as well.
Bryson City	11/11/2009	Flash Flood	0/0	\$0	\$0	--
Bryson City	11/11/2009	Flood	0/0	\$0	\$0	--
Bryson City	12/9/2009	Flood	0/0	\$0	\$0	--
Bryson City	1/24/2010	Flash Flood	0/0	\$0	\$0	--
Bryson City	4/26/2012	Flash Flood	0/0	\$23,185	\$0	Strong storms dropped 2 to 3 inches of rain in a couple hours over central Swain County. This caused streams in and around Bryson City to leave their banks. Bryson Branch flooded the intersection of Bryson Walk and Slope Street and Veterans Blvd. Jenkins Branch flooded parts of Jenkins Branch Road, causing some property damage
Bryson City	1/15/2013	Flood	0/0	\$45,020	\$0	Flooded locations in and near the Cherokee Indian reservation included the Parkway entrance (US441), the Saunooke Bridge, which connects Big Cove Road to Newfound Gap Road, Meetinghouse Road and Whitewater Drive. Big Cove Road was also flooded in the Piney Grove area along Rabun Fork. Mt. Noble Road was damaged by mudslide. Oconaluftee Island Park was flooded for a while by the Oconaluftee River in Cherokee, though damage to the park was minimal. Several roads were damaged by flash flooding and landslides. Federal disaster declaration.
Needmore	1/17/2013	Flood	0/0	\$0	\$0	--
Lauada	12/24/2015	Flood	0/0	\$530	\$0	After as much as 4 inches of rain fell in about 36 hours across southern Swain County, a stream gauge on the Little Tennessee near Needmore exceeded its established flood stage, indicating flooding of multiple side roads across the southern part of the county, including Needmore Rd near the Franklin Co. border.
EASTERN BAND OF CHEROKEE INDIANS						
Snowbird	3/3/1997	Flash Flood	0/0	\$0	\$0	--
Cherokee	7/4/2006	Flash Flood	0/0	\$0	\$0	--
Cherokee	12/9/2009	Flood	0/0	\$6,334	\$0	Several trailers were flooded along the Oconoluftee River just off highway 441 in Cherokee.

SECTION 5: HAZARD PROFILES

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS						
Big Cove	7/14/2011	Flash Flood	0/0	\$47,762	\$0	Very heavy rainfall in the headwaters of Raven Fork over northern Haywood County sent a wall of water down the stream into Swain County. As the water reached the Cherokee Tribal Trout Hatchery at the end of Big Cove Rd, hundreds of fish were swept out of the hatchery's raceway, with many of them dying after the waters receded.
Big Cove	1/15/2013	Flood	0/0	\$3,939,281	\$0	Flooded locations in and near the Cherokee Indian reservation included the Parkway entrance (US441), the Saunooke Bridge, which connects Big Cove Road to Newfound Gap Road, Meetinghouse Road and Whitewater Drive. Big Cove Road was also flooded in the Piney Grove area along Rabun Fork. Mt. Noble Road was damaged by mudslide. Oconaluftee Island Park was flooded for a while by the Oconaluftee River in Cherokee, though damage to the park was minimal. Several roads were damaged by flash flooding and landslides, resulting in a federal disaster declaration.

Source: NCEI Storm Events Database

Eastern Band of Cherokee Indians

According to the previous hazard mitigation plan, records of historical flood events on the EBCI Reservation are sparse; however, numerous floods on the Oconaluftee River, Rave Fork, and Soco Creek have been documented. There have been approximately 16 recorded flood events since 1840 that have crested above flood stage (10 feet) on the Oconaluftee River and many other events have exceeded 9 feet. The two largest recorded floods occurred in November 1906 and March 1913 with the river cresting at approximately 13 feet at Cherokee. Little information is available regarding damages due to these events. Limited records also indicate a flood occurred in December 1969 that was nearly equal to those in 1906 and 1913 in which several buildings were inundated with floodwaters, roadways were blocked, and the site of a new community center was flooded.

More recently, in 1993, a flooding event of similar magnitude occurred. Anecdotal accounts in local newspapers describe a wall of water through the EBCI Reservation and significant damage to buildings and road infrastructure. Another recent flood event occurred between May 5 and May 7, 2003. Heavy rains moved through the area causing flooding along all the major waterways in the area. Extensive roadway damage occurred throughout the reservation and 6 businesses and 8 residences were reportedly damaged with 4 structures being completely destroyed. Preliminary estimates calculated the total damage from this event to be approximately \$1.8 million.

Several more records of recent flood events were found in the local newspaper, *Cherokee One Feather*. These events included:

- ◆ December 8, 2009: High rains caused parts of the Oconaluftee River to flood. The rains also caused downed trees and a mudslide in the Big Cove area.
- ◆ July 14-15, 2011: A flash flood occurred along Straight Fork Creek in the Qualla Boundary. No injuries or deaths were reported, but there was considerable damage at the Cherokee Tribal

Fish Hatchery. Hatchery officials said a wall of water 8 to 10 feet high raced through the complex and damage estimates ranged from \$30,000 to \$50,000.

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been 328 flood losses reported in the Smoky Mountain Region through the National Flood Insurance Program (NFIP) since 1970, totaling over \$9.8 million in claims payments. A summary of these figures for each Smoky Mountain county is provided in **Table 5.35**. It should be emphasized these numbers include only those losses to structures insured through the NFIP policies, and for losses in which claims were sought and received. It is likely many additional instances of flood loss in the Smoky Mountain Region were either uninsured, denied claims payment, or not reported.

TABLE 5.35: SUMMARY OF INSURED FLOOD LOSSES IN THE SMOKY MOUNTAIN REGION

Location	Flood Losses	Claims Payments
CHEROKEE COUNTY	37	\$501,476
Andrews	5	\$192,489
Murphy	4	\$24,946
Unincorporated Area	28	284,041
GRAHAM COUNTY	2	\$10,847
Fontana*	*	*
Lake Santeetlah**	*	*
Robbinsville	0	\$0
Unincorporated Area	2	\$10,847
HAYWOOD COUNTY	244	\$7,992,637
Canton	50	\$3,033,702
Clyde	127	\$3,842,008
Maggie Valley	4	\$23,642
Waynesville	14	\$117,734
Unincorporated Area	49	\$975,551
JACKSON COUNTY	26	\$657,990
Dillsboro	4	\$262,079
Forest Hills	0	\$0
Sylva	4	\$121,213
Webster	0	\$0
Unincorporated Area	18	\$274,698
SWAIN COUNTY	15	\$432,173
Bryson City	11	\$405,822
Unincorporated Area	4	\$26,351
EASTERN BAND OF CHEROKEE	4	\$244,607
SMOKY MOUNTAIN REGION TOTAL	328	\$9,839,730

*Fontana Dam is covered by Graham County. They do not participate separately but activities are covered by the County.

**As of September 8, 2017, the NFIP application from Lake Santeetlah has been submitted and received by FEMA. While not formally processed yet, it is expected to be complete in the near future. *Source: FEMA, NFIP*

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

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properties nationwide.

Currently (as of February 2017), there are 29 non-mitigated repetitive loss properties located in the Smoky Mountain Region, which accounted for 75 losses and more than \$2.7 million in claims payments under the NFIP. The average claim amount for these properties is \$36,685. Twenty-one of the twenty-nine properties are single family residential and the remaining eight are other residential or nonresidential buildings. Without mitigation these properties will likely continue to experience flood losses. **Table 5.36** presents detailed information on repetitive loss properties and NFIP claims and policies for the Smoky Mountain Region.

TABLE 5.36: SUMMARY OF REPETITIVE LOSS PROPERTIES IN THE SMOKY MOUNTAIN REGION

Location	Number of Properties	Types of Properties	Num Buid	Content Payments	Total Payments	Average
CHEROKEE COUNTY	8		2	\$	\$57,858	\$
Andrews	2	1 single family, 1 nonresidential	4	\$	\$48,370	\$56,504
Murphy	1	single family	2	\$	\$0	\$3,566
Unincorporated Area	5	5 single family	1	\$	\$9,488	\$172,568
GRAHAM COUNTY	0		0	\$	\$0	\$
Fontana	0	-	0	\$	\$0	\$0
Lake Santeetlah	0	-	0	\$	\$0	\$0
Robbinsville	0	-	0	\$	\$0	\$0
Unincorporated Area	0	-	0	\$	\$0	\$0
HAYWOOD COUNTY	17	0	3	\$	\$92,354	\$1,730,663
Canton	0	-	0	\$	\$0	\$0
Clyde	14	10 single family, 2 other residential, 2 other nonresidential	28	\$	\$80,253	\$1,503,745
Maggie Valley	0	-	0	\$	\$0	\$0
Waynesville	2	1 single family, 1 nonresidential	4	\$	\$1,912	\$70,529
Unincorporated Area	1	single family	2	\$	\$10,189	\$156,387
JACKSON COUNTY	3		6	\$	\$90,000	\$185,178
Dillsboro	0	-	0	\$	\$0	\$0
Forest Hills	0	-	0	\$	\$0	\$0
Sylva	0	-	0	\$	\$0	\$0
Webster	0	-	0	\$	\$0	\$0
Unincorporated Area	3	2 single family, 1 other nonresidential	6	\$	\$90,000	\$185,178
SWAIN COUNTY	2		8	\$	\$60,371	\$366,569
Bryson City	2	2 nonresidential	8	\$	\$60,371	\$366,569
Unincorporated Area	0	-	0	\$	\$0	\$0
EASTERN BAND OF CHEROKEE INDIANS	1	nonresidential	3	\$	\$236,298	\$236,298
SMOKY MOUNTAIN REGION	29		7	\$	\$536,880	\$2,751,346

Source: National Flood Insurance Program

5.14.4 Extent

It is often thought the 0.2-percent annual chance flood is the greatest extent (or severity of flooding). However, flooding may exceed the boundaries and anticipated depth of this hazard.

Flood extent, or magnitude, can also be defined by flow or discharge rate (in cubic feet per second), and height of flood waters. The USGS drainage areas, discharge rates, and available flood stage available for the Smoky Mountain Region are in **Table 5.37**. Maximum discharge and maximum gage height are the indicators of flood hazard extent.

Extent of flooding can also be measured in terms of damage and human impacts (including loss of life and injuries). The greatest amount of damage reported from a flood event was approximately \$22 million (2017 dollars). However, costlier events are possible. Further, fatalities and injuries have occurred with this hazard and are possible in the future.

TABLE 5.37: SUMMARY OF DISCHARGE RATES IN THE SMOKY MOUNTAIN REGION

Water Feature	Gage Location	Median Discharge (ft ³ /s)	Max Discharge (ft ³ /s – yr)	Drainage Area (sq miles)	Max Gage Height (ft/yr)
Valley River	at Tomatla, Cherokee County	143	7,480 (2015)	104	14.43 (2015)
Nantahala River	Near Hewitt, Swain County	478	3,940 (2013)	145	5.58 (2013)
Little Tennessee River	at Needmore, Swain County	656	15,800 (2015)	436	10.21 (2015)
Cheoah River	near Bearpen Gap, Graham County	136	12,800 (2014)	206	12.08 (2014)
Tuckasegee River	at Bryson City, Swain County	1,150	27,600 (2013)	655	12.67 (2013)
Oconaluftee River	Birdtown, Swain County	372	10,900 (2013)	372	9.37 (2013)
Tuckasegee River	at Barker's Creek, Jackson County	557	10,800 (2015)	360	10.64 (2015)
West Fork Pigeon River	above Lake Logan near Hazelwood, Haywood County	61	4,480 (2015)	27.6	7.13 (2015)
West Fork Pigeon River	near Retreat, Haywood County	73	6,080 (2015)	33.5	8.16 (2015)
West Fork Pigeon River	at Bethel, Haywood County	102	7,080 (2015)	58.4	10.28 (2015)
Lake Logan	at Dam near Hazelwood, Haywood County	n/a	n/a	33.3	56.43 (2015)
East Fork Pigeon River	near Canton	89	5,760 (2015)	51.5	7.87 (2015)
Tuckasegee River	at SR1172 near Cullowhee, Jackson County	255	7,760 (2015)	147	13.97 (2013)

5.14.5 Probability of Future Occurrences

Areas with designated special flood hazard areas are subject to an approximate annual probability of flooding of at least 1.0-percent. This results in varying degrees of probability across jurisdictions and the

region. Flood events will remain a threat in the Smoky Mountain Region. This is discussed further in Section 6 in terms of vulnerability. In general, Murphy, Unincorporated Cherokee County, Lake Santeetlah, Unincorporated Graham County, Bryson City, Unincorporated Swain County, Unincorporated Jackson County, Canton, and Waynesville are subject to more frequent flood events due to a higher presence of special flood hazard boundaries.

The NCEI's Storm Events Database indicates 117 flood events in the Smoky Mountain Region between 1996 and 2016. This results in a historic average flood occurrence rate of approximately six floods per year. Based on the rate of historic occurrences, the flood hazard was assigned an annual probability of "highly likely" (greater than 90 percent annual chance).

Other Hazards

5.15 HAZARDOUS MATERIALS INCIDENTS

5.15.1 Background

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.²³ 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 because of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes, and earthquakes, which in addition to causing incidents can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills, and a variety of other environmental pollutants that caused widespread toxicological concern.

Hazardous material incidents can include the spilling, leaking, pumping, pouring, emitting, emptying,

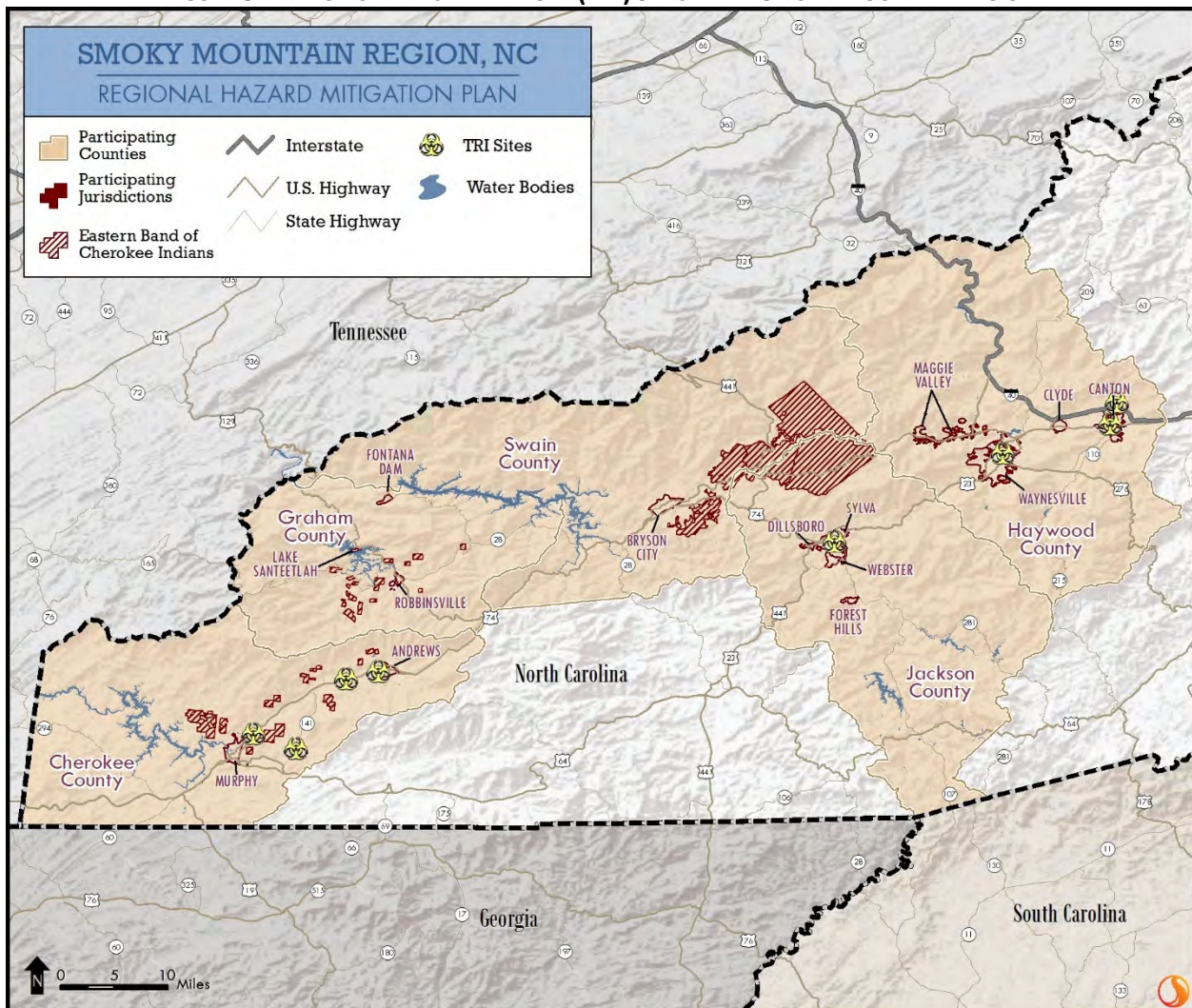
²³ FEMA, 1997.

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.

5.15.2 Location

Because 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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. The Smoky Mountain Region has eight TRI sites. These sites are shown in **Figure 5.21**.

FIGURE 5.21 : TOXIC RELEASE INVENTORY (TRI) SITES IN THE SMOKY MOUNTAIN REGION



Source: EPA

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 and winding, making hazardous material transport in the area especially treacherous. All roads that permit hazardous material transport are considered potentially at risk to an incident.

5.15.3 Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” (highlighted in yellow in **Table 5.39** below) 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 materials “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 persons due to the presence of hazardous material, or
- ◆ a vehicle accident or derailment resulting in the release of a hazardous material.

Table 5.38 presents summary information on historic HAZMAT incidents reported in the Smoky Mountain Region. **Table 5.39** presents detailed information on historic HAZMAT incidents reported in the Smoky Mountain Region.

TABLE 5.38: SUMMARY OF HAZMAT INCIDENTS IN THE SMOKY MOUNTAIN REGION

Location	Number of Occurrences	Property Damage (2017 Dollars)
CHEROKEE COUNTY	4	\$7,060
Andrews	0	\$0
Murphy	3	\$0
Unincorporated Area	1	\$7,060
GRAHAM COUNTY	--	--
Fontana		
Lake Santeetlah		
Robbinsville		
Unincorporated Area		
HAYWOOD COUNTY	30	\$88,891
Canton		
Clyde		
Maggie Valley		
Waynesville		
Unincorporated Area		

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JACKSON COUNTY	4	
Dillsboro		
Forest Hills		
Sylva		
Webster		
Unincorporated Area		
SWAIN COUNTY	6	\$2,110
Bryson City		
Unincorporated Area		
EASTERN BAND OF CHEROKEE	0	--
SMOKY MOUNTAIN REGION TOTAL	44	

TABLE 5.39: SUMMARY OF HAZMAT INCIDENTS IN THE SMOKY MOUNTAIN REGION

Report Number	Date	City	Mode	Serious Incident?	Fatalities/Injuries	Damages (2017)	Quantity Released
Cherokee County							
I-1972110115	10/9/1972	Murphy	Rail	No	0/0	\$0	0
I-1974010040	11/27/1973	Murphy	Rail	No	0/0	\$0	0
I-1976030970	3/16/1976	Murphy	Highway	No	0/0	\$0	0
I-1997010861	01/06/1997	Marble	Highway	No	0/0	\$7,060	50 LGA
Graham County							
--	--	--	--	--	--	--	--
Haywood County							
I-1973070581	7/17/1973	Canton	Highway	No	0/0	\$0	0
I-1976110011	7/21/1976	Canton	Rail	No	0/1	\$0	10 LGA
I-1979020469	1/29/1979	Waynesville	Highway	No	0/0	\$0	0
I-1980071276	6/16/1980	Waynesville	Highway	No	0/0	\$0	0
I-1980090336	6/18/1980	Canton	Rail	No	0/0	\$0	0
I-1982080698	8/12/1982	Clyde	Highway	Yes	0/0	\$0	6,250 LGA
I-1985110033	10/2/1985	Waynesville	Rail	No	0/0	\$0	0.12 LGA
I-1986090467	09/11/1986	Harmons Den	Highway	No	0/0	\$0	30 LGA
I-1987080048	6/3/1987	Canton	Rail	No	0/0	\$0	0.25 LGA
I-1988090195	8/4/1988	Clyde	Highway	Yes	0/0	\$0	6,000 LGA
I-1989070500	7/13/1989	Clyde	Highway	Yes	0/0	\$0	5,500 LGA
I-1991060181	5/29/1991	Clyde	Highway	No	0/0	\$4,910	55 LGA
I-1996020185	12/31/1995	Canton	Highway	No	0/0	\$4	2 LGA
I-1996090182	8/20/1996	Waynesville	Highway	No	0/0	\$3,130	4 LGA
I-1996110450	10/17/1996	Waynesville	Highway	No	0/0	\$713	40 LGA
I-1997030854	3/4/1997	Canton	Highway	No	0/0	\$0	0
I-1997041086	4/6/1997	Waynesville	Highway	No	0/0	\$0	0
I-1998040167	03/12/1998	Crabtree	Highway	No	0/0	\$1,160	3 LGA
I-1998050099	04/14/1998	Waterville	Highway	No	0/0	\$3,750	10 LGA
I-1998090470	8/7/1998	Waynesville	Highway	No	0/0	\$4	4 LGA
I-1998111002	10/3/1998	Waynesville	Highway	No	0/0	\$3	3 LGA
I-1999040598	3/16/1999	Waynesville	Highway	Yes	0/0	\$250	200 LGA
I-1999040888	4/13/1999	Canton	Highway	No	0/0	\$1,025	30 LGA
I-2000090192	8/11/2000	Waynesville	Highway	No	0/0	\$59,001	100 LGA
I-2000120378	8/22/2000	Canton	Highway	No	0/0	\$0	5 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (2017)	Quantity Released
I-2003111034	11/12/2003	Canton	Highway	Yes	0/0	\$6,000	330 LGA
I-2004090919	08/28/2004	Maggie Valley	Highway	No	0/0	\$4,000	100 LGA
I-2005090796	8/23/2005	Canton	Rail	No	0/0	\$2,000	0.26418 LGA
I-2006080466	7/18/2006	Canton	Highway	No	0/0	\$1,550	15 LGA
I-2010090110	4/13/2010	Waynesville	Highway	No	0/0	\$1,391	50 LGA
Jackson County							
I-1980101535	10/2/1980	Cashiers	Highway	No	0/0	\$0	1 LGA
I-1979010129	12/31/1978	Cashiers	Highway	No	0/0	\$0	3 LGA
I-1980091406	9/15/1980	Cashiers	Highway	No	0/0	\$0	1 LGA
I-1980030761	2/26/1980	Cashiers	Highway	No	0/0	\$0	1 LGA
Swain County							
I-1977090461	09/01/1977	Bryson City	Highway	No	0/0	\$0	0
I-1977111031	11/16/1977	Bryson City	Highway	No	0/0	\$0	0
I-1978080563	08/07/1978	Bryson City	Highway	No	0/0	\$0	1 LGA
I-1992091038	08/25/1992	Cherokee	Highway	No	0/0	\$6	6 LGA
I-1996100595	7/12/1996	Whittier	Highway	No	0/0	\$5	5 LGA
E-2006070211	7/10/2006	Whittier	Highway	No	0/0	\$2,110	40 LGA
Eastern Band of Cherokee Indians							
NONE REPORTED—EBCI communities included in the county data							

Source: USDOT PHMSA

5.15.4 Extent

The extent of hazardous materials incidents can be defined in terms of amount of material released. According to USDOT PHMSA, the largest hazardous materials incident reported in the region is 6,250 liquid gallons released on the roadway in Clyde (Haywood County). It should be noted that larger events are possible.

5.15.5 Probability of Future Occurrence

Given the location of eight toxic release inventory sites in the Smoky Mountain Region and several serious roadway incidents, it is possible that a hazardous material incident may occur in the region (1 to 10 percent annual probability). Such an event could have catastrophic consequences. County, municipal and Tribal 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.

5.16 WILDFIRE

5.16.1 Background

A wildfire is any outdoor fire (i.e. grassland, forest, brush land) that is not under control, supervised, or prescribed.²⁴ Wildfires are part of the natural management of forest ecosystems, but may also be

²⁴ Prescription burning, or “controlled burn,” undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

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.

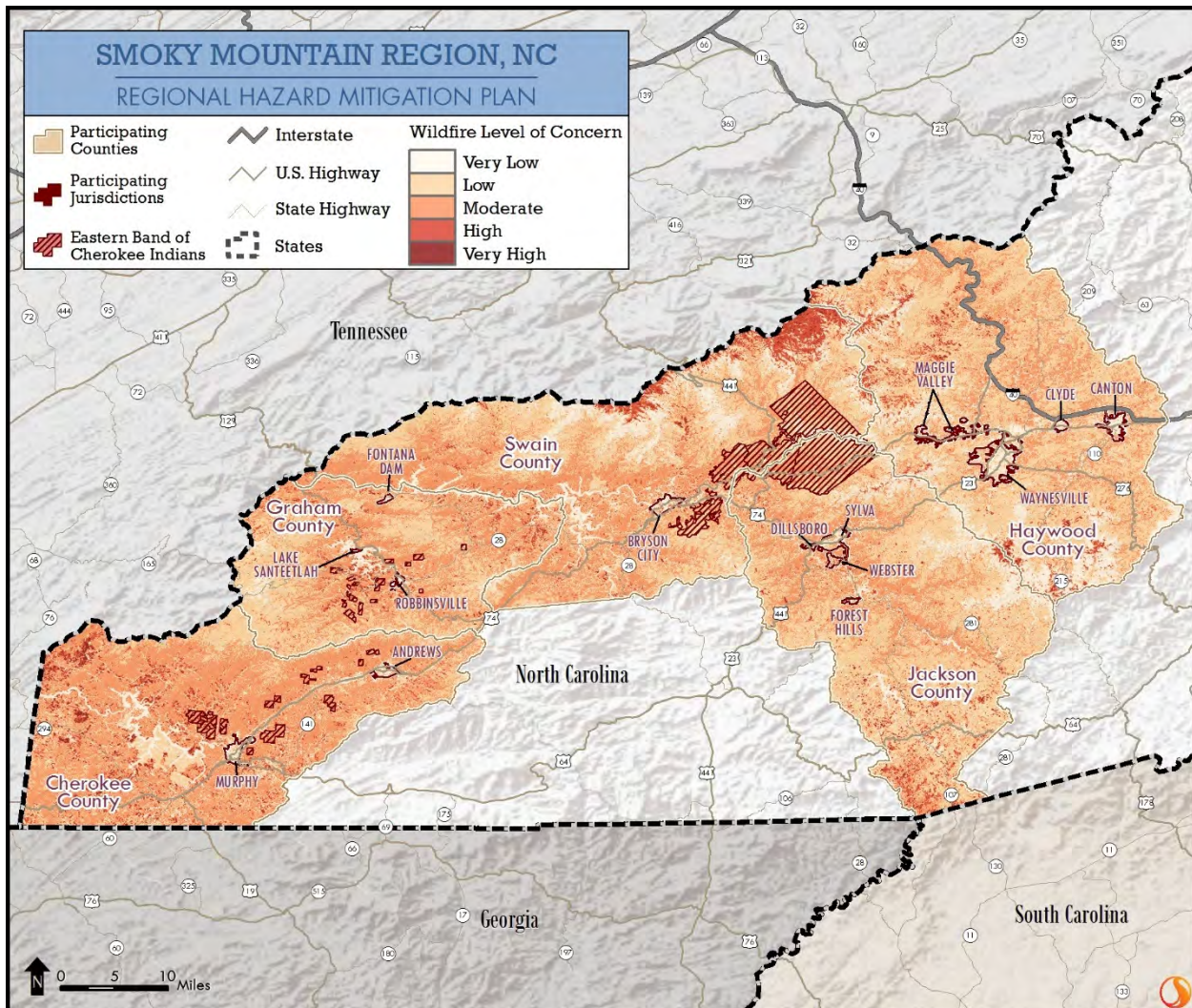
Wildfires can result in severe economic losses as well. Businesses that depend on timber, such as paper mills and lumber companies, experience losses that are often passed along to consumers through higher prices and sometimes jobs are lost. The high cost of responding to and recovering from wildfires 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.

5.16.2 Location

The entire region is at risk to a wildfire occurrence as shown in **Figure 5.22**, Level of Wildfire Concern based on the Southern Wildfire Risk Assessment. (Note - this map is further described in Section 6 in terms of jurisdictional vulnerability.) 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. The Fire Occurrence Areas in **Figure 5.23** give an indication of historic locations impacted.

FIGURE 5.22: WILDFIRE RISK AREAS IN THE SMOKY MOUNTAIN REGION



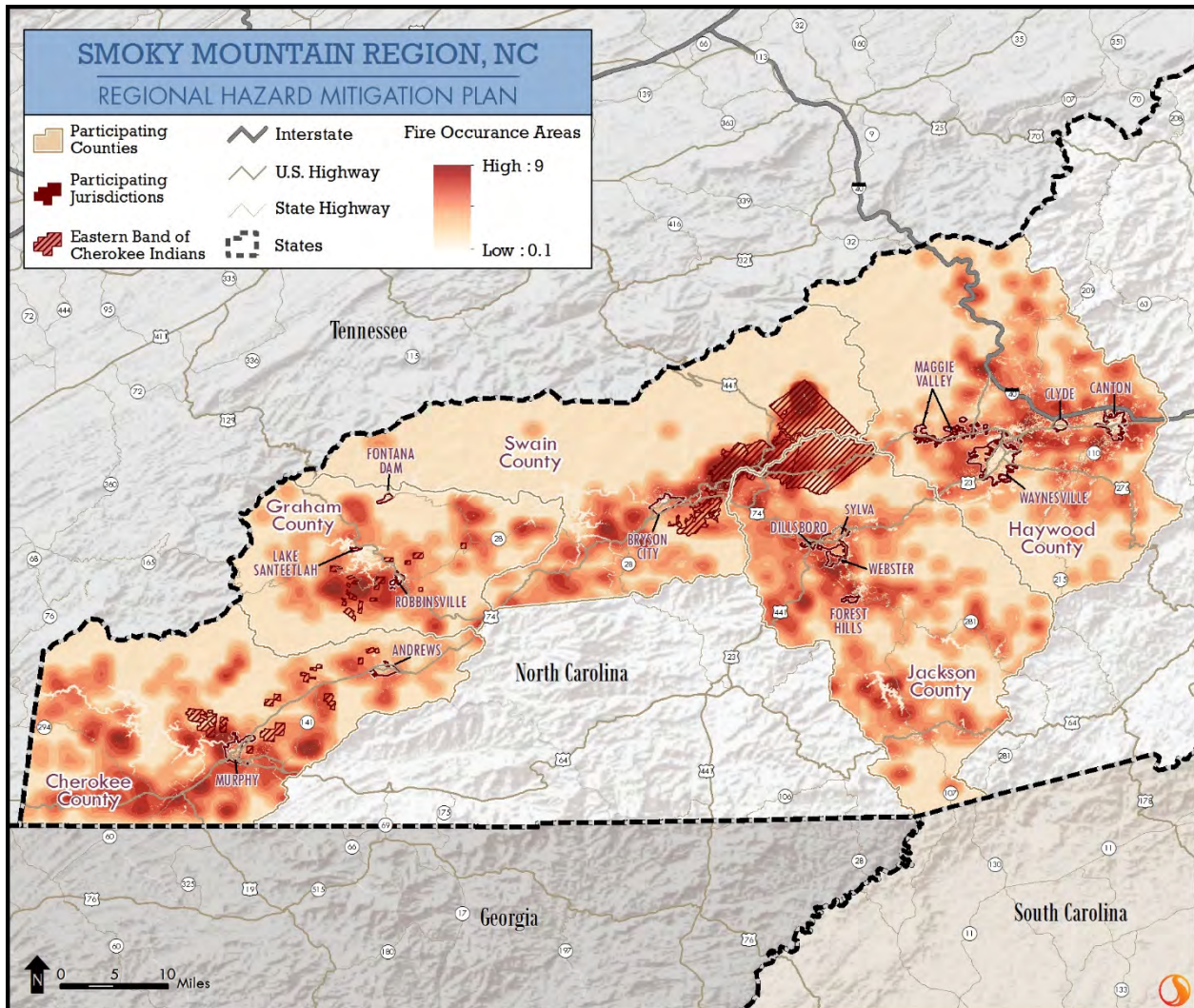
5.16.3 Historical Occurrences

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county. It should be noted that 2016 saw a spike in the number of acres burned by wildfires, particularly in Graham, Swain, and Jackson Counties. More information on the 2016 wildfires is located at the end of this section.

Figure 5.23 shows the Fire Occurrence Areas (FOA) in the Smoky Mountain Region based on data from the Southern Wildfire Risk Assessment. All counties in the Smoky Mountain Region contain areas considered to be of “high” fire occurrence (up to nine yearly fires per 1,000 acres). It should be noted that many unincorporated areas, the towns of Webster, Dillsboro, Maggie Valley, and Murphy, and many parts of the Eastern Band of Cherokee Indians include areas of high fire occurrence, as shown in the

figure below.

FIGURE 5.23: HISTORIC WILDFIRE EVENTS IN THE SMOKY MOUNTAIN REGION



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, the Smoky Mountain Region experiences an average of 168 wildfires annually which burn a combined 1,902 acres, on average. The data indicates that 2016 fires in Swain and Graham Counties resulted in a much higher than average acres burned, including 8,941 total acres in Graham County for the year and 8,863 total acres burned in Swain County for year. Jackson County also experienced an increase in acres burned, with 1,064 acres burned in 2016 compared to 203 acres burned per year on average. More information regarding the 2016 wildfires is below. **Table 5.40** provides a summary table for wildfire occurrences in the Smoky Mountain Region. **Table 5.41** lists the number of reported wildfire occurrences in the participating counties between the years 2002 and 2016.

TABLE 5.40: SUMMARY TABLE OF ANNUAL WILDFIRE OCCURRENCES (2002-2016)*

	Cherokee County	Graham County	Haywood County	Jackson County	Swain County	Smoky Mountain Region
Average Number of Fires per year	50	16	41	40	21	168
Average Number of Acres Burned per year	143	689	160	206	703	1,902
Average Number of Acres Burned per fire	3	44	4	5	33	11

*These values reflect averages over a 15-year period.

Source: North Carolina Division of Forest Resources

TABLE 5.41: HISTORICAL WILDFIRE OCCURRENCES IN THE SMOKY MOUNTAIN REGION (2002-2017)

Year	Cherokee County		Graham County		Haywood County		Jackson County		Swain County	
	Number of Fires	Number of Acres Burned	Number of Fires	Number of Acres Burned	Number of Fires	Number of Acres Burned	Number of Fires	Number of Acres Burned	Number of Fires	Number of Acres Burned
2002	33	109.1	12	163.6	59	325.7	41	156.9	19	23.6
2003	23	86	1	3	23	22.6	27	40.7	10	29.1
2004	51	109	20	175.6	63	220.1	60	128.1	22	152.9
2005	45	118.6	7	6.2	41	216	33	185	24	149.2
2006	95	224.7	16	26.5	71	278.2	57	540.1	24	163.1
2007	84	313	83	542	55	261	75	367	23	405
2008	68	367	9	118	44	554	53	95	28	257
2009	50	66	8	17	53	59	44	76	7	27
2010	43	45	17	33	24	26	30	147	24	285
2011	46	141	11	37	26	45	20	46	18	50
2012	45	47	9	189	7	4	15	76	8	50
2013	23	67	2	2	18	64	14	10	12	25
2014	49	178	4	19	32	43	34	130	10	28
2015	23	144	8	68	24	169	16	28	8	43
2016	70	127	27	8941	82	119	77	1064	81	8863

Source: North Carolina Division of Forest Resources

Eastern Band of Cherokee Indians

(Taken from the 2011 EBCI plan) According to the 2001 Fire Management Plan, there were a total of 174 fires reported on the EBCI Reservation between 1986 and 1997, burning a total of 906.9 acres. Of these fires 71% have been caused by debris burning, although other causes include smoking, children, as well as miscellaneous causes.

In addition to the detail provided above, two events were reported in local newspapers for the EBCI Reservation lands, one in 2001 and one in 2009. No additional information about the size, severity,

extent, or damages was provided.

- ◆ March 26, 2001: A forest fire on Qualla Boundary burned about 110 acres but did not threaten any structures. (*Source: Star News*).
- ◆ April 27, 2009: A downed power line in the Big Cove community of the Qualla Boundary sparked dry vegetation. In total, 2,200 acres were burned with a small number of those being within Great Smoky Mountains Park. Most of the fire was in the Big Cove community and at one point the fire approached several homes but did not continue into that area. The fire circled the mountain and zigzagged upward along the peak and down the other side. This fire is known as the Stony Ridge Fire. (*Source: National Park Service*).
- ◆ February 25, 2014: A wildfire burned 85 acres in the Yellowhill Community. No injuries or structural damage was reported. According to the BIA Cherokee Agency, the cause of the wildfire was arson. (*Source: Cherokee One Feather*)
- ◆ April 17-21, 2016: Three wildfires burned over 300 acres. Fires started in the Yellowhill, Big Cove, and Birdtown communities. The EBCI Secretary of Public Safety reported no injuries or damages. (*Source: Cherokee One Feather*)
- ◆ Fall 2016 – wildfires burned across much of the region, including EBCI lands, particularly on the Qualla Boundary. See below for details.

2016 Wildfires

In the late October through November of 2016, western North Carolina suffered from what are considered to be wildfires of historic extent. In November alone, western North Carolina experienced an outbreak of wildfires that burned over 55,000 acres in the wake of an extreme drought.²⁵ Graham County and Swain County were particularly hard hit. In Graham County, two fires burned over 8,000 acres near Lake Santeetlah. One of which, the Maple Springs Fire, (**Figure 5.24**²⁶) burned over 7,500 acres before being contained.²⁷ Another fire in Graham County required evacuations. In Swain County, residents of six streets were forced to evacuate after a fire burned over 6,800 acres.²⁸ The Tellico Fire (**Figure 5.25**²⁹), which burned on the Swain County-Macon County border, burned over 13,600 acres before being contained. Homes in the Tellico and Queen Creek communities were only several hundred feet from the fire, and faced a voluntary evacuation. This prompted a state of emergency to be declared for the county.



Figure 5.25: A heavy air tanker drops fire retardant ahead of the Tellico Fire

Source: The US Forest Service, North Carolina

²⁵ <http://www.charlotteobserver.com/news/local/article114911183.html>

²⁶ <https://inciweb.nwcg.gov/incident/photograph/5090/22/>

²⁷ <http://wlos.com/news/local/boteler-fire-and-nantahala-branch-fires-update>

²⁸ <http://wlos.com/news/local/mandatory-evacuations-issued-in-swain-county-because-of-wildfires>

²⁹ <https://inciweb.nwcg.gov/incident/photograph/5084/19/61188/>

Jackson County also experienced an increase in acres burned, with 1,064 acres burned in 2016 compared to 203 acres burned per year on average. In addition, dozens of fires were reported on the Qualla Boundary, totaling over 480 acres burned.³⁰

Firefighting and rescue crews from all over the state traveled to western North Carolina to aid in relief efforts.³¹ According to the USDA's Joint Information Center Western NC Wildfires, by November 25, 2016, nine incident management teams and over 6,000 state and federal personnel from all over the country were deployed to assist the Southeast with fire suppression, in addition to hundreds of state volunteer firefighters and emergency personnel. At the time, North Carolina alone was in use of seven airplanes, eight single engine air tankers (SEATs), six type 1 (large) helicopters, five type 2 (medium) helicopters, and three type 3 (large helicopters) to aid in fire suppression.³² The USDA estimates that suppression costs from October through December in western North Carolina totaled \$36.8 million.³³ Aside from the impacts to human and environmental health and safety, the fires had a significant impact on the region's economy, which relies heavily on tourism during the fall and winter months.³⁴

5.16.4 Extent

Wildfire extent can be defined by the number of fires occurring in a given year or by the number of acres burned in a given year. According to data from the North Carolina Forest Service, from 2007 to 2016 the greatest number of fires to occur was 84 fires in Cherokee County in 2008. The greatest number of acres burned during this time occurred in Graham County in 2016, with 8,941 acres burned.

The greatest number of fires and acres burned each year from 2002-2016 per county can be found in each County's annex.

5.16.5 Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in the Smoky Mountain Region. The likelihood of wildfires increases during drought cycles and abnormally dry 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 Smoky Mountain Region for future wildfire events is "highly likely" (greater than 90-percent annual chance).

5.17 CONCLUSIONS ON HAZARD RISK

³⁰ <http://wlos.com/news/local/fire-updates-dires-greater-than-6000-acres-burn-in-swain-and-graham-counties>

³¹ <http://myfox8.com/2016/11/22/new-wildfire-sparks-evacuations-in-blowing-rock/>

³² USDA Forest Services Joint Information Center Western NC Wildfires. Evening Summary (2016, November 25). Retrieved from <https://www.fs.usda.gov/detail/nfsnc/alerts-notices/?cid=fseprd525902>

³³ <http://www.citizen-times.com/story/news/local/2017/03/31/wnc-wildfires-yield-hefty-price-tag/99736410/>

³⁴ <http://www.citizen-times.com/story/news/local/2016/11/18/outbreak-wnc-wildfires-takes-toll-wildlife-environment/93788956/>

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.

To draw some meaningful planning conclusions on hazard risk for the Smoky Mountain Region, the results of the hazard profiling process were used to generate countywide hazard classifications per a “Priority Risk Index” (PRI). The purpose of the PRI is to categorize and prioritize all potential hazards for the Smoky Mountain 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 using 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 Smoky Mountain Region to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for the Smoky Mountain Region is based principally on the PRI, a tool used to measure the degree of risk for identified hazards in a planning area. The PRI is used to assist the Smoky Mountain Regional Hazard Mitigation Planning Committee in gaining consensus on the determination of those hazards that pose the most significant threat to the Smoky Mountain 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 Smoky Mountain Region based on standardized criteria.

The application of the PRI results in numerical values allowing 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 factor³⁵ as summarized in **Table 5.42**. 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:

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

According to the weighting scheme and point system applied, the highest possible value for any hazard is 4.0. When the scheme is applied for the Smoky Mountain Region, the highest PRI value is 3.3 (winter storm and freeze hazard). Prior to being finalized, PRI values for each identified hazard were reviewed and accepted by the members of the Regional Hazard Mitigation Planning Committee. In addition, each county has a unique PRI found in their respective annexes.

³⁵ The Regional Hazard Mitigation Planning Committee, based upon any unique concerns or factors for the planning area, may adjust the PRI weighting scheme during future plan updates.

TABLE 5.42: PRIORITY RISK INDEX FOR THE SMOKY MOUNTAIN 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 90% annual probability	3	
	Highly Likely	90%+ annual probability	4	
Impact	Minor	Only minor property damage and minimal disruption to government functions and services. No shutdown of critical facilities.	1	30%
	Limited	Minor injuries are possible. More than 10% of buildings damaged or destroyed. Temporary shutdown of critical facilities (less than one week).	2	
	Critical	Multiple deaths/injuries possible. More than 25% of buildings 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 buildings damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Limited to one specific area	1	20%
	Small	Small areas affected	2	
	Moderate	Large areas	3	
	Large	All areas	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	

5.17.1 Priority Risk Index Results

Table 5.43 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE 5.43: SUMMARY OF THE PRI RESULTS FOR THE SMOKY MOUNTAIN REGION

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Highly Likely	Limited	Moderate	Less than 6 hours	Less than 6 hours	2.9
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Critical	Negligible	Less than 6 hours	Less than 6 hours	2.8
Thunderstorm/High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 24 hours	3.3
Tornado	Likely	Catastrophic	Small	Less than 6 hours	Less than 6 hours	3
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.7
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	1.8
Flood	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3
Other Hazards						
Hazardous Materials Incident	Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

5.18 FINAL DETERMINATIONS

The conclusions drawn from the hazard profiling process for the Smoky Mountain Region, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard into three categories: High Risk, Moderate Risk, and Low Risk (**Table 5.44**). 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 Smoky Mountain Region. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment*. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or

unprecedented magnitudes are still possible in some cases and their assigned classification will continue to be evaluated during future plan updates.

TABLE 5.44: CONCLUSIONS ON HAZARD RISK FOR THE SMOKY MOUNTAIN REGION

HIGH RISK	Thunderstorm/High Wind Winter Storm and Freeze Flood Hailstorm Lightning Landslide Wildfire
MODERATE RISK	Drought Hurricane and Tropical Storm Tornado
LOW RISK	HAZMAT Dam and Levee Failure Earthquake Erosion

SECTION 6

VULNERABILITY ASSESSMENT

This section identifies and quantifies the vulnerability of the jurisdictions within the Smoky Mountain 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 Qualitative Vulnerability Assessment Results
- ◆ 6.6 Quantitative Vulnerability Assessment Results
- ◆ 6.7 Conclusions on Hazard Vulnerability

44 CFR Requirement

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

6.1 OVERVIEW

This section builds upon the information provided in Section 4: *Hazard Identification* and Section 5: *Hazard Profiles* by identifying and characterizing an inventory of assets in the Smoky Mountain Region. In addition, the potential impact and expected amount of damages caused to these assets by each identified hazard event is assessed. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard. In doing so, the Smoky Mountain counties, their participating jurisdictions, and the Tribe 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 Smoky Mountain Region. The remainder of this section focuses on the results of the assessment conducted.

6.2 METHODOLOGY

This vulnerability assessment was conducted by using a two-fold, qualitative and quantitative approach. The qualitative assessment draws on previous impacts in the and near the planning area, as well as professional judgement to determine vulnerability in the region and jurisdictions. The quantitative assessment utilizes a geographic information system (GIS)-based analysis and a risk modeling software (Hazus-MH) analysis.

6.2.1 Qualitative Assessment

The qualitative approach was employed for hazards that generally have the potential to impact, or occur within, the entire planning area. Or, such hazards may lack a geographic boundary or sufficient data to perform a reliable analysis. A qualitative vulnerability assessment was employed for all hazards.

Many of the hazards listed above are considered atmospheric and have the potential to affect all current and future buildings and all populations. Drought, hailstorm, lightning, thunderstorm wind, tornado, winter storm and freeze, dam failure, and erosion have the potential to impact the entire Smoky Mountain Region.

Social vulnerability was considered for all hazards. For dam failure and erosion, historical occurrences and property damage information was not available.

6.2.2 Quantitative Assessment - GIS Analysis

Other hazards have specified geographic boundaries that permit additional analysis using Geographic Information Systems (GIS). These hazards include:

- ◆ Flood
- ◆ Hazardous Material Incident
- ◆ Landslide
- ◆ Wildfire

The objective of the GIS-based analysis was to determine the estimated vulnerability of critical facilities and populations for the identified hazards in the Smoky Mountain 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 geo-referenced point locations for identified assets (critical facilities and infrastructure, special populations, etc.) when available. ESRI® ArcGIS™ 10.2 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. 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 with 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 Quantitative Assessment – Hazus-MH

A risk modeling software was used for the following hazards:

- ◆ Earthquake
- ◆ Hurricane and Tropical Storm

There are several models that exist to model hazards. Hazus-MH was used in this vulnerability assessment to address the aforementioned hazards.

FEMA's Hazus-MH

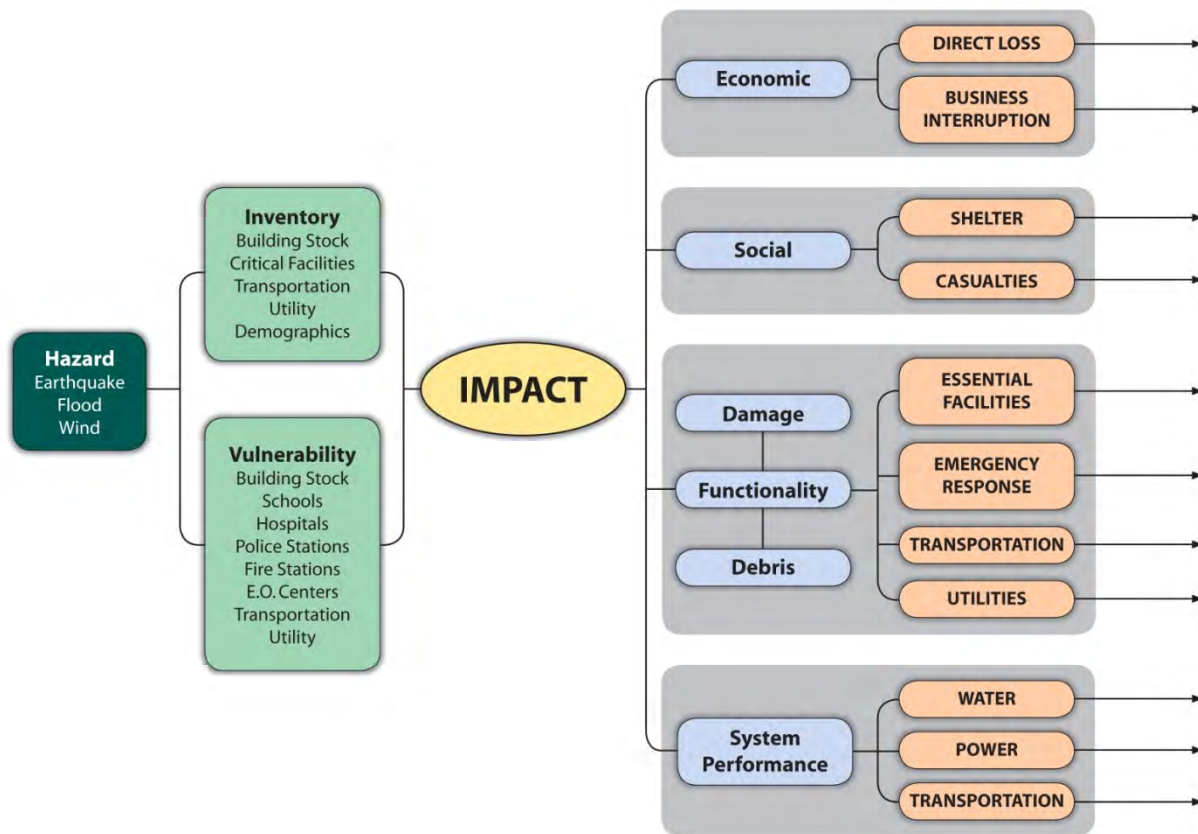
Hazus-MH (“Hazus”) is a standardized loss estimation software program developed by FEMA. It is built upon an integrated GIS platform to conduct analysis at a regional level (i.e., not on a structure-by-structure basis). The Hazus risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., wind speed and building types) can be modeled using the software to determine the impact (i.e., damages and losses) on the built environment.



The Smoky Mountain Regional Risk Assessment utilized Hazus-MH to produce hazard damage loss estimations for hazards for the planning area. At the time this analysis was completed, Hazus-MH 3.1 was used to estimate potential damages from hurricane winds earthquake hazards using Hazus-MH methodology. Although the program can also model losses for flood and storm surge, it was not used in this Risk Assessment.

Figure 6.1 illustrates the conceptual model of the Hazus-MH methodology.

FIGURE 6.1: CONCEPTUAL MODEL OF HAZUS-MH METHODOLOGY



Hazus-MH is capable of providing a variety of loss estimation results. In order to be consistent with other hazard assessments, annualized losses are presented when possible. Some additional results based on location-specific scenarios may also be presented to provide a complete picture of hazard vulnerability.

Loss estimates provided in this vulnerability assessment are based on best available data and methodologies. The results are an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, non-specific locations, demographics, or economic parameters).

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

6.3 EXPLANATION OF DATA SOURCES

Earthquake

Hazus-MH 3.1 (as described above) was used to assess earthquake vulnerability. A level 1, probabilistic scenario to estimate annualized loss was utilized. In this scenario, several return periods (events of varying intensities) are run to determine annualized loss. Default Hazus earthquake damage functions and methodology were used to determine the probability of damage for 100-, 250-, 500-, 750-,

1,000-, 1,500-, and 2,500-year frequency events (also known as a return period). Results are calculated at the 2010 U.S. Census tract level in Hazus and presented at the county level.

Flood

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 1.0-percent annual chance flood and the 0.2-percent annual chance flood areas. For the vulnerability assessment, local parcel data and critical facilities were overlaid on the 1.0-percent annual chance floodplains and the 0.2-percent annual chance floodplains. It should be noted that such an analysis does not account for building elevation.

Hurricane and Tropical Storm Wind

Hazus-MH 3.1 (as described above) was used to assess wind vulnerability. For the hurricane wind analysis, a probabilistic scenario was created to estimate the annualized loss damage and probable peak wind speeds in the Smoky Mountain Region. Default Hazus wind speed data, damage functions, and methodology were used in to determine the probability of damage for 100-, 500-, and 1,000-year frequency events (also known as return periods) in the scenario. Results are calculated in Hazus at the 2010 U.S. Census tract level and presented at the county level.

Hazardous Materials Incident

For the fixed hazardous materials incident analysis, Toxic Release Inventory (TRI) data was used. The Toxics Release Inventory is a publicly available database from the federal Environmental Protection Agency (EPA) that contains information on toxic chemical 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 expanded by the Pollution Prevention Act of 1990. Each year, facilities that meet certain activity thresholds must report their releases and other waste management activities for listed toxic chemicals to EPA and to their state or tribal entity. A facility must report if it meets the following three 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.

Wildfire

The data used to determine vulnerability to wildfire in the Smoky Mountain 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 “Level of Concern” (LOC) was used to determine vulnerability of people and property. The LOC is presented on a scale of 1 to 100. It combines a Wildfire Susceptibility Index (WFSI) with a Fire Effects Index (FEI). The primary purpose of the LOC data is to highlight areas of concern that may be conducive to mitigation actions. Due to the assumptions made, it is not a true probability. However, it does provide a comparison of risk throughout the region.

6.4 ASSET INVENTORY

An inventory of geo-referenced assets within the Smoky Mountain counties, jurisdictions and the Tribe was compiled in order to identify and characterize those properties potentially at risk to the identified hazards¹. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Under this assessment, two categories of physical assets were created and then further assessed through GIS analysis. Additionally, social assets are addressed to determine population at risk to the identified hazards. These are presented below in Section 6.4.2.

6.4.1 Physical and Improved Assets

The two categories of physical assets consist of:

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

The following tables provide a detailed listing of the geo-referenced assets that have been identified for inclusion in the vulnerability assessment for the Smoky Mountain Region. **Figure 6.2** shows the locations of critical facilities.

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 Smoky Mountain Region (study area of vulnerability assessment).²

TABLE 6.1: IMPROVED PROPERTY IN THE SMOKY MOUNTAIN REGION

Location	Estimated Number of Parcels	Estimated Number Improved Parcels ³	Total Estimated Value of Improved Parcels
Cherokee County	33,829	16,622	\$ 1,908,682,589
Andrews	853	627	\$ 82,241,206

¹ 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.

² 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.

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

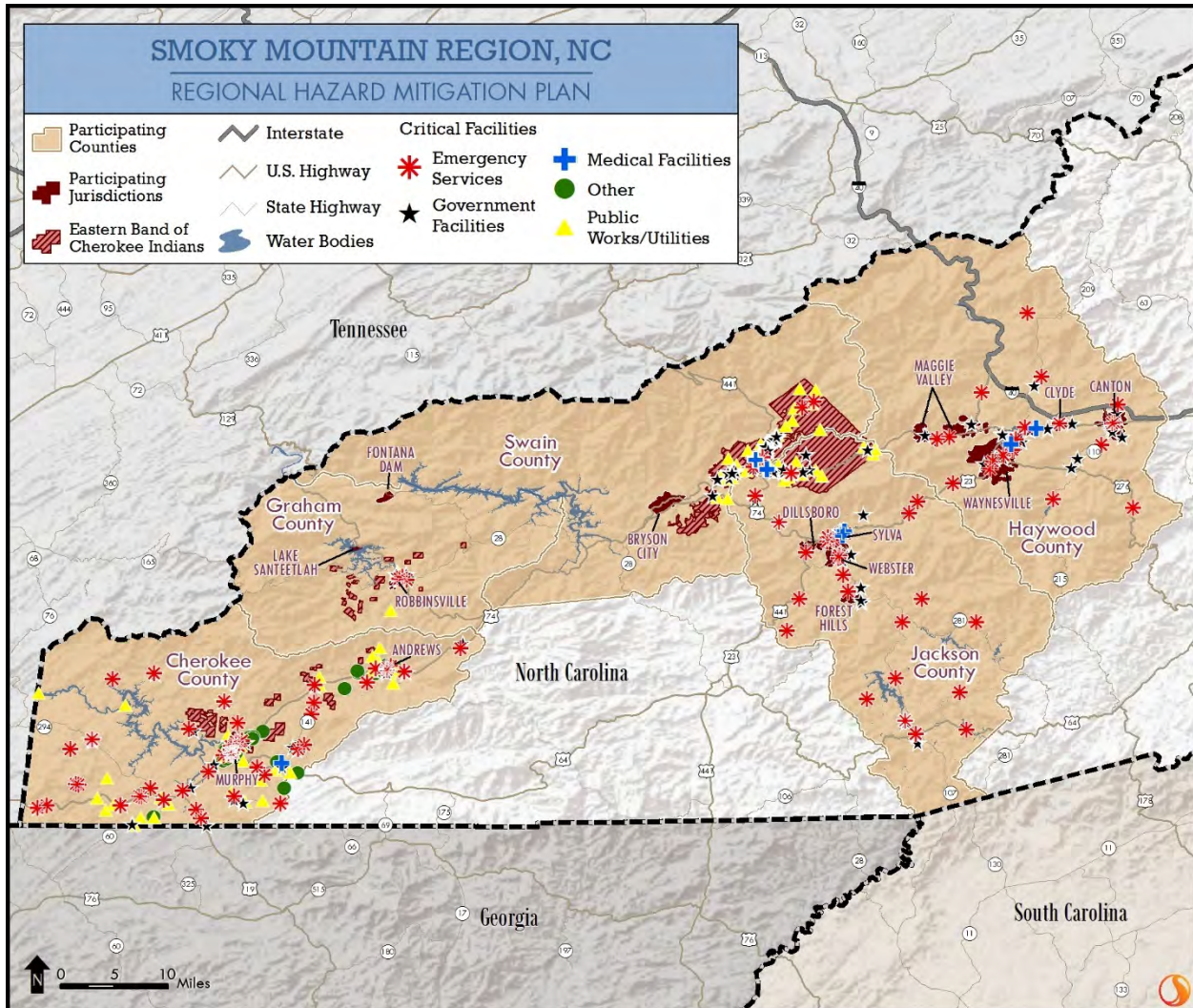
SECTION 6: VULNERABILITY ASSESSMENT

Location	Estimated Number of Parcels	Estimated Number Improved Parcels ³	Total Estimated Value of Improved Parcels
Murphy	1,206	876	\$161,999,264
Unincorporated Area	31,704	15,095	\$1,661,457,829
EBCI ⁴	66	24	\$ 2,984,290
Graham County	10,151	4,916	\$486,164,790
Fontana Dam	1	1	\$50,530
Lake Santeetlah	305	200	\$42,720,880
Robbinsville	328	250	\$47,976,690
Unincorporated Area	9,465	4,455	\$394,565,130
EBCI ⁵	52	10	\$851,560
Haywood County	49,677	31,706	\$4,695,581,300
Canton	2,499	1,955	\$256,206,300
Clyde	721	528	\$58,906,300
Maggie Valley	2,369	1,566	\$252,971,400
Waynesville	5,916	4,707	\$864,721,600
Unincorporated Area	38,172	22,950	\$3,262,775,700
Jackson County	39,327	21,609	\$5,361,586,080
Dillsboro	167	122	\$23,103,930
Forest Hills	216	132	\$20,556,040
Sylva	1,491	1,143	\$230,088,520
Webster	244	170	\$60,049,220
Unincorporated Area	37,203	20,038	\$5,025,309,860
EBCI ⁵	6	4	\$2,478,510
Swain County	12,637	6,821	\$879,929,398
Bryson City	978	760	\$143,213,256
Unincorporated Area	11,636	6,054	\$735,070,902
EBCI ⁵	23	7	\$1,645,240
Eastern Band of Cherokee Indians⁵	5,046	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	150,667	81,674	\$13,331,944,157

⁴ EBCI data indicated for Cherokee, Graham, and Swain Counties are derived from that county’s parcel data and falls within the EBCI jurisdictional boundary and/or is indicated as part of the EBCI by the parcel attribute data.

⁵ Parcel data and values not available. This information is provided by the EBCI as address points, all points with “Address Use” type “Road” have been removed. Address points are in Haywood, Jackson, and Swain Counties. Some address points overlap with parcel data provided by counties: 154 address points (91 buildings) fall in Unincorporated Swain County (25 parcels).

FIGURE 6.2: CRITICAL FACILITY LOCATIONS IN THE SMOKY MOUNTAIN REGION



Cherokee, Graham, Haywood and Jackson Counties have provided critical facilities data. Critical Facilities were identified for the Eastern Band of Cherokee Indians using E911 Address Points categorized as “Governmental Use.” A summary of this information is provided in **Table 6.2** below. These lists are not all-inclusive and only includes information provided by the counties.

TABLE 6.2: CRITICAL FACILITY INVENTORY IN THE SMOKY MOUNTAIN REGION (COUNTY/COMMUNITY DATA)

CHEROKEE COUNTY						
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total	
Emergency Services	5	10	35	0	50	
EOC/Communications Facility	0	3	17	0	20	
Public Works Facility	1	0	2	0	3	
Fire Station/EMS	3	4	16	0	23	
Police Station	1	2	0	0	3	
Jail	0	1	0	0	1	
Government Facilities	4	6	25	0	35	
Government Office	1	4	1	0	6	
Community Center	1	0	13	0	14	
School	2	2	11	0	15	
Medical Facilities	0	0	1	0	1	
Hospital	0	0	1	0	1	
Public Works/Utilities	1	2	31	0	34	
Energy/Solar Farm	0	0	12	0	12	
Power Substation	0	1	4	0	5	
Water and Wastewater Systems	1	1	11	0	13	
Dam	0	0	4	0	4	
Other	5	10	12	2	29	
Commercial Facility	4	10	5	2	21	
Manufacturing Facility	0	0	2	0	2	
Food/Agricultural Facility	1	0	4	0	5	
Transportation/Airport	0	0	1	0	1	
Total	15	28	104	2	149	
GRAHAM COUNTY						
Category and Type	Fontana Dam	Lake Santeetlah	Robbinsville	Unincorporated	EBCI	Total
Emergency Services	0	0	2	1	0	3
EMS Base	0	0	0	1	0	1
Sheriff's Office	0	0	1	0	0	1
Jail	0	0	1	0	0	1
Government Facilities	0	0	9	2	0	11
Government Office	0	0	8	0	0	8
Community Center	0	0	0	1	0	1
School	0	0	1	1	0	2
Public Works/Utilities	0	0	3	1	0	4
Sewer/Sewer Plant	0	0	2	0	0	2
Water Treatment Plant	0	0	1	1	0	2
Other	0	0	0	1	0	1
Transportation	0	0	0	1	0	1
Total	0	0	14	5	0	19

SECTION 6: VULNERABILITY ASSESSMENT

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	3	2	2	4	10	21
Fire Station	2	1	1	2	10	16
Police Station	1	1	1	2	0	5
Government Facilities	4	1	2	9	10	26
Government Office	0	0	1	6	1	8
Community Center	0	0	0	1	0	1
School	4	1	1	2	9	17
Medical Facilities	0	0	0	1	1	2
Medical Center	0	0	0	0	1	1
Health Center	0	0	0	1	0	1
Total	7	3	4	14	21	49

JACKSON COUNTY							
Category and Type	Dillsboro	Forest Hills	Sylva	Webster	Unincorporated	EBCI	Total
Emergency Services	0	0	5	1	23	0	29
EMS/EOC	0	0	1	0	6	0	7
Fire Station	0	0	1	1	15	0	17
Highway Patrol	0	0	1	0	0	0	1
Police Station	0	0	1	0	0	0	1
Sheriff's Office	0	0	1	0	2	0	3
Government Facilities	0	0	4	1	12	0	17
Government Office	0	0	4	0	2	0	6
Recreation Center	0	0	0	0	2	0	2
School	0	0	0	1	8	0	9
Medical Facilities	0	0	0	2	0	0	2
Hospital	0	0	0	1	0	0	1
Health Center	0	0	0	1	0	0	1
Total	0	0	9	4	35	0	48

EASTERN BAND CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	6
Fire Station	3
Police Station	3
Government Facilities	116
Office	66
Community Building	14
Visitor Center	2
School	34
Medical Facilities	11
Hospital	11
Public Works/Utilities	49
Communication Tower	7
Water and Wastewater Systems	38
Other Utility Facility	4
Other	3
Casino	3
Total	185

6.4.2 Social Vulnerability

In addition to identifying assets potentially at risk to identified hazards, it is important to identify and assess segments of the residential population in the Smoky Mountain Region potentially at risk to these hazards.

Table 6.3 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in the Smoky Mountain Region according to Census data is 158,611 persons. Additional population estimates are presented in Section 3: *Community Profile*.

TABLE 6.3: TOTAL POPULATION IN THE SMOKY MOUNTAIN REGION

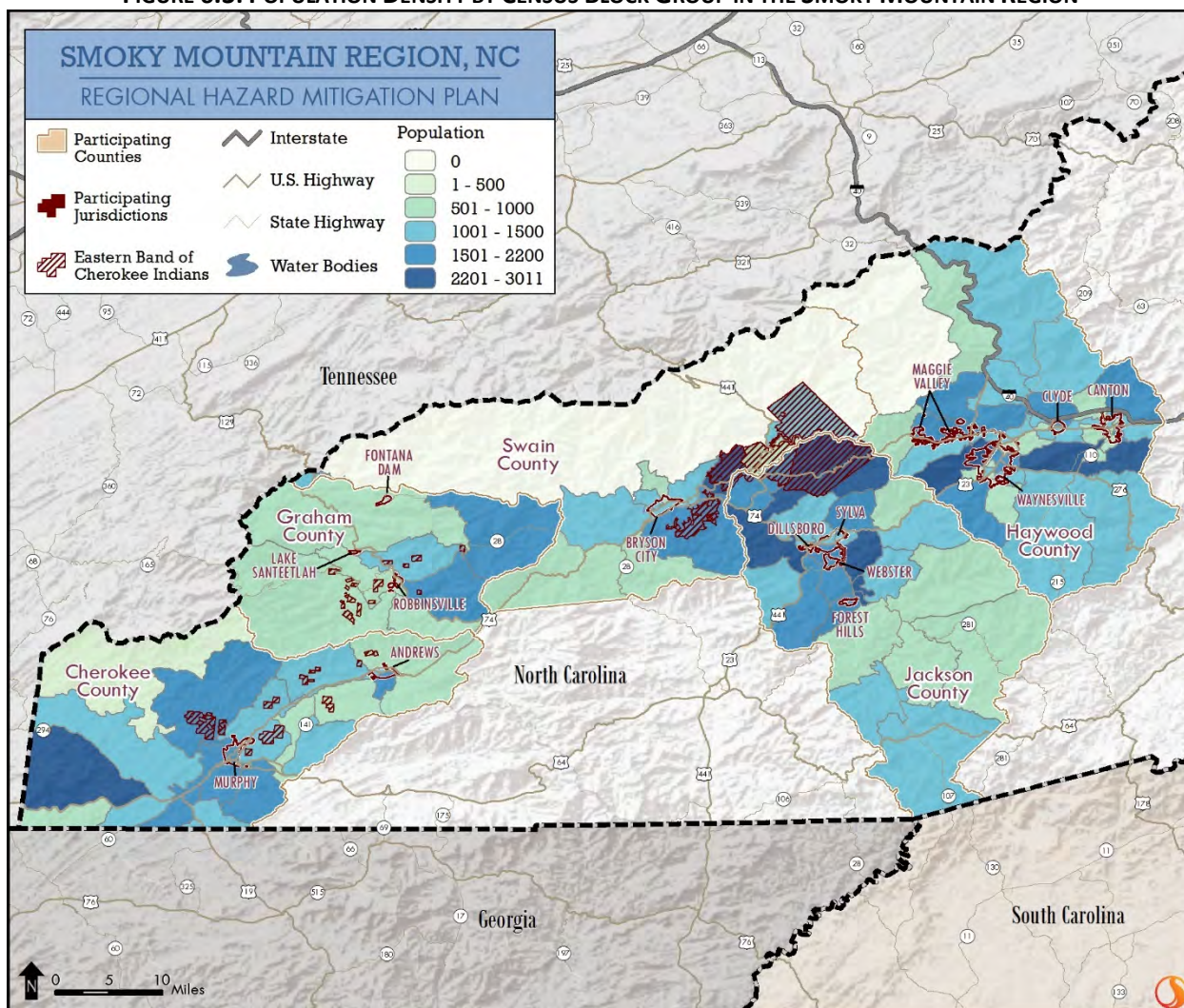
Location	Total 2015 Population
Cherokee County	27,092
Graham County	8,700
Haywood County	59,170
Jackson County	40,812
Swain County	14,163
Eastern Band of Cherokee Indians	9,796
SMOKY MOUNTAIN REGION TOTAL	159,733

Source: U.S. Census; American Community Survey 2015

In addition, **Figure 6.3** illustrates the 2015 American Community Survey population density by census block group.⁶

⁶ Population by census block was not available at the time this plan was completed.

FIGURE 6.3: POPULATION DENSITY BY CENSUS BLOCK GROUP IN THE SMOKY MOUNTAIN REGION



Source: U.S. Census Bureau; American Community Survey 2015

6.5 QUALITATIVE VULNERABILITY ASSESSMENT RESULTS

A qualitative analysis was performed for all hazards. As noted earlier, hazards absent of specific geographic boundaries are assumed to impact the entire planning region, including current and future buildings, or due to lack of data, analysis would not lead to credible results. Such hazards warrant a qualitative analysis but not a quantitative analysis. This includes drought, hailstorm, lightning, severe thunderstorm, tornado, winter storm and freeze, dam and levee failure, and erosion. The total region exposure, and thus risk to these hazards, is approximately \$13 billion, as presented in **Table 6.1**. Potential vulnerabilities and impacts are described for each hazard below. The hazards included below are limited to those that did not include a quantitative analysis. For succinctness, qualitative considerations for hazards that permitted the quantitative analysis are included under that hazard's subsection in Section 6.6.

6.5.1 Drought

Drought is an atmospheric hazard and it has the potential to impact all existing and future assets, critical facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices
 - Increased wildfires
 - Loss of incomes
 - Loss of hydroelectric power
- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

6.5.2 Hailstorm

For all jurisdictions in the Smoky Mountain Region, all current and future buildings (including critical facilities) and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. In addition, hail is capable of damaging crops, which can result in economic harm to areas or individual property owners. Hail occasionally causes injuries and even fatalities to persons unable to seek shelter during a hailstorm event.

6.5.3 Lightning

For all jurisdictions in the Smoky Mountain Region, all current and future buildings (including critical facilities) and populations are at risk to the lightning hazard. Lightning may result in structure fire, electrical system failure, injuries, or deaths.

6.5.4 Thunderstorm Wind/High Wind

For all jurisdictions in the Smoky Mountain Region, all current and future buildings (including critical facilities) and populations are at risk to the severe thunderstorm hazard. Wind events can result in downed trees, power lines, or blown off shutters and roofs. Wind events can also damage crops and agricultural structures. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding, although these impacts are best reviewed under the flood section.

6.5.5 Tornado

All current and future buildings (including critical facilities) and populations within the Smoky Mountain Region should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage to structures, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

6.5.6 Winter Storm and Freeze

All current and future buildings (including critical facilities) and populations within the Smoky Mountain Region should be considered at risk to winter storm events. Structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure (e.g., hypothermia), falls, and vehicular accidents. Secondary health impacts caused by shoveling, such as a heart attack, are also possible. Additional impacts on the communities within the Smoky Mountain Region include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, and fires due to improper heating. Young children or the elderly may be particularly vulnerable to winter storms resulting in power outages if a safe secondary power source is not available.

6.5.7 Dam and Levee Failure

Given the low number of historic dam breaches in the Smoky Mountain Region, no further analysis was completed for this hazard. In addition, sophisticated dam breach plans (typically completed by the U.S. Army Corp of Engineers) have been completed for dams of concern in the region. However, it should be noted that high hazard dams can result in injuries or loss of life. In addition, flooding resulting from dam failure can cause property damage and business disruption. There 72 high hazard dams in the region as indicated in Section 5. Populations, structures, and critical facilities located near high hazard dams are considered at risk to dam failure (see **Figure 5.19**). However, it should be noted that breaches from low and intermediate hazard dams can occur, but will likely results in less severe consequences.

6.5.8 Erosion

Given the low number of historical events, lack of location data, and limited threat to life and property, no further analysis was completed for erosion in this section. However, erosion can result in loss of life or injury, as well as property damage. Structures located on eroding stream banks can fall into the water, and persons or structures on unstable grounds may fall off ledges or overhangs. Populations, structures, and critical facilities located on or near eroding streambanks or ledges are considered at risk to erosion. All communities containing floodplain boundaries are at risk within the Smoky Mountain Region.

6.6 QUANTITATIVE VULNERABILITY ASSESSMENT RESULTS

Hazards with a more definitive boundary are conducive to a more complex and detailed analysis. The hazards presented in this subsection include: hurricane and tropical storm winds, earthquake, landslide, flood, hazardous materials incident, and wildfire.

6.6.1 Hurricane and Tropical Storm

Historical evidence indicates that the Smoky Mountain Region has a significant risk to the hurricane and tropical storm hazard. There have been three disaster declarations due to hurricanes (Hurricane Hugo, Hurricane Ivan, and Tropical Storm Frances) in the region. Several tracks have come near or traversed through the Smoky Mountain Region, as shown and discussed in Section 5: *Hazard Profiles*.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table 6.4**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining loss to specific participating jurisdictions was not feasible. Estimates were made for the EBCI lands based on tracts in all Smoky Mountain Region counties.

TABLE 6.4: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Cherokee County	\$5,126,287,421	0	0%	\$1,201,454	0.023437%	\$41,733	0.000814%
Graham County	\$1,408,586,933	0	0%	\$294,040	0.020874%	\$8,185	0.000581%
Haywood County	\$11,508,742,024	\$225,956	0.001963%	\$482,040	0.004188%	\$91,233	0.000792%
Jackson County	\$7,784,691,059	\$23,539	0.000302%	\$225,337	0.002894%	\$51,496	0.000661%
Swain County	\$2,734,027,126	0	0%	\$175,853	0.006432%	\$13,088	0.000478%
Eastern Band of Cherokee Indians	\$838,781,436	\$1,606	0.000191%	\$54,645	0.006514%	\$5,298	0.000631%
SMOKY MOUNTAIN REGION TOTAL	\$29,401,115,999	\$251,101	0.000854%	\$2,433,370	0.008276%	\$211,035	0.000717%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

Given some equal susceptibility across the entire Smoky Mountain Region, it is assumed that the total population is at risk to the hurricane and tropical storm hazard. Aside from losses, hurricanes and tropical storm events can also result in business interruption and in some cases, evacuations.

Critical Facilities Vulnerability

Given equal vulnerability across the Smoky Mountain Region, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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 6.20** at the end of this section.

Additional Vulnerability Considerations

Due to the inland location of the region, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but remains a real threat to the Smoky Mountain Region due to induced events like flooding and landsliding.

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

6.6.2 Earthquake

As the Hazus model suggests below, and historical occurrences confirm, any earthquake activity in the area may inflict minor damage to the planning area but is unlikely to result in catastrophic, widespread losses.

For the earthquake hazard vulnerability assessment, a probabilistic scenario was created to estimate the annualized loss for the region and compare them to the total exposure. Total exposure is the sum of all building and content asset replacement values within a county. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table 6.5** summarizes the findings.

TABLE 6.5: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Loss Ratio	500 Year Event Loss	500 Year Event Loss Ratio	Annualized Loss	Annualized Loss Ratio ¹
Cherokee County	\$5,126,287,421	\$279,344	0.005449%	\$5,056,621	0.098640%	\$49,436	0.000964%
Graham County	\$1,408,586,933	\$86,973	0.006174%	\$1,542,173	0.109483%	\$14,950	0.001061%
Haywood County	\$11,508,742,024	\$344,869	0.002996%	\$5,487,161	0.047678%	\$56,899	0.000494%
Jackson County	\$7,784,691,059	\$265,902	0.003415%	\$4,221,523	0.054228%	\$44,379	0.000570%
Swain County	\$2,734,027,126	\$128,739	0.004708%	\$2,059,775	0.075338%	\$21,941	0.000802%
Eastern Band of Cherokee Indians	\$838,781,436	\$33,806	0.004030%	\$551,579	0.065759%	\$5,735	0.000683%
SMOKY MOUNTAIN REGION TOTAL	\$29,401,115,999	\$1,139,632	0.003876%	\$18,918,832	0.064347%	\$193,339	0.000657%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities Vulnerability

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table 6.20**.

Additional Vulnerability Considerations

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in the Smoky Mountain Region. The region holds the record for the strongest earthquake reported in North Carolina history, so some susceptibility certainly exists here (magnitude VII MMI in Waynesville). Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

6.6.3 Landslide

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. Most areas of the Smoky Mountain Region are identified as high incidence (more than 15% of the area is involved in landsliding) areas in the USGS landslide data. Additionally, portions of the study area in Cherokee, Graham, Haywood, and Jackson Counties are classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding). **Table 6.6** presents potential vulnerability in moderate incidence areas while **Table 6.7** presents vulnerability in high incidence areas.

TABLE 6.6: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	16,968	50%	7,821	47%	\$848,162,023	44%
Andrews	20	2%	16	3%	\$6,895,920	8%
Murphy	591	49%	425	49%	\$72,894,674	45%
Unincorporated Area	16,297	51%	7,358	49%	\$765,631,889	46%
EBCI	60	91%	22	92%	\$2,739,540	92%
Graham County	1,864	18%	794	16%	\$61,897,540	13%
Fontana Dam	0	0%	0	0%	\$0	0%

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Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	3	1%	3	1%	\$1,996,980	4%
Unincorporated Area	1,824	19%	786	18%	\$59,373,220	15%
EBCI	37	71%	5	50%	\$527,340	62%
Haywood County	434	1%	180	1%	\$18,038,300	0%
Canton	0	0%	0	0%	\$0	0%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	0	0%	0	0%	\$0	0%
Unincorporated Area	434	1%	180	1%	\$18,038,300	1%
Jackson County	9,462	24%	5,392	25%	\$2,407,725,900	45%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	0	0%	0	0%	\$0	0%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	9,462	25%	5,392	27%	\$2,407,725,900	48%
EBCI	0	0%	0	0%	\$0	0%
Swain County	0	0%	0	0%	\$0	0%
Bryson City	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%
Eastern Band of Cherokee Indians*	0	0%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	28,728	19%	14,187	17%	\$3,335,823,763	25%

Source: USGS

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE 6.7: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	16,861	50%	8,801	53%	\$1,060,520,566	56%
Andrews	833	98%	611	97%	\$75,345,286	92%
Murphy	615	51%	451	51%	\$89,104,590	55%
Unincorporated Area	15,407	49%	7,737	51%	\$895,825,940	54%
EBCI	6	9%	2	8%	\$244,750	8%
Graham County	8,287	82%	4,122	84%	\$424,267,250	87%
Fontana Dam	1	100%	1	100%	\$50,530	100%
Lake Santeetlah	305	100%	200	100%	\$42,720,880	100%
Robbinsville	325	99%	247	99%	\$45,979,710	96%
Unincorporated Area	7,641	81%	3,669	82%	\$335,191,910	85%
EBCI	15	29%	5	50%	\$324,220	38%
Haywood County	49,243	99%	31,526	99%	\$4,677,543,000	100%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	2,369	100%	1,566	100%	\$252,971,400	100%
Waynesville	5,916	100%	4,707	100%	\$864,721,600	100%
Unincorporated Area	37,738	99%	22,770	99%	\$3,244,737,400	99%
Jackson County	29,865	76%	16,217	75%	\$2,953,860,180	55%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	216	100%	132	100%	\$20,556,040	100%
Sylva	1,491	100%	1,143	100%	\$230,088,520	100%
Webster	244	100%	170	100%	\$60,049,220	100%
Unincorporated Area	27,741	75%	14,646	73%	\$2,617,583,960	52%
EBCI	6	100%	4	100%	\$2,478,510	100%
Swain County	12,637	100%	6,821	100%	\$879,929,398	100%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	11,636	100%	6,054	100%	\$735,070,902	100%
EBCI	23	100%	7	100%	\$1,645,240	100%
Eastern Band of Cherokee Indians*	5,046	100%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN	121,939	81%	67,487	83%	\$9,996,120,394	75%

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Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
REGION						
TOTAL						

Source: USGS

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire Smoky Mountain Region, the total population is assumed to be at risk to landslide hazards. Eighty-one percent of parcels, and 83% of improved parcels, in the Smoky Mountain Region are located on lands with a high incidence of landslides. In addition, another 19% of parcels and 17% of improved parcels are located in areas of high susceptibility with moderate landslide incidence.

Critical Facilities

There are 75 critical facilities within this study that are located in the high susceptibility/moderate incidence hazard area. Within the high incidence landslide hazard area, there are 375 critical facilities throughout the study region. These critical facility types and locations are provided in **Table 6.8** and **Table 6.9**. Additionally, a list of critical facilities and their associated risk can be found in **Table 6.20** at the end of this section.

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TABLE 6.8: CRITICAL FACILITIES IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	1	5	18	0	24
EOC/Communications Facility	0	1	7	0	8
Public Works Facility	0	0	1	0	1
Fire Station/EMS	1	2	10	0	13
Police Station	0	1	0	0	1
Jail	0	1	0	0	1
Government Facilities	0	2	12	0	14
Government Office	0	1	0	0	1
Community Center	0	0	8	0	8
School	0	1	4	0	5
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	16	0	16
Energy/Solar Farm	0	0	6	0	6
Power Substation	0	0	2	0	2
Water and Wastewater Systems	0	0	5	0	5
Dam	0	0	3	0	3
Other	1	6	3	1	11
Commercial Facility	1	6	1	1	9
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	0	0	1	0	1
Transportation/Airport	0	0	1	0	1
Total	2	13	49	1	65

GRAHAM COUNTY

Only the Water Treatment Plant on Long Creek Road is in the High Susceptibility Moderate Incidence area.

HAYWOOD COUNTY

No critical facilities in the high incidence/high susceptibility areas.

JACKSON COUNTY

Category and Type	Dillsboro	Forest Hills	Sylva	Webster	Unincorporated	EBCI	Total
Emergency Services	0	0	0	0	5	0	5
EMS/EOC	0	0	0	0	2	0	2
Fire Station	0	0	0	0	2	0	2
Highway Patrol	0	0	0	0	0	0	0
Police Station	0	0	0	0	0	0	0
Sheriff's Office	0	0	0	0	1	0	1
Government Facilities	0	0	0	0	4	0	4
Government Office	0	0	0	0	1	0	1
Recreation Center	0	0	0	0	1	0	1
School	0	0	0	0	2	0	2
Medical Facilities	0	0	0	0	0	0	0
Hospital	0	0	0	0	0	0	0
Health Center	0	0	0	0	0	0	0
Total	0	0	0	0	9	0	9

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EASTERN BAND OF CHEROKEE INDIANS	
No critical facilities in the high incidence/high susceptibility areas.	

TABLE 6.9: CRITICAL FACILITIES IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	4	6	16	0	26
EOC/Communications Facility	0	3	9	0	12
Public Works Facility	1	0	1	0	2
Fire Station/EMS	2	2	6	0	10
Police Station	1	1	0	0	2
Jail	0	0	0	0	0
Government Facilities	4	4	13	0	21
Government Office	1	3	1	0	5
Community Center	1	0	5	0	6
School	2	1	7	0	10
Medical Facilities	0	0	1	0	1
Hospital	0	0	1	0	1
Public Works/Utilities	1	2	15	0	18
Energy/Solar Farm	0	0	6	0	6
Power Substation	0	1	2	0	3
Water and Wastewater Systems	1	1	6	0	8
Dam	0	0	1	0	1
Other	4	4	9	1	18
Commercial Facility	3	4	4	1	12
Manufacturing Facility	0	0	2	0	2
Food/Agricultural Facility	1	0	3	0	4
Transportation/Airport	0	0	0	0	0
Total	13	16	54	1	84

GRAHAM COUNTY						
Category and Type	Fontana Dam	Lake Santeetlah	Robbinsville	Unincorporated	EBCI	Total
Emergency Services	0	0	2	1	0	3
EMS Base	0	0	0	1	0	1
Sheriff's Office	0	0	1	0	0	1
Jail	0	0	1	0	0	1
Government Facilities	0	0	9	2	0	11
Government Office	0	0	8	0	0	8
Community Center	0	0	0	1	0	1
School	0	0	1	1	0	2
Public Works/Utilities	0	0	3	0	0	3
Sewer/Sewer Plant	0	0	2	0	0	2
Water Treatment Plant	0	0	1	0	0	1
Other	0	0	0	1	0	1
Transportation	0	0	0	1	0	1
Total	0	0	14	4	0	18

SECTION 6: VULNERABILITY ASSESSMENT

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	3	2	2	4	10	21
Fire Station	2	1	1	2	10	16
Police Station	1	1	1	2	0	5
Government Facilities	4	1	2	9	10	26
Government Office	0	0	1	6	1	8
Community Center	0	0	0	1	0	1
School	4	1	1	2	9	17
Medical Facilities	0	0	0	1	1	2
Medical Center	0	0	0	0	1	1
Health Center	0	0	0	1	0	1
Total	7	3	4	14	21	49

JACKSON COUNTY							
Category and Type	Dillsboro	Forest Hills	Sylva	Webster	Unincorporated	EBCI	Total
Emergency Services	0	0	5	1	18	0	24
EMS/EOC	0	0	1	0	4	0	5
Fire Station	0	0	1	1	13	0	15
Highway Patrol	0	0	1	0	0	0	1
Police Station	0	0	1	0	0	0	1
Sheriff's Office	0	0	1	0	1	0	2
Government Facilities	0	0	4	1	8	0	13
Government Office	0	0	4	0	1	0	5
Recreation Center	0	0	0	0	1	0	
School	0	0	0	1	6	0	7
Medical Facilities	0	0	2	0	0	0	2
Hospital	0	0	1	0	0	0	1
Health Center	0	0	1	0	0	0	1
Total	0	0	11	2	26	0	39

EASTERN BAND CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	6
Fire Station	3
Police Station	3
Government Facilities	116
Office	66
Community Building	14
Visitor Center	2
School	34
Medical Facilities	11
Hospital	11
Public Works/Utilities	49
Communication Tower	7
Water and Wastewater Systems	38
Other Utility Facility	4
Other	3
Casino	3
Total	185

Additional Vulnerability Considerations

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in the Smoky Mountain Region, though some areas may have 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. Vulnerabilities for Smoky Mountain Region assets are greatly dependent on individual design and mitigation measures in place. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available.

6.6.4 Flood

Historical evidence indicates that the Smoky Mountain Region is susceptible to flood events. The NCEI Storm Events Database reported 117 flood events, resulting in over \$44.8 million (2017 dollars) in property damages, nearly \$3 million in crop damages, and three fatalities throughout the 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 Smoky Mountain 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 6.10** presents the potential at-risk property to the 1.0-percent Annual Chance Flood (ACF). **Table 6.11** presents the potential at-risk property to the 0.2-percent ACF (combining those in the 1.0-percent and 0.2-percent flood hazard areas). Both the approximate number of parcels and the approximate value are presented.

TABLE 6.10: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ACF FLOOD HAZARD

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,569	8%	1,263	8%	\$224,416,554	12%
Andrews	74	9%	46	7%	\$12,728,090	15%
Murphy	84	7%	64	7%	\$25,042,784	15%
Unincorporated Area	2,408	8%	1,152	8%	\$186,559,700	11%
EBCI	3	11%	1	13%	\$85,980	5%
Graham County	2,281	23%	1,194	24%	\$158,352,070	33%
Fontana Dam	6	11%	2	7%	\$101,060	8%
Lake Santeetlah	86	28%	68	34%	\$20,534,960	48%
Robbinsville	53	16%	43	17%	\$24,072,960	50%
Unincorporated Area	2,121	23%	1,081	25%	\$113,643,090	29%
EBCI	15	33%	0	0%	0	0%
Haywood County	5,217	11%	3,797	12%	\$636,583,100	14%
Canton	330	12%	213	10%	\$68,067,200	24%
Clyde	393	19%	242	16%	\$31,160,100	15%
Maggie Valley	412	12%	296	14%	\$68,362,900	19%

SECTION 6: VULNERABILITY ASSESSMENT

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Waynesville	1,694	22%	1,439	24%	\$246,415,800	23%
Unincorporated Area	2,388	7%	1,607	8%	\$222,577,100	8%
Jackson County	3,893	10%	2,410	11%	\$895,091,090	17%
Dillsboro	53	32%	40	33%	\$10,506,130	45%
Forest Hills	21	10%	15	11%	\$2,297,880	11%
Sylva	215	14%	176	15%	\$37,073,890	16%
Webster	46	19%	34	20%	\$34,082,800	57%
Unincorporated Area	3,557	10%	2,144	11%	\$809,081,430	16%
EBCI	1	17%	1	25%	\$2,048,960	83%
Swain County	1,358	11%	882	13%	\$137,962,502	16%
Bryson City	269	28%	220	29%	\$38,539,400	27%
Unincorporated Area	1,077	9%	656	11%	\$98,608,092	13%
EBCI	12	52%	6	50%	\$815,010	50%
Eastern Band of Cherokee Indians*	845	17%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	16,163	11%	9,546	12%	\$2,052,405,316	15%

Source: FEMA DFIRM

**"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE 6.11: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,693	8%	1,337	8%	\$242,453,714	13%
Andrews	83	10%	54	9%	\$13,739,810	17%
Murphy	129	11%	92	11%	\$32,513,574	20%
Unincorporated Area	2,475	8%	1,188	8%	\$195,754,730	12%
EBCI	6	21%	3	38%	\$445,600	26%
Graham County	2,311	23%	1,214	25%	\$161,310,570	33%
Fontana Dam	6	11%	2	7%	\$101,060	8%
Lake Santeetlah	86	28%	68	34%	\$20,534,960	48%
Robbinsville	62	19%	51	20%	\$24,941,570	52%

SECTION 6: VULNERABILITY ASSESSMENT

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	2,142	23%	1,093	25%	\$115,732,980	29%
EBCI	15	33%	0	0%	\$0	0%
Haywood County	5,666	11%	4,143	13%	\$685,369,900	15%
Canton	363	13%	239	11%	\$71,117,700	25%
Clyde	452	22%	294	20%	\$44,646,900	21%
Maggie Valley	468	14%	337	16%	\$73,962,000	21%
Waynesville	1,779	23%	1,513	25%	\$257,682,100	25%
Unincorporated Area	2,604	8%	1,760	9%	\$237,961,200	9%
Jackson County	4,082	10%	2,539	12%	\$916,599,010	17%
Dillsboro	72	43%	53	43%	\$12,234,300	53%
Forest Hills	24	11%	18	14%	\$2,655,310	13%
Sylva	226	15%	187	16%	\$38,089,880	17%
Webster	48	20%	35	21%	\$34,369,360	57%
Unincorporated Area	3,711	10%	2,245	11%	\$827,201,200	16%
EBCI	1	17%	1	25%	\$2,048,960	83%
Swain County	1,519	12%	999	15%	\$160,252,552	18%
Bryson City	342	35%	278	36%	\$49,679,990	35%
Unincorporated Area	1,164	10%	1,077	12%	\$109,757,552	15%
EBCI	13	57%	7	58%	\$815,010	50%
Eastern Band of Cherokee Indians*	1,049	21%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	17,320	11%	10,232	13%	\$2,165,985,746	16%

Source: FEMA DFIRM

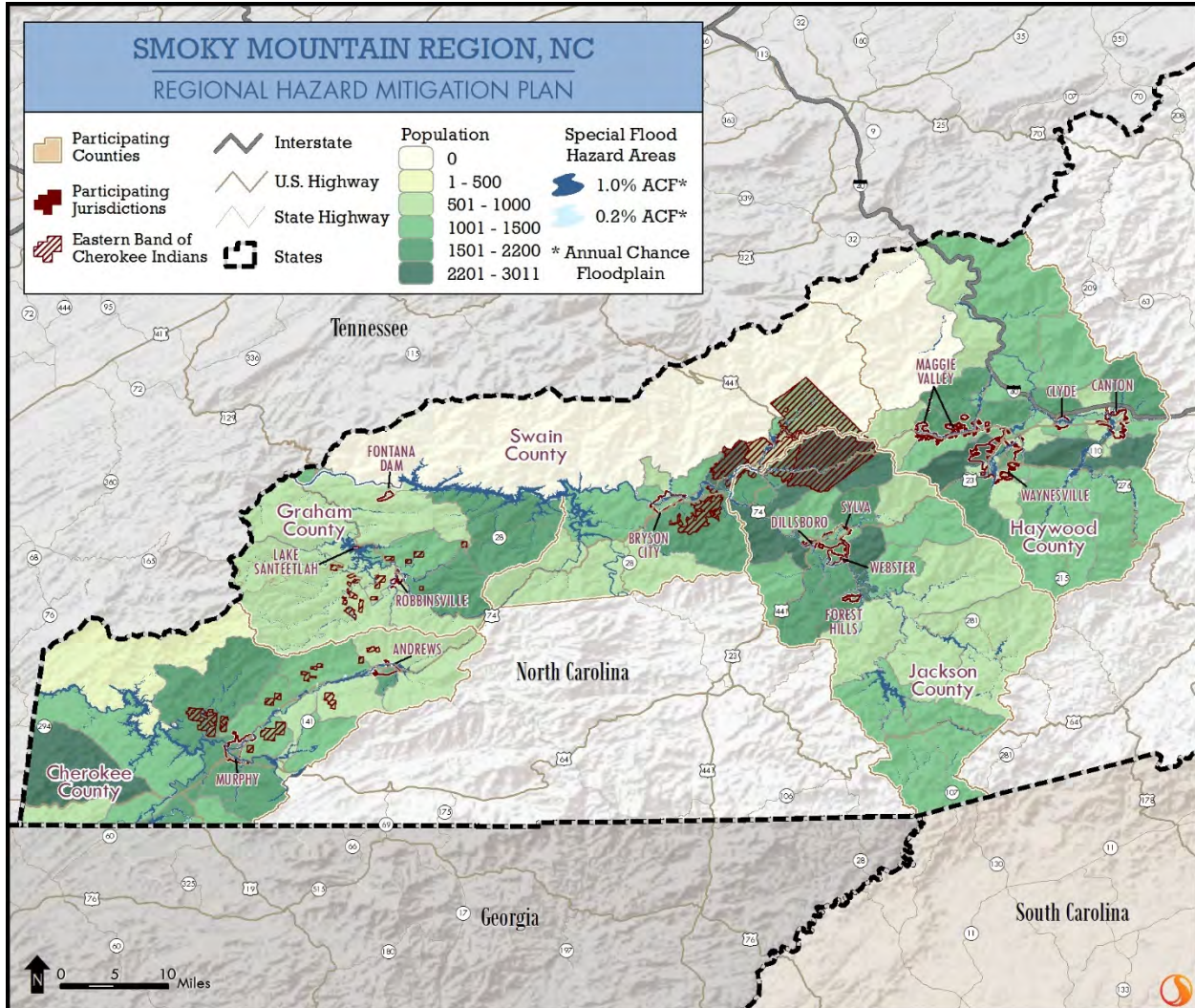
*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

In addition, the Eastern Band of Cherokee Indians has conducted a detailed study of specific buildings residing in the floodplain. This study includes information on building type, condition, and approximate value, as well as the potential damage (in dollars) to various levels of flooding. A total of 745 structures were identified in the floodplain area. For additional information EBCI Emergency Management should be contacted.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure 6.4** is presented to gain a better understanding of at risk population.

FIGURE 6.4 : POPULATION DENSITY NEAR FLOODPLAINS



SOURCE: FEMA DFIRM, U.S. Census; American Community Survey 2015

Critical Facilities

The critical facility analysis revealed 81 of the community identified critical facilities are in the Smoky Mountain Region 1.0-percent annual chance floodplain and 0.2-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.) This information is presented in **Table 6.12** and **Table 6.13** below. Analysis was also conducted in the critical facilities data provided by the counties.

SECTION 6: VULNERABILITY ASSESSMENT

TABLE 6.12: CRITICAL FACILITIES LOCATED IN THE 1.0-PERCENT FLOOD HAZARD AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	0	0	2	0	2
EOC/Communications Facility	0	0	0	0	0
Public Works Facility	0	0	0	0	0
Fire Station/EMS	0	0	2	0	2
Police Station	0	0	0	0	0
Jail	0	0	0	0	0
Government Facilities	0	0	1	0	1
Government Office	0	0	0	0	0
Community Center	0	0	1	0	1
School	0	0	0	0	0
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	6	0	6
Energy/Solar Farm	0	0	2	0	2
Power Substation	0	0	1	0	1
Water and Wastewater Systems	0	0	1	0	1
Dam	0	0	2	0	2
Other	2	0	1	0	3
Commercial Facility	1	0	1	0	3
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	1	0	0	0	1
Transportation/Airport	0	0	0	0	0
Total	2	0	10	0	12

GRAHAM COUNTY

No critical facilities in the 1.0-percent flood hazard areas.

HAYWOOD COUNTY

Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	2	0	0	2	1	5
Fire Station	1	1	0	1	1	5
Police Station	1	0	0	1	0	2
Government Facilities	0	1	0	0	0	1
Government Office	0	0	0	0	0	0
Community Center	0	0	0	0	0	0
School	0	1	0	0	0	1
Medical Facilities	0	0	0	0	0	0
Medical Center	0	0	0	0	0	0
Health Center	0	0	0	0	0	1
Total	2	1	0	2	1	6

JACKSON COUNTY

Only the Glenville-Cashiers Rescue Squad and the Cullowhee Fire Department Substation 3 are in the 1.0-percent flood hazard areas.

EASTERN BAND CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	25
Office	11
Community Building	5
Visitor Center	1
School	8
Medical Facilities	0
Hospital	0
Public Works/Utilities	10
Communication Tower	0
Water and Wastewater Systems	9
Other Utility Facility	1
Other	2
Casino	2
Total	37

TABLE 6.13: CRITICAL FACILITIES LOCATED IN THE COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	0	0	2	0	2
EOC/Communications Facility	0	0	0	0	0
Public Works Facility	0	0	0	0	0
Fire Station/EMS	0	0	2	0	2
Police Station	0	0	0	0	0
Jail	0	0	0	0	0
Government Facilities	0	0	1	0	1
Government Office	0	0	0	0	0
Community Center	0	0	1	0	1
School	0	0	0	0	0
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	7	0	7
Energy/Solar Farm	0	0	2	0	2
Power Substation	0	0	1	0	1
Water and Wastewater Systems	0	0	2	0	2
Dam	0	0	2	0	2
Other	3	0	1	0	4
Commercial Facility	2	0	1	0	3
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	1	0	0	0	1
Transportation/Airport	0	0	0	0	0
Total	3	0	11	0	14

GRAHAM COUNTY

Only the Water Treatment Plant on the Rodney Orr Bypass and the Building Inspections office in Robbinsville are in the combined 1.0-percent and 0.2-percent flood hazard areas.

SECTION 6: VULNERABILITY ASSESSMENT

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	3	1	0	2	1	7
Fire Station	2	1	0	1	1	5
Police Station	1	0	0	1	0	2
Government Facilities	0	1	0	0	0	1
Government Office	0	0	0	0	0	0
Community Center	0	0	0	0	0	0
School	0	1	0	0	0	1
Medical Facilities	0	0	0	1	0	1
Medical Center	0	0	0	0	0	0
Health Center	0	0	0	1	0	1
Total	3	2	0	3	1	9

JACKSON COUNTY

Only the Glenville-Cashiers Rescue Squad, the Cullowhee Fire Department Substation 3 and the Cullowhee Valley School are in the combined 1.0-percent and 0.2-percent flood hazard areas.

EASTERN BAND CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	38
Office	19
Community Building	5
Visitor Center	1
School	13
Medical Facilities	0
Hospital	0
Public Works/Utilities	13
Communication Tower	0
Water and Wastewater Systems	12
Other Utility Facility	1
Other	2
Casino	2
Total	53

Additional Vulnerability Considerations

In conclusion, a flood has the potential to impact many existing and future buildings, facilities, and populations in the Smoky Mountain Region. Some areas are at a higher risk than others. Eastern Band of Cherokee Indians (portions in Cherokee and Swain Counties), Lake Santeetlah, Dillsboro, and Bryson City are jurisdictions where greater than 30 percent of the structures are potentially at risk to flooding. Similarly, Lake Santeetlah, Robbinsville, Dillsboro, Webster, Bryson City, and the Swain County portion of Eastern Band of Cherokee Indians are jurisdictions where over 30 percent of the value of building improvements is potentially at risk to flooding.

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 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain as provided by FEMA. It is certainly possible more severe events could occur beyond these boundaries or urban (flash) flooding could impact additional structures. Such site-

specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

Impacts of flood include business interruption, mold issues, and damaged contents and equipment, to name a few. Just a few inches of water in a building could cause damage to flooring and foundation structure that cost thousands of dollars to repair. If the water rises more than a few inches in a structure, electrical systems and appliances could be compromised. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions. Repetitive flood events can result in significant business and personal interruption, (i.e., repeat evacuations), and increased damages to structures over time, such as mold or wood rot.

6.6.5 Hazardous Materials Incident

Although historical evidence and existing Toxic Release Inventory sites indicate that the Smoky Mountain Region is susceptible to hazardous materials events, there are few reports of damage. Therefore, it is difficult to calculate a reliable annualized loss figure. It is assumed that while one major event could result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate for the Smoky Mountain Region.

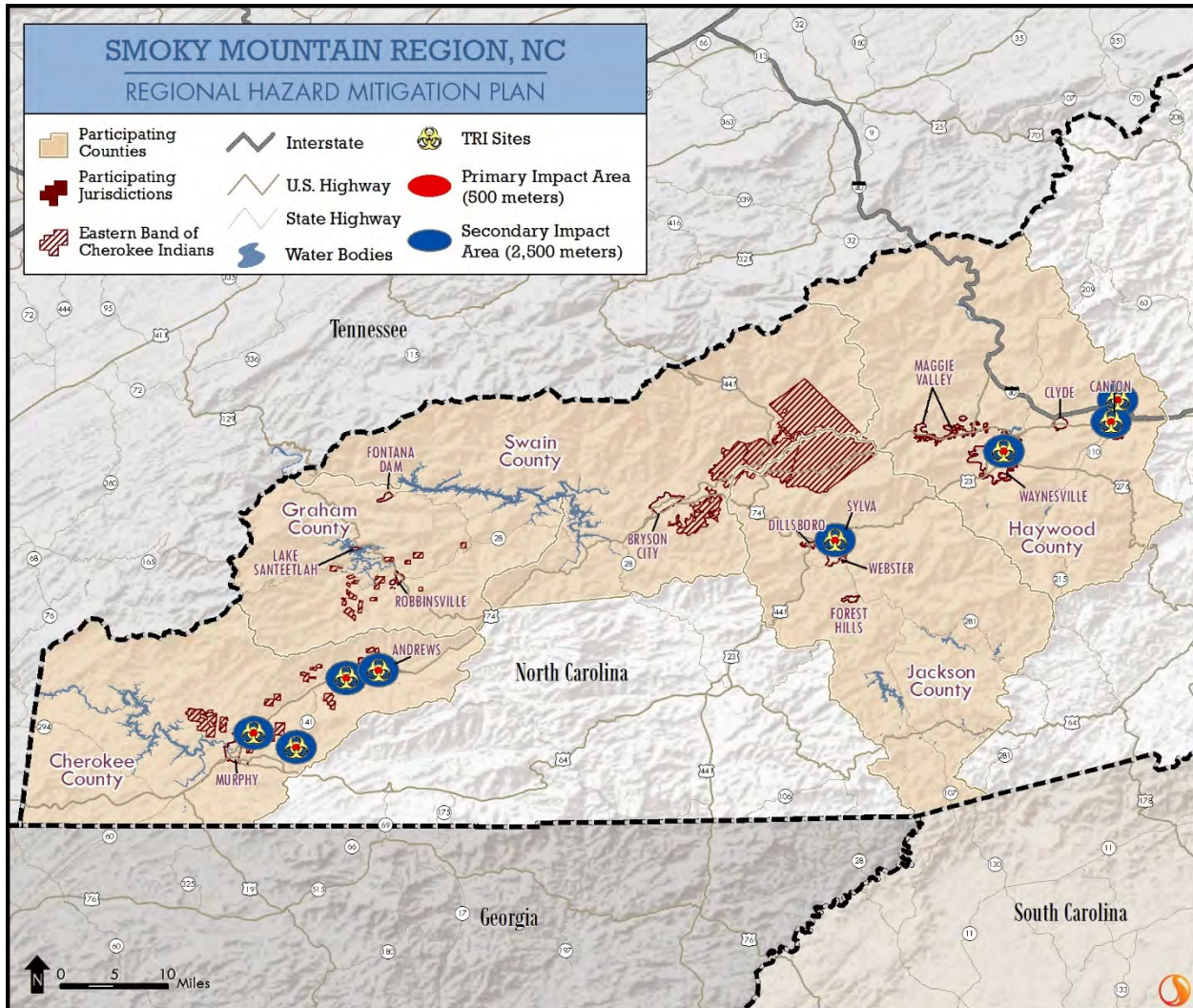
Most hazardous materials incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. In a hazardous materials 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.⁷ In both scenarios, two sizes of buffers—500 meters and 2,500 meters—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 Smoky Mountain Region, along with buffers, were used for analysis as shown in **Figure 6.5**. 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 6.6** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table 6.14** (fixed sites), **Table 6.15** (mobile road sites) and **Table 6.16** (mobile railroad sites).⁸

⁷ This type of analysis will likely yield conservative results which are likely higher than what is reported following an actual event.

⁸ Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE 6.5 : TRI SITES WITH BUFFERS IN THE SMOKY MOUNTAIN REGION



Source: EPA

TABLE 6.14: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (FIXED SITES)

Location	500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	245	1%	175	1%	\$29,763,790	2%
Andrews	155	18%	116	19%	\$15,539,610	19%
Murphy	4	0%	2	0%	\$517,780	0%
Unincorporated Area	86	0%	57	0%	\$13,706,400	1%
EBCI	0	0%	0	0%	\$0	0%
Graham County	0	0%	0	0%	\$0	0%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%

SECTION 6: VULNERABILITY ASSESSMENT

Location	500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	473	1%	414	1%	\$138,864,200	3%
Canton	75	3%	67	3%	\$25,653,300	10%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	335	6%	301	6%	\$93,728,600	11%
Unincorporated Area	63	0%	46	0%	\$19,482,300	1%
Jackson County	188	0%	144	1%	\$21,102,000	0%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	188	13%	144	13%	\$21,102,000	9%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%
Swain County	0	0%	0	0%	\$0	0%
Bryson City	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%
Eastern Band of Cherokee Indians*	0	0%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	906	1%	733	1%	\$189,729,990	1%

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Location	2,500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	4,121	12%	2,417	15%	\$290,615,400	15%
Andrews	846	99%	622	99%	\$81,404,496	99%
Murphy	143	12%	85	10%	\$22,709,174	14%
Unincorporated Area	3,130	10%	1,710	11%	\$186,501,730	11%
EBCI	2	3%	0	0%	\$0	0%
Graham County	0	0%	0	0%	\$0	0%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%
Haywood County	9,194	19%	7,018	22%	\$1,002,237,200	21%
Canton	2,479	99%	1,938	99%	\$249,765,500	97%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	3,534	60%	2,843	60%	\$498,712,900	58%
Unincorporated Area	3,181	8%	2,237	10%	\$253,758,800	8%
Jackson County	2,347	6%	1,705	8%	\$297,969,620	6%

SECTION 6: VULNERABILITY ASSESSMENT

Location	2,500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	1,473	99%	1,128	99%	\$219,233,820	95%
Webster	55	23%	25	15%	\$3,048,470	5%
Unincorporated Area	819	2%	552	3%	\$75,687,330	2%
EBCI	0	0%	0	0%	\$0	0%
Swain County	0	0%	0	0%	\$0	0%
Bryson City	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%
Eastern Band of Cherokee Indians*	0	0%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	15,662	10%	11,140	14%	\$1,590,822,220	12%

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

FIGURE 6.6 : MOBILE HAZMAT BUFFERS IN THE SMOKY MOUNTAIN REGION

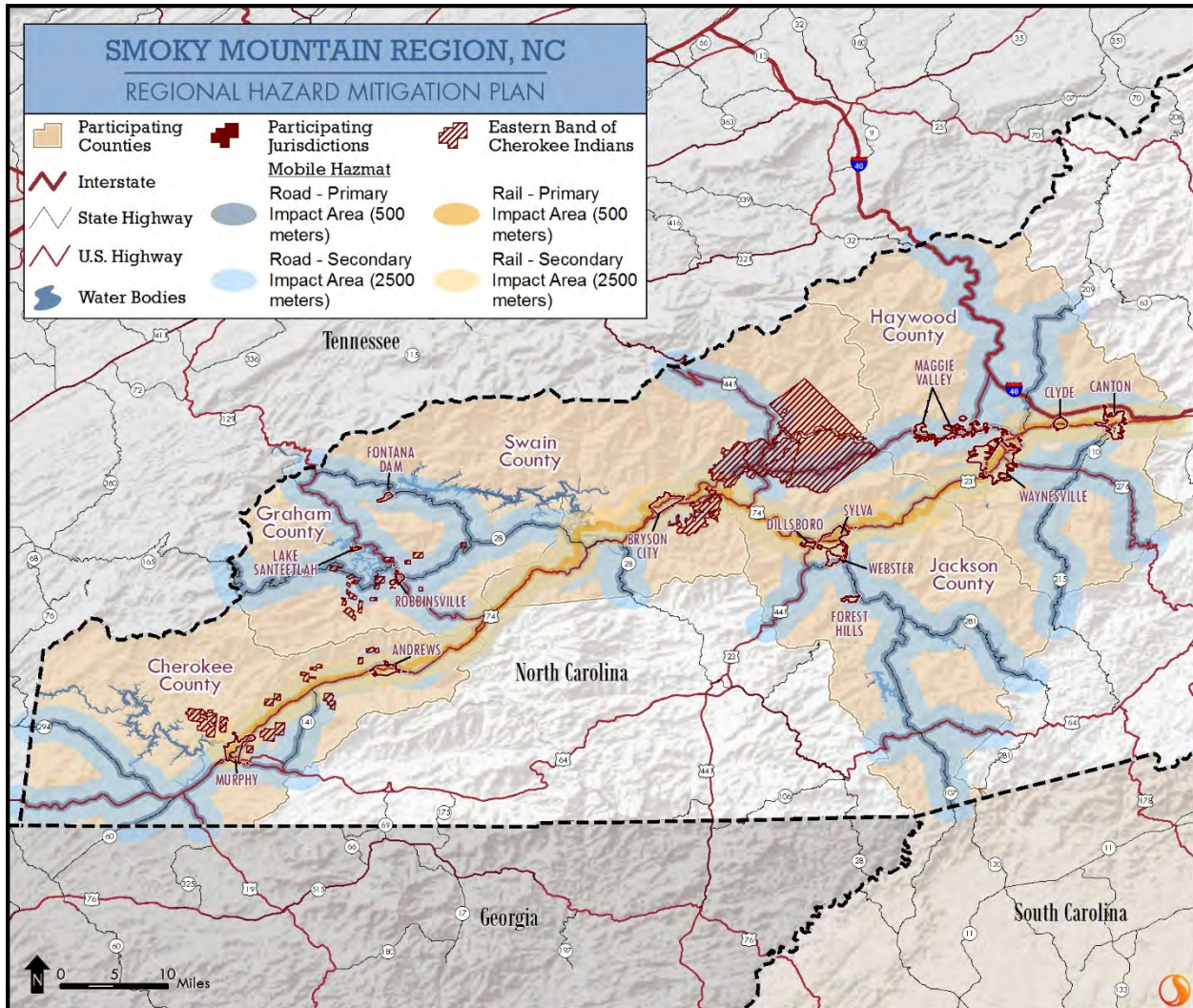


TABLE 6.15: POTENTIAL VULNERABILITY OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - ROAD)

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	7,598	22%	4,259	26%	\$540,112,744	28%
Andrews	172	20%	117	19%	\$22,415,220	27%
Murphy	532	44%	371	42%	\$64,239,544	40%
Unincorporated Area	6,888	22%	3,767	25%	\$452,088,270	27%
EBCI	6	9%	4	17%	\$1,369,710	46%
Graham County	3,508	35%	1,840	37%	\$211,812,150	44%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	122	40%	77	39%	\$12,112,920	28%

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Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Robbinsville	223	68%	162	65%	\$40,000,450	83%
Unincorporated Area	3,142	33%	1,599	36%	\$159,206,540	40%
EBCI	21	40%	2	20%	\$492,240	58%
Haywood County	17,810	36%	12,505	39%	\$1,941,035,200	41%
Canton	1,106	44%	818	42%	\$137,161,700	54%
Clyde	553	77%	392	74%	\$43,266,900	73%
Maggie Valley	1,669	70%	1,160	74%	\$180,049,900	71%
Waynesville	3,626	61%	2,948	63%	\$524,296,700	61%
Unincorporated Area	10,856	28%	7,187	31%	\$1,056,260,000	32%
Jackson County	11,976	30%	7,538	35%	\$1,857,828,950	35%
Dillsboro	144	86%	106	87%	\$18,156,800	79%
Forest Hills	30	14%	24	18%	\$2,833,440	14%
Sylva	1,157	78%	903	79%	\$201,155,290	87%
Webster	165	68%	132	78%	\$54,582,450	91%
Unincorporated Area	10,477	28%	6,371	32%	\$1,580,679,920	31%
EBCI	3	50%	2	50%	\$421,050	17%
Swain County	3,295	26%	2,079	30%	\$326,096,584	37%
Bryson City	843	86%	653	86%	\$125,540,864	88%
Unincorporated Area	2,441	21%	1,421	23%	\$199,060,500	27%
EBCI	11	48%	5	71%	\$1,495,220	91%
Eastern Band of Cherokee Indians*	2,496	49%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	46,683	31%	28,221	35%	\$4,876,885,628	37%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	24,132	71%	12,507	75%	\$1,439,337,260	75%
Andrews	853	100%	627	100%	\$82,241,206	100%
Murphy	1,206	100%	876	100%	\$161,999,264	100%
Unincorporated Area	22,036	70%	10,991	73%	\$1,192,993,030	72%

SECTION 6: VULNERABILITY ASSESSMENT

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
EBCI	37	56%	13	54%	\$2,103,760	70%
Graham County	8,822	87%	4,387	89%	\$443,116,170	91%
Fontana Dam	1	100%	1	100%	\$50,530	100%
Lake Santeetlah	305	100%	200	100%	\$42,720,880	100%
Robbinsville	328	100%	250	100%	\$47,976,690	100%
Unincorporated Area	8,147	86%	3,927	88%	\$351,538,280	89%
EBCI	41	79%	9	90%	\$829,790	97%
Haywood County	43,433	87%	28,607	90%	\$4,220,600,100	90%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	2,367	100%	1,564	100%	\$251,712,600	100%
Waynesville	5,916	100%	4,707	100%	\$864,721,600	100%
Unincorporated Area	31,930	84%	19,853	87%	\$2,789,053,300	85%
Jackson County	31,366	80%	18,026	83%	\$4,625,487,570	86%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	216	100%	132	100%	\$20,556,040	100%
Sylva	1,491	100%	1,143	100%	\$230,088,520	100%
Webster	244	100%	170	100%	\$60,049,220	100%
Unincorporated Area	29,242	79%	16,455	82%	\$4,289,211,350	85%
EBCI	6	100%	4	100%	\$2,478,510	100%
Swain County	8,898	70%	5,125	75%	\$712,285,578	81%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	7,897	68%	4,358	72%	\$567,427,082	77%
EBCI	23	100%	7	100%	\$1,645,240	100%
Eastern Band of Cherokee Indians*	4,392	87%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	121,043	80%	68,652	84%	\$11,440,826,678	86%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE 6.16: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - RAILROAD)

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,610	8%	1,649	10%	\$214,948,847	11%
Andrews	558	65%	411	66%	\$61,039,976	74%
Murphy	597	50%	431	49%	\$82,873,890	51%
Unincorporated Area	1,447	5%	801	5%	\$69,424,021	4%
EBCI	8	12%	6	25%	\$1,610,960	54%
Graham County	74	1%	24	0%	\$2,376,690	0%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	74	1%	24	1%	\$2,376,690	1%
EBCI	0	0%	0	0%	\$0	0%
Haywood County	6,556	13%	5,015	16%	\$854,099,400	18%
Canton	981	39%	751	38%	\$101,962,000	40%
Clyde	528	73%	375	71%	\$40,334,800	68%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	2,155	36%	1,852	39%	\$367,854,600	43%
Unincorporated Area	2,892	8%	2,037	9%	\$343,948,000	11%
Jackson County	3,101	8%	2,112	10%	\$321,863,250	6%
Dillsboro	163	98%	120	98%	\$22,624,340	98%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	982	66%	763	67%	\$147,063,470	64%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	1,956	5%	1,229	6%	\$152,175,440	3%
EBCI	0	0%	0	0%	\$0	0%
Swain County	2,338	19%	1,493	22%	\$260,696,274	30%
Bryson City	691	71%	552	73%	\$101,926,934	71%
Unincorporated Area	1,640	14%	936	15%	\$157,274,120	21%
EBCI	7	30%	5	71%	\$1,495,220	91%
Eastern Band of Cherokee Indians*	11	0%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN	14,690	10%	10,293	13%	\$1,653,984,461	12%

SECTION 6: VULNERABILITY ASSESSMENT

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
REGION TOTAL						

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	8,486	25%	4,896	29%	\$601,459,321	32%
Andrews	853	100%	627	100%	\$82,241,206	100%
Murphy	1,205	100%	875	100%	\$161,797,504	100%
Unincorporated Area	6,401	20%	3,384	22%	\$355,576,101	21%
EBCI	27	41%	10	42%	\$1,844,510	62%
Graham County	210	2%	82	2%	\$6,163,260	1%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	210	2%	82	2%	\$6,163,260	2%
EBCI	0	0%	0	0%	\$0	0%
Haywood County	20,867	42%	15,485	49%	\$2,350,120,000	50%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	5,691	96%	4,572	97%	\$831,482,900	96%
Unincorporated Area	11,956	31%	8,430	37%	\$1,203,524,500	37%
Jackson County	10,378	26%	6,479	30%	\$944,849,580	18%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	1,475	99%	1,129	99%	\$218,444,500	95%
Webster	67	27%	32	19%	\$4,829,210	8%
Unincorporated Area	8,664	23%	5,193	26%	\$696,001,930	14%
EBCI	5	83%	3	75%	\$2,470,010	100%
Swain County	8,222	65%	4,799	70%	\$687,724,938	78%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	7,225	62%	4,032	67%	\$542,866,442	74%

SECTION 6: VULNERABILITY ASSESSMENT

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
EBCI	19	83%	7	100%	\$1,645,240	100%
Eastern Band of Cherokee Indians*	503	10%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	48,666	32%	31,741	39%	\$4,590,317,099	34%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire Smoky Mountain 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

Table 6.17 shows the number and type of critical facility located in the different HAZMAT risk zones.

TABLE 6.17: CRITICAL FACILITIES IN HAZMAT RISK ZONES

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
Cherokee County	9	42	77	127	42	76
Andrews	4	15	6	15	13	15
Murphy	0	6	9	29	17	29
Unincorporated Area	5	19	62	81	12	30
EBCI	0	2	0	2	0	2
Graham County	0	0	18	18	0	0
Fontana Dam	0	0	0	0	0	0
Lake Santeetlah	0	0	0	0	0	0
Robbinsville	0	0	14	14	0	0
Unincorporated Area	0	0	4	4	0	0
EBCI	0	0	0	0	0	0
Haywood County	6	18	40	49	22	36
Canton	3	6	5	7	3	7
Clyde	0	0	3	3	3	3
Maggie Valley	0	0	4	4	0	0
Waynesville	3	10	9	14	9	14
Unincorporated Area	0	2	19	21	7	12
Jackson County	2	13	37	45	10	21
Dillsboro	0	0	0	0	0	0
Forest Hills	0	0	0	0	0	0
Sylva	2	11	10	11	7	11
Webster	0	0	2	2	0	0
Unincorporated Area	0	2	25	32	3	10

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
EBCI	0	0	0	0	0	0
Swain County	N/A	N/A	N/A	N/A	N/A	N/A
Bryson City	N/A	N/A	N/A	N/A	N/A	N/A
Unincorporated Area	N/A	N/A	N/A	N/A	N/A	N/A
EBCI	N/A	N/A	N/A	N/A	N/A	N/A
Eastern Band of Cherokee Indians	0	0	120	176	1	11
SMOKY MOUNTAIN REGION TOTAL	17	73	292	415	75	144

Additional Vulnerability Considerations

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in the Smoky Mountain 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. HAZMAT events can result in injuries, death, property damage, business interruption, and in some cases, evacuations or sheltering in place.

6.6.6 Wildfire

Although historical evidence indicates the Smoky Mountain 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 approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

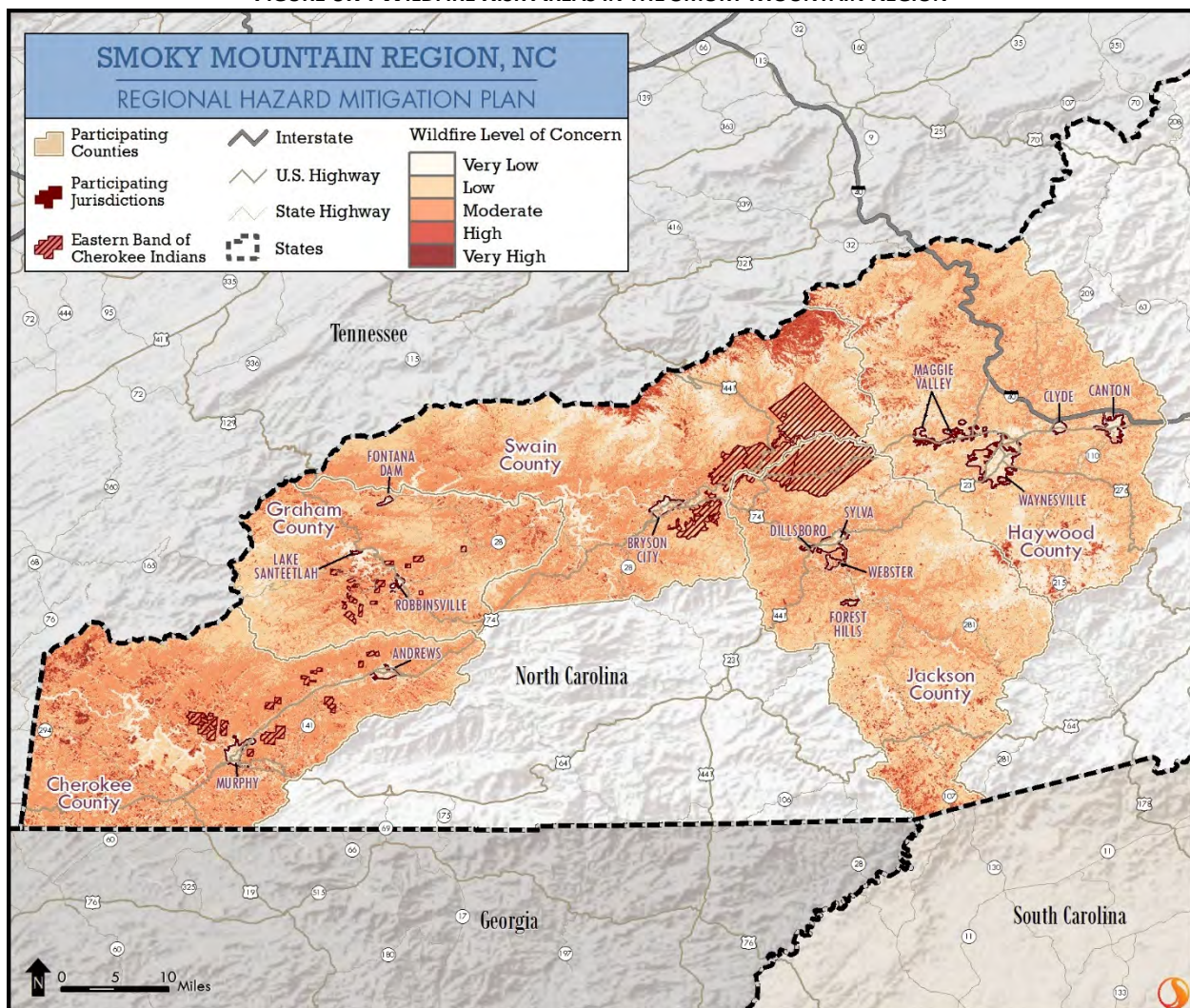
- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

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- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Figure 6.7 shows the areas of concern and their class rankings. Initially provided as raster data, it was converted to a polygon for analysis. Each county contains some lands where the value falls into the very high or high risk categories. Cherokee County has the highest percentage of parcels and improved parcels labeled as high risk. There is also a large amount of high risk area on the EBCI lands. Jackson County also has areas of high risk near the participating jurisdictions of Sylva, Webster, and Dillsboro. The areas of high risk in Swain County occur primarily in the unincorporated areas of the county. Unincorporated areas in Graham County near Robbinsville are also identified in this data. Lastly, Haywood County has the lowest percentage of parcels and improvements in high or very high risk areas when compared throughout the region. However, there is considerable risk overall when viewed outside of just high risk areas. All counties and the EBCI lands carry a substantial wildfire risk according to the Southern Wildfire Risk Assessment Fire Intensity Data. Table 6.18 shows the results of the analysis.

FIGURE 6.7: WILDFIRE RISK AREAS IN THE SMOKY MOUNTAIN REGION



Source: Southern Wildfire Risk Assessment Data

TABLE 6.18: VULNERABILITY OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	14,124	42%	7,098	43%	\$886,814,265	46%
Andrews	71	8%	43	7%	\$11,844,746	14%
Murphy	228	19%	147	17%	\$37,389,310	23%
Unincorporated Area	13,785	43%	6,891	46%	\$835,241,799	50%
EBCI	40	61%	17	71%	\$2,338,410	78%
Graham County	3,759	37%	1,876	38%	\$195,795,360	40%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	47	15%	41	21%	\$9,382,570	22%
Robbinsville	45	14%	31	12%	\$13,170,490	27%
Unincorporated Area	3,633	38%	1,797	40%	\$172,607,650	44%
EBCI	34	65%	7	70%	\$634,650	75%
Haywood County	4,441	9%	2,774	9%	\$701,320,400	15%
Canton	88	4%	66	3%	\$55,966,900	22%
Clyde	12	2%	8	2%	\$5,154,900	9%
Maggie Valley	172	7%	133	8%	\$36,383,500	14%
Waynesville	180	3%	138	3%	\$78,964,600	9%
Unincorporated Area	3,989	10%	2,429	11%	\$524,850,500	16%
Jackson County	11,654	30%	7,173	33%	\$2,218,575,680	41%
Dillsboro	42	25%	29	24%	\$8,791,060	38%
Forest Hills	55	25%	43	33%	\$7,856,260	38%
Sylva	166	11%	140	12%	\$66,234,930	29%
Webster	162	66%	119	70%	\$36,406,090	61%
Unincorporated Area	11,226	30%	6,840	34%	\$2,096,886,130	42%
EBCI	3	50%	2	50%	\$2,401,210	97%
Swain County	3,407	27%	2,128	31%	\$310,796,923	35%
Bryson City	170	17%	125	16%	\$23,261,562	16%
Unincorporated Area	3,220	28%	1,999	33%	\$286,400,541	39%
EBCI	17	74%	4	57%	\$1,134,820	69%
Eastern Band of Cherokee Indians*	330	7%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN	37,715	25%	21,049	26%	\$4,313,302,628	32%

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Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
REGION TOTAL						

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire Smoky Mountain 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

The critical facility analysis revealed that there are 4 schools (Cherokee and Haywood Counties), 3 fire stations (Cherokee and Jackson Counties), and 1 police station (EBCI) located in wildfire areas of concern, along with several other facilities considered critical. Critical facilities vulnerable to high or very high wildfire risk are detailed by county in **Table 6.19**. Of all the counties in the region, Cherokee County appears to have an elevated risk, with 17 critical facilities vulnerable to high or very high wildfire risk. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table 6.20** at the end of this section.

TABLE 6.19: CRITICAL FACILITIES IN HIGH TO VERY HIGH WILDFIRE RISK AREAS (COUNTY/COMMUNITY DATA)

CHEROKEE COUNTY						
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total	
Emergency Services	0	0	2	0	2	
EOC/Communications Facility	0	0	1	0	1	
Public Works Facility	0	0	0	0	0	
Fire Station/EMS	0	0	1	0	1	
Police Station	0	0	0	0	0	
Jail	0	0	0	0	0	
Government Facilities	0	0	4	0	4	
Government Office	0	0	1	0	1	
Community Center	0	0	1	0	1	
School	0	0	2	0	2	
Medical Facilities	0	0	0	0	0	
Hospital	0	0	0	0	0	
Public Works/Utilities	1	0	6	0	7	
Energy/Solar Farm	0	0	3	0	3	
Power Substation	0	0	1	0	1	
Water and Wastewater Systems	1	0	1	0	2	
Dam	0	0	1	0	1	
Other	1	0	3	0	4	
Commercial Facility	1	0	1	0	2	
Manufacturing Facility	0	0	1	0	1	
Food/Agricultural Facility	0	0	1	0	1	
Transportation/Airport	0	0	0	0	0	
Total	2	0	15	0	17	

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GRAHAM COUNTY

Only the Department of Social Services in Robbinsville is located in High to Very High Risk Areas.

HAYWOOD COUNTY

Only Junaluska Elementary School and Riverbend Elementary School are located in High to Very High Risk Areas.

JACKSON COUNTY

Only the Balsam Main Fire Station and the Canada Fire Department are located in High to Very High Risk Areas.

EASTERN BAND OF CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	6
Office	5
Community Building	1
Visitor Center	0
School	0
Medical Facilities	7
Hospital	7
Public Works/Utilities	3
Communication Tower	1
Water and Wastewater Systems	1
Other Utility Facility	1
Other	0
Casino	0
Total	16

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in the Smoky Mountain Region. Smoke inhalation may cause impacts on the population including increased respiratory illnesses. Wildfires can result in damaged or destroyed structures and agricultural lands, business interruptions, and evacuations. Businesses in the Smoky Mountain Region that rely heavily on mountain tourism may be especially hard hit during and after wildfire events.

6.7 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 Smoky Mountain 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 Smoky Mountain 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 Smoky Mountain 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 the Smoky Mountain 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 atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table 6.20** 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”).

Lastly, more specific jurisdiction-level conclusions can be found in the county annexes.

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TABLE 6:20.: AT-RISK CRITICAL FACILITIES

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
CHEROKEE COUNTY																				
Best Western	Commercial Facility	X	X	X	X	X	X	X	X	X					X	X	X		X	
Cool Springs Apartments	Commercial Facility	X	X	X	X	X	X	X	X	X							X	X	X	
Days Inn Motel	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Garden Apartments	Commercial Facility	X	X	X	X	X	X	X	X		X			X	X		X	X	X	
Gwenmont Apartments	Commercial Facility	X	X	X	X	X	X	X	X	X							X	X	X	
Hampton Inn	Commercial Facility	X	X	X	X	X	X	X	X	X					X	X	X		X	
Harrah's Cherokee Valley River Casino	Commercial Facility	X	X	X	X	X	X	X	X		X				X		X		X	
Harrah's Hotel	Commercial Facility	X	X	X	X	X	X	X	X	X					X		X		X	
Holiday Inn Express	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	X
Ingles Market at 2060 US 19	Commercial Facility	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	
Ingles Market at 297 Main St	Commercial Facility	X	X	X	X	X	X	X	X		X		X		X	X	X		X	
John C Campbell Folk School	Commercial Facility	X	X	X	X	X	X	X	X		X						X			
Lowes	Commercial Facility	X	X	X	X	X	X	X	X		X				X	X	X		X	
Mission Farm	Commercial Facility	X	X	X	X	X	X	X	X		X	X	X			X	X			
Mountain Vista Inn	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Murphy Motel	Commercial Facility	X	X	X	X	X	X	X	X	X						X	X			
Quality Inn	Commercial Facility	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Sunset Motel	Commercial Facility	X	X	X	X	X	X	X	X		X						X		X	
Walmart	Commercial Facility	X	X	X	X	X	X	X	X	X					X	X	X		X	
West Motel	Commercial Facility	X	X	X	X	X	X	X	X	X					X		X		X	
Westwind Apartments	Commercial Facility	X	X	X	X	X	X	X	X		X				X		X	X	X	
Andrews Community Center	Community Center	X	X	X	X	X	X	X	X		X			X	X		X	X	X	
Bellview Community Center	Community Center	X	X	X	X	X	X	X	X		X					X	X			
Culberson Community Center	Community Center	X	X	X	X	X	X	X	X	X						X	X			
Grape Creek Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Hanging Dog Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Hiwassee Dam Community Center	Community Center	X	X	X	X	X	X	X	X	X						X	X			
Marble Community Center	Community Center	X	X	X	X	X	X	X	X	X						X	X	X	X	
Martins Creek Community Center	Community Center	X	X	X	X	X	X	X	X		X									
Peachtree Community Center	Community Center	X	X	X	X	X	X	X	X		X			X	X	X	X			
Ranger Community Center	Community Center	X	X	X	X	X	X	X	X		X	X	X			X	X			
Texana Community Center	Community Center	X	X	X	X	X	X	X	X	X							X	X	X	
Topton Community Center	Community Center	X	X	X	X	X	X	X	X		X					X	X	X	X	
Unaka Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Wolf Creek Community Center	Community Center	X	X	X	X	X	X	X	X	X						X	X			X

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Appalachia Dam	Dam	X	X	X	X	X	X	X	X		X	X	X							
Beaver Creek Dam	Dam	X	X	X	X	X	X	X	X	X										
Dan Holland Dam	Dam	X	X	X	X	X	X	X	X	X					X		X		X	X
TVA Hiwassee Dam	Dam	X	X	X	X	X	X	X	X	X		X	X							
Bryson 60 LLC	Energy / Solar Farm	X	X	X	X	X	X	X	X		X					X	X			
Inman Solar	Energy / Solar Farm	X	X	X	X	X	X	X	X		X									X
Ketner Farms	Energy / Solar Farm	X	X	X	X	X	X	X	X		X									
Ledford Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X							X			
Martins Creek Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X									X
Mcdonald Property	Energy / Solar Farm	X	X	X	X	X	X	X	X	X							X			
Murphy Point Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X					X	X			
Murphy Power Farms LLC	Energy / Solar Farm	X	X	X	X	X	X	X	X	X		X	X			X	X			
NC Renewable Properties	Energy / Solar Farm	X	X	X	X	X	X	X	X	X		X	X			X	X			
Raper Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X					X	X			
Shields Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X						X	X			X
Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X						X	X			
Cell Tower at 1120 Mason Way	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Cell Tower at 124 Church of Christ Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X				X		X			
Cell Tower at 150 Robin Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X	X							X		X	

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cell Tower at 192 Lance Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X			
Cell Tower at 4216 Harshaw Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 447 Red Belt Ln	EOC / Communications Facility	X	X	X	X	X	X	X	X		X									
Cell Tower at 5386 W US 64	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 659 High Falls Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 66 Hunter Rdg	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X			X
Cell Tower at 914 Hideaway Mountain Dr	EOC / Communications Facility	X	X	X	X	X	X	X	X	X										
Cell Tower / Emergency Radio Repeater Fain Mountain Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X					X		X			X
Cherokee County 911, CKSR PSAP	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X	
Cherokee County Communications (EOC) Center	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X	
Emergency Radio Repeater East Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X		X				X		X			X
Emergency Radio Repeater North Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X										
Emergency Radio Repeater West Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER							
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire	
Emergency Radio Repeater Wolf Creek Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X											
Frontier Communications Operations Center	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X		
WCVP AM / WCNG FM Radio Station	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X				
WKRK AM Radio Station	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X		X		
Andrews Fire Department Station 14	Fire Station / EMS	X	X	X	X	X	X	X	X		X				X		X	X	X		
Andrews Rescue Squad Station 34	Fire Station / EMS	X	X	X	X	X	X	X	X		X				X		X	X	X		
Bellview Fire Department Station 18	Fire Station / EMS	X	X	X	X	X	X	X	X		X					X	X				
Cherokee County Ems Station 1	Fire Station / EMS	X	X	X	X	X	X	X	X		X						X	X	X		
Cherokee County Ems Station 2	Fire Station / EMS	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X		
Cherokee County Ems Station 3	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X				
Cherokee County Rescue Squad Station 20	Fire Station / EMS	X	X	X	X	X	X	X	X	X							X	X	X		
Culberson Fire Department Station 13	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X				
Grape Creek Fire Department Station 17	Fire Station / EMS	X	X	X	X	X	X	X	X	X											
Hanging Dog Fire Department Station 22	Fire Station / EMS	X	X	X	X	X	X	X	X	X											

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Hiwassee Dam Fire Department Station 21	Fire Station / EMS	X	X	X	X	X	X	X	X	X					X	X				
Martins Creek Fire Department Station 26	Fire Station / EMS	X	X	X	X	X	X	X	X		X									
Murphy Fire Department Station 12	Fire Station / EMS	X	X	X	X	X	X	X	X		X					X	X	X		
Peachtree Fire Department Station 16	Fire Station / EMS	X	X	X	X	X	X	X	X		X			X	X	X	X			
Ranger Fire Department Station 19	Fire Station / EMS	X	X	X	X	X	X	X	X		X	X	X			X	X			
Substation Cherokee County Rescue Station 20	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			
Substation Hiwassee Dam Fire Department Station 21	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Substation of Murphy Fire Department Station 12	Fire Station / EMS	X	X	X	X	X	X	X	X	X				X		X	X	X		
Substation Valletown Fire Department Station 29	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X	X	X	
Substation Valletown Fire Department Station 30	Fire Station / EMS	X	X	X	X	X	X	X	X		X					X	X	X	X	
Unaka Fire Department Station 25	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Valletown Fire Department Station 31	Fire Station / EMS	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Wolf Creek Fire Department Station 24	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			X

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Bruce Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X						X			
CR Brown Enterprise	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	
Parker and Reichman	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X				X		X		X	
Raper Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X					X	X			X
Woods Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X	X					X		X	X	X	
Andrews Town Hall	Government Office	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Cherokee County Annex Building	Government Office	X	X	X	X	X	X	X	X		X						X	X	X	
Cherokee County Courthouse	Government Office	X	X	X	X	X	X	X	X		X						X	X	X	
Cherokee County Department of Social Services	Government Office	X	X	X	X	X	X	X	X		X					X	X			X
Cherokee County Health Department	Government Office	X	X	X	X	X	X	X	X	X							X	X	X	
Murphy Town Hall	Government Office	X	X	X	X	X	X	X	X		X						X	X	X	
Murphy Medical Center	Hospital	X	X	X	X	X	X	X	X		X					X	X			
Cherokee County Jail	Jail	X	X	X	X	X	X	X	X	X							X	X	X	
Aegis Power Systems	Manufacturing Facility	X	X	X	X	X	X	X	X		X			X	X	X	X			X
Moog Components Group	Manufacturing Facility	X	X	X	X	X	X	X	X		X			X	X	X	X			
Andrews Police Department	Police Station	X	X	X	X	X	X	X	X		X				X		X	X	X	

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cherokee County Sherrif's Department	Police Station	X	X	X	X	X	X	X	X	X							X	X	X	
Murphy Police Department	Police Station	X	X	X	X	X	X	X	X		X						X	X	X	
Blue Ridge Mountain EMC Substation	Power Substation	X	X	X	X	X	X	X	X	X					X	X				
Duke Power Substation at 489 Palmer Ln	Power Substation	X	X	X	X	X	X	X	X	X							X		X	X
Duke Power Substation at 1823 Business 19	Power Substation	X	X	X	X	X	X	X	X		X			X	X	X		X		
T.V.A. / Blue Ridge Mountain EMC Substation	Power Substation	X	X	X	X	X	X	X	X		X				X	X		X		
TVA Substation	Power Substation	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
NCDOT Construction and Maintenance Complex	Public Works Facility	X	X	X	X	X	X	X	X		X					X	X			
NCDOT Garage	Public Works Facility	X	X	X	X	X	X	X	X	X						X	X			
NCDOT Offices	Public Works Facility	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Andrews Elementary School	School	X	X	X	X	X	X	X	X		X				X		X	X	X	
Andrews High School	School	X	X	X	X	X	X	X	X		X			X		X		X		
Andrews Middle School	School	X	X	X	X	X	X	X	X		X				X	X		X		
Hiwassee Dam Elementary/Middle/High School	School	X	X	X	X	X	X	X	X	X					X	X				
Marble Elementary School	School	X	X	X	X	X	X	X	X	X					X	X	X	X		

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER							
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire	
Martins Creek Elementary School	School	X	X	X	X	X	X	X	X		X										
Mountain Youth Center	School	X	X	X	X	X	X	X	X		X										
Murphy Adventist Elementary School	School	X	X	X	X	X	X	X	X		X				X	X					
Murphy Elementary School	School	X	X	X	X	X	X	X	X		X						X				
Murphy High School	School	X	X	X	X	X	X	X	X	X					X	X	X			X	
Murphy Middle School	School	X	X	X	X	X	X	X	X		X				X	X	X			X	
Peachtree Elementary School	School	X	X	X	X	X	X	X	X		X			X	X	X	X				X
Ranger Elementary School	School	X	X	X	X	X	X	X	X	X						X	X				X
The Learning Center	School	X	X	X	X	X	X	X	X	X							X	X	X		
Tri-County Community College	School	X	X	X	X	X	X	X	X		X					X	X				
Andrews Murphy Airport	Transportation / Airport	X	X	X	X	X	X	X	X	X					X	X	X	X	X		
Andrews Waste Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X		X	X	X	X	X		
Andrews Water Filtration Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X					X				X		
Murphy Water Filtration Plant / WWT	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X									X		X
Town of Andrews Water Tank at 155 Wells St	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X			X		X	X
Town of Andrews Water Tank at 158 Ridge Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X						X	X	X	X		

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Town of Andrews Water Tank at 9556 US 19	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X		X		
Town of Murphy Water Intake and Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X		X	X				
Town of Murphy Water Tank at 108 Fain Peak	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X	X		X		
Town of Murphy Water Tank at 1513 Poor House Mountain Trl	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X				
Town of Murphy Water Tank at 315 Fort Butler St	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X				X		X	X	X	X	
Town of Murphy Water Tank at 4582 E US 64	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X									X	
Town of Murphy Water Tank at 884 Pleasant Valley Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X	X				
Town of Murphy Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X	X				X
GRAHAM COUNTY																				
Senior Building	Community Center	X	X	X	X	X	X	X	X		X				X	X				
EMS Base	EMS Base	X	X	X	X	X	X	X	X		X				X	X				
Building Inspections	Government Office	X	X	X	X	X	X	X	X		X	X			X	X				
Court House / Tax Dep / County Clerk / Reg of Deeds	Government Office	X	X	X	X	X	X	X	X		X				X	X				
Department of Social Services	Government Office	X	X	X	X	X	X	X	X		X				X	X				X
Elections Office	Government Office	X	X	X	X	X	X	X	X		X				X	X				
Health Department	Government Office	X	X	X	X	X	X	X	X		X				X	X				

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Managers / Finance Office	Government Office	X	X	X	X	X	X	X	X		X				X	X				
Town of Robbinsville Govt Office at 4 Court St	Government Office	X	X	X	X	X	X	X	X		X				X	X				
Town of Robbinsville Govt Office at 6 Court St	Government Office	X	X	X	X	X	X	X	X		X				X	X				
Jail	Jail	X	X	X	X	X	X	X	X		X				X	X				
Robbinsville Elem School	School	X	X	X	X	X	X	X	X		X				X	X				
Robbinsville Mid & High School	School	X	X	X	X	X	X	X	X		X				X	X				
Sewer	Sewer/Sewer Plant	X	X	X	X	X	X	X	X		X				X	X				
Sewer Plant	Sewer/Sewer Plant	X	X	X	X	X	X	X	X		X				X	X				
Sheriff's Office	Sheriff's Office	X	X	X	X	X	X	X	X		X				X	X				
Transit Building	Transportation	X	X	X	X	X	X	X	X		X				X	X				
Water Treatment Plant at 2457 Long Creek Rd	Water Treatment Plant	X	X	X	X	X	X	X	X	X										
Water Treatment Plant at 616 Rodney Orr Bypass	Water Treatment Plant	X	X	X	X	X	X	X	X		X		X		X	X				
HAYWOOD COUNTY																				
Haywood Senior Resource Center	Community Center	X	X	X	X	X	X	X	X		X						X		X	
Blue Ridge Paper Products Emergency Response	Fire Station	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	
Blue Ridge Paper Products Emergency Response - Waynesville Facility	Fire Station	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Canton Fire Department	Fire Station	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
Center Pigeon Fire Department	Fire Station	X	X	X	X	X	X	X	X		X						X			
Clyde Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X		X			X	X	X	X	
Crabtree-Iron Duff Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Cruso Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Fines Creek Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X						X			
Jonathan Creek Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X	X	X			X	X			
Junaluska Community Volunteer Fire	Fire Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Lake Logan-Cecil Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Maggie Valley Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
North Canton United Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X			X
Saunook Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Waynesville Fire Department Station 1 - Headquarters	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X			X
Waynesville Fire Department Station 2	Fire Station	X	X	X	X	X	X	X	X		X	X	X		X		X	X	X	

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
County Offices 1	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
County Offices 2	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Government Office	Government Office	X	X	X	X	X	X	X	X		X						X		X	
Haywood County Health and Human Services Department	Government Office	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood County Historic Courthouse	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Maggie Valley Town Hall	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Town of Waynesville Public Services Department	Government Office	X	X	X	X	X	X	X	X		X				X	X	X		X	
Waynesville Town Hall	Government Office	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
DLP Haywood Regional Health and Fitness Center	Health Center	X	X	X	X	X	X	X	X		X		X		X		X	X	X	
DLP Haywood Regional Medical Center	Medical Center	X	X	X	X	X	X	X	X		X					X	X	X	X	
Canton Police Department / Town of Canton Municipal Building	Police Station	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
Clyde Police Department / Town of Clyde Municipal Building	Police Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood County Sheriff's Department	Police Station	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Maggie Valley Police Department	Police Station	X	X	X	X	X	X	X	X		X					X	X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Waynesville Police Department and Town Offices	Police Station	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Bethel Elementary School	School	X	X	X	X	X	X	X	X		X					X	X			
Bethel Middle School	School	X	X	X	X	X	X	X	X		X					X	X			
Canton Middle School	School	X	X	X	X	X	X	X	X		X				X	X	X		X	
Central Haywood High School	School	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Clyde Elementary School	School	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood Community College	School	X	X	X	X	X	X	X	X		X					X	X		X	
Haywood Early College	School	X	X	X	X	X	X	X	X		X					X	X		X	
Hazelwood Elementary School	School	X	X	X	X	X	X	X	X		X					X	X		X	
Jonathan Valley Elementary School	School	X	X	X	X	X	X	X	X		X					X	X			
Junaluska Elementary School	School	X	X	X	X	X	X	X	X		X					X	X		X	X
Meadowbrook Elementary School	School	X	X	X	X	X	X	X	X		X						X		X	
North Canton Elementary School	School	X	X	X	X	X	X	X	X		X				X		X		X	
Pisgah High School	School	X	X	X	X	X	X	X	X		X				X	X	X		X	
Regional High Technology Center	School	X	X	X	X	X	X	X	X		X					X	X	X	X	
Riverbend Elementary School	School	X	X	X	X	X	X	X	X		X					X	X			X
Tuscola High School	School	X	X	X	X	X	X	X	X		X					X	X		X	
Waynesville Middle School	School	X	X	X	X	X	X	X	X		X				X		X	X	X	

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
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HAYWOOD COUNTY																				
Glenville Cashiers EMS	EMS/EOC	X	X	X	X	X	X	X	X	X					X	X				
Glenville Cashiers Rescue Squad	EMS/EOC	X	X	X	X	X	X	X	X	X		X	X		X	X				
Harris Regional Hospital EMS Base	EMS/EOC	X	X	X	X	X	X	X	X		X			X	X	X			X	
Jackson County Emergency Mgmt	EMS/EOC	X	X	X	X	X	X	X	X		X				X	X			X	
Qualla Volunteer Fire Rescue	EMS/EOC	X	X	X	X	X	X	X	X		X				X	X	X	X		
SR 1340 EMS Base	EMS/EOC	X	X	X	X	X	X	X	X		X					X				
Webster Complex JC Rescue Squad	EMS/EOC	X	X	X	X	X	X	X	X		X			X	X	X			X	
Balsam Main Station	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	X
Balsam Woodfin	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	
Canada	Fire Station	X	X	X	X	X	X	X	X		X				X	X				X
Cashiers Catfish Run	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Cashiers Flat Creek	Fire Station	X	X	X	X	X	X	X	X		X									
Cashiers Main Station	Fire Station	X	X	X	X	X	X	X	X	X					X	X				
Cashiers US 65	Fire Station	X	X	X	X	X	X	X	X	X					X	X				
Cashiers Yellow Mountain Fire Station	Fire Station	X	X	X	X	X	X	X	X		X									
Cullowhee Caney Fork	Fire Station	X	X	X	X	X	X	X	X		X	X	X							
Cullowhee Main	Fire Station	X	X	X	X	X	X	X	X		X					X				

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
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Cullowhee Tuckasegee	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Qualla Main Station	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	
Qualla Substation	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X	X		
Savannah Main	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Savannah Pumpkintown Rd	Fire Station	X	X	X	X	X	X	X	X		X						X			
Sylva County Services Substation	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Sylva Main Station	Fire Station	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Cashiers County Office Bldg	Government Office	X	X	X	X	X	X	X	X	X					X	X				
Community Services Center	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Justice & Administration Center	Government Office	X	X	X	X	X	X	X	X		X			X	X	X			X	
Old Dillsboro Rd	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Skyland Services Center	Government Office	X	X	X	X	X	X	X	X		X			X		X	X	X	X	
Webster Complex	Government Office	X	X	X	X	X	X	X	X		X			X	X	X				
Sylva Dialysis	Health Center	X	X	X	X	X	X	X	X		X			X	X	X			X	
Highway Patrol	Highway Patrol	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	
Harris Regional Hospital	Hospital	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Sylva Police Department	Police Station	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Cashiers Recreation Center	Recreation Center	X	X	X	X	X	X	X	X	X					X	X				
Cullowhee Recreation Center	Recreation Center	X	X	X	X	X	X	X	X		X				X	X				

SECTION 6: VULNERABILITY ASSESSMENT

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Blue Ridge School	School	X	X	X	X	X	X	X	X	X					X	X				
Cullowhee Valley School	School	X	X	X	X	X	X	X	X		X		X		X	X				
Fairview School	School	X	X	X	X	X	X	X	X		X					X				
Scotts Creek Elementary School	School	X	X	X	X	X	X	X	X		X					X			X	
Smokey Mountain Elementary School	School	X	X	X	X	X	X	X	X		X				X	X			X	
Smoky Mountain High School	School	X	X	X	X	X	X	X	X		X				X	X				
Southwestern Community College Campus	School	X	X	X	X	X	X	X	X		X				X	X				
Summit Charter School	School	X	X	X	X	X	X	X	X	X						X				
WCU Albright / Benton Residence Halls	School	X	X	X	X	X	X	X	X		X					X				
Sheriff Office	Sheriff's Office	X	X	X	X	X	X	X	X		X			X	X	X			X	
Sheriff Substation Cashiers Glenville	Sheriff's Office	X	X	X	X	X	X	X	X	X					X	X				
Sheriff Substation Qualla	Sheriff's Office	X	X	X	X	X	X	X	X		X				X	X	X	X		
EASTERN BAND CHEROKEE INDIANS																				
Casino Hotel - Loading Dock	Casino	X	X	X	X	X	X	X	X		X	X	X			X	X			
Casino Hotel - Main Hotel Entrance	Casino	X	X	X	X	X	X	X	X		X	X	X			X	X			
Casino Parking Deck / Bus Entrance	Casino	X	X	X	X	X	X	X	X		X				X	X				
Access to Broadband & Verizon Cell Tower	Communication Tower	X	X	X	X	X	X	X	X		X				X	X				

SECTION 6: VULNERABILITY ASSESSMENT

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Barnett Knob Firetower	Communication Tower	X	X	X	X	X	X	X	X		X										
Broadband & Verizon Cell Tower at 607 Barnett Knob Firetower Rd	Communication Tower	X	X	X	X	X	X	X	X		X										
Broadband & Verizon Cell Tower at 683 Jim Bowman Dr	Communication Tower	X	X	X	X	X	X	X	X		X						X		X	X	
Broadband & Verizon Cell Tower at 759 Old Salt Mine Dr	Communication Tower	X	X	X	X	X	X	X	X		X						X				
Broadband & Verizon Cell Tower at 76 Long View Ln	Communication Tower	X	X	X	X	X	X	X	X		X				X	X					
Mt. Noble Fire Tower	Communication Tower	X	X	X	X	X	X	X	X		X						X				
3200 Acre Tract Community Building	Community Building	X	X	X	X	X	X	X	X		X				X	X		X			
Big Cove Community Rec. Center	Community Building	X	X	X	X	X	X	X	X		X										
Big Y Community Bldg	Community Building	X	X	X	X	X	X	X	X		X	X	X				X				
Birdtown Community Center	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Birdtown Recreation	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Paint Town Comm Bldg at 10 Old Gap Rd	Community Building	X	X	X	X	X	X	X	X		X				X	X					
Paint Town Comm Bldg at 59 Paint Town Community Building Rd	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Paint Town Gymnasium	Community Building	X	X	X	X	X	X	X	X		X					X	X				

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Rough Branch Community Building	Community Building	X	X	X	X	X	X	X	X		X					X	X			X
Soco Community Club Building	Community Building	X	X	X	X	X	X	X	X		X					X	X			
Wolfetown Community Center & Gym	Community Building	X	X	X	X	X	X	X	X		X					X	X			
Yellow Hill Community Club	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X			
Yellowhill Community Building	Community Building	X	X	X	X	X	X	X	X		X					X	X			
Yellowhill Outdoor Recreation Building	Community Building	X	X	X	X	X	X	X	X		X					X	X			
Fire Station 1	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Substation #2, Metal Building	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Substation #3, Red Concrete Block Bldg	Fire Station	X	X	X	X	X	X	X	X		X									
Ambulance Emergency Entrance	Hospital	X	X	X	X	X	X	X	X		X						X			
Delivery Entrance	Hospital	X	X	X	X	X	X	X	X		X					X	X			X
Emergency Helicopter Landing Pad	Hospital	X	X	X	X	X	X	X	X		X						X			
Pharmacy Drive Thru Window	Hospital	X	X	X	X	X	X	X	X		X					X	X			X
Primary Care Entrance	Hospital	X	X	X	X	X	X	X	X		X					X	X			X
Public Emergency Entrance	Hospital	X	X	X	X	X	X	X	X		X						X			X
Rotunda Entrance	Hospital	X	X	X	X	X	X	X	X		X					X	X			X
Staff Entrance A	Hospital	X	X	X	X	X	X	X	X		X						X			X

SECTION 6: VULNERABILITY ASSESSMENT

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Staff Entrance B	Hospital	X	X	X	X	X	X	X	X		X					X				X
Urgent Care Medical Center	Hospital	X	X	X	X	X	X	X	X		X				X	X				
Urgent Care Pharmacy	Hospital	X	X	X	X	X	X	X	X		X				X	X				
Admin Office (Children’s Res.Services) Bldg #13	Office	X	X	X	X	X	X	X	X		X				X	X				
Admin. Office (Development Office) Bldg #14	Office	X	X	X	X	X	X	X	X		X				X	X				
After School Program	Office	X	X	X	X	X	X	X	X		X				X	X				X
American Legion Post #143	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Animal Shelter	Office	X	X	X	X	X	X	X	X		X				X	X				
Bureau of Indian Affairs	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Cherokee Animal Shelter	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Cherokee Department of Transportation & Transit	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Cherokee Family Safety Building	Office	X	X	X	X	X	X	X	X		X				X	X				
Cherokee Home Health Services	Office	X	X	X	X	X	X	X	X		X				X	X				
Cherokee Preservation	Office	X	X	X	X	X	X	X	X		X				X	X				
Cherokee Technical Support Center	Office	X	X	X	X	X	X	X	X		X				X	X				
Cherokee Tribal Natural Resource Enforcement	Office	X	X	X	X	X	X	X	X		X				X	X				
Cherokee Youth Center	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Children's Center - Agelink Building	Office	X	X	X	X	X	X	X	X		X					X	X			X
Council House	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Davita Dialysis Center	Office	X	X	X	X	X	X	X	X		X					X	X			X
Dora Reed Center - Cherokee Tribal Daycare Center	Office	X	X	X	X	X	X	X	X		X					X	X			
EBCI Legal Department	Office	X	X	X	X	X	X	X	X		X					X	X			
EBCI PHHS Administration Building	Office	X	X	X	X	X	X	X	X		X					X	X			
Emergency Operations Center	Office	X	X	X	X	X	X	X	X		X					X	X			
Employee Entrance & Costume Shop for Village	Office	X	X	X	X	X	X	X	X		X						X			
Employees Entrance Bingo Hall	Office	X	X	X	X	X	X	X	X		X					X	X			
EMS Base	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Entrance Bingo Building	Office	X	X	X	X	X	X	X	X		X					X	X			
Facility Management	Office	X	X	X	X	X	X	X	X		X					X	X			
Facility Mgt. Garage	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			X
Finance - Maggie Wachacha Building	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Forestry Department	Office	X	X	X	X	X	X	X	X		X					X	X			
GLW Complex - Cherokee Choices	Office	X	X	X	X	X	X	X	X		X					X	X			
GLW Complex - Enrollment Office	Office	X	X	X	X	X	X	X	X		X					X	X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
GLW Complex - Main Entrance	Office	X	X	X	X	X	X	X	X		X					X	X			
GLW Complex - Tribal Education Computer Center	Office	X	X	X	X	X	X	X	X		X					X	X			
Housekeeping - Warehouse	Office	X	X	X	X	X	X	X	X		X					X	X			
Internal Audit / ALE	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Juvenile Services	Office	X	X	X	X	X	X	X	X		X					X	X			
Kituwah Immersion Academy	Office	X	X	X	X	X	X	X	X		X					X	X			
Kituwah Immersion Academy	Office	X	X	X	X	X	X	X	X		X					X	X			
Main Entrance, Wastewater Treatment Plant	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
NC Cooperative Extension	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 238 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 264 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 296 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Owner: EBCI at 508 Goose Creek Rd	Office	X	X	X	X	X	X	X	X		X						X			
Plant Management Site	Office	X	X	X	X	X	X	X	X		X					X	X			
Qualla Housing Authority	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Rock Bldg - Tribal Office	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Services	Office	X	X	X	X	X	X	X	X		X					X	X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Sewage Pumping Station	Office	X	X	X	X	X	X	X	X		X				X	X		X		
Side Outlet of Bingo	Office	X	X	X	X	X	X	X	X		X				X	X				
Supply - Tribal Warehouse	Office	X	X	X	X	X	X	X	X		X				X	X				
Teen Health Center	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
The Beloved Women's and Children's Health Center	Office	X	X	X	X	X	X	X	X		X				X	X				
Top	Office	X	X	X	X	X	X	X	X		X				X	X				
Tribal Child Support Enforcement	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Tribal Construction Inventory Shop	Office	X	X	X	X	X	X	X	X		X				X	X				
Tribal Gaming Commission Building	Office	X	X	X	X	X	X	X	X		X				X	X				
Tribal Housing	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Tribal Motor Pool - Building Behind Tribal Utilities	Office	X	X	X	X	X	X	X	X		X				X	X				
Tribal Utilities "Brad" Building	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Tsali Care Center - Nursing Home	Office	X	X	X	X	X	X	X	X		X				X	X			X	
Tsali Manor - Senior Citizens Center	Office	X	X	X	X	X	X	X	X		X				X	X				
U.N.I.T.Y.	Office	X	X	X	X	X	X	X	X		X				X	X				
U.S. Post Office	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Vacant at 75 John Crowe Hill Dr	Office	X	X	X	X	X	X	X	X		X				X	X				

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
WCU Cherokee Center	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			X
Building at 246 Joshua Toineeta Rd	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Fire & Safety	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			
Environmental Air Shelter	Other Utility Facility	X	X	X	X	X	X	X	X		X	X	X			X	X			X
Salt Shed Facility	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			
Evidence Control	Police Station	X	X	X	X	X	X	X	X		X					X	X			
Justice Center	Police Station	X	X	X	X	X	X	X	X		X					X	X			
New Police Sub-Station	Police Station	X	X	X	X	X	X	X	X		X									
Cherokee Central Schools - Auto Mechanics Building	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Ball Diamond Access	School	X	X	X	X	X	X	X	X		X	X	X			X	X			
Cherokee Central Schools - Facility Management / Field House	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Gathering Place	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Greenhouse	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Janitorial Warehouse	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Office	School	X	X	X	X	X	X	X	X		X						X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cherokee Central Schools - Storage Building	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Back Entrance / Cafeteria	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Classrooms at 130B Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X			
Cherokee Elementary School - Classrooms at 130C Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X			
Cherokee Elementary School - Classrooms at 130D(S) Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X			
Cherokee Elementary School - Classrooms at 130E Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Classrooms at 130F Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Hope Center	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Elementary School - Main Entrance	School	X	X	X	X	X	X	X	X		X	X	X				X			
Cherokee Elementary School - Playground Across from Bldg. F	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Playground at Ball Diamonds	School	X	X	X	X	X	X	X	X		X	X	X				X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cherokee Elementary School - Playground Behind Bldg. A	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee High School - Back Entrance	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200J Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200K Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200L Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200N Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Gymnasium	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Main Entrance	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Middle School - Back Entrance / Cafeteria	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Middle School - Classrooms at 150D(N) Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cherokee Middle School - Classrooms at 150G Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Middle School - Classrooms at 150H Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Middle School - Classrooms at 150M Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Middle School - Main Entrance	School	X	X	X	X	X	X	X	X		X	X	X				X			
Kituwah Academy - Storage Building	School	X	X	X	X	X	X	X	X		X				X	X				
Noah Powell Education Center	School	X	X	X	X	X	X	X	X		X	X	X			X	X			
Cherokee Visitor's Center	Visitor Center	X	X	X	X	X	X	X	X		X					X	X			
New Cherokee Visitors Center Site	Visitor Center	X	X	X	X	X	X	X	X		X	X	X			X	X			
2 Water Storage Tanks	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Cherokee Tribal Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Water & Sewer Storage Site Bldg	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Pump Station at 2003 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Pump Station at 5 Old Salt Mine Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Sewage Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Stream Gauge Station at 10725 Big Cove Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X									
Stream Gauge Station at 1144 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Stream Gauge Station at 1980 Big Cove Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Stream Gauge Station at 2286 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Stream Gauge Station at 2601 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Stream Gauge Station at 42 Tsali Blvd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Stream Gauge Station at 63 Wrights Creek Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Stream Gauge Station at 79 Bunches Creek Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X							
Stream Gauge Station at 960 Straight Fork Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X									
Tribal Water Storage Tank at 1055 Old No 4 Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Tribal Water Storage Tank at 243 Joshua Toineeta Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Waste Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X				X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Water & Sewer - O&M Shop	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Blue Wing Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Water Department - Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X	X	X	
Water Department - Maintenance Building	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			X
Water Department - Pump Station at 2353 Old Mission Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Pump Station at 458 Paint Town Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Water Department - Pumping Site	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X			X	X			
Water Department - Sim Taylor Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Department - Stillwell Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Water Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Department - Water Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X				X			
Water Storage Tank at 218 Kiowa Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Storage Tank at 268 Eagles Nest Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			

SECTION 6: VULNERABILITY ASSESSMENT

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Water Storage Tank at 333 Soggy Hill Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X									
Water Tank & Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Tank at 201 Water Dam Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X	X				
Water Tank at 711 Rough Branch Housing Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X				
Water Treatment Plant - Water Storage Tank	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X	X			X	
Water Treatment Plant - Water Tank at 234 Junior Wright Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X				
Water Treatment Plant - Water Tank at 738 Jim Bowman Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X			X	

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SECTION 7

CAPABILITY ASSESSMENT

This section of the Plan discusses the capability of the communities in the Smoky Mountain 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 projects¹. 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 Smoky Mountain 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 existing tools” (44 CFR, Part 201.6(c)(3)).

7.2 CONDUCTING THE CAPABILITY ASSESSMENT

During the previous development of this plan in 2012 (the first iteration of the regional plan), a detailed survey of existing plans and policies was undertaken. This information was then used to score each jurisdiction's capability. The results was a numerical score of capability, similar to a grade. In this version of the plan, however, capabilities were reviewed similar to previous efforts but a numerical score on capability was not provided. There were numerous reasons for this revised approach, but it was primarily driven by receipt of conflicting information. Thus, rather focusing on a number for which capability could be graded, actual gaps or achievements in capability were tracked based on received and researched information.

For this version of the plan, a Capability Assessment Review Form 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 was distributed to each participating jurisdiction.² Other indicators included information related to the region's fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes was evaluated by each point of contact. The current political climate, an important consideration for any local planning or decision making process, was also evaluated with respect to hazard mitigation. Capability information for the region was also updated based on information found in plans and local government websites.

At a minimum, 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 information 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 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 Smoky Mountain 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 Smoky Mountain Regional Hazard Mitigation Planning Committee.

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, and

² A copy of the Capability Assessment Review Form can be found in Appendix B.

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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 Smoky Mountain 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 Smoky Mountain Region. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE 7.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning / Regulatory Tool	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM COUNTY	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD COUNTY	Canton	Clyde	Maggie Valley	Waynesville	JACKSON COUNTY	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND of CHEROKEE	
Hazard Mitigation Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Comprehensive Land Use Plan				✓						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Floodplain Management Plan														✓	✓		✓				
Open Space Management Plan (Parks & Rec/Greenway)								✓					✓								
Stormwater Management Plan/Ordinance										✓			✓	✓	✓	✓	✓				
Natural Resource Protection Plan																					✓
Flood Response Plan																					
Emergency Operations Plan	✓			✓	C	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓	✓
Continuity of Operations Plan				✓									✓								
Evacuation Plan																					
Disaster Recovery Plan																					

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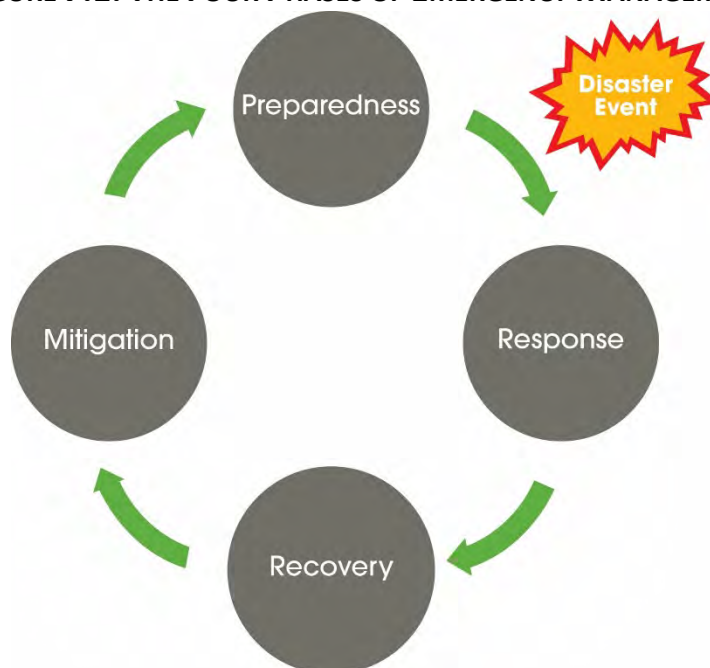
Planning / Regulatory Tool	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM COUNTY	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD COUNTY	Canton	Clyde	Maggie Valley	Waynesville	JACKSON COUNTY	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND of CHEROKEE
Capital Improvements Plan	*							✓					✓		✓		✓			
Economic Development Plan	*								✓				✓							✓
Historic Preservation Plan												✓ 3	✓							
Flood Damage Prevention Ordinance	✓	✓	✓	✓	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zoning Ordinance		✓	✓			✓			✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
Subdivision Ordinance			✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Unified Development Ordinance																				
Post-Disaster Redevelopment Ordinance																				
Building Code	✓			✓	C	C	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fire Code	✓			✓	C	C	C	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓
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 a disaster event 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.

³ Waynesville Design Review Guidelines

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 Smoky Mountain 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 five counties, the jurisdiction and Tribe participating in this multi-jurisdictional plan has previously participating in this regional planning effort. With the exception of Fontana Dam, all participants had an existing hazard mitigation plan prior to this regional effort. .

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.

- ◆ None of the counties or Tribe participating in this multi-jurisdictional plan have adopted a disaster recovery plan. They 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.

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- ◆ Cherokee County, Graham County, Haywood County, Jackson County, Swain County, and the Eastern Band of Cherokee Indians each maintain emergency operations plans through their respective Emergency Management Departments.
- ◆ The Towns of Fontana Dam, Lake Santeetlah, and Robbinsville are covered by Graham County's emergency operations plan.
- ◆ Haywood County's emergency operation plan is designed to address plans of action for multiple hazards that may threaten a jurisdiction with the County, including the Towns of Canton, Clyde, Maggie Valley, and Waynesville.
- ◆ Jackson County maintains a countywide emergency operations plan that covers all of its municipalities (Dillsboro, Forest Hills, Sylva, and Webster).
- ◆ Bryson City is covered by the Swain County emergency operations plan.

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 Jackson County and Graham County have adopted a continuity of operations plan.

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 Smoky Mountain 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.

- ◆ Graham County has adopted a county land use plan.
- ◆ Although Haywood County does not have a comprehensive land use plan in place, Maggie Valley and Clyde have adopted town land use plans and Waynesville has adopted a town land development plan.
- ◆ Jackson County and all of its participating jurisdictions have adopted comprehensive land use plans.
- ◆ Swain County completed a land use plan in 2012. Bryson City adopted its first land development plan in 2008.

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- ◆ Although the Eastern Band of Cherokee Indians does not have a comprehensive plan in place, as the Tribe continues to grow economically, there are trends toward more comprehensive planning.

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.

- ◆ The Haywood County Manager is responsible for development of the County's capital improvement program.
- ◆ Jackson County, Forest Hills, and Webster have capital improvement plans in place to guide the schedule of spending on public improvements.
- ◆ Cherokee County is currently developing a capital improvement plan for future implementation.

Economic Development Plan: An economic development plan is intended to provide a comprehensive overview of a community's economy. An economic development plan can set policies for a community's economic growth and identify strategies, programs, and projects to improve and maintain a community's economy.

- ◆ Jackson County and the Eastern band of Cherokee Indians have economic development plans.
- ◆ Canton has adopted an economic development plan since the previous hazard mitigation plan update.
- ◆ Cherokee County is currently developing an economic development plan for future implementation.

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.

- ◆ Jackson County and the city of Waynesville in Haywood County have historic preservation plans.

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.

- ◆ Cherokee County does not have a zoning ordinance. However, the Towns of Andrews and Murphy have adopted zoning ordinances that are overseen by Town Zoning Administrators.

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- ◆ The Town of Lake Santeetlah has adopted a zoning ordinance, however Graham County and the remaining jurisdictions have not adopted such ordinances.
- ◆ Haywood County does not have a zoning ordinance in place, but all of the jurisdictions, Canton, Clyde, Maggie Valley, and Waynesville have adopted zoning ordinances that are administered by the Town Planning Department or Town Administrator.
- ◆ Jackson County and all four of its jurisdictions have adopted and enforce zoning ordinances. These ordinances are intended to promote and enhance the unique community atmosphere and preserve the social, economic, cultural, historic, and aesthetic conditions.
- ◆ Neither Swain County nor Bryson City has adopted zoning ordinances.
- ◆ The Eastern Band of Cherokee Indians has very limited zoning. The Code establishes the Cherokee Business Zone and prohibits certain events and activities within that zone, but no other zones are established or addressed and no specific uses are prohibited or encouraged.

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.

- ◆ Cherokee County and Graham County do not have subdivision ordinances in place. The Town of Murphy in Cherokee County has adopted a subdivision ordinance.
- ◆ Haywood County has a subdivision ordinance that was adopted by the Board of County Commissioners and applies to all areas of unincorporated Haywood County. One of the stated purposes is to ensure that land is subdivided in a manner “that shall be of such character that it can be used safely without danger to health or peril from fire, flood, erosion, air and/or water pollution.” All of the participating jurisdictions in Haywood County have also adopted subdivision ordinances.
- ◆ Jackson County’s Code of Ordinances includes subdivision regulations which address steep slope and flood hazard. All of the participating jurisdictions in Jackson County have also adopted subdivision ordinances.
- ◆ Swain County has a subdivision ordinance that was adopted by the County Board of Commissioners and applies to all areas of unincorporated Swain County. The Town of Bryson City has not adopted a subdivision ordinance.
- ◆ The Eastern Band of Cherokee Indians does not have any subdivision regulations in place.

Building Codes, Fire 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 and fire code, which applies throughout the state; however, jurisdictions may adopt codes if approved as providing adequate minimum standards. All of the participating counties and jurisdictions have adopted a building code except for the towns in Cherokee (Andrews and Murphy). The towns in Graham County (Fontana Dam, Lake

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Santeetlah, and Robbinsville) are covered by Graham County's building code. The building code is enforced by each county's building inspector.

- ◆ All jurisdictions, with the exception of the towns of Andrews, Murphy, Dillsboro, Forest Hills, and Webster, have adopted fire codes. The towns of Fontana Dam, Lake Santeetlah, and Robbinsville are covered by Graham County's fire code.
- ◆ The Towns of Canton and Waynesville have their own inspections departments that enforce the building code within their town limits.

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).⁴ 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,

⁴ Participation in BCEGS is voluntary and may be declined by local governments if they do not wish to have their local building codes evaluated.

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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 Smoky Mountain 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
CHEROKEE COUNTY	2/2/89	4/19/10	137	\$31,342,900	28	\$284,041
Andrews	2/1/85	4/19/10	6	\$1,939,900	5	\$192,489.11
Murphy	7/3/86	4/19/10(M)	6	\$ 2,016,000	4	\$24,946.48
GRAHAM COUNTY	2/1/12	4/19/10	47	\$8,189,100	2	\$10,846.72
Fontana Dam*	2/1/12	4/19/10	--	--	--	--
Lake Santeetlah	9/12/17	02/18/17	--	--	--	--
Robbinsville	12/1/89	4/19/10	2	\$245,600	--	--
HAYWOOD COUNTY	7/15/84	4/3/12	234	\$52,686,400	49	\$975,551
Canton	2/2/77	4/3/12	37	\$10,368,100	50	\$3,033,702
Clyde	12/1/83	4/3/12	63	\$10,343,900	127	\$3,842,008
Maggie Valley	4/17/84	4/3/12	41	\$13,348,200	4	\$23,642
Waynesville	1/6/83	4/3/12	333	\$52,266,500	14	\$117,734
JACKSON COUNTY	5/17/89	4/19/10	238	\$56,339,800	18	\$274,698
Dillsboro	5/15/86	4/19/10	9	\$2,635,000	4	\$262,079
Forest Hills	5/10/10	4/19/10	2	\$273,500	--	--
Sylva	7/3/86	4/19/10	33	\$8,425,800	4	\$121,213
Webster	4/19/10	4/19/10	5	\$761,000	--	--
SWAIN COUNTY	7/17/86	4/19/10	69	\$14,752,600	4	\$26,351
Bryson City	12/4/84	4/19/10	34	\$8,185,400	11	\$405,822
EASTERN BAND OF CHEROKEE	5/17/89	4/19/10	47	\$10,739,300	4	\$244,607

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

*Fontana Dam is covered by Graham County. They do not participate separately but activities are covered by the County.

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

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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 Reduction
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.

- ◆ Only Cherokee County currently participates in the CRS. Participation in the CRS program should be considered as a mitigation action by the counties, municipalities, and Tribe. The program would be most beneficial to the Town of Waynesville, Jackson County, and Haywood County, which have 278, 275, and 229 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.

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.

- ◆ The Towns of Dillsboro and Webster and the Village of Forest Hills have adopted floodplain management plans.

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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.

- ◆ Haywood County has adopted a Comprehensive System-wide Parks and Recreation Master Plan and Jackson County has adopted a Recreation Master Plan since completion of the 2012 plan.
- ◆ A Greenway Project has been suggested by Swain County as a way to acquire and control parts of the Tuckaseegee River floodway.
- ◆ Jackson County has adopted an open space management plan since the last hazard mitigation plan update occurred.

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.

- ◆ Only Jackson County has adopted stormwater management plans.
- ◆ The Town of Clyde in Haywood County has developed a stormwater master plan and adopted a stormwater management ordinance that is overseen by the Town Administrator.
- ◆ The Towns of Dillsboro, Forest Hill, Sylva, and Webster in Jackson County also have stormwater management plans in place.

7.3.6 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 Smoky Mountain Region with regard to relevant staff and personnel resources. A symbol was used to indicate the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A "C" indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (since the 2017 plan).

TABLE 7.4: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM COUNTY	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD COUNTY	Canton	Clyde	Maggie Valley	Waynesville	JACKSON COUNTY	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND of CHEROKEE
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	✓			✓	C	C	C	✓	✓	✓	✓	✓	✓					✓		✓
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	✓			✓	C	C	C	✓					✓					✓		✓
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.

7.3.7 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

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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 Smoky Mountain Region with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A “C” indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE 7.5: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM COUNTY	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD COUNTY	Canton	Clyde	Maggie Valley	Waynesville	JACKSON COUNTY	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND of CHEROKEE
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																				
Partnering Arrangements or Intergovernmental Agreements	✓	✓	✓										✓	✓	✓	✓	✓	✓	✓	

7.3.8 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

SECTION 7: CAPABILITY ASSESSMENT

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 Smoky Mountain 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, zoning, and subdivision.
- ◆ There is resistance to zoning and comprehensive land use planning in Haywood, Jackson, and Swain Counties and it is possible that citizens will not support the implementation of a hazard mitigation plan. However, the counties feel that public outreach can be used to educate citizens on the necessity of such a plan by using examples of damage from past disaster events.
- ◆ Cherokee County, the Town of Andrews, and the Town of Murphy indicated that their residents have a better understanding of hazard vulnerability, as well as the need to mitigate that vulnerability, due to the number of natural and manmade hazards that have occurred and that have been effectively controlled in the past.
- ◆ The Eastern Band of Cherokee Indians was the first Native American Nation to participate in the FEMA Project Impact Initiative and is also a Cooperating Technical Partner with an ongoing floodplain mapping initiative. The Tribe is making continuous and costly improvements to its emergency management program and has demonstrated a serious commitment to hazard mitigation even in the absence of a recent major disaster. Mitigation and hazard reduction principles are indirectly referenced throughout many of the Tribal documents, plans, and policies.

7.4 CONCLUSIONS ON LOCAL CAPABILITY

A Capability Assessment examines 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.

All of the participating jurisdictions lack a Disaster Recovery Plan and most lack an Economic Development Plan. With the results of this plan's risk assessment, all of the jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that complements the economic development strategy is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction's economic development goals.

SECTION 7: CAPABILITY ASSESSMENT

It is recognized that Haywood County and the Town of Waynesville, and Jackson County have well over 200 homes each in the NFIP. Participation in the Community Rating System could be worthwhile as having a CRS rating of 8 or better will result in significant dollars remaining in the community. However, this decision must be carefully considered and committed to at the local level given the need for program administration.

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 SMRHMP 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 Smoky Mountain Region to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Smoky Mountain Regional Hazard Mitigation Planning Committee 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 Smoky Mountain Region
- ◆ 8.5 Plan Update Requirement

8.1 INTRODUCTION

The intent of the Mitigation Strategy is to provide the Smoky Mountain 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 Smoky Mountain 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 Smoky Mountain counties, jurisdictions and the Tribe 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 Smoky Mountain 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

Beginning with the 2012 Smoky Mountain Regional plan and continuing with this update, the Regional Hazard Mitigation Planning Committee members were tasked with establishing a priority for each action. This was communicated at the second Regional Hazard Mitigation Planning Committee 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 review¹
- ◆ Funding availability
- ◆ Continued compliance with the NFIP

The point of contact for each county and for the Tribe 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.

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. A more detailed cost/benefit analysis will be applied to particular projects prior to the application for or obligation of funding, as appropriate.

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, the Smoky Mountain counties, the participating municipalities and the Tribe developed six goal statements for local hazard mitigation planning in the region during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table 8.1**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE 8.1: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards .
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas .
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

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 Smoky Mountain 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 Smoky Mountain Regional Hazard Mitigation Planning Committee meetings. In general, all activities considered by the Regional Hazard Mitigation Planning Committee 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
- ◆ Stormwater 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., windproofing, floodproofing, 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 SMOKY MOUNTAIN REGION

In order to determine the most appropriate mitigation techniques for the communities in the Smoky Mountain Region, the Regional Hazard Mitigation Planning Committee 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 Smoky Mountain Region county plans and the Tribe's plan were evaluated to determine their 2017 implementation status. Updates on the implementation status of each action are provided. 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 2017 planning process.

SECTION 9

MITIGATION ACTION PLAN

This section describes the planning process undertaken by the Smoky Mountain Region in the development of its 2017 Regional Hazard Mitigation Plan. It consists of the following two subsections:

- ◆ 9.1 Overview
- ◆ 9.2 Mitigation Action Plans

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 Smoky Mountain Region. Each action is listed in the MAP in conjunction with background information such as hazard(s) addressed, relative priority, and estimated cost. 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 Smoky Mountain 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.
- ◆ Estimated Cost—Anticipated cost of 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. In general, actions with a priority of moderate or high are anticipated to be completed within the next five years unless otherwise specified.
- ◆ Implementation Status (2017)—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 20 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
Cherokee County	9:3	24
Andrews	9:8	15
Murphy	9:12	16
Graham County	9:16	25
Fontana Dam	9:21	8
Lake Santeetlah	9:24	9
Robbinsville	9:27	12
Haywood County	9:30	32
Canton	9:35	20
Clyde	9:38	20
Maggie Valley	9:41	21
Waynesville	9:45	20
Jackson County	9:48	22
Dillsboro	9:54	10
Forest Hills	9:57	24
Sylva	9:63	28
Webster	9:71	24
Swain County	9:78	19
Bryson City	9:82	17
Eastern Band of Cherokee Indians	9:86	43

Cherokee County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed. Summer 2012.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County/Town Executives; County Grants Management	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County/Town Executives	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-10	Integrate county EOP with HMP as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. EOP lists hazards identified in HMP and roles and responsibilities per agency.
P-11	Monitor and manage the County's Steep Slope initiative to ensure sufficient accessibility of entrances and exits for emergency service vehicles.	All	High	County/Town Administration	N/A	General Fund	2022	Politically infeasible to implement at this time.
P-12	Continue participation in NFIP and work toward CRS System.	All	High	County/Town Administration; County Building Inspection; County Emergency Management	N/A	General Fund	Completed	Completed.
P-13	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. Comprehensive review of EOP is done every three years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-14	Evaluate the need for a drought management plan and protocol to be implemented throughout the county in the event a drought should occur.	Drought	Moderate	County Emergency Management	N/A	General Fund	2022	In progress. Plan and advisory committee in development phase.
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
PP-3	Identify critical facilities and the need for a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	N/A	Unknown	2022	Critical facilities identified. There was no political will to advance this action further over the last five years given lack of funding sources.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022- 2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-5	Identify structures subject to recurring flooding so that they can be retrofitted.	Flood	Moderate	Emergency Management/Planning/GIS	Low; staff hours	Local	2022	New Action
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	Hazard Mitigation Task Force	Unknown	General Fund	Completed	Completed as of 2012 plan update.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. Mutual aid agreements in place.
ES-4	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management	N/A	General Fund	Complete	Complete.
PEA-3	Develop and implement a comprehensive community information program to inform the public of the risk of potential hazards, potential mitigation measures, as well as what actions they can take to protect themselves and their property.	All	Low	County Emergency Management	N/A	General Fund	2022	This is in progress but not complete. Developing comprehensive public outreach plan and identifying key agency involvement.

Town of Andrews Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC		Local, State, Federal	2022-2030	Pending municipal involvement (limited political will to complete this action over the last five years)

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County and municipal executives; County and municipal Grants Management	Unknown	Local, State, Federal	2030	Pending municipal involvement and funding sources. (limited political will to complete this action over the last five years)
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County and municipal executives	Unknown	Local, State, Federal	2030	There was limited political will to complete this action over the last five years. This action item is ongoing as opportunities for integration continue.
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service Cherokee; County Fire Marshal; County and municipal Fire Departments	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	2022-2030	There was no political will to complete this action over the last five years. As funding permits and homeowners volunteer we can focus more on this action.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	2022-2030	There was no political will to complete this action over the last five years. The town is still committed, will continue as funding becomes available.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped, and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	County/Town Executives; County Grants Administration	Unknown	General Fund	Completed	Completed as of 2012 plan update.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

Town of Murphy Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP Task Force	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed. Summer 2012.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC	Unknown	Local, State, Federal	2022	Although zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement. However, the program is note formalized.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County and municipal executives; County and municipal Grants Management	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County and municipal executives	Unknown	Local, State, Federal	2022	All jurisdictions share building staff and knowledge reference flood plain and code enforcement. However, a formal program or MOU is not in place.
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service Cherokee; County Fire Marshal; County and municipal Fire Departments	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	Deleted	No longer feasible or necessary. No structures in floodplain throughout the town.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	Deleted	No longer feasible or necessary. No structures in floodplain throughout the town.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped, and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	County/Town Executives; County Grants Administration	Unknown	General Fund	Completed	Completed as of the 2012 plan.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-4	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.

Graham County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Floodplain Manager	Unknown	State and FEMA funding	Completed	Completed. On February 21, 2011, the floodplain ordinance was rescinded to old ordinance.
P-2	Continue to enforce building codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspector	Unknown	Self-funded	Completed	Completed August 2012
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management Director	Unknown	Self-funded; partial state funding	Annual; 2030	Revisions as determined by need, evaluation and assessment.
P-4	Explore expanding floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	Low	County Tax Assessor	Unknown	Self-funded	2022	County has rejoined NFIP. There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	County Fire Marshal; County Forest Ranger	Unknown	Self-funded; Partial state funding	Annually until 2022	Development continues as a result of wildfires and threat assessment.
P-6	Encourage fire-vulnerable subdivisions to become Firewise communities.	Wildfire	Low	County Fire Marshal; NCDNR Forest Ranger	Unknown	Self-funded; Firewise reimbursement	2030	County remains committed to this action, but there was no political will to complete this action over the last five years.
P-7	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	County Manager	Unknown	Self-funded	2022	County officials have considered a "Steep Slope Ordinance", but there was no political will to complete this action over the last five years.
P-8	Expand Land Use Plan to address grade of banks on residential/commercial property.	Landslide	Low	County Tax Assessor	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years. County officials have considered a "Steep Slope Ordinance" but have taken no action.
P-9	Identify potential landslide problem areas in County.	Landslide	High	County Emergency Management Director	Unknown	Self-funded	2022	There was no political will to complete this action over the last five years. Assessment is as needed.
P-10	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	High	County Building Inspector	Unknown	Self-funded	Completed	Completed. Inspections department ensures compliance before issuing occupancy permits.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-11	Integrate County/municipality EOP Plan with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Low	County Emergency Management Director	Unknown	Self-funded; Partially state funded	Completed	This action is underway with annual update.
P-12	Develop a natural hazards vulnerability assessment for the next update of the hazard mitigation plan.	All	High	County Emergency Management Director; NCDEM	Unknown	Self-funded	Completed	Completed. Natural hazards were assessed in the hazard mitigation plan in 2012 and 2017.
Property Protection								
PP-1	Evaluate the relocation/elevation/flood proofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Emergency Management Director	Unknown	Self-funded	2022	Assessment and recommendations continue, but there was no political will to complete this action over the last five years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Low	County Manager	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	County Manager	Unknown	Self-funded	2022-2030	There was no political will to complete this action over the last five years. Evaluate spills and encroachments as presented.
NRP-2	Whenever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Low	County Manager	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years.
Emergency Services								
ES-1	Explore adding flood monitoring facilities on streams and coupling with a disaster warning system to give early warning of floods.	Flood; Dam Failure	High	County Emergency Management Director	Unknown	State-funded	2022	Regional hydroelectric producers cooperating with early warning/failure devices and notification but nothing on streams.
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	High	County Emergency Management Director	Unknown	Self-funded	2022	In progress. Continued use of MOA and mutual aid agreements.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	Exercise Emergency Warning/Broadcast Systems on a quarterly schedule.	All	High	County Emergency Management Director	Unknown	Self-funded; Partially state or Federal funding	Completed	Implemented reverse 911 system in March 2017.
ES-4	Procure and maintain up-to-date emergency response vehicles/equipment to ensure emergency response is capable of responding to various hazards.	All	High	County Emergency Management Director	Unknown	Self-funded; Partially state or Federal funding	2022-2030	Continued participation in DPR program to obtain, maintain, and improve response capabilities. Additional equipment or training may be necessary
ES-5	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	High	County Building Inspector	Unknown	Self-funded	2022	There was no political will to complete this action over the last five years.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director	Unknown	Self-funded	2030	County website, social media platforms, and reverse 911 system used for information releases and emergency notifications.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director	Unknown	Self-funded	2022	While some education is conducted through the year, there is no formal program. There was no political will to complete this action over the last five years.

Town of Fontana Dam Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Town Government in cooperation with County Government	Unknown	Local	2022	There was no political will to complete this action over the last five years. Continue to identify hazards and assess risk.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	Town Government in cooperation with County Government	Unknown	Local	2022-2030	Maintained NFIP participation and good standing. Ensure compliance with NFIP during issuance of permits and inspections.
Property Protection								

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate response/recovery efforts with other communities and counties.	All	High	Town Government in cooperation with County Government	Unknown	Local	2022	Continued use of MOA and mutual aid agreements.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	Low	Town Government	Unknown	Local	2030	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Coordinate with the County to explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director, Town Government	Unknown	Self-funded	2022-2030	Completed. County and municipality websites, social media platforms, and reverse 911 utilized for release of information.
PEA-3	Coordinate with the County to conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director, Town Government	Unknown	Self-funded	2022	Informational presentations at the request of interested parties.

Town of Lake Santeetlah Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	NCDEM	Unknown	State and FEMA funding	Completed	Completed February 21, 2011.
P-2	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Town Government in cooperation with County Government	Unknown	Local	2030	Continued revision and reassessment.
P-3	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	Town Government in cooperation with County Government	Unknown	Local	Completed	Completed. Regulations passed in 2008.
Property Protection								

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate response/recovery efforts with other communities and counties.	All	High	Town Government in cooperation with County Government	Unknown	Local	2030	Continued use of MOA and mutual aid agreements.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	Low	Town Government	Unknown	Local	2022	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Coordinate with the County to explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director, Town Government	Unknown	Self-funded	2030	In progress. County and municipal websites, social media platforms, and reverse 911 system utilized for notifications.
PEA-3	Coordinate with the County to conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director, Town Government	Unknown	Self-funded	2022	In progress. Informational presentations are being made at request of interested parties.

Town of Robbinsville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	NCDEM/FEMA	Unknown	State and FEMA funding	Completed	Completed February 21, 2011.
P-2	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	High	Town Government	Unknown	Local funds	Completed	Completed. Inspections department ensures compliance before issuing occupancy permits.
P-3	Integrate county/municipality EOP Plan with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	Town Government	Unknown	Local funds	2022	There was no political will to complete this action over the last five years.
P-4	Develop a natural hazards vulnerability assessment for the next update of the hazard mitigation plan.	All	High	County Emergency Management Directors; NCDEM	Unknown	Self-funded	Completed	Completed. The hazard mitigation plan includes a vulnerability assessment.
P-5	Create a storm water runoff plan for the Town.	Flood	High	Town Government	Unknown	State/FEMA/Local funds	2022	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Evaluate the relocation/elevation/flood proofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	Town Government	Unknown	Procure mitigation grants	2022	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	Town Government	Unknown	Local government and self-funding	2022	Assessments as needed to ensure compliance.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	Town Government	Unknown	Local government and self-funding	2022	Continued assessment of encroachments and spills. There was no political will to complete this action over the last five years.
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Low	Town Government	Unknown	State and FEMA	2030	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Dam/Levee Failure; Flood; Hurricane; Winter Storm; Severe Thunderstorm	High	Town	Unknown	National Weather Service	2022-2030	Implementation of reverse 911 system in March 2017. However, gages still needed.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.

Haywood County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive Water Shortage Response Plan in conjunction with the existing incorporated municipalities.	Drought	High	County Emergency Management	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-2	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	County Emergency Management	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-3	Review potential new regulations designed to prevent or mitigate wildfires including requiring fire breaks within subdivisions.	Wildfire	Moderate	NC Forest Service	Unknown	Local; State	2022-2030	Pending agency involvement and funding sources
P-4	Development of monitoring program to assess daily wildfire risk.	Wildfire	Low	NC Forest Service	Unknown	Local; State	2022-2030	Pending agency involvement and funding sources
P-5	Complete a comprehensive review of existing regulations to determine where changes need to be made to increase flood hazards mitigation.	Flood	High	County Planning	Unknown	Local	Completed	Completed. New flood damage prevention ordinance.
P-6	Review possibility of revising existing Flood Damage Prevention Ordinance policies concerning substantial improvement.	Flood	Low	County Planning	Unknown	State	2022-2030	Priority changed from high to low. There was no political will to complete this action over the last five years.
P-7	Purchase and make use of ArcView GIS mapping format.	Flood	Moderate	County IT	Unknown	Local	Completed	Completed. Using ArcView GIS with FTE position.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Continue participation in NFIP and CRS System—review policy initiatives and programs to lower CRS Score.	Flood	High	County Planning	Unknown	Local; State	2022	County has maintained participation in NFIP which requires continuous action and funding. There was no political will to complete this action over the last five years.
P-9	Comprehensive review of existing emergency response plans for all natural disasters.	All	High	County Emergency Management	Unknown	Local; State	2022	Priority changed from moderate to high. There was no political will to complete this action over the last five years.
P-10	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-11	County shall review the need to require all new residential developments to include common areas, dedicated to the County, for the storage of sand and salt to be used by the County to aid in making roadways safe for vehicular traffic.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-12	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	County Erosion Control	Unknown	Local; State	2022-2030	There was no political will to complete this action over the last five years.
P-13	Consider the development of a comprehensive stormwater management ordinance.	Erosion; Landslide	Moderate	County Erosion Control	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Continue to review the possibility of purchasing additional property in identified flood areas to convert it to open space.	Flood	Moderate	County Planning	Unknown	Local; Federal	2022-2030	There was no political will to complete this action over the last five years.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Work with the Army Corps of Engineers to conduct a comprehensive hydrological study of existing watersheds and water ways to determine what the recharge rate is to avoid depletion of necessary water.	Drought	Low	County Erosion Control	Unknown	Local; State; Federal	2030	There was no political will to complete this action over the last five years. Priority changed from moderate to low.
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	Completed	Completed.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred . At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	Moderate	County Emergency Management; County Erosion Control	Unknown	Local; State; Federal	2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	NC Forest Service	Unknown	State	2022	Requires continuous action and funding.
PEA-3	Develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	County Emergency Management	Unknown	Local; NC Fire Service	2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-4	Develop educational brochures informing local residents on techniques they can utilize to address flood hazard mitigation.	Flood	High	County Planning	Unknown	Federal	Completed	Completed.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-5	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	County Emergency Management	Unknown	Local; State	2022-2030	Requires continuous action and funding. There was limited to political will to advance this action over the last five years.
PEA-6	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local	2022	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-7	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	County Emergency Management	Unknown	Local	2022	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-8	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
PEA-9	Development of educational materials/brochures to educate the public about landslides.	Erosion; Landslide	High	County Emergency Management; County Erosion Control	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
PEA-10	Provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	New Action
PEA-11	Increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	New Action

Town of Canton Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town; County Emergency Management	Unknown	Local; Non-profits	2022-2030	Deferred until funding is available.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Low	Town; County Emergency Management; County Planning	Unknown	Local	2030	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local	Completed	Completed. A Nixle notification system is in place.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town; County Emergency Management	Unknown	Local	2022-2030	There was limited funding political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred. At this time, neither Haywood County nor the Town of Canton have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	Town Fire Department; NC Fire Service	Unknown	State	2022-2030	There was no political will to complete this action over the last five years.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	Town; County	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	Town	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Canton	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Canton	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Requires continuous action and funding.

Town of Clyde Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town; County Emergency Management	Unknown	Local; Non-profits	2022-2030	There was no political will to complete this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	Town; County Emergency Management; County Planning	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local	Completed	Completed. 2009.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	High	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred. Requires continuous action, coordination, political will and funding.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	Town; County	Unknown	Local	2022-2030	Deferred. Requires continuous action, coordination, political will and funding.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	Town; County	Unknown	Local	Completed	Completed. 2008.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	Town; County	Unknown	Local	Completed	Completed. 2008.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	Town	Unknown	Local	Completed	Completed. 2008.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	Town; County Emergency Management	Unknown	Local	Completed	Completed. 2008.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	Town; County Emergency Management	Unknown	Local	Completed	Completed. 2008
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Clyde	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Clyde	Unknown	Local; State; Federal	2022-2030	New Action

Town of Maggie Valley Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town Sanitary District	Unknown	Local; USACE	2022-2030	There was no political will to complete this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	County Emergency Management; Town Police Department; Town Public Works	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	High	County Erosion Control; Town Planning	Unknown	Local	2017	In progress. Town is in process of adopting County Erosion and Sediment Control Ordinance and Slope Ordinance.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PP-2	Protect water treatment plant from flooding.	Flood	High	Town Planning; Town Public Works	Unknown	Local	2022	New action. Currently constructing a FEMA-approved levee to protect wastewater treatment plant.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022	There was no political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide		County Emergency Management; Town Planning	Unknown	Local; NCDOT	2022-2030	Requires continuous action, coordination, political will and funding. There was limited political will to advance this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	County Emergency Management	Unknown	Local	2022-2030	There was limited political will to advance this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	County Emergency Management	Unknown	Local; NC Fire Service	2022-2030	There was limited political will to advance this action over the last five years.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	County Emergency Management	Unknown	Local; NC Fire Service	2022	There was limited political will to advance this action over the last five years.
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	County Emergency Management	Unknown	Local; SHMO	2022	There was limited political will to advance this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local	2022-2030	There was limited political will to advance this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	County Emergency Management	Unknown	Local	2022	There was limited political will to advance this action over the last five years.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	County Emergency Management	Unknown	Local	2022	There was limited political will to advance this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	County Emergency Management	Unknown	Local; SHMO	2022	There was limited political will to advance this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Maggie Valley	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Maggie Valley	Unknown	Local; State; Federal	2022-2030	New Action

Town of Waynesville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town Public Works	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town Police; Town Fire; Town Public Works	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	Town Police; Town Fire	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	Town Planning	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	County Emergency Management; Town Fire	Unknown	Local budget	2022	There was limited political will to complete this action over the last five years.
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local budget	Completed	Completed.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town Public Works	Unknown	Local budget	2022	There was limited political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	NCDOT	Unknown	NCDOT	Completed	Completed.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	All Town Departments	Unknown	Local; NC Fire Service	2022	There was limited political will to complete this action over the last five years.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	All Town Departments	Unknown	Local; NC Fire Service	2022-2030	There was limited political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	All Town Departments	Unknown	Local; SHMO	2022	There was limited political will to complete this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	All Town Departments	Unknown	Local	2022-2030	There was limited political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	All Town Departments	Unknown	Local; SHMO	2022	There was limited political will to complete this action over the last five years.
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Waynesville	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Waynesville	Unknown	Local; State; Federal	2022-2030	New Action

Jackson County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Emergency Management	Unknown	General revenue	Completed	Completed. New floodplain maps have been placed into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Erosion Control Officer	Unknown	General revenue	Completed	Completed. The County continues to actively enforce codes and ordinances that apply to hazards and public safety.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	Completed. Annual reviews	Jackson County Emergency Management reviews the Emergency Operations Plan on an annual basis and amends the plan as necessary.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Erosion Control Officer	Unknown	General revenue	2022	In progress. The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	County Fire Marshal	Unknown	General revenue	Completed	The County Fire Marshal reviews the County's fire management plan and amends the plan as necessary.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	County Planning	Unknown	General revenue	Completed	Completed. The County has an adopted Subdivision Ordinance that include standards for roadway design. The Planning Department maintains the ordinance and recommends amendments as necessary.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Flood; Landslide; Severe Thunderstorm	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	Completed. The County's land use plan supports the Mountain and Hillside Development Ordinance which includes regulations regarding development on steep slopes.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Emergency Management	Unknown	General revenue	Completed	Completed. The County has acquired a small GPS system to assist with the documentation of hazard location for local and state use.
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Landslide; Wind	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The County Building Inspections department continues to enforce all building code requirements for manufactured homes.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	County Emergency Management	Unknown	General revenue	2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	Unknown	General revenue	2022	The County continues to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. Currently no critical public structures require relocation or elevation.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. Will continue to enforce new building codes which prohibit building in floodplain.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	County Emergency Management	Unknown	Grants for acquisition funds	2022	The County has and will continue to seek funding, as appropriate, to purchase non-residential property that has been damaged during a prior disaster.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain stream maintenance throughout the community to the fullest extent possible.	Flood; Dam Failure	High	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County continues to actively improve and maintain stream maintenance through the Erosion and Sedimentation Control Ordinance.
NRP-2	Preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County has and continues to identify conservation opportunities that preserve natural wetlands and other significant natural resources.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022	The County continues to evaluate funding opportunities to purchase stream monitoring equipment. There was no political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	County Emergency Management	Unknown	General revenue	2022	The Emergency Management Department is engaged with surrounding communities and counties to coordinate resources during response and recovery events.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County has and continues to educate contractors, developers and homeowners regarding best management practices but no formal program is in place.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	County Emergency Management	Unknown	General revenue	2022	The Emergency Management Department has a dedicated webpage that includes updated information regarding potential hazards in the County. The website also includes the ability to participate in the CodeRED notification program. Additional updates may be required.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	In progress. The Emergency Management Department is active in the local school system teaching students how to prepare for hazards. They also offer classes to the general public as requested.
PES-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	County Emergency Management	Unknown	General revenue	Completed	Completed. Effective FIRM maps and FIS are available to the public. The FIRM Maps can also be accessed on the County's online GIS system.

Town of Dillsboro Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Update zoning ordinance in floodplain.	Flood	High	County Planning	Unknown	General revenue	Completed	Completed. Zoning ordinance updated.
P-2	Appoint a council member as community coordinator to work with other towns and counties in the area.	All	High	Town Mayor	Unknown	General revenue	Completed	Completed. Council member appointed and will be replaced when elected officials leave their post.
P-3	Continued consistency in enforcing codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Planning	Unknown	General revenue	Completed	Completed. The Town of Dillsboro contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-4	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	Ensure that manufactured homes are installed and secured properly.	Flood; Tornado; Landslide; Wind; Earthquake; Lightning	High	County Building Inspections	Unknown	General revenue	2022-2030	Through inter-local agreement with the Town, the Jackson County Building Inspection Department ensures that all new manufactured homes are installed and secured as required by state building codes.
Property Protection								
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate all hazardous responses with Jackson County Emergency Management Coordinator.	All	High	Town Mayor	Unknown	General revenue	2022-2030	The Town of Dillsboro continues to coordinate hazardous response with the Jackson County Emergency Management Coordinator.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	The Town of Dillsboro collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response. Additional education may be requires
PEA-2	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Dillsboro	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Village of Forest Hills Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County GIS and Tax	Unknown	General revenue	Completed	Completed. New floodplain maps have been implemented into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	The Village of Forest Hills contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	2017-2022	The Jackson County Emergency Management Department assists the Village with reviewing the EOP on an annual basis and recommends any necessary amendments to the plan.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	2022-2030	The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Cullowhee Fire; County Fire Marshal	Unknown	General revenue	Completed	Completed. The Fire management plan is monitored and maintained by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Village Mayor; County Planning; County Building Inspections	Unknown	General revenue	Completed	Completed. Enforcement is by the Jackson County Building Inspections Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Village Mayor	Unknown	General revenue	Completed	Completed. Accomplished with Hillside and Steep Slope Development Ordinance.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	Village Mayor; County Planning	Unknown	General revenue	Completed	Jackson County's Emergency Management Department assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Wind; Lightning; Earthquake	High	Village Mayor; County Building Inspections	Unknown	General revenue	Completed	Through and interlocal agreement with the Village, the Jackson County Building Inspections Department ensures that all new manufactured homes are installed and secured as required by state building codes.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	Village Mayor; County Emergency Management	Unknown	General revenue	2017-2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Village of Forest Hills	Unknown	General revenue	2022-2030	The Village continues to seek opportunities to enhance the capacity for critical facilities and public buildings to be equipped with second sources of power.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	2017-2030	The Village, with assistance from the County, continues to evaluate and implement strategies to floodproof and potentially relocate critical services located within the floodplain. Limited political will to advance further over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	2017-2030	The Village, with assistance from the County will minimize the placement of critical facilities within the floodplain. If a critical facility is located within the floodplain the Town will comply with the County's floodplain ordinance. Limited political will to advance further over the last 5 years.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	County Planning	Unknown	General revenue	2030	The Village continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. Limited political will and opportunity to advance further over the last 5 years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	Village Mayor; County Erosion Control Department	Unknown	General revenue	2022-2030	The Village continues to monitor and maintain streams within its jurisdiction. Limited political will to advance further over the last 5 years.
NRP-2	Preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Department	Unknown	General revenue	2022-2030	The Village remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements. Additional actions may be required.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022-2030	Jackson County's Emergency Management Department, in coordination with the municipality, continues to seek funding sources to acquire additional monitoring equipment. There was no political will to advance this action further over the last five years.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Village Mayor; County Emergency Management	Unknown	General revenue	2022-2030	The Village of Forest Hills, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Building Inspections	Unknown	General revenue	2022-2030	The Village contracts, through an interlocal agreement, with the Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	Village Mayor	Unknown	General revenue	Completed	Completed. The Village's website links to the County page that includes CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County's Emergency Management website also provides general information about emergency preparedness.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	Village Fire Department; County Emergency Management	Unknown	General revenue	2022	Completed. The Village collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response. Additional education may be required.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Village of Forest Hills	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Town of Sylva Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	Completed. New floodplain maps have been implemented into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town of Sylva contracts with Jackson County to provide consistent code administration for building inspections, floodplain enforcement, and zoning code enforcements that includes steep slopes.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	2022	Jackson County's Emergency Management Department annually reviews the Town's EOP and recommends any necessary amendments.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	2022	The County continues to collect and maintain data related to occupancy and use but there was limited political to advance this over the last 5 years.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	The Fire management plan is monitored and maintained by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town of Sylva has a Subdivision Ordinance that specifies road construction standards. This is enforced through interlocal agreement by the Jackson County Planning Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town has adopted zoning regulations including steep slope regulations that are enforced through an interlocal agreement by the Jackson County Planning Department.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Planning	Unknown	General revenue	Completed	Completed. Jackson County's Emergency Management Department assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-9	Integrate county and municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	The County and municipality continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and nay amendments necessary to ensure continued integration will be completed.
P-10	Adopt and implement stormwater management ordinance.	Flood; Severe Thunderstorm	High	County Planning	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
P-11	Adopt and implement hillside development ordinance.	Landslide	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
P-12	Ensure that manufactured homes are installed and secured properly.	Flood; Tornado; Hail; Landslide; Wind; Lightning; Earthquake	High	County Building Inspections	Unknown	General revenue	Completed	Through an interlocal agreement with the Town, the Jackson County Building Inspections Department ensures that all new manufactured homes are installed and secured as required by state building codes.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-13	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Town of Sylva	Unknown	General revenue	2022-2030	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power. There was limited opportunity to advance over the last year years.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	Town Mayor; County Building Inspections	Unknown	General revenue	2030	The Town continues to evaluate and implement strategies to floodproof and potentially relocate critical services located within the floodplain. It has developed a plan of action for vehicle parking/storage in flood events and has relocated storage from the Town's Police Department basement to minimize flood damage. There was limited opportunity and political will to advance over the last year years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	2030	The Town will minimize the placement of critical facilities within the floodplain.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	Town Mayor	Unknown	General revenue	2022-2030	The Town continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. There was limited opportunity and political will to advance over the last year years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible by surveying for debris on a quarterly basis.	Flood	High	County Erosion Department	Unknown	General revenue	2022	There has been limited political will to complete this action over the last 5 years. However, the Town continues to monitor and maintain streams within its jurisdiction.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	Town Mayor	Unknown	General Revenue	2022-2030	The Town remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements.
NRP-3	Adopt and implement sedimentation and erosion control ordinance.	Severe Winter Storm; Flood; Landslide; Severe Thunderstorm	High	County Erosion Control Department	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022	<p>Jackson County Emergency Management Department, in coordination with the municipality, continues to seek funding resources to acquire additional monitoring equipment.</p> <p>There has been limited political will and opportunity to complete this action over the last 5 years.</p>

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Town Mayor; Town Manager	Unknown	General revenue	2022	The Town of Sylva, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Improve existing stormwater management systems and construct new system.	Flood	Moderate	Town Mayor	Unknown	General revenue	2022	There has been limited political will to complete this action over the last 5 years. The Town has previously (2005) conducted a study to improve the stormwater system and continues to seek funding sources to implement the plan.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Building Inspections	Unknown	General revenue	Completed	Completed/ongoing The Town contracts, through an interlocal agreement, with Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	Town Manager	Unknown	General revenue	Completed	Completed. The Town of Sylva's website links to the County page that includes CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County Emergency Management site also provides general information about emergency preparedness.
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2030	The Town of Sylva collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Sylva	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Town of Webster Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	Completed. New flood maps have been implemented into the Jackson County GIS System. This is being administered by the Inter-Local Agreement between the Town and County.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town of Webster contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	Completed	The Jackson County Emergency Management Department assists the Town with reviewing the EOP on an annual basis and recommends any necessary amendments to the plan.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Fire Department	Unknown	General revenue	Completed	Completed/ongoing. The Fire management plan is developed and maintained by interlocal agreement by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Town Mayor; Town Council	Unknown	General revenue	Completed	Completed. The Town of Webster has adopted the County's Subdivision Ordinance that specifies road construction standards. This is enforced through interlocal agreement by the Jackson County Planning Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Town Mayor; Town Council	Unknown	General revenue	Completed	Completed. The Town has adopted the County's Mountain and Hillside Development Ordinance that addresses development on steep slopes. The County Planning Department administers the ordinance through an interlocal agreement.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Planning	Unknown	General revenue	Completed	Completed. Jackson County's Emergency Management Departments assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Wind; Lightning; Earthquake	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed. Through an interlocal agreement with the Town, the Jackson County Building Inspection Department ensures that all new manufactured homes are installed and secured as required by state building codes.
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	County Emergency Management	Unknown	General revenue	2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Town of Webster	Unknown	General revenue	2022	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	2022	The Town, with assistance from the County, continues to evaluate and implement strategies to floodproof and potentially relocate critical services located with the floodplain. There was no political will to complete this action over the last five years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed/ongoing. The Town will minimize the placement of critical facilities within the floodplain. If a critical facility is located within the floodplain the Town will comply with the County's floodplain ordinance.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	High	County Emergency Management	Unknown	General revenue	2030	The Town continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. There has been limited political will to complete this action over the last 5 years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community.	Flood	High	County Erosion Control Department	Unknown	General revenue	2022-2030	The Town, with assistance from the County, continues to monitor and maintain streams within its jurisdiction. There was limited political will to complete this action over the last five years.
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Officer	Unknown	General Revenue	2022-2030	The town remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements. There was limited political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022-2030	Jackson County Emergency Management Department, in coordination with the four municipalities, continues to seek funding sources to acquire additional monitoring equipment. There was limited political will to complete this action over the last five years.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Town Mayor	Unknown	General revenue	2022-2030	The Town of Webster, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town contracts through an interlocal agreement with the Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	County Emergency Management; County Fire	Unknown	General revenue	Completed	Completed/ongoing. The Town of Webster's website links to the County page that includes the CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County Emergency Management site also provides general information about emergency preparedness.
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	Town Mayor	Unknown	General revenue	2022	The Town collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Webster	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Swain County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with large scale detailed maps in order to provide detailed flood hazard information.	Flood	Moderate	County Emergency Management; County Mapping; Town Council NCDEM	Unknown	Federal	Completed	Completed. New flood maps were adopted in 2010.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintain adequate public safety. Constant vigilance regarding construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Staff time only	Completed	Completed/Ongoing. Requires continued funding and staff time to enforce codes for new and existing development.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	Moderate	County Emergency Management	Unknown	Staff time only	Completed	Ongoing annually.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand floodplain/tax data to include residential/commercial distinction and occupied/unoccupied distinction.	Flood	Moderate	County Mapping	Unknown	Local	2022	There was no political will to complete this action over the last five years.
P-5	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Town Council; NCDFS	Unknown	Local and State	2030	Recent fires have increased awareness of this need. There was limited political will to complete this action over the last five years.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	Moderate	County Emergency Management; County Fire Marshal; County Inspections Office; Town Council	Unknown	Local	2030	Not likely to be instituted over the next few years, Local gov't has no interest in the subdivision plan. There was limited political will to complete this action over the last five years.
P-7	Acquire a small GPS system to document hazard locations for local and state use.	All	Moderate	County Emergency Management	Unknown	Local	Completed	Completed.
P-8	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management; Town Council	Unknown	Local	Completed	Completed. In 2005.
Property Protection								
PP-1	Evaluate the relocation/elevation/floodproofing of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	Moderate	County Emergency Management; County Inspections Office; Town Council	Unknown	HMGP	2030	There was limited political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Emergency Management; County Inspections Office; Town Council	Unknown	Staff time	Completed	Completed/Ongoing. Requires continuous action as new facilities are constructed.
PP-3	As additional grants become available, the County should apply for acquisition funds to purchase nonresidential properties that were damaged during a previous disaster when practical.	Flood	Moderate	County Emergency Management; Town Council	Unknown	State, Federal	Completed	There was limited political will to complete this action over the last five years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	Moderate	County Government; Town Council	Unknown	US Army Corps of Engineers	2030	There was limited political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of food problems.	Flood/All	Moderate	County Government; Town Council	Unknown	National Weather Service	2030	There was no political will to complete this action over the last five years.
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	Moderate	County Emergency Management; Town Council	Unknown	Staff time only	Completed	Completed/Ongoing. Requires continuous action and staff time.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Continue providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Local	2030	Completed/ongoing. This action is ongoing as funding and staff time becomes available.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Moderate	County Emergency Management	Unknown	Local	Completed.	Completed in 2008.
PEA-3	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, or at the office.	All	Moderate	County Emergency Management; Town Council	Unknown	Local	2030	There was no political will to complete this action over the last five years.

Town of Bryson City Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	Moderate	County Inspections Office, Town Council	Unknown	Staff time only	Currently in place	Completed. This action is currently in place and will continue as staff time allows.
P-2	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with large scale detailed maps in order to provide detailed flood hazard information.	Flood	Moderate	County Emergency Management; County Mapping; Town Council; NCDEM	Unknown	Federal funding	Completed	New flood maps were adopted in 2010.
P-3	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintain adequate public safety. Constant vigilance regarding construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	Moderate	County Inspections Office, Town Council	Unknown	Staff time only	Currently in place	Completed. This action is currently in place and requires continued staff time dedicated to code enforcement.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Town Council; NCDFS	Unknown	Local, State, Federal	In progress; 2018	Recent fires have increased the awareness of this need but it was not completed over the last five years given limited political will.
P-5	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	Moderate	County Emergency Management; County Fire Marshal; County Inspections Office; Town Council	Unknown	Staff time only	N/A	Delete. This action is no longer politically feasible for the county.
P-6	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management; Town Council	Unknown	Staff time only	2022	Completed/ongoing with new hazard mitigation plan updates.
Property Protection								
PP-1	Evaluate the relocation/elevation/floodproofing of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	Moderate	County Emergency Management; Town Inspections Office	Unknown	HMGP	2030	This action is dependent on political will and receipt of funding.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Emergency Management; Town Inspections Office	Unknown	Staff time	Currently in place	Completed. This action is currently in place and requires continued staff time to review the site of critical facilities.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	As additional grants become available, the County should apply for acquisition funds to purchase nonresidential properties that were damaged during a previous disaster when practical.	Flood	Moderate	County Emergency Management, Town Council	Unknown	State, Federal	funding currently being sought, 2022	This action is ongoing until staff time can be dedicated toward grant applications and funding is acquired.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	Moderate	County Government, Town Council	Unknown	US Army Corps of Engineers	2030	There was limited political will to complete this action over the last five years.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of food problems. Also needed for abandoned City water impoundment.	Flood/All	Moderate	County Emergency Management, Town Council	Unknown	National Weather Service	2030	There was limited political will to complete this action over the last five years.

SECTION 9: MITIGATION ACTION PLAN

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	Moderate	County Emergency Management, Town Council	Unknown	Staff time only	Currently in place	Completed/ongoing. This action requires continued action and funding, and is therefore ongoing.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
ES-4	Evaluate need for Dam safety plan.	Flood	Moderate	Emergency Management	Varies/low	State, FEMA. Local staff hours for administration	2022-2030	New Action
Public Education and Awareness								
PEA-1	Continue providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Local	2022	This action requires continued action and funding. There was limited political will to formalize this action over the last five years.
PEA-2	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, or at the office.	All	Moderate	County Emergency Management, Town Council	Unknown	Local	2022	This action is pending funding, political will, and staff time.

Eastern Band of Cherokee Indians Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Formal recognition of Local Emergency Planning Committee (LEPC). Having an LEPC will further the coordination of multiple agency programs toward institutionalizing mitigation into routine operations.	All	High	EBCI Emergency Management; EBCI Tribal Council; EBCI LEPC	Unknown	N/A	Completed	Resolution No. 373 was passed on March 4, 1993 to the Tribal Council requesting the formal recognition of the LEPC and defining its role in implementing the Emergency Operations Plan.
P-2	Create a fund for mitigation projects identified in this plan and in the future from gaming revenues to ensure the long term sustainability of the Tribe by reducing exposure to disasters.	All	High	EBCI Emergency Management	Unknown	Annual Tribe Budget Request	2022	Emergency Management will budget for two mitigation projects each year but it was not politically feasible over the last 5 years.
P-3	Institutionalize mitigation into housing infrastructure, capital improvement, and housing improvement funds. Develop guidelines for projects designed or completed with these funds established in Section 16 of the Cherokee Code. Guidelines would require that when tribal dollars are dispersed from the fund for projects in identified hazard areas, mitigation measures will be constructed into the design/project. Draft Guidelines and Sample Mitigation Measures for infrastructure and buildings, for each type of hazard. Modify Sections 16-33, 16-35 and 16-38 of the Cherokee Code to include this provision.	All	High	EBCI Emergency Management; EBCI Tribal Council	Unknown	Capital Budget	Within 5 years	Additional education and training is needed in order to develop guidelines for project designs. There was limited political will to advance this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Develop hazard and damage data tracking system. Using GIS, develop a centralized system to track hazard related data to provide tribal officials with essential information required to focus hazard mitigation, disaster response and disaster recovery efforts in the future.	All	High	EBCI Emergency Management; EBCI Tribal Planning; EBCI GIS	Unknown	Capital Budget	Completed	Completed/Ongoing: At new EOC we now have an onsite, part-time GIS person on staff to assist collecting data to develop a database to store the information.
P-5	Improve the effectiveness of inspections by building and environmental staff in enforcing current local codes to increase the resistance of new development to the effects of natural hazards. While inspection effectiveness has improved significantly in recent years, the rural and private nature of the Reservation still presents challenges of construction without permits.	All	High	EBCI Tribal Construction; EBCI Environmental Planning; EBCI Construction Inspection; EBCI Environmental Inspection; EBCI Building Inspections	Unknown	Capital Budget	2022	Assess the current capacity of all inspectional services on the EBCI Reservation as they relate potential hazards. Ensure adequate resources to existing inspectional services and provide additional hazard related training to inspectional staff to ensure codes are enforced properly. Develop a system of weekly tracking of inspection activities, across disciplines and track with one central organized system. More education and training is needed to justify before presenting to the tribal government. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-6	Develop a comprehensive plan for all Tribal trust and fee land holdings, addressing economic development, housing, land use, historic/cultural preservation, transportation and other typical planning elements.	All	Moderate	EBCI Business Committee; EBCI Tribal Planning; EBCI Emergency Management	Unknown	BIA; HUD; Capital Budget; PDM	2030	There was no political will to complete this action over the last five years.
P-7	The Cherokee Business District Master Plan lists a potential long-term goal of relocating fire, police and other services outside of the downtown area and the Comprehensive Economic Development Plan identifies the need for new police and fire stations. Section 61 of the Cherokee Code, Zoning, should be modified to preclude construction of critical emergency service facilities in hazard prone areas when feasible alternatives are available.	All	Moderate	EBCI Tribal Council; EBCI Business Committee; EBCI Tribal Planning/ Emergency Management/ Police/Fire	Unknown	BIA; HUD; Capital Budget; PDM	2030	Deferred until funding is allocated for the Cherokee Business District Plan to be updated or modified.
P-8	Conduct a risk analysis for Information Technology and Enrollment Records to include Business Continuity Planning, Facilities Management, Security and other Emergency Management Issues.	All	High	EBCI Finance; EBCI Enrollment; EBCI Emergency Management	Unknown	NC EMPG	2030	Deferred until funding is identified to implement the action.
p-9	Develop a Capital Improvement Plan to guide the scheduling of spending on public improvements.	Flood	High	EBCI Executive; EBCI Tribal Council; EBCI Finance; EBCI Emergency Management	Unknown	NC EMPG	2030	Deferred until funding is identified to implement the action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Continue remapping currently underway on Raven Fork and the Oconaluftee to complete the Oconaluftee River and Soco Creek, and other major tributaries on the Qualla Boundary. Inventory all mapped and unmapped rivers in the Snowbird and Cherokee County Communities and prioritize remapping based on existing and anticipated development.	Flood	High	EBCI Environmental Planning	Unknown	CTP agreement; NCDEM Mapping Funds	2022	This project has been ongoing for 5 years; however the tribe is waiting for the state to map the Western North Carolina Area. Amend existing FEMA Cooperating Technical Partner agreement and prepare Mapping Activity Statements for prioritized work. If successful in obtaining funds, solicit for contractors to complete mapping, adopt and update Chapter 143, Article II of the Cherokee Code, Flood Damage Prevention, to incorporate the new mapping.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-11	Prevent production chemical releases from fish hatchery by studying the problem and identifying solutions. There is frequent flooding of a fish hatchery located on the upstream portion of Raven’s Fork. Although the fish hatchery is not shown as in the floodplain, it reportedly floods frequently, perhaps due to water diverted from the Fork for use in the processes at the facility. During significant flood events, the hatchery is flooded and the chemicals used in the breeding process are washed into the main river channel. This contamination has the potential to have significant negative effects on the water quality of the river, impacting the habitat of a number of aquatic species. Negative recreational impacts reportedly occur, as well, due to odor. There is not enough available information to calculate monetary losses in this analysis. Secondary impacts however can be significant. Study the problem and identify solutions.	Flood	Moderate	EBCI Emergency Management; EBCI Police; EBCI Fire	Unknown	USEPA; USACE	2022	<p>There has been no political will to complete this action over the last 5 years except with the exception of further defining an approach:</p> <p>The Tribe will meet with the owner of the facility to develop a solution to the problem. Determine whether process currently follows environmental standards or whether process can be modified. Determine whether chemicals can be stored in locations above typical flooding levels and not used during times of flooding threat. Seek assistance from the USACE in identifying potential structural solutions if feasible. Identify who should be responsible for associated costs and how to fund them.</p>

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-12	Increase enforcement of sound construction practices in landslide hazard areas.	Landslide	High	EBCI Environmental Planning	Unknown	Capital Budget	2022	Chapter 113 D of the Cherokee Code addresses sedimentation and erosion control for land disturbances exceeding more than one acre and requires permits and preparation of a plan to control erosion. The tribal environmental inspectors will coordinate with other inspectors and department personnel in the field to ensure monitoring and enforcement of the standards is occurring and will examine ways of increasing site inspection frequency during construction. Increased emphasis on enforcement and monitoring should also focus heavily on Cherokee DOT road projects. Completion of the plan will be contingent on budgetary or grant funding.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-13	Modify Chapter 113 D, <i>Soil Erosion and Sedimentation Control</i> , to require, at minimum, a permit for disturbances not related to agriculture. While it may not be necessary to require a plan for these smaller disturbances, by issuing permits, there will be an opportunity to build in management practices as permit conditions and monitor and enforce those conditions. Gather example regulations and codes from similar jurisdictions, develop code language and submit for consideration to Tribal Council. If approved, develop a permitting program and identify ways to address additional staffing needs for enforcement. Notify the public of the code change.	Landslide	High	EBCI Environmental Planning	Unknown	Capital Budget	2022	No change given limited political will to further this action over the last 5 years. More education and awareness is needed to justify this action.
P-14	Develop a monitoring program for landslide activity on selected locations through the EBCI Reservation. Identify areas of historic landslides where the potential loss of life and impact to the community is greatest and develop a simple monitoring program to evaluate slope movement over time in order to identify areas where landslides activity is greatest, and the risk to residents and property is greatest. Use collected data to analyze the need for potential need for structural protective measures, or continuously assess the risk to adjacent property	Landslide	Moderate	EBCI Public Works	Unknown	Capital Budget	2022	Limited political will to further this action over the last 5 years. Additional and ongoing education and training is necessary.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-15	<p>Train Cherokee and BIA Staff in Firewise community planning and prevention techniques, shifting the focus from suppression to prevention. The BIA Fire Management Plan focuses heavily on suppression of wildfires. While that is of critical importance, there are many very simple measures communities can take to protect existing development from being destroyed by wildfire and to design future developments in a way that minimizes their vulnerability associated with wildfire.</p> <p>Contact the National Fire Protection Association about opportunities to participate in its Firewise Communities training program. Identify funding to train not only Fire Department and Forrest Managers, but planning and environmental staff as well. Identify ways of incorporating techniques learned in training into existing mitigation related programs.</p>	Wildfire	High	EBCI Emergency Management; EBCI Fire; BIA Cherokee Agency	Unknown	Tribal Training Funds; BIA; NFPA	Completed	Completed/ongoing. Coordination between Fire Department prevention team and BIA Training Coordinator will provide ongoing training and education.
P-16	Implement a requirement for appropriate defensible space for new construction in the Urban Wildland Interface areas.	Wildfire	High	EBCI Fire, EBCI Planning, BIA	Unknown	Capital Budget	2022	In progress - Working with Fire Management to determine appropriate level of defensible space for structures located in the UWI depending on the slope and fuel type present.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-17	<p>Expand Regulation of Open Debris Burning: Under Chapter 113 C of the Cherokee Code, open burning of leaves, brush and yard trimmings are allowed without a permit if the material to be burned originates on the property and no public pick up services are available. Research for the Risk Assessment portion of Section IV of this plan demonstrated that the overwhelming majority of wildfires are caused by debris burning. Modify Chapter 113 C so that permits are required for all debris burning, thereby giving tribal government the opportunity to establish permit conditions and, when necessary perform site visits, to ensure that precautions are taken to prevent the spread of fire.</p> <p>Draft revised code language, review with BIA and Fire Department management and propose to Council. Develop permitting mechanism and best management practice conditions.</p>	Wildfire	High	EBCI Environmental Planning	Unknown	Capital Budget; BIA	Completed	This is an important part of the Fire Department and Environmental Planning Process review.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-18	Encourage the use of fire resistant building materials in high risk areas. While issuing permits for new construction in high UWI areas, provide information to builders and home owners on fire resistant roofing and siding materials, fire resistant landscaping materials and defensible space. Consider waiving fees and developing other incentives of owners willing to incorporate these materials/techniques into new construction.	Wildfire	Moderate	EBCI Building Inspections; EBCI Emergency Management; EBCI Fire; BIA	Unknown	Capital Budget	2022	There has been limited political will to further this action over the last 5 years. This project will be ongoing all parties involved need more education and training.
P-19	Identify areas vulnerable to having access cutoff due to the impacts of severe winter storms and develop a plan to ensure continuity of critical services to these areas.	Winter Storm	High	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	Capital Budget	Completed	COMPLETED in October 2006. Will work with the communities on shelters and Emergency Disaster Kits.
P-19a	Work with the vulnerable communities identified (P-19) on shelters and Emergency Disaster Kits.	Winter Storm	Moderate	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	Capital Budget	2030	New Action
P-20	Develop a program to clear overhanging limbs from utility lines to critical facilities annually. Meet with the responsible departments and other appropriate parties, possibly including the Cherokee Boys Club and identify a systematic approach to annual trimming of overhanging limbs from utility lines annually during the fall.	Winter Storm	High	EBCI Emergency Management; EBCI Public Works; Utility companies	Unknown	Public Works Budget; Private utility companies	2022	Deferred due to cost constraints and limited political will the project has been put on hold.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-21	<p>Collect data regarding seismic design of all critical facilities and infrastructure to identify vulnerabilities to damage due to a significant earthquake event. At minimum include schools, government buildings, fire and police facilities and emergency shelters.</p> <p>With input from all local departments develop a list of critical facilities and infrastructure with the potential to cause large scale injury or loss of life if damaged during an earthquake. Perform a structural evaluation on these facilities to determine how they would be expected to perform during different level earthquakes and to make specific structural retrofit recommendations.</p> <p>In addition to structural mitigation measures, also investigate the potential implementation of non-structural measures in facilities with high occupancy rates (similar to the program used for day care centers with FEMA Project Impact grant). Such measures can include securing loose items such as book shelves, overhead fixtures, shatter proof glass, etc. Many such measures can be accomplished with donated labor and minimal materials cost.</p>	Earthquake	Moderate	EBCI Building Department; EBCI Emergency Management	Unknown	Capital Budget; PDM; HMGP; Donated labor; USDOE	<p>Within 1 year: identify structures;</p> <p>Within 2 years: design program to implement minor non-structural measures;</p> <p>Within 5 years; Fund and complete a full structural evaluation</p>	There has been limited political will to further this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-22	<p>Develop Drought Management Plan and Protocols</p> <p>Evaluate the need for a drought management plan and protocol to be implemented throughout the Reservation in the event a drought should occur.</p> <p>Review and analysis current regional, and State drought management plans and procedures to determine what potential measures can be under taken at the local level.</p>	Drought	Low	EBCI Emergency Management	Unknown	Capital Budget; BIA; Dept. of Agriculture	2020	In the process of developing a drought management plan.
P-23	<p>Utility Line Maintenance Program: Develop a program to protect key portions of utility systems from damage due to a high wind event.</p> <p>Working with local utility companies, analyze key portions of utility networks and assess the vulnerability to damages due to high winds. Investigate the potential of developing a program to harden identified vulnerabilities including removing overhanging limbs and trees from key utility lines.</p>	Wind	Low	EBCI Emergency Management; EBCI Public Works; Utility companies	Unknown	Capital Budget; Local utility company funds	2022	There has been limited political will to further this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-24	<p>Form a working subcommittee of the HMPC along with security personnel from Harrah's Casino to work with the Federal and state government to further evaluate security needs.</p> <p>Some hazard prone sites should not be published in a public document such as this plan. Working with the subcommittee retain the services of a security expert to identify other potential sites that may be at risk and to determine appropriate security measures to protect those sites.</p>	Manmade	Moderate	EBCI Emergency Management; EBCI Police; Harrah's Casino	Unknown	Capital Budget; Harrah's Casino; DHS grants	2030	Deferred: Potential sites have been determined however due to cost containment the purchase of security systems has been placed on hold.
P-25	<p>Increase Security at Ceremonial Fairgrounds</p> <p>Develop a plan to address security during large events at Ceremonial Fairgrounds.</p> <p>Working with the subcommittee established in MM-1, develop an operational plan to define increased security measures during large and publicized events. Measures may include limiting access and egress points and patrolling them, surveillance monitoring and other activities.</p>	Manmade	High	EBCI Emergency Management; EBCI Police	Unknown	Capital Budget	Completed	Completed/ongoing. Incident Action plans and increased security measures are implemented during large and publicized events.
P-26	<p>Monitor and audit security performance at Harrah's Casino.</p> <p>Evaluate at least annually the Casino's ongoing security efforts and conduct periodic audits to ensure that security continues functioning at high levels.</p>	Manmade	High	EBCI Office of Principal Chief	Unknown	N/A	2030	Deferred until a funding source is identified.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Perform an all-hazard site specific audit on critical facilities (schools, hospitals, shelters, fire and police facilities, etc.) to assess their specific vulnerability to all natural hazards and develop recommendations for potential mitigation measures.	All	High	EBCI Emergency Management	Unknown	PDM; HMGP; DOE DHS School Safety Funds; Capital Budget	2022	There has been limited political will to further this action over the last 5 years. Due to limited staff and staff turnover has affected the timely completion of this objective. New staff is currently attending training to become more familiar with accessing critical facilities
PP-2	Implement technically feasible and cost beneficial retrofit mitigation measures identified through the Critical Facility Audit. Working with departments responsible for each facility, develop an implementation strategy including funding sources, scope of work, project schedule, and project budget.	All	High	EBCI Emergency Management	Unknown	PDM; HMGP; FMA; Capital Budget	2022	There has been limited political will to further this action over the last 5 years. Due to limited staff and staff turnover has affected the timely completion of this objective. New staff is currently attending training to become more familiar with accessing critical facilities
PP-3	Protect communications equipment behind police department and propane fuel tank behind casino. Install increased fencing around communications equipment and surveillance cameras which will feed to the Police Department. Install increased fencing around the large propane tank behind Harrah's casino to completely encapsulate the tank.	Manmade	High	EBCI Emergency Management; EBCI Police	Unknown	Capital Budget; Homeland Security Grant; Harrah's Casino	Completed	The fencing was COMPLETED in 2006 and the propane tank was removed and placed underground in 2007.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Natural Resource Protection								

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
NRP-1	<p>Create a riparian buffer zone along less developed waterways.</p> <p>Stream bank erosion is a serious problem on the EBCI reservation from both a water quality perspective and a property protection perspective. Riparian Buffers serve as natural boundaries between local waterways and existing development and help protect resources by filtering pollutants, providing flood control, alleviating stream bank erosion and providing lateral room for movement of a stream channel. While it may be difficult to create a buffer zone along the developed portions of Raven Fork, the Oconaluftee River and Soco Creek, other watercourses where development pressure may eventually exist will be examined.</p> <p>Identify areas where stream bank erosion has historically caused problems and areas where existing development patterns would allow for a riparian corridor to work. Propose language to modify Chapter 113 D of the Cherokee Code and a program to administer the new restriction. Consider exempting certain agricultural and recreational operations from buffer regulations to promote passive recreational use of these areas as is consistent with other tribal goals.</p>	Landslide	Moderate	EBCI Environmental Planning	Unknown	EPA Clean Water Management Trust Fund	2030	There has been limited political will to further this action over the last 5 years. This project will be ongoing as time and funding permits.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Continue to develop reverse 911 capabilities as part of an Emergency Notification System to contact many homeowners with pre-recorded messages in the event of an emergency.	All	High	EBCI Emergency Management	Unknown	DHS/FEMA; NCDEM; HMGP; PDM	2030	The system has been purchased and installed. Updating the data will be ongoing for future use.
ES-2	Many of the identified emergency shelters are located in flood-prone locations. Identify and equip backup shelter for flooding disasters. Identify back up shelters for flooding disasters in anticipation of losing standard emergency shelters during flooding. Consider transportation access to the shelters and work with local churches outside of flood prone areas. Identify funding to equip alternate shelters with generators, cots and other essential needs.	Flood	High	EBCI Emergency Management	Unknown	Capital Budget; DHS/FEMA	COMPLETED	This action was COMPLETED prior to October 1, 2009. A new shelter was facility was built in the Big Y and Birdtown communities, and generators were purchased in the FY2011 budgets for these locations. The State EM will assist in purchasing a Transfer switch for the Birdtown Facility.
ES-3	Install flood evacuations signs in Yellowhill community (an area of high transient visits) to guide visitors to safety during flooding events and to raise awareness of flooding potential.	Flood	Moderate	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	FEMA; NCDEM; Capital Budget	2022	The signs have been purchased due to construction of sidewalks installation of signs has been put on hold.

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<p>ES-4</p>	<p>Develop a flood warning system for Soco Creek and the Oconaluftee River. The system will increase the ability to locally and specifically forecast flood events and flood depths. Focus efforts on areas with high concentrations of residential and recreational properties where risk of injury and loss of life is high. Adding a voluntary building flood audit will provide building occupants with a strategy to employ in conjunction with the warnings to protect themselves.</p> <p>Work with state of North Carolina, NOAA, USGS, and NRCS to identify on-going efforts in the region as well as develop a specific action plan for the development and implementation of a system. There is a stream gauge on the Oconaluftee. Additional gauges will need to be added. The gauges send information through a repeater back to a central computer that would be in the emergency management office. Stream levels during flooding would be monitored and with assistance of the National Weather Service, flood level predictions would be made. The voluntary audit portion of the program will build upon the flood prone building inventory generated for this plan. Voluntary participants will have their homes surveyed for elevation and a simple one or two page audit completed providing instructions on what specific actions to take for certain predicted floods (e.g. move valuables to second story, disconnect electricity, bag furnaces, etc.). When a flood level is predicted, those property owners who participated in the audit would be contacted, possibly via the reverse 911 system and notified to activate their plan.</p>	<p>Flood</p>	<p>High</p>	<p>EBCI Emergency Management</p>	<p>Unknown</p>	<p>NRCS; USGS; NCDEM; PDM</p>	<p>2022</p>	<p>There has been limited political will to further this action over the last 5 years. March 2008 Water & Earth Technologies, Inc was contracted to develop a Flood Hazard Mitigation and Response plan. During the process of developing the plan a feasibility study was conducted to research for the most appropriate locations for two warning systems.</p>
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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-5	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Structural Projects								
S-1	Replacement of culverts to alleviate the potential for flooding of the existing homes.	Flood	High	EBCI Transportation; EBCI Tribal Construction	Unknown	NCDEM Hazard Mitigation Section	2022	There has been limited political will to further this action over the last 5 years.
Public Education and Awareness								
PEA-1	Develop and implement a comprehensive community education program to inform the public of risk of potential hazards, potential mitigation measures, as well as what actions they can take to protect themselves and their property.	All	High	EBCI Emergency Management	Unknown	Capital Budget	2022	The Emergency Staff along with the Health & Medical Division have been conducting Disaster Preparedness in the Communities. Some Education Materials have been distributed when available. Additional work is needed to further education and formalize the program.
PEA-2	Promote early warning of the onset of natural hazard by encouraging residents to utilize NOAA Weather Warning System Radios. Provide information on the use and function of the system as well as information on purchasing receivers. Place receivers in key public facilities and educate occupants. Advertise information through public education program. Work with vendors to assist residents and business owners to obtain receivers.	All	High	EBCI Emergency Management	Unknown	Resident/business funding; FEMA; Capital Budget	2022	Some progress has been made including Radios have been placed in key public facilities. However, it is not fully completed.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	<p>Expand the purchase of NFIP flood insurance on the EBCI Reservation by education home owners and business owners located in the 100 year floodplain of the benefits of carrying flood insurance.</p> <p>Utilize the educational program. Mail educational materials to homeowners, targeting all structures estimated to be in the 100 flood plain, based on the Hazard Mapping and associated Flood Prone Structures Worksheet. Conduct an evening seminar where interested homeowners can learn of the principles of the NFIP, as well as other floodplain management techniques. Obtain NFIP materials from FEMA and mail to each flood prone property with an offer to meet and explain the details of the program. Use FEMA and NCDEM staff to support/provide the training.</p>	Flood	High	EBCI Building Inspections; EBCI Emergency Management	Unknown	Capital Budget	2022	<p>There has been limited political will to further this action over the last 5 years.</p> <p>Legislation to be introduced to Tribal Council by resolution.</p>

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	<p>Develop an education and mitigation program to remove unsecured propane and oil tanks from the floodplain or to strap down and secure tanks.</p> <p>The primary source of heating on the EBCI Reservation is bottled propane. A majority of the buildings located in flood prone areas have exterior propane tanks, which are many times located in the rear of the property closest to the river, often in the floodway. Most of the tanks are not secured in place to prevent floatation during a flooding event. Using the hazard maps from this plan, inventory all propane tanks in flood prone areas. Identify existing strap down devises on the market and identify a vendor to work with to educate the inventoried building owners on the risks of storing propane and oil in the floodplain in unsecured tanks. Provide guidance on measures to secure these tanks and, when possible, provide incentives for implementing these potential measures. If enough interest is generated in the program, identify funding mechanisms so owners could apply to a pool for matching grants to install the protection.</p>	Flood	High	EBCI Emergency Management ; EBCI Public Works	Unknown	Capital Budget; PDM; FMA	2022	The Emergency Management, Public Safety and Environmental Department have been discussing this issue but it has not been advanced to date.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-5	<p>Develop a flood assistance program to offer homeowners and business owners located in the floodplain advice on how to identify, implement and fund effective mitigation measures.</p> <p>Assemble a team of experts from within Cherokee government and outside. Send direct mailings to the flood prone properties inventoried through this plan. Specifically look at the community of mobile homes along Grape Creek in Cherokee County that experiences frequent flooding. Encourage these homeowners to obtain flood insurance as a first step. Explain the importance of having flood insurance as it pertains not only to their own financial recovery, but to their chances of being eligible for grant funding to help mitigate the problem. Offer assistance to perform flood audits identifying specific mitigation measures considering the full range of potential options including structural elevation, relocation, acquisition and demolition, flood proofing or minor retrofitting, such as strapping down oil or gas tanks. Once measures have been identified, apply for state and federal assistance to aid homeowners in acquiring assistance with the cost of implementing measures. Give priority to NFIP repetitive loss properties and develop selection criteria based on factors such as historic levels of damages and benefit cost ratio.</p>	Flood	High	EBCI Emergency Management; EBCI Building Inspections; EBCI Environmental Planning	Unknown	Capital Budget; PDM; FMA; HMGP	2022	Activity has occurred but the action is not fully completed. The EM and Environmental Planning have been attending meeting in the Big Cove Community to conduct education on flood assistance. Big Cove Community was selected due to the high concentration of residential and business located along the Raven Fork and Oconaluftee River.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-6	<p>Educate property owners located in the UWI on wildfire mitigation techniques.</p> <p>Target owners of structures located in the designated wildfire hazard areas identified by this plan by direct mailing and other outreach techniques to educate them on the potential wildfire risks facing their property as well as the potential mitigation measures including defensible space, fire resistant materials, adequate property access, and additional structural measures. Offer to send experienced professionals to audit properties and offer wildfire damage prevention techniques at low costs. Hold outreach sessions as interest warrants.</p>	Wildfire	High	EBCI Emergency Management; EBCI Fire; BIA Cherokee Agency	Unknown	Local Funding	2022	<p>There has been limited political will to further this action over the last 5 years.</p> <p>In the summer of 2008 students from the Student Conservation Foundations went door to door conducting fire prevention education and a wildfire fire study around the residents. In the fall of 2008 a follow up was conduct with EM, Fire Dept, and Healthy Cherokee to install smoke detectors, remove debris from around the residents and conduct further education.</p>

SECTION 10

PLAN MAINTENANCE

This section discusses how the Smoky Mountain 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 three subsections:

- ◆ 10.1 Implementation and Integration
- ◆ 10.2 Monitoring, Evaluation, and Enhancement
- ◆ 10.3 Continued Public Involvement

44 CFR Requirement

44 CFR Part 201.6(c)(4)(i):

The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.

44 CFR Part 201.6(c)(4)(ii):

The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

10.1 IMPLEMENTATION AND INTEGRATION

Each agency, department, or other partner participating under the Smoky Mountain 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 Smoky Mountain 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, county, and tribal 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. Opportunities to integrate hazard mitigation into other planning mechanisms will be considered when mechanisms are under review or in the process of an update. The members of the Smoky Mountain Regional Hazard Mitigation Planning Committee (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 Smoky Mountain Region.

Since the previous six plans were adopted (Cherokee County and Haywood County in 2006 and Graham County, Jackson County, Swain County, and the Eastern Band of Cherokee Indians in 2011), and the initial regional plan was adopted in 2012, each County, participating jurisdiction and the Tribe have 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/Tribal emergency operations plans;
- ◆ Integrating the mitigation plan into review and updates of building codes; and
- ◆ 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, Tribal staff 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 Smoky 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 Regional 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.

The Smoky Mountain Region established monitoring, evaluation and enhancement procedures during the 2012 plan development. 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 2017. Further, plan update procedures were followed accordingly. The jurisdictions 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 2017 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 and will be re-evaluated during the next plan update process.

When determined necessary, the Smoky Mountain Regional Hazard Mitigation Planning Committee shall meet in March of every year to monitor and evaluate 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, County, and Tribal 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 Smoky Mountain Region which includes the counties of Cherokee, Graham, Haywood, Jackson and Swain and the Eastern Band of Cherokee Indians. The Cherokee County Emergency Management Coordinator will be responsible for reconvening the Regional Hazard Mitigation Planning Committee for these reviews.

Five 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 Smoky 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 Smoky Mountain county/Tribal 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. The Cherokee County Emergency Management Coordinator will be responsible for reconvening the Regional Hazard Mitigation Planning Committee and conducting the five-year review.

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/tribal 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 Smoky Mountain Region Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the North Carolina Division of Emergency Management (NCDEM) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

Disaster Declaration

Following a disaster declaration, the Smoky 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 of the Cherokee County Emergency Management Coordinator to reconvene the Regional Hazard Mitigation Planning Committee 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 the Smoky Mountain counties and the Tribe will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected County/Tribal 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 and Tribal 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 websites of participating jurisdictions to advertise any maintenance and/or periodic review activities taking place; and
- ◆ Keeping copies of the Plan in public libraries.

10.4 EVALUATION OF PREVIOUS 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 2017. That said, the jurisdictions 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 2017 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 and will be re-evaluated during the next plan update process.

The five-year comprehensive update process began as early as 2015 when lead points of contact from each of the four participating counties began having conversations about the updating process. These conversations were facilitated by the NCEM Area Coordinator and Mitigation Staff in Raleigh, NC, and included discussion about the need to apply for a grant to update the plan. Once the grant was obtained, early conversations in 2016 centered around more detailed components of the planning process such as which county would lead the process and would the counties seek consultant assistance for updating the plan. These early conversations led to a successful update and will be used in future updates of the plan.

Annex A

Cherokee County

This annex includes jurisdiction-specific information for Cherokee County and its participating municipalities. It consists of the following five subsections:

- ◆ A.1 Cherokee County Community Profile
- ◆ A.2 Cherokee County Risk Assessment
- ◆ A.3 Cherokee County Capability Assessment
- ◆ A.4 Cherokee County Mitigation Strategy

A.1 CHEROKEE COUNTY COMMUNITY PROFILE

A.1.1 Geography and the Environment

Cherokee County is the westernmost county in the state of North Carolina. It is comprised of two towns, the Town of Andrews and the Town of Murphy, as well as many small unincorporated communities.

The county is situated between two major white water river gorges in the Blue Ridge Mountains and its land is covered by mountains, valleys, rivers, and lakes. The county's highest elevation reaches 5,149 feet and its lowest elevation is 1,170 feet. The total area of the county is 467 square miles, 11 square miles of which is water area.

Summer temperatures in the valley portion of the county range from highs of about 85°F to lows in the 60s. Winter temperatures in the valley range from highs of 50°F to lows around 20°F. Year round, average temperatures in the mountainous areas of the county are typically 10°F lower than the valley. The county averages about six inches of rainfall each month.

A.1.2 Population and Demographics

According to the U.S. Census 2015 American Community Survey 5-year Population Estimate, Cherokee County has a population of 27,092 people. The county saw a 1.3 percent decline in the population between 2010 and 2015, and the population density is 60 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the county and both of the participating jurisdictions are presented in **Table A.1**.

TABLE A.1: POPULATION COUNTS FOR CHEROKEE COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
CHEROKEE COUNTY	20,170	24,298	27,444	27,092	-1.3%
Town of Andrews	2,551	1,602	1,781	2,050	15.1%
Town of Murphy	1,575	1,568	1,627	2,095	28.8%

Source: US Census Bureau

Based on the 2015 American Community Survey, the median age of residents of Cherokee County is 50.0 years. The racial characteristics of the county are presented in **Table A.2**. Whites make up the majority of the population in the county, accounting for nearly 94 percent of the population.

TABLE A.2: DEMOGRAPHICS OF CHEROKEE COUNTY

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
CHEROKEE COUNTY	93.6%	1.6%	1.8%	2.8%	2.8%
Town of Andrews	81.0%	4.3%	1.1%	13.6%	11.4%
Town of Murphy	86.4%	8.4%	1.4%	3.8%	6.1%

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

Source: US Census Bureau

A.1.3 Housing

According to the 2015 American Community Survey, there are 17,667 housing units in Cherokee County, the majority of which are single family homes or mobile homes. This is an increase of 152 units since 2000. Housing information for the county and two towns is presented in **Table A.3**. As shown in the table, the two incorporated towns have a significantly lower percentage of seasonal housing units compared to the unincorporated county.

TABLE A.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
CHEROKEE COUNTY	13,499	17,515	17,667	20.9%	\$142,600
Town of Andrews	831	971	966	3.0%	\$56,000
Town of Murphy	813	860	978	4.1%	\$139,100

Source: US Census Bureau

A.1.4 Infrastructure

Transportation

There are several US and state highways that serve Cherokee County and link it with other regions of North Carolina as well as the neighboring states of Georgia and Tennessee. US-64 is a cross-country highway that passes through the county from east to west. US-74 is another major four-lane highway that travels northeast to southwest through Cherokee County and connects Chattanooga, Tennessee; Asheville, North Carolina; Charlotte, North Carolina; and Wilmington North Carolina. Additionally, US-19 and US-129 pass through the county and provide connections to Atlanta, Georgia to the south and Knoxville, Tennessee to the north.

Cherokee County is also served by one airport. Western Carolina Regional Airport is a county-owned public-use airport located in Andrews. It was formerly known as the Andrews-Murphy Airport.

Currently, there is no passenger or freight rail service in Cherokee County; however, the NC Department of Transportation is considering providing future rail service by creating a stop in Murphy. The Great Smoky Mountains Railroad scenic line also includes a depot located in Andrews but departures are not currently offered from within the county.

Utilities

Electrical power in Cherokee County is provided by several electricity cooperatives, the Tri-State Electrical Membership Corporation, Murphy Power Board, and the Blue Ridge Mountain Electric Membership Corporation. Duke Energy Progress also provides service to some residents on the east side of the county.

Water and sewer service is provided to residents by the cities of Andrews and Murphy.

Community Facilities

There are a number of buildings and community facilities located throughout Cherokee County. According to the data collected for the vulnerability assessment (Table 6.2), there are 50 emergency services facilities (fire, police, EMS), 35 government buildings, 34 public facilities, fire/EMS stations, and several other critical facilities.

There is one hospital located in Cherokee County. Murphy Medical center is a 191-bed short term acute center located in the Town of Murphy.

There is a total of six recreation parks in Cherokee County. The first, Murphy Recreation Park, offers pavilions available for rent. The remaining five comprise the Andrews Recreation Park System, located in Northeast Cherokee County. This system consists of three government-owned and two leased properties totaling over 70 acres. Facilities include a swimming pool, skate park, ball fields, walking trails, basketball and tennis courts, soccer fields, picnic tables, community center, and more.

A.1.5 Land Use

The population centers and transportation routes in Cherokee County are concentrated along the waterways where the most fertile farmland is found. Unlike counties located outside of the mountain region, there is very little farmland that is free of actual or potential development pressures and the remaining farmland is extremely vulnerable to development. Portions of the county fall within the boundaries of the Nantahala National Forest and parts of the Eastern Cherokee Indian lands are located within the county.

Cherokee County has long adhered to an unrestricted, open-market land use policy. Aside from recently passed standards for road building, other land use policies; such as rules for mobile homes, water and sewer lines, conservation incentives, and property tax relief for farmers; reflect state, Federal, or municipal initiatives. Land use controls are only employed by the two incorporated municipalities in the county. The county itself has no zoning, and there are no ordinances or planning oversight committees for development located outside of the Towns of Andrews and Murphy.

A.1.6 Employment and Industry

According to the North Carolina Department of Commerce¹, Labor and Economic Analysis Division, Demand Driven Data Delivery System, in 2015, Cherokee County had an average annual employment of 7,877 workers. In 2015, Education and Health Services employed 2,221 persons (28.2 percent) of the County's workforce followed by Trade, Transportation and Utilities occupations (1,501, 19%); Leisure and Hospitality (947; 12%); Manufacturing occupations (878; 11.1%), and Construction occupations (385; 4.9%). In 2015, the median annual wage in Cherokee County was \$28,424 compared to \$32,510 for the state of North Carolina.²

A.2 CHEROKEE COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Cherokee County. Each hazard profile includes a description of the hazard's location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of Cherokee County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

A.2.1 Asset Inventory

Table A.4 lists the number of parcels, total number of parcels with improvements, and the total assessed value of improvements for Cherokee County and its participating jurisdictions (study area of vulnerability assessment).³

TABLE A.4: IMPROVED PROPERTY IN CHEROKEE COUNTY

Location	Estimated Number of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Andrews	853	627	\$ 82,241,206
Murphy	1,206	876	\$161,999,264
Unincorporated Area	31,704	15,095	\$1,661,457,829
EBCI ⁴	66	24	\$ 2,984,290
CHEROKEE COUNTY TOTAL⁵	33,829	16,622	\$ 1,908,682,589

¹ <http://d4.nccommerce.com/QCEWSelection.aspx>

² <http://d4.nccommerce.com/OESSSelection.aspx>

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 EBCI data indicated for Cherokee, Graham, and Swain Counties are derived from that county's parcel data and falls within the EBCI jurisdictional boundary and/or is indicated as part of the EBCI by the parcel attribute data.

⁵ Number of buildings for the county is based on the number of parcels with an improved building value greater than zero.

Table A.5 lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, and schools and other critical facilities located in Cherokee County. Critical facility data was obtained from the county and municipal leads. **Table A.48**, near 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 county.

TABLE A.5: CRITICAL FACILITY INVENTORY IN CHEROKEE COUNTY

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	5	10	35	0	50
EOC/Communications Facility	0	3	17	0	20
Public Works Facility	1	0	2	0	3
Fire Station/EMS	3	4	16	0	23
Police Station	1	2	0	0	3
Jail	0	1	0	0	1
Government Facilities	4	6	25	0	35
Government Office	1	4	1	0	6
Community Center	1	0	13	0	14
School	2	2	11	0	15
Medical Facilities	0	0	1	0	1
Hospital	0	0	1	0	1
Public Works/Utilities	1	2	31	0	34
Energy/Solar Farm	0	0	12	0	12
Power Substation	0	1	4	0	5
Water and Wastewater Systems	1	1	11	0	13
Dam	0	0	4	0	4
Other	5	10	12	2	29
Commercial Facility	4	10	5	2	21
Manufacturing Facility	0	0	2	0	2
Food/Agricultural Facility	1	0	4	0	5
Transportation/Airport	0	0	1	0	1
Total	15	28	104	2	149

Source: County GIS

A.2.2 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 Cherokee County that are potentially at risk to these hazards.

Table A.6 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in Cherokee County according to Census data is 27,092 persons. Additional population estimates are presented above in Section A.1.

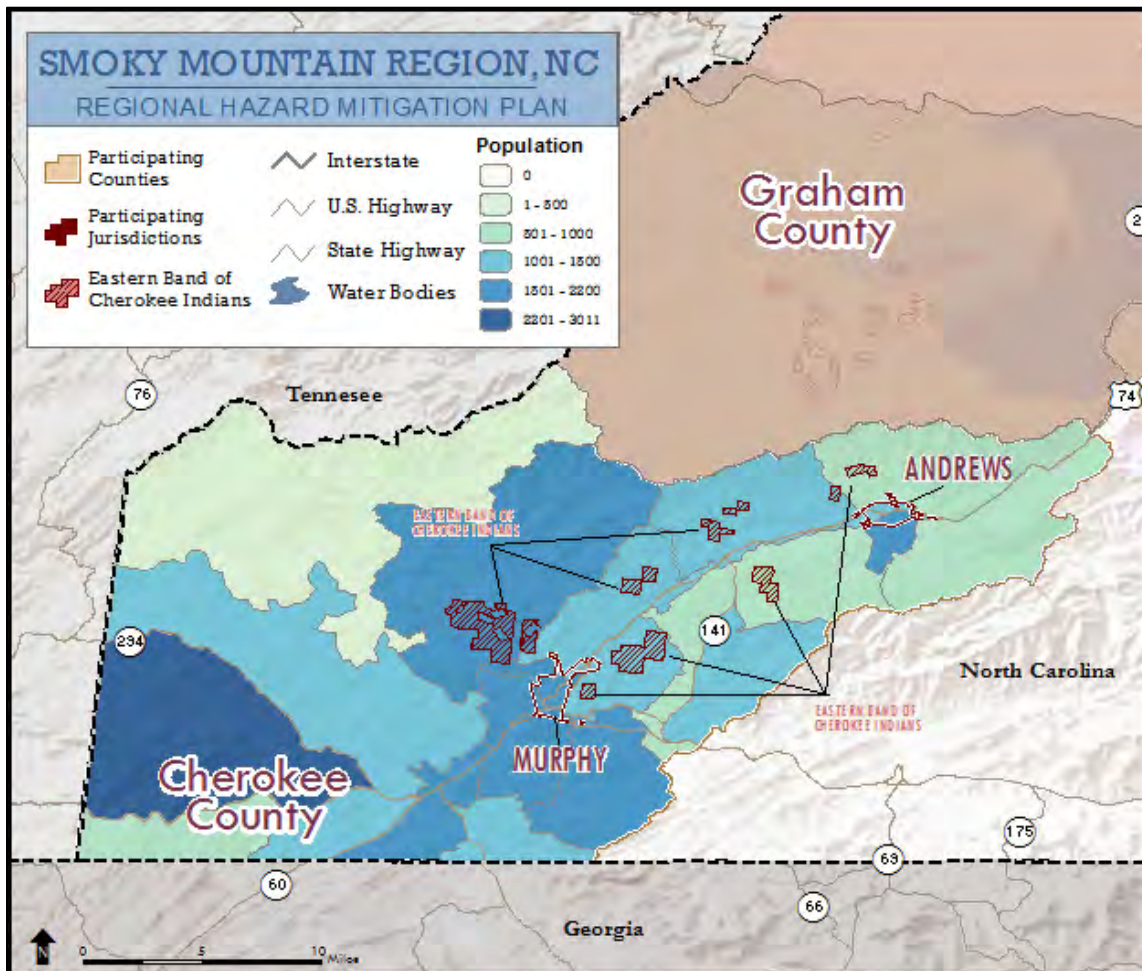
TABLE A.6: TOTAL POPULATION IN CHEROKEE COUNTY

Location	Total 2015 Population
Andrews	2,050
Murphy	2,095
Unincorporated Area	22,947
CHEROKEE COUNTY TOTAL	27,092

Source: U.S. Census Bureau 2015 American Community Survey

In addition, **Figure A.1** illustrates the population density by census tract as it was reported by the U.S. Census Bureau American Community Survey in 2015.⁶

FIGURE A.1: POPULATION DENSITY IN CHEROKEE COUNTY



Source: U.S. Census Bureau 2015 American Community Survey

⁶ Population by census block was not available at the time this plan was completed.

HAZARD PROFILES

A.2.3 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Cherokee County 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 are exposed to drought, making the spatial extent potentially widespread.

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Cherokee County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

According to the North Carolina Drought Monitor, Cherokee County has had drought occurrences sixteen of the last seventeen years (2000-2016). **Table A.7** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE A.7: HISTORICAL DROUGHT OCCURRENCES IN CHEROKEE COUNTY

Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
Cherokee County				
				EXTREME
				EXTREME
				EXTREME
				NORMAL
				ABNORMAL
				ABNORMAL
				MODERATE
				EXCEPTIONAL
				EXCEPTIONAL
				SEVERE
				MODERATE
				MODERATE
				SEVERE
				ABNORMAL
				ABNORMAL
				ABNORMAL
				EXCEPTIONAL

Source: North Carolina Drought Monitor

Extent

The most severe drought condition is Exceptional. Cherokee County has received this ranking three times over the sixteen-year reporting period.

Probability of Future Occurrences

According the North Carolina Drought Monitor’s historical data, sixteen of the last seventeen years has resulted in drought in Cherokee County, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered “highly likely” (greater than 90% annual probability). This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices

- Increased wildfires
- Loss of incomes
- Loss of hydroelectric power
- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

A.2.4 Hailstorm

Location

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

Historical Occurrences

According to the National Centers for Environmental Information’s (NCEI) Storm Events Database, 51 recorded hailstorm events affected Cherokee County from 1970 to 2016.⁷ **Table A.8** is a summary of the hail events in Cherokee County. **Table A.9** provides detailed information about each event that occurred in the county. In all, hail occurrences resulted in over \$15,580 (2017 dollars) in property damages, all of which were reported in the county’s unincorporated area. 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. Therefore, it is likely that damages are greater than the reported value.

TABLE A.8: SUMMARY OF HAIL OCCURRENCES IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2017)
Andrews	9	\$0
Murphy	14	\$0
Unincorporated Area	28	\$15,580
CHEROKEE COUNTY TOTAL	51	\$15,580

Source: National Centers for Environmental Information

⁷ These hail events are only inclusive of those reported by the National Centers for Environmental Information’s (NCEI) Storm Events Database. It is likely that additional hail events have affected Cherokee County. 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.

TABLE A.9: HISTORICAL HAIL OCCURRENCES IN CHEROKEE COUNTY

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Cherokee County	5/31/1981	1.50	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	6/7/1985	1.75	0/0	\$0
Cherokee County	3/15/1989	0.75	0/0	\$0
Cherokee County	5/20/1989	1.75	0/0	\$0
Cherokee County	6/2/1989	0.75	0/0	\$0
Cherokee County	4/9/1991	0.75	0/0	\$0
Cherokee County	3/19/1992	1.25	0/0	\$0
Murphy	3/31/1993	1.75	0/0	\$0
Murphy	3/31/1993	0.88	0/0	\$0
Murphy	8/25/1993	1.00	0/0	\$0
Cherokee County	5/15/1994	1.75	0/0	\$0
Hayesville	5/14/1995	0.75	0/0	\$0
Andrews	8/19/1995	0.75	0/0	\$0
Murphy	1/5/1997	0.75	0/0	\$0
Countywide	1/24/1997	1.00	0/0	\$0
Murphy	1/24/1997	1.00	0/0	\$0
Murphy and Andrews	3/29/1997	0.75	0/0	\$0
Andrews	4/21/1997	0.75	0/0	\$0
Ranger	6/21/1997	1.75	0/0	\$0
Andrews	11/30/1997	1.25	0/0	\$0
Andrews	11/30/1997	1.25	0/0	\$0
Ranger	1/8/1998	0.75	0/0	\$0
Andrews	1/8/1998	0.75	0/0	\$0
Marble	2/17/1998	1.00	0/0	\$0
Hiwassee Dam	4/8/1998	1.00	0/0	\$0
Andrews	4/8/1998	0.75	0/0	\$0
Murphy	5/7/1998	1.00	0/0	\$0
Andrews Murphy Airport	9/6/1998	1.00	0/0	\$0
Murphy	5/7/1999	1.75	0/0	\$0
Violet	6/25/2001	0.75	0/0	\$0
Marble	4/28/2002	1.00	0/0	\$7,790
Peachtree	4/28/2002	1.75	0/0	\$7,790
Hiwassee Dam	5/2/2002	1.75	0/0	\$0
Marble	6/4/2002	0.88	0/0	\$0
Andrews	7/22/2002	0.75	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Murphy	4/30/2003	0.75	0/0	\$0
Murphy	6/6/2005	1.75	0/0	\$0
Murphy	4/19/2006	0.88	0/0	\$0
Marble	4/21/2006	1.25	0/0	\$0
Andrews	5/20/2006	0.75	0/0	\$0
Andrews	5/20/2006	1.00	0/0	\$0
Hiwassee Dam	5/20/2006	0.88	0/0	\$0
Murphy	5/21/2006	0.75	0/0	\$0
Valleystown	5/20/2008	0.75	0/0	\$0
McGeetown	8/2/2008	1.00	0/0	\$0
Murphy	3/28/2010	1.25	0/0	\$0
Murphy	3/28/2010	1.25	0/0	\$0
Persimmon Creek	3/31/2012	1.00	0/0	\$0
Murphy	4/26/2012	1.00	0/0	\$0

Source: National Centers for Environmental Information

Extent

Hail extent can be defined by the size of the hail stone. Hail ranged in diameter from 0.75 inches to 1.75 inches. However, larger hailstones are possible as indicated in the Torro Scale (*Section 5*).

Probability of Future Occurrences

A total of 51 events are recorded in the NCEI's Storm Events Database between 1970 and 2016, meaning more than one hail event occurred each year on average in Cherokee County. Therefore, hail events are considered "highly likely" (greater than 90 percent annual chance). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Cherokee County 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 county.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. Events for the county indicate an average of approximately \$350 per event. While no deaths or injuries were reported in the county due to hail, they are possible.

A.2.5 Hurricane and Tropical Storm

Location

Hurricanes 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 Cherokee County. The entire county is equally susceptible to hurricane and tropical storms.

Historical Occurrences

According to the National Hurricane Center’s historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region between 1850 and 2015. This includes nine tropical storms and nineteen tropical depressions. **Table A.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE A.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

The National Centers for Environmental Information reported only one event associated with a hurricane or tropical storm in Cherokee County between 1950 and 2016. This storm was a tropical depression recorded on September 16, 2004. The storm resulted in \$15,000 (2017 dollars) of property damage and numerous trees and power lines were reported down across the county. In addition, the National Hurricane Center reported that two tropical depressions passed through the county: Tropical Storm Bill traversed in the county in 2003 and an unnamed storm passed through in 1928.

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Extent

Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Chapter 5, Table 5.8). The greatest classification of hurricane to traverse directly through Cherokee County was a tropical depression (Unnamed 1928 Storm) which carried tropical force winds of 30 knots (approximately 35 miles per hour) upon arrival in the county. It should be noted that stronger storms could impact the county without a direct hit. Additional impacts such as tornadoes and flooding may also impact the area.

Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but hurricanes and tropical storm events remain a real threat to Cherokee County due to induced events like flooding and landsliding. A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of the Smoky Mountain Region between 1851 and 2015, resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of “likely” (between 10 and 90% annual probability) was assigned.

Vulnerability Assessment

Historical evidence indicates that Cherokee County has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the county, as shown and discussed in the section above.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table A.11**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining an accurate loss estimate specific to participating jurisdictions was not feasible.

TABLE A.11: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Cherokee County	\$5,126,287,421	0	0%	\$1,201,454	0.023437%	\$41,733	0.000814%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

Given equal susceptibility across the county, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Cherokee County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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 A.48** 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 Cherokee County. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

A.2.6 Lightning

Location

Lightning occurs randomly, therefore it is impossible to predict where and with what frequency it will strike. It is assumed that all Cherokee County is uniformly exposed to lightning.

Historical Occurrences

According to the National Centers for Environmental Information, there have been no recorded lightning events in Cherokee County since 1950. , However, it is likely that lightning events have in fact impacted the county. 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.

Extent

Aside from damages, lighting extent can be defined using Vaisala, Inc.'s U.S. National Lightning Detection Network (NLDN) (Chapter 5, **Figure 5.6**). Although the Smoky Mountain Region experienced an average of 3 to 12 flashes per square mile per year, the majority of Cherokee County appears to be on the upper end, with an average of 6 to 12 flashes.

Probability of Future Occurrences

Although there were no historical lightning events reported in Cherokee County via NCEI data, it is a regular occurrence accompanied by 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 (NLDN⁸), the majority of Cherokee County is located in an area that experienced an average of 6 to 12 lightning flashes per square mile per year between 2005 and 2014. Therefore, the probability of future events is highly likely (greater than 90% annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

Vulnerability Assessment

All current and future buildings and populations within Cherokee County are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

A.2.7 Thunderstorm Wind/High Wind

Location

A 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, Cherokee County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Cherokee County has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms resulted in one disaster declaration in Cherokee County in 1995.⁸ According to NCEI, there have been 10 reported high or strong wind events since 1994 and 132 reported thunderstorm wind events

⁸A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

since 1950 in Cherokee County.⁹ These events caused over \$1.1 million in property damages and over \$85,000 in crop damages (2017 dollars). **Tables A.12 and A.13** summarize this information. **Table A.14** presents detailed high/strong wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.¹⁰

TABLE A.12: SUMMARY OF HIGH/STRONG WIND OCCURRENCES IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Property Damage (2017 dollars)
Andrews	0	\$0	\$0
Murphy	0	\$0	\$0
Unincorporated Area	10	\$119,165	\$14,876
CHEROKEE COUNTY TOTAL	10	\$119,165	\$14,876

Source: National Centers for Environmental Information

TABLE A.13: SUMMARY OF THUNDERSTORM (WIND) OCCURRENCES IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Andrews	10	\$150,964	\$30,098
Murphy	55	\$534,637	\$0
Unincorporated Area	67	\$348,028	\$41,553
CHEROKEE COUNTY TOTAL	132	\$1,033,629	\$71,651

Source: National Centers for Environmental Information

TABLE A.14: HISTORICAL WIND OCCURRENCES IN CHEROKEE COUNTY

Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Cherokee Co.	7/9/1965	Thunderstorm Wind	--	0/0	\$0	
Cherokee Co.	6/25/1966	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/24/1970	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/2/1974	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	12/15/1974	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	2/18/1976	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	2/18/1976	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/5/1985	Thunderstorm Wind	--	0/0	\$0	--

⁹ These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional thunderstorm events have occurred in Cherokee County. As additional local data becomes available, this hazard profile will be amended.

¹⁰ The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

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Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Cherokee Co.	6/6/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/6/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	6/7/1985	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/15/1987	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/20/1989	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/1/1990	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	4/9/1991	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	7/3/1992	Thunderstorm Wind	--	0/0	\$0	--
Northern	2/21/1993	Thunderstorm Wind	--	0/0	\$0	--
Murphy	4/15/1993	Thunderstorm Wind	--	0/0	\$0	--
Murphy	8/25/1993	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	5/14/1994	Thunderstorm Wind	--	0/0	\$0	--
Nr Andrews	5/14/1995	Thunderstorm Wind	--	0/0	\$0	--
Marble	8/19/1995	Thunderstorm Wind	--	0/0	\$9,326	Several trees were blown down.
Murphy	5/25/1996	Thunderstorm Wind	51	0/0	\$0	--
Andrews	6/7/1996	Thunderstorm Wind	--	0/0	\$3,622	Several trees were downed.
Murphy	8/19/1996	Thunderstorm Wind	--	0/0	\$0	--
Andrews	7/4/1997	Thunderstorm Wind	--	0/0	\$35,409	Large trees and powerlines blown down.
Cherokee Co.	4/3/1998	Thunderstorm Wind	--	0/0	\$17,433	Trees and powerlines down countywide.
Murphy	6/4/1998	Thunderstorm Wind	--	0/0	\$0	--
Andrews Murphy Airport	9/6/1998	Thunderstorm Wind	--	0/0	\$12,203	Plane blown over.
Cherokee Co.	5/7/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees and power lines down.
Cherokee Co.	7/5/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees down.
Andrews	7/6/1999	Thunderstorm Wind	--	0/0	\$25,536	Trees down on Highway 19
Murphy	7/29/1999	Thunderstorm Wind	--	0/0	\$6,810	Trees down.
Cherokee Co.	2/13/2000	Thunderstorm Wind	--	0/0	\$0	--
Marble	2/13/2000	Thunderstorm Wind	--	0/0	\$16,528	Power lines down.

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Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Cherokee Co.	3/19/2000	High Wind	60	0/0	\$0	Widespread 30-40 mph winds with gusts to 60 mph in the higher elevations.
Cherokee Co.	11/9/2000	Thunderstorm Wind	--	0/0	\$0	--
Violet	6/25/2001	Thunderstorm Wind	--	0/0	\$0	--
Hiwassee Dam	7/3/2001	Thunderstorm Wind	--	0/0	\$0	--
Ranger	7/4/2001	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	10/25/2001	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	11/29/2001	High Wind	--	0/0	\$32,094	Strong winds uprooted trees and downed power lines.
Murphy	5/2/2002	Thunderstorm Wind	--	0/0	\$38,949	Mobile home blown into road and trees down throughout county.
Murphy	5/13/2002	Thunderstorm Wind	--	0/0	\$15,580	Trees reported down west of Murphy
Murphy	6/4/2002	Thunderstorm Wind	--	0/0	\$15,580	Trees reported down in Murphy.
Unaka	6/20/2002	Thunderstorm Wind	--	0/0	\$15,580	Two trees were reported down in Unaka.
Murphy	7/30/2002	Thunderstorm Wind	--	0/0	\$0	--
Cherokee Co.	11/11/2002	Thunderstorm Wind	--	0/0	\$23,370	Several trees reported down countywide.
Hiwassee Dam	5/5/2003	Thunderstorm Wind	60	0/0	\$7,563	A few trees downed at Hiwassee Dam.
Oak Park	6/11/2003	Thunderstorm Wind	55	0/0	\$27,227	Several trees and power lines down across the west portion of the county.
Hiwassee Dam	6/11/2003	Thunderstorm Wind	55	0/0	\$9,076	Two large trees were reported down on highway 294 in the Hiwassee Dam area.
Ranger	7/13/2003	Thunderstorm Wind	60	0/0	\$0	--
Andrews	7/16/2003	Thunderstorm Wind	60	0/0	\$0	--
Murphy	8/15/2003	Thunderstorm Wind	60	0/0	\$0	--
Cherokee Co.	11/18/2003	Thunderstorm Wind	70	0/0	\$30,252	Numerous trees were downed countywide.
Murphy	5/22/2004	Thunderstorm Wind	60	0/0	\$22,028	Several trees were reported down on power lines four miles west northwest of Murphy.
Murphy	5/31/2004	Thunderstorm Wind	65	0/0	\$29,371	Numerous trees were down countywide.
Murphy	6/12/2004	Thunderstorm Wind	65	0/0	\$7,343	Trees down on power lines at Bear Paw Village
Murphy	6/12/2004	Thunderstorm Wind	60	0/0	\$2,937	Tree down on Duke Lodge Road
Murphy	7/5/2004	Thunderstorm Wind	60	0/0	\$29,371	Trees downed across the county.

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Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Andrews	7/12/2004	Thunderstorm Wind	60	0/0	\$1,469	A tree down at Junaluska and Andrews.
Murphy	7/13/2004	Thunderstorm Wind	60	0/0	\$22,028	Trees down in eastern and western sections of the county around 1245 am EDT on 07/14.
Hiwassee Dam	7/14/2004	Thunderstorm Wind	60	0/0	\$14,685	Several trees were reported down in the Hiwassee Dam area.
Murphy	7/26/2004	Thunderstorm Wind	60	0/0	\$2,937	A tree was reported down on Country Walk Road.
Murphy	7/26/2004	Thunderstorm Wind	60	0/0	\$2,937	A tree was reported down on Harshaw Road.
Cherokee Co.	12/22/2004	High Wind	45	0/0	\$0	--
Murphy	2/21/2005	Thunderstorm Wind	65	0/0	\$4,277	Numerous trees down countywide
Murphy	6/6/2005	Thunderstorm Wind	65	0/0	\$21,386	Numerous trees down countywide.
Andrews	8/3/2005	Thunderstorm Wind	60	0/0	\$21,386	A few trees reported down in Andrews area.
Murphy	8/4/2005	Thunderstorm Wind	60	0/0	\$14,258	Several trees down near Murphy
Cherokee Co.	4/8/2006	Thunderstorm Wind	60	0/0	\$13,842	Several trees and powerlines down across the eastern third of the county.
Murphy	5/20/2006	Thunderstorm Wind	60	0/0	\$27,685	Several trees and power lines were reported down one mile west of Murphy.
Murphy	5/20/2006	Thunderstorm Wind	60	0/0	\$16,611	A few trees were reported down on power lines two miles east of Murphy.
Marble	5/27/2006	Thunderstorm Wind	60	0/0	\$8,305	A few trees were reported down in Marble.
Andrews	6/23/2006	Thunderstorm Wind	60	0/0	\$16,611	Several trees and powerlines down.
Murphy	7/4/2006	Thunderstorm Wind	65	0/0	\$34,606	Several trees and powerlines were reported down across the county with a concentration noted in the western part of the county.
Murphy	7/4/2006	Thunderstorm Wind	60	0/0	\$20,764	Several trees reported down in the National Forest west and northwest of Murphy.
Murphy	7/13/2006	Thunderstorm Wind	60	0/0	\$24,916	Several trees and powerlines reported down across the southern third of the county.
Cherokee Co.	7/21/2006	Thunderstorm Wind	60	0/0	\$41,527	Numerous trees down across the county.
Murphy	8/15/2006	Thunderstorm Wind	55	0/0	\$4,153	Two trees down near Murphy.
Murphy	9/23/2006	Thunderstorm Wind	60	0/0	\$13,842	A few trees down on a private road.
Murphy	9/28/2006	Thunderstorm Wind	60	0/0	\$27,685	Numerous trees were reported down across the western third of the county.

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Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Cherokee Co.	10/17/2006	High Wind	65	0/0	\$34,606	Numerous trees and powerlines down across the highest elevations.
Cherokee Co.	12/1/2006	Strong Wind	40	0/0	\$13,842	A few trees down countywide.
Cherokee Co.	2/25/2007	High Wind	60	0/0	\$20,159	Numerous trees down at higher elevations.
Andrews	6/25/2007	Thunderstorm Wind	55	0/0	\$10,751	Winds downed a tree at Andrews and numerous powerlines countywide.
Marble	1/30/2008	Thunderstorm Wind	55	0/0	\$0	--
Ogreeta	4/11/2008	Thunderstorm Wind	60	0/0	\$6,524	Three trees downed by thunderstorm winds near the Hiawassee Dam.
Valleytown	5/20/2008	Thunderstorm Wind	60	0/0	\$0	--
Rhodo	5/20/2008	Thunderstorm Wind	55	0/0	\$0	--
Valleytown	6/28/2008	Thunderstorm Wind	52	0/0	\$6,524	A large tree downed on powerlines.
Postell	6/28/2008	Thunderstorm Wind	50	0/0	\$1,305	A tree downed on Candy Mountain Road west of Murphy.
Ogreeta	6/28/2008	Thunderstorm Wind	50	0/0	\$1,305	A tree downed at Hiawassee Dam.
Murphy	7/6/2008	Thunderstorm Wind	55	0/0	\$0	--
Murphy	7/21/2008	Thunderstorm Wind	55	0/0	\$0	--
Murphy	7/22/2008	Thunderstorm Wind	55	0/0	\$0	--
Holhouse	7/28/2008	Thunderstorm Wind	55	0/0	\$0	--
Mission	7/28/2008	Thunderstorm Wind	55	0/0	\$0	--
Johnsonville	8/2/2008	Thunderstorm Wind	50	0/0	\$2,610	A tree downed by thunderstorm winds in the western portions of the county.
Murphy	6/11/2009	Thunderstorm Wind	55	0/0	\$10,134	A trained spotter reported several trees downed by thunderstorm winds in Murphy.
Murphy	6/17/2009	Thunderstorm Wind	52	0/0	\$6,334	A few trees downed by thunderstorm winds.
Murphy	6/17/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Ranger	6/21/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Murphy	6/21/2009	Thunderstorm Wind	52	0/0	\$2,534	One tree downed by thunderstorm winds.
Hiwassee Dam	6/28/2009	Thunderstorm Wind	52	0/0	\$6,334	One tree and several powerlines downed by thunderstorm winds northwest of Murphy.
Sunny Point	6/28/2009	Thunderstorm Wind	50	0/0	\$2,534	One tree downed southwest of Murphy.

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Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Cherokee Co.	12/9/2009	High Wind	60	0/0	\$12,668	Several trees downed countywide.
Marble	6/25/2010	Thunderstorm Wind	50	0/0	\$2,460	One tree downed by thunderstorm winds.
Hiwassee Dam	7/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Murphy	8/13/2010	Thunderstorm Wind	55	0/0	\$12,299	Numerous trees downed by thunderstorm winds across the western half of the county.
Andrews	10/25/2010	Thunderstorm Wind	60	0/0	\$12,299	Trees and powerlines downed by thunderstorm winds along with numerous tree limbs down around Andrews.
Cherokee Co.	11/30/2010	High Wind	50	0/0	\$0	--
Murphy	2/25/2011	Thunderstorm Wind	50	0/0	\$9,552	One tree downed on Harshaw Road and several trees downed on US 19 by thunderstorm wind near Murphy.
Culberson	3/26/2011	Thunderstorm Wind	50	0/0	\$0	--
Hothouse	6/9/2011	Thunderstorm Wind	50	0/0	\$5,970	A few trees downed by thunderstorm winds 3 miles northwest of Hothouse.
Andrews	6/15/2011	Thunderstorm Wind	60	0/0	\$23,881	Numerous trees and powerlines downed by thunderstorm wind in Andrews.
Hiwassee Dam	6/18/2011	Thunderstorm Wind	55	0/0	\$11,941	Several trees downed by thunderstorm wind at the Hiwassee Dam.
Murphy	6/18/2011	Thunderstorm Wind	55	0/0	\$11,941	Several trees downed 6 miles southwest of Murphy in the Ranger area.
Murphy	6/19/2011	Thunderstorm Wind	55	0/0	\$17,911	Several trees and powerlines downed by thunderstorm wind countywide.
Murphy	8/3/2011	Thunderstorm Wind	50	0/0	\$5,970	A tree downed on powerlines near the Pleasant Valley community.
Murphy	8/3/2011	Thunderstorm Wind	50	0/0	\$5,970	A tree downed powerlines by thunderstorm wind at the intersection of Morgan Hill Road and Martins Creek Road near Murphy.
Murphy	8/8/2011	Thunderstorm Wind	60	0/0	\$17,911	Many trees and powerlines downed by thunderstorm wind near Murphy.
Murphy	7/31/2012	Thunderstorm Wind	50	0/0	\$0	--
Murphy	8/1/2012	Thunderstorm Wind	50	0/0	\$3,478	Several trees were downed in Murphy.
Cherokee Co.	12/20/2012	High Wind	50	0/0	\$5,796	At least 2 or 3 trees downed countywide.
Cherokee Co.	1/17/2013	High Wind	52	0/0	\$0	--

Location	Date	Event Type	Magnitude (knots)	Deaths/Injuries	Property Damage (2017 dollars)	Details
Murphy	6/5/2013	Thunderstorm Wind	52	0/0	\$5,628	Several trees downed across the county.
Murphy	6/8/2014	Thunderstorm Wind	50	0/0	\$10,927	Five trees downed in Murphy.
Murphy	6/10/2014	Thunderstorm Wind	50	0/0	\$5,464	Several trees were downed in Murphy.
Bates Creek	7/8/2014	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/8/2014	Thunderstorm Wind	50	0/0	\$0	--
Murphy	6/8/2015	Thunderstorm Wind	50	0/0	\$0	--
Valleytown	6/8/2015	Thunderstorm Wind	50	0/0	\$0	--
Murphy	6/26/2015	Thunderstorm Wind	50	0/0	\$0	--
Grape Creek	7/11/2015	Thunderstorm Wind	50	0/0	\$0	--
Slow Creek	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Valleytown	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Slow Creek	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/6/2016	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Ogreeta	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--
Murphy	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--

Source: National Centers for Environmental Information

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind event in Cherokee County was reported on November 18, 2003 at 70 knots (approximately 80 mph). It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

Given the high number of previous events (142 total wind events reported from NCEI), it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. The reported events result in an average of over 2 events per year. Therefore, a probability level of highly likely (greater than 90% annual probability) for future wind events for the entire county.

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

A.2.8 Tornado

Location

Tornadoes occur throughout the state of North Carolina and have occurred in Cherokee County. 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 Cherokee County is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they have occurred, and are possible in the future, in Cherokee County. According to the National Centers for Environmental Information, there have been a total of eight recorded tornado events in Cherokee County since 1973 (**Table A.15**), resulting in over \$147 million (2017 dollars) in property damages.¹¹ In addition, 4 deaths and 26 injuries were reported (**Table A.16**). 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 40 years.

TABLE A.15: SUMMARY OF TORNADO OCCURRENCES IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2012)
Andrews	0	\$0
Murphy	0	\$0
Unincorporated Area	8	\$147,081,126
CHEROKEE COUNTY TOTAL	8	\$147,081,126

Source: National Centers for Environmental Information

TABLE A.16: HISTORICAL TORNADO IMPACTS IN CHEROKEE COUNTY

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY					
Cherokee Co.	4/2/1974	F1	0/0	\$144,193	n/a
Cherokee Co	4/3/1974	F1	0/0	\$0	n/a
Cherokee Co	4/3/1974	F4	4/26	\$144,193,281	n/a
Cherokee Co	4/4/1974	F0	0/0	\$144,193	n/a
Cherokee Co	9/21/1979	F0	0/0	\$98,001	n/a
Cherokee Co	4/16/1991	F0	0/0	\$52,162	More than 200 trees were twisted and blown down, and the roof of an elementary school was damaged.
Wolf Creek	5/7/1998	F1	0/0	\$130,747	The tornadic thunderstorm moved east out of Polk County Tennessee into Cherokee County. It damaged several houses and a campground before finally dissipating.

¹¹ These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional tornadoes have occurred in Cherokee County. As additional local data becomes available, this hazard profile will be amended.

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
CHEROKEE COUNTY					
Postell	3/2/2012	EF2	0/0	\$2,318,548	An EF-2 tornado with maximum wind speeds around 120 mph produced a damage path 21.5 miles long and 400 yards wide. The tornado track extended across almost the entire county and damaged the northern part of Murphy. The storm destroyed five homes and five businesses. The number of structures affected totaled one hundred eighteen. In Murphy, a Feed Store and two rows of commercial storage units were destroyed. Also, a shopping strip with a Sherwin-Williams store suffered heavy damage. Surprisingly there were no injuries reported despite the heavy damage and long track.

On March 2, 2012, an F2 tornado devastated a corridor across Cherokee County near the Tennessee boarder. The Town of Murphy was hardest hit and damage was reported in 5 additional communities. Cherokee County reported 5 homes and 5 businesses were destroyed, 37 homes and 20 businesses had major damage, and 40 homes and 21 businesses suffered minor damage.

Extent

The greatest magnitude of a tornado is an EF5 (over 200 miles per hour). The greatest magnitude of tornado that has impacted Cherokee County is an F4 (207 to 260 miles per hour), during an event that occurred on April 3, 1974, though stronger events are possible. The 1974 event also impacted the Town of Murphy. According to NCEI, the tornado resulted in 4 fatalities and 26 injuries, and caused \$144 million in property damage. The National Weather Service reports that this tornado was part of the largest outbreak of tornadoes in the nation’s history, referred to by meteorologists as the Super Outbreak, in which 148 tornadoes swept across 13 states in an estimated 24 hours.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county. Furthermore, the mountainous terrain of the county makes tornadoes a rare occurrence. With eight tornadoes reported in 43 years (1973-2016), there was an annual occurrence rate of 19-percent. Therefore, the probability of future tornado occurrences affecting Cherokee County is possible (1 to 10 percent annual probability). While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Cherokee County experience a direct tornado strike.

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

A.2.9 Winter Storm and Freeze

Location

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. Cherokee County is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in two disaster declarations in Cherokee County. This includes the Blizzard of 1996 and one subsequent 1996 winter storm.¹² According to the National Centers for Environmental Information, there have been a total of 29 recorded winter storm events in Cherokee County since 1993 (**Table A.17**).¹³ These events resulted in almost \$1,811 (2017 dollars) in damages. Those events with reported damages and fatalities are presented in **Table A.18**.¹⁴

TABLE A.17: SUMMARY OF WINTER STORM EVENTS IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2017)	Crop Damage (2017)
Andrews	0	\$0	\$0
Murphy	0	\$0	\$0
Unincorporated Area	29	\$1,811	\$0
CHEROKEE COUNTY TOTAL	29	\$1,811	\$0

Source: National Centers for Environmental Information

TABLE A.18: HISTORICAL WINTER STORM IMPACTS IN CHEROKEE COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
CHEROKEE COUNTY					
Cherokee County	3/19/1996	Heavy Snow	0/0	\$1,811	\$0
Cherokee County	1/10/1997	Winter Storm	0/0	\$0	\$0
Cherokee County	12/30/1997	Winter Storm	0/0	\$0	\$0
Cherokee County	12/22/1998	Ice Storm	0/0	\$0	\$0
Cherokee County	12/2/2000	Winter Storm	0/0	\$0	\$0
Cherokee County	12/18/2000	Winter Storm	0/0	\$0	\$0
Cherokee County	1/1/2001	Winter Storm	0/0	\$0	\$0
Cherokee County	1/20/2001	Winter Storm	0/0	\$0	\$0
Cherokee County	3/20/2001	Winter Storm	0/0	\$0	\$0

¹² A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

¹³ These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional winter storm conditions have affected Cherokee County.

¹⁴ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
CHEROKEE COUNTY					
Cherokee County	1/5/2002	Winter Storm	0/0	\$0	\$0
Cherokee County	1/5/2003	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/16/2003	Winter Storm	0/0	\$0	\$0
Cherokee County	1/9/2004	Winter Storm	0/0	\$0	\$0
Cherokee County	1/29/2005	Ice Storm	0/0	\$0	\$0
Cherokee County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/1/2007	Winter Weather	0/0	\$0	\$0
Cherokee County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Cherokee County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	3/5/2013	Blizzard	0/0	\$0	\$0
Cherokee County	2/13/2014	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/26/2015	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/8/2016	Heavy Snow	0/0	\$0	\$0
Cherokee County	2/12/2016	Heavy Snow	0/0	\$0	\$0

There have been several severe winter weather events in Cherokee County. The text below describes one of the major events and associated impacts on the county. Similar impacted 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.

Winter storms throughout the planning area have several negative externalities including hypothermia, 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 to fire or an accumulation of toxic fumes.

Extent

The extent of winter storms can be measured by the amount of snowfall or ice accumulation received (in inches). The greatest 24-hour snowfall reported in Cherokee County was 18 inches in the Town of Murphy (reported on March 16, 1880). Due to extreme variations in elevation throughout the county, extent totals will vary, and higher levels of accumulation are possible. Ice accumulation of several inches is also possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Cherokee County due to location and elevation. According to historical information, Cherokee County experiences an average of one winter storm event each year. Therefore, the annual probability is highly likely (greater than 90% annual chance).

Vulnerability Assessment

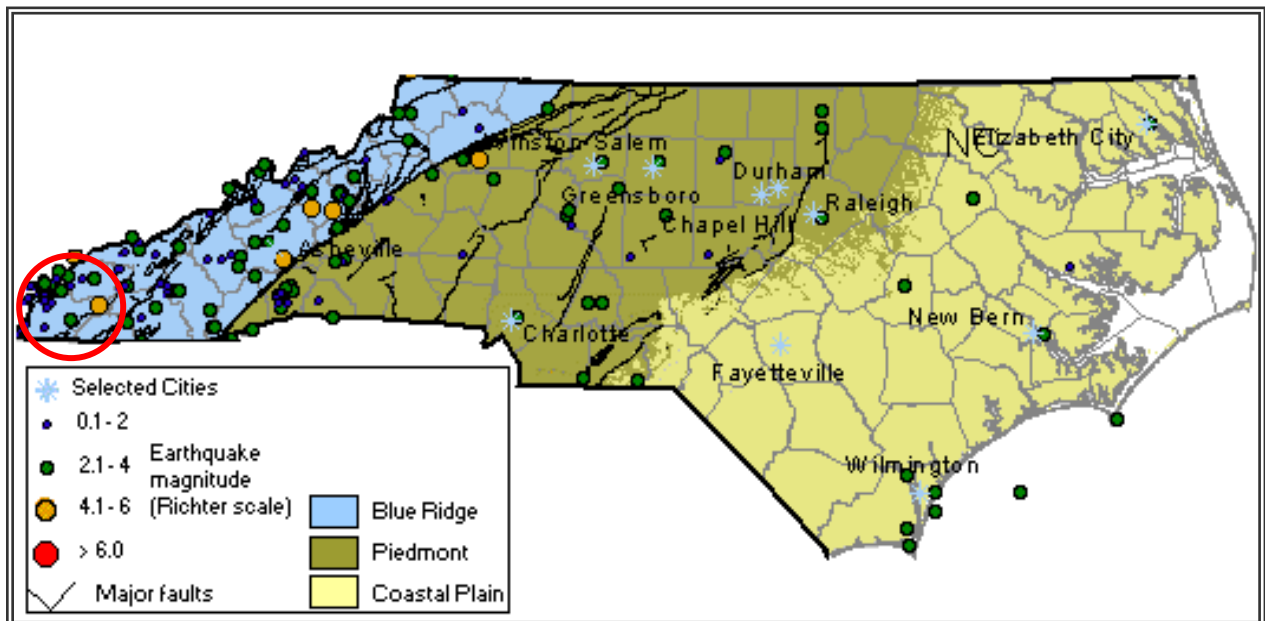
All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack). However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

A.2.10 Earthquake

Location

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 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 A.2** is a map showing geological and seismic information for North Carolina.

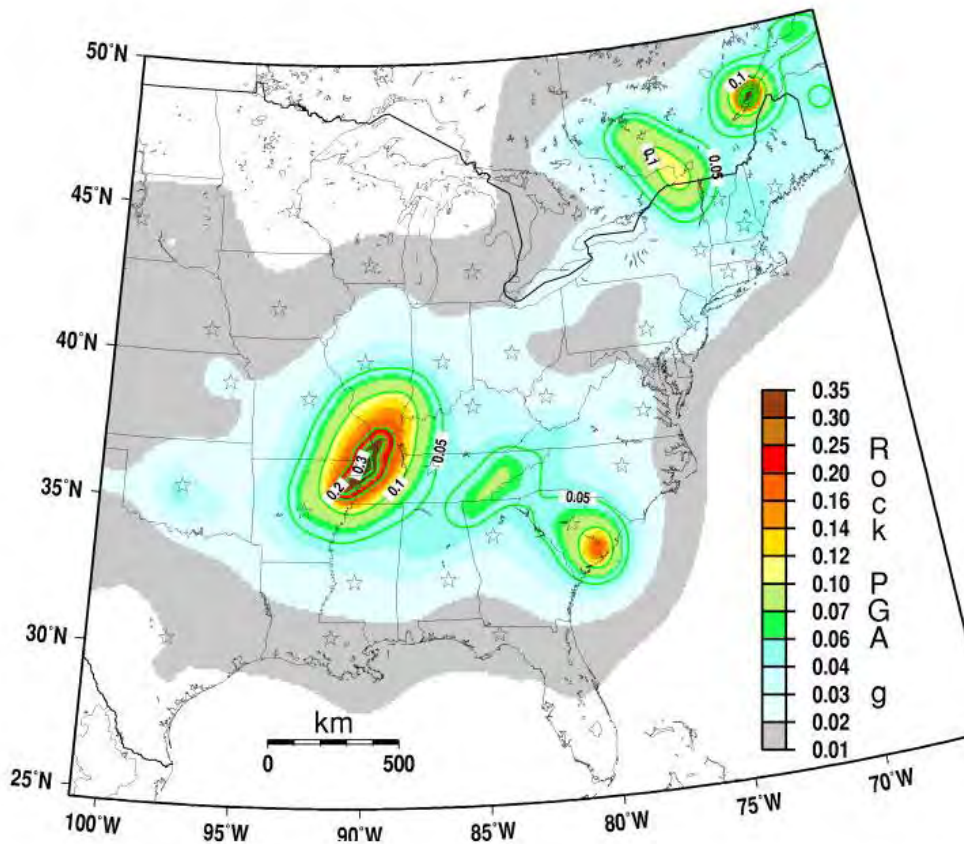
FIGURE A.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure A.3 shows the intensity level associated with Cherokee County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Cherokee County lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE A.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2008

Historical Occurrences

At least 24 earthquakes are known to have affected Cherokee County since 1874. The strongest of these measured a V on the Modified Mercalli Intensity (MMI) scale. **Table A.19** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table A.20** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁵

¹⁵ Due to reporting mechanisms, not all earthquakes events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported.

TABLE A.19: SUMMARY OF SEISMIC ACTIVITY IN CHEROKEE COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Andrews	8	IV	-
Murphy	16	V	-
Unincorporated Area	0	-	-
CHEROKEE COUNTY TOTAL	24	V (slightly strong)	< 4.8

Source: National Geophysical Data Center

TABLE A.20: SIGNIFICANT SEISMIC EVENTS IN CHEROKEE COUNTY (1638 -1985)

Location	Date	MMI (magnitude)
Cherokee County		
Murphy	11/16/1877	V
Andrews	2/21/1916	IV
Murphy	10/18/1916	II
Murphy	10/20/1924	II
Murphy	11/3/1928	III
Andrews	1/1/1935	III
Murphy	1/1/1935	IV
Murphy	1/1/1936	III
Murphy	3/31/1938	IV
Murphy	1/2/1954	IV
Andrews	9/7/1956	III
Andrews	7/2/1957	IV
Murphy	7/2/1957	V
Andrews	11/24/1957	IV
Murphy	11/24/1957	IV
Andrews	7/13/1969	IV
Murphy	7/13/1969	IV
Murphy	11/20/1969	III
Andrews	11/30/1973	IV
Murphy	11/30/1973	V
Murphy	7/27/1977	III
Andrews	8/13/1979	IV
Murphy	8/13/1979	V
Murphy	7/27/1980	IV

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Cherokee County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table A.22**.

TABLE A.21: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

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

*This event is accounted for in the Cherokee County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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).

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The strongest intensity of earthquake to occur in Cherokee County is an MMI of V (slightly strong; less than 4.8 on the Richter scale), which has occurred during four separate earthquake events. However, stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Cherokee County is unlikely. With 24 reported earthquakes occurring in 347 years, the historic annual rate of occurrence for earthquakes in Cherokee County is 7-percent. Therefore, the annual probability for the county is estimated between 1 and 10 percent (possible). It is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county.

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the potential dollar loss for Cherokee County. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table A.22** summarizes the findings.

TABLE A.22: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Ratio	500 Year Event Loss	500 Year Event Ratio	Annualized Loss	Annualized Loss Ratio ¹
Cherokee County	\$5,126,287,421	\$279,344	0.005449%	\$5,056,621	0.098640%	\$49,436	0.000964%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table A.48**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Cherokee County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

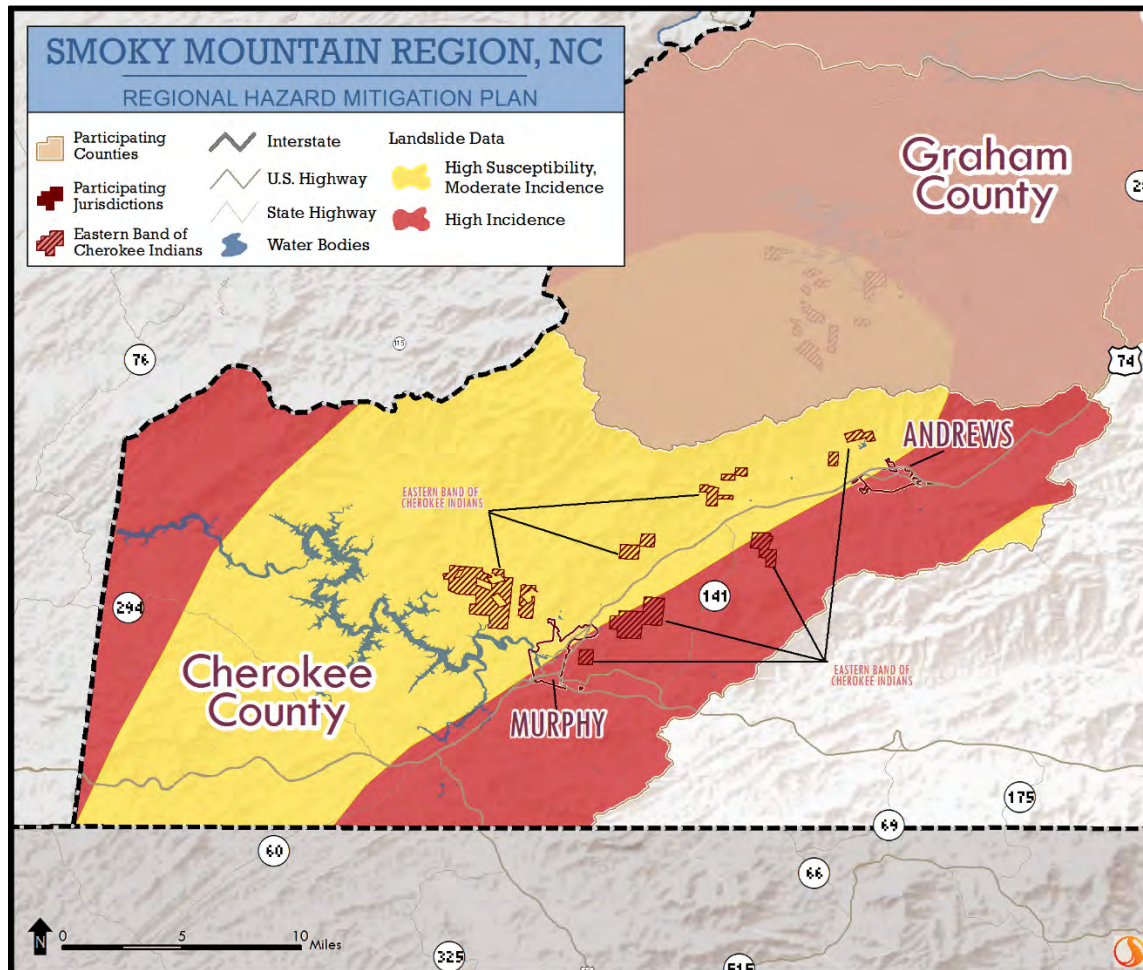
A.2.11 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Cherokee County.

According to **Figure A.4** below, which leverages USGS landslide information, the majority of the county has moderate (1.5% - 15% of the area is involved in landsliding) landslide activity. The remaining portion of the county, along the east and west county boundaries, has a high incidence occurrence (more than 15% of the area is involved in landsliding) rate. There is high susceptibility throughout the county.

FIGURE A.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF CHEROKEE COUNTY



Source: USGS

Historical Occurrences

Steep topography throughout Cherokee County 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. **Table A.23** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey¹⁶. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure A.5**. Some incidence mapping has also been 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 Cherokee County.

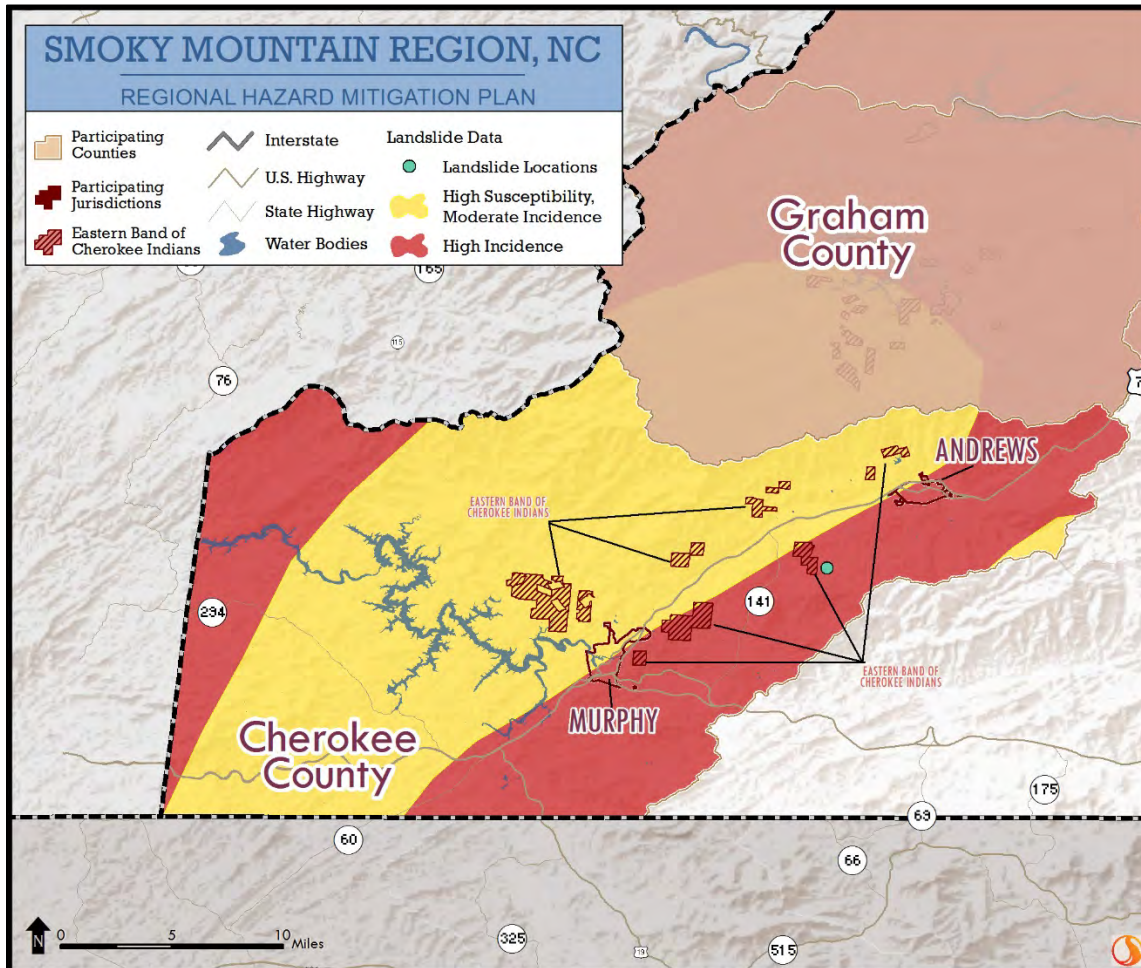
¹⁶ It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

TABLE A.23: SUMMARY OF LANDSLIDE ACTIVITY IN CHEROKEE COUNTY

LOCATION	NUMBER OF OCCURRENCES
Andrews	-
Murphy	-
Unincorporated Area	1
CHEROKEE COUNTY TOTAL	1

Source: North Carolina Geological Survey

FIGURE A.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN CHEROKEE COUNTY



Source: North Carolina Geological Survey

The information below identifies additional historical landslide information reported in the previous hazard mitigation plan. These incidents are reported above, but the following list shows an exact location and date of historic landslides in Cherokee County and its municipalities:

- ◆ 3/01 US64 - 1.6 miles east of Murphy
- ◆ 3/94 SR 1331 - Hangingdog Rd 6.0 miles north of Murphy
- ◆ 4/92 US64 - 0.5 miles east of Murphy

- ◆ 4/94 US74 - Bypass Murphy (near Bulldog Dr)
- ◆ 1/77 19/129 North (Red Marble Rd)
- ◆ 1/77 SR 1314 (near Violet)
- ◆ 4/75 SR 1375 Bluff Rd
- ◆ 5/72 SR 1314 Between Hiwassee Dam and Violet
- ◆ 10/74 SR 1331 Blackwell Gap

Extent

The USGS landslide susceptibility index can be used to measure extent in terms of incidence, which is between moderate (1.5% - 15% of the area is involved in landsliding) and high (more than 15% of the area is involved in landsliding) in Cherokee County. There is also some level of susceptibility (varies) throughout the county. While limited information exists on debris generated from past events, million of dollars in damages is possible. The most severe events may result in loss of life.

Probability of Future Occurrences

Based on historical occurrences (one reported landslide in 40 years) and the USGS susceptibility index, the probability of future landslide events is likely (10 to 100 percent probability). The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as having a lower, “moderate” incidence ranking. Both areas are reported in Cherokee County, with the western-most and eastern-most portions located in the high incidence area. It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas in Cherokee County have greater risk than others given factors such as steepness on slope and modification of slopes (i.e., greater slope or modification of slope may increase risk and occurrence).

Vulnerability Assessment

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. Most areas of Cherokee County are identified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding) areas in the USGS landslide data. Additionally, portions of the study area in the county are classified as high incidence (more than 15% of the area is involved in landsliding). **Table A.24** presents potential vulnerability in moderate incidence areas while **Table A.25** presents vulnerability in high incidence areas.

TABLE A.24: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY MODERATE INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	16,968	50%	7,821	47%	\$848,162,023	44%
Andrews	20	2%	16	3%	\$6,895,920	8%
Murphy	591	49%	425	49%	\$72,894,674	45%

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	16,297	51%	7,358	49%	\$765,631,889	46%
EBCI	60	91%	22	92%	\$2,739,540	92%

Source: USGS

TABLE A.25: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	16,861	50%	8,801	53%	\$1,060,520,566	56%
Andrews	833	98%	611	97%	\$75,345,286	92%
Murphy	615	51%	451	51%	\$89,104,590	55%
Unincorporated Area	15,407	49%	7,737	51%	\$895,825,940	54%
EBCI	6	9%	2	8%	\$244,750	8%

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk.

Critical Facilities

All critical facilities located in a high susceptibility/moderate incidence area are detailed in **Table A.27**. This includes a total of 65 facilities. A total of 84 of Cherokee County’s critical facilities are located in areas of high landslide incidence, as presented in **Table A.28**. A list of specific critical facilities and their associated risk can be found in **Table A.48** at the end of this section.

**TABLE A.26: CRITICAL FACILITIES IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE
LANDSLIDE HAZARD AREAS**

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	1	5	18	0	24
EOC/Communications Facility	0	1	7	0	8
Public Works Facility	0	0	1	0	1
Fire Station/EMS	1	2	10	0	13
Police Station	0	1	0	0	1
Jail	0	1	0	0	1
Government Facilities	0	2	12	0	14
Government Office	0	1	0	0	1
Community Center	0	0	8	0	8
School	0	1	4	0	5
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	16	0	16
Energy/Solar Farm	0	0	6	0	6
Power Substation	0	0	2	0	2
Water and Wastewater Systems	0	0	5	0	5
Dam	0	0	3	0	3
Other	1	6	3	1	11
Commercial Facility	1	6	1	1	9
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	0	0	1	0	1
Transportation/Airport	0	0	1	0	1
Total	2	13	49	1	65

TABLE A.27: CRITICAL FACILITIES IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	4	6	16	0	26
EOC/Communications Facility	0	3	9	0	12
Public Works Facility	1	0	1	0	2
Fire Station/EMS	2	2	6	0	10
Police Station	1	1	0	0	2
Jail	0	0	0	0	0
Government Facilities	4	4	13	0	21
Government Office	1	3	1	0	5
Community Center	1	0	5	0	6
School	2	1	7	0	10
Medical Facilities	0	0	1	0	1
Hospital	0	0	1	0	1
Public Works/Utilities	1	2	15	0	18
Energy/Solar Farm	0	0	6	0	6
Power Substation	0	1	2	0	3
Water and Wastewater Systems	1	1	6	0	8
Dam	0	0	1	0	1
Other	4	4	9	1	18
Commercial Facility	3	4	4	1	12
Manufacturing Facility	0	0	2	0	2
Food/Agricultural Facility	1	0	3	0	4
Transportation/Airport	0	0	0	0	0
Total	13	16	54	1	84

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in Cherokee County, 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 county 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.

A.2.12 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table A.28** explains these classifications.

TABLE A.28: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources¹⁷

According to the North Carolina Division of Land Management there are 42 dams in Cherokee County.¹⁸ Of these dams, 11 are classified as high hazard potential, seven are classified as intermediate hazard potential, and 24 are classified as low hazard. High hazard dams are listed in **Table A.29**. It should also be noted that dam regulations for classifying dams was recently changed. Thus, generally more dams are classified as high hazard.

TABLE A.29: CHEROKEE COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
CHEROKEE COUNTY				
Andrews Water Supply Dam	High	40.0	1,500	Local Government
Appalachia Lake Dam	High	-	69,360	Federal
Greenbriar Development LLC Dam	High	-	-	-
Hiawassee Lake Dam	High	-	434,000	Federal
Hideaway Mountain Lake Dam	High	0.5	5	Private
Pied Piper Dam Lower	High	4.0	65	Private
Pied Piper Dam Upper	High	2.0	18	Private
Senecal Dam	High	0.1	1	Private
Skomp Dam	High	4.0	44.0	Private
Tanglewood Forest Dam Lower	High	8.0	100	Private
Upper Tanglewood Dam	High	2.0	25	Private

¹⁷ <https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety>

¹⁸ From the March 16, 2017 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources.

Source: North Carolina Division of Land Resources

Historical Occurrences

No dam breaches were reported in Cherokee County. However, several breach scenarios in the county could be catastrophic.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria. Of the 42 dams in Cherokee County, 11 are classified as high-hazard, which could result in fatalities if breached.

Probability of Future Occurrences

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 was completed in a *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.

A.2.13 Erosion

Location

Erosion in Cherokee County is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Cherokee County's mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the county, particularly along the banks of rivers and streams, but it is not a significant threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion in Cherokee County. This includes searching local newspapers, obtaining input from the planning team, and reviewing the previous hazard mitigation plan. Little information could be found and erosion was not addressed in the previous Cherokee County hazard mitigation plan. Prior to joining the regional planning effort, erosion was not addressed in the previous Cherokee County hazard mitigation plan.

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs (e.g., inches per year). There are no erosion rate records located in Cherokee County but it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for Cherokee County, and it will continue to occur. The annual probability level assigned for erosion is unlikely (less than 1 percent annual probability).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

A.2.14 Flood

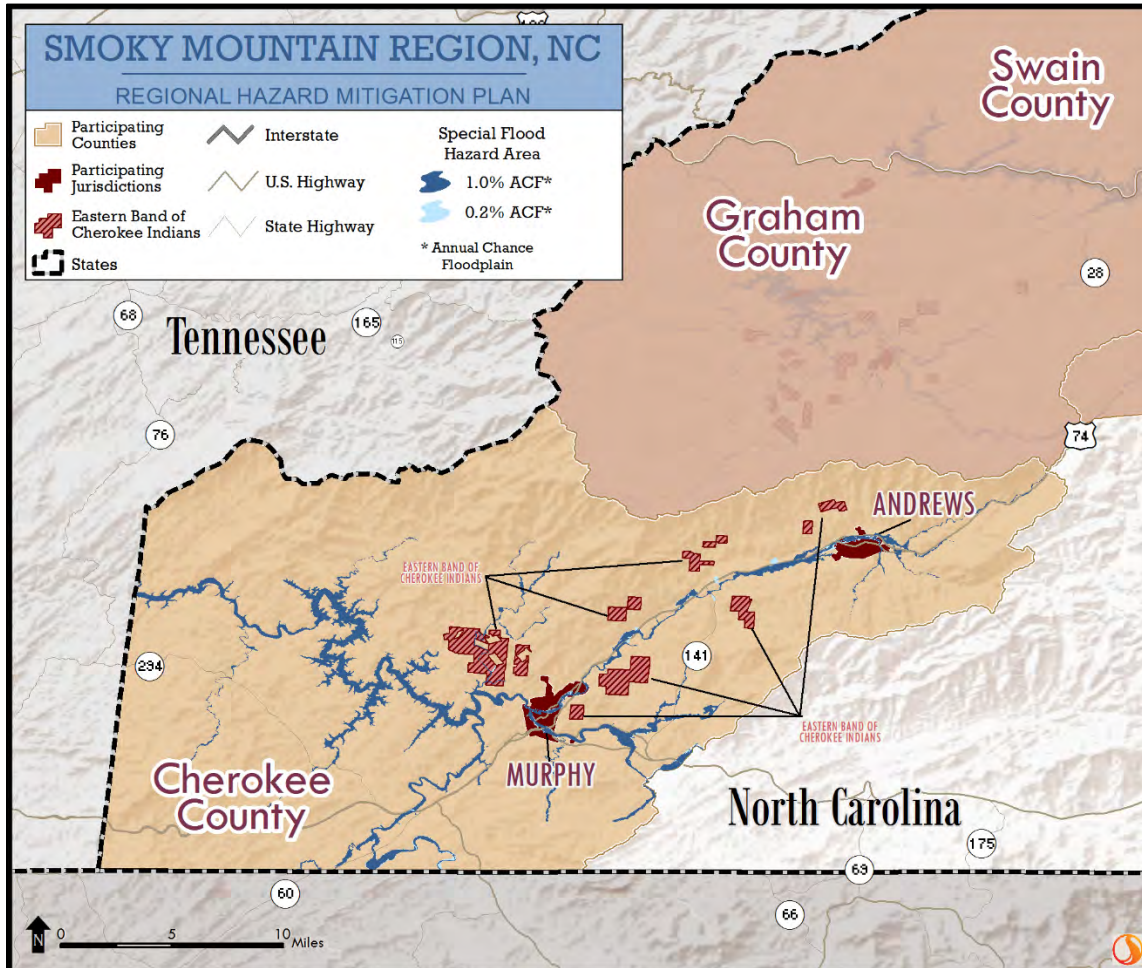
Location

There are areas in Cherokee County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).¹⁹ 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 467 square miles that make up Cherokee County, there are 7.63 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain) and 0.84 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain).

These flood zone values account for 1.8 percent of the total land area in Cherokee County. 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 A.6**, **Figure A.7**, and **Figure A.8** illustrate the location and extent of currently mapped special flood hazard areas for Cherokee County, the Town of Andrews, and the Town of Murphy based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

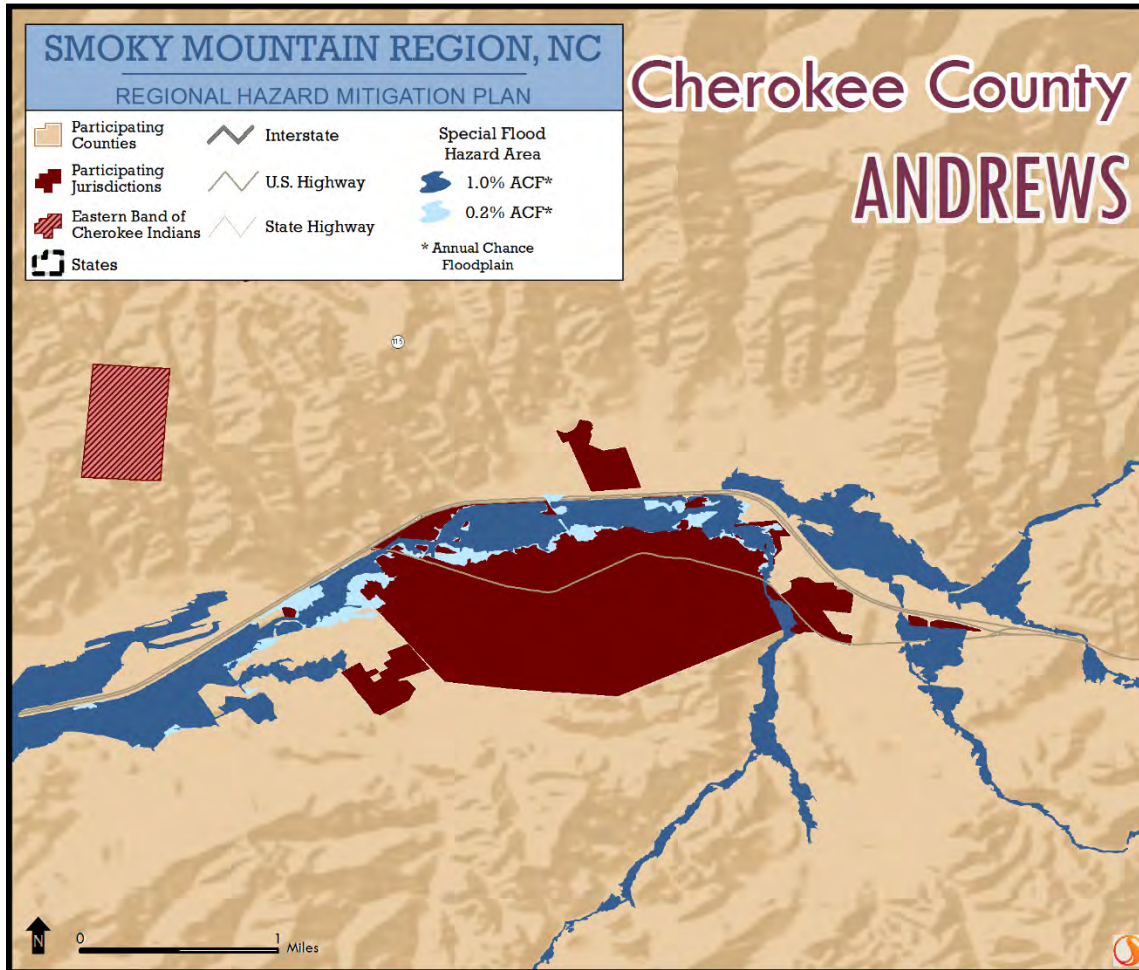
¹⁹ The county-level DFIRM data used for Cherokee County were updated in 2010.

FIGURE A.6: SPECIAL FLOOD HAZARD AREAS IN CHEROKEE COUNTY



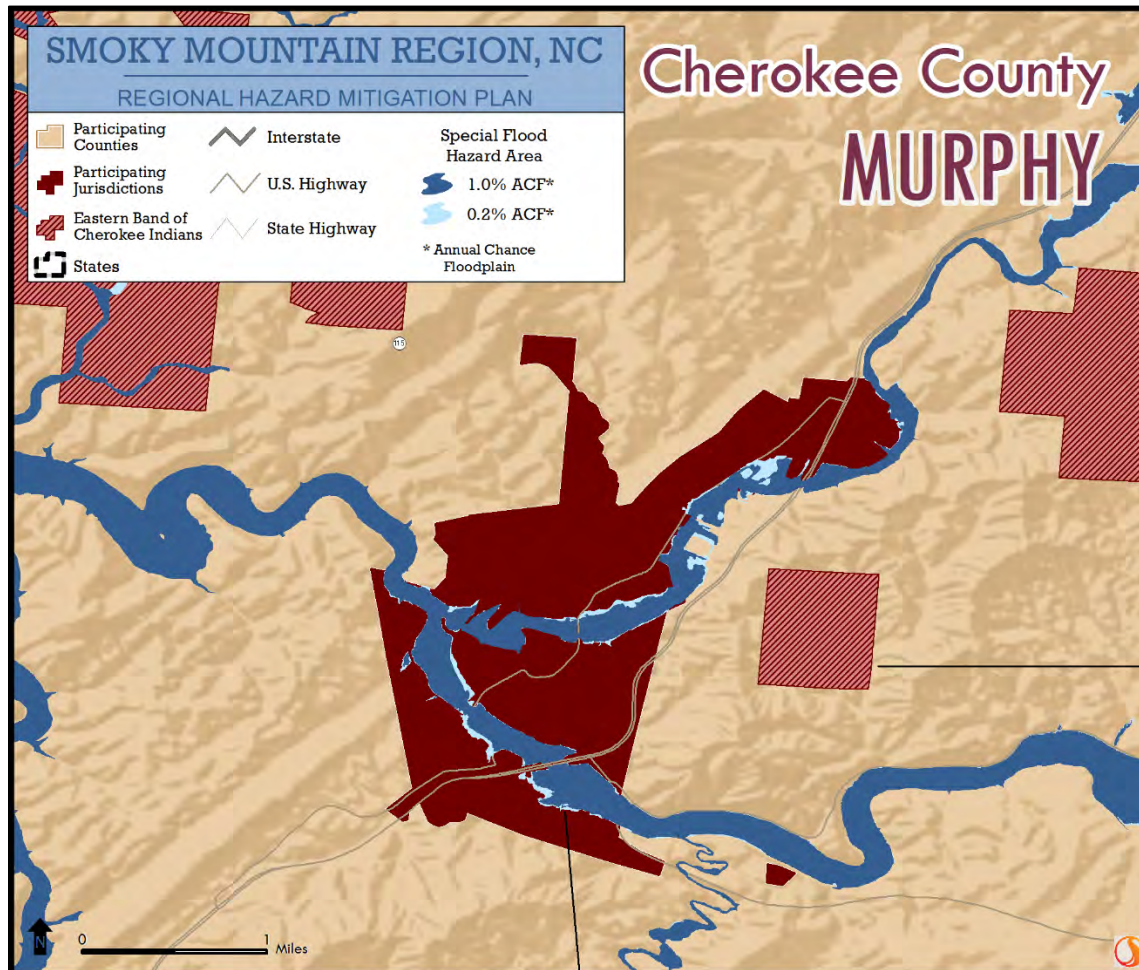
Source: Federal Emergency Management Agency

FIGURE A.7: SPECIAL FLOOD HAZARD AREAS IN ANDREWS



Source: Federal Emergency Management Agency

FIGURE A.8: SPECIAL FLOOD HAZARD AREAS IN MURPHY



Source: Federal Emergency Management Agency

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 15 events in Cherokee County since 1996.²⁰ A summary of these events is presented in **Table A.30**. These events accounted for over \$2.6 million (2017 dollars) in property damage in the county.²¹ Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table A.31**.

TABLE A.30: SUMMARY OF FLOOD OCCURRENCES IN CHEROKEE COUNTY

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
CHEROKEE COUNTY	15	\$2,600,376	\$0
Andrews	1	\$0	\$0

²⁰ These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

²¹ The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Murphy	6	\$16,482.15	\$0
Unincorporated Area	8	\$2,583,894	\$0

Source: National Centers for Environmental Information

TABLE A.31: HISTORICAL FLOOD EVENTS IN CHEROKEE COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
CHEROKEE COUNTY						
Murphy	6/16/1996	Flash Flood	0/0	\$3,622	\$0	Two feet of water flooded Hwy 64 after about 2 inches of rain fell within an hour.
Tomotla & Murphy	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Suit	6/28/1997	Flash Flood	0/0	\$26,557	\$0	Two private bridges (driveways) washed away and one heavily damaged on Crow Street in Suit. Also, 3 to 4 inches of water in the Easy Storage on Hwy 294 near Oak Grove Road.
Cherokee Co.	1/7/1998	Flood	0/0	\$0	\$0	--
Cherokee Co.	1/7/1998	Flash Flood	0/0	\$0	\$0	--
Andrews	5/7/1999	Flood	0/0	\$0	\$0	--
Murphy	7/7/1999	Flood	0/0	\$0	\$0	--
Murphy	6/4/2002	Flash Flood	0/0	\$0	\$0	--
Countywide	5/6/2003	Flash Flood	0/0	\$2,556,277	\$0	Creeks out of banks, low spots flooded, and roads closed countywide. Tiles, private bridges washed out.
Cherokee Co.	7/16/2003	Flash Flood	0/0	\$0	\$0	--
Murphy	9/21/2009	Flood	0/0	\$0	\$0	--
Texana	9/26/2009	Flood	0/0	\$0	\$0	--
Murphy	1/15/2013	Flood	0/0	\$2,251	\$0	Many roads closed due to flooding.
Murphy	12/2/2015	Flood	0/0	\$10,609	\$0	Peace Valley KOA Campground near Murphy was evacuated.
Tomotla	12/2/2015	Flood	0/0	\$1,061	\$0	Several homes had flooded basements along the banks of the Hiwassee and Valley Rivers. Several road closures. One person was evacuated from their home. One business along the Hiwassee River flooded.
Murphy	6/16/1996	Flash Flood	0/0	\$3,622	\$0	Two feet of water flooded highway 64 after a little over two inches of rain fell in about an hour.

Source: National Centers for Environmental Information

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 2,693 parcels (8 percent of the total) and 1,337 improved properties (8 percent of the total) located in the 1.0-percent annual chance floodplain or 0.2-percent annual chance floodplain within Cherokee County.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. A gage currently exists in Cherokee County at Tomatla, at the Valley River. The maximum discharge at this gage was 7,840 cubic feet per second in 2015. Historically, the greatest peak discharge recorded for the county was at the Hiwassee River above the Town of Murphy in 1961. Water reached a discharge of 23,100 cubic feet per second.

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been 37 flood losses reported in Cherokee County through the National Flood Insurance Program (NFIP) since 1970, totaling over \$500,000 in claims payments. A summary of these figures for the county is provided in **Table A.32**. 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 Cherokee County were either uninsured, denied claims payment, or not reported.

TABLE A.32: SUMMARY OF INSURED FLOOD LOSSES IN CHEROKEE COUNTY

Location	Flood Losses	Claims Payments
CHEROKEE COUNTY	37	\$501,476
Andrews	5	\$192,489
Murphy	4	\$24,946
Unincorporated Area	28	284,041

Source: FEMA, NFIP

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.

As of February 2017, there are eight non-mitigated repetitive loss properties located in Cherokee County, which accounted for 24 losses and more than \$232,000 in claims payments under the NFIP. The average claim amount for these properties is \$9,693. Seven of the eight properties are single family residential and the remaining property is nonresidential. Without mitigation, these properties will likely continue to experience flood losses. **Table A.34** presents detailed information on repetitive loss properties and NFIP claims and policies for Cherokee County.

TABLE A.33: SUMMARY OF REPETITIVE LOSS PROPERTIES IN CHEROKEE COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
CHEROKEE COUNTY	8		24	\$174,781	\$57,858	\$232,639	\$9,693
Andrews	2	1 single family, 1 nonresidential	4	\$8,134	\$48,370	\$56,504	\$14,126
Murphy	1	single family	2	\$3,566	\$0	\$3,566	\$1,783

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Unincorporated Area	5	5 single family	18	\$163,080	\$9,488	\$172,568	\$9,587

Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat in areas prone to flooding in Cherokee County. NCEI’s Storm Events Database indicated 15 flood events in Cherokee County between 1996 and 2016, resulting in a historic annual occurrence rate of 75-percent. Information on previous NFIP losses also indicates ongoing flood risk. Therefore, flood was assigned a future probability of “likely” (between 10 and 100 percent annual probability). The participating jurisdictions and unincorporated areas of the county have risk to flooding, though not all areas will experience flood. 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 county and participating jurisdictions. For example, the northern portion of Andrews has more floodplain and thus a higher risk of flood than the southern portion of the county. Flood 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.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 A.34** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and **Table A.35** presents potential at-risk property susceptible to either the 1.0-percent or 0.2-percent annual chance flood in Cherokee County. Both the number of parcels and the approximate value are presented.

TABLE A.34: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF)

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,569	8%	1,263	8%	\$224,416,554	12%
Andrews	74	9%	46	7%	\$12,728,090	15%
Murphy	84	7%	64	7%	\$25,042,784	15%
Unincorporated Area	2,408	8%	1,152	8%	\$186,559,700	11%
EBCI	3	11%	1	13%	\$85,980	5%

Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE A.35: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,693	8%	1,337	8%	\$242,453,714	13%
Andrews	83	10%	54	9%	\$13,739,810	17%
Murphy	129	11%	92	11%	\$32,513,574	20%
Unincorporated Area	2,475	8%	1,188	8%	\$195,754,730	12%
EBCI	6	21%	3	38%	\$445,600	26%

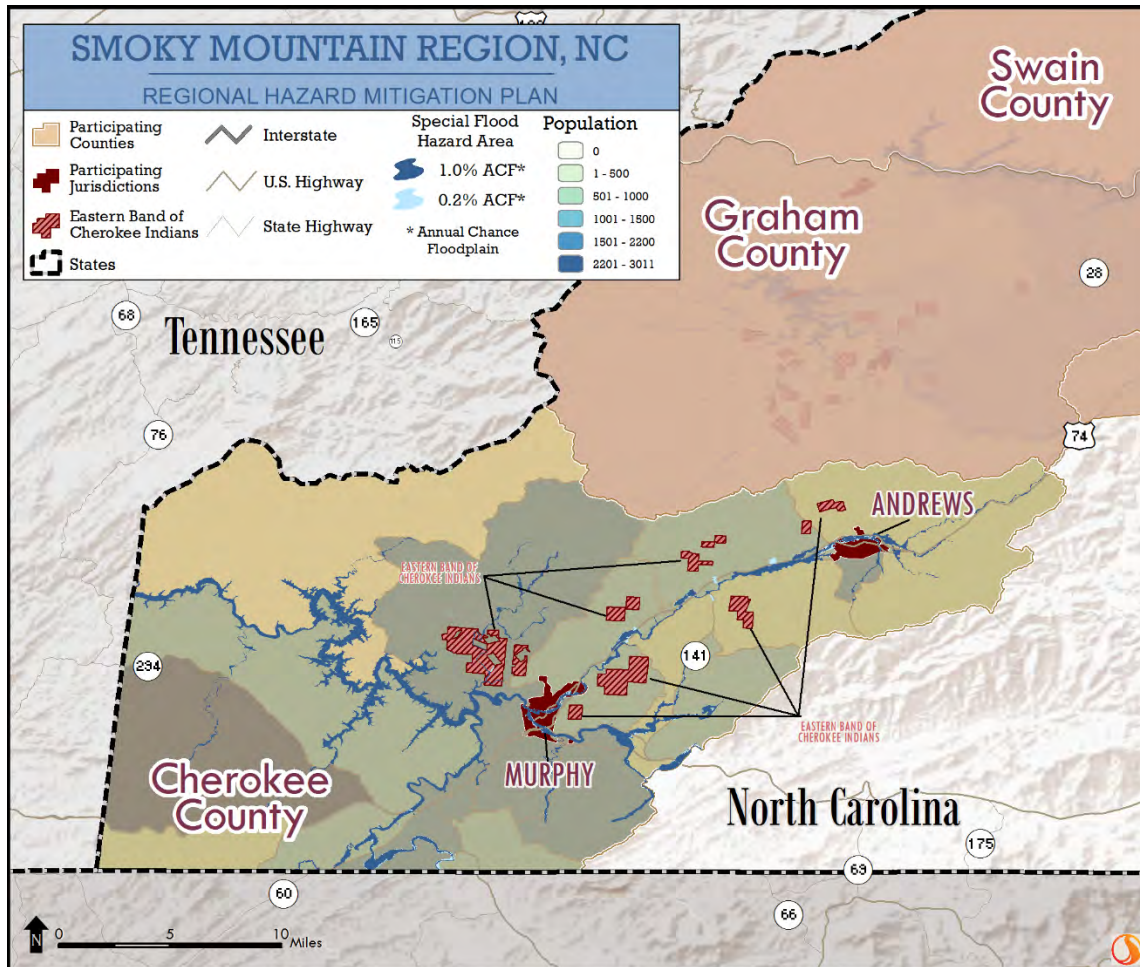
Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure A.9** is presented to gain a better understanding of at risk population.

FIGURE A.9: POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census 2015

Critical Facilities

The critical facility analysis revealed that there are 14 critical facilities located in the Cherokee County 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. Critical facilities located in the Cherokee County 1.0-percent annual chance floodplain are presented in **Table A.36**, and critical facilities located in the 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain are detailed in **Table A.37**. A list of specific critical facilities and their associated risk can be found in **Table A.48** at the end of this section.

TABLE A.36: CRITICAL FACILITIES LOCATED IN THE 1.0-PERCENT FLOOD HAZARD AREAS

ANNEX A: CHEROKEE COUNTY

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	0	0	2	0	2
EOC/Communications Facility	0	0	0	0	0
Public Works Facility	0	0	0	0	0
Fire Station/EMS	0	0	2	0	2
Police Station	0	0	0	0	0
Jail	0	0	0	0	0
Government Facilities	0	0	1	0	1
Government Office	0	0	0	0	0
Community Center	0	0	1	0	1
School	0	0	0	0	0
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	6	0	6
Energy/Solar Farm	0	0	2	0	2
Power Substation	0	0	1	0	1
Water and Wastewater Systems	0	0	1	0	1
Dam	0	0	2	0	2
Other	2	0	1	0	3
Commercial Facility	1	0	1	0	3
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	1	0	0	0	1
Transportation/Airport	0	0	0	0	0
Total	2	0	10	0	12

TABLE A.37: CRITICAL FACILITIES LOCATED IN THE COMBINED 1.0-PERCENT AND 0.2-PERCENT ANNUAL CHANCE FLOOD HAZARD AREAS

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	0	0	2	0	2
EOC/Communications Facility	0	0	0	0	0
Public Works Facility	0	0	0	0	0
Fire Station/EMS	0	0	2	0	2
Police Station	0	0	0	0	0
Jail	0	0	0	0	0
Government Facilities	0	0	1	0	1
Government Office	0	0	0	0	0
Community Center	0	0	1	0	1
School	0	0	0	0	0
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	0	0	7	0	7
Energy/Solar Farm	0	0	2	0	2
Power Substation	0	0	1	0	1
Water and Wastewater Systems	0	0	2	0	2
Dam	0	0	2	0	2
Other	3	0	1	0	4
Commercial Facility	2	0	1	0	3
Manufacturing Facility	0	0	0	0	0
Food/Agricultural Facility	1	0	0	0	1
Transportation/Airport	0	0	0	0	0
Total	3	0	11	0	14

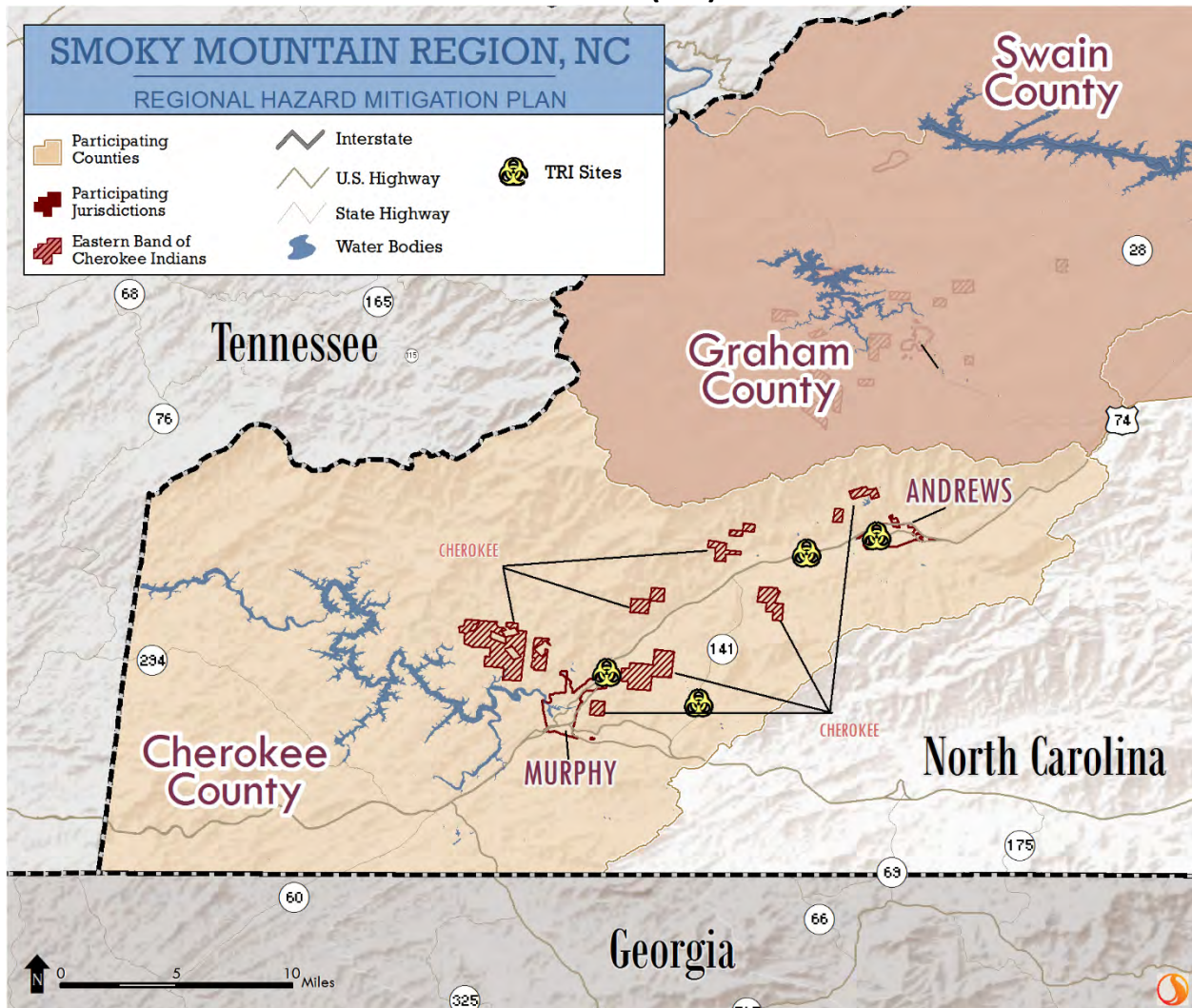
In conclusion, a flood has the potential to impact many existing and future buildings and populations in Cherokee County, though some areas are at a higher risk than others. All types of structures in a floodplain are at-risk, though elevated structures will have a reduced risk. As noted, the floodplains used in this analysis include the 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain as provided by FEMA. It is certainly possible more severe events could occur beyond these boundaries or urban (flash) flooding could impact additional structures. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

A.2.15 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Cherokee County has four TRI sites. These sites are shown in **Figure A.10**.

FIGURE A.10: TOXIC RELEASE INVENTORY (TRI) SITES IN CHEROKEE COUNTY



Source: EPA

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

Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” (highlighted in yellow in Table A.38 below) 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 materials “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 persons due to the presence of hazardous material, or
- ◆ a vehicle accident or derailment resulting in the release of a hazardous material.

Table A.39 presents detailed information on historic HAZMAT incidents reported in Cherokee County.

TABLE A.38: SUMMARY OF HAZMAT INCIDENTS IN CHEROKEE COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (\$)	Quantity Released
Cherokee County							
I-1972110115	10/9/1972	Murphy	Rail	No	0/0	\$0	0
I-1974010040	11/27/1973	Murphy	Rail	No	0/0	\$0	0
I-1976030970	3/16/1976	Murphy	Highway	No	0/0	\$0	0
I-1997010861	01/06/1997	Marble	Highway	No	0/0	\$7,060	50 LGA

Source: USDOT PHMSA

Extent

According to USDOT PHMSA, the largest hazardous materials incident reported in the county is 50 LGA released on the highway in Marble, an unincorporated community. It should be noted that larger events are possible. The most serious events could result in loss of life.

Probability of Future Occurrences

Given the location of four toxic release inventory sites in Cherokee County and several roadway and rail incidents, it is possible that a hazardous material incident may occur in the county. With four events occurring since 1972, a hazardous materials incident is possible (between 1 and 10% annual probability). County and town 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.

Although there are four TRI sites and a limited record of previous events in the county, hazardous materials incidents will continue to be a threat. The county may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

Vulnerability Assessment

Although historical evidence and existing Toxic Release Inventory sites indicate that Cherokee County is susceptible to hazardous materials events, there are few reports of damage. However, it is assumed that one major event could result in significant losses for Cherokee County.

Most hazardous materials 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

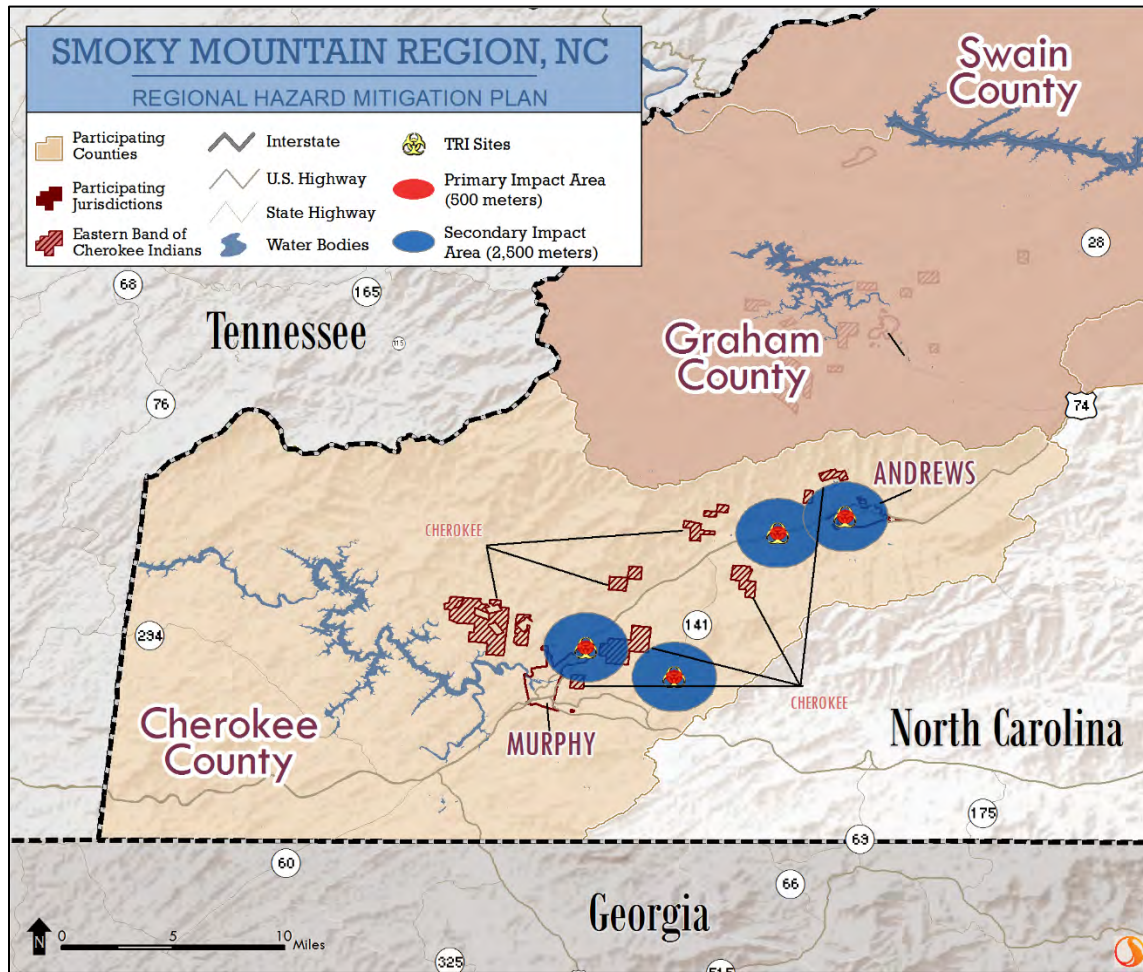
cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather 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.²² In both scenarios, two sizes of buffers—500 and 2,500 meters—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 Cherokee County, along with buffers, were used for analysis as shown in **Figure A.11**. 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 A.12** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table A.39** (fixed sites), **Table A.40** (mobile road sites) and **Table A.41** (mobile railroad sites).²³

²² This type of analysis will likely yield conservative results (generally higher than what is actually reported after an event).

²³ Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE A.11: TRI SITES WITH BUFFERS IN CHEROKEE COUNTY



Source: EPA

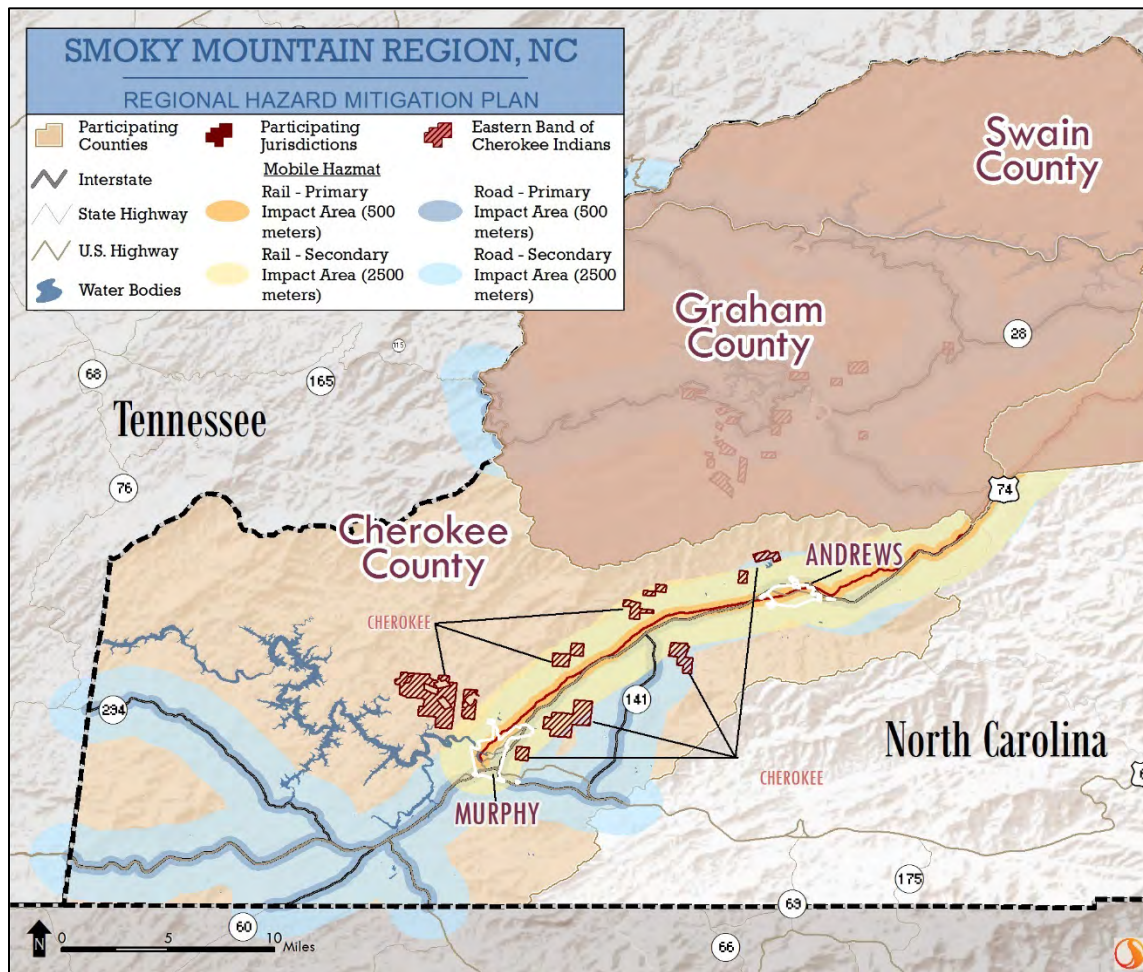
TABLE A.39: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (FIXED SITES)

Location	500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	245	1%	175	1%	\$29,763,790	2%
Andrews	155	18%	116	19%	\$15,539,610	19%
Murphy	4	0%	2	0%	\$517,780	0%
Unincorporated Area	86	0%	57	0%	\$13,706,400	1%
EBCI	0	0%	0	0%	\$0	0%

Location	2,500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	4,121	12%	2,417	15%	\$290,615,400	15%
Andrews	846	99%	622	99%	\$81,404,496	99%
Murphy	143	12%	85	10%	\$22,709,174	14%
Unincorporated Area	3,130	10%	1,710	11%	\$186,501,730	11%
EBCI	2	3%	0	0%	\$0	0%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

FIGURE A.12: MOBILE HAZMAT BUFFERS IN CHEROKEE COUNTY



**TABLE A.40: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - ROAD)**

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	7,598	22%	4,259	26%	\$540,112,744	28%
Andrews	172	20%	117	19%	\$22,415,220	27%
Murphy	532	44%	371	42%	\$64,239,544	40%
Unincorporated Area	6,888	22%	3,767	25%	\$452,088,270	27%
EBCI	6	9%	4	17%	\$1,369,710	46%
Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	24,132	71%	12,507	75%	\$1,439,337,260	75%
Andrews	853	100%	627	100%	\$82,241,206	100%
Murphy	1,206	100%	876	100%	\$161,999,264	100%
Unincorporated Area	22,036	70%	10,991	73%	\$1,192,993,030	72%
EBCI	37	56%	13	54%	\$2,103,760	70%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

**TABLE A.41: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,610	8%	1,649	10%	\$214,948,847	11%
Andrews	558	65%	411	66%	\$61,039,976	74%
Murphy	597	50%	431	49%	\$82,873,890	51%
Unincorporated Area	1,447	5%	801	5%	\$69,424,021	4%
EBCI	8	12%	6	25%	\$1,610,960	54%
Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	8,486	25%	4,896	29%	\$601,459,321	32%
Andrews	853	100%	627	100%	\$82,241,206	100%
Murphy	1,205	100%	875	100%	\$161,797,504	100%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	6,401	20%	3,384	22%	\$355,576,101	21%
EBCI	27	41%	10	42%	\$1,844,510	62%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk to a hazardous materials incident. 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 42 Cherokee County facilities located in a HAZMAT risk zone, nine of which are within the 500-meter buffer. The number of critical facilities within HAZMAT risk zones for each jurisdiction in Cherokee County are detailed in **Table A.42**. A list of specific critical facilities and their associated risk can be found in **Table A.48** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors in Cherokee County revealed that there are 127 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 76 critical facilities located in the railroad HAZMAT buffer areas. A list of specific critical facilities and their associated risk can be found in **Table A.48** at the end of this section.

TABLE A.42: CRITICAL FACILITIES IN HAZMAT RISK ZONES IN CHEROKEE COUNTY

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
Cherokee County	9	42	77	127	42	76
Andrews	4	15	6	15	13	15
Murphy	0	6	9	29	17	29
Unincorporated Area	5	19	62	81	12	30
EBCI	0	2	0	2	0	2

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in Cherokee County. 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. Further, incidents from neighboring counties could also impact the county and participating jurisdictions.

A.2.16 Wildfire

Location

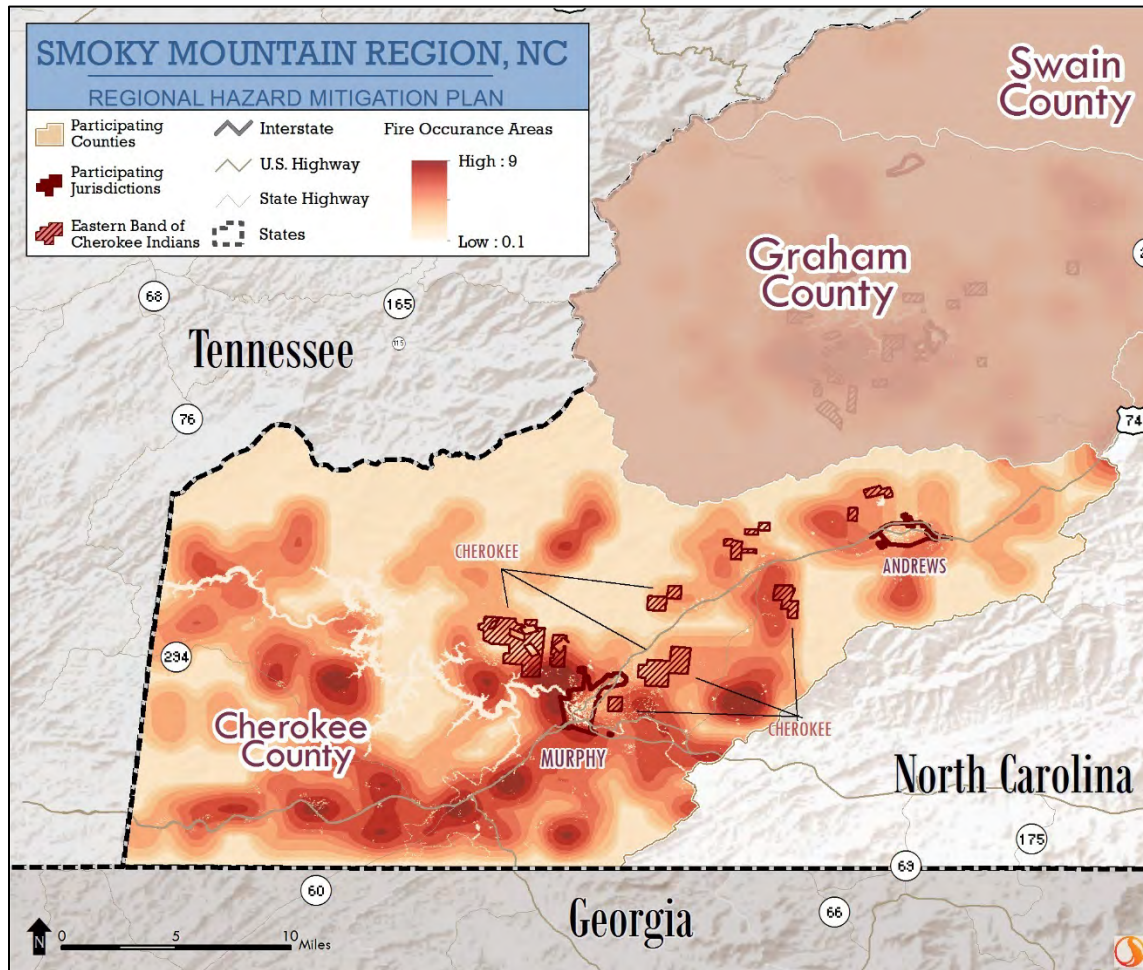
The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic locations impacted.

Historical Occurrences

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county.

Figure A.13 shows the Fire Occurrence Areas (FOA) in Cherokee County based on data from the Southern Wildfire Risk Assessment.

FIGURE A.13: HISTORIC WILDFIRE EVENTS IN CHEROKEE COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, Cherokee County experiences an average of 50 wildfires annually which burn an average of 143 acres per year. The data indicates that most of these fires are small, averaging three acres per fire. **Table A.43** lists the number of reported wildfire occurrences in the county between the years 2002 and 2016.

TABLE A.43: HISTORICAL WILDFIRE OCCURRENCES IN CHEROKEE COUNTY

Year	Number of Fires	Number of Acres Burned
2002	33	109.1
2003	23	86
2004	51	109
2005	45	118.6
2006	95	224.7
2007	84	313
2008	68	367

Year	Number of Fires	Number of Acres Burned
2009	50	66
2010	43	45
2011	46	141
2012	45	47
2013	23	67
2014	49	178
2015	23	144
2016	70	127

Source: North Carolina Division of Forest Resources

Extent

Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2002 to 2016. The greatest number of fires to occur in Cherokee County in any year was 95 in 2006. The greatest number of acres to burn in the county in a single year occurred in 2008 when 367 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

Probability of Future Occurrences

Wildfire events will be an ongoing annual occurrence in Cherokee County. 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. In this case, the participating jurisdictions appear to have a similar risk to the surrounding areas. The probability assigned to Cherokee County for future wildfire events is highly likely (greater than 90% annual probability).

Vulnerability Assessment

Although historical evidence indicates that Cherokee County is susceptible to wildfire events, there are few reports of damage. However, it should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment’s Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non- specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Figure A.14, Figure A.15, and Figure A.16 show the wildfire risk areas for Cherokee County and participating jurisdictions. Initially provided as raster data, it was converted to a polygon for analysis. Cherokee County has the highest percentage of parcels and improved parcels labeled as high and very high risk when compared to the region, as detailed in **Table A.44**. However, there is considerable risk overall when viewed outside of just high risk areas.

FIGURE A.14: WILDFIRE RISK AREAS IN CHEROKEE COUNTY

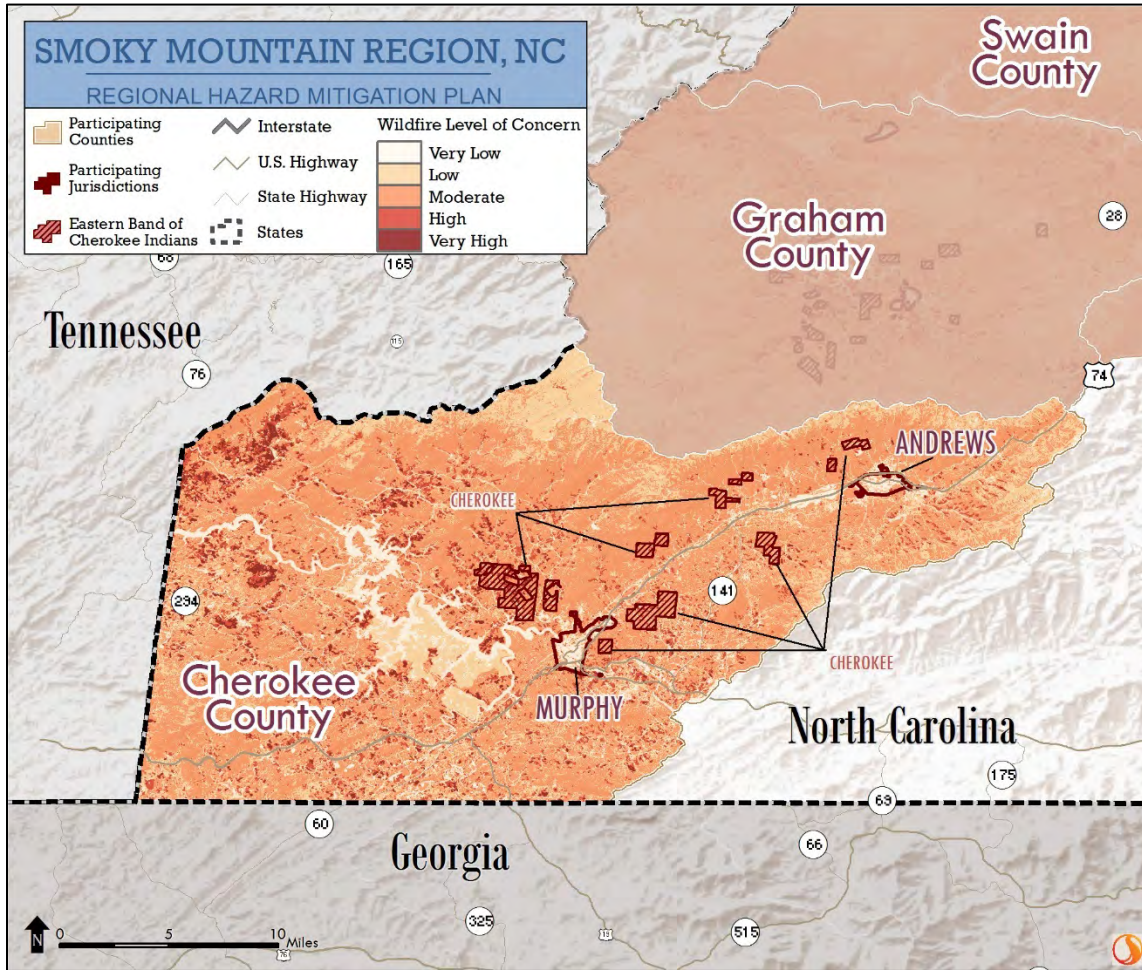


FIGURE A.15: WILDFIRE RISK AREAS IN ANDREWS

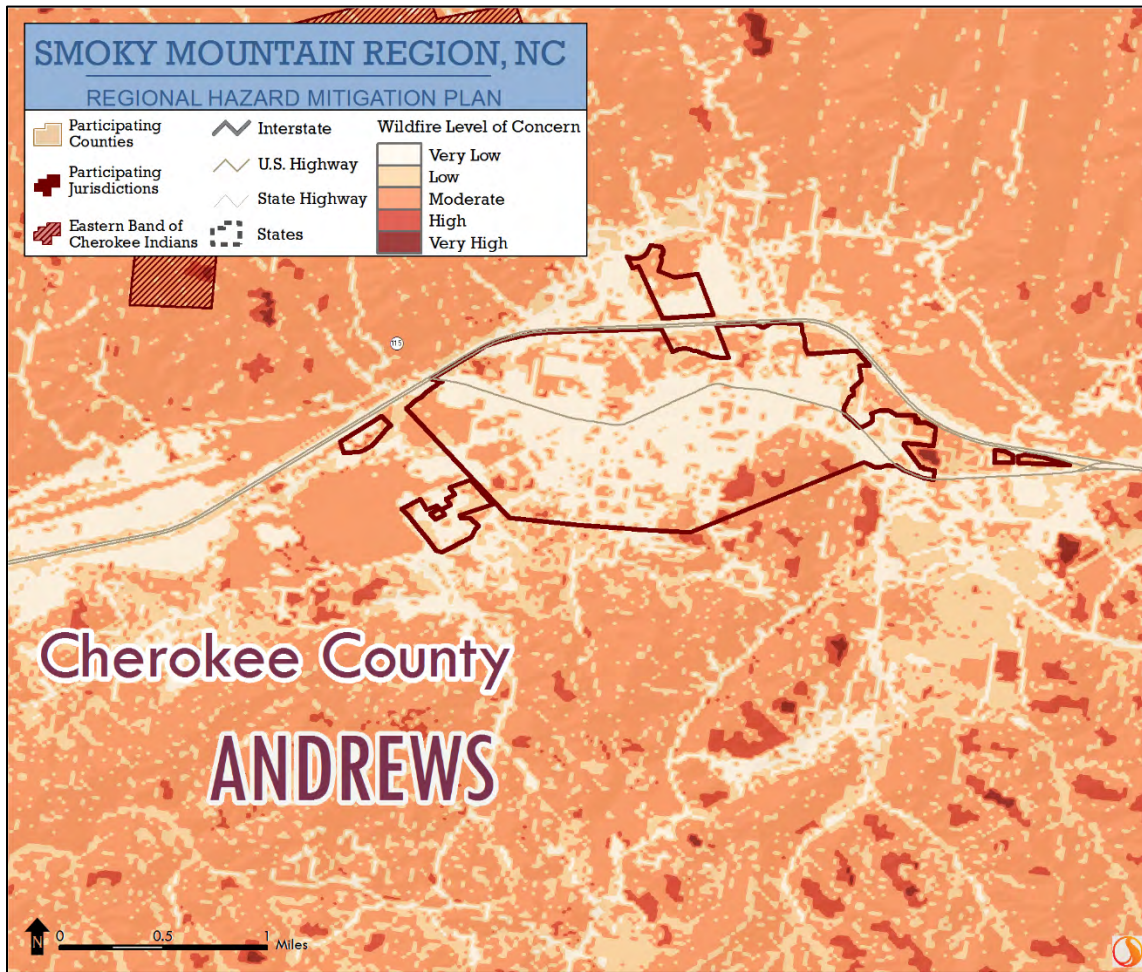
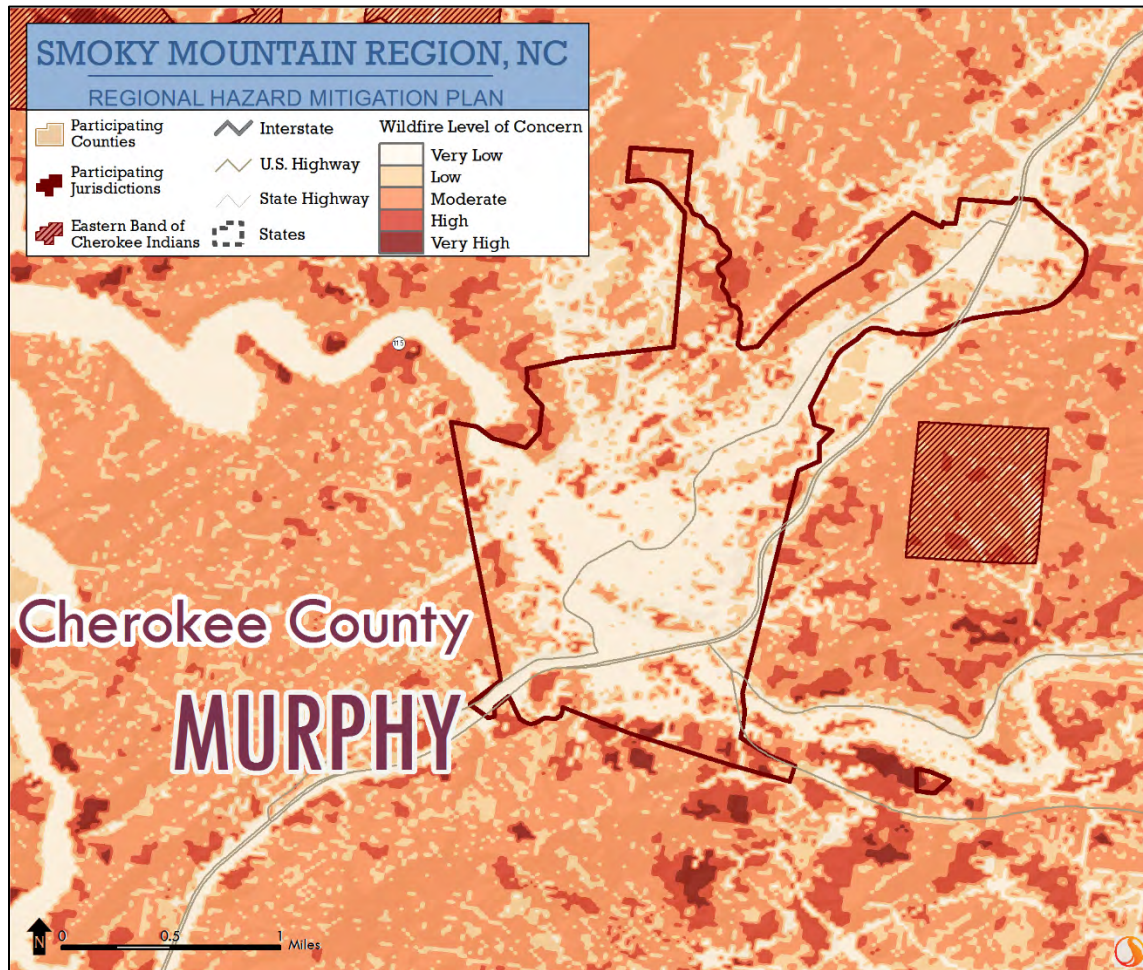


FIGURE A.16: WILDFIRE RISK AREAS IN MURPHY



Source: Southern Wildfire Risk Assessment Data

TABLE A.44: VULNERABILITY OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	14,124	42%	7,098	43%	\$886,814,265	46%
Andrews	71	8%	43	7%	\$11,844,746	14%
Murphy	228	19%	147	17%	\$37,389,310	23%
Unincorporated Area	13,785	43%	6,891	46%	\$835,241,799	50%
EBCI	40	61%	17	71%	\$2,338,410	78%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

Looking at jurisdictional level, unincorporated areas of the county face the highest level of wildfire risk. While the jurisdictions report a fairly low number of parcels and improvements in high or very high risk

areas, each should be mindful that they are on the urban-wildland boundary (particularly in Murphy) and fire may quickly spread to those lower areas of concern. In general, densely developed areas that are not in the wildland urban interface, which are present in some jurisdictional areas, are at a lower risk to wildfire.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. 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

The critical facility analysis revealed that there are 17 critical facilities located in wildfire areas of high to very high risk. Of all the counties in the region, Cherokee County appears to have an elevated risk, with the greatest number of critical facilities in areas of high to very high risk, as detailed in **Table A.45**. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table A.48** at the end of this section.

TABLE A.45: CRITICAL FACILITIES IN HIGH TO VERY HIGH WILDFIRE RISK AREAS IN CHEROKEE COUNTY

CHEROKEE COUNTY					
Category and Type	Andrews	Murphy	Unincorporated	EBCI	Total
Emergency Services	0	0	2	0	2
EOC/Communications Facility	0	0	1	0	1
Public Works Facility	0	0	0	0	0
Fire Station/EMS	0	0	1	0	1
Police Station	0	0	0	0	0
Jail	0	0	0	0	0
Government Facilities	0	0	4	0	4
Government Office	0	0	1	0	1
Community Center	0	0	1	0	1
School	0	0	2	0	2
Medical Facilities	0	0	0	0	0
Hospital	0	0	0	0	0
Public Works/Utilities	1	0	6	0	7
Energy/Solar Farm	0	0	3	0	3
Power Substation	0	0	1	0	1
Water and Wastewater Systems	1	0	1	0	2
Dam	0	0	1	0	1
Other	1	0	3	0	4
Commercial Facility	1	0	1	0	2
Manufacturing Facility	0	0	1	0	1
Food/Agricultural Facility	0	0	1	0	1
Transportation/Airport	0	0	0	0	0
Total	2	0	15	0	17

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in Cherokee County. Wildfires present significant risk to the county and jurisdictions within. These wildfires impact the economy by potentially causing widespread destruction of homes and critical facilities and interrupting businesses.

A.2.17 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Cherokee County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table A.46 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE A.46: SUMMARY OF PRI RESULTS FOR CHEROKEE COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Highly Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.6
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	2.2
Thunderstorm/ High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 6 hours	3.4
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.0
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.7
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Unlikely	Minor	Small	More than 24 hours	More than 1 week	1.5
Flood	Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3.0
Other Hazards						
Hazardous Materials Incident	Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

A.2.18 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Cherokee County, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table A.47**). 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 Cherokee County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section A.4. 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.

TABLE A.47: CONCLUSIONS ON HAZARD RISK FOR CHEROKEE COUNTY

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire Landslide
MODERATE RISK	Tornado Hurricane and Coastal Storm Earthquake Drought Hailstorm
LOW RISK	Hazardous Material Incident Lightning Dam and Levee Failure Erosion

Conclusions on Hazard Vulnerability

The results of this vulnerability assessment are useful in at least three ways:

- ◆ Informed decision-making based on improved understanding of risk.
- ◆ Baseline measure on which to reduce risk.
- ◆ Relative comparison of risk among the natural hazards addressed to prioritize greatest needs.

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 atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table A.48** 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”).

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TABLE A.48: AT-RISK CRITICAL FACILITIES IN CHEROKEE COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
CHEROKEE COUNTY																				
Best Western	Commercial Facility	X	X	X	X	X	X	X	X	X					X	X	X		X	
Cool Springs Apartments	Commercial Facility	X	X	X	X	X	X	X	X	X							X	X	X	
Days Inn Motel	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Garden Apartments	Commercial Facility	X	X	X	X	X	X	X	X		X			X	X		X	X	X	
Gwenmont Apartments	Commercial Facility	X	X	X	X	X	X	X	X	X							X	X	X	
Hampton Inn	Commercial Facility	X	X	X	X	X	X	X	X	X					X	X	X		X	
Harrah's Cherokee Valley River Casino	Commercial Facility	X	X	X	X	X	X	X	X		X				X		X		X	
Harrah's Hotel	Commercial Facility	X	X	X	X	X	X	X	X	X					X		X		X	
Holiday Inn Express	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	X
Ingles Market at 2060 US 19	Commercial Facility	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	
Ingles Market at 297 Main St	Commercial Facility	X	X	X	X	X	X	X	X		X		X		X	X	X		X	
John C Campbell Folk School	Commercial Facility	X	X	X	X	X	X	X	X		X						X			
Lowes	Commercial Facility	X	X	X	X	X	X	X	X		X				X	X	X		X	
Mission Farm	Commercial Facility	X	X	X	X	X	X	X	X		X	X	X			X	X			
Mountain Vista Inn	Commercial Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Murphy Motel	Commercial Facility	X	X	X	X	X	X	X	X	X						X	X			
Quality Inn	Commercial Facility	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X
Sunset Motel	Commercial Facility	X	X	X	X	X	X	X	X		X						X		X	

ANNEX A: CHEROKEE COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Walmart	Commercial Facility	X	X	X	X	X	X	X	X	X				X	X	X		X		
West Motel	Commercial Facility	X	X	X	X	X	X	X	X	X				X		X		X		
Westwind Apartments	Commercial Facility	X	X	X	X	X	X	X	X		X			X		X	X	X		
Andrews Community Center	Community Center	X	X	X	X	X	X	X	X		X		X	X		X	X	X		
Bellview Community Center	Community Center	X	X	X	X	X	X	X	X		X				X	X				
Culberson Community Center	Community Center	X	X	X	X	X	X	X	X	X					X	X				
Grape Creek Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Hanging Dog Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Hiwassee Dam Community Center	Community Center	X	X	X	X	X	X	X	X	X					X	X				
Marble Community Center	Community Center	X	X	X	X	X	X	X	X	X					X	X	X	X		
Martins Creek Community Center	Community Center	X	X	X	X	X	X	X	X		X									
Peachtree Community Center	Community Center	X	X	X	X	X	X	X	X		X		X	X	X	X				
Ranger Community Center	Community Center	X	X	X	X	X	X	X	X		X	X	X		X	X				
Texana Community Center	Community Center	X	X	X	X	X	X	X	X	X						X	X	X		
Topton Community Center	Community Center	X	X	X	X	X	X	X	X		X				X	X	X	X		
Unaka Community Center	Community Center	X	X	X	X	X	X	X	X	X										
Wolf Creek Community Center	Community Center	X	X	X	X	X	X	X	X	X					X	X			X	
Appalachia Dam	Dam	X	X	X	X	X	X	X	X		X	X	X							
Beaver Creek Dam	Dam	X	X	X	X	X	X	X	X	X										

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Dan Holland Dam	Dam	X	X	X	X	X	X	X	X	X				X		X		X	X	
TVA Hiwassee Dam	Dam	X	X	X	X	X	X	X	X	X		X	X							
Bryson 60 LLC	Energy / Solar Farm	X	X	X	X	X	X	X	X		X				X	X				
Inman Solar	Energy / Solar Farm	X	X	X	X	X	X	X	X		X								X	
Ketner Farms	Energy / Solar Farm	X	X	X	X	X	X	X	X		X									
Ledford Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X							X			
Martins Creek Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X								X	
Mcdonald Property	Energy / Solar Farm	X	X	X	X	X	X	X	X	X							X			
Murphy Point Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X				X	X				
Murphy Power Farms LLC	Energy / Solar Farm	X	X	X	X	X	X	X	X	X		X	X			X	X			
NC Renewable Properties	Energy / Solar Farm	X	X	X	X	X	X	X	X	X		X	X			X	X			
Raper Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X		X					X	X			
Shields Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X						X	X		X	
Solar Farm	Energy / Solar Farm	X	X	X	X	X	X	X	X	X						X	X			
Cell Tower at 1120 Mason Way	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X		X	
Cell Tower at 124 Church of Christ Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X			X			X			
Cell Tower at 150 Robin Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X	X							X		X	
Cell Tower at 192 Lance Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X			

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Cell Tower at 4216 Harshaw Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 447 Red Belt Ln	EOC / Communications Facility	X	X	X	X	X	X	X	X		X									
Cell Tower at 5386 W US 64	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 659 High Falls Rd	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
Cell Tower at 66 Hunter Rdg	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X			X
Cell Tower at 914 Hideaway Mountain Dr	EOC / Communications Facility	X	X	X	X	X	X	X	X	X										
Cell Tower / Emergency Radio Repeater Fain Mountain Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X					X		X		X	
Cherokee County 911, CKSR PSAP	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X	
Cherokee County Communications (EOC) Center	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X	
Emergency Radio Repeater East Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X		X				X		X		X	
Emergency Radio Repeater North Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X										
Emergency Radio Repeater West Tac Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X			
Emergency Radio Repeater Wolf Creek Site	EOC / Communications Facility	X	X	X	X	X	X	X	X	X										
Frontier Communications Operations Center	EOC / Communications Facility	X	X	X	X	X	X	X	X		X						X	X	X	

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WCVP AM / WCNG FM Radio Station	EOC / Communications Facility	X	X	X	X	X	X	X	X		X					X	X			
WKRK AM Radio Station	EOC / Communications Facility	X	X	X	X	X	X	X	X	X						X	X			X
Andrews Fire Department Station 14	Fire Station / EMS	X	X	X	X	X	X	X	X		X				X		X	X	X	
Andrews Rescue Squad Station 34	Fire Station / EMS	X	X	X	X	X	X	X	X		X				X		X	X	X	
Bellview Fire Department Station 18	Fire Station / EMS	X	X	X	X	X	X	X	X		X					X	X			
Cherokee County Ems Station 1	Fire Station / EMS	X	X	X	X	X	X	X	X		X						X	X	X	
Cherokee County Ems Station 2	Fire Station / EMS	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	
Cherokee County Ems Station 3	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			
Cherokee County Rescue Squad Station 20	Fire Station / EMS	X	X	X	X	X	X	X	X	X							X	X	X	
Culberson Fire Department Station 13	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			
Grape Creek Fire Department Station 17	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Hanging Dog Fire Department Station 22	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Hiwassee Dam Fire Department Station 21	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			
Martins Creek Fire Department Station 26	Fire Station / EMS	X	X	X	X	X	X	X	X		X									
Murphy Fire Department Station 12	Fire Station / EMS	X	X	X	X	X	X	X	X		X						X	X	X	

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Peachtree Fire Department Station 16	Fire Station / EMS	X	X	X	X	X	X	X	X		X			X	X	X	X			
Ranger Fire Department Station 19	Fire Station / EMS	X	X	X	X	X	X	X	X		X	X	X			X	X			
Substation Cherokee County Rescue Station 20	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			
Substation Hiwassee Dam Fire Department Station 21	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Substation of Murphy Fire Department Station 12	Fire Station / EMS	X	X	X	X	X	X	X	X	X					X		X	X	X	
Substation Valleytown Fire Department Station 29	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X	X	X	
Substation Valleytown Fire Department Station 30	Fire Station / EMS	X	X	X	X	X	X	X	X		X					X	X	X	X	
Unaka Fire Department Station 25	Fire Station / EMS	X	X	X	X	X	X	X	X	X										
Valleytown Fire Department Station 31	Fire Station / EMS	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Wolf Creek Fire Department Station 24	Fire Station / EMS	X	X	X	X	X	X	X	X	X						X	X			X
Bruce Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X						X			
CR Brown Enterprise	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	
Parker and Reichman	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X				X		X		X	
Raper Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X		X					X	X			X

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FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Woods Farm	Food / Agricultural Facility	X	X	X	X	X	X	X	X	X				X		X	X	X		
Andrews Town Hall	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X		
Cherokee County Annex Building	Government Office	X	X	X	X	X	X	X	X		X					X	X	X		
Cherokee County Courthouse	Government Office	X	X	X	X	X	X	X	X		X					X	X	X		
Cherokee County Department of Social Services	Government Office	X	X	X	X	X	X	X	X		X				X	X			X	
Cherokee County Health Department	Government Office	X	X	X	X	X	X	X	X	X						X	X	X		
Murphy Town Hall	Government Office	X	X	X	X	X	X	X	X		X					X	X	X		
Murphy Medical Center	Hospital	X	X	X	X	X	X	X	X		X				X	X				
Cherokee County Jail	Jail	X	X	X	X	X	X	X	X	X						X	X	X		
Aegis Power Systems	Manufacturing Facility	X	X	X	X	X	X	X	X		X			X	X	X	X		X	
Moog Components Group	Manufacturing Facility	X	X	X	X	X	X	X	X		X			X	X	X	X			
Andrews Police Department	Police Station	X	X	X	X	X	X	X	X		X			X		X	X	X		
Cherokee County Sheriff's Department	Police Station	X	X	X	X	X	X	X	X	X						X	X	X		
Murphy Police Department	Police Station	X	X	X	X	X	X	X	X		X					X	X	X		
Blue Ridge Mountain EMC Substation	Power Substation	X	X	X	X	X	X	X	X	X					X	X				
Duke Power Substation at 489 Palmer Ln	Power Substation	X	X	X	X	X	X	X	X	X						X		X	X	
Duke Power Substation at 1823 Business 19	Power Substation	X	X	X	X	X	X	X	X		X			X	X	X		X		

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FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
T.V.A. / Blue Ridge Mountain EMC Substation	Power Substation	X	X	X	X	X	X	X	X		X				X	X		X		
TVA Substation	Power Substation	X	X	X	X	X	X	X	X		X	X	X		X	X		X		
NCDOT Construction and Maintenance Complex	Public Works Facility	X	X	X	X	X	X	X	X		X				X	X				
NCDOT Garage	Public Works Facility	X	X	X	X	X	X	X	X	X					X	X				
NCDOT Offices	Public Works Facility	X	X	X	X	X	X	X	X		X			X	X	X	X	X		
Andrews Elementary School	School	X	X	X	X	X	X	X	X		X			X		X	X	X		
Andrews High School	School	X	X	X	X	X	X	X	X		X			X		X		X		
Andrews Middle School	School	X	X	X	X	X	X	X	X		X				X	X		X		
Hiwassee Dam Elementary/Middle/High School	School	X	X	X	X	X	X	X	X	X					X	X				
Marble Elementary School	School	X	X	X	X	X	X	X	X	X					X	X	X	X		
Martins Creek Elementary School	School	X	X	X	X	X	X	X	X		X									
Mountain Youth Center	School	X	X	X	X	X	X	X	X		X									
Murphy Adventist Elementary School	School	X	X	X	X	X	X	X	X		X				X	X				
Murphy Elementary School	School	X	X	X	X	X	X	X	X		X					X		X		
Murphy High School	School	X	X	X	X	X	X	X	X	X				X	X	X		X		
Murphy Middle School	School	X	X	X	X	X	X	X	X		X			X	X	X		X		
Peachtree Elementary School	School	X	X	X	X	X	X	X	X		X			X	X	X	X		X	

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Ranger Elementary School	School	X	X	X	X	X	X	X	X	X					X	X				X
The Learning Center	School	X	X	X	X	X	X	X	X	X						X	X	X		
Tri-County Community College	School	X	X	X	X	X	X	X	X		X				X	X				
Andrews Murphy Airport	Transportation / Airport	X	X	X	X	X	X	X	X	X				X	X	X	X	X		
Andrews Waste Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X		X	X	X	X	X	
Andrews Water Filtration Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X				X		X		X		
Murphy Water Filtration Plant / WWT	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X							X		X	
Town of Andrews Water Tank at 155 Wells St	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X				X		X		X	X
Town of Andrews Water Tank at 158 Ridge Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X						X	X	X	X	
Town of Andrews Water Tank at 9556 US 19	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X		X	
Town of Murphy Water Intake and Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Town of Murphy Water Tank at 108 Fain Peak	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X		X	
Town of Murphy Water Tank at 1513 Poor House Mountain Trl	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Town of Murphy Water Tank at 315 Fort Butler St	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X				X		X	X	X		
Town of Murphy Water Tank at 4582 E US 64	Water and Wastewater Systems	X	X	X	X	X	X	X	X	X									X	

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
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Town of Murphy Water Tank at 884 Pleasant Valley Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Town of Murphy Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			X

A.3 CHEROKEE COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of Cherokee County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

A.3.1 Planning and Regulatory Capability

Table A.49 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Cherokee County. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE A.49: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	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
Cherokee County	✓						✓					*	*		✓					✓	✓	✓	✓
Andrews	✓														✓	✓						✓	
Murphy	✓														✓	✓	✓					✓	

A more detailed discussion on the county’s planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan

Cherokee County, Town of Andrews, Town of Murphy participated in the previous (2012) update of this regional plan.

Emergency Operations Plan

Cherokee County maintains an emergency operations plan through its Emergency Management Department.

General Planning

Comprehensive Land Use Plan

Cherokee County does not have an active county growth management plan.

Zoning Ordinance

Cherokee County does not have a zoning ordinance in place. However, the Towns of Andrews and Murphy have adopted zoning ordinances that are overseen by the Town Zoning Administrators.

Subdivision Ordinance

Cherokee County does not have a subdivision ordinance in place.

Building Codes, Fire Codes Permitting, and Inspections

North Carolina has a state compulsory building and fire code which applies throughout the state. The building code is enforced throughout the county by the county building inspector. The Towns of Andrews and Murphy have not adopted their own building codes.

Capital Improvement Plan

Cherokee County is currently developing a capital improvement plan for future implementation

Economic Development Plan

Cherokee County is currently developing an economic development plan for future implementation.

Floodplain Management

Table A.50 provides NFIP policy and claim information for each participating jurisdiction in Cherokee County.

TABLE A.50: 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
CHEROKEE COUNTY	2/2/89	4/19/10	137	\$31,342,900	28	\$284,041
Andrews	2/1/85	4/19/10	6	\$1,939,900	5	\$192,489.11
Murphy	7/3/86	4/19/10(M)	6	\$ 2,016,000	4	\$24,946.48

(M) – No Elevation Determined, all Zone A, C and X

(S) – Suspended Community

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance to meet the NFIP requirements. Cherokee County, Andrews, and Murphy all participate in the NFIP and have adopted flood damage prevention regulations.

Stormwater Management Plan

Cherokee County has not adopted a stormwater management plan.

Community Rating System

Cherokee County has joined the Community Rating System.

A.3.2 Administrative and Technical Capability

Table A.51 provides a summary of the capability assessment results for Cherokee County with regard to relevant staff and personnel resources.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A “C” indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (since the 2017 plan).

TABLE A.51: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Cherokee County		✓		✓	✓		✓	✓	✓	
Andrews		✓						✓		
Murphy		✓								

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.

A.3.3 Fiscal Capability

Table A.52 provides a summary of the results for Cherokee County with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A “C” indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE A.52: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Cherokee County	✓	✓							✓
Andrews	✓	✓			*				✓
Murphy	✓	✓			*				✓

A.3.4 Political Capability

The previous hazard mitigation plan indicates that the Cherokee County Commissioners support the concept of hazard mitigation and will promote the economic efficiency and social utility of mitigation measures contained in the hazard mitigation plan. Additionally, Cherokee County, Andrews, and Murphy feel their residents have a better understanding of hazard vulnerability, as well as the need to mitigate that vulnerability, due to the number of natural and manmade hazards that have occurred and that have been effectively controlled in the past.

A.3.5 Conclusions on Local Capability

In addition to this regional hazard mitigation plan, Cherokee County has adopted an emergency operations plan, both of which increase the county’s capability in an emergency situation. However, the county and its jurisdictions lack a disaster recovery plan. With the results of this plan’s risk assessment, Cherokee County and its jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction’s economic development goals.

Cherokee County is in the process of developing an economic development plan, which can improve economic resiliency in the community, leading to increased fiscal capacity for mitigating hazards. The county is also in the process of developing a capital improvement plan, which can improve capability by implementing a plan for infrastructure that is more resilient to the natural hazards identified in this plan. A capital improvement plan can be used to direct capital funds to public improvements located away from high-risk areas. Alternatively, a capital improvement plan can be cross-referenced with this plan to identify public improvements located in at-risk areas and allocate funds for safeguarding those improvements.

Capability could be improved by implementing a land development ordinance that can be used to guide growth out of high-risk areas. Likewise, having a planner on staff who is familiar with land development, natural resources, and hazards would aid in Cherokee County and its jurisdictions’ ability assist community members in developing land in a way that mitigates the impacts of natural hazards.

A.4 CHEROKEE COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Cherokee County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Hazard Mitigation Planning Committee and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

A.4.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Cherokee County developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table A.53**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE A.53: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards .
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

A.4.2 Mitigation Action Plan

The mitigation actions proposed by Cherokee County, the Town of Andrews, and the Town of Murphy are listed in the following individual Mitigation Action Plans.

Cherokee County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed. Summer 2012.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County/Town Executives; County Grants Management	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County/Town Executives	Unknown	Local, State, Federal	Completed	Completed. Though zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-10	Integrate county EOP with HMP as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. EOP lists hazards identified in HMP and roles and responsibilities per agency.
P-11	Monitor and manage the County's Steep Slope initiative to ensure sufficient accessibility of entrances and exits for emergency service vehicles.	All	High	County/Town Administration	N/A	General Fund	2022	Politically infeasible to implement at this time.
P-12	Continue participation in NFIP and work toward CRS System.	All	High	County/Town Administration; County Building Inspection; County Emergency Management	N/A	General Fund	Completed	Completed.
P-13	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. Comprehensive review of EOP is done every three years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-14	Evaluate the need for a drought management plan and protocol to be implemented throughout the county in the event a drought should occur.	Drought	Moderate	County Emergency Management	N/A	General Fund	2022	In progress. Plan and advisory committee in development phase.
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
PP-3	Identify critical facilities and the need for a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	N/A	Unknown	2022	Critical facilities identified. There was no political will to advance this action further over the last five years given lack of funding sources.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022- 2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-5	Identify structures subject to recurring flooding so that they can be retrofitted.	Flood	Moderate	Emergency Management/Planning/GIS	Low; staff hours	Local	2022	New Action
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	Hazard Mitigation Task Force	Unknown	General Fund	Completed	Completed as of 2012 plan update.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	Moderate	County Emergency Management	N/A	General Fund	Completed	Complete. Mutual aid agreements in place.
ES-4	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management	N/A	General Fund	Complete	Complete.
PEA-3	Develop and implement a comprehensive community information program to inform the public of the risk of potential hazards, potential mitigation measures, as well as what actions they can take to protect themselves and their property.	All	Low	County Emergency Management	N/A	General Fund	2022	This is in progress but not complete. Developing comprehensive public outreach plan and identifying key agency involvement.

Town of Andrews Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC		Local, State, Federal	2022-2030	Pending municipal involvement (limited political will to complete this action over the last five years)
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County and municipal executives; County and municipal Grants Management	Unknown	Local, State, Federal	2030	Pending municipal involvement and funding sources. (limited political will to complete this action over the last five years)
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County and municipal executives	Unknown	Local, State, Federal	2030	There was limited political will to complete this action over the last five years. This action item is ongoing as opportunities for integration continue.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service Cherokee; County Fire Marshal; County and municipal Fire Departments	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	2022-2030	There was no political will to complete this action over the last five years. As funding permits and homeowners volunteer we can focus more on this .action.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	2022-2030	There was no political will to complete this action over the last five years. The town is still committed, will continue as funding becomes available.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022	New Action.
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped, and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	County/Town Executives; County Grants Administration	Unknown	General Fund	Completed	Completed as of 2012 plan update.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of 2012 plan update.

Town of Murphy Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a method for a central repository of information regarding hazards, including documents from the county and all municipalities. This repository would become the central focus for research into such hazards.	All	Moderate	County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-2	Up-to-date digital (GIS) floodplain layers and maps that would allow the county mapping department to assess parcels, addresses, and ownership as well as define or otherwise delineate the type of structure in the floodplain (residential, commercial, etc.) and incorporate an up-to-date digital (GIS) inundation map from the US Army Corps of Engineers to access parcels, addresses, and ownership as well as otherwise delineate the type of structure in the area of potential inundation (residential, commercial, etc.)	Flood	Moderate	County Mapping/GIS/IT	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-3	Consolidation of written (electronic or plain copy) documents into a single, seamless, integrated plan that incorporates all phases of a comprehensive emergency management program. This would all emergency managers, planners, and elected officials an opportunity to examine their mitigation efforts in conjunction with preparedness plans, response procedures, and recovery activity.	All	Moderate	County Emergency Management; County EOP Task Force	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Use of technology to accomplish an automated system to coordinate plans information, development information, road expansion information, or other demographics if desired. Further, it is desired that towns and county automated systems that contain such information have the ability to be integrated with one another and relative information shared between the systems.	All	Moderate	County IT; County Planning	Unknown	Local, State, Federal	Completed	Completed. Summer 2012.
P-5	To establish, where feasible, joint (town and county) guidelines for hazard mitigation implementation and to use all available information in the decision making process that is likely to effect within a five year period, based on growth projections, a municipal jurisdiction. This includes planning and zoning authority that is currently exercised by either the municipality or the county.	All	Moderate	County Emergency Management; Hazard Mitigation Task Force/LEPC	Unknown	Local, State, Federal	2022	Although zoning is not enforced in county, all jurisdictions share building staff and knowledge reference flood plain and code enforcement. However, the program is not formalized.
P-6	To establish, where feasible, joint (town and county) mitigation funding sources. To establish joint searches for opportunities to implement hazard mitigation goals, objectives, or recommendations.	All	Moderate	County and municipal executives; County and municipal Grants Management	Unknown	Local, State, Federal	2022	There was no political will to complete this action over the last five years.
P-7	Formation of a cooperative hazard mitigation program to integrate hazard mitigation into new developments, commercial districts, land use planning, growth planning, infrastructure, and other initiatives.	All	Moderate	County and municipal executives	Unknown	Local, State, Federal	2022	All jurisdictions share building staff and knowledge reference flood plain and code enforcement. However, a formal program or MOU is not in place.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Follow the goals and recommendations for goal achievement outlined by the NC Forest Service to reduce the vulnerability of wildfires that would likely effect urban populations.	Wildfire	Moderate	NC Forest Service Cherokee; County Fire Marshal; County and municipal Fire Departments	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
P-9	Research and implement Wildfire Mitigation goals as set forth by the NC Forest Services and other fire officials to reduce the risk to and the vulnerability from wildfire whether accidentally or purposefully set.	Wildfire	Moderate	NC Forest Service; County Fire Marshal; County/Town Fire Departments; County/Town Administration	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.
Property Protection								
PP-1	Retrofit or relocate residential structures currently located in the 100-year floodplain to a base elevation one foot above the floodplain.	Flood	Moderate	County Emergency Management; County Planning; NCDEM	Unknown	Local, State, Federal	Deleted	No longer feasible or necessary. No structures in floodplain throughout the town.
PP-2	Retrofit all critical facilities to reduce collapsing materials such as light fixtures, ceiling tiles, shelves, or other unsecured material.	All	Moderate	County Emergency Management; County Inspections	Unknown	Local, State, Federal	Deleted	No longer feasible or necessary. No structures in floodplain throughout the town.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	To establish, where feasible, additional emergency response forces, by at least 10%, that are trained, equipped, and prepared to respond to a variety of emergency and disaster situations.	All	Moderate	County/Town Executives; County Grants Administration	Unknown	General Fund	Completed	Completed as of the 2012 plan.
ES-4	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	To establish, where feasible, joint (town and county) public education materials and public education for hazard mitigation implementation.	All	Moderate	Hazard Mitigation Task Force	Unknown	Local, State, Federal	Completed	Completed as of the 2012 plan.

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Annex B

Graham County

This annex includes jurisdiction-specific information for Graham County and its participating municipalities. It consists of the following five subsections:

- ◆ B.1 Graham County Community Profile
- ◆ B.2 Graham County Risk Assessment and Vulnerability Assessment
- ◆ B.3 Graham County Capability Assessment
- ◆ B.4 Graham County Mitigation Strategy

B.1 GRAHAM COUNTY COMMUNITY PROFILE

B.1.1 Geography and the Environment

Graham County is located along the western border of North Carolina in the Great Smoky Mountains. It is comprised of three towns, the Town of Fontana Dam, the Town of Lake Santeetlah, and the Town of Robbinsville, as well as many smaller unincorporated communities. The Town of Fontana Dam was recently incorporated on June 8, 2011.

Two-thirds of the county is the Nantahala National Forest and over 85% of the county's land cover is comprised of forestland. The elevation in the county ranges from 1,177 feet to 5,560 feet. The total area of the county is 302 square miles, 10 square miles of which is covered by water.

Graham County has a temperate climate. The summers are mild with cool nights and high rainfall, while the winters are typically not severe but do include sharp cold spells. Annual rainfall averages 45 inches and annual snowfall is 9 inches. The average annual temperature is 59°F while the average high is 70°F and the average low is 46°F. The extreme difference in altitude across the county results in varying local climates at places of higher elevation versus the lowlands. The high elevations experience radical temperature fluctuations year-round with more frequent and heavier rainfall.

B.1.2 Population and Demographics

According to the U.S. Census 2015 American Community Survey 5-year Population Estimate, Graham County has a population of 8,700 people. The county saw a 1.8 percent decline in the population between 2010 and 2015, and the population density is 30 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the county and its participating jurisdictions are presented in **Table B.1**.¹

¹ Census data is not currently available for the Town of Fontana due to its recent incorporation.

TABLE B.1: POPULATION COUNTS FOR GRAHAM COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
GRAHAM COUNTY	7,196	7,993	8,861	8,700	-1.8%
Town of Fontana Dam	--	--	--	--	--
Town of Lake Santeetlah	47	67	45	36	-20.0%
Town of Robbinsville	709	747	620	575	-7.3%

Source: US Census Bureau

Based on the 2015 American Community Survey 5-year Population Estimate, the median age of residents of Graham County is 44.6 years. The racial characteristics of the county are presented in **Table B.2**. Whites make up the majority of the population in the county, accounting for 88.6 percent of the population.

TABLE B.2: DEMOGRAPHICS OF GRAHAM COUNTY

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
GRAHAM COUNTY	88.6%	0.5%	7.6%	3.3%	1.5%
Town of Fontana Dam	--	--	--	--	--
Town of Lake Santeetlah	100%	0.0%	0.0%	0.0%	0.0%
Town of Robbinsville	89.6%	1.4%	1.9%	7.1%	13.4%

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

Source: US Census Bureau

B.1.3 Housing

According to the 2015 American Community, there are 5,930 housing units in Graham County, the majority of which are single family homes or mobile homes. Housing information for the county and towns is presented in **Table B.3**. As shown in the table, the vast majority of Lake Santeetlah's housing units serve as vacation homes to people who are permanent residents in other counties or states.

TABLE B.3: HOUSING CHARACTERISTICS IN GRAHAM COUNTY

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
GRAHAM COUNTY	5,084	5,930	5,930	25.7%	\$120,700
Town of Fontana Dam	--	--	--	--	--
Town of Lake Santeetlah	172	195	192	85.6%	\$522,600
Town of Robbinsville	393	384	429	2.6%	\$50,900

Source: US Census Bureau

B.1.4 Infrastructure

Transportation

There are several US and state highways that serve Graham County. US 129 is an interstate highway that passes through the county from northwest to southwest, ultimately connecting Tennessee to Florida. NC 143 is a primary state highway that also runs from the Tennessee border across the western portion of Graham County, connecting the Cherokee National Forest and the Nantahala National Forest. This highway is best known for its 18-mile section of the Cherokee Skyway that is a National Scenic Byway. NC 28 also runs across the northern portion of the county, linking it to neighboring Swain County.

Currently, there are no airports located in Graham County nor is there passenger or freight rail serving the county.

Utilities

Electric power in Graham County is provided by Duke Energy, a public utility.

Water and sewer service is provided to residents by the Towns of Lake Santeetlah and Robbinsville; however, private or shared wells and septic systems are most common.

Community Facilities

There are a several buildings and community facilities located throughout Graham County. According to the data collected for the vulnerability assessment (Section 6.4.1), there is 1 sheriff/police station, and 2 public schools located within the county. There is also one community center located in the unincorporated area.

B.1.5 Land Use

Most of the land in Graham County is still forest land, some of which is comprised of virgin timber. Development in the county is concentrated mostly in and around Lake Santeetlah and Robbinsville as well as the unincorporated community of Stecoah. The land uses in the county are overwhelmingly residential and/or rural. Robbinsville is the only area in which development is more focused.

B.1.6 Employment and Industry

In 2015, Graham County had an average annual employment of 1,951 workers. In 2015, according to the North Carolina Employment Security Commission, the Education and Health Services industry employed the most people, with 21.8 percent of the workforce, followed by Construction (21.4%); Leisure and Hospitality (14.7%); Trade, Transportation, and Utilities (14.2%); and Public Administration (12.4%). In 2015, the annual median wage in Graham County was \$24,182, compared to \$32,510 for the state of North Carolina.

B.2 GRAHAM COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Graham County. Each hazard profile includes a description of the hazard's

location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of Graham County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

B.2.1 Asset Inventory

Table B.4 lists the number of parcels, total value of parcels, total number of parcels with improvements, and the total assessed value of improvements for Graham County and its participating jurisdictions (study area of vulnerability assessment).²

TABLE B:4: IMPROVED PROPERTY IN GRAHAM COUNTY

Location	Estimated Number of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements (2017)
Fontana Dam	1	1	\$50,530
Lake Santeetlah	305	200	\$42,720,880
Robbinsville	328	250	\$47,976,690
Unincorporated Area	9,465	4,455	\$394,565,130
EBCI ³	52	10	\$851,560
GRAHAM COUNTY TOTAL⁴	10,151	4,916	\$486,164,790

Table B.5 lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, and schools and other critical facilities located in Graham County. Critical facility data was obtained from the county and municipal leads. **Table B.41**, near 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 county.

² 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.

³ EBCI data indicated for Cherokee, Graham, and Swain Counties are derived from that county’s parcel data and falls within the EBCI jurisdictional boundary and/or is indicated as part of the EBCI by the parcel attribute data.

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

TABLE B.5: CRITICAL FACILITY INVENTORY IN GRAHAM COUNTY

GRAHAM COUNTY						
Category and Type	Fontana Dam	Lake Santeetlah	Robbinsville	Unincorporated	EBCI	Total
Emergency Services	0	0	2	1	0	3
EMS Base	0	0	0	1	0	1
Sheriff's Office	0	0	1	0	0	1
Jail	0	0	1	0	0	1
Government Facilities	0	0	9	2	0	11
Government Office	0	0	8	0	0	8
Community Center	0	0	0	1	0	1
School	0	0	1	1	0	2
Public Works/Utilities	0	0	3	1	0	4
Sewer/Sewer Plant	0	0	2	0	0	2
Water Treatment Plant	0	0	1	1	0	2
Other	0	0	0	1	0	1
Transportation	0	0	0	1	0	1
Total	0	0	14	5	0	19

Source: County GIS

B.2.2 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 Graham County that are potentially at risk to these hazards.

Table B.6 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates⁵. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in Graham County according to Census data is 8,700 persons. Additional population estimates are presented above in Section A.1.

TABLE B.6: TOTAL POPULATION IN GRAHAM COUNTY

Location	Total 2015 Population
Fontana Dam	--
Lake Santeetlah	36
Robbinsville	575
Unincorporated Area	8,089
GRAHAM COUNTY TOTAL	8,700

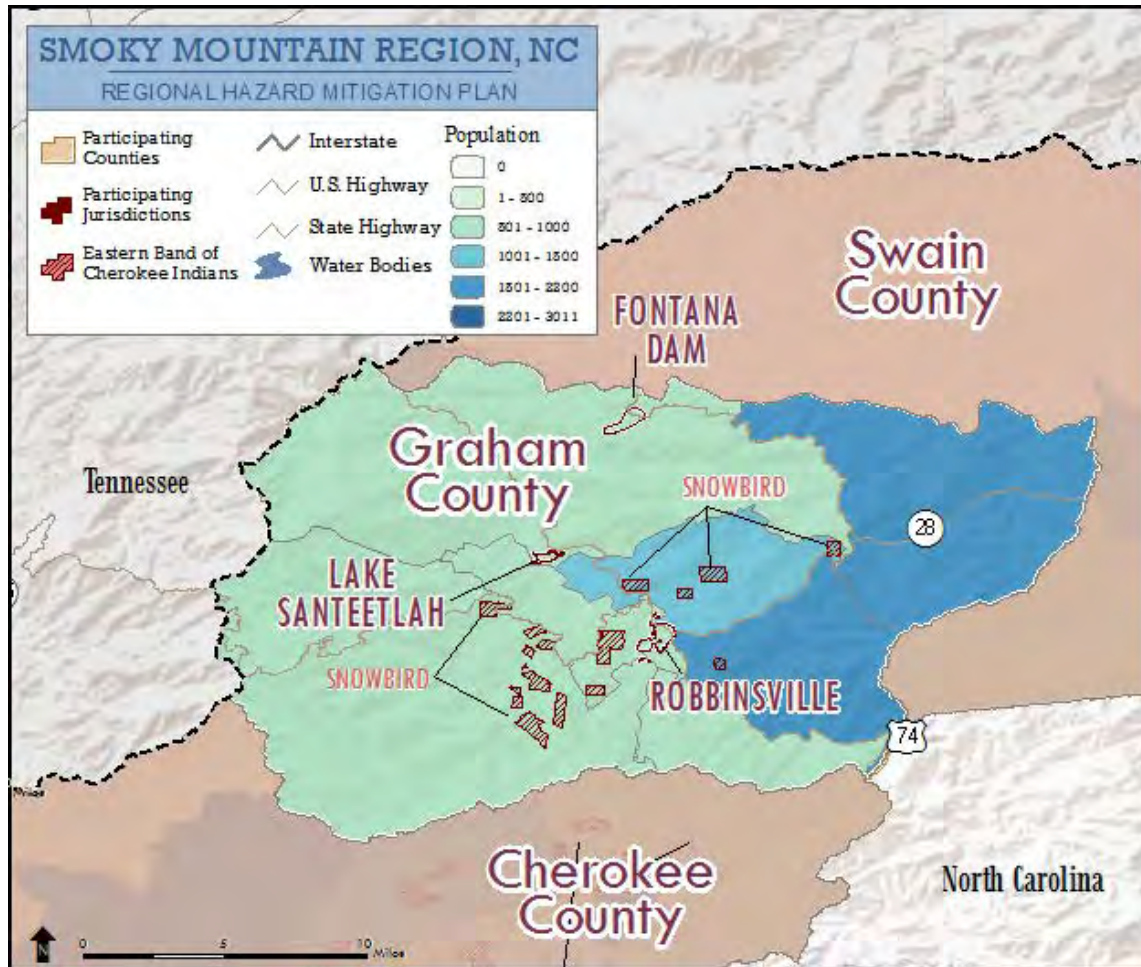
Source: U.S. Census 2015 American Community Survey

In addition, **Figure B.1** illustrates the population density by census tract as it was reported by the U.S. Census Bureau 2015 American Community Survey.⁶

⁵ Census data is not currently available for the Town of Fontana due to its recent incorporation.

⁶ Population by census block was not available at the time this plan was completed.

FIGURE B.1: POPULATION DENSITY IN GRAHAM COUNTY



Source: U.S. Census Bureau 2015 American Community Survey

HAZARD PROFILES

B.2.3 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Graham County 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 county would be uniformly exposed to drought, making the spatial extent potentially widespread.

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Graham County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

According to the North Carolina Drought Monitor, Graham County has had drought occurrences fifteen of the last seventeen years (2000-2016). **Table B.7** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications. The most severe drought condition is Exceptional.

TABLE B. 7: HISTORICAL DROUGHT OCCURRENCES IN GRAHAM COUNTY

Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
Graham County				
				EXCEPTIONAL
				EXTREME
				EXTREME
				NORMAL
				ABNORMAL
				ABNORMAL
				MODERATE
				EXCEPTIONAL
				EXCEPTIONAL
				EXTREME
				MODERATE
				MODERATE
				ABNORMAL
				ABNORMAL
				ABNORMAL
				ABNORMAL
				ABNORMAL
				EXCEPTIONAL

Source: North Carolina Drought Monitor

Extent

The most severe drought condition is Exceptional. Graham County has received this ranking four times over the sixteen-year reporting period.

Probability of Future Occurrences

According to the North Carolina Drought Monitor's historical data, sixteen of the last seventeen years has resulted in drought in Graham County, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered "highly likely" (greater than 90% annual probability). This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices
 - Increased wildfires
 - Loss of incomes

- Loss of hydroelectric power
- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

B.2.4 Hailstorm

Location

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

Historical Occurrences

According to the National Centers for Environmental Information’s (NCEI) Storm Events Database, 32 recorded hailstorm events affected Graham County from 1970 to 2016 **Table B.8** is a summary of the hail events in Graham County. **Table B.9** provides detailed information about each event that occurred in the county. Hail occurrences did not result in property damages. 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. Therefore, it is likely that damages are greater than the reported value.

TABLE B.8: SUMMARY OF HAIL OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2012)
Fontana Dam	1	\$0
Lake Santeetlah	0	\$0
Robbinsville	17	\$0
Unincorporated Area	14	\$0
GRAHAM COUNTY TOTAL	32	\$0

Source: National Centers for Environmental Information

TABLE B.9: HISTORICAL HAIL OCCURRENCES IN GRAHAM COUNTY

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Graham County	4/3/1974	3.00	0/0	\$0
Graham County	4/9/1991	0.75	0/0	\$0
Robbinsville	2/21/1993	1.75	0/0	\$0
Robbinsville	3/31/1993	0.75	0/0	\$0
Robbinsville	4/15/1993	0.88	0/0	\$0
Robbinsville	11/11/1995	0.75	0/0	\$0
Robbinsville	6/24/1996	0.75	0/0	\$0
Tapoco	3/29/1997	1.75	0/0	\$0
Tapoco	7/4/1997	1.25	0/0	\$0
Robbinsville	7/4/1997	1.25	0/0	\$0
Robbinsville	2/17/1998	0.75	0/0	\$0
Fontana	4/3/1998	0.75	0/0	\$0
Tuskegee	4/16/1998	1.00	0/0	\$0
Tapoco	4/16/1998	1.75	0/0	\$0
Stecoah	4/16/1998	1.00	0/0	\$0
Robbinsville	5/7/1998	1.00	0/0	\$0
Robbinsville	5/7/1999	0.75	0/0	\$0
Robbinsville	6/14/2001	0.75	0/0	\$0
Stecoah	7/8/2001	0.75	0/0	\$0
Stecoah	6/4/2002	0.88	0/0	\$0
Robbinsville	6/20/2002	1.75	0/0	\$0
Robbinsville	5/2/2003	0.75	0/0	\$0
Stecoah	5/15/2003	1.25	0/0	\$0
Robbinsville	7/14/2004	0.75	0/0	\$0
Robbinsville	5/20/2008	0.75	0/0	\$0
Bear Creek	5/8/2009	0.88	0/0	\$0
Rhymers Ferry	5/8/2009	1.00	0/0	\$0
Milltown	6/11/2009	0.75	0/0	\$0
Robbinsville	9/27/2010	0.75	0/0	\$0
Tulula	6/8/2011	1.00	0/0	\$0
Robbinsville	4/26/2012	0.75	0/0	\$0
Robbinsville	5/22/2013	1.00	0/0	\$0

Source: National Centers for Environmental Information

Extent

Hail extent can be defined by the size of the hail stone. Hail ranged in diameter from 0.75 inches to 3.00 inches. However, larger hailstones are possible as indicated in the Torro Scale (*Section 5*).

Probability of Future Occurrences

A total of 32 events are recorded in the NCEI's Storm Events Database between 1970 and 2016, resulting in a 70-percent historic annual rate of occurrence for hail events in Graham County. Therefore, hail events are considered likely in Graham County (10 to 90 percent annual chance). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Graham County 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 county.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. While no deaths or injuries were reported in the county due to hail, they are possible.

B.2.5 Hurricane and Tropical Storm

Location

Hurricanes 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 Graham County. The entire county is equally susceptible to hurricane and tropical storms.

Historical Occurrences

According to the National Hurricane Center's historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region between 1850 and 2015. This includes nine tropical storms and nineteen tropical depressions. **Table B.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE B.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

The National Centers for Environmental Information reported did not report any event associated with a hurricane or tropical storm in Graham County between 1950 and 2016. However, the National Hurricane Center reported four tropical depressions that traversed directly through Graham County. This included remnants of Hurricane Andrew (1992), Tropical Storm Bill (2003), Hurricane Frances (2004), and Hurricane Ivan (2004).

Federal records also indicate that a disaster declaration was made in 2004 (Hurricane Ivan) for the county.⁷

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. Frances caused significant crop damages totaling \$55 million statewide. North Carolina residents received almost \$20.6 million in federal disaster assistance following the storm.

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

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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Extent

Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (**Section 5, Table 5.8**). The greatest classification of hurricane to traverse directly through Graham County was a tropical depression (Unnamed 1906 Storm) which carried tropical force winds of 30 knots upon arrival in the county. It should be noted that stronger storms could impact the county without a direct hit.

Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but remains a real threat to Graham County due to induced events like flooding and landsliding. A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of Graham County between 1851 and 2015, resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of likely (between 10 and 90% annually) was assigned.

Vulnerability Assessment

Historical evidence indicates that Graham County has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the county, as shown and discussed in the section above.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table B.11**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH

reports losses at the U.S. Census tract level, so determining an accurate loss estimate specific to participating jurisdictions was not feasible.

TABLE B. 11: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Graham County	\$1,408,586,933	0	0%	\$294,040	0.020874%	\$8,185	0.000581%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

Given equal susceptibility across the county, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Graham County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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 B.41** 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 Graham County. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

B.2.6 Lightning

Location

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

Historical Occurrences

According to the National Centers for Environmental Information, there has been a total of one recorded lightning event in Graham County since 1950, as listed in summary **Table B.12**.⁸ This event was not reported as causing any damage. Detailed information on historical lightning events can be found in **Table B.13**.

⁸ 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 Graham County..

It is likely that more than one lightning event has in fact impacted the county. 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 B.12: SUMMARY OF LIGHTNING OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2017)
Fontana Dam	0	\$0
Lake Santeetlah	0	\$0
Robbinsville	1	\$0
Unincorporated Area	0	\$0
GRAHAM COUNTY TOTAL	1	\$0

Source: NCEI Storm Events Database

TABLE B.13: HISTORICAL LIGHTNING OCCURRENCES IN GRAHAM COUNTY

	Date	Deaths/ Injuries	Property Damage*	Details
Graham County				
Robbinsville	5/5/1999	0/0	\$0	Intense lightning in Robbinsville knocked out the Graham County 911 system for the entire day.

Extent

Aside from damages, lighting extent can be defined using Vaisala, Inc.’s U.S. National Lightning Detection Network (NLDN) (Figure 5.6). Although the Smoky Mountain Region experienced an average of 3 to 12 flashes per square mile per year, the majority of Graham County appears to have an average of 3 to 6 flashes.

Probability of Future Occurrences

Although there was only one historical lightning event reported in Graham County via NCEI data, it is a regular occurrence accompanied by 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 majority of Graham County is located in an area that experienced an average of 3 to 6 lightning flashes per square mile per year between 2005 and 2014. Therefore, the probability of future events is highly likely (greater than 90% annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

Vulnerability Assessment

All current and future buildings and populations within Graham County are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

B.2.7 Thunderstorm Wind/High Wind

Location

A 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, Graham County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Graham County has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms resulted in one disaster declaration in Graham County in 1995.⁹ According to NCEI, there have been 24 reported high or strong wind events since 1994 and 72 reported thunderstorm wind events since 1950 in Graham County.¹⁰ These events caused over \$800,000 (2017 dollars) in damages. **Table B.14** and **Table B.15** summarize this information. **Table B.16** presents detailed high wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.¹¹

TABLE B.14: SUMMARY OF HIGH/STRONG WIND OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 Dollars)
Fontana Dam	0	\$0	\$0
Lake Santeetlah	0	\$0	\$0
Robbinsville	0	\$0	\$0
Unincorporated Area	24	\$733,467	\$0
GRAHAM COUNTY TOTAL	24	\$733,467	\$0

Source: National Centers for Environmental Information

TABLE B.15: SUMMARY OF THUNDERSTORM WIND OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2012)	Crop Damage (2017 Dollars)
Fontana Dam	8	\$0	\$0
Lake Santeetlah	2	\$0	\$0
Robbinsville	28	\$68,750	\$0
Unincorporated Area	34	\$6,053	\$0
GRAHAM COUNTY TOTAL	72	\$74,805	\$0

⁹A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

¹⁰ These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional thunderstorm events have occurred in Graham County. As additional local data becomes available, this hazard profile will be amended.

¹¹ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

TABLE B.16: HISTORICAL THUNDERSTORM (WIND) OCCURRENCES IN GRAHAM COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	5/1/1990	Thunderstorm Wind	--	0/0	\$0	--
Robbinsville	2/21/1993	Thunderstorm Wind	--	0/0	\$0	--
West Portion	8/20/1993	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	5/15/1994	Thunderstorm Wind	--	0/0	\$0	--
Robbinsville	5/14/1995	Thunderstorm Wind	--	0/0	\$0	--
Snowbird	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	5/19/1995	Thunderstorm Wind	--	0/0	\$0	--
Graham Co.	1/18/1996	High Wind	--	0/0	\$0	--
Robbinsville	6/24/1996	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	9/16/1996	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/23/1996	High Wind	50	0/0	\$0	--
Stecoah	11/8/1996	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	1/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	3/3/1997	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/4/1997	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	7/4/1997	Thunderstorm Wind	50	0/3	\$0	--
Robbinsville	7/4/1997	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	1/7/1998	High Wind	50	0/0	\$0	--
Fontana Village	5/21/1998	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Graham Co.	1/23/1999	High Wind	50	0/0	\$0	--
Graham Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Robbinsville	6/10/1999	Thunderstorm Wind	55	0/0	\$0	--
Graham Co.	2/13/2000	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Graham Co.	3/6/2001	High Wind	55	0/0	\$0	--
Fontana Village	7/9/2001	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/13/2001	High Wind	50	0/0	\$0	--
Robbinsville	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Fontana Village	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	10/24/2001	Thunderstorm Wind	50	0/0	\$16,047	Trees and power lines countywide. The squall line reached Robbinsville, before 1 am. At least two of the trees fell onto automobiles.
Stecoah	10/25/2001	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	11/29/2001	High Wind	50	0/0	\$0	--
Graham Co.	2/4/2002	High Wind	50	0/0	\$0	--
Stecoah	5/2/2002	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	5/2/2002	Thunderstorm Wind	60	0/0	\$46,739	Trees and powerlines were downed, causing widespread power outages. A tree was blown onto a house, resulting in damage.
Robbinsville	5/13/2002	Thunderstorm Wind	50	0/0	\$1,558	Trees and powerlines were blown down.
Robbinsville	6/20/2002	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Graham Co.	11/11/2002	Thunderstorm Wind	55	0/0	\$3,116	Trees were blown down and power outages occurred across the county.
Graham Co.	2/4/2003	High Wind	60	0/0	\$0	--
Robbinsville	5/2/2003	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	10/14/2003	High Wind	50	0/0	\$1,513	Trees and power lines were blown down.
Graham Co.	3/5/2004	High Wind	50	0/0	\$1,469	Showers and weak thunderstorms moving across the region brought some of the stronger winds to the surface, causing some trees and power lines to fall. Some power outages occurred.
Graham Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Robbinsville	5/31/2004	Thunderstorm Wind	55	0/0	\$4,406	Trees and power lines were blown down.
Tapoco	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Stecoah	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Robbinsville	7/5/2004	Thunderstorm Wind	55	0/0	\$0	--
Fontana Village	7/13/2004	Thunderstorm Wind	50	0/0	\$0	--

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.
Graham Co.	12/23/2004	High Wind	50	0/0	\$7,343	In Graham County, a garage was blown down in the Sweetwater district. In Madison County, a large sign was blown onto a pickup truck along I-26. Trees were also downed. The strongest winds occurred just before daybreak.
Graham Co.	2/21/2005	Thunderstorm Wind	60	0/0	\$0	--
Robbinsville	5/20/2005	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	6/6/2005	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	8/30/2005	High Wind	50	0/0	\$7,129	As the remnants of hurricane Katrina moved across middle and west Tennessee, high winds developed over the mountains of North Carolina. Numerous trees and power lines were blown down, with damage being most concentrated in the southwest mountains, and in Avery County of the northern mountains. At least 2 trees fell on and damaged structures.
Fontana Village	4/8/2006	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	4/21/2006	Thunderstorm Wind	60	0/0	\$0	--
Robbinsville	5/13/2006	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	7/21/2006	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	12/1/2006	High Wind	55	0/0	\$0	--
Graham Co.	4/15/2007	High Wind	55	0/0	\$0	--
Graham Co.	4/16/2007	High Wind	60	0/0	\$671,958	A widespread damaging high wind event developed during the day of the 16th. However, this 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.
Robbinsville	1/30/2008	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	3/4/2008	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Robbinsville	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Bear Creek	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Tulula	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Sweetgum	2/11/2009	Thunderstorm Wind	50	0/0	\$0	--
Cheoah	4/10/2009	Thunderstorm Wind	50	0/0	\$0	--
Brock	5/8/2009	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	6/17/2009	Thunderstorm Wind	55	0/0	\$0	--
Graham Co.	12/9/2009	High Wind	55	0/0	\$0	--
Milltown	7/26/2010	Thunderstorm Wind	50	0/0	\$0	--
Brock	8/5/2010	Thunderstorm Wind	50	0/0	\$0	--
Santeetlah	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Tapoco	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Stecoah	6/7/2011	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	6/15/2011	Thunderstorm Wind	65	0/0	\$0	--
Yellow Creek	6/18/2011	Thunderstorm Wind	55	0/0	\$0	--
Cheoah	6/19/2011	Thunderstorm Wind	50	0/0	\$0	--
Santeetlah	6/19/2011	Thunderstorm Wind	50	0/0	\$0	--
Yellow Creek	8/3/2011	Thunderstorm Wind	50	0/0	\$0	--
Tulula	8/8/2011	Thunderstorm Wind	50	0/0	\$0	--
Fontana Village	7/1/2012	Thunderstorm Wind	50	0/0	\$0	--
Stecoah	7/5/2012	Thunderstorm Wind	55	0/0	\$0	--
Milltown	7/31/2012	Thunderstorm Wind	50	0/0	\$0	--
Graham Co.	12/26/2012	High Wind	50	0/0	\$0	--
Milltown	1/30/2013	Thunderstorm Wind	55	0/0	\$0	--
Robbinsville	2/21/2014	Thunderstorm Wind	50	0/0	\$0	--
Robbinsville	5/22/2014	Thunderstorm Wind	50	0/0	\$0	--
Tapoco	7/14/2015	Thunderstorm Wind	55	0/0	\$0	--

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
GRAHAM COUNTY						
Tapoco	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--

Source: National Centers for Environmental Information

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind event in Graham County was reported on June 15, 2011 at 65 knots (approximately 75 mph). It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

Given the high number of previous events (96 events over 66 years), it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. Additionally, it is likely many events have gone unreported. Therefore, thunderstorm wind events were assigned a probability of “highly likely” (greater than 90-percent annual chance).

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

B.2.8 Tornado

Location

Tornadoes occur throughout the state of North Carolina, and thus in Graham County. 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 Graham County is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they do occur in Graham County. According to the National Centers for Environmental Information, there has been a total of one recorded tornado event in Graham County since 1973 (**Table B.17**), resulting in over \$1.4 million (2017 dollars) in property damages.¹² In addition, 2 deaths and 11 injuries were reported (**Table B.18**). The magnitude of this tornadoes was F2 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 40 years.

¹² These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional tornadoes have occurred in Graham County. As additional local data becomes available, this hazard profile will be amended.

TABLE B.17: SUMMARY OF TORNADO OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2017)
Fontana Dam	0	\$0
Lake Santeetlah	0	\$0
Robbinsville	0	\$0
Unincorporated Area	1	\$1,441,933
GRAHAM COUNTY TOTAL	1	\$1,441,933

Source: National Centers for Environmental Information

TABLE B.18: HISTORICAL TORNADO IMPACTS IN GRAHAM COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Graham County					
Graham County	4/3/1974	F2	2/11	\$1,441,933	n/a

*Property Damage is reported in 2017 dollars.

Source: National Centers for Environmental Information

Extent

The greatest extent of tornado is an EF5 (over 200 miles per hour). The greatest magnitude of tornado that has impacted Graham County is an F2 (113 – 157 mph), during an event that occurred on April 3, 1974, though stronger events are possible. According to NCEI, the tornado resulted in 2 fatalities, 11 injuries, and \$1.4 million in property damage. The National Weather Service reports that this tornado was part of the largest outbreak of tornadoes in the nation’s history, referred to by meteorologists as the Super Outbreak, in which 148 tornadoes swept across 13 states in an estimated 24 hours.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county (one reported event in 43 years). Furthermore, the mountainous terrain of the county makes tornadoes a rare occurrence. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Graham County experience a direct tornado strike. The probability of future tornado occurrences affecting Graham County is possible (1 to 10 percent annual probability).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

B.2.9 Winter Storm and Freeze

Location

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. Graham County is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in one disaster declaration in Graham County. This was the Blizzard of 1996.¹³ According to the National Centers for Environmental Information, there have been a total of 153 recorded winter storm events in Graham County since 1993 (Table B.19).¹⁴ These events resulted in over \$1.3 million (2017 dollars) in damages. Reported damages were caused by crop damages from a freeze/frost event in April of 2007, and are presented in Table B.20.¹⁵

TABLE B.19: SUMMARY OF WINTER STORM EVENTS IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2017)	Crop Damage (2017)
Fontana Dam	0	\$0	\$0
Lake Santeetlah	0	\$0	\$0
Robbinsville	0	\$0	\$0
Unincorporated Area	190	\$0	\$1,343,916
GRAHAM COUNTY TOTAL	153	\$0	\$1,343,916

Source: National Centers for Environmental Information

TABLE B.20: HISTORICAL WINTER STORM IMPACTS IN GRAHAM COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	1/6/1996	Winter Storm	0/0	\$0	\$0
Graham County	1/11/1996	Winter Storm	0/0	\$0	\$0
Graham County	1/26/1996	Ice Storm	0/0	\$0	\$0
Graham County	2/1/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/7/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/11/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Graham County	2/16/1996	Winter Weather	0/0	\$0	\$0
Graham County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Graham County	11/9/1996	Winter Weather	0/0	\$0	\$0
Graham County	11/10/1996	Winter Weather	0/0	\$0	\$0

¹³ A complete listing of historical disaster declarations can be found in Section 4: Hazard Profiles.

¹⁴ These ice and winter storm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional winter storm conditions have affected Graham County.

¹⁵ The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	1/9/1997	Ice Storm	0/0	\$0	\$0
Graham County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Graham County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Graham County	12/5/1997	Winter Weather	0/0	\$0	\$0
Graham County	12/27/1997	Winter Weather	0/0	\$0	\$0
Graham County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Graham County	1/18/1998	Winter Weather	0/0	\$0	\$0
Graham County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Graham County	3/2/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/10/1998	Heavy Snow	0/0	\$0	\$0
Graham County	3/11/1998	Winter Weather	0/0	\$0	\$0
Graham County	3/11/1998	Heavy Snow	0/0	\$0	\$0
Graham County	12/17/1998	Winter Weather	0/0	\$0	\$0
Graham County	2/13/1999	Winter Weather	0/0	\$0	\$0
Graham County	2/24/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/3/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/15/1999	Winter Weather	0/0	\$0	\$0
Graham County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Graham County	12/24/1999	Winter Weather	0/0	\$0	\$0
Graham County	1/16/2000	Winter Weather	0/0	\$0	\$0
Graham County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/29/2000	Ice Storm	0/0	\$0	\$0
Graham County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Graham County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Graham County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Graham County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Graham County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Graham County	1/1/2001	Heavy Snow	0/0	\$0	\$0

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Graham County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Graham County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Graham County	2/3/2002	Heavy Snow	0/0	\$0	\$0
Graham County	2/6/2002	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Graham County	12/4/2002	Winter Weather	0/0	\$0	\$0
Graham County	12/22/2002	Winter Weather	0/0	\$0	\$0
Graham County	1/6/2003	Winter Weather	0/0	\$0	\$0
Graham County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Graham County	1/19/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/6/2003	Heavy Snow	0/0	\$0	\$0
Graham County	2/9/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/18/2003	Winter Weather	0/0	\$0	\$0
Graham County	2/23/2003	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2003	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Graham County	3/30/2003	Winter Weather	0/0	\$0	\$0
Graham County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Graham County	11/28/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/3/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/5/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2003	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Graham County	1/9/2004	Winter Weather	0/0	\$0	\$0
Graham County	1/27/2004	Winter Weather	0/0	\$0	\$0
Graham County	2/7/2004	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2004	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2004	Winter Weather	0/0	\$0	\$0
Graham County	3/30/2004	Winter Weather	0/0	\$0	\$0
Graham County	4/13/2004	Winter Weather	0/0	\$0	\$0
Graham County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Graham County	12/14/2004	Winter Weather	0/0	\$0	\$0
Graham County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Graham County	1/22/2005	Winter Weather	0/0	\$0	\$0

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	2/10/2005	Winter Weather	0/0	\$0	\$0
Graham County	2/28/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/1/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/8/2005	Winter Weather	0/0	\$0	\$0
Graham County	3/11/2005	Winter Weather	0/0	\$0	\$0
Graham County	4/2/2005	Winter Weather	0/0	\$0	\$0
Graham County	4/23/2005	Winter Weather	0/0	\$0	\$0
Graham County	11/21/2005	Winter Weather	0/0	\$0	\$0
Graham County	12/26/2005	Winter Weather	0/0	\$0	\$0
Graham County	1/14/2006	Heavy Snow	0/0	\$0	\$0
Graham County	1/30/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/8/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/9/2006	Heavy Snow	0/0	\$0	\$0
Graham County	2/11/2006	Winter Weather	0/0	\$0	\$0
Graham County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Graham County	2/18/2006	Winter Weather	0/0	\$0	\$0
Graham County	3/22/2006	Winter Weather	0/0	\$0	\$0
Graham County	11/19/2006	Winter Weather	0/0	\$0	\$0
Graham County	12/7/2006	Winter Weather	0/0	\$0	\$0
Graham County	12/26/2006	Heavy Snow	0/0	\$0	\$0
Graham County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Graham County	1/21/2007	Winter Weather	0/0	\$0	\$0
Graham County	1/28/2007	Winter Weather	0/0	\$0	\$0
Graham County	2/1/2007	Heavy Snow	0/0	\$0	\$0
Graham County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Graham County	4/8/2007	Frost/Freeze	0/0	\$0	\$1,343,916
Graham County	1/1/2008	Winter Weather	0/0	\$0	\$0
Graham County	1/22/2008	Winter Weather	0/0	\$0	\$0
Graham County	2/26/2008	Heavy Snow	0/0	\$0	\$0
Graham County	10/27/2008	Winter Weather	0/0	\$0	\$0
Graham County	11/21/2008	Winter Weather	0/0	\$0	\$0
Graham County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Graham County	1/8/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/13/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/17/2009	Winter Weather	0/0	\$0	\$0
Graham County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Graham County	2/2/2009	Winter Weather	0/0	\$0	\$0

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	3/1/2009	Winter Weather	0/0	\$0	\$0
Graham County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Graham County	10/17/2009	Winter Weather	0/0	\$0	\$0
Graham County	12/18/2009	Winter Storm	0/0	\$0	\$0
Graham County	1/2/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/9/2010	Winter Weather	0/0	\$0	\$0
Graham County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Graham County	2/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/10/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Graham County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Graham County	3/3/2010	Winter Weather	0/0	\$0	\$0
Graham County	3/22/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/4/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Graham County	12/15/2010	Winter Weather	0/0	\$0	\$0
Graham County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Graham County	1/5/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Graham County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Graham County	1/24/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/26/2011	Winter Weather	0/0	\$0	\$0
Graham County	2/9/2011	Winter Weather	0/0	\$0	\$0
Graham County	3/6/2011	Winter Weather	0/0	\$0	\$0
Graham County	3/11/2011	Winter Weather	0/0	\$0	\$0
Graham County	11/29/2011	Winter Weather	0/0	\$0	\$0
Graham County	12/7/2011	Winter Weather	0/0	\$0	\$0
Graham County	1/2/2012	Winter Weather	0/0	\$0	\$0
Graham County	10/29/2012	Winter Weather	0/0	\$0	\$0
Graham County	11/5/2012	Winter Weather	0/0	\$0	\$0
Graham County	12/29/2012	Winter Weather	0/0	\$0	\$0
Graham County	1/17/2013	Winter Weather	0/0	\$0	\$0

ANNEX B: GRAHAM COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
GRAHAM COUNTY					
Graham County	2/1/2013	Winter Weather	0/0	\$0	\$0
Graham County	2/2/2013	Winter Weather	0/0	\$0	\$0
Graham County	2/19/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/2/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/5/2013	Winter Storm	0/0	\$0	\$0
Graham County	3/20/2013	Winter Weather	0/0	\$0	\$0
Graham County	3/25/2013	Winter Storm	0/0	\$0	\$0
Graham County	11/26/2013	Winter Weather	0/0	\$0	\$0
Graham County	1/2/2014	Winter Weather	0/0	\$0	\$0
Graham County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Graham County	1/21/2014	Heavy Snow	0/0	\$0	\$0
Graham County	1/28/2014	Winter Weather	0/0	\$0	\$0
Graham County	2/10/2014	Winter Weather	0/0	\$0	\$0
Graham County	2/12/2014	Winter Storm	0/0	\$0	\$0
Graham County	3/24/2014	Winter Weather	0/0	\$0	\$0
Graham County	3/29/2014	Winter Weather	0/0	\$0	\$0
Graham County	10/31/2014	Winter Weather	0/0	\$0	\$0
Graham County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Graham County	11/26/2014	Winter Weather	0/0	\$0	\$0
Graham County	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Graham County	1/26/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/16/2015	Winter Storm	0/0	\$0	\$0
Graham County	2/18/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Graham County	2/20/2015	Winter Weather	0/0	\$0	\$0
Graham County	2/23/2015	Winter Storm	0/0	\$0	\$0
Graham County	2/25/2015	Winter Storm	0/0	\$0	\$0
Graham County	3/27/2015	Winter Weather	0/0	\$0	\$0
Graham County	1/20/2016	Winter Weather	0/0	\$0	\$0
Graham County	1/22/2016	Winter Storm	0/0	\$0	\$0
Graham County	2/8/2016	Winter Weather	0/0	\$0	\$0
Graham County	3/20/2016	Winter Weather	0/0	\$0	\$0

Source: National Centers for Environmental Information

There have been several severe winter weather events in Graham County. The text below describes one of the major events and associated impacts on the county. Similar impacted 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.

Extent

The greatest amount of snowfall reported was the 1993 snowstorm which tallied 24 inches. More snow is possible. In addition, several inches of ice accumulation is possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Graham County due to location and elevation. According to historical information, Graham County experiences an average of eight winter storm events each year. Therefore, the annual probability is highly likely (greater than 90%).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack).

Winter storms throughout the planning area have several negative externalities including hypothermia, 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 to fire or an accumulation of toxic fumes.

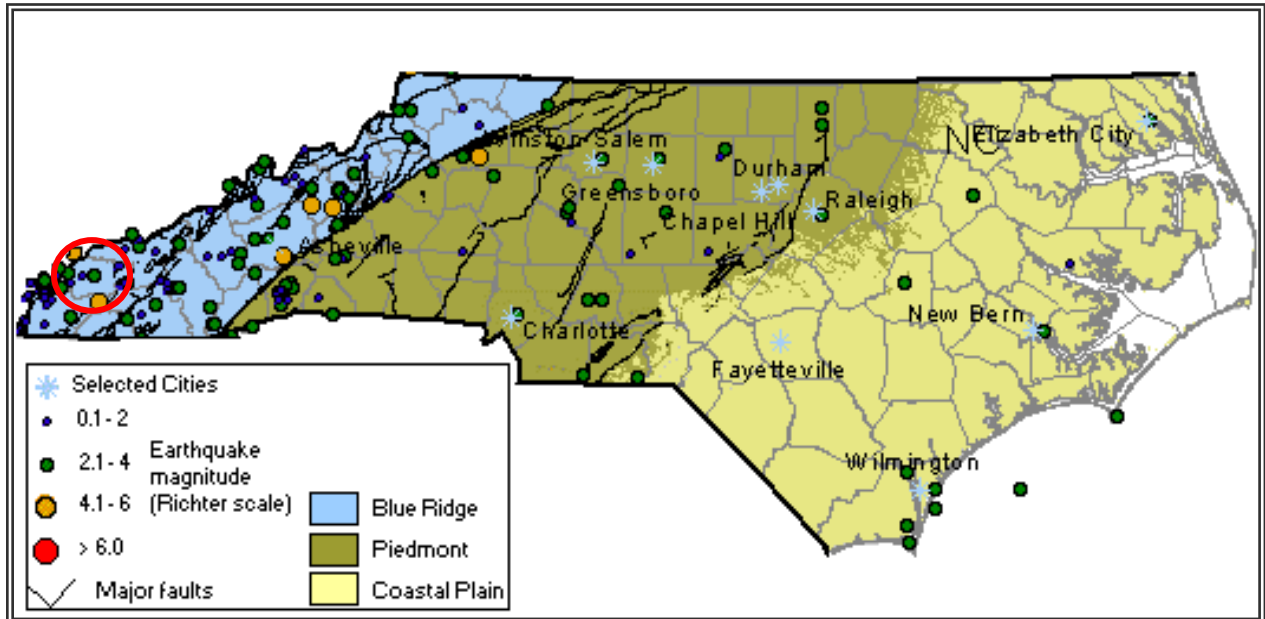
However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

B.2.10 Earthquake

Location

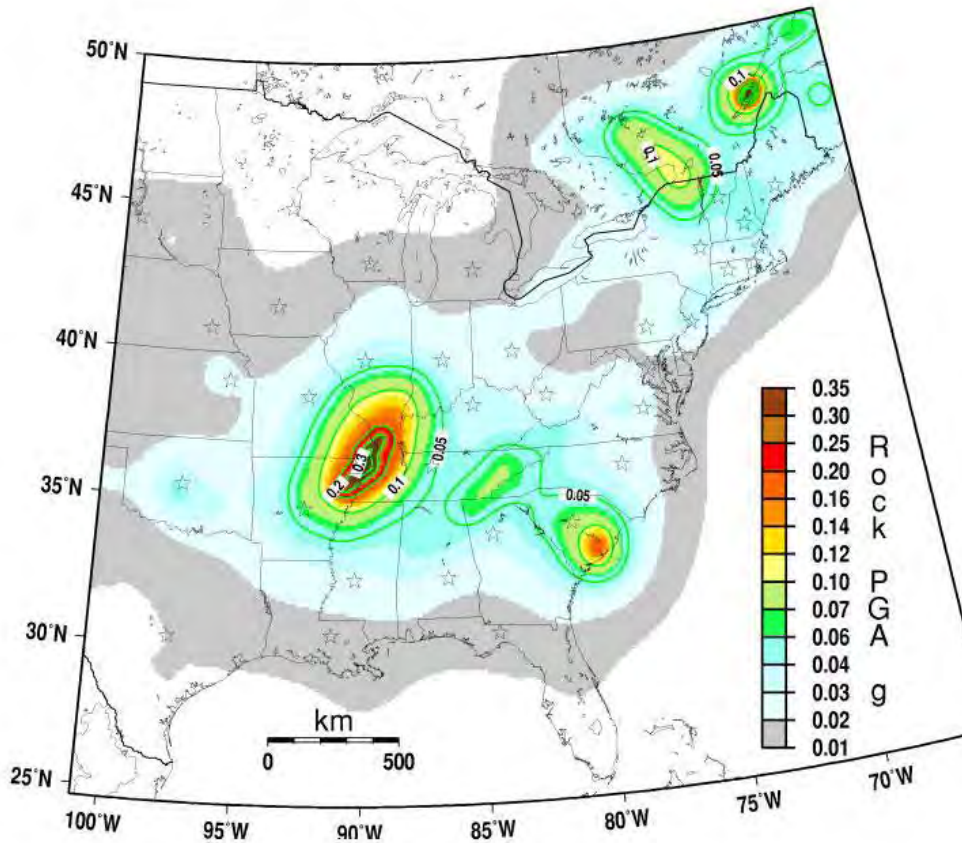
Approximately two-thirds of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes 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 B.2** is a map showing geological and seismic information for North Carolina.

FIGURE B.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure B.3 shows the intensity level associated with Graham County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Graham County lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE B.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS

Source: USGS, 2008

Historical Occurrences

At least 18 earthquakes are known to have affected Graham County since 1874. The strongest of these measured a V on the Modified Mercalli Intensity (MMI) scale. **Table B.21** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table B.22** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁶

¹⁶ Due to reporting mechanisms, not all earthquake events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported.

TABLE B.21: SUMMARY OF SEISMIC ACTIVITY IN GRAHAM COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Fontana Dam	6	V	-
Lake Santeetlah	0	-	-
Robbinsville	12	V	-
Unincorporated Area	0	-	-
GRAHAM COUNTY TOTAL	18	V (slightly strong)	< 4.8

Source: National Geophysical Data Center

TABLE B.22: SIGNIFICANT SEISMIC EVENTS IN GRAHAM COUNTY (1638 -1985)

Location	Date	MMI (magnitude)
Graham County		
Robbinsville	1/25/1933	III
Robbinsville	1/1/1935	IV
Robbinsville	1/2/1954	IV
Fontana Dam	9/7/1956	IV
Robbinsville	9/7/1956	V
Robbinsville	9/7/1956	II
Fontana Dam	11/24/1957	V
Robbinsville	11/24/1957	IV
Robbinsville	11/9/1968	IV
Robbinsville	7/13/1969	III
Robbinsville	7/13/1969	III
Fontana Dam	9/12/1973	IV
Fontana Dam	11/30/1973	V
Robbinsville	11/30/1973	V
Robbinsville	8/13/1979	IV
Robbinsville	7/27/1980	IV
Fontana Dam	9/24/1982	IV
Fontana Dam	9/24/1982	IV

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Graham County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table B.23**.

TABLE B.23: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/07/1812	New Madrid, MO	8.7	XII	VI

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
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

*This event is accounted for in the Graham County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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)*.

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The strongest intensity of earthquake to occur in Graham County is an MMI of V (slightly strong; less than 4.8 on the Richter scale), which has occurred during four separate earthquake events. However, stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Graham County is unlikely, given 18 recorded earthquakes in Graham County over 347 years. However, it is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the potential dollar loss for Graham County. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table B.24** summarizes the findings.

TABLE B.24: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Ratio	500 Year Event Loss	500 Year Event Ratio	Annualized Loss	Annualized Loss Ratio ¹
Graham County	\$1,408,586,933	\$86,973	0.006174%	\$1,542,173	0.109483%	\$14,950	0.001061%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table B.41**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Graham County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

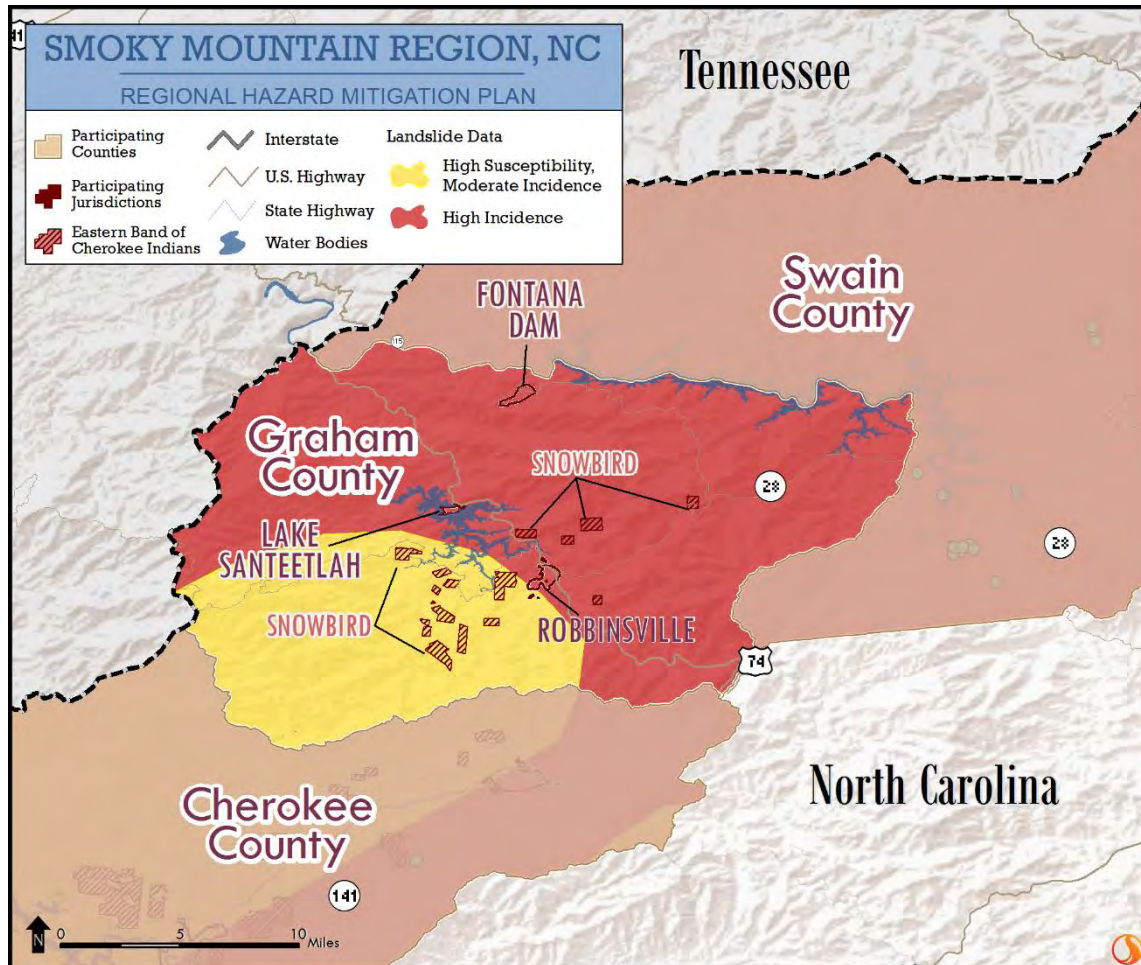
B.2.11 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Graham County.

According to **Figure B.4** below, which leverages USGS landslide information, the over half of the county has high landslide activity. The southwest portion of the county has a moderate incidence occurrence rate. There is high susceptibility throughout the county. **Figure B.5** shows the location of historic landslide incidents, if any have been recorded in the county.

FIGURE B.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF GRAHAM COUNTY

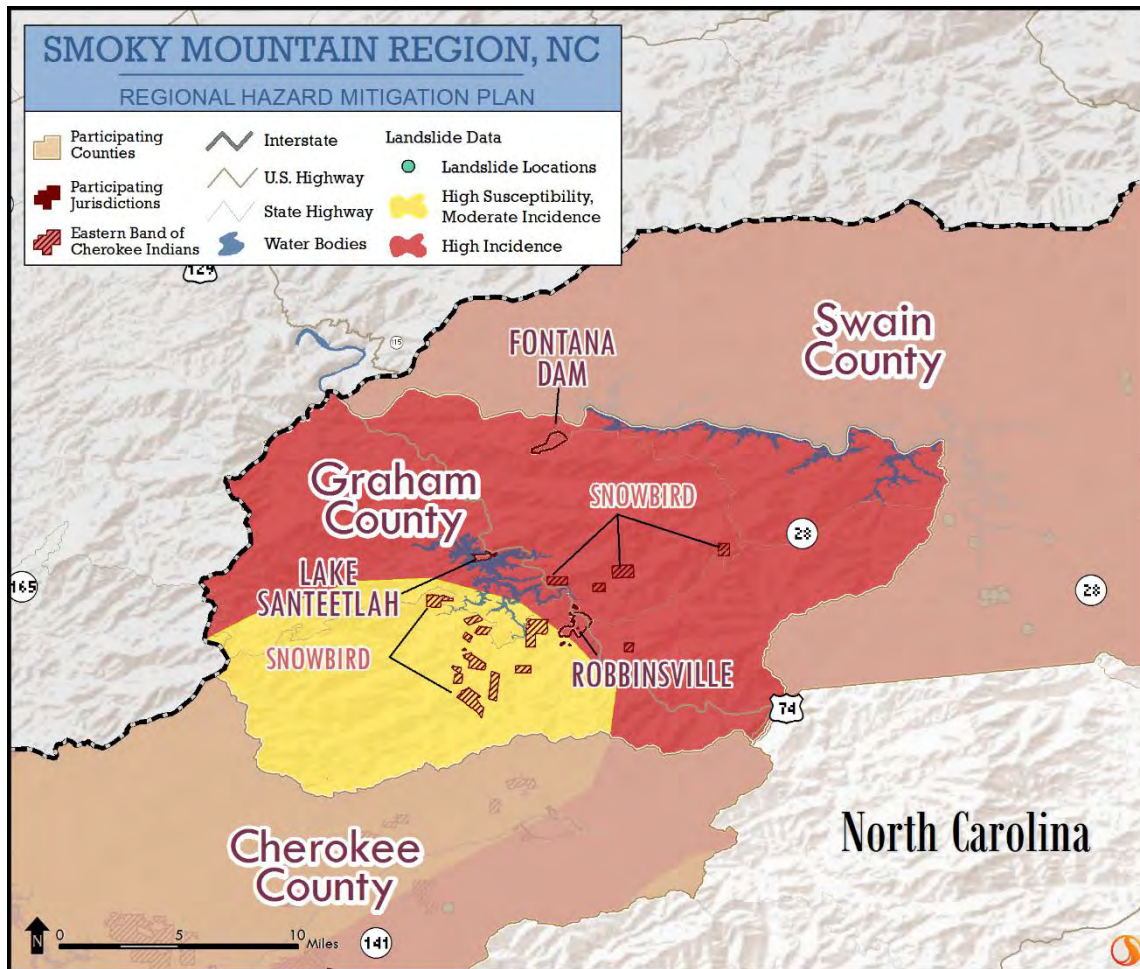


Historical Occurrences

Steep topography throughout Graham County 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. According to data from the North Carolina Geological Survey, no landslide events have occurred in Graham County¹⁷. Some incident mapping has also been 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 Graham County.

¹⁷ 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 B.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN GRAHAM COUNTY



Source: North Carolina Geological Survey

The following information identifies additional historical information reported in the previous hazard mitigation plan:

Landslides reported due to the 1994 floods that caused damages to roads and one structure. The 2004 heavy rains also caused landslides. NCDDEM classification suggests that a landslide having minor effect on the county is highly likely to occur. The county reports an average of 2 landslides every 10 years.

Extent

Landslides extent can be measured in debris. Limited information was available but tons of debris are possible.

Probability of Future Occurrences

Based on historical information and the USGS susceptibility index, the probability of future landslide events is likely (10 to 100 percent probability). The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as

having a lower, “moderate” incidence ranking. A majority of Graham County is located in the high incidence area though the southwestern portion of the county has a moderate incidence ranking. It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas in Graham County have greater risk than others given factors such as steepness on slope and modification of slopes.

Vulnerability Assessment

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. Most areas of Graham County are identified as high incidence (more than 15% of the area is involved in landsliding). Additionally, portions of the study area in the county are classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding) areas in the USGS landslide data. **Table B.25** presents potential vulnerability in moderate incidence areas while **Table B.26** presents vulnerability in high incidence areas.

TABLE B.25: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	1,864	18%	794	16%	\$61,897,540	13%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	3	1%	3	1%	\$1,996,980	4%
Unincorporated Area	1,824	19%	786	18%	\$59,373,220	15%
EBCI	37	71%	5	50%	\$527,340	62%

Source: USGS

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE B.26: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	8,287	82%	4,122	84%	\$424,267,250	87%
Fontana Dam	1	100%	1	100%	\$50,530	100%
Lake Santeetlah	305	100%	200	100%	\$42,720,880	100%
Robbinsville	325	99%	247	99%	\$45,979,710	96%

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	7,641	81%	3,669	82%	\$335,191,910	85%
EBCI	15	29%	5	50%	\$324,220	38%

Source: USGS

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk.

Critical Facilities

The Water Treatment Plant on Long Creek Road is the only known critical facility in the High Susceptibility/Moderate Incidence area in Graham County. A total of 18 of Graham County’s critical facilities are located in areas of high landslide incidence, as presented in **Table B.27**. A list of specific critical facilities and their associated risk can be found in **Table B.41** at the end of this section.

TABLE B.27: CRITICAL FACILITIES IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

GRAHAM COUNTY						
Category and Type	Fontana Dam	Lake Santeetlah	Robbinsville	Unincorporated	EBCI	Total
Emergency Services	0	0	2	1	0	3
EMS Base	0	0	0	1	0	1
Sheriff’s Office	0	0	1	0	0	1
Jail	0	0	1	0	0	1
Government Facilities	0	0	9	2	0	11
Government Office	0	0	8	0	0	8
Community Center	0	0	0	1	0	1
School	0	0	1	1	0	2
Public Works/Utilities	0	0	3	0	0	3
Sewer/Sewer Plant	0	0	2	0	0	2
Water Treatment Plant	0	0	1	0	0	1
Other	0	0	0	1	0	1
Transportation	0	0	0	1	0	1
Total	0	0	14	4	0	18

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in Graham County, 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 county 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.

B.2.12 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table B.28** explains these classifications.

TABLE B.28: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

According to the North Carolina Division of Land Management there are 11 dams in Graham County.¹⁸ Of these dams, seven are classified as high hazard potential and four are classified as low hazard potential. High hazard dams are listed in **Table B.29**.

TABLE B.29: GRAHAM COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
GRAHAM COUNTY				
Fontana Lake Dam	High	-	587,328	Federal
Fontana/Emergency Spillway Dam	High	-	587,328	Federal
Mission Ready Dam	High	-	250	Private
Phillips Dam	High	2.4	22	Private
Robert Mosely Dam	High	1.8	29	Private
Santeetlah Dam	High	2,800.0	271,320	Utility
Tobacco Branch Dam	High	5.0	48	Private

Source: North Carolina Division of Land Resources

¹⁸ From the March 16, 2017 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (<https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety>).

It should also be noted that the North Carolina dam classification regulations were recently updated. As a result of the change, more dams are generally classified as high hazard.

(Taken from previous Graham County hazard mitigation plan.) The most significant dam in Graham County is the Fontana Dam. At 480 feet in height, it is the highest concrete dam east of the Rocky Mountains. Built in three years' time at a cost of \$74.7 million, the Fontana dam became operational as a hydro-electric dam starting in January 1945. The Fontana Dam has three electrical generating units with a peak capacity of 250,000 kilowatts. The dam is 2,365 feet in length and 376 feet thick at its base. Lake Fontana is 11,685 acres in size and has 240 miles of shoreline. The Lake Fontana reservoir has a flood-storage capacity of 513,965 acre-feet. The dam is a Tennessee Valley Authority dam and is monitored and maintained for safety. Other significant dams in Graham County include the Tapoco (Cheoah) Dam and the Lake Santeetlah Dam.

Historical Occurrences

No dam breaches were reported in Graham County. However, several breach scenarios in the county could be catastrophic.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria. Of the 11 dams in Graham County, 7 are classified as high-hazard, which could result in fatalities if breached.

Probability of Future Occurrences

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 was completed in a *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.

B.2.13 Erosion

Location

Erosion in Graham County is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Graham County's mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the county, particularly along the banks of rivers and streams, but it is not a significant threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion in Graham County. This includes searching local newspapers, interviewing local officials, and reviewing the previous hazard mitigation plan. Little information could be found. Prior to joining the regional planning effort, erosion was not addressed in the previous Graham County hazard mitigation plan.

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs (inches per year, for example). There are no erosion rate records located in Graham County but it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for the Smoky Mountain Region, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent annually).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

B.2.14 Flood

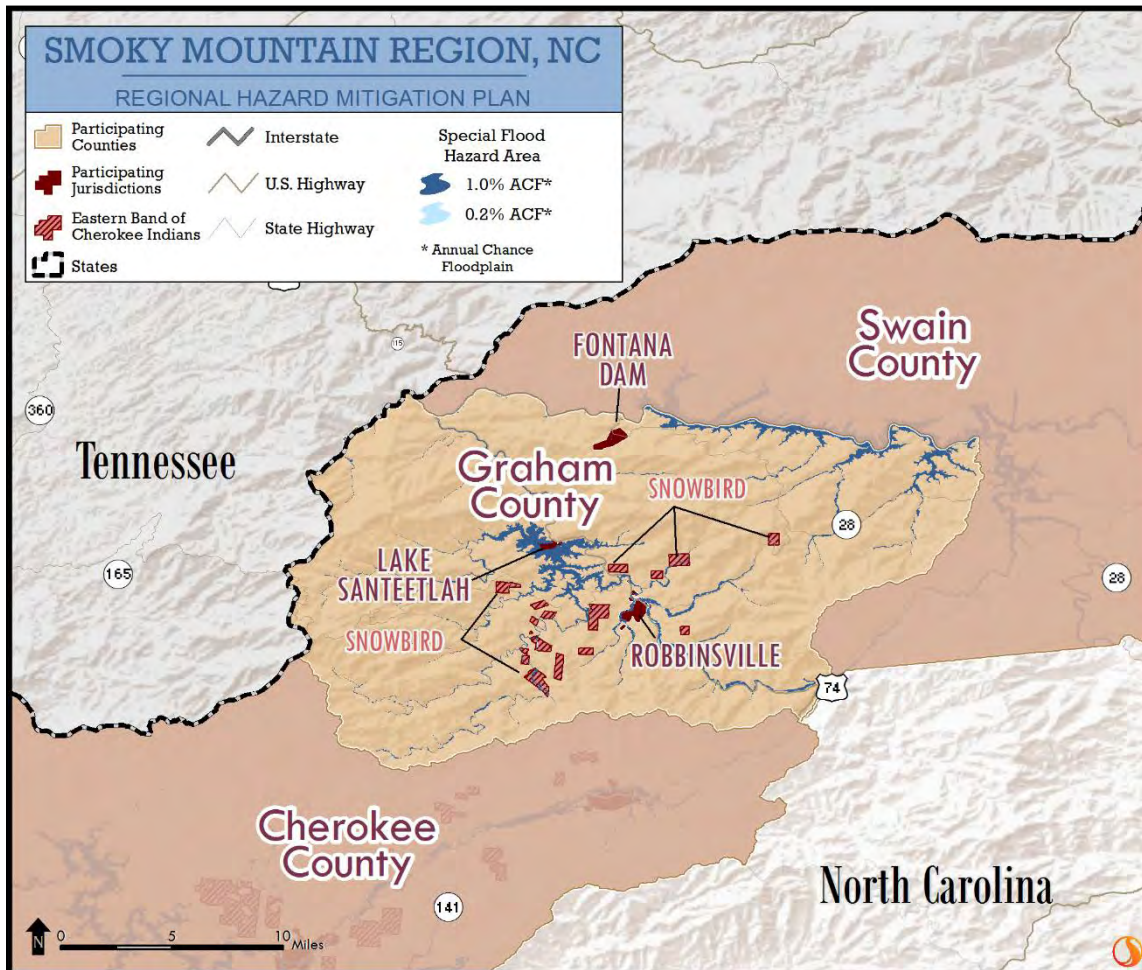
Location

There are areas in Graham County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).¹⁹ 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 302 square miles that make up Graham County, there are 15.29 square miles of land in zones A, AE (1.0% annual chance floodplain/100-year floodplain), 0.25 square miles of land in floodways, and 0.17 square miles of land in Zone X500 (0.2% annual chance floodplain/500-year floodplain). Therefore, there is a total of 15.46 square miles of land in floodplain areas in Graham County.

These flood zone values account for 5.1 percent of the total land area in Graham County. 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 B.6 , Figure B.7 , Figure B.8 , and Figure B.9** illustrate the location and extent of currently mapped special flood hazard areas for Graham County and the Towns of Fontana Dam, Lake Santeetlah, and Robbinsville based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

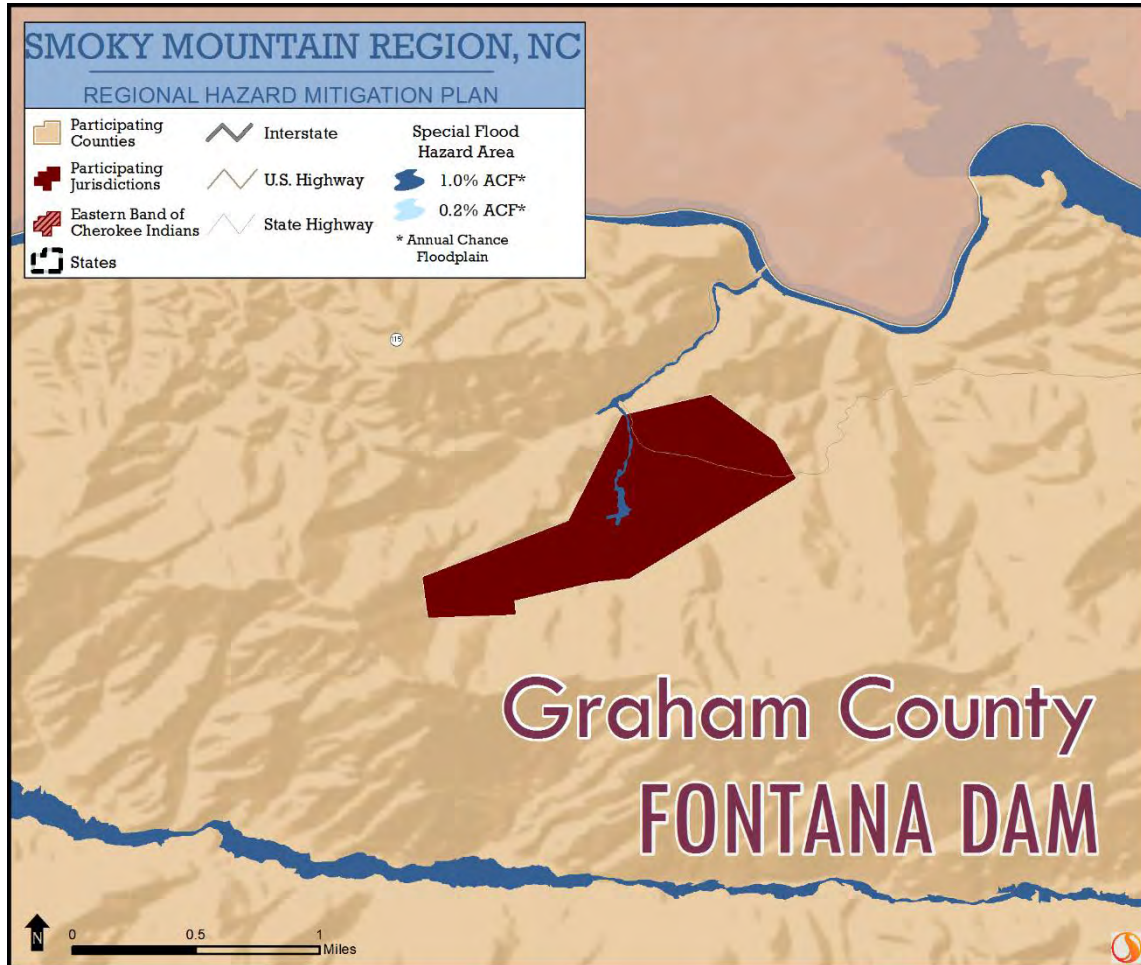
¹⁹ The county-level DFIRM data used for Graham County were updated in 2010.

FIGURE B.6: SPECIAL FLOOD HAZARD AREAS IN GRAHAM COUNTY



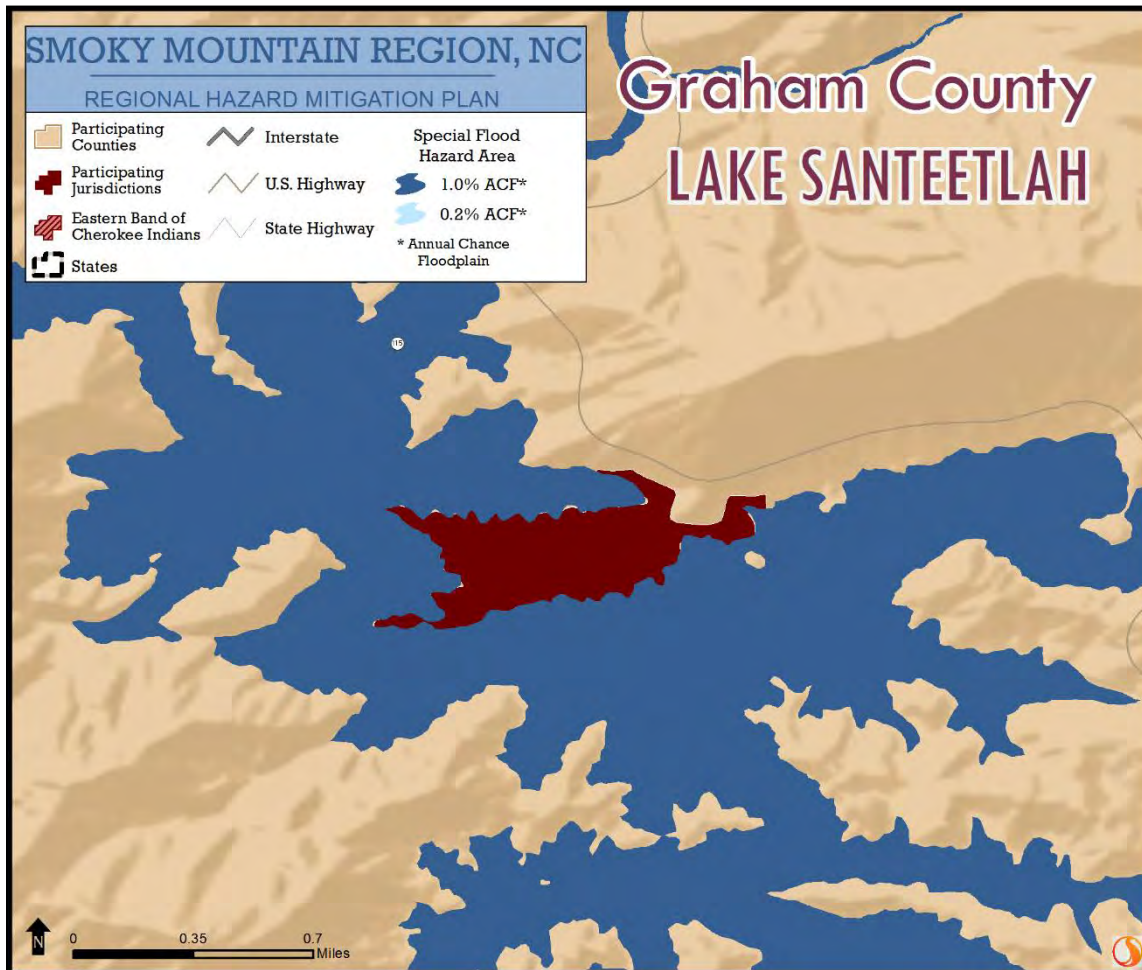
Source: Federal Emergency Management Agency

FIGURE B.7: SPECIAL FLOOD HAZARD AREAS IN FONTANA DAM



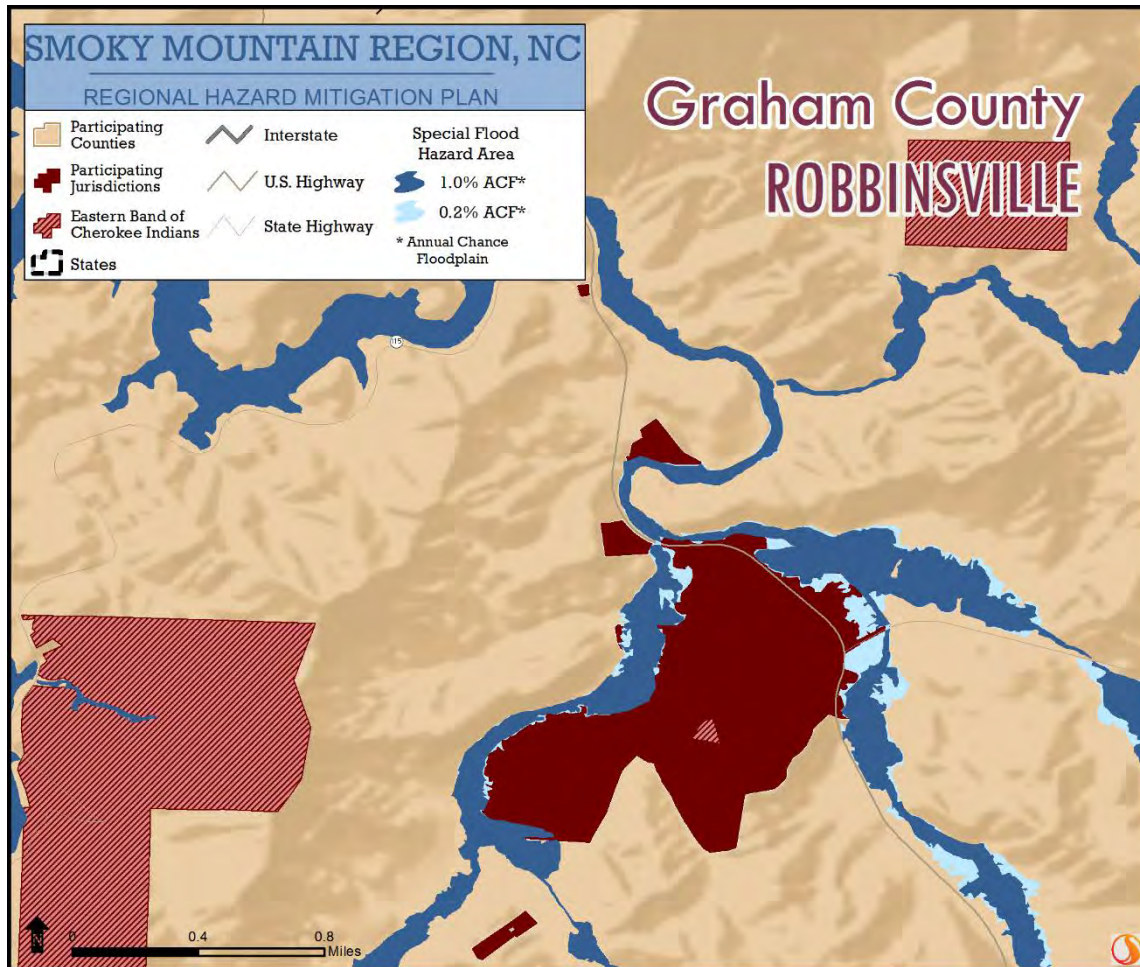
Source: Federal Emergency Management Agency

FIGURE B.8: SPECIAL FLOOD HAZARD AREAS IN LAKE SANTEETLAH



Source: Federal Emergency Management Agency

FIGURE B.9: SPECIAL FLOOD HAZARD AREAS IN ROBBINSVILLE



Source: Federal Emergency Management Agency

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 10 events in Graham County since 1996.²⁰ A summary of these events is presented in **Table B.30** . These events accounted for over \$558,000 (2017 dollars) in property damage in the county.²¹ Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table B.31** .

TABLE B.30: SUMMARY OF FLOOD OCCURRENCES IN GRAHAM COUNTY

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
GRAHAM COUNTY	10	\$558,777	\$0
Fontana	1	\$0	\$0

²⁰ These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

²¹ The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Lake Santeetlah	0	\$0	\$0
Robbinsville	1	\$0	\$0
Unincorporated Area	8	\$558,777	\$0

Source: National Centers for Environmental Information

TABLE B.31: HISTORICAL FLOOD EVENTS IN GRAHAM COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
GRAHAM COUNTY						
Robbinsville	9/24/1997	Flash Flood	0/0	\$0	\$0	--
Fontana Village	2/22/2003	Flash Flood	0/0	\$0	\$0	--
Graham Co.	5/5/2003	Flood	0/0	\$0	\$0	--
Graham Co.	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Flooding from overnight rainfall worsened during the morning hours, as numerous thunderstorms produced intense rainfall rates. By late afternoon, 24-hour rainfall totals averaged around 6 inches across the county. The result was numerous washed out or submerged bridges, as well as widespread rock and mud slides.
Graham Co.	5/7/2003	Flash Flood	0/0	\$378,147	\$0	Another round of heavy rain-producing thunderstorms caused a second consecutive day of flash flooding across the county. Several roads were closed due to flooded creeks and streams, as well as due to rock and mud slides. Portions of highways 28 and 129 were closed. Rock and mudslides caused some homes and trailers to be swept away. Yellow Creek flooded several homes. Numerous bridges were washed out.
Graham Co.	5/7/2003	Flood	0/0	\$0	\$0	--
Graham Co.	7/1/2003	Flood	0/0	\$0	\$0	--

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
GRAHAM COUNTY						
Graham Co.	9/16/2004	Flood	0/0	\$29,371	\$0	In response to persistent moderate to heavy rainfall associated with the remnants of Hurricane Ivan, severe flooding developed across the mountains for the second time in 9 days. Flooding first developed across the southwest mountains, when several small streams and creeks overflowed their banks, including Toot Hollow Creek near Bryson City. Several rescues were required during the evening in Macon County, as creeks and streams began to threaten homes. Overnight, flooding became more widespread, with Macon County enduring the worst of it. The Little Tennessee River overflowed its banks during the early morning of the 17th, and continued to flood through much of the day. The river flooded an industrial park in Macon County, causing extensive damage. In Swain County, 500,000 gallons of raw sewage and numerous natural gas tanks were swept down the river. Hundreds of structures were damaged or destroyed, and several private bridges were swept away. Portions of highways 105, 64, and 28 were all closed in Macon County, some due to major damage that was estimated to take several months to repair. In addition, a trout farm lost 60,000 pounds of fish.
Graham Co.	11/24/2004	Flood	0/0	\$0	\$0	--
Tapoco	1/7/2009	Flash Flood	0/0	\$0	\$0	--

Source: National Centers for Environmental Information

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 2,281 parcels (23 percent of the total) and 2,311 improved properties (23 percent of the total) properties located in the 100-year or 500-year floodplain within Graham County.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. A gauge currently exists in Graham County near Bearpen Gap, at the Cheoah River. The maximum discharge at this gauge was 12,800 cubic feet per second in 2014.

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been two flood losses reported in Graham County through the National Flood Insurance Program (NFIP), totaling almost \$11,000

in claims payments. A summary of these figures for the county is provided in **Table B.32** . 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 Graham County were either uninsured, denied claims payment, or not reported.

TABLE B.32: SUMMARY OF INSURED FLOOD LOSSES IN GRAHAM COUNTY

Location	Flood Losses	Claims Payments
GRAHAM COUNTY	2	\$10,847
Fontana Dam*	--	--
Lake Santeetlah**	*	*
Robbinsville	0	\$0
Unincorporated Area	2	\$10,847

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

*Fontana Dam is covered by Graham County. They do not participate separately but activities are covered by the County.

**Joined September 12, 2017.

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.

As of February 2017, there are zero non-mitigated repetitive loss properties located in Graham County.

Probability of Future Occurrences

Flood events will remain a threat in Graham County and its participating jurisdictions in areas prone to flooding. NCEI’s Storm Events Database indicated 10 flood events in Graham County between 1996 and 2016. This results in an approximate historic average occurrence rate of one flood every two years. Therefore, flood was assigned a probability of “likely” (between 10 and 90 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 county and participating jurisdictions. For example, central areas of the county, especially in and around Lake Santeetlah, have concentrated floodplains and thus a higher flood risk. Flood is not the greatest hazard of concern but will continue occur and cause damage. Therefore, mitigation actions may be warranted.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 B.33** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and **Table B.34** presents potential at-risk property susceptible to

either the 1.0-percent or 0.2-percent annual chance flood in Graham County. Both the number of parcels and the approximate value are presented.

TABLE B.33: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF)

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,569	8%	1,263	8%	\$224,416,554	12%
Andrews	74	9%	46	7%	\$12,728,090	15%
Murphy	84	7%	64	7%	\$25,042,784	15%
Unincorporated Area	2,408	8%	1,152	8%	\$186,559,700	11%
EBCI	3	11%	1	13%	\$85,980	5%
Graham County	2,281	23%	1,194	24%	\$158,352,070	33%
Fontana Dam	6	11%	2	7%	\$101,060	8%
Lake Santeetlah	86	28%	68	34%	\$20,534,960	48%
Robbinsville	53	16%	43	17%	\$24,072,960	50%
Unincorporated Area	2,121	23%	1,081	25%	\$113,643,090	29%
EBCI	15	33%	0	0%	0	0%

Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE B.34: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	2,693	8%	1,337	8%	\$242,453,714	13%
Andrews	83	10%	54	9%	\$13,739,810	17%
Murphy	129	11%	92	11%	\$32,513,574	20%
Unincorporated Area	2,475	8%	1,188	8%	\$195,754,730	12%
EBCI	6	21%	3	38%	\$445,600	26%
Graham County	2,311	23%	1,214	25%	\$161,310,570	33%
Fontana Dam	6	11%	2	7%	\$101,060	8%
Lake Santeetlah	86	28%	68	34%	\$20,534,960	48%
Robbinsville	62	19%	51	20%	\$24,941,570	52%

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	2,142	23%	1,093	25%	\$115,732,980	29%
EBCI	15	33%	0	0%	\$0	0%

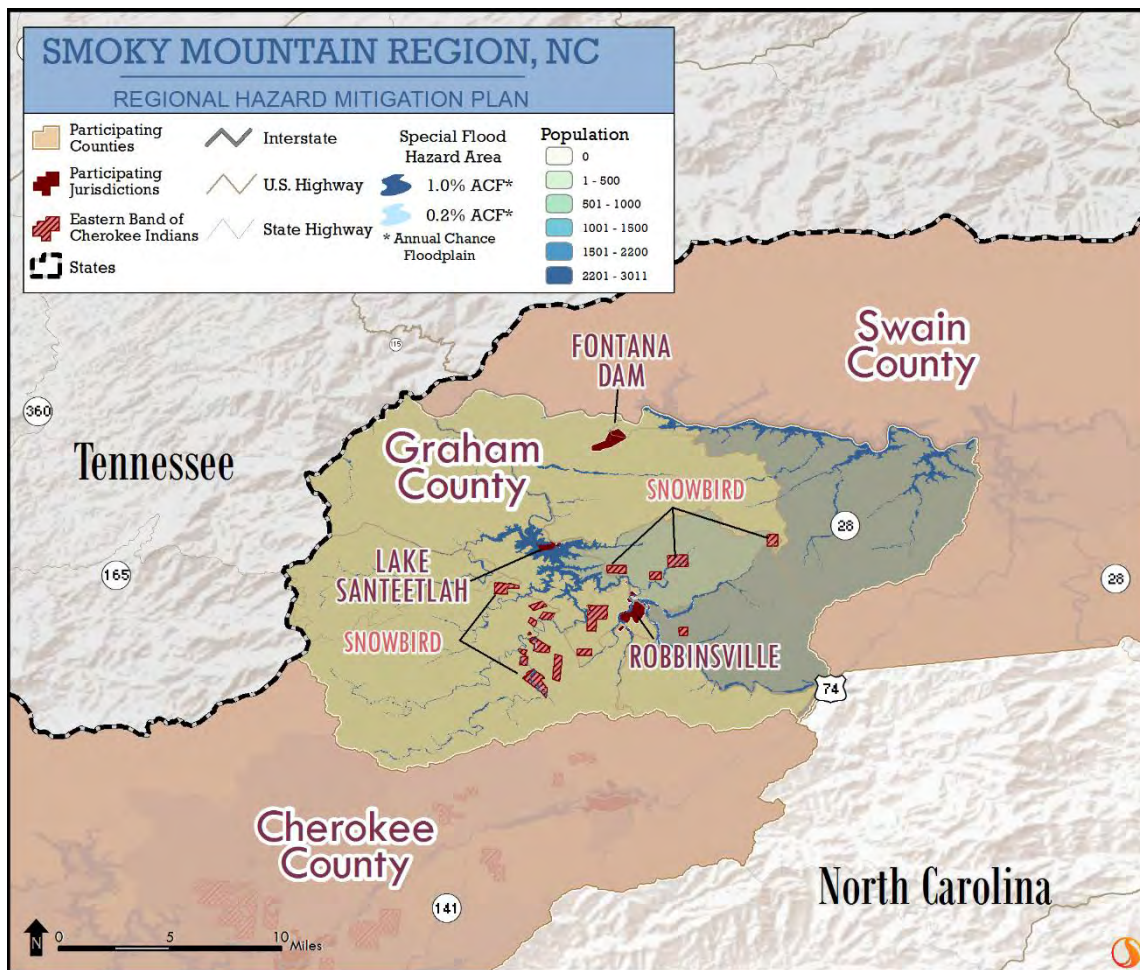
Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure B.10** is presented to gain a better understanding of at risk population.

FIGURE B.10 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census 2015

Critical Facilities

The critical facility analysis revealed that there are no critical facilities located in the Graham County 1.0-percent annual chance floodplain. The water treatment plant on Rodney Road Bypass and the Building

Inspections office in Robbinsville are the only critical facilities located in the 0.2-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. A list of specific critical facilities and their associated risk can be found in **Table B.41** at the end of this section.

In conclusion, a flood has the potential to impact many existing and future buildings and populations in Graham County, 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 are outside the scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

B.2.15 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Graham County has no TRI sites.

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

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 materials “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.

There have been no historic HAZMAT incidents reported in Graham County.

Extent

Hazardous Materials Incidence extent can be defined into terms of amount of material released or associated impacts. While no events have been reported, the bulk release (over 199 gallons) would classify the event as a hazardous material and much more is possible.

Probability of Future Occurrences

Given the curvy, mountainous roads in Graham County, it is possible that a hazardous material incident may occur in the county, though it is unlikely (less than one percent annual probability) given the lack of historical incidents. County and town 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.

Although there are no TRI sites and no record of previous events in the county, hazardous materials incidents will continue to be a threat. The county may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

Vulnerability Assessment

There are no reports of damage from hazardous materials incidents in Graham County. However, it is assumed that one major event could result in significant losses for Graham County.

Most hazardous materials 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 materials 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.²² In both scenarios, two sizes of buffers—500 and 2,500 meters—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. An analysis was not performed for fixed sites, as no TRI sites were reported in Graham County. 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 B.11** shows the areas used for mobile toxic release buffer analysis.

²² This type of analysis will likely yield conservative results (generally higher than actual reported values).

The results indicate the approximate number of parcels, improved value, as shown in **Table B.35** (mobile road sites) and **Table B.36** (mobile railroad sites).²³

FIGURE B.11 : MOBILE HAZMAT BUFFERS IN GRAHAM COUNTY

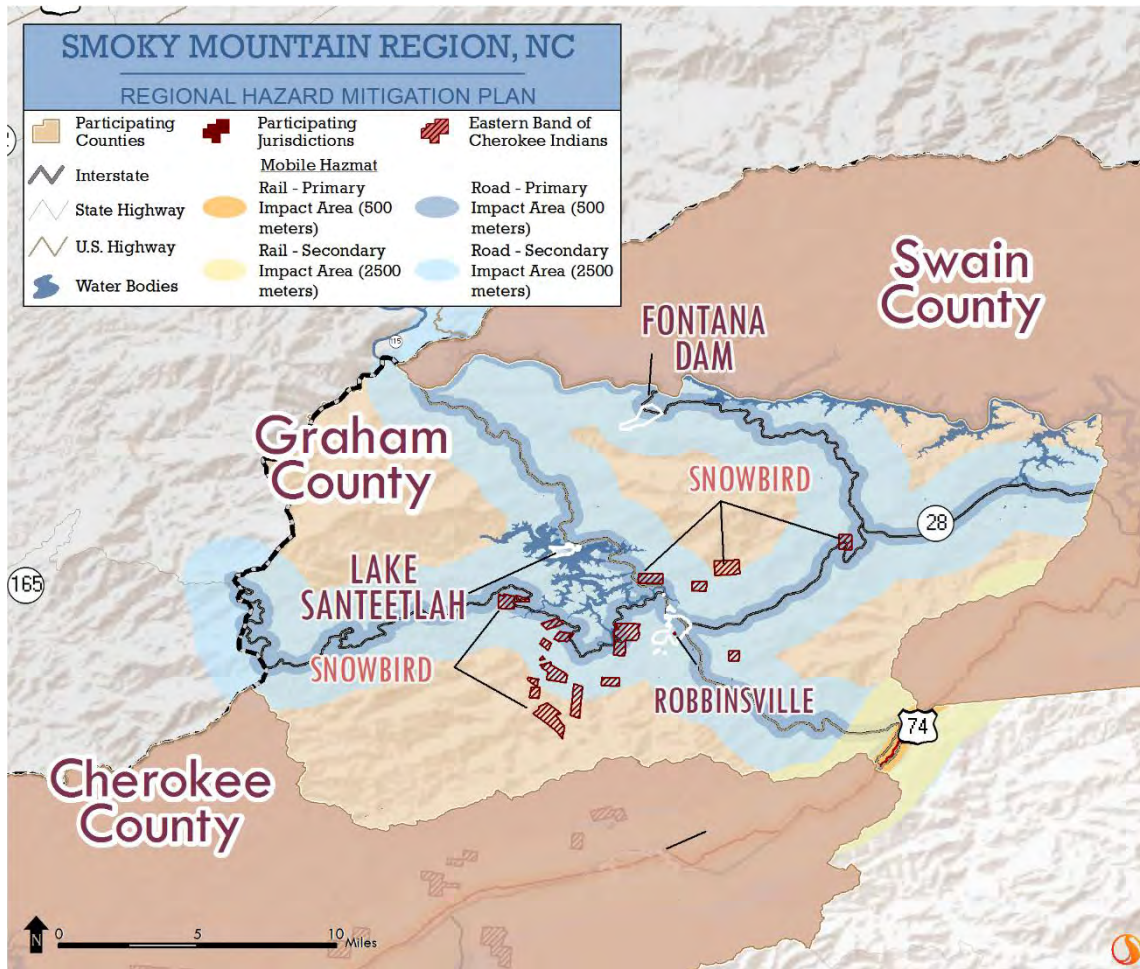


TABLE B.35: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - ROAD)

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	3,508	35%	1,840	37%	\$211,812,150	44%
Fontana Dam	0	0%	0	0%	\$0	0%

²³ Note that parcels included in the 2,500-meter analysis are also included in the 500 meter analysis.

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Lake Santeetlah	122	40%	77	39%	\$12,112,920	28%
Robbinsville	223	68%	162	65%	\$40,000,450	83%
Unincorporated Area	3,142	33%	1,599	36%	\$159,206,540	40%
EBCI	21	40%	2	20%	\$492,240	58%

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	8,822	87%	4,387	89%	\$443,116,170	91%
Fontana Dam	1	100%	1	100%	\$50,530	100%
Lake Santeetlah	305	100%	200	100%	\$42,720,880	100%
Robbinsville	328	100%	250	100%	\$47,976,690	100%
Unincorporated Area	8,147	86%	3,927	88%	\$351,538,280	89%
EBCI	41	79%	9	90%	\$829,790	97%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

**TABLE B.36: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	74	1%	24	0%	\$2,376,690	0%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	74	1%	24	1%	\$2,376,690	1%
EBCI	0	0%	0	0%	\$0	0%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	210	2%	82	2%	\$6,163,260	1%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	0	0%	0	0%	\$0	0%
Robbinsville	0	0%	0	0%	\$0	0%
Unincorporated Area	210	2%	82	2%	\$6,163,260	2%
EBCI	0	0%	0	0%	\$0	0%

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given susceptibility across the entire county, 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 no Graham County facilities located in a HAZMAT risk zone. A list of specific critical facilities and their associated risk can be found in **Table B.41** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors in Graham County revealed that there are 18 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and zero critical facilities located in the railroad HAZMAT buffer areas. A list of specific critical facilities and their associated risk can be found in **Table B.41** 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 Graham County. 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. Further, incidents from neighboring counties could also impact the county and participating jurisdictions.

B.2.16 Wildfire

Location

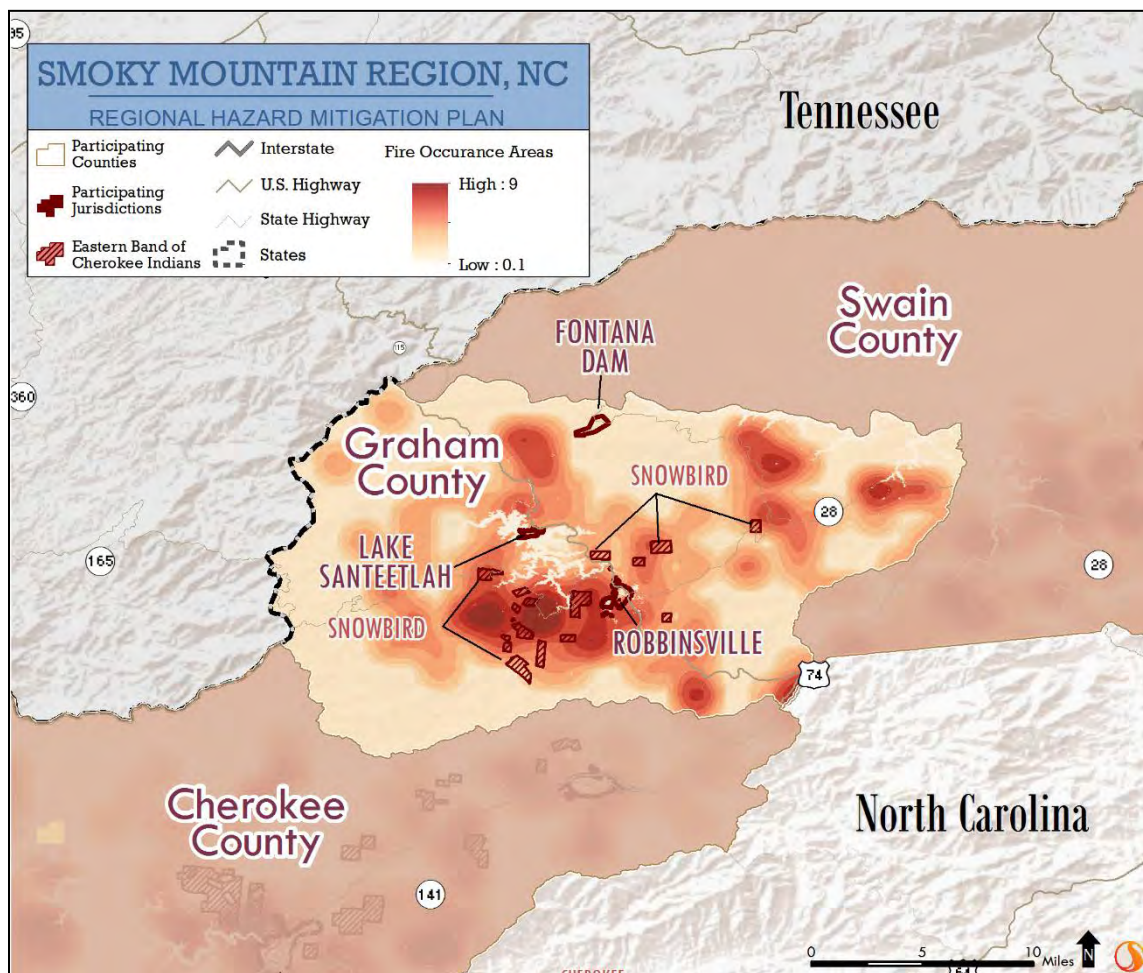
The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic location.

Historical Occurrences

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county.

Figure B.12 shows the Fire Occurrence Areas (FOA) in Graham County based on data from the Southern Wildfire Risk Assessment.

FIGURE B.12: HISTORIC WILDFIRE EVENTS IN GRAHAM COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, Graham County experiences an average of 16 wildfires annually which burn an average of 689 acres per year. The data indicates that each fire burns an average of 44 acres. This average higher than the 2006 to 2011 ten-year average of 11 acres burned per fire (included in the previous plan update), which is in part attributed to a

much larger than average number acres burned in 2016 (a total of 8,941 acres). **Table B.37** lists the number of reported wildfire occurrences in the county between the years 2002 and 2016.

TABLE B.37: HISTORICAL WILDFIRE OCCURRENCES IN GRAHAM COUNTY

Year	Number of Fires	Number of Acres Burned
2002	12	163.6
2003	1	3
2004	20	175.6
2005	7	6.2
2006	16	26.5
2007	83	542
2008	9	118
2009	8	17
2010	17	33
2011	11	37
2012	9	189
2013	2	2
2014	4	19
2015	8	68
2016	27	8941

Source: North Carolina Division of Forest Resources

2016 Wildfires

In the late October through November of 2016, western North Carolina suffered from what are considered to be wildfires of historic extent. In November alone, western North Carolina experienced an outbreak of wildfires that burned over 55,000 acres in the wake of an extreme drought.²⁴ Graham County and Swain County were particularly hard hit. In Graham County, two fires burned over 8,000 acres near Lake Santeetlah. One of which, the Maple Springs Fire, (**Figure B.13**²⁵) burned over 7,500 acres before being contained.²⁶ Another fire in Graham County required evacuations.



Figure B.13: The Maple Springs Fire burns in Graham County

Source: The US Forest Service, North Carolina

²⁴ <http://www.charlotteobserver.com/news/local/article114911183.html>

²⁵ <https://inciweb.nwcg.gov/incident/photograph/5090/22/>

²⁶ <http://wlos.com/news/local/boteler-fire-and-nantahala-branch-fires-update>

Firefighting and rescue crews from all over the state traveled to western North Carolina to aid in relief efforts.²⁷ According to the USDA's Joint Information Center Western NC Wildfires, by November 25, 2016, nine incident management teams and over 6,000 state and federal personnel from all over the country were deployed to assist the Southeast with fire suppression, in addition to hundreds of state volunteer firefighters and emergency personnel. At the time, North Carolina alone was in use of seven airplanes, eight single engine air tankers (SEATs), six type 1 (large) helicopters, five type 2 (medium) helicopters, and three type 3 (large helicopters) to aid in fire suppression.²⁸ The USDA estimates that suppression costs from October through December in western North Carolina totaled \$36.8 million.²⁹ Aside from the impacts to human and environmental health and safety, the fires had a significant impact on the region's economy, which relies heavily on tourism during the fall and winter months.³⁰

Extent

Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2007 to 2016. The greatest number of fires to occur in Graham County in any year was 83 in 2007. The greatest number of acres to burn in the county in a single year occurred in 2016 when 8,941 acres were burned. Although this data lists the extent that has occurred to date, larger and more frequent wildfires are possible throughout the county.

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Graham County. 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. Some areas, such as southwest Robbinsville and unincorporated areas of the county have experienced more fires than other areas, potentially indicating higher risk. The probability assigned to Graham County for future wildfire events is highly likely (greater than 90% annual probability).

Vulnerability Assessment

Although historical evidence indicates that Graham County is susceptible to wildfire events, there are few reports of damage. However, it should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

²⁷ <http://myfox8.com/2016/11/22/new-wildfire-sparks-evacuations-in-blowing-rock/>

²⁸ UDA Forest Services Joint Information Center Western NC Wildfires. Evening Summary (2016, November 25). Retrieved from <https://www.fs.usda.gov/detail/nfsnc/alerts-notices/?cid=fseprd525902>

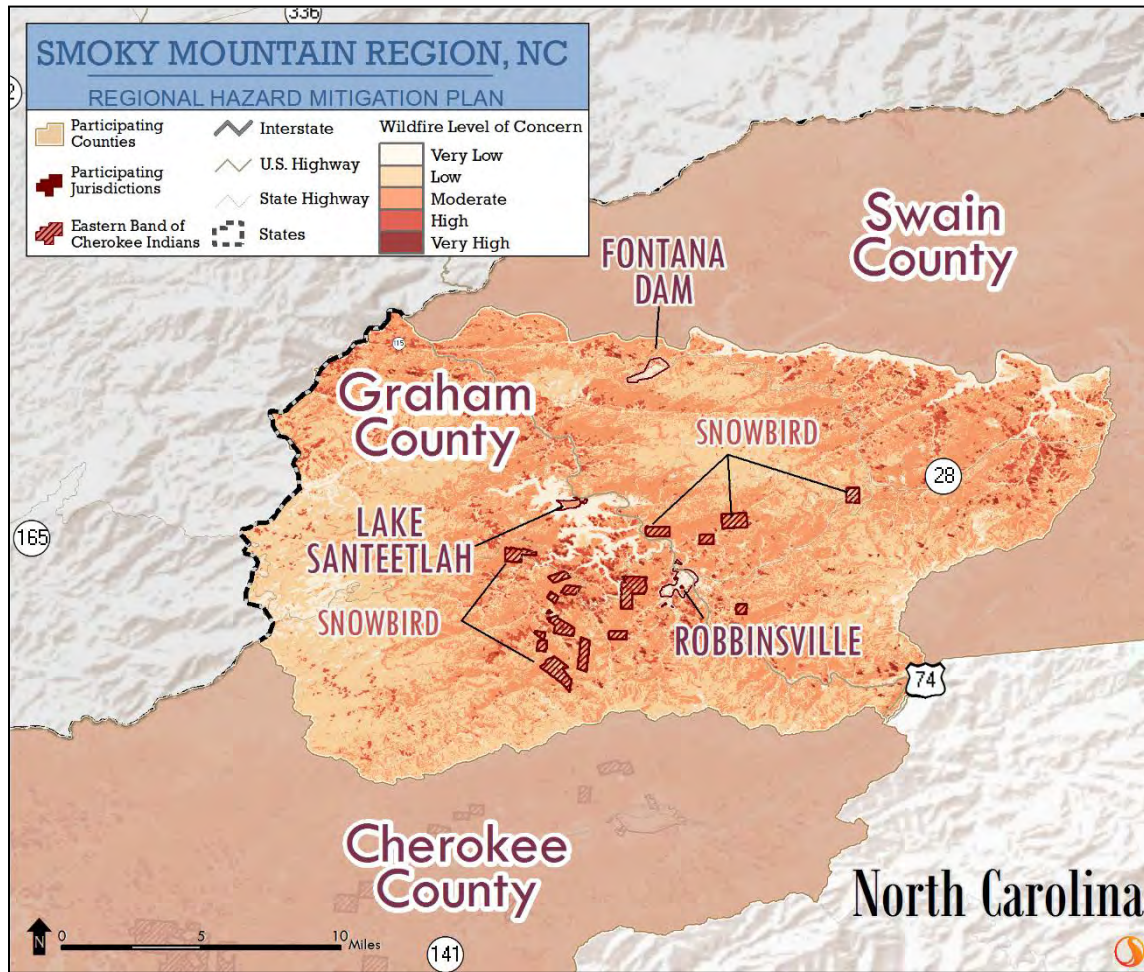
²⁹ <http://www.citizen-times.com/story/news/local/2017/03/31/wnc-wildfires-yield-hefty-price-tag/99736410/>

³⁰ <http://www.citizen-times.com/story/news/local/2016/11/18/outbreak-wnc-wildfires-takes-toll-wildlife-environment/93788956/>

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non- specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

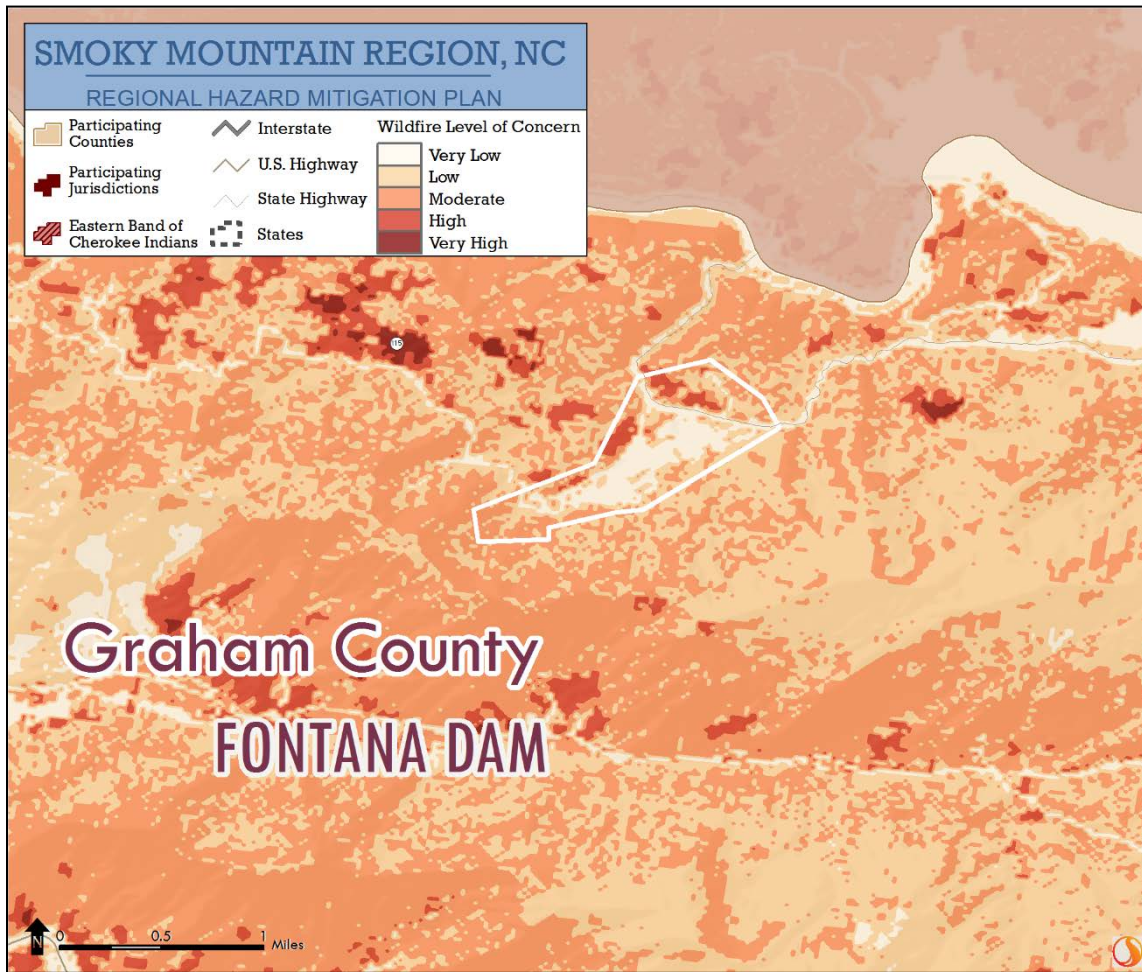
Figure B.14, Figure B.15, and Figure B.16 show the wildfire risk areas for Graham County and participating jurisdictions. Initially provided as raster data, it was converted to a polygon for analysis. Thirty-seven percent of parcels and 38 percent of improved parcels in Graham County are in areas of high to very high wildfire risk, as detailed in **Table B.38**. However, there is considerable risk overall when viewed outside of just high risk areas.

FIGURE B.14: WILDFIRE RISK AREAS IN GRAHAM COUNTY



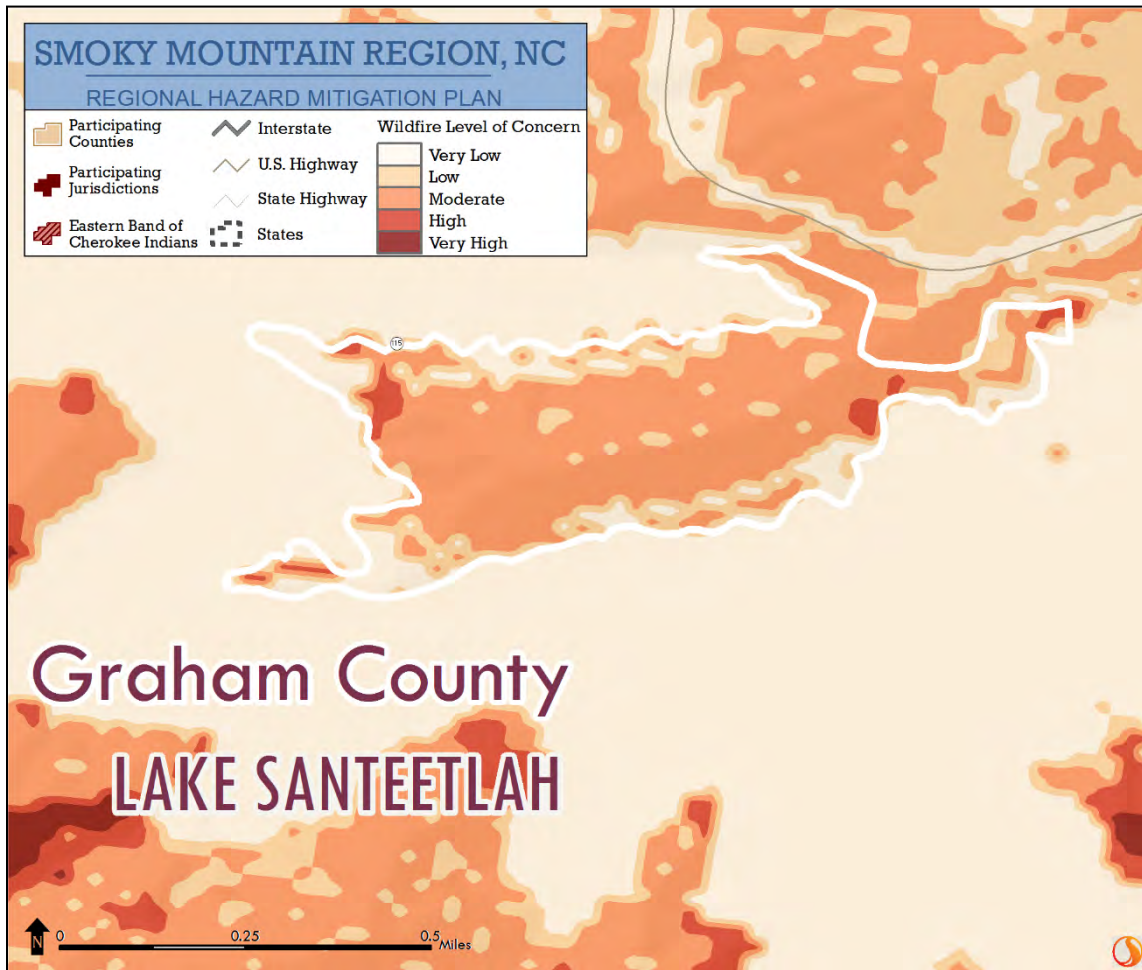
Source: Southern Wildfire Risk Assessment Data

FIGURE B.15: WILDFIRE RISK AREAS IN FONTANA DAM



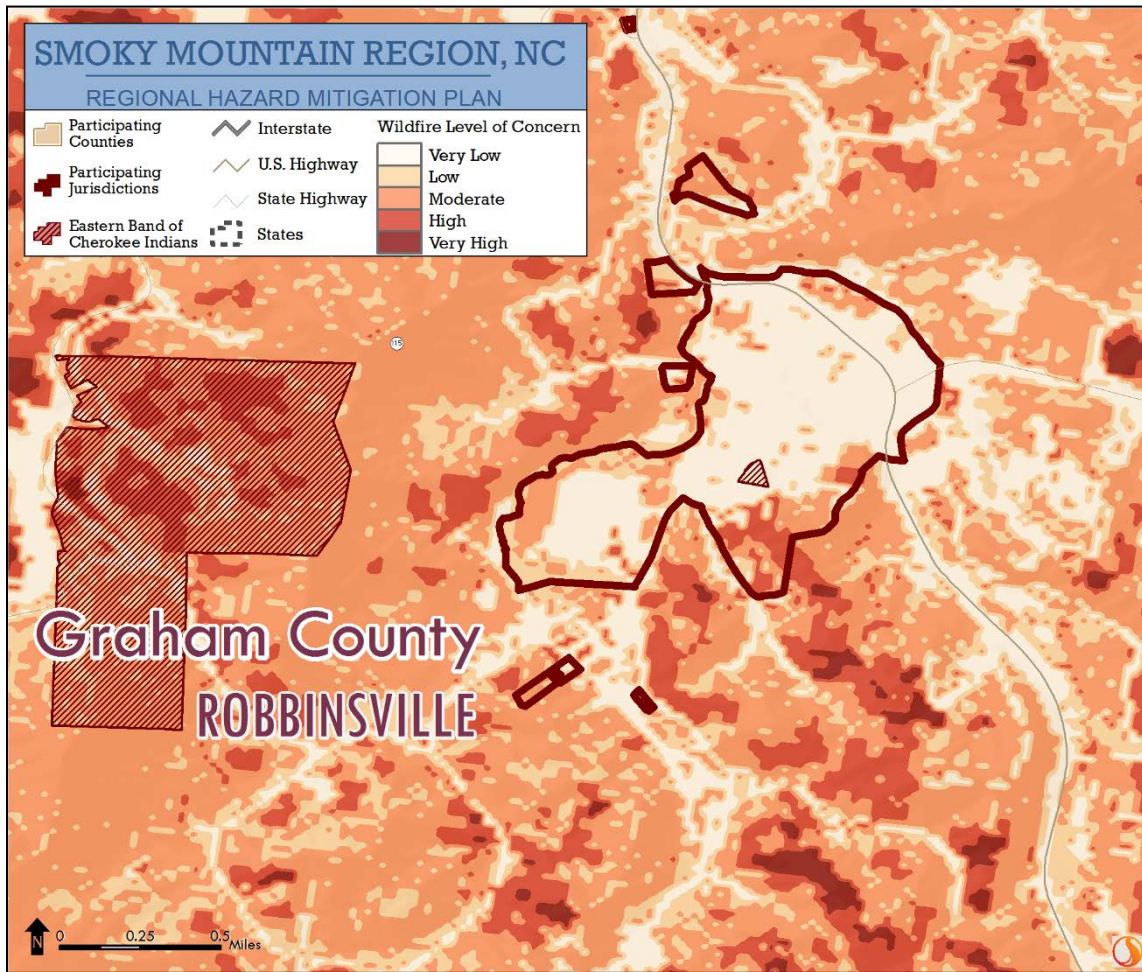
Source: Southern Wildfire Risk Assessment Data

FIGURE B.16: WILDFIRE RISK AREAS IN LAKE SANTEETLAH



Source: Southern Wildfire Risk Assessment Data

FIGURE B.17: WILDFIRE RISK AREAS IN ROBBINSVILLE



Source: Southern Wildfire Risk Assessment Data

TABLE B.38: VULNERABILITY OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Graham County	3,759	37%	1,876	38%	\$195,795,360	40%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	47	15%	41	21%	\$9,382,570	22%
Robbinsville	45	14%	31	12%	\$13,170,490	27%
Unincorporated Area	3,633	38%	1,797	40%	\$172,607,650	44%
EBCI	34	65%	7	70%	\$634,650	75%

Looking at jurisdictional level, unincorporated areas of the county face the highest level of concern areas than jurisdictions. While the jurisdictions report a lower level of concern, each should mindful that they are on the urban-wildland boundary and fire may quickly spread to those lower areas of concern. In general, densely developed areas that are not in the wildland urban interface, which are present in some jurisdictional areas, are at a lower risk to wildfire.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. 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

The critical facility analysis revealed that the only critical facility located in an area of high to very high wildfire risk is the Department of Social Services in Robbinsville. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table B.41** at the end of this section.

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in Graham County. Elevated levels of concern are contained to sparsely populated unincorporated areas in the county that are far from the more populated participating jurisdictions. However, mitigation measures may still be needed depending on the development in the area.

B.2.17 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Graham County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table B.39 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE B.39: SUMMARY OF PRI RESULTS FOR GRAHAM COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	2.2
Thunderstorm/ High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 24 hours	3.3
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.0
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.7
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	1.8
Flood	Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	2.7
Other Hazards						
Hazardous Materials Incident	Unlikely	Limited	Small	Less than 6 hours	Less than 24 hours	1.9
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

B.2.17 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Graham County, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table B.40**). 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 Graham County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section B.4. 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.

TABLE B.40: CONCLUSIONS ON HAZARD RISK FOR GRAHAM COUNTY

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire Landslide
MODERATE RISK	Tornado Hurricane and Coastal Storm Lightning Drought Hailstorm
LOW RISK	Hazardous Material Incident Earthquake Dam and Levee Failure Erosion

Conclusions on Hazard Vulnerability

The results of this vulnerability assessment are useful in at least three ways:

- ◆ Informed decision-making based on improved understanding of risk.
- ◆ Baseline measure on which to reduce risk.
- ◆ Relative comparison of risk among the natural hazards addressed to prioritize greatest needs.

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 atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table B.41** 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”).

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TABLE B.41: AT-RISK CRITICAL FACILITIES IN GRAHAM COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
GRAHAM COUNTY																				
Senior Building	Community Center	X	X	X	X	X	X	X	X		X					X	X			
EMS Base	EMS Base	X	X	X	X	X	X	X	X		X					X	X			
Building Inspections	Government Office	X	X	X	X	X	X	X	X		X		X			X	X			
Court House / Tax Dep / County Clerk / Reg of Deeds	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Department of Social Services	Government Office	X	X	X	X	X	X	X	X		X					X	X			X
Elections Office	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Health Department	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Managers / Finance Office	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Town of Robbinsville Govt Office at 4 Court St	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Town of Robbinsville Govt Office at 6 Court St	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Jail	Jail	X	X	X	X	X	X	X	X		X					X	X			
Robbinsville Elem School	School	X	X	X	X	X	X	X	X		X					X	X			
Robbinsville Mid & High School	School	X	X	X	X	X	X	X	X		X					X	X			
Sewer	Sewer/Sewer Plant	X	X	X	X	X	X	X	X		X					X	X			
Sewer Plant	Sewer/Sewer Plant	X	X	X	X	X	X	X	X		X					X	X			
Sheriff's Office	Sheriff's Office	X	X	X	X	X	X	X	X		X					X	X			
Transit Building	Transportation	X	X	X	X	X	X	X	X		X					X	X			

ANNEX B: GRAHAM COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER							
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire	
Water Treatment Plant at 2457 Long Creek Rd	Water Treatment Plant	X	X	X	X	X	X	X	X	X											
Water Treatment Plant at 616 Rodney Orr Bypass	Water Treatment Plant	X	X	X	X	X	X	X	X		X		X			X	X				

B.3 GRAHAM COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of Graham County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

B.3.1 Planning and Regulatory Capability

Table B.42 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Graham County.

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE B.42: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	Planning Tool/Regulatory Tool																						
	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
Graham County	✓	✓					✓	✓							✓					✓	✓	✓	
Fontana Dam	✓						C								C					C	C	✓	
Lake Santeetlah	✓						✓								✓	✓				C	C	✓	
Robbinsville	✓						✓								✓					C	C	✓	

A more detailed discussion on the county’s planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan

Graham County has previously adopted a hazard mitigation plan. Graham County and its jurisdictions (the Towns of Lake Santeetlah, Robbinsville, and Fontana Dam) were included in the original regional hazard mitigation plan.

Emergency Operations Plan

Graham County maintains an emergency operations plan through its Emergency Management Department. The Towns of Lake Santeetlah, Robbinsville, and Fontana Dam maintain the county emergency operations plan.

Continuity of Operations Plan

Graham County has adopted a continuity of operations plan since the last regional hazard mitigated plan update occurred.

General Planning

Comprehensive Land Use Plan

Graham County has adopted a county land use plan.

Zoning Ordinance

The Town of Lake Santeetlah has adopted zoning.

Subdivision Ordinance

Graham County does not have a subdivision ordinance in place.

Building Codes, Permitting, and Inspections

North Carolina has a state compulsory building code which applies throughout the state. The building code is enforced throughout the county by the county building inspector. The Towns of Fontana Dam, Lake Santeetlah, and Robbinsville have adopted county building codes.

Floodplain Management

Table B.43 provides NFIP policy and claim information for each participating jurisdiction in Graham County.

TABLE B.43: 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
Graham County	2/1/12	4/19/10	47	\$8,189,100	2	\$10,846.72
Fontana Dam*	2/1/12	4/19/10	--	--	--	--
Lake Santeetlah**	09/12/17	09/12/17	--	--	--	--
Robbinsville	12/1/89	4/19/10	2	\$245,600	--	--

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017
 *Fontana Dam is covered by Graham County. They do not participate separately but activities are covered by the County.

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Graham County, Robbinsville, Fontana Dam, and Lake Santeetlah participate in the NFIP and have adopted flood damage prevention regulations.

B.3.2 Administrative and Technical Capability

Table B.44 provides a summary of the capability assessment results for Graham County with regard to relevant staff and personnel resources.

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

TABLE B.44: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Graham County	✓	✓	✓	✓	✓			✓	✓	
Fontana Dam					C				C	
Lake Santeetlah					C				C	
Robbinsville					C				C	

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.

B.3.3 Fiscal Capability

Table B.45 provides a summary of the results for Graham County with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently being developed for future implementation;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

TABLE B.45: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Graham County	✓								
Fontana Dam									
Lake Santeetlah	✓								
Robbinsville	✓								

B.3.4 Political Capability

The previous hazard mitigation plan indicates that overall Graham County feels that each ordinance is sufficient and acceptable and that no ordinances impede mitigation. All participating jurisdictions and county participate in the NFIP.

B.4.5 Conclusions on Local Capability

In addition to this regional hazard mitigation plan, Graham County has adopted an emergency operations plan, both of which increase the county's capability in an emergency situation. However, the county and its jurisdictions lack a disaster recovery plan. With the results of this plan's risk assessment, Graham County and its jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction's economic development goals.

The county and its jurisdictions engage in capital improvement programming, but do not have a capital improvement plan. A capital improvement plan can be used to direct capital funds to public improvements located out of high-risk areas. Additionally, a capital improvement plan can be cross-referenced with this plan to identify public improvements located in at-risk areas and allocate funds for safeguarding those improvements.

Since the last hazard mitigation plan update, Graham County and its jurisdictions have improved administrative and technical capability by adding a floodplain manager and a staff member with GIS knowledge.

Capability could be improved by adopting a land development ordinance used to guide growth out of high-risk areas, especially since Graham County already has a planner on staff familiar with land development principles. The Town of Lake Santeetlah has recently adopted a Zoning Ordinance, thereby increasing their capability to guide development away from areas of risk.

B.4 GRAHAM COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Graham County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Hazard Mitigation Planning Committee and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

B.4.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Graham County developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table B.46**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE B.46: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards.
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

B.4.2 Mitigation Action Plan

The mitigation actions proposed by Graham County, the Town of Fontana Dam, the Town of Lake Santeetlah, and the Town of Robbinsville are listed in the following individual Mitigation Action Plans.

Graham County Mitigation Action Plan

Graham County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Floodplain Manager	Unknown	State and FEMA funding	Completed	Completed. On February 21, 2011, the floodplain ordinance was rescinded to old ordinance.
P-2	Continue to enforce building codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspector	Unknown	Self-funded	Completed	Completed August 2012
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management Director	Unknown	Self-funded; partial state funding	Annual; 2030	Revisions as determined by need, evaluation and assessment.
P-4	Explore expanding floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	Low	County Tax Assessor	Unknown	Self-funded	2022	County has rejoined NFIP. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	County Fire Marshal; County Forest Ranger	Unknown	Self-funded; Partial state funding	Annually until 2022	Development continues as a result of wildfires and threat assessment.
P-6	Encourage fire-vulnerable subdivisions to become Firewise communities.	Wildfire	Low	County Fire Marshal; NCDNR Forest Ranger	Unknown	Self-funded; Firewise reimbursement	2030	County remains committed to this action, but there was no political will to complete this action over the last five years.
P-7	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	County Manager	Unknown	Self-funded	2022	County officials have considered a "Steep Slope Ordinance", but there was no political will to complete this action over the last five years.
P-8	Expand Land Use Plan to address grade of banks on residential/commercial property.	Landslide	Low	County Tax Assessor	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years. County officials have considered a "Steep Slope Ordinance" but have taken no action.
P-9	Identify potential landslide problem areas in County.	Landslide	High	County Emergency Management Director	Unknown	Self-funded	2022	There was no political will to complete this action over the last five years. Assessment is as needed.
P-10	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	High	County Building Inspector	Unknown	Self-funded	Completed	Completed. Inspections department ensures compliance before issuing occupancy permits.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-11	Integrate County/municipality EOP Plan with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Low	County Emergency Management Director	Unknown	Self-funded; Partially state funded	Completed	This action is underway with annual update.
P-12	Develop a natural hazards vulnerability assessment for the next update of the hazard mitigation plan.	All	High	County Emergency Management Director; NCDEM	Unknown	Self-funded	Completed	Completed. Natural hazards were assessed in the hazard mitigation plan in 2012 and 2017.
Property Protection								
PP-1	Evaluate the relocation/elevation/flood proofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Emergency Management Director	Unknown	Self-funded	2022	Assessment and recommendations continue, but there was no political will to complete this action over the last five years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Low	County Manager	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	County Manager	Unknown	Self-funded	2022-2030	There was no political will to complete this action over the last five years. Evaluate spills and encroachments as presented.
NRP-2	Whenever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Low	County Manager	Unknown	Self-funded	2030	There was no political will to complete this action over the last five years.
Emergency Services								
ES-1	Explore adding flood monitoring facilities on streams and coupling with a disaster warning system to give early warning of floods.	Flood; Dam Failure	High	County Emergency Management Director	Unknown	State-funded	2022	Regional hydroelectric producers cooperating with early warning/failure devices and notification but nothing on streams.
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	High	County Emergency Management Director	Unknown	Self-funded	2022	In progress. Continued use of MOA and mutual aid agreements.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	Exercise Emergency Warning/Broadcast Systems on a quarterly schedule.	All	High	County Emergency Management Director	Unknown	Self-funded; Partially state or Federal funding	Completed	Implemented reverse 911 system in March 2017.
ES-4	Procure and maintain up-to-date emergency response vehicles/equipment to ensure emergency response is capable of responding to various hazards.	All	High	County Emergency Management Director	Unknown	Self-funded; Partially state or Federal funding	2022-2030	Continued participation in DPR program to obtain, maintain, and improve response capabilities. Additional equipment or training may be necessary
ES-5	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	High	County Building Inspector	Unknown	Self-funded	2022	There was no political will to complete this action over the last five years.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director	Unknown	Self-funded	2030	County website, social media platforms, and reverse 911 system used for information releases and emergency notifications.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director	Unknown	Self-funded	2022	While some education is conducted through the year, there is no formal program. There was no political will to complete this action over the last five years.

Town of Fontana Dam Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Town Government in cooperation with County Government	Unknown	Local	2022	There was no political will to complete this action over the last five years. Continue to identify hazards and assess risk.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	Town Government in cooperation with County Government	Unknown	Local	2022-2030	Maintained NFIP participation and good standing. Ensure compliance with NFIP during issuance of permits and inspections.
Property Protection								

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate response/recovery efforts with other communities and counties.	All	High	Town Government in cooperation with County Government	Unknown	Local	2022	Continued use of MOA and mutual aid agreements.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	Low	Town Government	Unknown	Local	2030	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Coordinate with the County to explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director, Town Government	Unknown	Self-funded	2022-2030	Completed. County and municipality websites, social media platforms, and reverse 911 utilized for release of information.
PEA-3	Coordinate with the County to conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director, Town Government	Unknown	Self-funded	2022	Informational presentations at the request of interested parties.

Town of Lake Santeetlah Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	NCDEM	Unknown	State and FEMA funding	Completed	Completed February 21, 2011.
P-2	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Town Government in cooperation with County Government	Unknown	Local	2030	Continued revision and reassessment.
P-3	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	Town Government in cooperation with County Government	Unknown	Local	Completed	Completed. Regulations passed in 2008.
Property Protection								

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate response/recovery efforts with other communities and counties.	All	High	Town Government in cooperation with County Government	Unknown	Local	2030	Continued use of MOA and mutual aid agreements.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	Provide opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	Flood	Low	Town Government	Unknown	Local	2022	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Coordinate with the County to explore the possibility of developing an internet-based emergency information website.	All	Low	County Emergency Management Director, Town Government	Unknown	Self-funded	2030	In progress. County and municipal websites, social media platforms, and reverse 911 system utilized for notifications.
PEA-3	Coordinate with the County to conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, at the office, or outside.	All	High	County Emergency Management Director, Town Government	Unknown	Self-funded	2022	In progress. Informational presentations are being made at request of interested parties.

Town of Robbinsville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	NCDEM/FEMA	Unknown	State and FEMA funding	Completed	Completed February 21, 2011.
P-2	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	High	Town Government	Unknown	Local funds	Completed	Completed. Inspections department ensures compliance before issuing occupancy permits.
P-3	Integrate county/municipality EOP Plan with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	Town Government	Unknown	Local funds	2022	There was no political will to complete this action over the last five years.
P-4	Develop a natural hazards vulnerability assessment for the next update of the hazard mitigation plan.	All	High	County Emergency Management Directors; NCDEM	Unknown	Self-funded	Completed	Completed. The hazard mitigation plan includes a vulnerability assessment.
P-5	Create a storm water runoff plan for the Town.	Flood	High	Town Government	Unknown	State/FEMA/Local funds	2022	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Evaluate the relocation/elevation/flood proofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	Town Government	Unknown	Procure mitigation grants	2022	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	Town Government	Unknown	Local government and self-funding	2022	Assessments as needed to ensure compliance.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	Town Government	Unknown	Local government and self-funding	2022	Continued assessment of encroachments and spills. There was no political will to complete this action over the last five years.
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Low	Town Government	Unknown	State and FEMA	2030	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Dam/Levee Failure; Flood; Hurricane; Winter Storm; Severe Thunderstorm	High	Town	Unknown	National Weather Service	2022-2030	Implementation of reverse 911 system in March 2017. However, gages still needed.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.

Annex C

Haywood County

This annex includes jurisdiction-specific information for Haywood County and its participating municipalities. It consists of the following five subsections:

- ◆ C.1 Haywood County Community Profile
- ◆ C.2 Haywood County Risk Assessment and Vulnerability Assessment
- ◆ C.3 Haywood County Capability Assessment
- ◆ C.4 Haywood County Mitigation Strategy

C.1 HAYWOOD COUNTY COMMUNITY PROFILE

C.1.1 Geography and the Environment

Haywood County is located in the high mountainous area of Western North Carolina. It is divided into thirteen townships and contains the four municipalities of Canton, Clyde, Maggie Valley, and Waynesville.

The county is surrounded by mountain ranges. The Bald Mountains lie on the north, the Newfound Mountain range is on the east, the Pisgah Ridge on the south, and the Balsam Mountain range on the west. The altitude in the county ranges from a low of 1,400 feet to 6,621 feet. The total area of the county is 555 square miles, 1 square mile of which is water area.

The climate across Haywood County varies considerably due to significant altitude-induced variations. On average, the annual temperature is 54°F, averaging 38°F in January and 71°F in June. Generally, temperatures in mountainous parts of the county are anywhere from 10-20°F cooler than those at the lower elevations. The average annual rainfall is 48 inches and the average annual snowfall is 12 inches.

C.1.2 Population and Demographics

According to the U.S. Census 2015 American Community Survey 5-year Population Estimate, Haywood County has a population of 59,170 people. The county has seen approximately 0.2% growth between 2010 and 2015, and the population density is 107 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the county and participating jurisdictions are presented in **Table C.1**.

TABLE C.1: POPULATION COUNTS FOR HAYWOOD COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
HAYWOOD COUNTY	46,942	54,033	59,036	59,170	0.2%
Town of Canton	3,790	4,029	4,227	4,156	-1.7%
Town of Clyde	1,041	1,324	1,223	1,311	7.2%
Town of Maggie Valley	185	607	1,150	1,533	33.3%
Town of Waynesville	6,758	9,232	9,869	9,748	-1.2%

Source: US Census Bureau

Based on the 2015 American Community Survey , the median age of residents of Haywood County is 46.8 years. The racial characteristics of the county are presented in **Table C.2**. Whites make up the majority of the population in the county, accounting for 96 percent of the population.

TABLE C.2: DEMOGRAPHICS OF HAYWOOD COUNTY

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
HAYWOOD COUNTY	96.0%	0.9%	0.3%	2.8%	3.6%
Town of Canton	93.7%	0.8%	0.7%	1.2%	9.7%
Town of Clyde	86.3%	0.5%	1.4%	11.8%	20.3%
Town of Maggie Valley	90.5%	2.4%	2.3%	4.8%	1.5%
Town of Waynesville	95.7%	1.9%	0.5%	1.9%	4.0%

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

Source: US Census Bureau

C.1.3 Housing

According to the 2015 American Community Survey , there are 35,086 housing units in Haywood County, the majority of which are single family homes or mobile homes. Housing information for the county and four towns is presented in **Table C.3**. As shown in the table, Maggie Valley has a significantly higher percentage of seasonal housing units compared to the other towns and the unincorporated county.

TABLE C.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
HAYWOOD COUNTY	28,640	34,954	35,086	16.2%	\$161,300
Town of Canton	2,003	2,068	2,111	1.1%	\$132,900
Town of Clyde	607	619	677	1.9%	\$135,700
Town of Maggie Valley	565	1,648	1,481	53.2	\$207,000
Town of Waynesville	4,761	5,534	6,052	7.3%	\$156,300

Source: US Census Bureau

C.1.4 Infrastructure

Transportation

There are several US and state highways that serve Haywood County. Interstate 40 bisects the northeastern portion of the county running from the Tennessee border to just east of the Town of Canton. Other major highways that run through the county include Highway 276, running roughly north to south, and Highways 19, 23, and 74, connecting east to west. A combined route of Highways 19, 23, and 74 has been made into a four lane limited access highway called the Smoky Mountain Expressway.

Currently, there are no airports located in Haywood County.

Norfolk Southern Railway operates a portion of the Murphy Branch through Haywood County, providing a rail connection with the rest of the state. Norfolk Southern operates a small yard in Canton which directly serves the Evergreen Packaging Paper Company and originates several local runs.

Utilities

Electrical power in Haywood County is provided by a public utility and an electricity cooperative. Duke Energy Progress and Haywood Electric Membership Corporation both service the county.

Water and sewer service is provided to residents by the Towns of Canton, Clyde, Maggie Valley, and Waynesville.

Community Facilities

There are a number of buildings and community facilities located throughout Haywood County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 16 fire stations, 5 police stations, 2 medical care facility, and 17 public schools located within the county.

There is one hospital located in Haywood County. The Haywood Regional Medical Center is a 121-bed short term acute center located in the Town of Clyde.

C.1.5 Land Use

Much of the historical development patterns in Haywood County took place in the level areas of the valleys, while the newer developments are occurring on the mountain ridges. This development pattern seen in mountainous regions such as Haywood County poses a unique set of circumstances since topography may lessen the impact of one hazard while exposing another. For instance, much of the development that took place in valleys is within floodplains and is more subject to flooding versus the development that is located on mountain ridges which may not be susceptible to flooding but is at greater risk to landslides or wildfires.

C.1.6 Employment and Industry

According to the North Carolina Employment Security Commission, Haywood County had an average annual employment of 16,737 workers in 2015. In 2015, the Education and Health Services industry was the largest employment sector with 25.5 percent of the County's workforce. The other leading industries were Trade, Transportation, and Utilities (20.5%); Leisure and Hospitality (14.9%); Manufacturing (14.1%); and Public

Administration (6.6%). In 2015, the annual median wage in Haywood County was \$29,120 compared to \$32,510 for the state of North Carolina.

C.2 HAYWOOD COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Haywood County. Each hazard profile includes a description of the hazard’s location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of Haywood County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

C.2.1 Asset Inventory

Table C.4 lists the number of parcels, total number of improved parcels, , and the total assessed value of improved parcels for Haywood County and its participating jurisdictions (study area of vulnerability assessment).¹

TABLE C.4: IMPROVED PROPERTY IN HAYWOOD COUNTY

Location	Number of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Canton	2,499	1,955	\$256,206,300
Clyde	721	528	\$58,906,300
Maggie Valley	2,369	1,566	\$252,971,400
Waynesville	5,916	4,707	\$864,721,600
Unincorporated Area	38,172	22,950	\$3,262,775,700
HAYWOOD COUNTY TOTAL²	49,677	31,706	\$4,695,581,300

Table C.5 lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, and schools and other critical facilities located in Haywood County. Critical facility data was obtained from the county and municipal leads. **Table C.49**, near 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 county.

¹ 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.

² Number of buildings for the county is based on the number of parcels with an improved building value greater than zero.

TABLE C.5: CRITICAL FACILITY INVENTORY IN HAYWOOD COUNTY

Category and Type	HAYWOOD COUNTY					TOTAL
	CANTON	CLYDE	MAGGIE VALLEY	WAYNESVILLE	UNINCORPORATED	
Emergency Services	3	2	2	4	10	21
Fire Station	2	1	1	2	10	16
Police Station	1	1	1	2	0	5
Government Facilities	4	1	2	9	10	26
Government Office	0	0	1	6	1	8
Community Center	0	0	0	1	0	1
School	4	1	1	2	9	17
Medical Facilities	0	0	0	1	1	2
Medical Center	0	0	0	0	1	1
Health Center	0	0	0	1	0	1
Total	7	3	4	14	21	49

Source: County GIS

C.2.2 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 Haywood County that are potentially at risk to these hazards.

Table C.6 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in Haywood County according to Census data is 59,170 persons. Additional population estimates are presented above in Section C.1.

TABLE C.6: TOTAL POPULATION IN HAYWOOD COUNTY

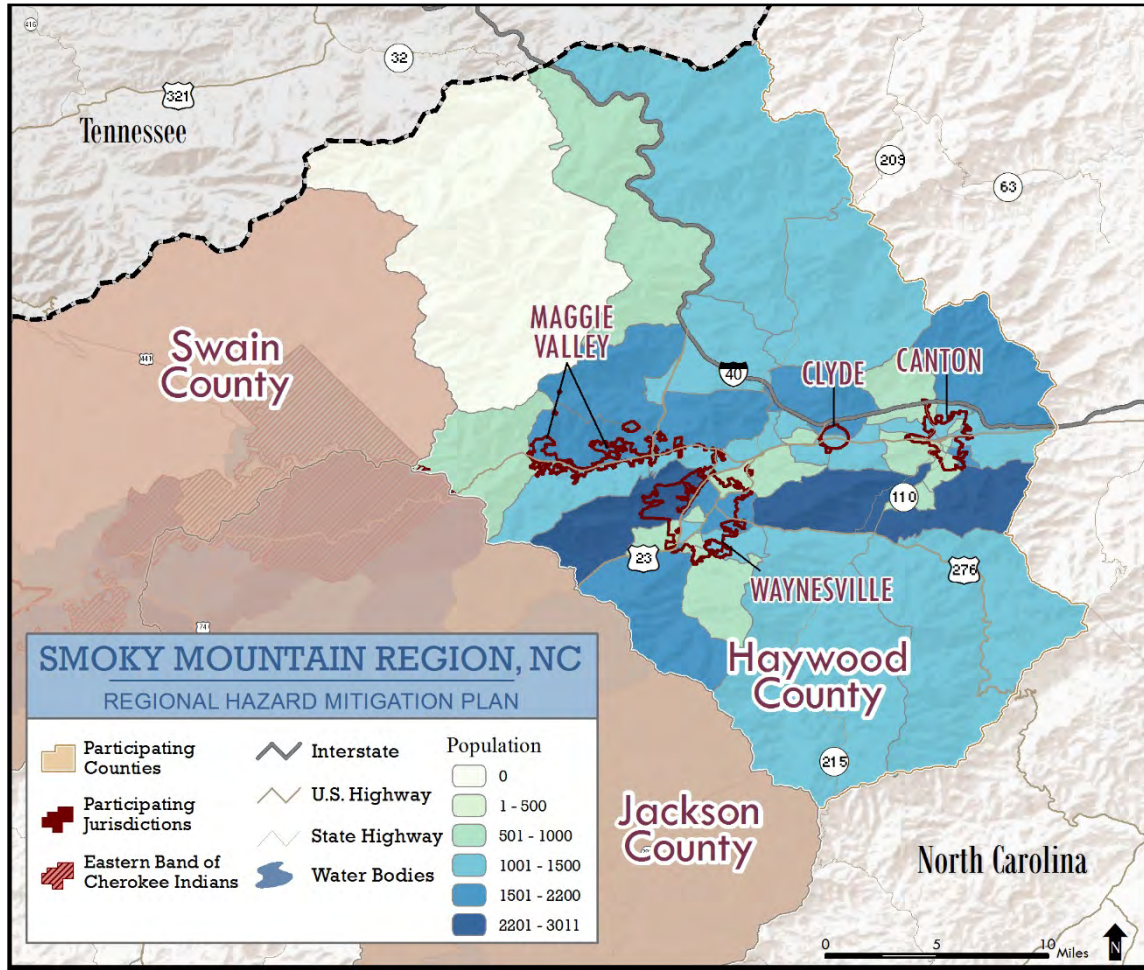
Location	Total 2015 Population
Canton	4,156
Clyde	1,311
Maggie Valley	1,533
Waynesville	9,748
Unincorporated Area	42,422
HAYWOOD COUNTY TOTAL	59,170

Source: U.S. Census 2015 American Community Survey

In addition, **Figure C.1** illustrates the population density by census tract as it was reported by the U.S. Census Bureau in the 2015 American Community Survey.³

³ Population by census block was not available at the time this plan was completed.

FIGURE C.1: POPULATION DENSITY IN HAYWOOD COUNTY



Source: U.S. Census Bureau 2015 American Community Survey

HAZARD PROFILES

C.2.3 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Haywood County 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 county would be uniformly exposed to drought, making the spatial extent potentially widespread

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Haywood County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

According to the North Carolina Drought Monitor, Haywood County has had drought occurrences sixteen of the last seventeen years (2000-2016). **Table C.7** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE C. 7: HISTORICAL DROUGHT OCCURRENCES IN HAYWOOD COUNTY

Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
Haywood County				
				EXCEPTIONAL
				EXTREME
				EXTREME
				NORMAL
				ABNORMAL
				ABNORMAL
				SEVERE
				EXCEPTIONAL
				EXCEPTIONAL
				SEVERE
				MODERATE
				ABNORMAL
				MODERATE
				ABNORMAL
				ABNORMAL
				SEVERE
				EXTREME

Source: North Carolina Drought Monitor

Extent

The most severe drought condition is Exceptional. Haywood County has received this ranking three times over the sixteen-year reporting period.

Probability of Future Occurrences

According to the North Carolina Drought Monitor’s historical data, sixteen of the last seventeen years has resulted in drought in Haywood County, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered “highly likely” (greater than 90% annual probability). This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices
 - Increased wildfires
 - Loss of incomes
 - Loss of hydroelectric power

- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

C.2.4 Hailstorm

Location

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

Historical Occurrences

According to the National Centers for Environmental Information’s (NCEI) Storm Events Database, 58 recorded hailstorm events affected Haywood County from 1970 to 2016.⁴ **Table C.8** is a summary of the hail events in Haywood County. **Table C.9** provides detailed information about each event that occurred in the county. In all, hail occurrences resulted in over \$73,427 (2012 dollars) in property damages, all of which were reported in during a 2004 event in Canton. 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. Therefore, it is likely that damages are greater than the reported value.

TABLE C.8: SUMMARY OF HAIL OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2012)
Canton	10	\$73,427
Clyde	3	\$0
Maggie Valley	3	\$0
Waynesville	19	\$0
Unincorporated Area	23	\$0
HAYWOOD COUNTY TOTAL	58	\$73,427

Source: National Centers for Environmental Information

⁴ These hail events are only inclusive of those reported by the National Centers for Environmental Information’s (NCEI) Storm Events Database. It is likely that additional hail events have affected Cherokee County. 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.

TABLE C.9: HISTORICAL HAIL OCCURRENCES IN HAYWOOD COUNTY

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Haywood County	1/13/1972	1.00	0/0	\$0
Haywood County	7/10/1985	1.75	0/0	\$0
Cove Creek	2/21/1993	0.75	0/0	\$0
Waynesville	5/18/1995	0.75	0/0	\$0
Maggie Valley	7/28/1997	1.00	0/0	\$0
Waynesville	1/8/1998	1.00	0/0	\$0
Waynesville	4/16/1998	0.88	0/0	\$0
Waynesville	5/6/1999	0.88	0/0	\$0
Maggie Valley	5/3/2000	0.75	0/0	\$0
Waynesville	5/3/2000	0.75	0/0	\$0
Canton	6/26/2000	1.75	0/0	\$0
Cruso	6/3/2002	0.75	0/0	\$0
Canton	6/4/2002	1.00	0/0	\$0
Waynesville	6/4/2002	1.75	0/0	\$0
Waynesville	6/4/2002	0.75	0/0	\$0
Cruso	5/2/2003	0.75	0/0	\$0
Waynesville	8/26/2003	1.00	0/0	\$0
Waynesville	4/12/2004	0.75	0/0	\$0
Clyde	5/8/2004	0.88	0/0	\$0
Canton	5/8/2004	1.00	0/0	\$73,427
Hazelwood	8/2/2004	1.25	0/0	\$0
Canton	6/18/2005	0.75	0/0	\$0
Waynesville	6/18/2005	1.00	0/0	\$0
Waynesville	6/18/2005	0.88	0/0	\$0
Waynesville	4/3/2006	1.75	0/0	\$0
Bethel	4/3/2006	1.00	0/0	\$0
Waynesville	4/3/2006	0.88	0/0	\$0
Canton	4/3/2006	0.75	0/0	\$0
Waynesville	4/8/2006	0.88	0/0	\$0
Maggie Valley	5/30/2006	1.75	0/0	\$0
Waynesville	6/22/2006	0.88	0/0	\$0
Cruso	8/4/2006	0.75	0/0	\$0
Waynesville	8/6/2006	0.88	0/0	\$0
Cruso	6/12/2007	1.00	0/0	\$0
Clyde	6/27/2007	0.75	0/0	\$0
Canton	6/28/2007	1.00	0/0	\$0
Waynesville	5/9/2008	1.00	0/0	\$0
Canton	6/9/2008	0.75	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Canton	6/9/2008	0.75	0/0	\$0
Waynesville	6/9/2008	0.88	0/0	\$0
Waynesville	5/9/2009	0.75	0/0	\$0
Shelton Laurel	5/14/2009	0.88	0/0	\$0
Cove	6/2/2009	0.75	0/0	\$0
Crabtree	4/9/2011	0.75	0/0	\$0
Beaverdam	4/9/2011	1.75	0/0	\$0
Suttontown	4/3/2012	1.00	0/0	\$0
West Canton	4/3/2012	1.00	0/0	\$0
Beaverdam	4/3/2012	1.00	0/0	\$0
Cruso	5/2/2012	1.00	0/0	\$0
Clyde	7/1/2012	1.25	0/0	\$0
Pines Creek	7/1/2012	1.00	0/0	\$0
Canton	7/30/2012	1.00	0/0	\$0
Canton	8/8/2012	0.88	0/0	\$0
West Canton	8/12/2013	1.00	0/0	\$0
Cruso	6/19/2014	1.00	0/0	\$0
Hyatt Creek	7/27/2014	1.75	0/0	\$0
Bethel	7/13/2016	0.75	0/0	\$0
Bethel	7/13/2016	1.00	0/0	\$0

Source: National Centers for Environmental Information

Extent

Hail extent can be defined by the size of the hail stone. Hail ranged in diameter from 0.75 inches to 1.75 inches. However, larger hailstones are possible as indicated in the Torro Scale (Section 5).

Probability of Future Occurrences

A total of 58 events are recorded in the NCEI’s Storm Events Database between 1970 and 2016, meaning more than one hail event occurred each year on average in Haywood County. Therefore, hail events are considered “highly likely” (greater than 90 percent annual chance). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Haywood County 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 county.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. Although all property damage was caused by one event, the total number of events indicate an average of approximately \$1,266 per event. While no deaths or injuries were reported in the county due to hail, they are possible.

C.2.5 Hurricane and Tropical Storm

Location

Hurricanes 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 Haywood County. The entire county is equally susceptible to hurricane and tropical storms.

Historical Occurrences

According to the National Hurricane Center's historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region between 1850 and 2015. This includes nine tropical storms and nineteen tropical depressions. **Table C.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE C.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

The National Centers for Environmental Information did not report any events associated with a hurricane or tropical storm in Haywood County between 1950 and 2015. However, the National Hurricane Center reported that two tropical depressions have traversed directly through Haywood County. This included remnants of Hurricane Danny in 1985 and an unnamed storm in 1896.

Federal records also indicate that two disaster declarations were made in 2004 (Tropical Storm Frances) and 2004 (Hurricane Ivan) for the county.⁵

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Extent

Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Chapter 5, Table 5.8). The greatest classification of hurricane to traverse directly through Haywood County was a tropical depression (Unnamed 1896 Storm) which carried tropical force winds of 30 knots upon arrival in the county. It should be noted that stronger storms could impact the county without a direct hit.

⁵ A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but still remains a real threat to Haywood County due to induced events like flooding and landsliding. A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of the Smoky Mountain Region between 1851 and 2015, resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of “likely” (between 10 and 90% annual probability) was assigned.

Vulnerability Assessment

Historical evidence indicates that Haywood County has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the county, as shown and discussed in the section above.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table C.11**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining an accurate loss estimate specific to participating jurisdictions was not feasible.

TABLE C. 11 POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Haywood County	\$11,508,742,024	\$225,956	0.001963%	\$482,040	0.004188%	\$91,233	0.000792%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

Given equal susceptibility across the county, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Haywood County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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 C.49** 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 Haywood County. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

C.2.6 Lightning

Location

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

Historical Occurrences

According to the National Centers for Environmental Information, there have been five recorded lightning events in Haywood County since 1950.⁶ These events resulted in approximately \$161,766 (2017 dollars) in damages, as listed in summary **Table C.12**. Furthermore, lightning caused one injury in the county. Detailed information on historical lightning events can be found in **Table C.13**.

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

TABLE C.12: SUMMARY OF LIGHTNING OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2017)
Canton	3	\$147,080
Clyde	0	\$0
Maggie Valley	1	\$14,685
Waynesville	0	\$0
Unincorporated Area	1	\$0
HAYWOOD COUNTY TOTAL	5	\$161,766

Source: NCEI Storm Events Database

TABLE C.13: HISTORICAL LIGHTNING OCCURRENCES IN HAYWOOD COUNTY

	Date	Deaths/ Injuries	Property Damage*	Details
Canton	12/16/2000	0/0	\$1,653	Lightning struck a tree and then a house, causing some property damage
Maggie Valley	5/8/2004	0/0	\$14,685	Lightning ignited a house fire.
Canton	5/19/2005	0/0	\$2,852	Lightning struck a building, resulting in some windows being blown out.

⁶ 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 Haywood County. 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.

	Date	Deaths/ Injuries	Property Damage*	Details
Canton	7/19/2005	0/0	\$142,576	Lightning struck a home, igniting a fire which destroyed the structure.
Big East Fork	6/22/2012	0/2	\$0	A father and son were injured by lightning while camping in the Graveyard Fields area along the Blue Ridge Parkway.

*Property damage is reported in 2017 dollars; All damage may not have been reported.

Source: NCEI Storm Events Database

Extent

Aside from damages, lightning extent can be defined using Vaisala’s U.S. National Lightning Detection Network (NLDN[®]) (Chapter 5, **Figure 5.6**). Haywood County is located in an area of the country that experienced an average of 3 to 12 lightning flashes per square kilometer per year between 2005 and 2014.

Probability of Future Occurrences

Although there were not a high number of historical lightning events reported in Haywood County via NCEI data, it is a regular occurrence accompanied by thunderstorms. However, lightning events will assuredly happen on an annual basis, though not all events will cause damage. Therefore, the probability of future events is highly likely (greater than 90 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

Vulnerability Assessment

All current and future buildings and populations within Haywood County are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

C.2.7 Thunderstorm Wind/High Wind

Location

A 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, Haywood County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Haywood County has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms resulted in four disaster declarations in Haywood County in 1973, 1977, 1995, and 1998.⁷ According to NCEI, there have been 74 reported wind events since 1994 and 58 reported thunderstorm wind events since 1950 in Haywood County.⁸ These events caused over \$1 million (2017 dollars) in damages. **Table**

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

⁸ 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 Haywood County. As additional local data becomes available, this hazard profile will be amended.

C.14 and Table C.15 summarize this information. Table C.16 presents detailed high wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.⁹

TABLE C.14: SUMMARY OF HIGH/STRONG WIND OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Canton	0	\$0	\$0
Clyde	0	\$0	\$0
Maggie Valley	0	\$0	\$0
Waynesville	0	\$0	\$0
Canton	0	\$0	\$0
Unincorporated Area	74	\$794,947	\$0
HAYWOOD COUNTY TOTAL	74	\$794,947	\$0

Source: National Centers for Environmental Information

TABLE C.15: SUMMARY OF THUNDERSTORM WIND OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2012)	Crop Damage (2017 dollars)
Canton	7	\$11,269	\$0
Clyde	3	\$0	\$0
Maggie Valley	13	\$90,553	\$0
Waynesville	14	\$180,656	\$0
Unincorporated Area	21	\$0	\$0
HAYWOOD COUNTY TOTAL	58	\$282,477	\$0

TABLE C.16: HISTORICAL THUNDERSTORM (WIND) OCCURRENCES IN HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	1/11/1963	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	6/27/1966	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	8/22/1968	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	4/2/1970	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/25/1975	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	3/21/1978	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	6/5/1985	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/12/1988	Thunderstorm Wind	60	0/0	\$0	--

⁹ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Waynesville	4/15/1993	Thunderstorm Wind	--	0/0	\$98,428	Trees were blown down, some atop houses.
Canton	9/1/1993	Thunderstorm Wind	43	0/0	\$9,843	A narrowly channeled wind gust estimated at 50 mph knocked over a 71,500 pound empty railroad boxcar. The boxcar was facing upwind between two large buildings with a wide open freight door when the wind knocked it over.
Waynesville	5/14/1995	Thunderstorm Wind	--	0/0	\$55,955	Sheriff reported trees down with one car destroyed and one house damaged.
Lake Junaluska	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Waynesville	8/19/1995	Thunderstorm Wind	--	0/0	\$0	--
Haywood Co.	1/18/1996	High Wind	--	0/0	\$0	--
Maggie Valley	4/20/1996	Thunderstorm Wind	--	0/0	\$90,553	--
Waynesville	4/20/1996	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	5/27/1996	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	12/17/1996	High Wind	50	0/0	\$27,166	High gradient winds caused some damage - mostly scattered trees and power lines were downed. In Haywood county trees were blown onto homes in Canton and Waynesville, and a shed was destroyed - the motorcycle inside was severely damaged.
Maggie Valley	7/28/1997	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/3/1998	High Wind	--	0/0	\$24,912	High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.
Maggie Valley	6/22/1998	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	7/20/1998	Thunderstorm Wind	50	0/0	\$0	--

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Haywood Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Waynesville	5/6/1999	Thunderstorm Wind	52	0/0	\$0	--
Haywood Co.	11/2/1999	High Wind	55	0/0	\$0	--
Haywood Co.	3/28/2000	High Wind	50	0/0	\$0	--
Haywood Co.	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Haywood Co.	12/16/2000	High Wind	55	0/0	\$0	--
Haywood Co.	3/6/2001	High Wind	55	0/0	\$0	--
Haywood Co.	3/20/2001	High Wind	55	0/0	\$0	--
Maggie Valley	6/22/2001	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/8/2001	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	10/13/2001	High Wind	50	0/0	\$0	--
Waynesville	10/25/2001	Thunderstorm Wind	50	0/0	\$8,024	The top was blown out of a large tree, resulting in damage to a car and a house.
Haywood Co.	11/29/2001	High Wind	50	0/0	\$0	--
Canton	1/24/2002	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/4/2002	High Wind	50	0/0	\$0	--
Waynesville	3/17/2002	Thunderstorm Wind	50	0/0	\$3,116	Several trees were blown down in and around Waynesville. Some were blown onto power lines, resulting in outages
Maggie Valley	5/2/2002	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	6/4/2002	Thunderstorm Wind	50	0/0	\$7,790	Several trees were blown down. One fell on an automobile.
Haywood Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	9/27/2002	High Wind	50	0/0	\$0	--
Haywood Co.	11/17/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	11/22/2002	Strong Wind	--	0/0	\$0	--
Haywood Co.	11/30/2002	High Wind	50	0/0	\$0	--
Waynesville	5/2/2003	Thunderstorm Wind	50	0/0	\$1,513	A few trees and power lines were blown down.
Haywood Co.	10/14/2003	High Wind	50	0/0	\$1,513	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.

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Clyde	5/8/2004	Thunderstorm Wind	52	0/0	\$0	--
Lake Junaluska	5/31/2004	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	5/31/2004	Thunderstorm Wind	55	0/0	\$4,406	Numerous trees were snapped off or blown down. Numerous power lines were blown down.
Haywood Co.	7/5/2004	High Wind	55	0/0	\$1,469	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.
Lake Junaluska	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/6/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	7/9/2004	Thunderstorm Wind	52	0/0	\$0	--
Lake Junaluska	8/2/2004	Thunderstorm Wind	50	0/0	\$0	--
Canton	8/2/2004	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	9/17/2004	High Wind	50	0/0	\$14,685	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.
Haywood Co.	12/1/2004	High Wind	50	0/0	\$0	--
Haywood Co.	1/22/2005	High Wind	60	0/0	\$0	--
Waynesville	2/21/2005	Thunderstorm Wind	60	0/0	\$1,426	High winds blew down several tall pine trees in the Laurel Ridge area of Waynesville. Some of the trees fell on a vehicle and a home, causing minimal damage.
Haywood Co.	4/2/2005	High Wind	60	0/0	\$7,129	Numerous trees, power poles, and power lines were blown down, resulting in widespread power outages.
Canton	5/19/2005	Thunderstorm Wind	50	0/0	\$1,426	Part of a tin roof off a barn.
Haywood Co.	8/30/2005	High Wind	50	0/0	\$0	--
Haywood Co.	1/14/2006	High Wind	60	0/0	\$0	--
Maggie Valley	4/3/2007	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	4/15/2007	High Wind	55	0/0	\$0	--
Haywood Co.	4/16/2007	High Wind	60	0/0	\$671,958	A widespread wind event caused thousands of trees to fall 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.
Haywood Co.	2/10/2008	High Wind	55	0/0	\$0	--
Haywood Co.	5/11/2008	High Wind	60	0/0	\$0	--

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Pines Creek	7/8/2008	Thunderstorm Wind	50	0/0	\$0	--
Clyde	7/22/2008	Thunderstorm Wind	50	0/0	\$0	--
Cove Creek	6/10/2009	Thunderstorm Wind	50	0/0	\$0	--
Morning Star	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	12/9/2009	High Wind	55	0/0	\$0	--
Cove	6/14/2010	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Maggie Valley	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Lake Junaluska	4/11/2011	Thunderstorm Wind	50	0/0	\$0	--
Nellie	6/15/2011	Thunderstorm Wind	60	0/0	\$0	--
Waterville	2/29/2012	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	4/26/2012	Thunderstorm Wind	55	0/0	\$0	--
Clyde	7/6/2012	Thunderstorm Wind	50	0/0	\$0	--
Cove Creek	7/6/2012	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	6/13/2013	Thunderstorm Wind	50	0/0	\$0	--
Waynesville	7/20/2013	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Maggie Valley	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Haywood Co.	2/24/2016	High Wind	50	0/0	\$0	--
Haywood Co.	4/3/2016	Strong Wind	40	0/0	\$2,060	Spotter reported a large limb down fell on and significantly damaged a vehicle 2 NW Waynesville.

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind events in Haywood County occurred in 1988, 2005 (three events), and 2006. Each of these events had a recorded wind speed at 60 knots (approximately 70 mph). It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

Given the high number of previous events (132 total wind events reported from NCEI), it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. Therefore, a probability of highly likely (greater than 90 percent annual probability) for future wind events was assigned for the county.

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

C.2.8 Tornado

Location

Tornadoes occur throughout the state of North Carolina, and thus in Haywood County. 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 Haywood County is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they have and do occur in Haywood County. According to the National Centers for Environmental Information, there has been a total of two recorded tornado events in Haywood County since 1973 (Table C.17), resulting in over \$1.2 million (2017 dollars) in property damages.¹⁰ No deaths were reported in either event, but the 2013 event resulted in one injury (Table C.18). 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 40 years.

TABLE C.17: SUMMARY OF TORNADO OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2017)
Canton	0	\$0
Clyde	0	\$0
Maggie Valley	0	\$0
Waynesville	0	\$0
Unincorporated Area	2	\$1,250,737
HAYWOOD COUNTY TOTAL	2	\$1,250,737

Source: National Centers for Environmental Information

TABLE C.18: HISTORICAL TORNADO IMPACTS IN HAYWOOD COUNTY

Location	Date	Magnitude	Death/Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY					
Haywood Co.	2/18/1976	F1	0/0	\$1,250,737	Tornado touched down near Lake Junaluska, damaging some houses and trees.

¹⁰ 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 Haywood County. As additional local data becomes available, this hazard profile will be amended.

Location	Date	Magnitude	Death/ Injuries	Property Damage (2017 dollars)	Details
HAYWOOD COUNTY					
Mt. Sterling	6/13/2013	EF1	0/1	\$0	<p>An NWS storm survey found part of an EF1 tornado track in the Big Creek area of the Great Smoky Mountains National Park. An area of extensive tree damage was found about 3.5 miles up the Big Creek trail from its terminus at Big Creek Campground. This was near the end of the damage path, about 15 miles north northwest of Maggie Valley. Hundreds of small trees were snapped 10 to 20 feet above ground level, and dozens of large trees were uprooted along a 0.5-mile section of the trail.</p> <p>Although the rugged terrain prevented a complete survey, the survey team observed a concentrated path of additional significant tree damage along a ridge about 1 mile west of Big Creek and 1 mile east of Low Gap. Discussions with a National Park Service maintenance crew and with a survey team from the University of North Carolina at Asheville indicated that the tornado either developed near or crossed the state line along the crest of the Smokies near Low Gap. A hiker was injured by a fallen tree on Low Gap Trail and required airlifting when he was discovered the next day. This was the first non-F/EF0 tornado ever documented on the NC side of the park.</p>

Source: National Centers for Environmental Information

Extent

The greatest extent of tornado is an EF5 (over 200 miles per hour). The magnitude of the 1976 tornado was F1 (73 to 112 miles per hour) in intensity, and the 2013 tornado was EF1 (86 to 110 miles per hour) in intensity, although an F5 event is possible.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county. Furthermore, the mountainous terrain of the county makes tornadoes a rare occurrence. With two tornadoes reported in 43 years (1973-2016), there was an annual occurrence rate of 19-percent in the county. Based on historical occurrences, the probability of future tornado occurrences affecting Haywood County is possible (1 to 10 percent annual probability). While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Haywood County experience a direct tornado strike.

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

C.2.9 Winter Storm and Freeze

Location

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. Haywood County is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in three disaster declarations in Haywood County. This includes the Blizzard of 1996, a subsequent 1996 winter storm, and a severe winter storm in 2010.¹¹ According to the National Centers for Environmental Information, there have been a total of 239 recorded winter storm events in Haywood County since 1993 (Table C.19).¹² These events resulted in almost \$2.3 million (2017 dollars) in damages. This reported damage was to crops in an April 2007 freeze event. Events with reported damages and fatalities are presented in Table C.20.¹³

TABLE C.19: SUMMARY OF WINTER STORM EVENTS IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Canton	0	\$0	\$0
Clyde	0	\$0	\$0
Maggie Valley	0	\$0	\$0
Waynesville	0	\$0	\$0
Unincorporated Area	239	\$0	\$2,687,833
HAYWOOD COUNTY TOTAL	239	\$0	\$2,687,833

TABLE C.20: HISTORICAL WINTER STORM IMPACTS IN HAYWOOD COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/6/1996	Winter Storm	0/0	\$0	\$0
Haywood County	1/11/1996	Winter Storm	0/0	\$0	\$0
Haywood County	1/26/1996	Ice Storm	0/0	\$0	\$0
Haywood County	2/1/1996	Winter Weather	0/0	\$0	\$0

¹¹ A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

¹² These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional winter storm conditions have affected Haywood County.

¹³ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	2/2/1996	Ice Storm	0/0	\$0	\$0
Haywood County	2/7/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	2/16/1996	Winter Weather	0/0	\$0	\$0
Haywood County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	3/8/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	3/20/1996	Heavy Snow	0/0	\$0	\$0
Haywood County	4/1/1996	Winter Weather	0/0	\$0	\$0
Haywood County	4/8/1996	Winter Weather	0/0	\$0	\$0
Haywood County	11/9/1996	Winter Weather	0/0	\$0	\$0
Haywood County	11/10/1996	Winter Weather	0/0	\$0	\$0
Haywood County	12/5/1996	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/1997	Ice Storm	0/0	\$0	\$0
Haywood County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Haywood County	12/5/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/8/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/27/1997	Winter Weather	0/0	\$0	\$0
Haywood County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Haywood County	1/18/1998	Winter Weather	0/0	\$0	\$0
Haywood County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Haywood County	2/3/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/2/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/10/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/1998	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/1998	Heavy Snow	0/0	\$0	\$0
Haywood County	4/10/1998	Winter Weather	0/0	\$0	\$0
Haywood County	12/17/1998	Winter Weather	0/0	\$0	\$0
Haywood County	2/19/1999	Winter Weather	0/0	\$0	\$0
Haywood County	2/24/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/3/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/3/1999	Heavy Snow	0/0	\$0	\$0
Haywood County	3/15/1999	Winter Weather	0/0	\$0	\$0
Haywood County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Haywood County	4/29/1999	Winter Weather	0/0	\$0	\$0
Haywood County	11/2/1999	Winter Weather	0/0	\$0	\$0

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	12/24/1999	Winter Weather	0/0	\$0	\$0
Haywood County	1/4/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2000	Winter Weather	0/0	\$0	\$0
Haywood County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/29/2000	Ice Storm	0/0	\$0	\$0
Haywood County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	4/8/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	12/3/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/13/2000	Winter Weather	0/0	\$0	\$0
Haywood County	12/17/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Haywood County	1/1/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/6/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/15/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Haywood County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	2/6/2002	Winter Weather	0/0	\$0	\$0
Haywood County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	11/17/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	11/22/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	12/4/2002	Heavy Snow	0/0	\$0	\$0
Haywood County	12/14/2002	Winter Weather	0/0	\$0	\$0
Haywood County	12/22/2002	Winter Weather	0/0	\$0	\$0
Haywood County	12/25/2002	Winter Weather	0/0	\$0	\$0
Haywood County	1/6/2003	Winter Weather	0/0	\$0	\$0
Haywood County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/19/2003	Winter Weather	0/0	\$0	\$0
Haywood County	1/23/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/26/2003	Winter Weather	0/0	\$0	\$0
Haywood County	2/6/2003	Heavy Snow	0/0	\$0	\$0

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	2/9/2003	Winter Weather	0/0	\$0	\$0
Haywood County	2/23/2003	Winter Weather	0/0	\$0	\$0
Haywood County	3/30/2003	Winter Weather	0/0	\$0	\$0
Haywood County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	3/30/2003	Winter Weather	0/0	\$0	\$0
Haywood County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	11/28/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/3/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/4/2003	Winter Storm	0/0	\$0	\$0
Haywood County	12/5/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/10/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2003	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Haywood County	1/9/2004	Winter Weather	0/0	\$0	\$0
Haywood County	1/27/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/5/2004	Winter Weather	0/0	\$0	\$0
Haywood County	2/7/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	2/12/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	2/26/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	3/30/2004	Winter Weather	0/0	\$0	\$0
Haywood County	4/13/2004	Winter Weather	0/0	\$0	\$0
Haywood County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	12/14/2004	Winter Weather	0/0	\$0	\$0
Haywood County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2005	Winter Weather	0/0	\$0	\$0
Haywood County	1/22/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/27/2005	Winter Weather	0/0	\$0	\$0
Haywood County	2/28/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/8/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/2005	Winter Weather	0/0	\$0	\$0
Haywood County	3/17/2005	Winter Weather	0/0	\$0	\$0
Haywood County	4/2/2005	Winter Weather	0/0	\$0	\$0
Haywood County	4/2/2005	Heavy Snow	0/0	\$0	\$0
Haywood County	4/23/2005	Winter Weather	0/0	\$0	\$0

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	11/21/2005	Winter Weather	0/0	\$0	\$0
Haywood County	11/21/2005	Winter Storm	0/0	\$0	\$0
Haywood County	12/3/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/8/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/15/2005	Winter Weather	0/0	\$0	\$0
Haywood County	12/26/2005	Winter Weather	0/0	\$0	\$0
Haywood County	1/14/2006	Winter Weather	0/0	\$0	\$0
Haywood County	1/30/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/8/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/2006	Winter Weather	0/0	\$0	\$0
Haywood County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Haywood County	2/18/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/20/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/22/2006	Winter Weather	0/0	\$0	\$0
Haywood County	3/25/2006	Heavy Snow	0/0	\$0	\$0
Haywood County	11/19/2006	Winter Weather	0/0	\$0	\$0
Haywood County	12/7/2006	Winter Weather	0/0	\$0	\$0
Haywood County	12/26/2006	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	1/21/2007	Winter Weather	0/0	\$0	\$0
Haywood County	1/28/2007	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2007	Winter Weather	0/0	\$0	\$0
Haywood County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	4/6/2007	Heavy Snow	0/0	\$0	\$0
Haywood County	4/8/2007	Frost/Freeze	0/0	\$0	\$2,687,833
Haywood County	1/1/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	1/16/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	1/19/2008	Winter Weather	0/0	\$0	\$0
Haywood County	1/31/2008	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2008	Winter Weather	0/0	\$0	\$0
Haywood County	2/26/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	10/27/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/16/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/18/2008	Winter Weather	0/0	\$0	\$0
Haywood County	11/21/2008	Winter Weather	0/0	\$0	\$0
Haywood County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Haywood County	1/8/2009	Winter Weather	0/0	\$0	\$0
Haywood County	1/13/2009	Winter Weather	0/0	\$0	\$0

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Haywood County	2/2/2009	Winter Storm	0/0	\$0	\$0
Haywood County	2/22/2009	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2009	Winter Storm	0/0	\$0	\$0
Haywood County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Haywood County	10/17/2009	Winter Weather	0/0	\$0	\$0
Haywood County	12/18/2009	Winter Storm	0/0	\$0	\$0
Haywood County	12/30/2009	Winter Weather	0/0	\$0	\$0
Haywood County	1/2/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/9/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/12/2010	Winter Weather	0/0	\$0	\$0
Haywood County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	2/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	3/3/2010	Winter Weather	0/0	\$0	\$0
Haywood County	3/22/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/4/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	12/15/2010	Winter Weather	0/0	\$0	\$0
Haywood County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Haywood County	1/5/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Haywood County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Haywood County	1/11/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/24/2011	Winter Weather	0/0	\$0	\$0
Haywood County	1/26/2011	Winter Weather	0/0	\$0	\$0
Haywood County	2/9/2011	Winter Weather	0/0	\$0	\$0
Haywood County	3/6/2011	Winter Weather	0/0	\$0	\$0
Haywood County	3/11/2011	Winter Weather	0/0	\$0	\$0
Haywood County	11/29/2011	Winter Weather	0/0	\$0	\$0
Haywood County	12/7/2011	Winter Weather	0/0	\$0	\$0

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	1/2/2012	Winter Weather	0/0	\$0	\$0
Haywood County	10/29/2012	Winter Storm	0/0	\$0	\$0
Haywood County	11/5/2012	Winter Weather	0/0	\$0	\$0
Haywood County	12/29/2012	Winter Weather	0/0	\$0	\$0
Haywood County	1/17/2013	Heavy Snow	0/0	\$0	\$0
Haywood County	1/25/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/1/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/15/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/19/2013	Winter Weather	0/0	\$0	\$0
Haywood County	2/27/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/1/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/5/2013	Winter Storm	0/0	\$0	\$0
Haywood County	3/20/2013	Winter Weather	0/0	\$0	\$0
Haywood County	3/25/2013	Winter Storm	0/0	\$0	\$0
Haywood County	4/4/2013	Winter Weather	0/0	\$0	\$0
Haywood County	11/25/2013	Winter Weather	0/0	\$0	\$0
Haywood County	11/26/2013	Heavy Snow	0/0	\$0	\$0
Haywood County	1/2/2014	Winter Storm	0/0	\$0	\$0
Haywood County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	1/15/2014	Winter Weather	0/0	\$0	\$0
Haywood County	1/21/2014	Heavy Snow	0/0	\$0	\$0
Haywood County	1/28/2014	Winter Weather	0/0	\$0	\$0
Haywood County	2/10/2014	Winter Weather	0/0	\$0	\$0
Haywood County	2/12/2014	Winter Storm	0/0	\$0	\$0
Haywood County	3/6/2014	Winter Weather	0/0	\$0	\$0
Haywood County	3/24/2014	Winter Weather	0/0	\$0	\$0
Haywood County	3/29/2014	Winter Weather	0/0	\$0	\$0
Haywood County	10/31/2014	Winter Weather	0/0	\$0	\$0
Haywood County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Haywood County	11/26/2014	Winter Weather	0/0	\$0	\$0
Haywood County	1/7/2015	Extreme Cold/Wind Chill	0/0	\$0	\$0
Haywood County	1/26/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/2/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/16/2015	Winter Storm	0/0	\$0	\$0
Haywood County	2/18/2015	Winter Weather	0/0	\$0	\$0
Haywood County	2/18/2015	Extreme Cold/Wind Chill	0/0	\$0	\$0

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
HAYWOOD COUNTY					
Haywood County	2/23/2015	Winter Storm	0/0	\$0	\$0
Haywood County	2/25/2015	Winter Storm	0/0	\$0	\$0
Haywood County	3/27/2015	Winter Weather	0/0	\$0	\$0
Haywood County	1/20/2016	Winter Weather	0/0	\$0	\$0
Haywood County	1/22/2016	Winter Storm	0/0	\$0	\$0
Haywood County	2/8/2016	Winter Weather	0/0	\$0	\$0
Haywood County	3/20/2016	Winter Weather	0/0	\$0	\$0
Haywood County	5/5/2016	Winter Weather	0/0	\$0	\$0

There have been several severe winter weather events in Haywood County. The text below describes one of the major events and associated impacts on the county. 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.

Winter storms throughout the planning area have several negative externalities including hypothermia, 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 to fire or an accumulation of toxic fumes.

Extent

The extent of winter storms can be measured by the amount of snowfall or ice accumulation received (in inches). Due to extreme variations in elevation throughout the county, extent totals will vary. However, the 1993 event reported up to 24 inches. More snow accumulation is possible. Ice accumulation of several inches is also possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Haywood County due to location and elevation. According to historical information, Haywood County experiences an average of ten winter storm events each year. Therefore, the annual probability is highly likely (greater than 90 percent).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack).

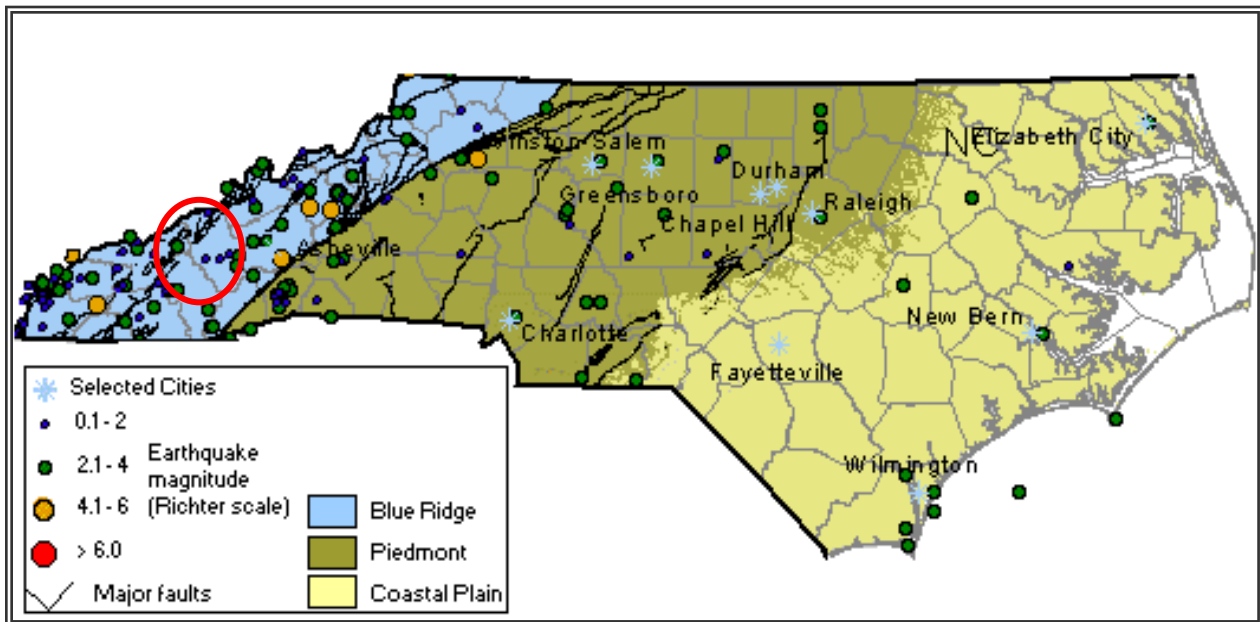
However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

C.2.10 Earthquake

Location

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 C.2** is a map showing geological and seismic information for North Carolina.

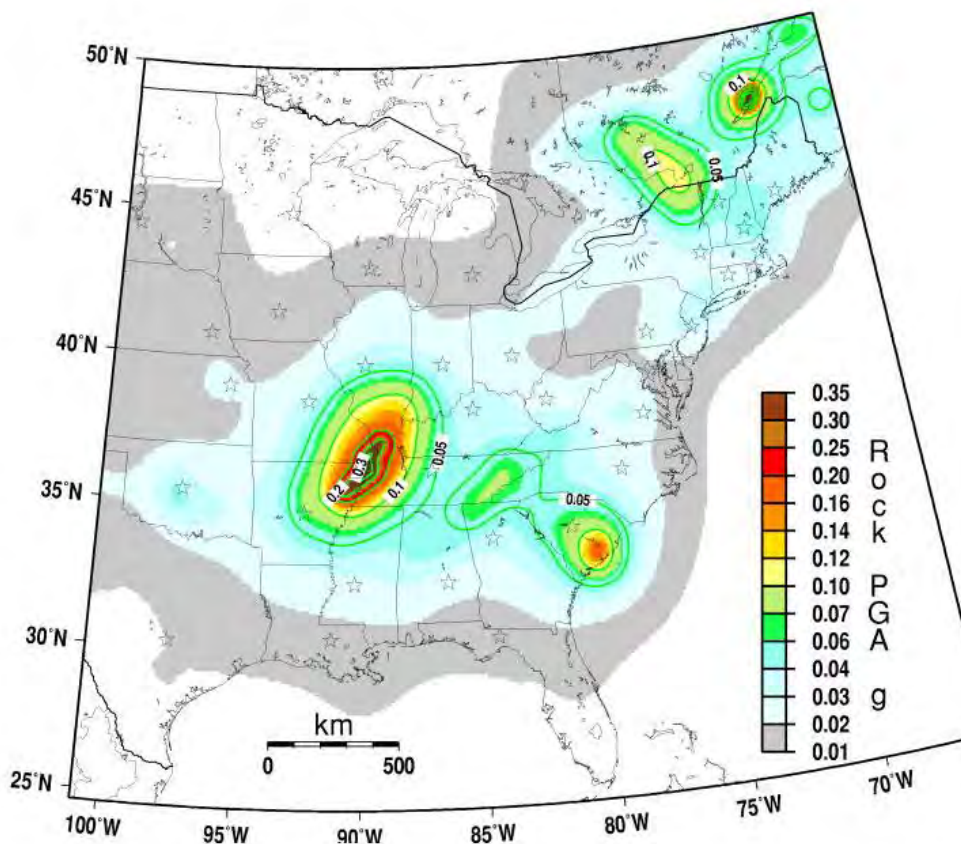
FIGURE C.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure C.3 shows the intensity level associated with Haywood County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Haywood County lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE C.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2008

Historical Occurrences

At least 19 earthquakes are known to have affected Haywood County since 1874. The strongest of these measured a VII on the Modified Mercalli Intensity (MMI) scale. **Table C.21** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table C.22** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁴

TABLE C.21: SUMMARY OF SEISMIC ACTIVITY IN HAYWOOD COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Canton	5	V	-
Clyde	3	V	-
Maggie Valley	0	-	-
Waynesville	11	VII	-
Unincorporated Area	0	-	-

¹⁴ Due to reporting mechanisms, not all earthquake events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported.

HAYWOOD COUNTY TOTAL	19	VII (very strong)	< 6.1
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Source: National Geophysical Data Center

TABLE C.22: SIGNIFICANT SEISMIC EVENTS IN HAYWOOD COUNTY (1638 -1985)

Location	Date	MMI (magnitude)
Haywood County		
Waynesville	9/1/1886	VII
Waynesville	11/3/1928	III
Canton	1/2/1954	IV
Waynesville	1/2/1954	IV
Canton	7/2/1957	V
Clyde	7/2/1957	V
Waynesville	7/2/1957	V
Clyde	11/24/1957	IV
Waynesville	11/24/1957	V
Waynesville	11/9/1968	IV
Waynesville	7/13/1969	III
Waynesville	11/20/1969	IV
Canton	11/30/1973	IV
Clyde	11/30/1973	III
Waynesville	11/30/1973	IV
Waynesville	5/16/1974	II
Canton	8/26/1979	III
Waynesville	8/26/1979	IV
Canton	7/27/1980	III

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Haywood County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table C.23**.

TABLE C.23: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/07/1812	New Madrid, MO	8.7	XII	VI
04/29/1852	Wytheville, VA	5.0	VI	VI
08/31/1861	Wilkesboro, NC	5.1	VII	VII
12/23/1875	Central Virginia	5.0	VII	VI
08/31/1886	Charleston, SC	7.3	X	VII
05/31/1897	Giles County, VA	5.8	VIII	VI
01/01/1913	Union County, SC	4.8	VII	VI
02/21/1916	Asheville, NC	5.5	VII	VII
07/08/1926	Mitchell County, NC	5.2	VII	VII

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
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

*This event is accounted for in the Haywood County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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, CERL, Memphis State University (1983).

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The strongest intensity of earthquake to occur in Haywood County is an MMI of VII (very strong; less than 6.1 on the Richter scale), which has occurred during the 1886 earthquake in Waynesville. However, stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Haywood County is unlikely. With 19 reported earthquakes occurring in 347 years, the historic annual rate of occurrence for earthquakes in Haywood County is 5.5-percent. However, it is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the annualized loss for Haywood County. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table C.24** summarizes the findings.

TABLE C.24: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Ratio	500 Year Event Loss	500 Year Event Ratio	Annualized Loss	Annualized Loss Ratio ¹
Haywood County	\$11,508,742,024	\$344,869	0.002996%	\$5,487,161	0.047678%	\$56,899	0.000494%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table C.49**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Haywood County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

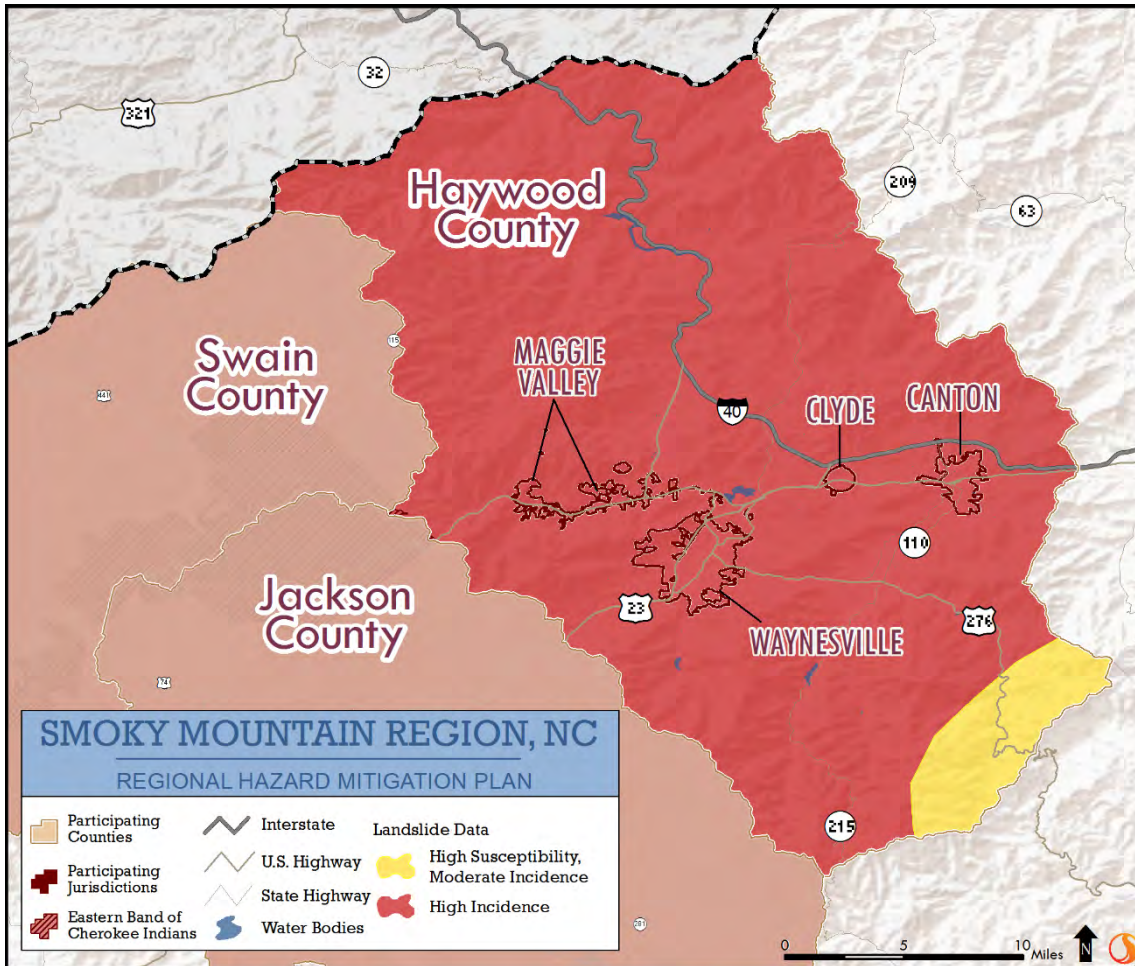
C.2.11 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Haywood County.

According to **Figure C.4** below, which leverages USGS landslide information, the majority of the county has high landslide activity. The remaining portion of the county, along the southeastern county boundary, has a moderate incidence occurrence rate. There is high susceptibility throughout the county.

FIGURE C.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF HAYWOOD COUNTY



Source: USGS

Historical Occurrences

Steep topography throughout Haywood County 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. **Table C.25** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey¹⁵. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure C.5**. Some incidence mapping has also been 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 Haywood County.

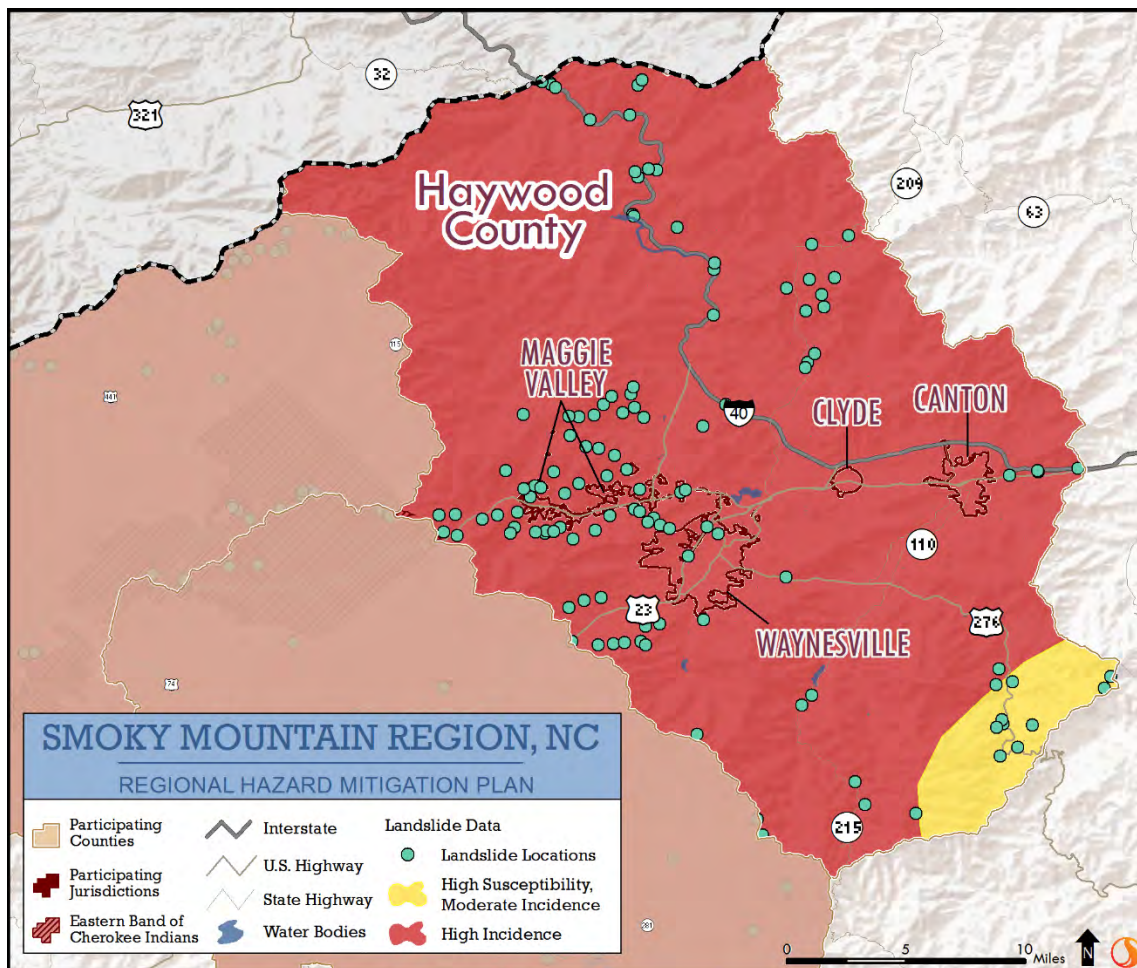
¹⁵ It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

TABLE C.25: SUMMARY OF LANDSLIDE ACTIVITY IN HAYWOOD COUNTY

Location	Number of Occurrences
Canton	-
Clyde	-
Maggie Valley	5
Waynesville	2
Unincorporated Area	114
HAYWOOD COUNTY TOTAL	121

Source: North Carolina Geological Survey

FIGURE C.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN HAYWOOD COUNTY



Source: North Carolina Geological Survey

The following information identifies additional historical information reported in the previous hazard mitigation plan:

Landslides are listed as one of the top three threats to the county. Landslides are reported with hurricane and flooding events. The North Carolina Geological Survey’s landslide database describes a landslide event from December 11, 2003 that destroyed a house and killed one person.

Extent

Landslide extent can be measured in terms of tons of debris or damage, for example. While limited information exists on debris generated from past events, millions of dollars in damages is possible. The most severe events may result in loss of life.

Probability of Future Occurrences

Based on historical occurrences (121 reported in 40 years), three landslides occur on average in Haywood County each year. Based on historical information and the USGS susceptibility index, the probability of future landslide events is highly likely (greater than 90% annual probability). The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as having a lower, “moderate” incidence ranking. A majority of Haywood County is located in the high incidence area though the southeastern tip of the county has a moderate incidence ranking. 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 Haywood County have greater risk than others given factors such as steepness on slope and modification of slopes (i.e., greater slope or modification of slope may increase risk and occurrence).

Vulnerability Assessment

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. Most areas of Haywood County are identified as high incidence (more than 15% of the area is involved in landsliding). Additionally, portions of the study area in the county are classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding) areas in the USGS landslide data. **Table C.26** presents potential vulnerability in moderate incidence areas while **Table C.27** presents vulnerability in high incidence areas.

TABLE C.26: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	434	1%	180	1%	\$18,038,300	0%
Canton	0	0%	0	0%	\$0	0%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	0	0%	0	0%	\$0	0%
Unincorporated Area	434	1%	180	1%	\$18,038,300	1%

Source: USGS

TABLE C.27: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH INCIDENCE LANDSLIDE HAZARD AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	49,243	99%	31,526	99%	\$4,677,543,000	100%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	2,369	100%	1,566	100%	\$252,971,400	100%
Waynesville	5,916	100%	4,707	100%	\$864,721,600	100%
Unincorporated Area	37,738	99%	22,770	99%	\$3,244,737,400	99%

Source: USGS

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk.

Critical Facilities

All critical facilities are in a high susceptibility area, as demonstrated by **Table C.28**. This includes a total of 49 facilities. A list of specific critical facilities and their associated risk can be found in **Table C.49** at the end of this section.

TABLE C.28: CRITICAL FACILITIES IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	3	2	2	4	10	21
Fire Station	2	1	1	2	10	16
Police Station	1	1	1	2	0	5
Government Facilities	4	1	2	9	10	26
Government Office	0	0	1	6	1	8
Community Center	0	0	0	1	0	1
School	4	1	1	2	9	17
Medical Facilities	0	0	0	1	1	2
Medical Center	0	0	0	0	1	1
Health Center	0	0	0	1	0	1
Total	7	3	4	14	21	49

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in Haywood County, 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 county 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.

C.2.12 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table C.29** explains these classifications.

TABLE C.29: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

According to the North Carolina Division of Land Management there are 29 dams in Haywood County.¹⁶ Of these dams, 17 are classified as high hazard potential, two are classified as intermediate hazard potential, and 10 are classified as low hazard. High hazard dams are listed in **Table C.30**.

TABLE C.30: HAYWOOD COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
HAYWOOD COUNTY				
Barrett Pond Dam	High	0.7	7	Private
Boland Pond Dam	High	0.2	1	Private
Broyhill Children's Home Pond Dam	High	2.0	36	Private
Cameron Dam	High	0.3	3	Private
Camp Daniel Boone Lake Dam	High	4.0	87	Private
Cataloochee Ranch Dam	High	0.5	5	Private
Cataloochee Ski Slope Dam	High	0.7	15	Private
Fishers Lake Dam	High	1.0	6	Private
Hardin Dam	High	1.2	7	Private
Harvey Dam	High	0.4	3	Private
Lake Jane Dam	High	3.0	22	Private
Lake Junaluska Dam	High	195.0	7,720	Private
Lake Logan Dam	High	90.0	2,400	Private
Lipham Dam	High	2.5	-	Private

¹⁶ From the March 16, 2017 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (<https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety>).

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
HAYWOOD COUNTY				
Smoky Mountain Sanctuary POA Dam	High	0.4	16	Private
Walters Dam	High	-	30,000	Utility
Waynesville Water Supply Dam	High	76.4	3,660	Local Government

Source: North Carolina Division of Land Resources

It should also be noted that the North Carolina dam classification regulations were recently updated. As a result of the change, more dams are generally classified as high hazard.

Historical Occurrences

No dam breaches were reported in Haywood County. However, several breach scenarios in the county could be catastrophic.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria. Of the 29 dams in Haywood County, 17 are classified as high-hazard, which could result in fatalities if breached.

Probability of Future Occurrences

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 was completed in a *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.

C.2.13 Erosion

Location

Erosion in Haywood County is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Haywood County’s mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the county, particularly along the banks of rivers and streams, but it is not a significant threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion in Haywood County. This includes searching local newspapers, obtaining input from the planning team, and reviewing the previous hazard mitigation plan. Haywood County, particularly Maggie Valley, was identified by the planning team as being susceptible to erosion, but further details were not provided. Prior to joining the regional planning effort, Haywood County recognized erosion as hazard and included mitigation actions to address the hazard

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs (such as inches per year). There are no erosion rate records located in Haywood County it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for the Haywood County, and it will continue to occur. Based on concerns from local officials, the annual probability level assigned for erosion is likely (between 10 and 90 percent annual probability).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

C.2.14 Flood

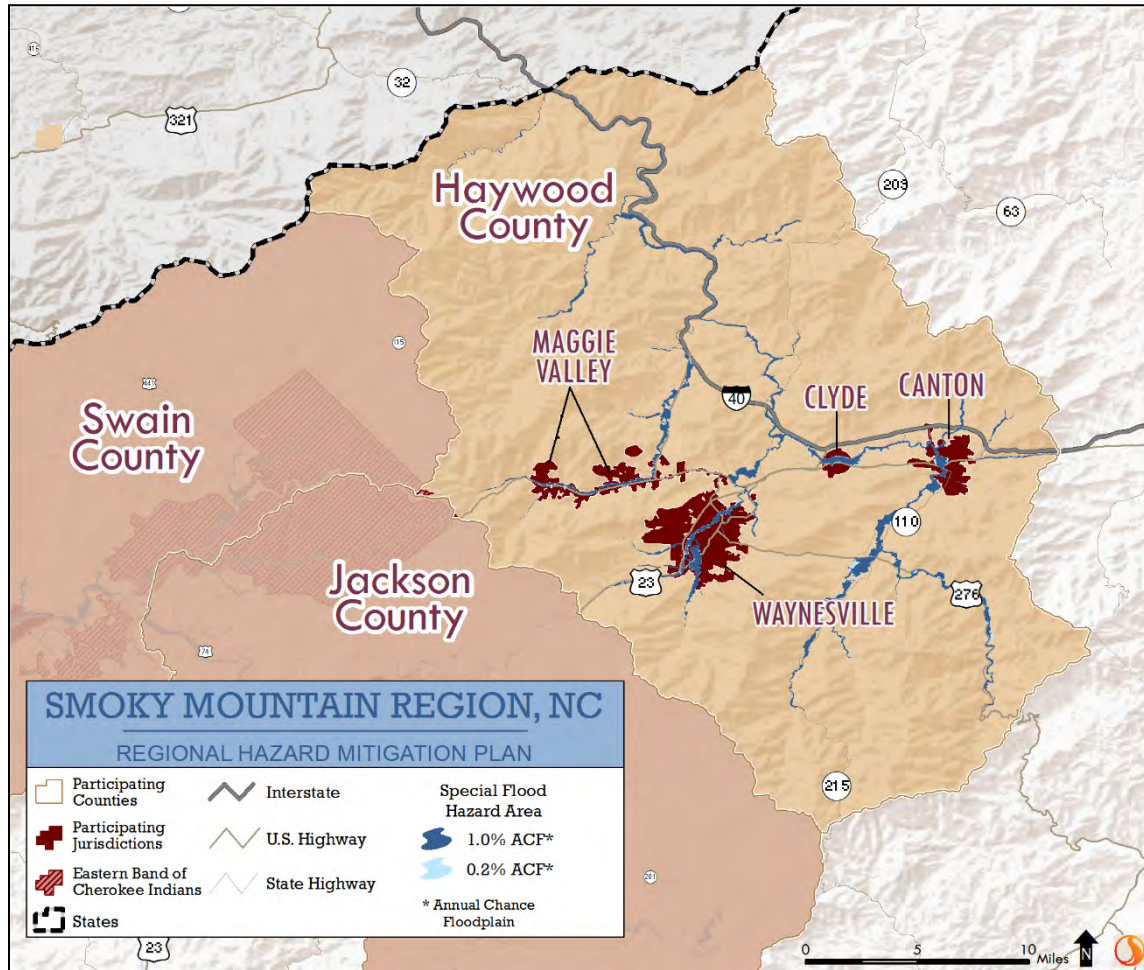
Location

There are areas in Haywood County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).¹⁷ 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 554 square miles that make up Haywood County, there are 8.38 square miles of land in zones A and AE (1.0% annual chance floodplain/100-year floodplain), 2.98 square miles of land in floodways, and 1.36 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). Total, there are 12.73 square miles of land in floodplain areas in Haywood County.

These flood zone values account for 1.76 percent of the total land area in Haywood County. 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 C.6, Figure C.7, Figure C.8, and Figure C.9** illustrate the location and extent of currently mapped special flood hazard areas for Haywood County, the Town of Canton, the Town of Clyde, the Town of Maggie Valley, and the Town of Waynesville based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

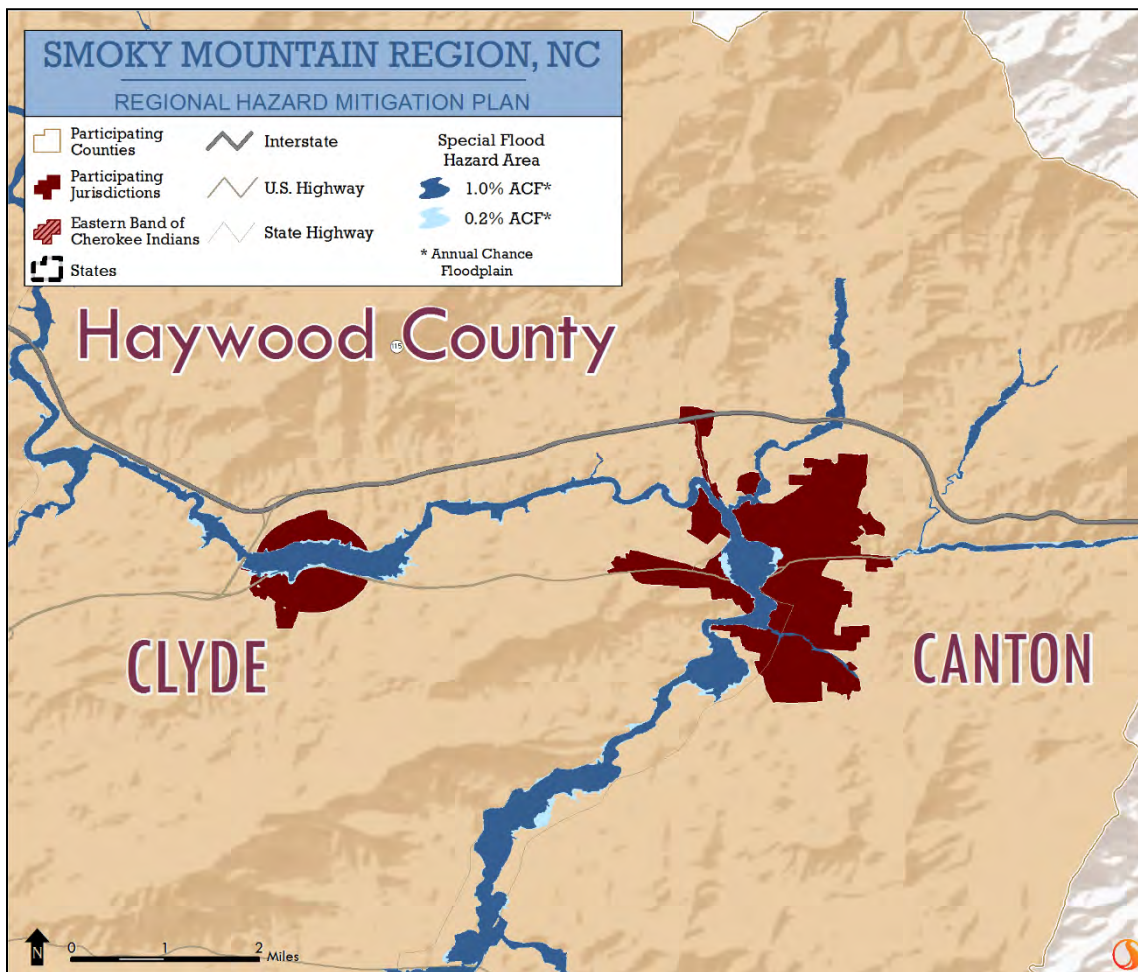
¹⁷The county-level DFIRM data used for Haywood County were updated in 2010.

FIGURE C.6: SPECIAL FLOOD HAZARD AREAS IN HAYWOOD COUNTY



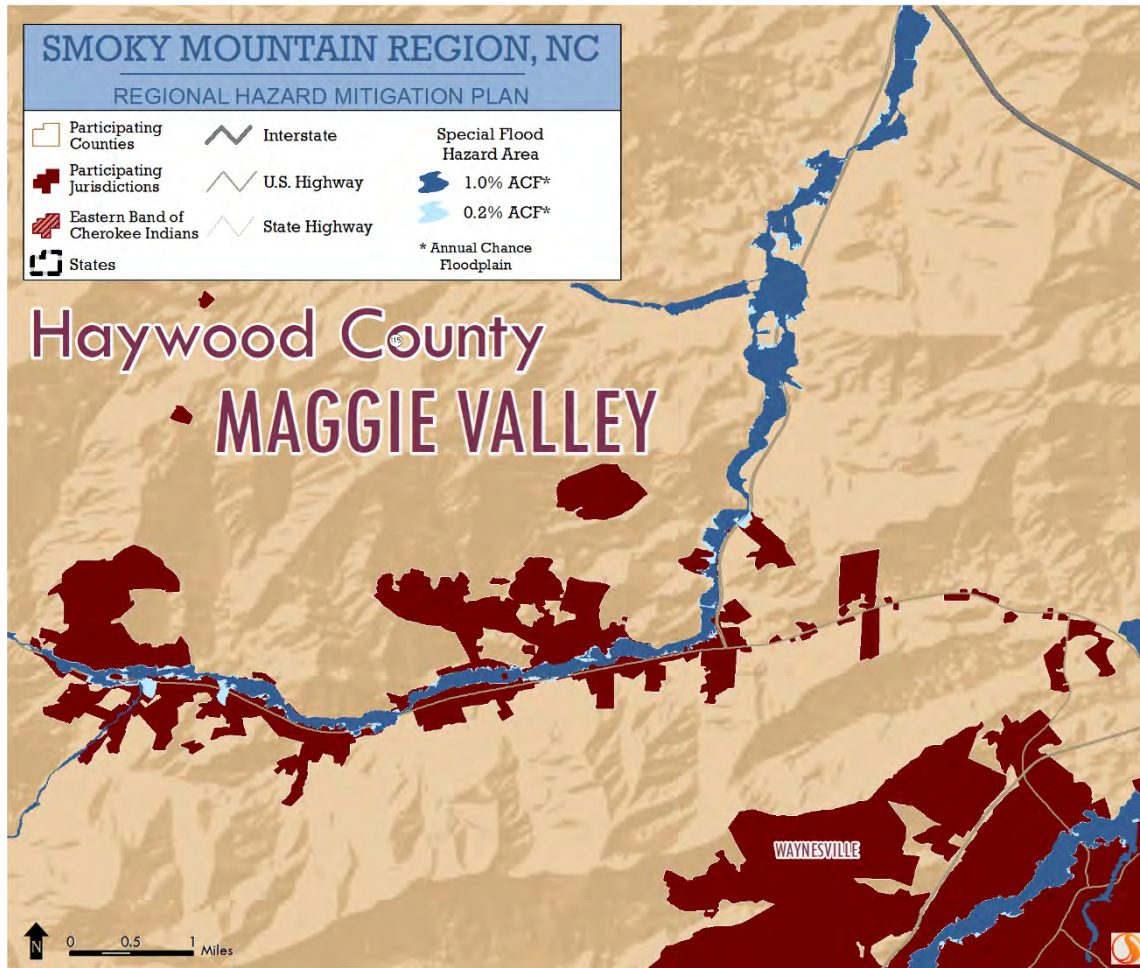
Source: Federal Emergency Management Agency

FIGURE C.7: SPECIAL FLOOD HAZARD AREAS IN CANTON AND CLYDE



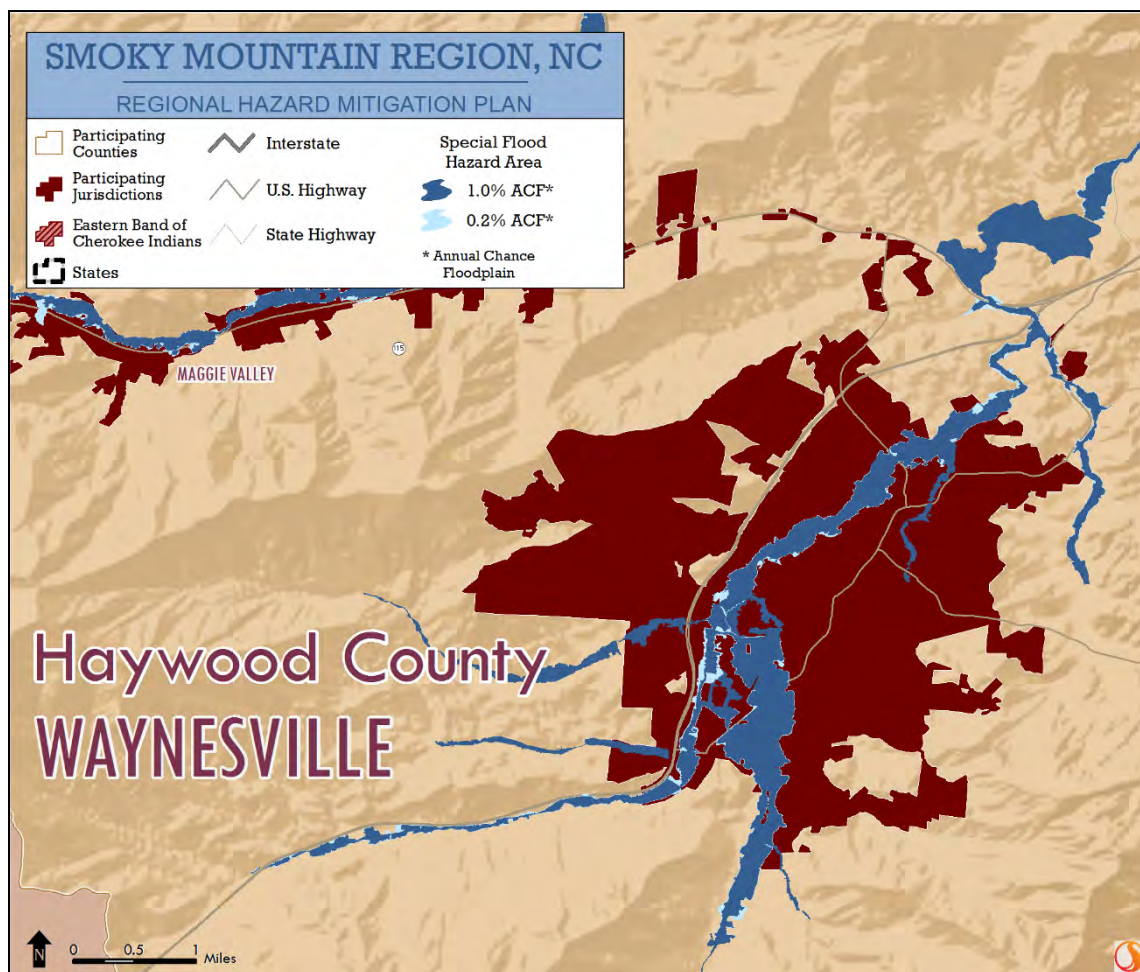
Source: Federal Emergency Management Agency

FIGURE C.8: SPECIAL FLOOD HAZARD AREAS IN MAGGIE VALLEY



Source: Federal Emergency Management Agency

FIGURE C.9: SPECIAL FLOOD HAZARD AREAS IN WAYNESVILLE



Source: Federal Emergency Management Agency

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 29 events in Haywood County since 1996.¹⁸ A summary of these events is presented in **Table C.31**. These events accounted for over \$35 million (2017 dollars) in property damage and almost \$3 million in crop damage in the county.¹⁹ Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table C.32**.

¹⁸ These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

¹⁹ The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

TABLE C.31: SUMMARY OF FLOOD OCCURRENCES IN HAYWOOD COUNTY

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
HAYWOOD COUNTY	29	\$35,065,221	\$2,937,067
Canton	1	\$0	\$0
Clyde	1	\$0	\$0
Maggie Valley	3	\$23,185	\$0
Waynesville	7	\$965,992	\$0
Unincorporated	17	\$34,076,044	\$2,937,067

Source: National Centers for Environmental Information

TABLE C.32: HISTORICAL FLOOD EVENTS IN HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	1/18/1996	Flood	0/0	\$0	\$0	--
Haywood Co.	1/26/1996	Flood	0/0	\$0	\$0	--
Cruso	11/8/1996	Flash Flood	0/0	\$0	\$0	--
Southern Half	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Maggie Valley	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Cruso	3/14/1997	Flash Flood	0/0	\$0	\$0	--
Maggie Valley	7/28/1997	Flash Flood	0/0	\$0	\$0	--
Waynesville	1/7/1998	Flash Flood	0/0	\$885,223	\$0	Excessive rain caused creeks and streams to rise well out of their banks. This combined with the enormous amounts of run-off to cause numerous roads and bridges to be covered in water or washed out. The Blue Ridge Parkway in Haywood county sustained considerable damage.
Haywood Co.	2/3/1998	Flash Flood	0/0	\$0	\$0	--
Cove Creek	6/4/2002	Flash Flood	0/0	\$0	\$0	--
Haywood Co.	5/6/2003	Flood	0/0	\$0	\$0	--
Central Portion	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Numerous creeks and larger stream flooded along the highway 74 corridor from Clyde to Waynesville to Balsam Gap, and further north to the Maggie Valley area. In Clyde, a mudslide caused a house on a slope to slide off its foundation, effectively destroying the home. A sinkhole also developed near Lake Junaluska.
Hepco	7/9/2003	Flash Flood	0/0	\$0	\$0	--
Haywood Co.	11/19/2003	Flood	0/0	\$0	\$0	--

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Cove Creek	5/31/2004	Flash Flood	0/0	\$146,853	\$0	Two severe thunderstorms moved in succession across central Haywood County, producing 3 to 5 inches of rain in just over an hour in the Cove Creek area. This excessive rainfall caused Cove Creek to expand from its typical width of 3 to 5 feet and depth of 2 feet to a width of 75 to 100 feet and depth of 10 to 12 feet. Several private bridges and roads or driveways were washed out.
Waynesville	6/12/2004	Flash Flood	0/0	\$0	\$0	--
Canton	7/9/2004	Flash Flood	0/0	\$0	\$0	--
Waynesville	7/10/2004	Flash Flood	0/0	\$0	\$0	--
Waynesville	7/25/2004	Flash Flood	0/0	\$7,343	\$0	A mud slide caused damage to the Saunook fire station. Allen's Creek overflowed its banks, flooding the Valleybrook trailer park.
Waynesville	7/26/2004	Flash Flood	0/0	\$73,427	\$0	Heavy rainfall produced by strong thunderstorms resulted in several creeks reaching or exceeding bankful in the Waynesville and Maggie Valley areas. Flooded creeks included Hyatt, Richley, Jonathan, and Allen Creeks. Several roads and bridges were covered with water. Evacuations were required at Pride Resort due to flooding along Jonathan Creek. A house was reportedly damaged by a mud slide.
Haywood Co.	9/7/2004	Flood	0/0	\$11,748,270	\$2,937,067	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.

ANNEX C: HAYWOOD COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Haywood Co.	9/16/2004	Flood	3/0	\$22,028,006	\$0	After an extended period of moderate to heavy rainfall, flooding developed first across the western part of the county, when several secondary roads became covered with water. During the overnight hours, flooding overspread the county, affecting most valley communities, which endured the second devastating flood event in just 9 days. Severe flooding developed first along Allens and Hyatt Creeks, followed by another round of severe flooding along the Pigeon River, which reached a record of 23 feet in Canton. A 69-year-old woman died when she attempted to drive her vehicle through the flooded river in Canton. A 27-year-old woman and her 4-year-old son were also killed during the evening of the 18th, when the woman attempted to drive her SUV through the flooded Pigeon River which was flowing over a Forest Service road off of I-40. Numerous businesses and hundreds of homes were damaged or destroyed by flood water or landslides. The river washed out a large portion of interstate 40 near the Tennessee border. Numerous other roads and highways were damaged in places, including highways 209, 215, 19, and 276
Waynesville	6/12/2005	Flash Flood	0/0	\$0	\$0	--
Waynesville	8/22/2005	Flash Flood	0/0	\$0	\$0	--
Clyde	8/26/2008	Flash Flood	0/0	\$0	\$0	--
Maggie	7/19/2012	Flash Flood	0/0	\$23,185	\$0	A small, stationary convective cell dropped about 4.5 inches of rain across the Indian Creek basin in about an hour's time. This resulted in a highly localized flash flood that damaged parts of Indian Creek Road, isolating 12 homes for a period of time. Water entered the basements of a few homes. The flooded stream washed out sections of the asphalt road and deposited boulders on it. Several small slope failures/landslides also occurred in the headwaters of the basin.
Saunook	1/15/2013	Flood	0/0	\$0	\$0	--
Cruso	1/30/2013	Flash Flood	0/0	\$1,126	\$0	Prolonged moderate to heavy rain caused Richland Creek to leave its banks and flood some local roads in the Waynesville area, including Water Street off of Dellwood Road. Water was up to the foundations of a couple buildings at this location. The creek also flooded the Frisbee golf course at the Waynesville Recreation Center. Tri Lakes Drive was flooded by Jonathan Creek near Maggie Valley. A couple small mudslides were also reported in the Maggie Valley area.

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
HAYWOOD COUNTY						
Ironduff	12/24/2015	Flash Flood	0/0	\$530	\$0	After as much as 3 inches of rain fell across Haywood County in about 24 hours, public reported flash flooding developed on Long Branch in the Lake Junaluska area, with Hyder Mountain Rd flooded and impassable.

Source: NCEI Storm Events Database

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 5,666 parcels (11 percent of the total) and 4,143 improved properties (13 percent of the total) located in the 100-year or 500-year floodplain within Haywood County.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there are five at or near water features in Haywood County. **Table C.33.** details these gauges. The maximum recorded discharge for a gauge in Haywood County was 7,080 cubic feet per second in 2015, measured at Bethel in the West Fork Pigeon River.

TABLE C.33: SUMMARY OF DISCHARGE RATES IN HAYWOOD COUNTY

Water Feature	Gage Location	Median Discharge (ft ³ /s)	Max Discharge (ft ³ /s – yr)	Drainage Area (sq miles)	Max Gage Height (ft/yr)
West Fork Pigeon River	above Lake Logan near Hazelwood, Haywood County	61	4,480 (2015)	27.6	7.13 (2015)
West Fork Pigeon River	near Retreat, Haywood County	73	6,080 (2015)	33.5	8.16 (2015)
West Fork Pigeon River	at Bethel, Haywood County	102	7,080 (2015)	58.4	10.28 (2015)
Lake Logan	at Dam near Hazelwood, Haywood County	n/a	n/a	33.3	56.43 (2015)
East Fork Pigeon River	near Canton	89	5,760 (2015)	51.5	7.87 (2015)

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been 244 flood losses reported in Haywood County through the National Flood Insurance Program (NFIP) since 1970, totaling nearly \$8 million in claims payments. A summary of these figures for the county is provided in **Table C.34.** 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 Haywood County were either uninsured, denied claims payment, or not reported.

TABLE C.34: SUMMARY OF INSURED FLOOD LOSSES IN HAYWOOD COUNTY

Location	Flood Losses	Claims Payments
HAYWOOD COUNTY	244	\$7,992,637
Canton	50	\$3,033,702
Clyde	127	\$3,842,008
Maggie Valley	4	\$23,642
Waynesville	14	\$117,734
Unincorporated Area	49	\$975,551

Source: FEMA, NFIP

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.

As of February 2017, there are 17 non-mitigated repetitive loss properties located in Haywood County, which accounted for 34 losses and more than \$1.7 million in claims payments under the NFIP. The average claim amount for these properties is \$50,901. Twelve of the properties are single family residential, two are other residential, and three are nonresidential. Without mitigation these properties will likely continue to experience flood losses. **Table C.35** presents detailed information on repetitive loss properties and NFIP claims and policies for Haywood County.

TABLE C.35: SUMMARY OF REPETITIVE LOSS PROPERTIES IN HAYWOOD COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
HAYWOOD COUNTY	17	0	34	\$1,638,308	\$92,354	\$1,730,663	\$50,901
Canton	0	-	0	\$0	\$0	\$0	\$0
Clyde	14	10 single family, 2 other residential, 2 other nonresidential	28	\$1,423,492	\$80,253	\$1,503,745	\$53,705
Maggie Valley	0	-	0	\$0	\$0	\$0	\$0
Waynesville	2	1 single family, 1 nonresidential	4	\$68,617	\$1,912	\$70,529	\$17,632
Unincorporated Area	1	single family	2	\$146,199	\$10,189	\$156,387	\$78,194

Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat in Haywood County. The NCEI's Storm Events Database indicates 29 flood events in Haywood County between 1996 and 2016. This results in more than one flood event per year. Information on previous NFIP losses also indicates ongoing flood risk. Therefore, flood was assigned a probability of "highly likely" (greater than 90% annual chance).

The participating jurisdictions and unincorporated areas of the county have risk to flooding, though not all areas will experience flood. 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 county and participating jurisdictions. For example, the northern portion of Andrews has more floodplain and thus a higher risk of flood than the southern portion or the county. Flood 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.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 C.36** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and **Table C.37** presents potential at-risk property susceptible to either the 1.0-percent or 0.2-percent annual chance flood in Haywood County. Both the number of parcels and the approximate value are presented.

TABLE C.36: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF)

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	5,217	11%	3,797	12%	\$636,583,100	14%
Canton	330	12%	213	10%	\$68,067,200	24%
Clyde	393	19%	242	16%	\$31,160,100	15%
Maggie Valley	412	12%	296	14%	\$68,362,900	19%
Waynesville	1,694	22%	1,439	24%	\$246,415,800	23%
Unincorporated Area	2,388	7%	1,607	8%	\$222,577,100	8%

Source: FEMA DFIRM

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

TABLE C.37: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	5,666	11%	4,143	13%	\$685,369,900	15%

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Canton	363	13%	239	11%	\$71,117,700	25%
Clyde	452	22%	294	20%	\$44,646,900	21%
Maggie Valley	468	14%	337	16%	\$73,962,000	21%
Waynesville	1,779	23%	1,513	25%	\$257,682,100	25%
Unincorporated Area	2,604	8%	1,760	9%	\$237,961,200	9%

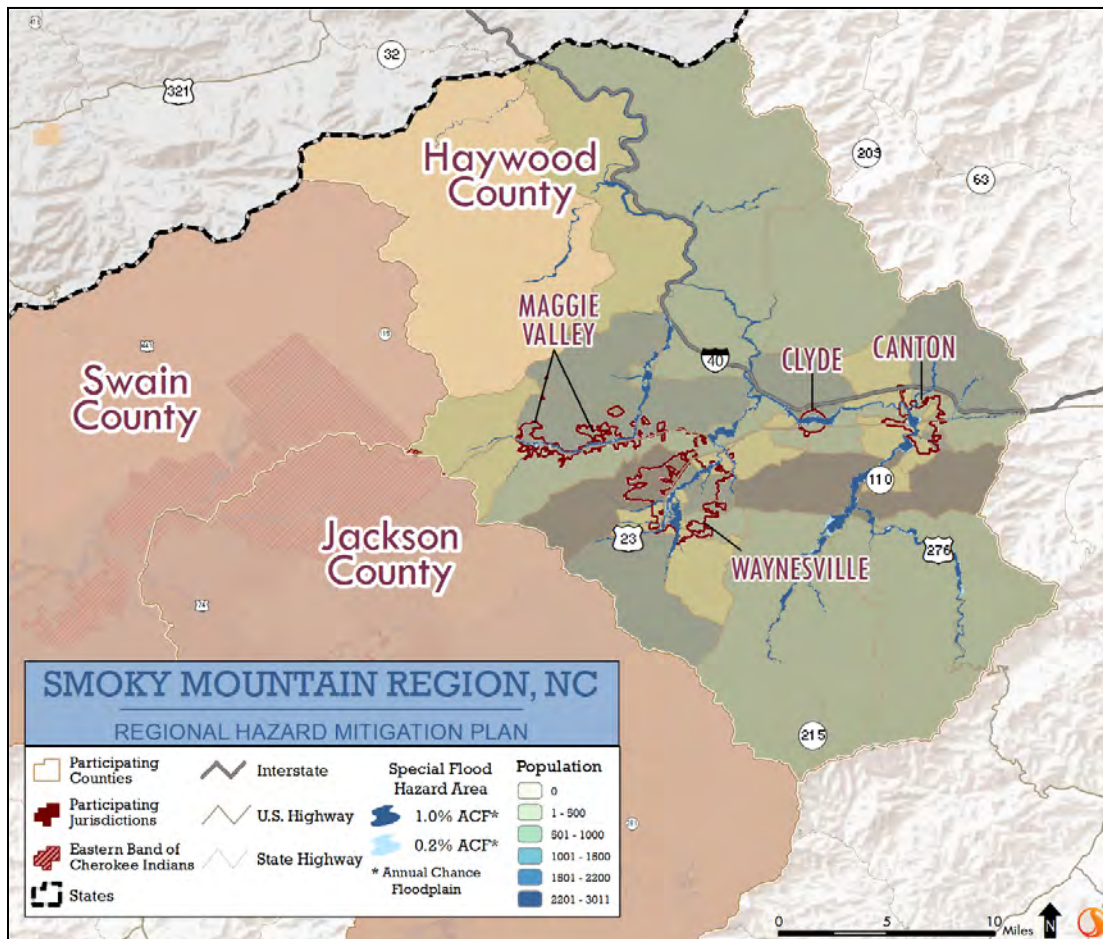
Source: FEMA DFIRM

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure C.10** is presented to gain a better understanding of at risk population.

FIGURE C.10 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census Bureau 2015

Critical Facilities

The critical facility analysis revealed that there is a total of nine critical facilities located in the Haywood County 1.0-percent annual chance floodplain and 0.2-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). Critical facilities located in the Haywood County 1.0-percent annual chance floodplain are presented in **Table C.38**, and critical facilities located in the 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain are detailed in **Table C.39**. A list of specific critical facilities and their associated risk can be found in **Table C.49** at the end of this section.

TABLE C.38: CRITICAL FACILITIES LOCATED IN THE 1.0-PERCENT FLOOD HAZARD AREAS

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	2	0	0	2	1	5
Fire Station	1	1	0	1	1	5
Police Station	1	0	0	1	0	2
Government Facilities	0	1	0	0	0	1
Government Office	0	0	0	0	0	0
Community Center	0	0	0	0	0	0
School	0	1	0	0	0	1
Medical Facilities	0	0	0	0	0	0
Medical Center	0	0	0	0	0	0
Health Center	0	0	0	0	0	1
Total	2	1	0	2	1	6

TABLE C.39: CRITICAL FACILITIES LOCATED IN THE 1.0-PERCENT AND 0.2-PERCENT ANNUAL CHANCE FLOOD HAZARD AREAS

HAYWOOD COUNTY						
Category and Type	Canton	Clyde	Maggie Valley	Waynesville	Unincorporated	Total
Emergency Services	3	1	0	2	1	7
Fire Station	2	1	0	1	1	5
Police Station	1	0	0	1	0	2
Government Facilities	0	1	0	0	0	1
Government Office	0	0	0	0	0	0
Community Center	0	0	0	0	0	0
School	0	1	0	0	0	1
Medical Facilities	0	0	0	1	0	1
Medical Center	0	0	0	0	0	0
Health Center	0	0	0	1	0	1
Total	3	2	0	3	1	9

In conclusion, a flood has the potential to impact many existing and future buildings and populations in Haywood County, 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 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain as provided by FEMA. It is certainly possible more severe events could occur beyond these boundaries or urban (flash) flooding could impact additional structures. Such site-specific vulnerability determinations are outside the

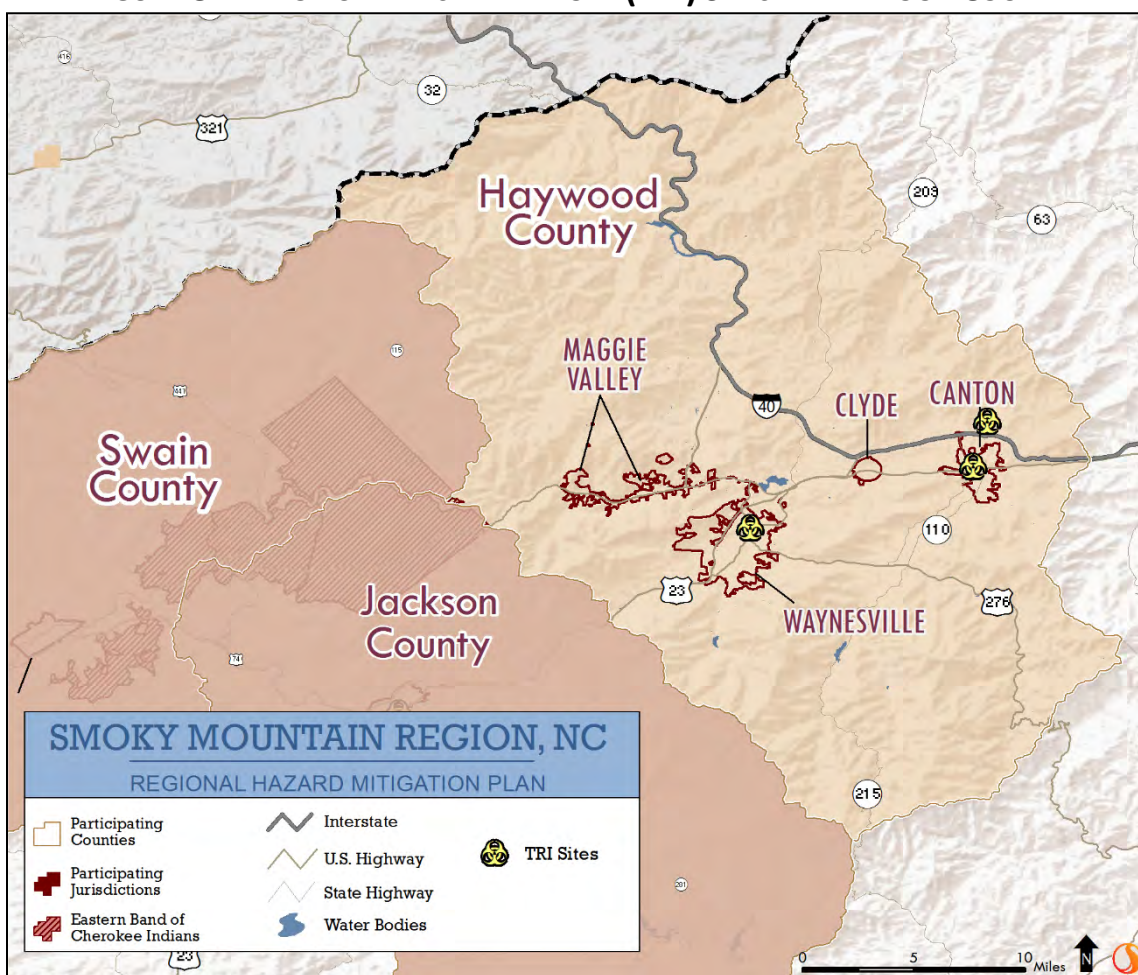
scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

C.2.15 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Haywood County has three TRI sites. These sites are shown in **Figure C.11**.

FIGURE C.11: TOXIC RELEASE INVENTORY (TRI) SITES IN HAYWOOD COUNTY



Source: EPA

In addition to “fixed” hazardous materials locations, hazardous materials may also impact the county via roadways and rail. Many roads in the county are narrow and winding, making hazardous material transport in

the area especially treacherous. All roads that permit hazardous material transport are considered potentially at risk to an incident.

Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” (highlighted in yellow in **Table C.40** below) 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 materials “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.

There have been 30 reported HAZMAT incidents in Haywood County. **Table C.40** presents detailed information on historic HAZMAT incidents reported in Haywood County.

TABLE C.40: SUMMARY OF HAZMAT INCIDENTS IN HAYWOOD COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (\$)	Quantity Released
Haywood County							
I-1973070581	7/17/1973	Canton	Highway	No	0/0	\$0	0
I-1976110011	7/21/1976	Canton	Rail	No	0/1	\$0	10 LGA
I-1979020469	1/29/1979	Waynesville	Highway	No	0/0	\$0	0
I-1980071276	6/16/1980	Waynesville	Highway	No	0/0	\$0	0
I-1980090336	6/18/1980	Canton	Rail	No	0/0	\$0	0
I-1982080698	8/12/1982	Clyde	Highway	Yes	0/0	\$0	6,250 LGA
I-1985110033	10/2/1985	Waynesville	Rail	No	0/0	\$0	0.12 LGA
I-1986090467	09/11/1986	Harmons Den	Highway	No	0/0	\$0	30 LGA
I-1987080048	6/3/1987	Canton	Rail	No	0/0	\$0	0.25 LGA
I-1988090195	8/4/1988	Clyde	Highway	Yes	0/0	\$0	6,000 LGA
I-1989070500	7/13/1989	Clyde	Highway	Yes	0/0	\$0	5,500 LGA
I-1991060181	5/29/1991	Clyde	Highway	No	0/0	\$4,910	55 LGA
I-1996020185	12/31/1995	Canton	Highway	No	0/0	\$4	2 LGA
I-1996090182	8/20/1996	Waynesville	Highway	No	0/0	\$3,130	4 LGA
I-1996110450	10/17/1996	Waynesville	Highway	No	0/0	\$713	40 LGA
I-1997030854	3/4/1997	Canton	Highway	No	0/0	\$0	0
I-1997041086	4/6/1997	Waynesville	Highway	No	0/0	\$0	0

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (\$)	Quantity Released
I-1998040167	03/12/1998	Crabtree	Highway	No	0/0	\$1,160	3 LGA
I-1998050099	04/14/1998	Waterville	Highway	No	0/0	\$3,750	10 LGA
I-1998090470	8/7/1998	Waynesville	Highway	No	0/0	\$4	4 LGA
I-1998111002	10/3/1998	Waynesville	Highway	No	0/0	\$3	3 LGA
I-1999040598	3/16/1999	Waynesville	Highway	Yes	0/0	\$250	200 LGA
I-1999040888	4/13/1999	Canton	Highway	No	0/0	\$1,025	30 LGA
I-2000090192	8/11/2000	Waynesville	Highway	No	0/0	\$59,001	100 LGA
I-2000120378	8/22/2000	Canton	Highway	No	0/0	\$0	5 LGA
I-2003111034	11/12/2003	Canton	Highway	Yes	0/0	\$6,000	330 LGA
I-2004090919	08/28/2004	Maggie Valley	Highway	No	0/0	\$4,000	100 LGA
I-2005090796	8/23/2005	Canton	Rail	No	0/0	\$2,000	0.26418 LGA
I-2006080466	7/18/2006	Canton	Highway	No	0/0	\$1,550	15 LGA
I-2010090110	4/13/2010	Waynesville	Highway	No	0/0	\$1,391	50 LGA

Source: USDOT PHMSA

Extent

Hazardous Materials Incidence extent can be defined into terms of amount of material released or associated impacts. The greatest amount recorded to date was 6,250 LGA. However, greater releases are possible.

Probability of Future Occurrences

Given the location of three toxic release inventory sites in Haywood County and several serious roadway incidents, it is possible that a hazardous material incident may occur in the county. Based on historic occurrences (30 events occurring since 1973), a hazardous materials incident was assigned a probability likely (between 10% and 100% annual probability). Haywood County has a very high number of hazardous material incidents compared to the other areas on the Smoky Mountain Region. The exact reason for this is unknown – it could be a result of more reporting or, perhaps, the results of increased population and thus chance for traffic accidents. County and town officials are mindful of hazardous events and take precautions to prevent such an event from occurring. Furthermore, there are detailed plans in place to respond to an occurrence.

Hazardous materials incidents will continue to be a threat to Haywood County. The county may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

Vulnerability Assessment

Historical evidence and existing Toxic Release Inventory sites indicate that Haywood County is susceptible to hazardous materials events, and there are several reports of damage. It is assumed that one major event could result in significant losses for Haywood County.

Most hazardous materials 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 materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather

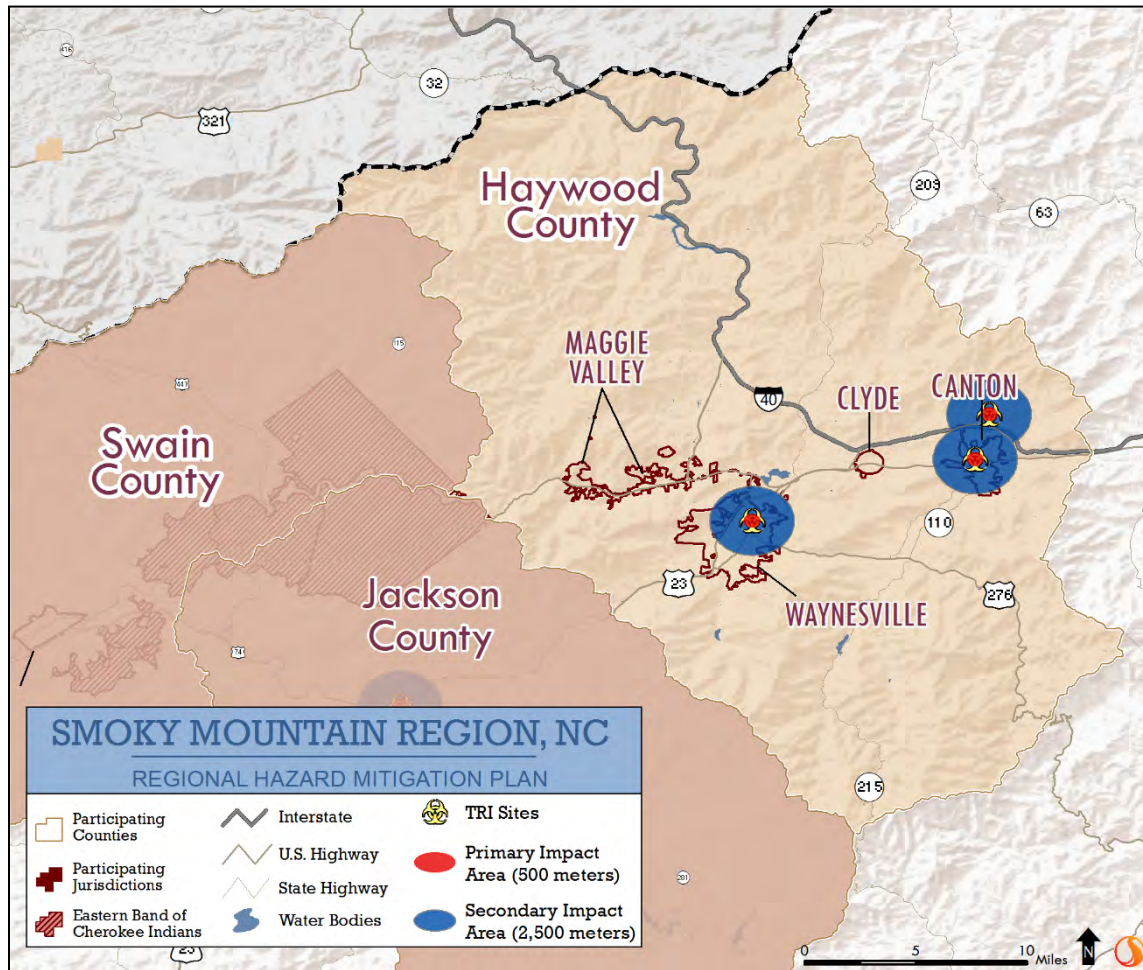
conditions will directly affect how the hazard develops. Certain chemicals may travel through the air or water, affecting a much larger area than the point of the incidence itself. Non-compliance with fire and building codes, as well as failure to maintain existing fire and containment features, can 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.²⁰ In both scenarios, two sizes of buffers—500 and 2,500 meters—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 Haywood County, along with buffers, were used for analysis as shown in **Figure C.12** 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 C.13** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table C.41** (fixed sites), **Table C.42** (mobile road sites) and **Table C.43** (mobile railroad sites).²¹

²⁰ This type of analysis will likely yield conservative results (likely higher than what is actually reported following an event).

²¹ Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE C.12 : TRI SITES WITH BUFFERS IN HAYWOOD COUNTY



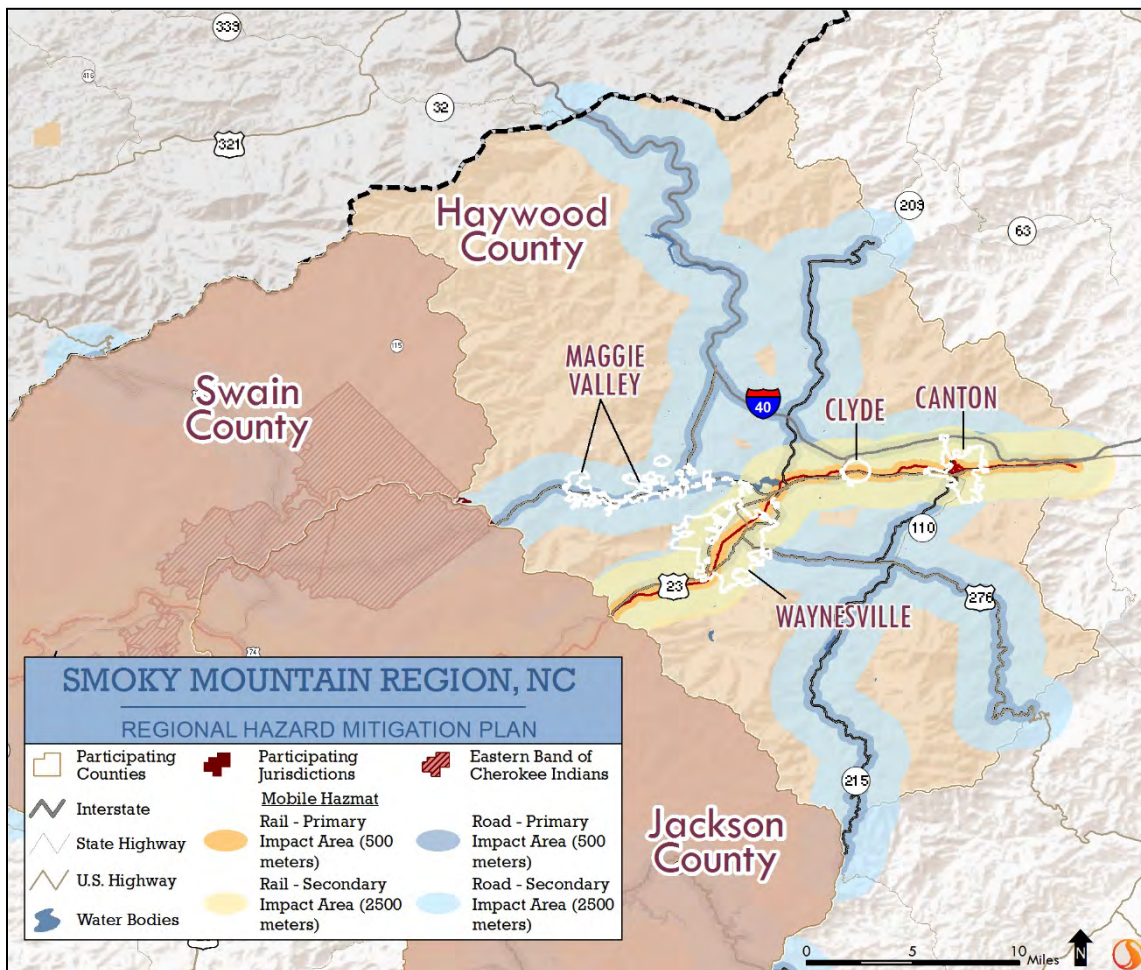
Source: EPA

TABLE C.41: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (FIXED SITES)

Location	500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	473	1%	414	1%	\$138,864,200	3%
Canton	75	3%	67	3%	\$25,653,300	10%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	335	6%	301	6%	\$93,728,600	11%
Unincorporated Area	63	0%	46	0%	\$19,482,300	1%

Location	2,500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	9,194	19%	7,018	22%	\$1,002,237,200	21%
Canton	2,479	99%	1,938	99%	\$249,765,500	97%
Clyde	0	0%	0	0%	\$0	0%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	3,534	60%	2,843	60%	\$498,712,900	58%
Unincorporated Area	3,181	8%	2,237	10%	\$253,758,800	8%

FIGURE C.13 : MOBILE HAZMAT BUFFERS IN HAYWOOD COUNTY



**TABLE C.42: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - ROAD)**

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	17,810	36%	12,505	39%	\$1,941,035,200	41%
Canton	1,106	44%	818	42%	\$137,161,700	54%
Clyde	553	77%	392	74%	\$43,266,900	73%
Maggie Valley	1,669	70%	1,160	74%	\$180,049,900	71%
Waynesville	3,626	61%	2,948	63%	\$524,296,700	61%
Unincorporated Area	10,856	28%	7,187	31%	\$1,056,260,000	32%

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	43,433	87%	28,607	90%	\$4,220,600,100	90%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	2,367	100%	1,564	100%	\$251,712,600	100%
Waynesville	5,916	100%	4,707	100%	\$864,721,600	100%
Unincorporated Area	31,930	84%	19,853	87%	\$2,789,053,300	85%

**TABLE C.43: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	6,556	13%	5,015	16%	\$854,099,400	18%
Canton	981	39%	751	38%	\$101,962,000	40%
Clyde	528	73%	375	71%	\$40,334,800	68%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	2,155	36%	1,852	39%	\$367,854,600	43%
Unincorporated Area	2,892	8%	2,037	9%	\$343,948,000	11%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	20,867	42%	15,485	49%	\$2,350,120,000	50%
Canton	2,499	100%	1,955	100%	\$256,206,300	100%
Clyde	721	100%	528	100%	\$58,906,300	100%
Maggie Valley	0	0%	0	0%	\$0	0%
Waynesville	5,691	96%	4,572	97%	\$831,482,900	96%
Unincorporated Area	11,956	31%	8,430	37%	\$1,203,524,500	37%

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk to a hazardous materials incident. 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 18 Haywood County facilities located in a HAZMAT risk zone. Six of those facilities are located in the primary, 500-meter zone. The numbers of critical facilities located in the different HAZMAT risk zones are presented in **Table C.44**. A list of specific critical facilities and their associated risk can be found in **Table C.49** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors in Haywood County revealed that there are 49 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 36 critical facilities located in the railroad HAZMAT buffer areas. A list of specific critical facilities and their associated risk can be found in **Table C.49** at the end of this section.

TABLE CA.44: CRITICAL FACILITIES IN HAZMAT RISK ZONES IN HAYWOOD COUNTY

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
Haywood County	6	18	40	49	22	36
Canton	3	6	5	7	3	7
Clyde	0	0	3	3	3	3
Maggie Valley	0	0	4	4	0	0
Waynesville	3	10	9	14	9	14
Unincorporated Area	0	2	19	21	7	12

As noted in the Hazard Profile Section, Haywood County has a very high number of hazardous material incidents compared to the other areas on the Smoky Mountain Region. This elevates the vulnerability of populations and the built environment with the county. This warrants additional attention to mitigation

measures for this hazard. Those areas in a primary buffer area 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. In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in Haywood County. Further, incidents from neighboring counties could also impact the county and participating jurisdictions.

C.2.16 Wildfire

Location

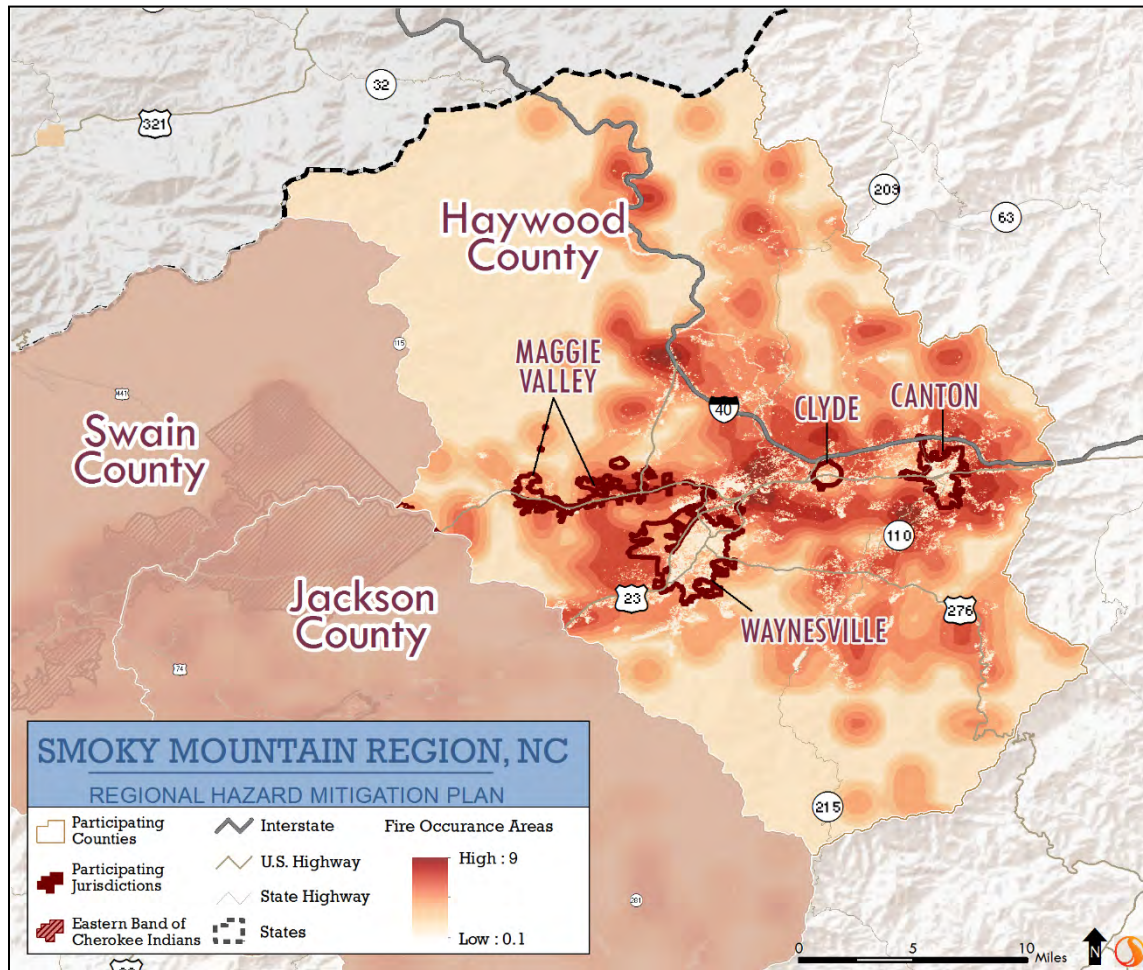
The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic locations impacted.

Historical Occurrences

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county.

Figure C.14 shows the Fire Occurrence Areas (FOA) in Haywood County based on data from the Southern Wildfire Risk Assessment

FIGURE C.14: HISTORIC WILDFIRE EVENTS IN HAYWOOD COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, Haywood County experiences an average of 41 wildfires annually which burn an average of 160 acres per year. The data indicates that most of these fires are small, averaging four acres per fire. **Table C.45** lists the number of reported wildfire occurrences in the county between the years 2002 and 2016.

TABLE C.45: HISTORICAL WILDFIRE OCCURRENCES IN HAYWOOD COUNTY

Year	Number of Fires	Number of Acres Burned
2002	59	325.7
2003	23	22.6
2004	63	220.1
2005	41	216
2006	71	278.2
2007	55	261

Year	Number of Fires	Number of Acres Burned
2008	44	554
2009	53	59
2010	24	26
2011	26	45
2012	7	4
2013	18	64
2014	32	43
2015	24	169
2016	82	119

Source: North Carolina Division of Forest Resources

Extent

Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2002 to 2016. The greatest number of fires to occur in Haywood County in any year was 82 in 2016. The greatest number of acres to burn in the county in a single year occurred in 2008 when 554 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Haywood County. 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. In this case, the participating jurisdictions appear to have a similar risk to the surrounding areas. The probability assigned to Haywood County for future wildfire events is highly likely (greater than 90 percent annual probability).

Vulnerability Assessment

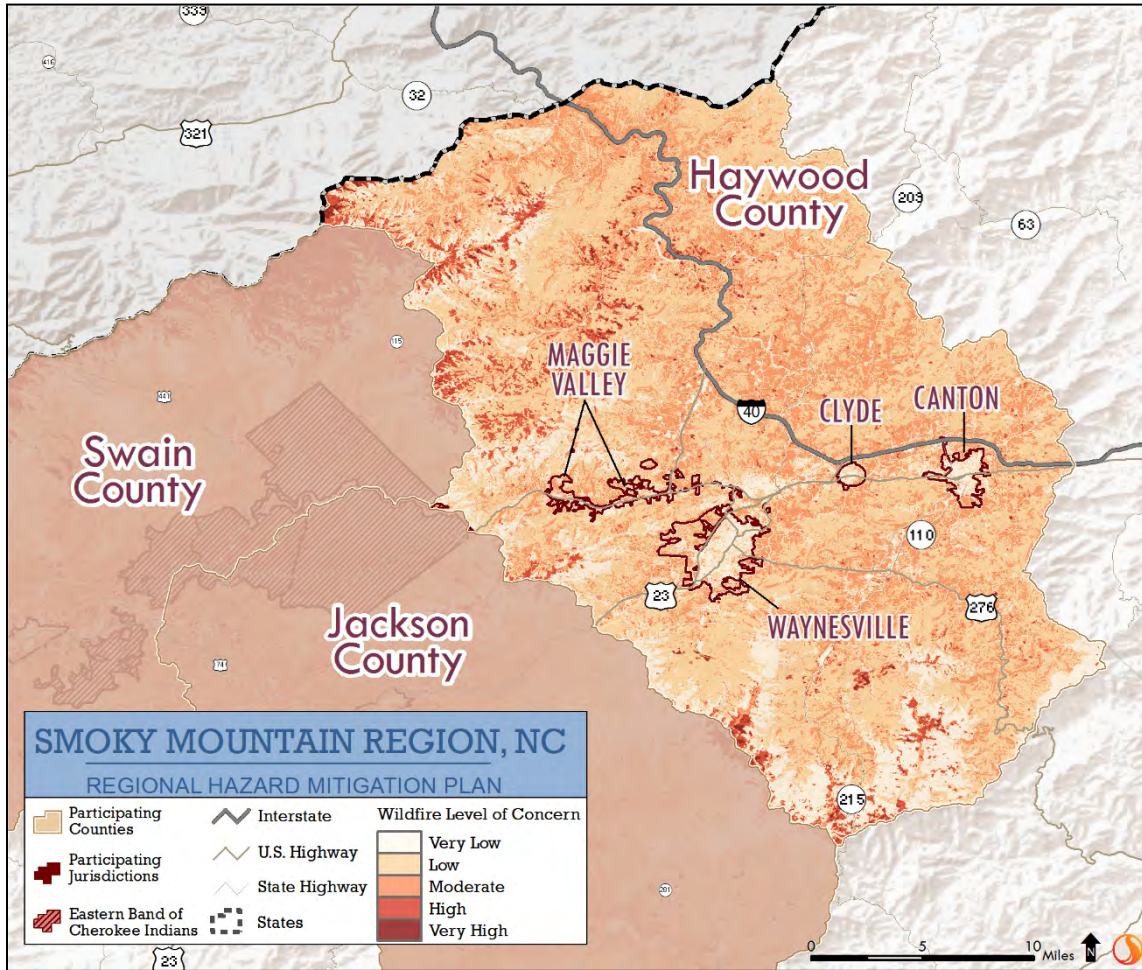
Although historical evidence indicates that Haywood County is susceptible to wildfire events, there are few reports of damage. However, it should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non- specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

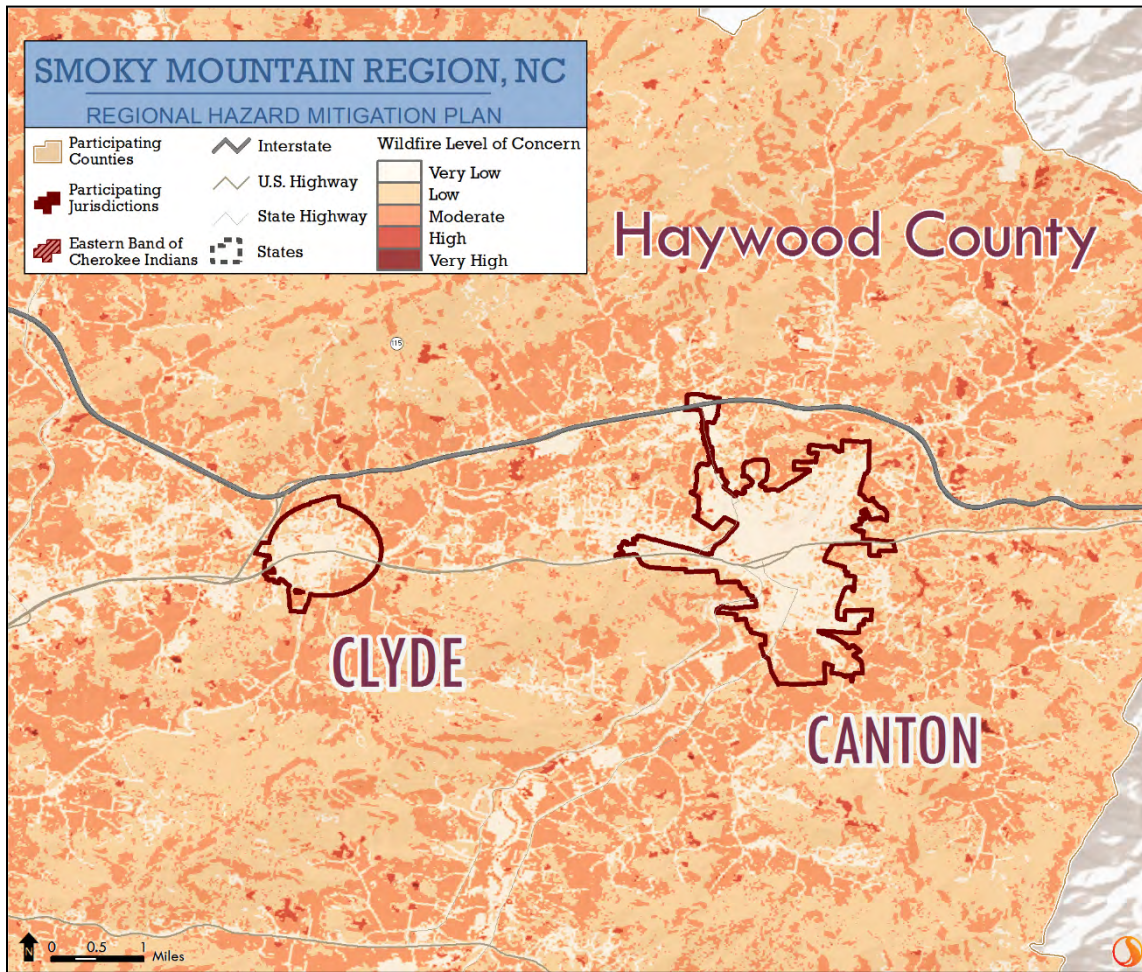
Figure C.15, Figure C.16, and Figure C.17 show the wildfire risk areas for Haywood County and participating jurisdictions. Initially provided as raster data, it was converted to a polygon for analysis. With nine percent of parcels and improved parcels in areas of high to very high wildfire risk, Haywood County has the lowest wildfire risk when compared to the other counties in the region, as detailed in **Table C.46**. However, there is considerable risk overall when viewed outside of just high risk areas.

FIGURE C.15: WILDFIRE RISK AREAS IN HAYWOOD COUNTY



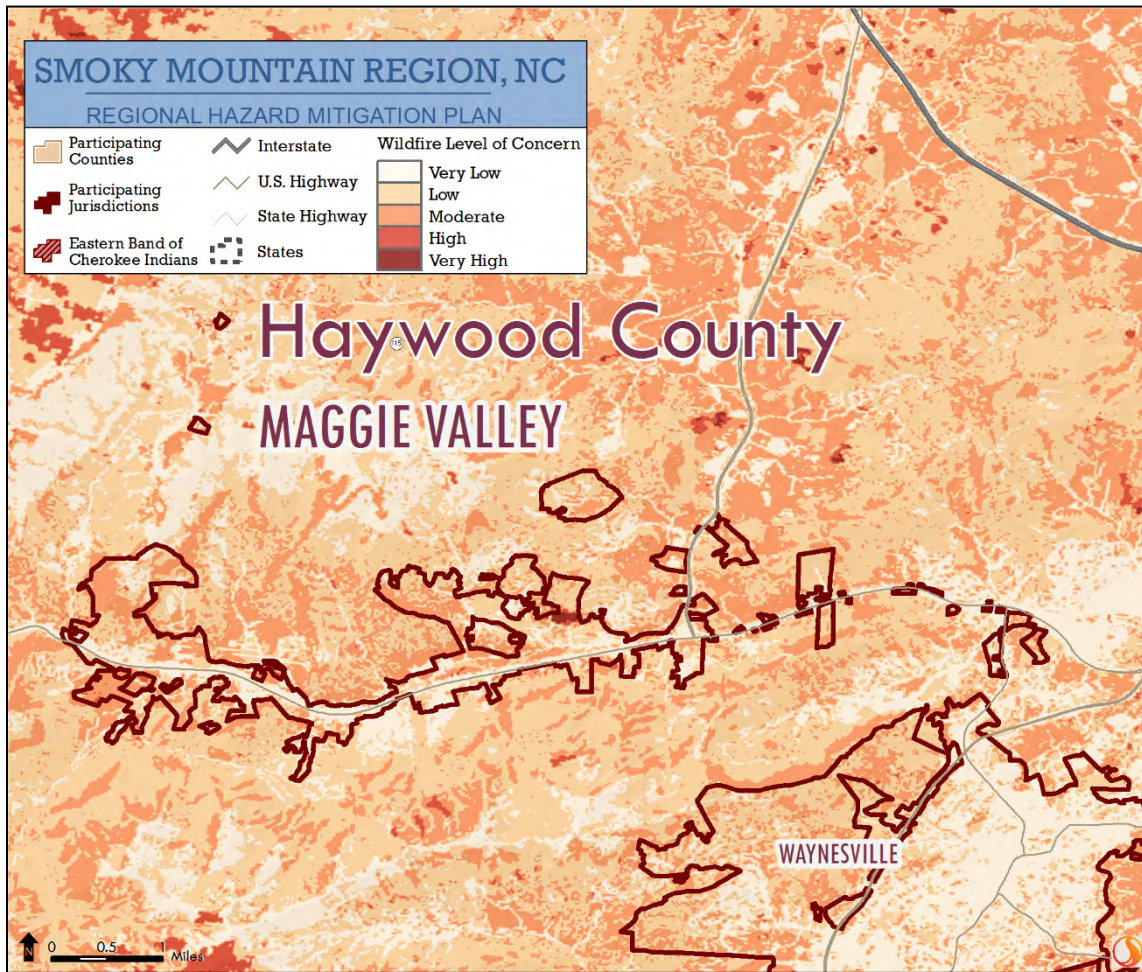
Source: Southern Wildfire Risk Assessment Data

FIGURE C.16: WILDFIRE RISK AREAS IN CANTON AND CLYDE



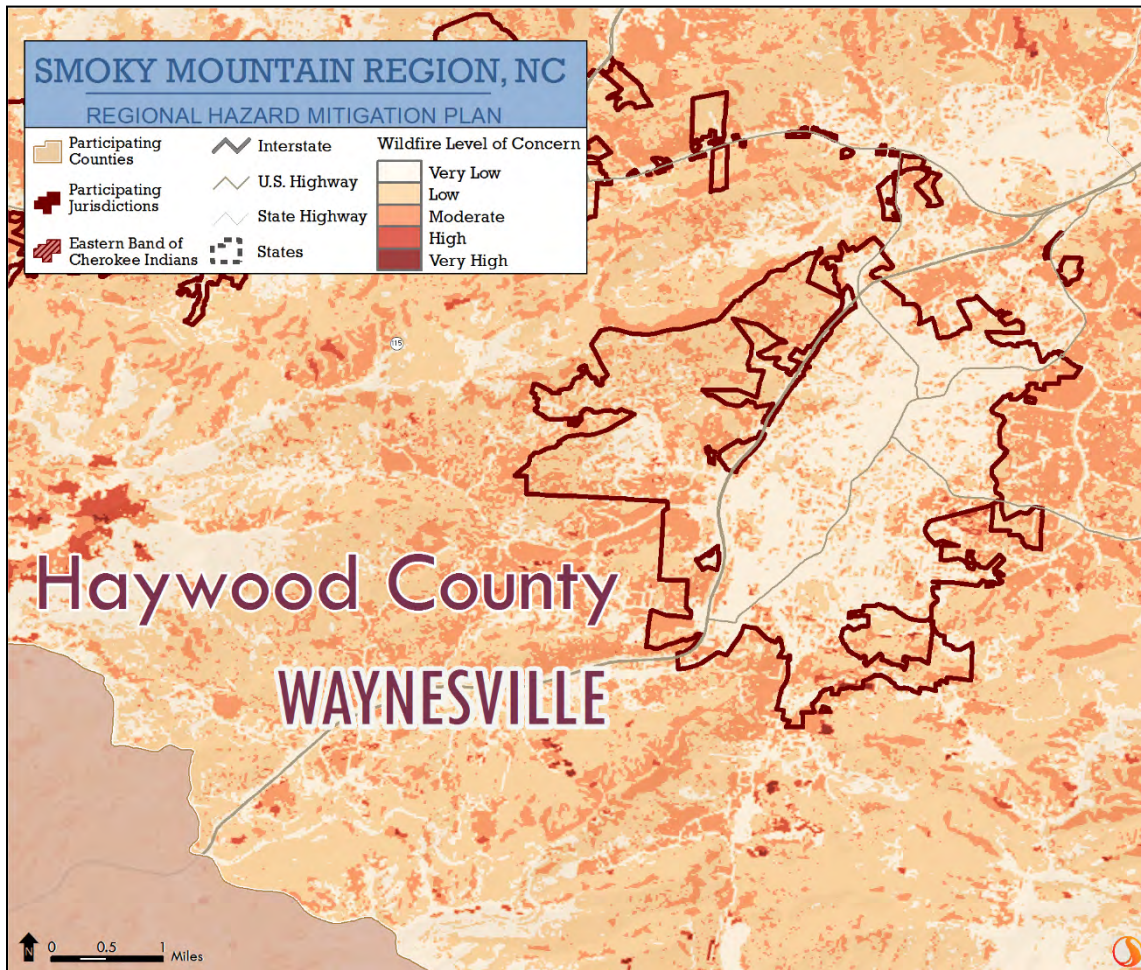
Source: Southern Wildfire Risk Assessment Data

FIGURE C.17: WILDFIRE RISK AREAS IN MAGGIE VALLEY



Source: Southern Wildfire Risk Assessment Data

FIGURE C.18: WILDFIRE RISK AREAS IN WAYNESVILLE



Source: Southern Wildfire Risk Assessment Data

Looking at jurisdictional level, unincorporated areas of the county face the highest level of wildfire risk. While the jurisdictions report a fairly low number of parcels and improvements in high or very high risk areas, each should be mindful that they are on the urban-wildland boundary and fire may quickly spread to those lower areas of concern. In general, densely developed areas that are not in the wildland urban interface, which are present in some jurisdictional areas, are at a lower risk to wildfire.

TABLE C.46: VULNERABILITY OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Haywood County	4,441	9%	2,774	9%	\$701,320,400	15%
Canton	88	4%	66	3%	\$55,966,900	22%
Clyde	12	2%	8	2%	\$5,154,900	9%
Maggie Valley	172	7%	133	8%	\$36,383,500	14%
Waynesville	180	3%	138	3%	\$78,964,600	9%

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Unincorporated Area	3,989	10%	2,429	11%	\$524,850,500	16%

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. 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

The critical facility analysis revealed that there are two critical facilities, both schools, located in high to very high wildfire risk areas of concern in Haywood County. These schools are the Junaluska Elementary School and Riverbend Elementary School. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table C.49** at the end of this section.

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in Haywood County. Wildfires present significant risk to the county and jurisdictions within. These wildfires impact the economy by potentially causing widespread destruction of homes and critical facilities and interrupting businesses.

C.2.17 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Haywood County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table C.47 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE C.47: SUMMARY OF PRI RESULTS FOR HAYWOOD COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Highly Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.6
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	2.5
Thunderstorm/ High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 6 hours	3.4
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.0
Landslide	Highly Likely	Critical	Small	Less than 6 hours	Less than 6 hours	3.0
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Likely	Minor	Small	More than 24 hours	More than 1 week	2.1
Flood	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3.0
Other Hazards						
Hazardous Materials Incident	Likely	Limited	Small	Less than 6 hours	Less than 24 hours	2.5
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

C.2.18 Conclusions on Hazard Risk

The conclusions drawn from the hazard profiling process for Haywood County, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table C.48**). 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 Haywood County. As noted

above, risk does vary for certain hazards based on jurisdiction. (For example, there is an elevated hazardous materials incident risk compared to the rest of the region and the jurisdictions in the county appear to have had more frequent wildfires in than the unincorporated areas of the county.) A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section C.4. 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.

TABLE C.48: CONCLUSIONS ON HAZARD RISK FOR HAYWOOD COUNTY

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire Hazardous Materials Incident
MODERATE RISK	Tornado Hurricane and Coastal Storm Landslide Drought Hailstorm
LOW RISK	Earthquake Lightning Dam and Levee Failure Erosion

Conclusions on Hazard Vulnerability

The results of this vulnerability assessment are useful in at least three ways:

- ◆ Informed decision-making based on improved understanding of risk.
- ◆ Baseline measure on which to reduce risk.
- ◆ Relative comparison of risk among the natural hazards addressed to prioritize greatest needs.

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 atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table C.49** 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”).

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TABLE C.49: AT-RISK CRITICAL FACILITIES IN HAYWOOD COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
HAYWOOD COUNTY																				
Haywood Senior Resource Center	Community Center	X	X	X	X	X	X	X	X		X						X		X	
Blue Ridge Paper Products Emergency Response	Fire Station	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	
Blue Ridge Paper Products Emergency Response - Waynesville Facility	Fire Station	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Canton Fire Department	Fire Station	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
Center Pigeon Fire Department	Fire Station	X	X	X	X	X	X	X	X		X						X			
Clyde Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X		X			X	X	X	X	
Crabtree-Iron Duff Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Cruso Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Fines Creek Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X						X			
Jonathan Creek Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X	X	X			X	X			
Junaluska Community Volunteer Fire	Fire Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Lake Logan-Cecil Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X					X	X			
Maggie Valley Volunteer Fire Department	Fire Station	X	X	X	X	X	X	X	X		X					X	X			

ANNEX C: HAYWOOD COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
North Canton United Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X		X	
Saunook Volunteer Fire Department Incorporated	Fire Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Waynesville Fire Department Station 1 - Headquarters	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X		X	
Waynesville Fire Department Station 2	Fire Station	X	X	X	X	X	X	X	X		X	X	X		X		X	X	X	
County Offices 1	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
County Offices 2	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Government Office	Government Office	X	X	X	X	X	X	X	X		X						X		X	
Haywood County Health and Human Services Department	Government Office	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood County Historic Courthouse	Government Office	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Maggie Valley Town Hall	Government Office	X	X	X	X	X	X	X	X		X					X	X			
Town of Waynesville Public Services Department	Government Office	X	X	X	X	X	X	X	X		X				X	X	X		X	
Waynesville Town Hall	Government Office	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
DLP Haywood Regional Health and Fitness Center	Health Center	X	X	X	X	X	X	X	X		X		X		X		X	X	X	
DLP Haywood Regional Medical Center	Medical Center	X	X	X	X	X	X	X	X		X					X	X	X	X	
Canton Police Department / Town of Canton Municipal Building	Police Station	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	

ANNEX C: HAYWOOD COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Clyde Police Department / Town of Clyde Municipal Building	Police Station	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood County Sheriff's Department	Police Station	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Maggie Valley Police Department	Police Station	X	X	X	X	X	X	X	X		X					X	X			
Waynesville Police Department and Town Offices	Police Station	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Bethel Elementary School	School	X	X	X	X	X	X	X	X		X					X	X			
Bethel Middle School	School	X	X	X	X	X	X	X	X		X					X	X			
Canton Middle School	School	X	X	X	X	X	X	X	X		X				X	X	X		X	
Central Haywood High School	School	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X	
Clyde Elementary School	School	X	X	X	X	X	X	X	X		X					X	X	X	X	
Haywood Community College	School	X	X	X	X	X	X	X	X		X					X	X		X	
Haywood Early College	School	X	X	X	X	X	X	X	X		X					X	X		X	
Hazelwood Elementary School	School	X	X	X	X	X	X	X	X		X					X	X		X	
Jonathan Valley Elementary School	School	X	X	X	X	X	X	X	X		X					X	X			
Junaluska Elementary School	School	X	X	X	X	X	X	X	X		X					X	X		X	X
Meadowbrook Elementary School	School	X	X	X	X	X	X	X	X		X						X		X	
North Canton Elementary School	School	X	X	X	X	X	X	X	X		X				X		X		X	
Pisgah High School	School	X	X	X	X	X	X	X	X		X				X	X	X		X	

ANNEX C: HAYWOOD COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Regional High Technology Center	School	X	X	X	X	X	X	X	X		X				X	X	X	X		
Riverbend Elementary School	School	X	X	X	X	X	X	X	X		X				X	X			X	
Tuscola High School	School	X	X	X	X	X	X	X	X		X				X	X		X		
Waynesville Middle School	School	X	X	X	X	X	X	X	X		X			X		X	X	X		

C.3 HAYWOOD COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of Haywood County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

C.3.1 Planning and Regulatory Capability

Table C.50 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Cherokee County. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE C.50: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	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
	Haywood County	✓			✓				✓				✓			✓		✓			✓	✓	✓
Canton	✓												✓		✓	✓	✓			✓	✓	✓	
Clyde	✓	✓			✓										✓	✓	✓			✓	✓	✓	
Maggie Valley	✓	✓													✓	✓	✓			✓	✓	✓	
Waynesville	✓	✓												✓	✓	✓	✓			✓	✓	✓	

A more detailed discussion on the county’s planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan

Haywood County has previously adopted a hazard mitigation plan. The Towns of Canton, Clyde, Maggie Valley, and Waynesville were also included in this plan.

Emergency Operations Plan

Haywood County maintains an emergency operations plan through its Emergency Management Department. The plan is designed to address plans of action for multiple hazards that may threaten a jurisdiction with the county, including the Towns of Canton, Clyde, Maggie Valley, and Waynesville.

General Planning

Comprehensive Land Use Plan

Although Haywood County does not have a comprehensive land use plan in place, Maggie Valley and Clyde have adopted a town land use plan and Waynesville has adopted a town land development plan.

Capital Improvements Plan

The Haywood County manager is responsible for development of the county's capital improvement program.

Economic Development Plan

The Town of Canton has adopted an Economic Development Plan.

Historic Preservation Plan

The Town of Waynesville has adopted a historic preservation plan (Waynesville Design Review Guidelines).

Zoning Ordinance

Haywood County does not have a zoning ordinance in place, but all four of the jurisdictions (Canton, Clyde, Waynesville, and Maggie Valley), have adopted zoning ordinances that are administered by the Town Planning Department or Town Administrator.

Subdivision Ordinance

Haywood County has a subdivision ordinance that was adopted by the Board of County Commissioners and applies to all areas of unincorporated Haywood County. One of the stated purposes is to ensure that land is subdivided in a manner "that shall be of such character that it can be used safely without danger to health or peril from fire, flood, erosion, air and/or water pollution." All of the participating jurisdictions in Haywood County have also adopted subdivision ordinances.

Building Codes, Permitting, and Inspections

North Carolina has a state compulsory building code which applies throughout the state. The building code is enforced throughout the county by the county building inspector. All of the participating jurisdictions have adopted a building code and the Towns of Canton and Waynesville have their own inspections departments that enforce the building code within their town limits.

Floodplain Management

Table C.51 provides NFIP policy and claim information for each participating jurisdiction in Haywood County.

TABLE C.51: 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
Haywood County	7/15/84	4/3/12	234	\$52,686,400	49	\$975,551
Canton	2/2/77	4/3/12	37	\$10,368,100	50	\$3,033,702
Clyde	12/1/83	4/3/12	63	\$10,343,900	127	\$3,842,008
Maggie Valley	4/17/84	4/3/12	41	\$13,348,200	4	\$23,642
Waynesville	1/6/83	4/3/12	333	\$52,266,500	14	\$117,734

(M) – No Elevation Determined, all Zone A, C and X

(S) – Suspended Community

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Haywood County, Canton, Clyde, Maggie Valley, and Waynesville all participate in the NFIP and have adopted flood damage prevention regulations.

Stormwater Management Plan

Only the Town of Clyde has adopted a stormwater management ordinance that is overseen by the Town Administrator.

Open Space Management Plan

Haywood County has adopted a Comprehensive System-wide Parks and Recreation Master Plan.

C.3.2 Administrative and Technical Capability

Table C.52 provides a summary of the capability assessment results for Haywood County with regard to relevant staff and personnel resources. A symbol was used to indicate the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A “C” indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (since the 2017 plan).

TABLE C.52: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Haywood County	✓	✓	✓	✓	✓		✓	✓	✓	
Canton	✓	✓	✓		✓			✓		
Clyde					✓			✓		
Maggie Valley	✓		✓		✓			✓		
Waynesville	✓	✓	✓		✓			✓		

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.

C.3.3 Fiscal Capability

Table C.53 provides a summary of the results for the Smoky Mountain Region with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A "C" indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE C.53: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Haywood County	✓	✓	✓						
Canton	✓	✓	✓						
Clyde	✓	✓	✓						
Maggie Valley	✓	✓	✓						
Waynesville	✓	✓	✓						

C.3.4 Political Capability

The previous hazard mitigation plan indicates that there has been local resistance to the adoption of comprehensive zoning regulations which has hampered Haywood County’s ability to properly address hazard mitigation through development regulations. The county has chosen to focus on adopting specific regulations designed to address the problems associated with mitigating natural hazards and hopes to one day adopt a comprehensive zoning ordinance to provide a central ordinance to ensure proper enforcement of these provisions. It should be noted that all of the participating towns in Haywood County (Canton, Clyde, Maggie Valley, and Waynsville) have adopted zoning ordinances .

The Haywood County Board of Commissions has an established history of being proactive in understanding the need for natural hazard mitigation and has adopted several policies and ordinances to properly address the problem. Local residents, however, do have major reservations with respect to several possible policy initiatives, most notably zoning, that could be utilized to properly address hazard mitigation with the county.

The county will continue public outreach and education activities to inform local residents on the need for comprehensive regulations to properly abate the negative secondary effects of natural hazards.

C.4.5 Conclusions on Local Capability

The county and its jurisdictions lack a disaster recovery plan. With the results of this plan's risk assessment, Haywood County and its jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction's economic development goals.

Haywood County has adopted a Capital Improvement Plan. A capital improvement plan can be used to direct capital funds to public improvements located out of high-risk areas. Additionally, a capital improvement plan can be cross-referenced with this plan to identify public improvements located in at-risk areas and allocate funds for safeguarding those improvements.

The Town of Canton has recently developed an economic development plan, which can improve economic resiliency in the community, leading to increased fiscal capacity for mitigating hazards.

Haywood County and its participating jurisdictions benefit from having general land development plans and ordinances when compared to other counties in the region. The Towns of Clyde, Maggie Valley, and Waynesville have adopted comprehensive land use plans. All participating towns within Haywood County have adopted zoning ordinances, and Haywood County and all participating jurisdictions have adopted subdivision ordinances. These plans and ordinances can be used to guide growth and development out of high-risk areas.

It is recognized that Haywood County and the Town of Waynesville have well over 200 homes each in the NFIP. Participation in the Community Rating System could be worthwhile as having a CRS rating of 8 or better will result in significant dollars remaining in the community. However, this decision must be carefully considered and committed to at the local level given the need for program administration.

C.4 HAYWOOD COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Haywood County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Hazard Mitigation Planning Committee and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

C.4.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Haywood County developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more

mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table C.54**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE C.54: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards.
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

C.4.2 Mitigation Action Plan

The mitigation actions proposed by Haywood County, the Town of Canton, the Town of Clyde, the Town of Maggie Valley, and the Town of Waynesville are listed in the following individual Mitigation Action Plans.

Haywood County Mitigation Action Plan

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive Water Shortage Response Plan in conjunction with the existing incorporated municipalities.	Drought	High	County Emergency Management	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-2	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	County Emergency Management	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-3	Review potential new regulations designed to prevent or mitigate wildfires including requiring fire breaks within subdivisions.	Wildfire	Moderate	NC Forest Service	Unknown	Local; State	2022-2030	Pending agency involvement and funding sources
P-4	Development of monitoring program to assess daily wildfire risk.	Wildfire	Low	NC Forest Service	Unknown	Local; State	2022-2030	Pending agency involvement and funding sources
P-5	Complete a comprehensive review of existing regulations to determine where changes need to be made to increase flood hazards mitigation.	Flood	High	County Planning	Unknown	Local	Completed	Completed. New flood damage prevention ordinance.
P-6	Review possibility of revising existing Flood Damage Prevention Ordinance policies concerning substantial improvement.	Flood	Low	County Planning	Unknown	State	2022-2030	Priority changed from high to low. There was no political will to complete this action over the last five years.
P-7	Purchase and make use of ArcView GIS mapping format.	Flood	Moderate	County IT	Unknown	Local	Completed	Completed. Using ArcView GIS with FTE position.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-8	Continue participation in NFIP and CRS System—review policy initiatives and programs to lower CRS Score.	Flood	High	County Planning	Unknown	Local; State	2022	County has maintained participation in NFIP which requires continuous action and funding. There was no political will to complete this action over the last five years.
P-9	Comprehensive review of existing emergency response plans for all natural disasters.	All	High	County Emergency Management	Unknown	Local; State	2022	Priority changed from moderate to high. There was no political will to complete this action over the last five years.
P-10	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-11	County shall review the need to require all new residential developments to include common areas, dedicated to the County, for the storage of sand and salt to be used by the County to aid in making roadways safe for vehicular traffic.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local; State	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
P-12	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	County Erosion Control	Unknown	Local; State	2022-2030	There was no political will to complete this action over the last five years.
P-13	Consider the development of a comprehensive stormwater management ordinance.	Erosion; Landslide	Moderate	County Erosion Control	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.
PP-2	Continue to review the possibility of purchasing additional property in identified flood areas to convert it to open space.	Flood	Moderate	County Planning	Unknown	Local; Federal	2022-2030	There was no political will to complete this action over the last five years.
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Work with the Army Corps of Engineers to conduct a comprehensive hydrological study of existing watersheds and water ways to determine what the recharge rate is to avoid depletion of necessary water.	Drought	Low	County Erosion Control	Unknown	Local; State; Federal	2030	There was no political will to complete this action over the last five years. Priority changed from moderate to low.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	Completed	Completed.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022-2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred . At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	Moderate	County Emergency Management; County Erosion Control	Unknown	Local; State; Federal	2030	There was no political will to complete this action over the last five years. Priority changed from high to moderate.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	NC Forest Service	Unknown	State	2022	Requires continuous action and funding.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	County Emergency Management	Unknown	Local; NC Fire Service	2030	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-4	Develop educational brochures informing local residents on techniques they can utilize to address flood hazard mitigation.	Flood	High	County Planning	Unknown	Federal	Completed	Completed.
PEA-5	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	County Emergency Management	Unknown	Local; State	2022-2030	Requires continuous action and funding. There was limited to political will to advance this action over the last five years.
PEA-6	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local	2022	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-7	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	County Emergency Management	Unknown	Local	2022	Deferred. At this time, Haywood County does not have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
PEA-8	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
PEA-9	Development of educational materials/brochures to educate the public about landslides.	Erosion; Landslide	High	County Emergency Management; County Erosion Control	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-10	Provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	New Action
PEA-11	Increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	New Action

Town of Canton Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town; County Emergency Management	Unknown	Local; Non-profits	2022-2030	Deferred until funding is available.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Low	Town; County Emergency Management; County Planning	Unknown	Local	2030	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local	Completed	Completed. A Nixle notification system is in place.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town; County Emergency Management	Unknown	Local	2022-2030	There was limited funding political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred. At this time, neither Haywood County nor the Town of Canton have the time, staff or money to implement this action. It will be revisited at the next 5 year update.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	Town Fire Department; NC Fire Service	Unknown	State	2022-2030	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	Town; County	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	Town	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Canton	Unknown	Local; State; Federal	2022-2030	New Action

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Canton	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years. Requires continuous action and funding.

Town of Clyde Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town; County Emergency Management	Unknown	Local; Non-profits	2022-2030	There was no political will to complete this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	Town; County Emergency Management; County Planning	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local	Completed	Completed. 2009.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	High	County Emergency Management; County Planning	Unknown	Local; NCDOT	2022-2030	Deferred. Requires continuous action, coordination, political will and funding.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	Town; County	Unknown	Local	2022-2030	Deferred. Requires continuous action, coordination, political will and funding.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	Town; County	Unknown	Local	Completed	Completed. 2008.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	Town; County	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	Town; County	Unknown	Local	Completed	Completed. 2008.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	Town; County Emergency Management	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	Town	Unknown	Local	Completed	Completed. 2008.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	Town; County Emergency Management	Unknown	Local	Completed	Completed. 2008.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	Town; County Emergency Management	Unknown	Local	Completed	Completed. 2008
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Clyde	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Clyde	Unknown	Local; State; Federal	2022-2030	New Action

Town of Maggie Valley Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town Sanitary District	Unknown	Local; USACE	2022-2030	There was no political will to complete this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	County Emergency Management; Town Police Department; Town Public Works	Unknown	Local	2022-2030	There was no political will to complete this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	High	County Erosion Control; Town Planning	Unknown	Local	2017	In progress. Town is in process of adopting County Erosion and Sediment Control Ordinance and Slope Ordinance.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	Town; County Emergency Management	Unknown	Local	2022	There was no political will to complete this action over the last five years.
PP-2	Protect water treatment plant from flooding.	Flood	High	Town Planning; Town Public Works	Unknown	Local	2022	New action. Currently constructing a FEMA-approved levee to protect wastewater treatment plant.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local; State; Federal	2022-2030	There was no political will to complete this action over the last five years.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	County Emergency Management; County Planning	Unknown	Local; State; Federal	2022	There was no political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide		County Emergency Management; Town Planning	Unknown	Local; NCDOT	2022-2030	Requires continuous action, coordination, political will and funding. There was limited political will to advance this action over the last five years.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	County Emergency Management	Unknown	Local	2022-2030	There was limited political will to advance this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	County Emergency Management	Unknown	Local; NC Fire Service	2022-2030	There was limited political will to advance this action over the last five years.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	County Emergency Management	Unknown	Local; NC Fire Service	2022	There was limited political will to advance this action over the last five years.
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	County Emergency Management	Unknown	Local; SHMO	2022	There was limited political will to advance this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	County Emergency Management; County Planning	Unknown	Local	2022-2030	There was limited political will to advance this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	County Emergency Management	Unknown	Local	2022	There was limited political will to advance this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	County Emergency Management	Unknown	Local	2022	There was limited political will to advance this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	County Emergency Management	Unknown	Local; SHMO	2022	There was limited political will to advance this action over the last five years.
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Maggie Valley	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Maggie Valley	Unknown	Local; State; Federal	2022-2030	New Action

Town of Waynesville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Development of a comprehensive study of use data to determine patterns of peak and off-peak water usage.	Drought	Moderate	Town Public Works	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-2	Comprehensive review of existing emergency response plans to continuously update and revise response plans.	Severe Winter Storm	Moderate	Town Police; Town Fire; Town Public Works	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-3	Continue to review development of winter storm tracking program.	Severe Winter Storm	Moderate	Town Police; Town Fire	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
P-4	Continue to review and revise soil erosion and sedimentation control ordinance.	Erosion; Landslide	Moderate	Town Planning	Unknown	Local budget	2022-2030	There was limited political will to advance this action over the last five years.
Property Protection								
PP-1	Work with local business community to develop plan to protect local infrastructure during an earthquake.	Earthquake	High	County Emergency Management; Town Fire	Unknown	Local budget	2022	There was limited political will to complete this action over the last five years.
PP-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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Develop emergency notification system in coordination with existing natural hazard emergency notification systems.	Earthquake	Moderate	County Emergency Management	Unknown	Local budget	Completed	Completed.
ES-2	Develop public emergency action plans to address flood events including identifying areas where sandbags could be placed to address flood events.	Flood	High	Town Public Works	Unknown	Local budget	2022	There was limited political will to complete this action over the last five years.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Continue coordination of efforts with NCDOT and local municipalities to erect landslide barriers along roadways identified in high risk landslide areas.	Erosion; Landslide	Moderate	NCDOT	Unknown	NCDOT	Completed	Completed.
Public Education and Awareness								
PEA-1	Development of educational materials/brochures to educate local residents on earthquake preparedness.	Earthquake	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-2	Development of educational materials/brochures to educate local residents on wildfire prevention.	Wildfire	High	All Town Departments	Unknown	Local; NC Fire Service	2022	There was limited political will to complete this action over the last five years.
PEA-3	County shall develop an educational brochure outlining the dangers of hail and outlining what steps, if any, individuals can take to mitigate the effects of a hailstorm.	Hail	Moderate	All Town Departments	Unknown	Local; NC Fire Service	2022-2030	There was limited political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to offset problems created during winter storm events.	Severe Winter Storm	High	All Town Departments	Unknown	Local; SHMO	2022	There was limited political will to complete this action over the last five years.
PEA-5	Review of need to require hazard disclosure for areas in the County that are susceptible to service disruption during a winter storm event.	Severe Winter Storm	Moderate	All Town Departments	Unknown	Local	2022-2030	There was limited political will to complete this action over the last five years.
PEA-6	Development of education materials/brochures to educate local residents on flood hazards produced by thunderstorm events.	Thunderstorm	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-7	Development of educational materials/brochures to educate local residents on dangers of tornadoes.	Tornado	High	All Town Departments	Unknown	Local	2022	There was limited political will to complete this action over the last five years.
PEA-8	Development of educational materials/brochures to educate local residents on preventative steps that can be taken to prevent landslides.	Erosion; Landslide	High	All Town Departments	Unknown	Local; SHMO	2022	There was limited political will to complete this action over the last five years.
PEA-9	Coordinate with Haywood County to provide hazard mitigation information to citizens via website and/or social networking sites.	All	Moderate	County Emergency Management, Town of Waynesville	Unknown	Local; State; Federal	2022-2030	New Action
PEA-10	Coordinate with Haywood County to increase public awareness about the hazards identified in this plan and the mitigation techniques that can be used to reduce the impacts of the hazards.	All	Moderate	County Emergency Management, Town of Waynesville	Unknown	Local; State; Federal	2022-2030	New Action

Annex D

Jackson County

This annex includes jurisdiction-specific information for Jackson County and its participating municipalities. It consists of the following five subsections:

- ◆ D.1 Jackson County Community Profile
 - ◆ D.2 Jackson County Risk Assessment
 - ◆ D.3 Jackson County Capability Assessment
 - ◆ D.4 Jackson County Mitigation Strategy
-

D.1 JACKSON COUNTY COMMUNITY PROFILE

D.1.1 Geography and the Environment

Jackson County is located in the midst of the Great Smoky Mountains in Western North Carolina. The county has four incorporated communities; the Town of Dillsboro, the Village of Forest Hills, the Town of Sylva, and the Town of Webster; and several well-defined unincorporated communities with post offices; such as Cashiers, Glenville, Tuckaseegee, Cullowhee, Balsam, and Whittier.

The county is defined by lofty vistas and fast-flowing water provided by some 185 named summits and approximately 250 named rivers and creeks. Notable geographic features include the Richland Balsam (the county's highest peak at 6,410 feet), Whitewater Falls (the second highest cascade east of the Rocky Mountains), Whiteside Mountain (the highest vertical cliffs in the Eastern United States), and Panthertown Valley (known as the "Yosemite of the East"). The county also includes a significant amount of US National Forest land and a portion of the Eastern Band of Cherokee Indian lands. The total area of the county is 495 square miles, of which 4 square miles is water area.

In winter, the average temperature in Jackson County is 39°F with an average daily low of 27°F. In summer, the average temperature is 71°F with the average daily high of 83°F. Due to its mountainous location, temperature can vary by 10-20°F across the county. The county's average total annual precipitation is about 51 inches and the average seasonal snowfall is 12 inches.

D.1.2 Population and Demographics

According to the U.S. Census 2015 American Community Survey 5-year Population Estimate , Jackson County has a population of 40,812 people. The county has seen approximately 1.3% growth between 2010 and 2015, and the population density is 83 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the county and participating jurisdictions are presented in **Table D.1**.

TABLE D.1: POPULATION COUNTS FOR JACKSON COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
JACKSON COUNTY	26,846	33,121	40,271	40,812	1.3%
Town of Dillsboro	95	205	232	295	27.2%
Village of Forest Hills	--	330	365	405	11.0%
Town of Sylva	1,809	2,435	2,588	2,597	0.3%
Town of Webster	410	486	363	409	12.7%

Source: US Census Bureau

Based on the 2015 American Community Survey , the median age of residents of Jackson County is 36.8 years. The racial characteristics of the county are presented in **Table D.2**. Whites make up the majority of the population in the county, accounting for over 83 percent of the population; however there is a sizable American Indian population, totaling almost 9 percent.

TABLE D.2: DEMOGRAPHICS OF JACKSON COUNTY

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
JACKSON COUNTY	83.3%	3.1%	8.8%	4.8%	5.3%
Town of Dillsboro	96.6%	2.0%	1.0%	0.4%	3.1%
Village of Forest Hills	97.5%	0.0%	0.0%	2.5%	0.7%
Town of Sylva	83.4%	5.0%	3.7%	7.9%	5.0%
Town of Webster	93.6%	1.2%	3.2%	2.0%	0.2%

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

Source: US Census Bureau

D.1.3 Housing

According to the 2015 American Community Survey , there are 26,322 housing units in Jackson County, the majority of which are single family homes or mobile homes. Housing information for the county and four towns is presented in **Table D.3**. As shown in the table, the county has a significantly higher percentage of seasonal housing units compared to the incorporated towns.

TABLE D.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
JACKSON COUNTY	19,291	25,948	26,322	26.4%	\$171,900
Town of Dillsboro	126	140	158	10.0%	\$220,000
Village of Forest Hills	182	226	205	4.9%	\$280,400
Town of Sylva	1,283	1,338	1,271	3.0%	\$141,100
Town of Webster	227	175	199	5.1%	\$235,200

Source: US Census Bureau

D.1.4 Infrastructure

Transportation

Jackson County is serviced by three main roads. The first, the Great Smoky Mountain Expressway, runs across the northern half of the county and connects Sylva to Waynesville and Asheville in the east and to Cherokee, Andrews, and Murphy in the west. NC 64 also traverses from east to west but across the southern portion of the county, connecting Cashiers to Brevard in the east and to Highlands in the west. The third road, NC 107, runs from north to south across the county, connecting Sylva to Cashiers.

There is one small airfield, Jackson County Airport, located in the county. This airport is a public airport that is owned and operated by the county.

Norfolk Southern Railway operates a portion of the Murphy Branch through Jackson County, providing a rail connection with the rest of the country. In Sylva, Norfolk Southern connects with the Great Smoky Mountains Railroad. Great Smoky Mountains Railroad operates the rest of the Murphy Branch from Dillsboro to Andrews.

Utilities

Electrical power in Jackson County is provided by Duke Energy Progress. Water and sewer service is provided to residents by the county as well as Dillsboro, Sylva, and Webster.

Community Facilities

There are a number of buildings and community facilities located throughout Jackson County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 17 fire stations, 4 police stations, 1 medical care facility, and 9 public schools located within the county.

There is one hospital located in Jackson County. The Harris Regional Hospital is an 86-bed short term acute center located in the Town of Sylva.

D.1.5 Land Use

Jackson County features a balance of forests and vibrant downtowns. However, there has been increased ridge top development and increased development pressure on sensitive land and resources. In 2007, the County Commissioners passed the county's first comprehensive land use plan despite protests from residents and real estate developers. This will help the county direct and shape growth that will protect the environment and maintain the county's rural character.

D.1.6 Employment and Industry

The North Carolina Employment Security Commission reported an annual average employment of 12,915 workers in Jackson County for 2015. In 2015, the top employment industry was Education and Health Services, making up 34.4 percent of total employment. Other major industries were Leisure and Hospitality (20.0%); Trade, Transportation, and Utilities (16.0%); and Public Administration (10.1%). In 2015, the County's annual median income was \$31,826 compared to \$32,510 for the state of North Carolina.

D.2 JACKSON COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Jackson County. Each hazard profile includes a description of the hazard’s location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of Jackson County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

D.2.1 Asset Inventory

Table D.4 lists the number of parcels, total number of parcels with improvements, and the total assessed value of improvements for Jackson County and its participating jurisdictions (study area of vulnerability assessment).¹

TABLE D.4: IMPROVED PROPERTY IN JACKSON COUNTY

Location	Number of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Dillsboro	167	122	\$23,103,930
Forest Hills	216	132	\$20,556,040
Sylva	1,491	1,143	\$230,088,520
Webster	244	170	\$60,049,220
Unincorporated Area	37,203	20,038	\$5,025,309,860
EBC15	6	4	\$2,478,510
JACKSON COUNTY TOTAL²	39,327	21,609	\$5,361,586,080

Table D.5 lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, and schools and other critical facilities located in Jackson County. Critical facility data was obtained from the county and municipal leads. In addition, **Figure D.1** shows the locations of essential facilities in Jackson County. **Table D.48**, near 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 county.

TABLE D.5: CRITICAL FACILITY INVENTORY IN JACKSON COUNTY

Location	Fire Stations	Police Stations	Medical Care Facilities	EOC	Schools	Other
Dillsboro	0	0	0	0	0	0

¹ 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.

² Number of buildings for the county is based on the number of parcels with an improved building value greater than zero.

Location	Fire Stations	Police Stations	Medical Care Facilities	EOC	Schools	Other
Forest Hills	0	0	0	0	0	0
Sylva	1	1	0	1	0	6
Webster	1	0	2	0	1	0
Unincorporated Area	15	2	0	6	8	4
JACKSON COUNTY TOTAL	7	2	1	0	10	0

Source: County GIS

D.2.2 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 Jackson County that are potentially at risk to these hazards.

Table D.6 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in Jackson County according to Census data is 40,182 persons. Additional population estimates are presented above in Section D.1.

TABLE D.6: TOTAL POPULATION IN JACKSON COUNTY

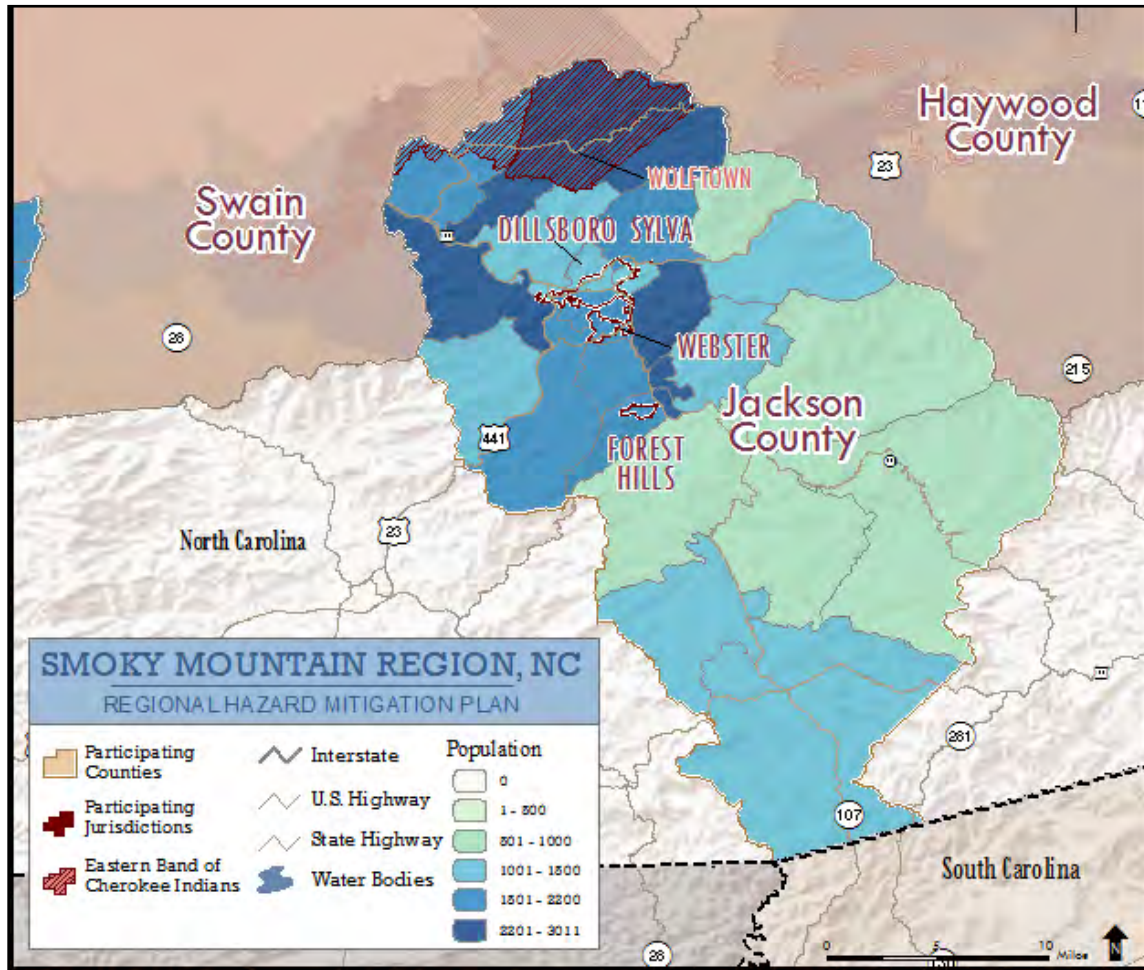
Location	Total 2010 Population
Dillsboro	295
Forest Hills	405
Sylva	2,597
Webster	409
Unincorporated Area	37,106
JACKSON COUNTY TOTAL	40,812

Source: U.S. Census 2015 American Community Survey

In addition, **Figure D.1** illustrates the population density by census tract as it was reported by the U.S. Census Bureau in the 2015 American Community Survey.³

³ Population by census block was not available at the time this plan was completed.

FIGURE D.1: POPULATION DENSITY IN JACKSON COUNTY



Source: U.S. Census Bureau, 2015 American Community Survey

HAZARD PROFILES

D.2.3 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Jackson County 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 county would be uniformly exposed to drought, making the spatial extent potentially widespread.

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Jackson County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

According to the North Carolina Drought Monitor, Jackson County has had drought occurrences sixteen of the last seventeen years (2000-2016). **Table D.7** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE D. 7: HISTORICAL DROUGHT OCCURRENCES IN JACKSON COUNTY

Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
Jackson County				
				EXCEPTIONAL
				EXTREME
				EXCEPTIONAL
				NORMAL
				ABNORMAL
				ABNORMAL
				SEVERE
				EXCEPTIONAL
				EXCEPTIONAL
				EXTREME
				MODERATE
				SEVERE
				MODERATE
				ABNORMAL
				ABNORMAL
				SEVERE
				EXCEPTIONAL

Source: North Carolina Drought Monitor

Extent

The most severe drought condition is Exceptional. Jackson County has received this ranking five times over the sixteen-year reporting period.

Probability of Future Occurrences

According to the North Carolina Drought Monitor’s historical data, sixteen of the last seventeen years has resulted in drought in Jackson County, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered “highly likely” (greater than 90% annual probability). This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices

- Increased wildfires
- Loss of incomes
- Loss of hydroelectric power
- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

D.2.4 Hailstorm

Location

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

Historical Occurrences

According to the National Centers for Environmental Information’s (NCEI) Storm Events Database, 57 recorded hailstorm events affected Jackson County from 1970 to 2016.⁴ **Table D.8** is a summary of the hail events in Jackson County. **Table D.9** provides detailed information about each event that occurred in the county. In all, hail occurrences resulted in over \$1,811,068 (2017 dollars) in property damages, all of which were reported in a 1996 event in Sylva. 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. Therefore, it is likely that damages are greater than the reported value.

TABLE D.8: SUMMARY OF HAIL OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017)
Dillsboro	1	\$0
Forest Hills	0	\$0
Sylva	11	\$1,811,068
Webster	2	\$0
Unincorporated Area	43	\$0

⁴ These hail events are only inclusive of those reported by the National Centers for Environmental Information’s (NCEI) Storm Events Database. It is likely that additional hail events have affected Cherokee County. 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.

Location	Number of Occurrences	Property Damage (2017)
JACKSON COUNTY TOTAL	57	\$1,811,068

Source: National Centers for Environmental Information

TABLE D.9: HISTORICAL HAIL OCCURRENCES IN JACKSON COUNTY

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Jackson County	6/7/1985	1.00	0/0	\$0
Jackson County	3/15/1989	0.75	0/0	\$0
Cashiers	3/31/1993	1.75	0/0	\$0
Sylva	4/15/1993	1.00	0/0	\$0
Sylva	8/25/1993	0.75	0/0	\$0
Jackson County	5/18/1995	1.75	0/0	\$0
Sylva	5/24/1996	1.50	0/0	\$0
Cullowhee	5/24/1996	0.75	0/0	\$0
Savannah	5/24/1996	1.75	0/0	\$0
Sylva	5/24/1996	1.75	0/0	\$1,811,068
Cullowhee	5/26/1996	1.50	0/0	\$0
Balsam	4/16/1998	1.00	0/0	\$0
Sylva	5/27/1998	1.00	0/0	\$0
Cullowhee	5/6/1999	0.75	0/0	\$0
Sylva	12/16/2000	0.88	0/0	\$0
Balsam	6/4/2002	1.00	0/0	\$0
Glenville	7/1/2002	0.75	0/0	\$0
Sylva	4/30/2003	0.75	0/0	\$0
Sylva	8/26/2003	0.75	0/0	\$0
Tuckasegee	5/8/2004	1.75	0/0	\$0
Cullowhee	5/8/2004	1.00	0/0	\$0
Cashiers	3/27/2005	0.88	0/0	\$0
Sylva	4/12/2005	0.88	0/0	\$0
Cullowhee	6/20/2005	0.75	0/0	\$0
Wolf Mountain	4/3/2006	1.00	0/0	\$0
Sylva	4/8/2006	0.75	0/0	\$0
Cullowhee	4/19/2006	1.00	0/0	\$0
Cullowhee	4/19/2006	1.75	0/0	\$0
Cashiers	4/20/2006	0.75	0/0	\$0
Wolf Mountain	5/20/2006	1.00	0/0	\$0
Sylva	5/30/2006	0.75	0/0	\$0
Cullowhee	6/12/2007	0.75	0/0	\$0
Cashiers	6/22/2008	0.75	0/0	\$0
Cashiers	6/22/2008	0.75	0/0	\$0

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Cashiers	7/21/2008	0.75	0/0	\$0
Wilmot	5/8/2009	0.75	0/0	\$0
Dicks Creek	5/8/2009	1.00	0/0	\$0
Balsam	5/8/2009	1.50	0/0	\$0
Dillsboro	5/16/2009	0.75	0/0	\$0
Big Ridge	6/2/2009	0.88	0/0	\$0
Balsam	5/11/2011	0.88	0/0	\$0
Wolf Mountain	6/1/2011	1.25	0/0	\$0
Cullowhee	6/6/2011	1.00	0/0	\$0
Pumpkintown	6/6/2011	0.88	0/0	\$0
Cullowhee	6/8/2011	0.75	0/0	\$0
Webster	6/8/2011	1.00	0/0	\$0
Rock Bridge	6/9/2011	1.00	0/0	\$0
Glenville	3/2/2012	1.75	0/0	\$0
Tuckasegee	4/3/2012	0.75	0/0	\$0
Tuckasegee	4/3/2012	1.00	0/0	\$0
Bessie	4/26/2012	1.75	0/0	\$0
Bessie	4/26/2012	1.50	0/0	\$0
Cashiers	7/1/2012	1.00	0/0	\$0
Willits	7/5/2012	1.00	0/0	\$0
Balsam	6/19/2014	0.88	0/0	\$0
Wilmot	7/8/2016	0.88	0/0	\$0
Webster	7/8/2016	1.00	0/0	\$0

Source: National Centers for Environmental Information

Extent

Hail extent can be defined by the size of the hail stone. Hail ranged in diameter from 0.75 inches to 1.75 inches. However, larger hailstones are possible as indicated in the Torro Scale (*Section 5*).

Probability of Future Occurrences

A total of 57 events are recorded in the NCEI's Storm Events Database between 1970 and 2016, resulting in more than one hail event each year on average in Jackson County. Therefore, hail events are considered "highly likely" (greater than 90% annual chance). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Jackson County 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 county.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. Although all reported property

damage can be attributed to a single event, events for the county indicate an average of approximately \$31,773 per event. While no deaths or injuries were reported in the county due to hail, they are possible.

D.2.5 Hurricane and Tropical Storm

Location

Hurricanes 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 Jackson County. The entire county is equally susceptible to hurricane and tropical storms.

Historical Occurrences

According to the National Hurricane Center’s historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region between 1850 and 2015. This includes nine tropical storms and nineteen tropical depressions. **Table D.10** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE D.10: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

The National Centers for Environmental Information did not report any events associated with a hurricane or tropical storm in Jackson County between 1950 and 2015. Of the recorded storm events, one tropical storm and three tropical depressions have traversed directly through Jackson County. This includes the unnamed storms of 1896, 1906, 1906, and 1939.

Federal records also indicate that two disaster declarations were made in 2004 (Tropical Storm Frances) and 2004 (Hurricane Ivan) for the county.⁵

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Extent

Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Chapter 5, **Table 5.8**). The greatest classification of hurricane to traverse directly through

⁵ A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

Jackson County was a tropical depression (Unnamed 1916 Storm) which carried tropical force winds of 35 knots upon arrival in the county. It should be noted that stronger storms could impact the county without a direct hit.

Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but still remains a real threat to Haywood County due to induced events like flooding and landsliding. A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of the Smoky Mountain Region between 1851 and 2015, resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of “likely” (between 10 and 90% annual probability) was assigned.

Vulnerability Assessment

Historical evidence indicates that Jackson County has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the county, as shown and discussed in the above section.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table D.11**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining an accurate loss estimate to specific participating jurisdictions was not feasible.

TABLE D.11: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Jackson County	\$7,784,691,059	\$23,539	0.000302%	\$225,337	0.002894%	\$51,496	0.000661%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

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

Critical Facilities

Given equal vulnerability across Jackson County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among

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 D.48** 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 Jackson County. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

D.2.6 Lightning

Location

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

Historical Occurrences

According to the National Centers for Environmental Information, there have been 15 recorded lightning events in Jackson County between 1950 and 2016.⁶ These events resulted in over \$3 million (2017 dollars) in damages, as listed in summary **Table D.12**. Furthermore, lightning caused one fatality and ten injuries in the county. Detailed information on historical lightning events can be found in **Table D.13**.

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

TABLE D.12: SUMMARY OF LIGHTNING OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017)
Dillsboro	1	\$11,941
Forest Hills	0	\$0
Sylva	2	\$38,798
Webster	0	\$0
Unincorporated Area	12	\$3,200,952
JACKSON COUNTY TOTAL	15	\$3,251,691

Source: NCEI Storm Events Database

Extent

⁶ 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 Jackson County. 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.

Aside from damages, lighting extent can be defined using Vaisala, Inc.'s U.S. National Lightning Detection Network (NLDN) (Chapter 5, **Figure 5.6**). Jackson County experienced an average of 3 to 12 flashes per square mile per year.

TABLE D.13: HISTORICAL LIGHTNING OCCURRENCES IN JACKSON COUNTY

Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY				
Cashiers	6/14/1997	0/0	\$0	Two houses were struck by lightning during the early morning of the 14th. Both houses suffered total losses.
Big Ridge	7/3/1999	0/7	\$0	A lightning strike caused injuries to 7 people at a campground, including burns to 3 people.
Cashiers	8/8/1999	1/2	\$0	Lightning struck 3 people hiking at Whiteside Cliffs near the Macon county line and South Carolina state line, and at an elevation of 4900 feet. A teenage boy died and the two others were injured.
Cashiers	7/3/2001	0/0	\$160,471	Lightning struck an unoccupied house, resulting in a fire that destroyed the structure and all its contents.
Cashiers	7/2/2002	0/1	\$0	A man in a hottub was struck by lightning.
Cullowhee	5/8/2004	0/0	\$0	Lightning caused widespread power outages.
Sylva	6/27/2005	0/0	\$7,129	Lightning sparked a fire out an outbuilding on Cowee Ridge. The structure was destroyed.
Cashiers	6/27/2005	0/0	\$285,152	Lightning sparked a house fire, causing extensive damage to the structure and its contents.
Cullowhee	5/6/2009	0/0	\$63,339	Lightning ignited a fire at a home in the Bariwood Community, causing significant damage.
Sylva	5/16/2009	0/0	\$31,669	Lightning ignited a fire at a garage housing two vintage vehicles on Thorn Hill Rd.
Grimeshawes	5/15/2010	0/0	\$184,481	Lightning ignited a fire at a condominium complex on Turning Leaf Lane. Two units were heavily damaged and two more received minor damage.
Big Ridge	4/25/2011	0/0	\$1,074,647	Lightning struck a house in the Glenridge area, igniting a fire that completely destroyed the home.

JACKSON COUNTY				
Bessie	4/27/2011	0/0	\$1,194,052	Lightning struck a home in the Finley Forest area, igniting a fire that destroyed the home.
Dillsboro	12/21/2011	0/0	\$238,810	Lightning started a fire at a home on Bright Mountain Rd, destroying the structure.

*Property damage is reported in 2017 dollars; All damage may not have been reported.

Source: NCEI Storm Events Database

Probability of Future Occurrences

Although there were not a high number of historical lightning events reported in Jackson County via NCEI data, it is a regular occurrence accompanied by 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®), Jackson County is located in an area of the country that experienced an average of 3 to 12 lightning flashes per square kilometer per year between 2005 and 2014. Therefore, the probability of future events is highly likely (greater than 90 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

Vulnerability Assessment

All current and future buildings and populations within Jackson County are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

D.2.7 Thunderstorm Wind/High Wind

Location

A 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, Jackson County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Jackson County has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms resulted in three disaster declarations in Jackson County in 1973, 1995, and 2013.⁷ According to NCEI, there have been 74 reported high wind events since 1994 and 85 reported thunderstorm wind events since 1950 in Jackson County.⁸ These events caused almost \$2.7 million (2017 dollars) in damages. **Table D.14** and **Table D.15** summarize this information. **Table D.16** presents detailed high wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.⁹

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

⁸ These thunderstorm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional thunderstorm events have occurred in Jackson County. As additional local data becomes available, this hazard profile will be amended.

⁹ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

TABLE D.14: SUMMARY OF HIGH WIND OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop damage (2017 dollars)
Dillsboro	0	\$0	\$0
Forest Hills	0	\$0	\$0
Sylva	0	\$0	\$0
Webster	0	\$0	\$0
Unincorporated Area	74	\$1,803,814	\$0
JACKSON COUNTY TOTAL	74	\$1,803,814	\$0

Source: National Centers for Environmental Information

TABLE D.15: SUMMARY OF THUNDERSTORM (WIND) OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017)	Crop damage (2017 dollars)
Dillsboro	2	\$18,652	\$0
Forest Hills	0	\$0	\$0
Sylva	22	\$297,174	\$0
Webster	3	\$0	\$15,580
Unincorporated Area	58	\$473,536	\$0
JACKSON COUNTY TOTAL	85	\$804,942	\$15,580

Source: National Centers for Environmental Information

TABLE D.16: HISTORICAL THUNDERSTORM (WIND) OCCURRENCES IN JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Jackson Co.	6/23/1969	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	6/7/1971	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	4/4/1989	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	5/27/1989	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	7/30/1991	Thunderstorm Wind	--	0/0	\$0	--
Sylva	8/25/1993	Thunderstorm Wind	--	0/0	\$0	--
Jackson Co.	5/18/1995	Thunderstorm Wind	--	0/1	\$149,213	Microburst demolished two mobile homes and damaged seven other homes.
Sylva/Dillsboro	5/18/1995	Thunderstorm Wind	--	0/0	\$18,652	Trees and power lines down. One mobile home damaged
Sylva	9/10/1995	Thunderstorm Wind	--	0/0	\$55,955	A tree fell on top of a house.
Sylva	9/11/1995	Thunderstorm Wind	--	0/0	\$74,606	A large tree was knocked down on the roof of St. John's Episcopal Church on Jackson Street.
Southern Jackson Co.	4/8/1996	High Wind	--	0/0	\$0	--
Cashiers	4/20/1996	Thunderstorm Wind	--	0/0	\$45,277	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Cullowhee	5/26/1996	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	5/26/1996	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	11/8/1996	Strong Wind	45	0/0	\$0	--
Southern Jackson Co.	11/8/1996	Strong Wind	45	0/0	\$0	--
Northern Jackson Co.	12/17/1996	High Wind	50	0/0	\$0	--
Jackson Co.	1/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	6/14/1997	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	7/4/1997	Thunderstorm Wind	50	0/1	\$0	--
Cashiers	7/28/1997	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	1/7/1998	High Wind	50	0/0	\$0	--
Southern Jackson Co.	1/7/1998	High Wind	50	0/0	\$0	--
Northern Jackson Co.	2/3/1998	High Wind	--	0/0	\$24,912	<p>A strong slow-moving winter storm moved from the Gulf of Mexico north through the Carolinas on the 3rd and 4th, bringing with it heavy rain, snow and high winds. Snow accumulated between 1 and 3 inches across the higher elevations of the mountains by early afternoon on the 3rd. Newland, Beech Mountain and Jonas Ridge had 4 inches of snow by early evening. Mount Mitchell ended up with 20 inches of snow. Roads were icy across the higher elevations and contributed to some wrecks. Heavy rain in Candler early in the morning caused a mobile home to collapse, destroying its' contents. Flooding developed across portions of the mountains during the afternoon as creeks overflowed, covering roads in many areas. High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.</p>

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	2/3/1998	High Wind	--	0/0	\$24,912	A strong slow-moving winter storm moved from the Gulf of Mexico north through the Carolinas on the 3rd and 4th, bringing with it heavy rain, snow and high winds. Snow accumulated between 1 and 3 inches across the higher elevations of the mountains by early afternoon on the 3rd. Newland, Beech Mountain and Jonas Ridge had 4 inches of snow by early evening. Mount Mitchell ended up with 20 inches of snow. Roads were icy across the higher elevations and contributed to some wrecks. Heavy rain in Candler early in the morning caused a mobile home to collapse, destroying its' contents. Flooding developed across portions of the mountains during the afternoon as creeks overflowed, covering roads in many areas. High gradient winds between strong high pressure in the upper Midwest and the passing strong low pressure combined with wet ground conditions to down numerous trees and power lines. Power outages and blocked roads were common into the evening hours. A building collapsed in Statesville due to the wind.
Sylva Jackson Co.	5/27/1998	Thunderstorm Wind	50	0/0	\$0	--
Sylva Jackson Co.	6/2/1998	Thunderstorm Wind	50	0/0	\$0	--
Sylva	6/19/1998	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	6/21/1998	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Southern Jackson Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	3/16/1999	Strong Wind	--	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Cullowhee	5/6/1999	Thunderstorm Wind	60	0/0	\$85,122	Two lines of strong and severe thunderstorms moved across the mountains during the early morning hours, causing a considerable amount of wind damage. One severe thunderstorm spawned a weak tornado in the city of Asheville around sunrise. Along the 2 mile damage path, 500 trees were downed, many on homes and vehicles. A garage was destroyed, roofs were blown partially off a couple buildings, a school roof was damaged, and some condos were condemned from tree damage. Elsewhere in the mountains, damaging thunderstorm winds of nearly 70 mph at times blew numerous trees down, many on houses and cars. A few thousand people were left without power. In addition to damaging wind, a few reports of dime to quarter size hail were received. Intense lightning in Robbinsville knocked out the Graham Co. 911 system for the entire day, and wind gusts near 55 mph blew numerous small limbs onto power lines which resulted in additional power outages across the Co..
Balsam	5/6/1999	Thunderstorm Wind	60	0/0	\$0	--
Savannah	5/6/1999	Thunderstorm Wind	60	0/0	\$0	--
Balsam	5/7/1999	Thunderstorm Wind	50	0/0	\$0	--
Wolf Mountain	7/6/1999	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	11/2/1999	High Wind	55	0/0	\$0	--
Southern Jackson Co.	3/19/2000	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/19/2000	High Wind	55	0/0	\$0	--
Sylva	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Southern Jackson Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Northern Jackson Co.	12/16/2000	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/16/2000	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/6/2001	High Wind	55	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	3/6/2001	High Wind	55	0/0	\$0	--
Southern Jackson Co.	3/20/2001	High Wind	55	0/0	\$0	--
Northern Jackson Co.	3/20/2001	High Wind	55	0/0	\$0	--
Sylva	6/22/2001	Thunderstorm Wind	50	0/0	\$0	--
Sylva	8/11/2001	Thunderstorm Wind	55	0/0	\$0	--
Southern Jackson Co.	10/13/2001	High Wind	50	0/0	\$0	--
Northern Jackson Co.	10/13/2001	High Wind	50	0/0	\$0	--
Cashiers	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Sylva	10/25/2001	Thunderstorm Wind	60	0/0	\$160,471	Winds blew down 30 to 40 trees at a small theme park and zoo. The trees crushed cages and caused other damage.
Cullowhee	10/25/2001	Thunderstorm Wind	60	0/0	\$160,471	Trees and power lines were blown down across the Co. as a squall line raced across the higher terrain of North Carolina. A small plane tied down at the Jackson Co. airport was flipped and heavily damaged. Some trees fell onto roads. Trees were also blown down at Western Carolina University and in the Fairview area. A large amount of hail was also reported, but no size was known. About 4500 customers lost power.
Southern Jackson Co.	11/24/2001	High Wind	50	0/0	\$0	--
Northern Jackson Co.	2/4/2002	High Wind	50	0/0	\$0	--
Southern Jackson Co.	2/4/2002	High Wind	50	0/0	\$0	--
Webster	3/17/2002	Thunderstorm Wind	65	0/0	\$15,580	The roof was torn off of a manufactured home and blown 250 feet into another home along Caney Fork 3 ESE of Cullowhee. In addition, trees were reported down in Webster, and several power lines were blown down in Cullowhee.
Sylva	5/2/2002	Thunderstorm Wind	60	0/0	\$4,674	Trees and powerlines were blown down in the Dills Creek area, resulting in power outages.
Jackson Co.	5/13/2002	Thunderstorm Wind	50	0/0	\$4,674	Trees and powerlines were blown down.
Cashiers	6/4/2002	Thunderstorm Wind	50	0/0	\$0	--
Jackson Co.	9/26/2002	Strong Wind	--	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Jackson Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Jackson Co.	9/27/2002	High Wind	50	0/0	\$0	--
Jackson Co.	9/27/2002	High Wind	50	0/0	\$0	--
Jackson Co.	12/13/2002	High Wind	65	0/0	\$0	--
Northern Jackson Co.	1/23/2003	High Wind	60	0/0	\$1,513	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.
Southern Jackson Co.	1/23/2003	High Wind	60	0/0	\$1,513	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.
Jackson Co.	2/4/2003	High Wind	60	0/0	\$0	--
Jackson Co.	2/4/2003	High Wind	60	0/0	\$0	--
Cullowhee	5/2/2003	Thunderstorm Wind	50	0/0	\$7,563	A few trees were blown down at Western Carolina University.
Cashiers	7/5/2003	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	10/14/2003	High Wind	50	0/0	\$1,513	High winds developed ahead of a cold front and blew down numerous trees and power lines across the southwest mountains of North Carolina.
Northern Jackson Co.	10/14/2003	High Wind	50	0/0	\$1,513	High winds developed ahead of a cold front and blew down numerous trees and power lines across the southwest mountains of North Carolina.
Northern Jackson Co.	11/18/2003	High Wind	50	0/0	\$756	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Southern Jackson Co.	11/18/2003	High Wind	50	0/0	\$756	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.
Northern Jackson Co.	3/7/2004	High Wind	50	0/0	\$4,406	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.
Southern Jackson Co.	3/7/2004	High Wind	50	0/0	\$2,937	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.
Sylva	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Sylva	6/22/2004	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	7/5/2004	High Wind	55	0/0	\$734	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.
Northern Jackson Co.	7/5/2004	High Wind	55	0/0	\$734	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.
Sylva	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Sylva	7/25/2004	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	8/20/2004	Thunderstorm Wind	50	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Northern Jackson Co.	9/7/2004	High Wind	50	0/0	\$14,685	High winds associated with the remnants of Hurricane Frances produced widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
Southern Jackson Co.	9/7/2004	High Wind	50	0/0	\$14,685	High winds associated with the remnants of Hurricane Frances produced widespread damage to trees and power lines across portions of the North Carolina mountains, and the higher elevations of the foothills.
Southern Jackson Co.	9/16/2004	High Wind	55	0/0	\$220,280	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 Co..
Northern Jackson Co.	9/16/2004	High Wind	55	0/0	\$73,427	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 Co..
Northern Jackson Co.	9/17/2004	High Wind	50	0/0	\$0	--
Southern Jackson Co.	9/17/2004	High Wind	50	0/0	\$0	--
Southern Jackson Co.	12/1/2004	High Wind	50	0/0	\$0	--
Northern Jackson Co.	1/22/2005	High Wind	60	0/0	\$0	--
Southern Jackson Co.	1/22/2005	High Wind	60	0/0	\$0	--
Southern Jackson Co.	8/30/2005	High Wind	50	0/0	\$0	--
Northern Jackson Co.	8/30/2005	High Wind	50	0/0	\$0	--
Southern Jackson Co.	1/14/2006	High Wind	60	0/0	\$0	--
Southern Jackson Co.	1/25/2006	High Wind	55	0/0	\$0	--
Northern Jackson Co.	1/25/2006	High Wind	55	0/0	\$0	--
Sylva	4/3/2006	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Cashiers	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	6/23/2006	Thunderstorm Wind	50	0/0	\$0	--
Sylva	7/21/2006	Thunderstorm Wind	50	0/0	\$0	--
Cashiers	10/11/2006	Thunderstorm Wind	55	0/0	\$0	--
Southern Jackson Co.	11/15/2006	High Wind	50	0/0	\$0	--
Northern Jackson Co.	11/15/2006	High Wind	50	0/0	\$0	--
Northern Jackson Co.	12/1/2006	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/1/2006	High Wind	55	0/0	\$0	--
Sylva	4/3/2007	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	4/15/2007	High Wind	70	0/0	\$0	--
Southern Jackson Co.	4/16/2007	High Wind	60	0/0	\$671,958	<p>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 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 construction site. Five homes were damaged by fallen trees in Lincoln Co., NC alone. Three homes were damaged in Iredell Co. and in In Catawba Co., 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.</p>

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Northern Jackson Co.	4/16/2007	High Wind	60	0/0	\$671,958	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 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 construction site. Five homes were damaged by fallen trees in Lincoln Co., NC alone. Three homes were damaged in Iredell Co. and in Catawba Co., 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.
Cullowhee	8/24/2007	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	1/30/2008	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	5/11/2008	High Wind	60	0/0	\$0	--
Southern Jackson Co.	5/11/2008	High Wind	60	0/0	\$0	--
Sylva	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--
Webster	7/21/2008	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	12/31/2008	High Wind	50	0/0	\$0	--
Southern Jackson Co.	12/31/2008	Strong Wind	40	0/0	\$32,619	A large tree fell on a home near Cashiers.
Cullowhee	6/11/2009	Thunderstorm Wind	50	0/0	\$0	--
Northern Jackson Co.	6/17/2009	Strong Wind	40	0/0	\$38,003	A tree was blown down on a trailer on Cope Creek Rd.
Sylva	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
JACKSON COUNTY						
Beta	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--
Grimeshawes	6/17/2009	Thunderstorm Wind	50	0/0	\$0	--
Webster	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Gay	6/18/2009	Thunderstorm Wind	50	0/0	\$0	--
Southern Jackson Co.	12/9/2009	High Wind	55	0/0	\$0	--
Northern Jackson Co.	12/9/2009	High Wind	55	0/0	\$0	--
Southern Jackson Co.	12/25/2009	High Wind	50	0/0	\$0	--
Dillsboro	5/28/2010	Thunderstorm Wind	50	0/0	\$0	--
Grimeshawes	5/28/2010	Thunderstorm Wind	55	0/0	\$0	--
Speedwell	6/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Sylva	9/22/2010	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Norton	10/25/2010	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	2/28/2011	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	4/4/2011	Thunderstorm Wind	60	0/0	\$0	--
Cashiers	4/27/2011	Thunderstorm Wind	55	0/0	\$0	--
Cashiers	4/27/2011	Thunderstorm Wind	55	0/0	\$0	--
Cullowhee	6/8/2011	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	6/15/2011	Thunderstorm Wind	65	0/0	\$0	--
Norton	6/19/2011	Thunderstorm Wind	60	0/0	\$0	--
Dicks Creek	7/5/2012	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--
Sylva	6/13/2013	Thunderstorm Wind	50	0/0	\$0	--
Sylva	2/21/2014	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	4/28/2014	Thunderstorm Wind	50	0/0	\$0	--
Balsam	7/27/2014	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	6/17/2015	Thunderstorm Wind	55	0/0	\$10,609	Law enforcement reported numerous trees and power lines down near the Western Carolina University campus. The campus library and a couple of homes received minor roof damage from fallen trees.
Dicks Creek	6/24/2015	Thunderstorm Wind	50	0/0	\$0	--
Cullowhee	8/14/2015	Thunderstorm Wind	50	0/0	\$10,609	Four large pine trees were blown down, with one falling on a garage.
Greens Creek	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Wilmot	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--

Source: National Centers for Environmental Information

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind event in Jackson County was reported on April 15, 2007 at 70 knots (approximately 80 mph). It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

Given the high number of previous events (159 total wind events reported from NCEI), it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. The reported events result in an average of almost 2 events per year. Therefore, a probability level of highly likely (greater than 90% annual probability) for future wind events for the entire county.

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

D.2.8 Tornado**Location**

Tornadoes occur throughout the state of North Carolina, and thus in Jackson County. 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 Jackson County is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they do occur in Jackson County. According to the National Centers for Environmental Information, there have been a total of three recorded tornado events in Jackson County since 1973 (**Table D.17**), resulting in nearly \$1.3 million (2017 dollars) in property damages.¹⁰ No deaths or injuries were reported (**Table D.18**). 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 40 years.

TABLE D.17: SUMMARY OF TORNADO OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2012)
Dillsboro	0	\$0
Forest Hills	0	\$0
Sylva	0	\$0
Webster	0	\$0
Unincorporated Area	3	\$1,310,021
JACKSON COUNTY TOTAL	3	\$1,310,021

Source: National Centers for Environmental Information

¹⁰ 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 Jackson County. As additional local data becomes available, this hazard profile will be amended.

TABLE D.18: HISTORICAL TORNADO IMPACTS IN JACKSON COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Jackson County					
Jackson County	3/12/1975	F0	0/0	\$1,320	Tornado touched down less than two minutes near Sylva; slight damage.
Jackson County	6/28/1976	F2	0/0	\$1,078,897	n/a
Jackson County	3/2/2012	EF0	0/0	\$57,964	An NWS storm survey found the path of a weak tornado in the Lake Glenville area. The tornado began along Pine Creek Rd about halfway between the Macon County line and the Lake. It traveled east southeast from there, crossing North Norton Rd and Woods Mountain Trail. Multiple trees were uprooted and snapped and a few homes and one church received minor roof damage. The tornado then crossed the lake and affected Glenshore Dr snapping and uprooting more trees and causing a tree to fall on a home, damaging the roof. The damage path ended there, at the shore of Lake Glenville.

*Property Damage is reported in 2017 dollars.

Source: NCEI

Extent

The greatest extent of tornado is an EF5 (over 200 miles per hour). The greatest magnitude of tornado to impact Jackson County was an F2 (113 to 157 miles per hour), although an EF5 event is possible.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county (three reported events in 43 years). Furthermore, the mountainous terrain of the county makes tornadoes a rare occurrence. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Jackson County experience a direct tornado strike. The probability of future tornado occurrences affecting Jackson County is possible (1 to 10 percent annual probability).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

D.2.9 Winter Storm and Freeze

Location

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. Jackson County is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in two disaster declarations in Jackson County. This includes the Blizzard of 1996 and a severe winter storm in 2010.¹¹ According to the National Centers for Environmental Information, there have been a total of 313 recorded winter storm events in Jackson County since 1993 (Table D.19).¹² These events resulted in over \$5 million (2017 dollars) in damages. Those events with reported damages and fatalities are presented in Table D.20.¹³

TABLE D.19: SUMMARY OF WINTER STORM EVENTS IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Dillsboro	0	\$0	\$0
Forest Hills	0	\$0	\$0
Sylva	0	\$0	\$0
Webster	0	\$0	\$0
Unincorporated Area	313	\$4,673,902	\$537,567
JACKSON COUNTY TOTAL	313	\$4,673,902	\$537,567

Source: National Centers for Environmental Information

TABLE D.20: HISTORICAL WINTER STORM IMPACTS IN JACKSON COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	2/1/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/1/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/7/1996	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/7/1996	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/11/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/1996	Winter Weather	0/0	\$0	\$0

¹¹ A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

¹² These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI). It is certain that additional winter storm conditions have affected Jackson County.

¹³ The dollar amount of damages provided by NCEI is divided by the number of affected counties to reflect a damage estimate for the county.

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	2/12/1996	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/16/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/1996	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/1996	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/18/1996	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/18/1996	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/9/1997	Ice Storm	0/0	\$0	\$0
Southern Jackson	1/9/1997	Ice Storm	0/0	\$0	\$0
Northern Jackson	1/10/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/10/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/13/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	12/8/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/27/1997	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/27/1997	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/29/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/29/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/30/1997	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/30/1997	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/18/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/18/1998	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/18/1998	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/27/1998	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/27/1998	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/2/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/1998	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/11/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/10/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/17/1998	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/31/1999	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/31/1999	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/13/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/3/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/9/1999	Winter Storm	0/0	\$0	\$0
Northern Jackson	3/26/1999	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/26/1999	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/29/1999	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/24/1999	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/16/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/16/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/20/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/22/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/22/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/26/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/29/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/29/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/8/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	11/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	11/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	12/13/2000	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/13/2000	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/17/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/17/2000	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/19/2000	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/1/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/1/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/8/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/20/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/6/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/6/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/20/2001	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/20/2001	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/3/2002	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/6/2002	Heavy Snow	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	2/3/2002	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/6/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/6/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2002	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/4/2002	Ice Storm	0/0	\$4,673,902	\$0
Northern Jackson	12/14/2002	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/22/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/22/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/25/2002	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/6/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/16/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/16/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/19/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/19/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/6/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/6/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/9/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/9/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/30/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	3/30/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/30/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/10/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/10/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	11/28/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/28/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/3/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/3/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2003	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/4/2003	Winter Storm	0/0	\$0	\$0
Northern Jackson	12/5/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/5/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/10/2003	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/18/2003	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/18/2003	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/18/2003	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/19/2003	Winter Weather	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	1/25/2004	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/2/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/5/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/7/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/7/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/12/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/15/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2004	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/26/2004	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/30/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/30/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/13/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/13/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/14/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/14/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/19/2004	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/19/2004	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/22/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/27/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/27/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/28/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/1/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/8/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/17/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/17/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	4/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/2/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/2/2005	Heavy Snow	0/0	\$0	\$0
Southern Jackson	4/2/2005	Heavy Snow	0/0	\$0	\$0
Northern Jackson	4/23/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/21/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/21/2005	Winter Weather	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	12/3/2005	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/3/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/15/2005	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/14/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/14/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/30/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/8/2006	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/8/2006	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/11/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2006	Heavy Snow	0/0	\$0	\$0
Southern Jackson	2/11/2006	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/18/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/22/2006	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/22/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/7/2006	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/9/2007	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/9/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/21/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/21/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/1/2007	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/1/2007	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/17/2007	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/17/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/6/2007	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/8/2007	Frost/Freeze	0/0	\$0	\$268,783
Southern Jackson	4/8/2007	Frost/Freeze	0/0	\$0	\$268,783
Northern Jackson	1/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/16/2008	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/16/2008	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/19/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/19/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/22/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/22/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/31/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/31/2008	Winter Weather	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	2/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/1/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/26/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/27/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/27/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/21/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/1/2008	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/1/2008	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/13/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/17/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/18/2009	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/19/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/2/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/22/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/1/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/1/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	4/7/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/17/2009	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/12/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/18/2009	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/18/2009	Winter Storm	0/0	\$0	\$0
Southern Jackson	12/30/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/30/2009	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/18/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/29/2010	Heavy Snow	0/0	\$0	\$0
Southern Jackson	1/29/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/4/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/4/2010	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/10/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/12/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/15/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/15/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/2010	Heavy Snow	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	3/2/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	3/22/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/22/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/4/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/12/2010	Heavy Snow	0/0	\$0	\$0
Southern Jackson	12/12/2010	Winter Weather	0/0	\$0	\$0
Northern Jackson	12/15/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/15/2010	Winter Weather	0/0	\$0	\$0
Southern Jackson	12/25/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	12/25/2010	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/7/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/10/2011	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/10/2011	Heavy Snow	0/0	\$0	\$0
Northern Jackson	1/11/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/24/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/24/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/26/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/9/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/9/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/6/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/11/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/29/2011	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/29/2011	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2012	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/2/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/11/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/29/2012	Winter Storm	0/0	\$0	\$0
Southern Jackson	10/29/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/5/2012	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/5/2012	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/17/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/25/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/25/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/1/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/2/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/2/2013	Heavy Snow	0/0	\$0	\$0
Northern Jackson	2/19/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/19/2013	Winter Weather	0/0	\$0	\$0

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Northern Jackson	3/2/2013	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/2/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/5/2013	Winter Storm	0/0	\$0	\$0
Southern Jackson	3/6/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/20/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/25/2013	Winter Storm	0/0	\$0	\$0
Northern Jackson	11/26/2013	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/2/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	1/21/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/28/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/28/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/10/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	2/12/2014	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/12/2014	Winter Storm	0/0	\$0	\$0
Northern Jackson	3/24/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	10/31/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	10/31/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/1/2014	Winter Weather	0/0	\$0	\$0
Southern Jackson	11/1/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	11/26/2014	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Northern Jackson	1/13/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	1/26/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/16/2015	Winter Storm	0/0	\$0	\$0
Southern Jackson	2/16/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/18/2015	Winter Weather	0/0	\$0	\$0
Northern Jackson	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Southern Jackson	2/23/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/23/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/25/2015	Winter Storm	0/0	\$0	\$0
Southern Jackson	2/25/2015	Winter Storm	0/0	\$0	\$0
Northern Jackson	1/20/2016	Winter Weather	0/0	\$0	\$0
Southern Jackson	1/20/2016	Winter Weather	0/0	\$0	\$0

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
JACKSON COUNTY					
Southern Jackson	1/22/2016	Winter Storm	0/0	\$0	\$0
Northern Jackson	1/22/2016	Winter Storm	0/0	\$0	\$0
Northern Jackson	2/8/2016	Winter Weather	0/0	\$0	\$0
Southern Jackson	3/3/2016	Winter Weather	0/0	\$0	\$0
Northern Jackson	3/20/2016	Winter Weather	0/0	\$0	\$0

Source: National Centers for Environmental Information

There have been several severe winter weather events in Jackson County. The text below describes one of the major events and associated impacts on the county. Similar impacted 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.

Extent

The extent of winter storms can be measured by the amount of snowfall or ice accumulation received (in inches). Due to extreme variations in elevation throughout the county, totals will vary. Twenty-four inches of snow was reported in the 1993 event although more accumulation is possible. Several inches of ice accumulation is also possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Jackson County due to location and elevation. According to historical information, Jackson County experiences an average of eight winter storm events each year. Based on historical occurrences, the annual probability is highly likely (greater than 90 percent).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack).

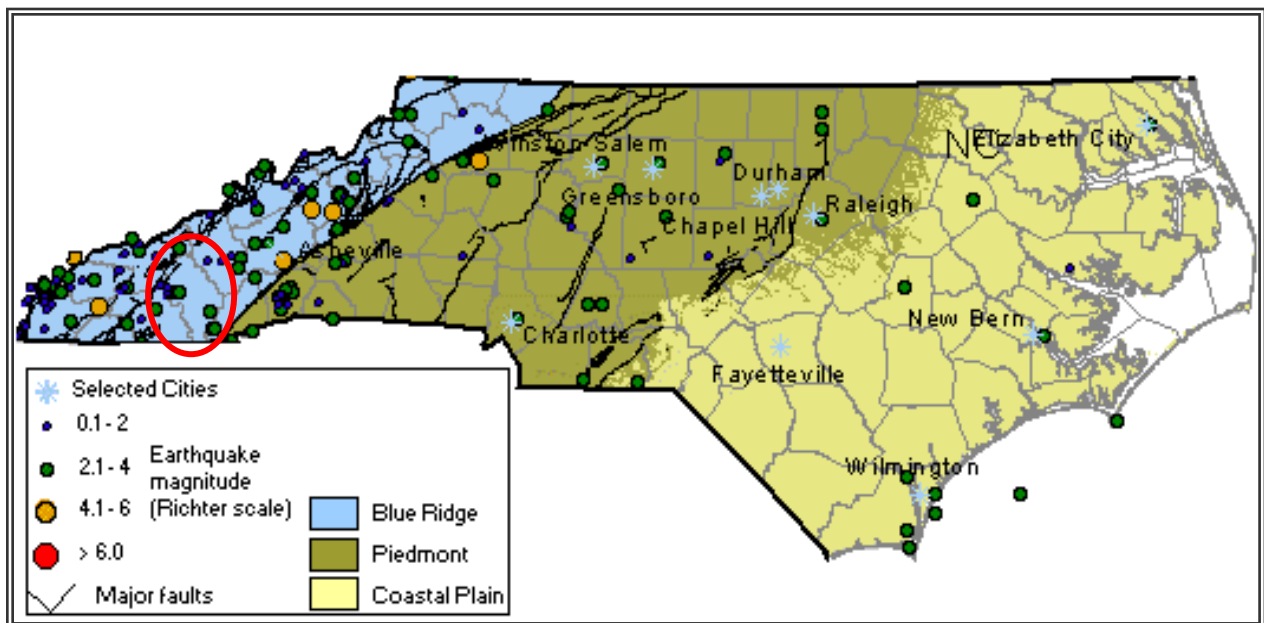
Winter storms throughout the planning area have several negative externalities including hypothermia, cost of snow and debris cleanup, business and government service interruption, traffic accidents, and power outages. Furthermore, citizens may resort to using inappropriate heating devices that could to fire or an accumulation of toxic fumes. However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

D.2.10 Earthquake

Location

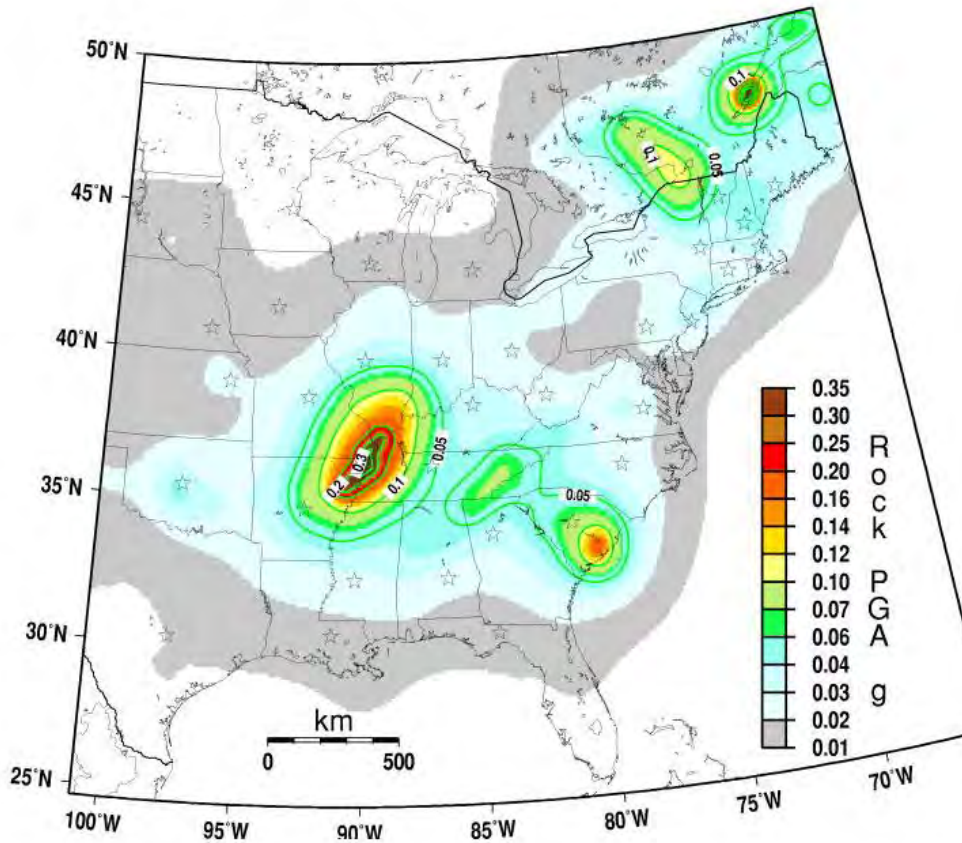
Approximately two-thirds of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes 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 D.2** is a map showing geological and seismic information for North Carolina.

FIGURE D.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure D.3 shows the intensity level associated with Jackson County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Jackson County lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE D.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS

Source: USGS, 2008

Historical Occurrences

At least 14 earthquakes are known to have affected Jackson County since 1874. The strongest of these measured a V on the Modified Mercalli Intensity (MMI) scale. **Table D.21** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table D.22** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁴

¹⁴ Due to reporting mechanisms, not all earthquake events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported.

TABLE D.21: SUMMARY OF SEISMIC ACTIVITY IN JACKSON COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Dillsboro	3	V	-
Forest Hills	0	-	-
Sylva	8	V	-
Webster	3	V	-
Unincorporated Area	0	-	-
JACKSON COUNTY TOTAL	14	V (slightly strong)	< 4.8

Source: National Geophysical Data Center

TABLE D.22: SIGNIFICANT SEISMIC EVENTS IN JACKSON COUNTY (1638 -1985)

Location	Date	MMI (magnitude)
Jackson County		
Sylva	9/7/1956	III
Dillsboro	11/24/1957	V
Sylva	11/24/1957	V
Webster	11/24/1957	V
Sylva	11/9/1968	IV
Sylva	11/20/1969	IV
Sylva	12/13/1969	III
Sylva	10/9/1971	III
Dillsboro	11/30/1973	IV
Sylva	11/30/1973	IV
Webster	11/30/1973	V
Dillsboro	8/26/1979	IV
Sylva	8/26/1979	V
Webster	8/26/1979	IV

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Jackson County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table D.23**.

TABLE D.23: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/07/1812	New Madrid, MO	8.7	XII	VI
04/29/1852	Wytheville, VA	5.0	VI	VI
08/31/1861	Wilkesboro, NC	5.1	VII	VII
12/23/1875	Central Virginia	5.0	VII	VI
08/31/1886	Charleston, SC	7.3	X	VII

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
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

*This event is accounted for in the Jackson County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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).

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The strongest intensity of earthquake to occur in Jackson County is an MMI of V (slightly strong; less than 4.8 on the Richter scale), which has occurred during five separate earthquake events. However, stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Jackson County is unlikely. However, it is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the potential dollar loss for Jackson County. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table D.24** summarizes the findings.

TABLE D.24: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Ratio	500 Year Event Loss	500 Year Event Ratio	Annualized Loss	Annualized Loss Ratio ¹
Jackson County	\$7,784,691,059	\$265,902	0.003415%	\$4,221,523	0.054228%	\$44,379	0.000570%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table D.48**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Jackson County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

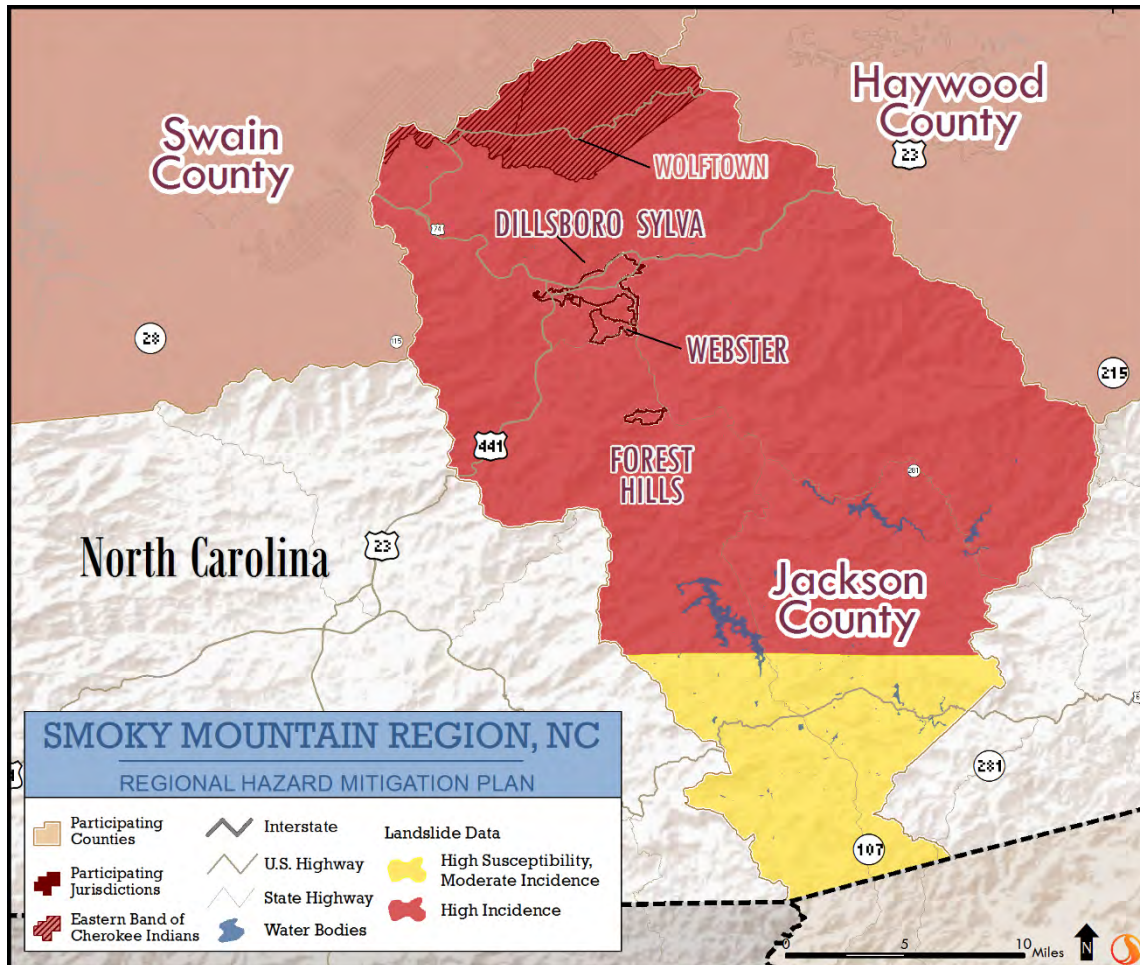
D.2.11 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Jackson County.

According to **Figure D.4** below, the majority of the county has high landslide activity. The remaining portion of the county, to the south, has a moderate incidence occurrence rate. There is high susceptibility throughout the county.

FIGURE D.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF JACKSON COUNTY



Source: USGS

Historical Occurrences

Steep topography throughout Jackson County 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. **Table D.25** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey¹⁵. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure D.5**. Some incidence mapping has also been 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 Jackson County.

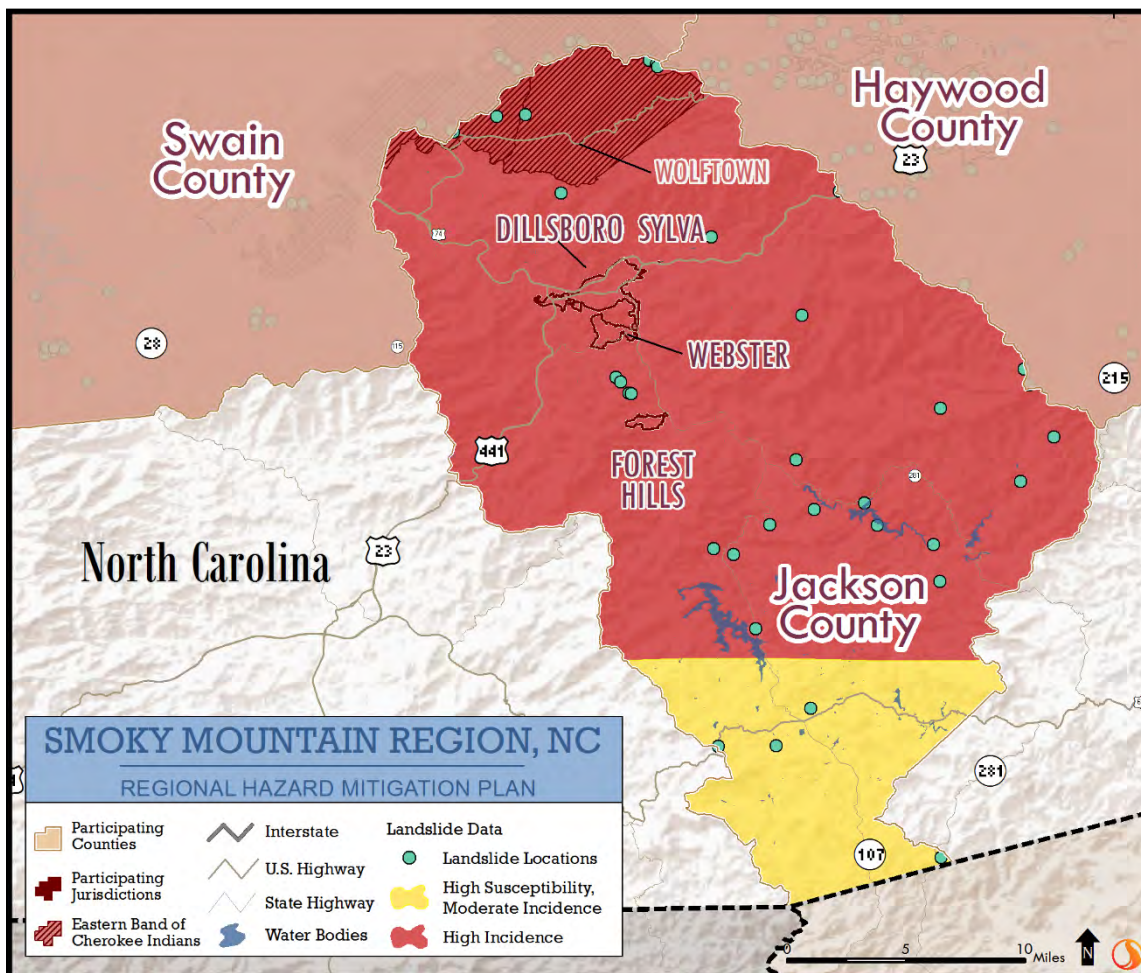
¹⁵ It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

TABLE D.25: SUMMARY OF LANDSLIDE ACTIVITY IN JACKSON COUNTY

Location	Number of Occurrences
Dillsboro	-
Forest Hills	-
Sylva	-
Webster	-
Unincorporated Area	28
JACKSON COUNTY TOTAL	28

Source: North Carolina Geological Survey

FIGURE D.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN JACKSON COUNTY



Source: North Carolina Geological Survey

The following information identifies additional historical information reported in the previous hazard mitigation plan:

There is no serious history of landslides in Jackson County though some incidents have been reported including the landslides as a result of the May 2003 heavy rains. Jackson County has also established an Erosion Department which is managed by a professional engineer. Public information is also provided via

the County website. NCDEM classification suggests that the probability of a landslide event having a minor effect on the county is highly likely to occur.

Extent

Landslide extent can be measured in terms of tons of debris or damage or frequency, for example. Incidence is between moderate (1.5% - 15% of the area is involved in landsliding) and high (more than 15% of the area is involved in landsliding) in Jackson County. While limited information exists on debris generated from past events, million of dollars in damages is possible. The most severe events may result in loss of life.

Probability of Future Occurrences

Based on historical information (28 reported events in 40 years) and the USGS susceptibility index, the probability of future landslide events is likely (10 to 100 percent probability). The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as having a lower, “moderate” incidence ranking. A majority of Jackson County is located in the high incidence area though the southern portion of the county has a moderate incidence ranking. It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas in Jackson County have greater risk than others given factors such as steepness on slope and modification of slopes (i.e., greater slope or modification of slope may increase risk and occurrence).

Vulnerability Assessment

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. Most areas of Jackson County are identified as high incidence (more than 15% of the area is involved in landsliding). Additionally, portions of the study area in the county are classified as high susceptibility/moderate incidence (1.5% - 15% of the area is involved in landsliding) areas in the USGS landslide data. **Table D.26** presents potential vulnerability in moderate incidence areas while **Table D.27** presents vulnerability in high incidence areas.

TABLE D.26: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH SUSCEPTIBILITY MODERATE INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	9,462	24%	5,392	25%	\$2,407,725,900	45%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	0	0%	0	0%	\$0	0%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	9,462	25%	5,392	27%	\$2,407,725,900	48%
EBCI	0	0%	0	0%	\$0	0%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.
 Source: USGS

TABLE D.27: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	29,865	76%	16,217	75%	\$2,953,860,180	55%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	216	100%	132	100%	\$20,556,040	100%
Sylva	1,491	100%	1,143	100%	\$230,088,520	100%
Webster	244	100%	170	100%	\$60,049,220	100%
Unincorporated Area	27,741	75%	14,646	73%	\$2,617,583,960	52%
EBCI	6	100%	4	100%	\$2,478,510	100%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.
 Source: USGS

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk.

Critical Facilities

All critical facilities located in a high susceptibility/moderate incidence area are detailed in **Table D.28**. This includes a total of nine facilities. A total of 39 of Jackson County’s critical facilities are located in areas of high landslide incidence, as presented in **Table D.29**. A list of specific critical facilities and their associated risk can be found in **Table D.48** at the end of this section.

TABLE D.28: CRITICAL FACILITIES IN HIGH SUSCEPTIBILITY / MODERATE INCIDENCE LANDSLIDE HAZARD AREAS

JACKSON COUNTY							
Category and Type	Dillsboro	Forest Hills	Sylva	Webster	Unincorporated	EBCI	Total
Emergency Services	0	0	0	0	5	0	5
EMS/EOC	0	0	0	0	2	0	2
Fire Station	0	0	0	0	2	0	2
Highway Patrol	0	0	0	0	0	0	0
Police Station	0	0	0	0	0	0	0
Sheriff's Office	0	0	0	0	1	0	1
Government Facilities	0	0	0	0	4	0	4
Government Office	0	0	0	0	1	0	1
Recreation Center	0	0	0	0	1	0	1
School	0	0	0	0	2	0	2
Medical Facilities	0	0	0	0	0	0	0
Hospital	0	0	0	0	0	0	0
Health Center	0	0	0	0	0	0	0
Total	0	0	0	0	9	0	9

TABLE D.29: CRITICAL FACILITIES IN HIGH INCIDENCE LANDSLIDE HAZARD AREAS

JACKSON COUNTY							
Category and Type	Dillsboro	Forest Hills	Sylva	Webster	Unincorporated	EBCI	Total
Emergency Services	0	0	5	1	18	0	24
EMS/EOC	0	0	1	0	4	0	5
Fire Station	0	0	1	1	13	0	15
Highway Patrol	0	0	1	0	0	0	1
Police Station	0	0	1	0	0	0	1
Sheriff's Office	0	0	1	0	1	0	2
Government Facilities	0	0	4	1	8	0	13
Government Office	0	0	4	0	1	0	5
Recreation Center	0	0	0	0	1	0	1
School	0	0	0	1	6	0	7
Medical Facilities	0	0	2	0	0	0	2
Hospital	0	0	1	0	0	0	1
Health Center	0	0	1	0	0	0	1
Total	0	0	11	2	26	0	39

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in Jackson County, 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 county 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.

D.2.12 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table D.30** explains these classifications.

TABLE D.30: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

According to the North Carolina Division of Land Management there are 69 dams in Jackson County.¹⁶ Of these dams, 28 are classified as high hazard potential, 19 are classified as intermediate hazard potential, and 22 are classified as low hazard. These high hazard dams are listed in **Table D.31**.

TABLE D.31: JACKSON COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
JACKSON COUNTY				
Bear Creek Dam	High	-	34,711	Utility
Breedlove Dam	High	1.0	8	Private
Cashiers Lake Dam	High	24.0	0	Private
Cedar Cliff Dam	High	-	7,000	Utility
Connelly Dam	High	-	-	Private
East Fork Dam	High	-	906	Utility
Fairfield Lake Dam	High	183.0	3,015	Private
Fradley Cove Estates	High	2.3	31	Private
Hampton Lake Dam	High	14.7	280	Private
Hanks Dam	High	15.0	125	Private
Hefner Dam	High	-	-	Private
Hodge Dam	High	0.6	5	Private
Hogback Dam	High	23.0	391	Private
Lancewood Dam	High	2.5	20	Private
Laurel Lake Dam	High	3.5	50	Private
Mcguire Lake Dam	High	2.6	45	Private

¹⁶ From the March 16, 2017 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (<https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety>).

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
JACKSON COUNTY				
Moody Bridge Partners Dam	High	-	-	Private
Pine Creek Dam	High	1.0	8	Private
Sapphire Valley Golf Course Dam	High	1.7	15	Private
Silver Springs Dam	High	7.4	65	Private
Stigler Dam	High	1.2	0	Private
Thorpe Lake Dam #1	High	-	70,800	Utility
Thorpe Lake Dam #2	High	-	70,800	Utility
Town of Sylva Water Supply	High	1.5	17	Local Government
Trout Lake Dam	High	7.5	82	Private
Tuckasegee Lake Dam	High	-	183	Utility
Wolf Creek Lake Dam	High	-	14,361	Utility
Wolf Lake	High	3.0	37	Private

Source: North Carolina Division of Land Resources

It should also be noted that the North Carolina dam classification regulations were recently updated. As a result of the change, more dams are generally classified as high hazard.

Historical Occurrences

Two dam breaches were reported in Jackson County, though no additional information was available. In addition, several breach scenarios in the county could be catastrophic.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria. Of the 69 dams in Cherokee County, 28 are classified as high-hazard, which could result in fatalities if breached.

Probability of Future Occurrences

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 was completed in a *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.

D.2.13 Erosion

Location

Erosion in Jackson County is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Jackson County’s mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the county, particularly along the banks of rivers and streams, but it is not a significant threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion in Jackson County. This includes searching local newspapers, obtaining input from the planning team, and reviewing the previous hazard mitigation plan. Prior to joining the regional planning effort, Jackson County recognized erosion as hazard and included

mitigation actions to address the hazard. Little information could be found beyond the hazard mitigation plan.

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs (e.g., inches per year). There are no erosion rate records located in Jackson County although it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for Jackson County, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent annually).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

D.2.14 Flood

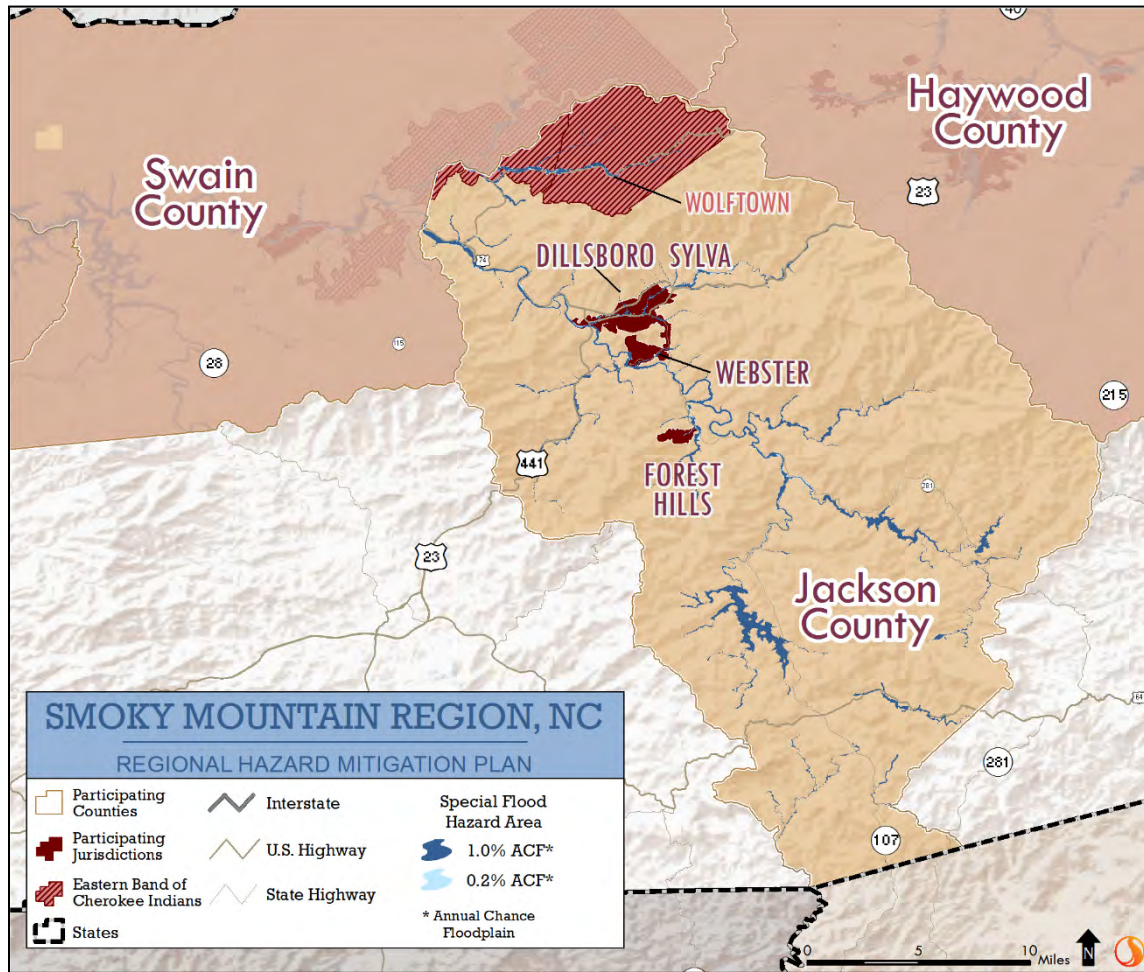
Location

There are areas in Jackson County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).¹⁷ 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 495 square miles that make up Jackson County, there are 9.43 square miles of land in Zones A and AE (1.0% annual chance floodplain/100-year floodplain), 1.70 square miles of land in floodways, and 0.89 square miles of land in Zone X500 (0.2-percent annual chance floodplain/500-year floodplain). Therefore, there is a total of 12.03 square miles of land in floodplain areas in Jackson County.

These flood zone values account for 2.43 percent of the total land area in Jackson County. 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 D.6**, **Figure D.7**, and **Figure D.8** illustrate the location and extent of currently mapped special flood hazard areas for Jackson County, the Town of Dillsboro, the Town of Sylva, the Town of Webster, and the Village of Forest Hills based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

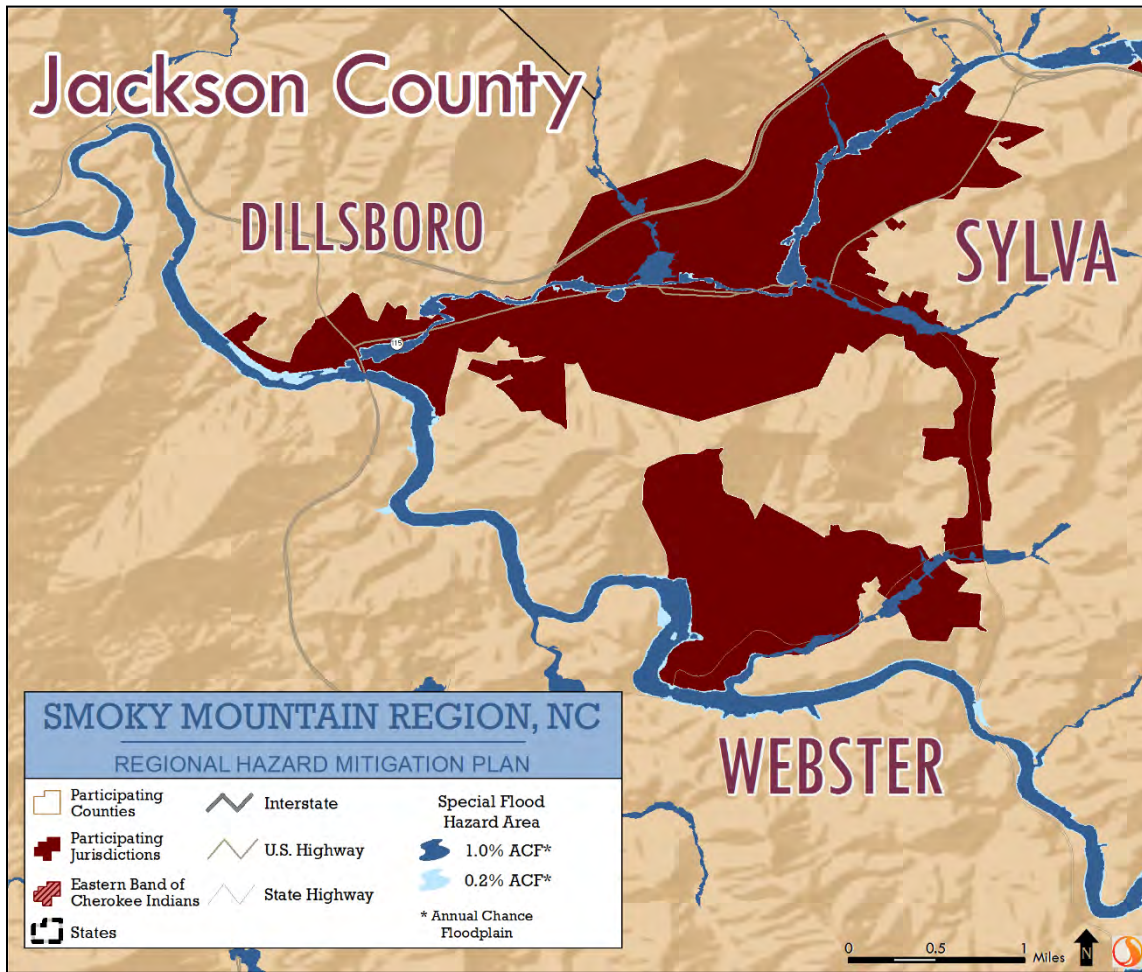
¹⁷ The county-level DFIRM data used for Jackson County were updated in 2010.

FIGURE D.6: SPECIAL FLOOD HAZARD AREAS IN JACKSON COUNTY



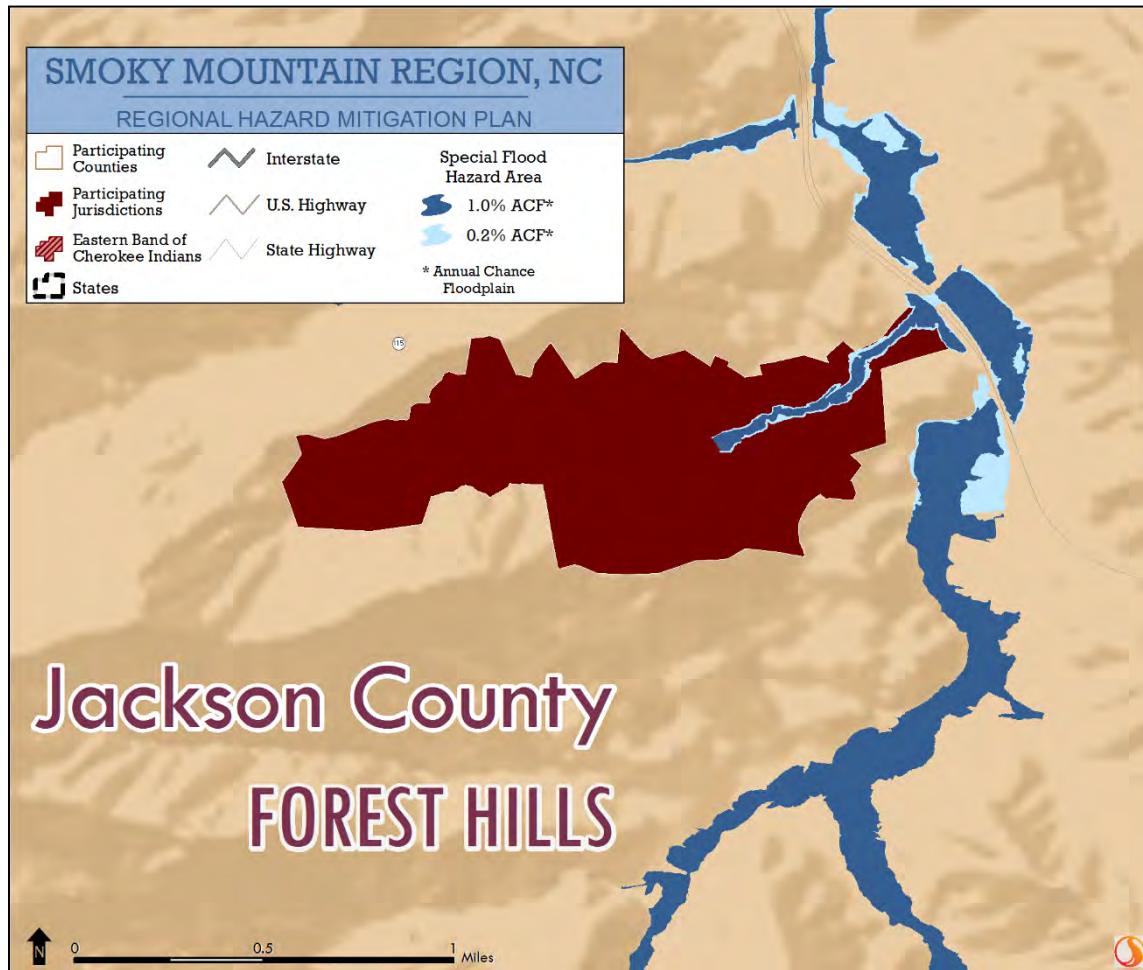
Source: Federal Emergency Management Agency

FIGURE D.7: SPECIAL FLOOD HAZARD AREAS IN DILLSBORO, SYLVA, AND WEBSTER



Source: Federal Emergency Management Agency

FIGURE D.8: SPECIAL FLOOD HAZARD AREAS IN FOREST HILLS



Source: Federal Emergency Management Agency

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 38 events in Jackson County since 1996.¹⁸ A summary of these events is presented in **Table D.32**. These events accounted for over \$1.4 million (2012 dollars) in property damage in the county.¹⁹ Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table D.33**.

TABLE D.32: SUMMARY OF FLOOD OCCURRENCES IN JACKSON COUNTY

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
JACKSON COUNTY	38	\$1,417,562	\$20,559
Dillsboro	1	\$0	\$0

¹⁸ These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

¹⁹ The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Forest Hills	0	\$0	\$0
Sylva	7	\$220,383	\$0
Webster	0	\$0	\$0
Unincorporated	30	\$1,339,400	\$20,559

Source: National Centers for Environmental Information

TABLE D.33: HISTORICAL FLOOD EVENTS IN JACKSON COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
North Portion	1/18/1996	Flood	0/0	\$0	\$0	--
North Portion	1/26/1996	Flood	0/0	\$0	\$0	--
Sylva	4/29/1996	Flash Flood	0/0	\$0	\$0	--
Pumpkintown	6/19/1996	Flash Flood	0/0	\$0	\$0	--
North Portion	9/28/1996	Flood	0/0	\$0	\$0	--
Sylva	2/28/1997	Flash Flood	0/0	\$0	\$0	--
East Of Sylva	2/28/1997	Flash Flood	0/0	\$0	\$0	--
Cashiers	7/23/1997	Flash Flood	0/0	\$0	\$0	--
South Portion	6/21/1998	Flash Flood	0/0	\$0	\$0	--
Sylva	8/7/2001	Flash Flood	0/0	\$0	\$0	--
South Portion	5/6/2003	Flood	0/0	\$0	\$0	--
North Portion	5/6/2003	Flood	0/0	\$0	\$0	--
North Portion	5/6/2003	Flash Flood	0/0	\$75,629	\$0	Numerous thunderstorms producing very heavy rainfall resulted in rapid rises and flash flooding along creeks and streams in area in and around the Cherokee Indian Reservation. Most creeks around the reservation flooded. The high water caused damage to numerous homes. Many bridges and campgrounds were washed away. Several rock slides and mudslides resulted in closure of major highways as well as side roads.
North Portion	5/7/2003	Flash Flood	0/0	\$151,259	\$0	Flash flooding developed for the second consecutive morning across northern portions of the county, as thunderstorms repeatedly moved over the same areas and produced intense rainfall rates. Particularly hard hit were areas from the Cherokee Indian Reservation to Dillsboro. Numerous creeks and streams overflowed their banks and flooded adjacent roadways. Mudslides also developed and caused some roads to be closed. Numerous bridges were washed out.
South Portion	5/7/2003	Flood	0/0	\$0	\$0	--
North Portion	5/7/2003	Flood	0/0	\$0	\$0	--
Cashiers	9/1/2003	Flash Flood	0/0	\$0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
South Portion	11/19/2003	Flood	0/0	\$0	\$0	--
Cullowhee	5/8/2004	Flash Flood	0/0	\$0	\$0	--
Cashiers	5/22/2004	Flash Flood	0/0	\$29,371	\$0	Slow-moving thunderstorms resulted in severe urban flooding, with 4 businesses receiving some water damage in the downtown area. Several roads were also barricaded.
Sylva	7/25/2004	Flash Flood	0/0	\$146,853	\$0	Strong thunderstorms produced very heavy rainfall in the Sylva area for several hours, resulting in a major flash flood event. Severe flooding occurred on numerous creeks and streams, including Cope Creek, Blantons Branch, Scotts Creek, and Cane Creek. Numerous roads were flooded, with some completely washed out.
South Portion	9/7/2004	Flood	0/0	\$146,853	\$10,280	Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.
North Portion	9/7/2004	Flood	0/0	\$146,853	\$10,280	Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
North Portion	9/16/2004	Flood	0/0	\$367,133	\$0	After an extended period of moderate to heavy rainfall, flooding began in Jackson County during the late evening. Cope Creek was the first stream to flood, and evacuations became necessary along the creek. Evacuations also occurred along the Tuckaseegee River, as flooding became quite severe overnight, exceeding the magnitude of the flood associated with Frances only 9 days earlier. Severe flooding also occurred along Scotts Creek, Caney Fork, and Cullowhee Creek. Scotts Creek covered Front Street in Dillsboro with 3 to 4 feet of water. Several landslides occurred, one of which destroyed several storage units at Lake Glenville. Large sections of some roads were washed out by slides or flood water, including portions of highways 19A, 281, 64, and 107, all of which were closed for long periods.
South Portion	9/16/2004	Flood	0/0	\$367,133	\$0	After an extended period of moderate to heavy rainfall, flooding began in Jackson County during the late evening. Cope Creek was the first stream to flood, and evacuations became necessary along the creek. Evacuations also occurred along the Tuckaseegee River, as flooding became quite severe overnight, exceeding the magnitude of the flood associated with Frances only 9 days earlier. Severe flooding also occurred along Scotts Creek, Caney Fork, and Cullowhee Creek. Scotts Creek covered Front Street in Dillsboro with 3 to 4 feet of water. Several landslides occurred, one of which destroyed several storage units at Lake Glenville. Large sections of some roads were washed out by slides or flood water, including portions of highways 19A, 281, 64, and 107, all of which were closed for long periods.
North Portion	6/12/2005	Flood	0/0	\$0	\$0	--
South Portion	6/12/2005	Flood	0/0	\$0	\$0	--
Cullowhee	6/20/2005	Flash Flood	0/0	\$0	\$0	--
Tuckaseegee	7/20/2005	Flash Flood	0/0	\$0	\$0	--
Sylva	8/22/2005	Flash Flood	0/0	\$0	\$0	--
Sylva	7/26/2007	Flash Flood	0/0	\$67,196	\$0	Flooding developed along Cripple Creek in the Balsam area, with floodwater entering several homes along the creek. Also, Arrowood Rd was flooded just off highway 74.
East Laport	8/26/2008	Flash Flood	0/0	\$0	\$0	--

ANNEX D: JACKSON COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
JACKSON COUNTY						
Sylva	5/16/2009	Flash Flood	0/0	\$6,334	\$0	Flooding along Allen Branch caused water to damage the underpinnings of some mobile homes along Tequila Heights (1 NE). Also, water from Cope Creek entered some apartment buildings and a business on Bridge St.
Addie	9/21/2009	Flood	0/0	\$0	\$0	--
Wilmot	1/15/2013	Flood	0/0	\$0	\$0	--
Dillsboro	1/15/2013	Flood	0/0	\$0	\$0	--
Barkers Creek	12/24/2015	Flash Flood	0/0	\$2,122	\$0	Newspaper reported flash flooding developed across portions of central Jackson County after more than 5 inches of rain fell in over 24 hours. Multiple tributaries of the Tuckasegee River overflowed their banks in the Tuckasegee and Cullowhee areas. Closed roads included Barkers Creek Rd, Caney Fork Rd, Wayehutta Rd, and Johns Creek Rd, which were all flooded by streams of the same names. Cullowhee Mountain Rd was also flooded by Cullowhee Creek and Old Settlement Rd was flooded by a small tributary to the Tuckasegee.
Tuckasegee	12/29/2015	Flood	0/0	\$53,045	\$0	After more than 3 inches of rain fell over just a few hours in the headwaters of the Tuckasegee basin, Emergency manager reported flooding developed along the West Fork of the river during the early morning hours. Several trailers were inundated with water from the stream near the intersection of Highway 107 and Fred Smith Rd. Multiple evacuations became necessary near this location.

Source: NCEI Storm Events Database

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 4,082 parcels (10 percent of the total) and 2,539 improved properties (12 percent of the total) located in the 1.0-percent annual chance floodplain or 0.2-percent annual chance floodplain within Jackson County.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. Two gauges currently exist in Jackson County at the Tuckasegee River, as presented in **Table D.34**. The maximum discharge at one of these gauges was 10,800 cubic feet per second in 2015.

TABLE D.34: SUMMARY OF DISCHARGE RATES IN JACKSON COUNTY

Water Feature	Gage Location	Median Discharge (ft ³ /s)	Max Discharge (ft ³ /s – yr)	Drainage Area (sq miles)	Max Gage Height (ft/yr)
Tuckasegee River	at Barker's Creek, Jackson County	557	10,800 (2015)	360	10.64 (2015)
Tuckasegee River	at SR1172 near Cullowhee, Jackson County	255	7,760 (2015)	147	13.97 (2013)

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been 26 flood losses reported in Jackson County through the National Flood Insurance Program (NFIP) since 1970, totaling nearly \$658,000 in claims payments. A summary of these figures for the county is provided in **Table D.35**. 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 Jackson County were either uninsured, denied claims payment, or not reported.

TABLE D.35: SUMMARY OF INSURED FLOOD LOSSES IN JACKSON COUNTY

Location	Flood Losses	Claims Payments
JACKSON COUNTY	26	\$657,990
Dillsboro	4	\$262,079
Forest Hills	0	\$0
Sylva	4	\$121,213
Webster	0	\$0
Unincorporated Area	18	\$274,698

Source: FEMA, NFIP

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.

As of February 2017, there are three non-mitigated repetitive loss properties located in Jackson County, which accounted for six losses and more than \$185,000 in claims payments under the NFIP. The average claim amount for these properties is \$30,863. Two of the properties are single family residential, and the other is nonresidential. Without mitigation these properties will likely continue to experience flood losses. **Table D.36** presents detailed information on repetitive loss properties and NFIP claims and policies for Jackson County.

TABLE D.36: SUMMARY OF REPETITIVE LOSS PROPERTIES IN JACKSON COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payment	Total Payments	Average Payment
JACKSON COUNTY	3		6	\$95,178	\$90,000	\$185,178	\$30,863
Dillsboro	0	-	0	\$0	\$0	\$0	\$0
Forest Hills	0	-	0	\$0	\$0	\$0	\$0
Sylva	0	-	0	\$0	\$0	\$0	\$0
Webster	0	-	0	\$0	\$0	\$0	\$0
Unincorporated Area	3	2 single family, 1 other nonresidential	6	\$95,178	\$90,000	\$185,178	\$30,863

Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat in Jackson County. NCEI's Storm Events Database indicated 38 flood events in Jackson County between 1996 and 2016, resulting in almost two flood events per year on average. Information on previous NFIP losses also indicates ongoing flood risk. Therefore, flood was assigned a probability of "highly likely" (greater than 90 percent annual probability).

The participating jurisdictions and unincorporated areas of the county have risk to flooding, though not all areas will experience flood. 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 county and participating jurisdictions. Flood 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.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 D.37** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and **Table D.38** presents potential at-risk property susceptible to either the 1.0-percent or 0.2-percent annual chance flood in Jackson County. Both the number of parcels and the approximate value are presented.

TABLE D.37: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF) FLOOD HAZARD

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	3,893	10%	2,410	11%	\$895,091,090	17%
Dillsboro	53	32%	40	33%	\$10,506,130	45%
Forest Hills	21	10%	15	11%	\$2,297,880	11%
Sylva	215	14%	176	15%	\$37,073,890	16%
Webster	46	19%	34	20%	\$34,082,800	57%
Unincorporated Area	3,557	10%	2,144	11%	\$809,081,430	16%
EBCI	1	17%	1	25%	\$2,048,960	83%

Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE D.38: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	4,082	10%	2,539	12%	\$916,599,010	17%
Dillsboro	72	43%	53	43%	\$12,234,300	53%
Forest Hills	24	11%	18	14%	\$2,655,310	13%
Sylva	226	15%	187	16%	\$38,089,880	17%
Webster	48	20%	35	21%	\$34,369,360	57%
Unincorporated Area	3,711	10%	2,245	11%	\$827,201,200	16%
EBCI	1	17%	1	25%	\$2,048,960	83%

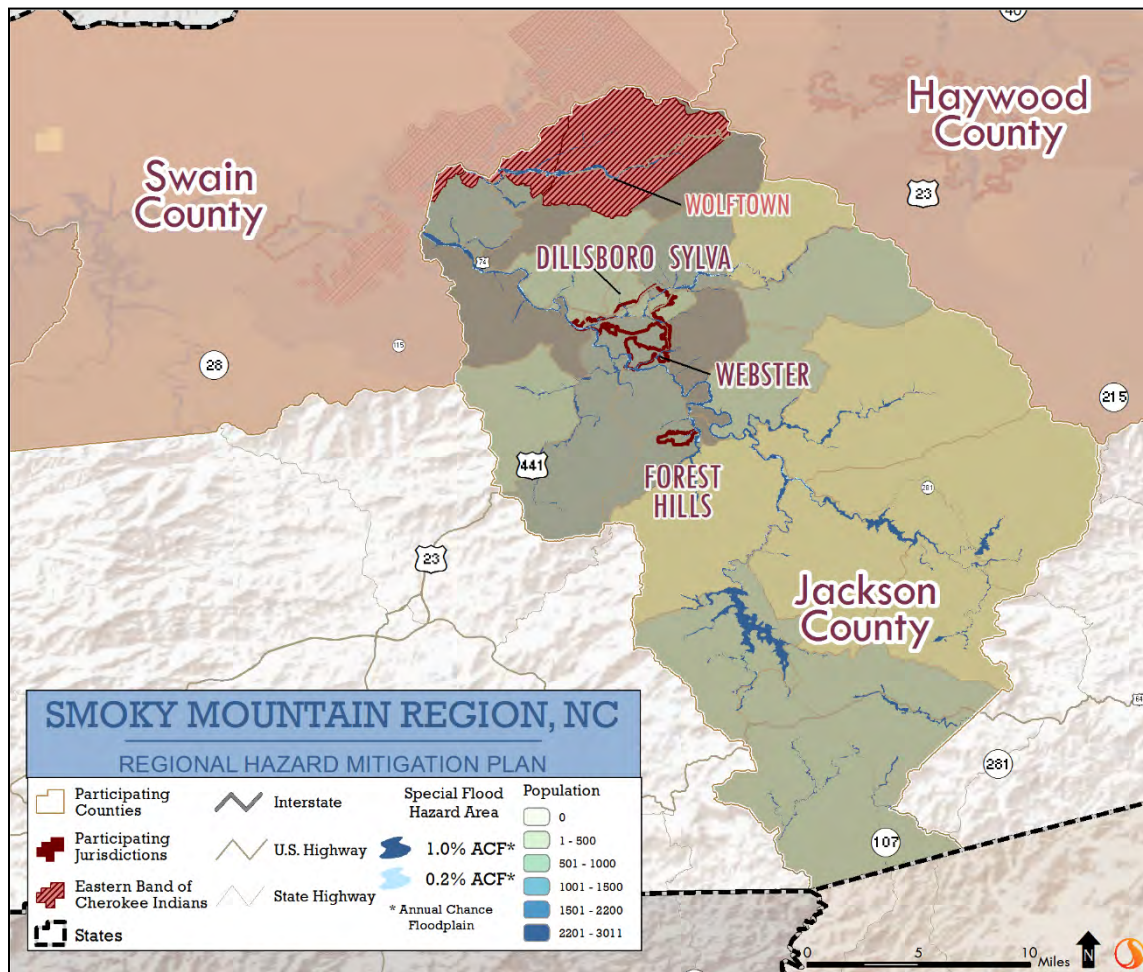
Source: FEMA DFIRM

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure D.9** is presented to gain a better understanding of at risk population.

FIGURE D.9 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census Bureau 2015

Critical Facilities

The critical facility analysis revealed that there is a total of three critical facilities located in the Jackson County 1.0-percent annual chance floodplain and 0.2-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.) Analysis indicates one fire station (Cullowhee Fire Department Substation 3) and one rescue squad (Glenville-Cashiers Rescue Squad) in the 1.0-percent annual chance floodplain and one school (Cullowhee Valley School) in the 0.2-percent annual chance floodplain. A list of specific critical facilities and their associated risk can be found in **Table D.48** at the end of this section.

In conclusion, a flood has the potential to impact many existing and future buildings and populations in Jackson County, 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 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain as provided by FEMA. It is certainly possible more severe events could occur beyond these boundaries or urban (flash) flooding could impact additional structures. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan

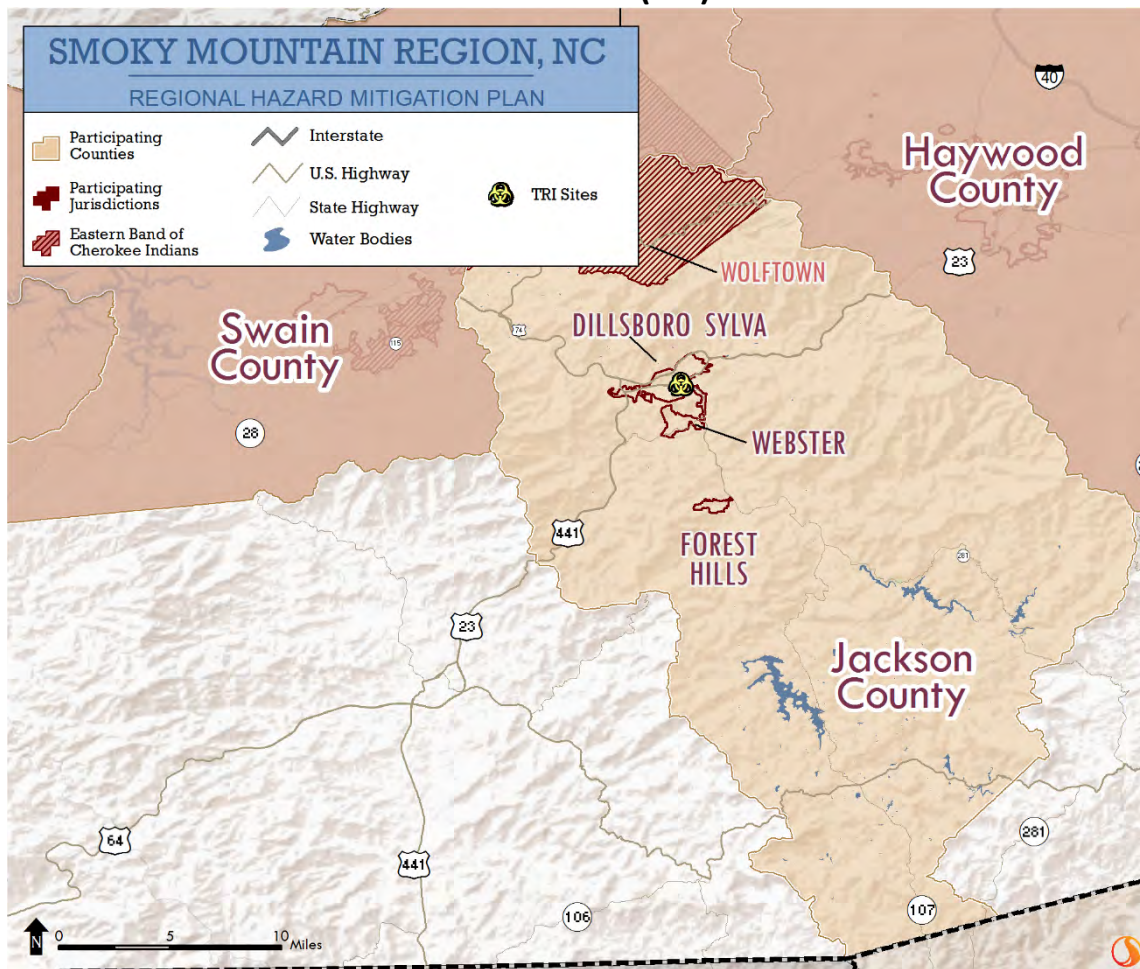
updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

D.2.15 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Jackson County has one TRI site. This site is shown in **Figure D.10**.

FIGURE D.10: TOXIC RELEASE INVENTORY (TRI) SITES IN JACKSON COUNTY



In addition to “fixed” hazardous materials locations, hazardous materials may also impact the county via roadways and rail. Many roads in the county are narrow and winding, making hazardous material

transport in the area especially treacherous. All roads that permit hazardous material transport are considered potentially at risk to an incident.

Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” (highlighted in yellow in **Table D.39** below) 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 materials “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 persons due to the presence of hazardous material, or
- ◆ a vehicle accident or derailment resulting in the release of a hazardous material.

There have been four hazardous materials incidents in Jackson County. **Table D.39** presents detailed information on historic HAZMAT incidents reported in Jackson County.

TABLE D.39: SUMMARY OF HAZMAT INCIDENTS IN JACKSON COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (\$)	Quantity Released
Jackson County							
I-1980101535	10/2/1980	Cashiers	Highway	No	0/0	\$0	1 LGA
I-1979010129	12/31/1978	Cashiers	Highway	No	0/0	\$0	3 LGA
I-1980091406	9/15/1980	Cashiers	Highway	No	0/0	\$0	1 LGA
I-1980030761	2/26/1980	Cashiers	Highway	No	0/0	\$0	1 LGA

Source: USDOT PHMSA

Extent

Hazardous Materials Incidence extent can be defined into terms of amount of material released or associated impacts. The greatest amount recorded to date was 3 LGA. However, greater releases are possible (and, several hundred general classify an incident).

Probability of Future Occurrences

Given the location of one toxic release inventory site in Jackson County and several roadway incidents, it is possible that a hazardous material incident may occur in the county. With four recorded events, a hazardous materials incident is possible (between 1% and 10% annual probability). County and town

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.

Although there is only one TRI site and a limited record of previous events, hazardous materials incidents will continue to be a threat to the county. The county may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

Vulnerability Assessment

Although existing Toxic Release Inventory sites indicate that Jackson County is susceptible to hazardous materials events, there are no reports of damage. It is assumed that while one major event could result in significant losses for Jackson County.

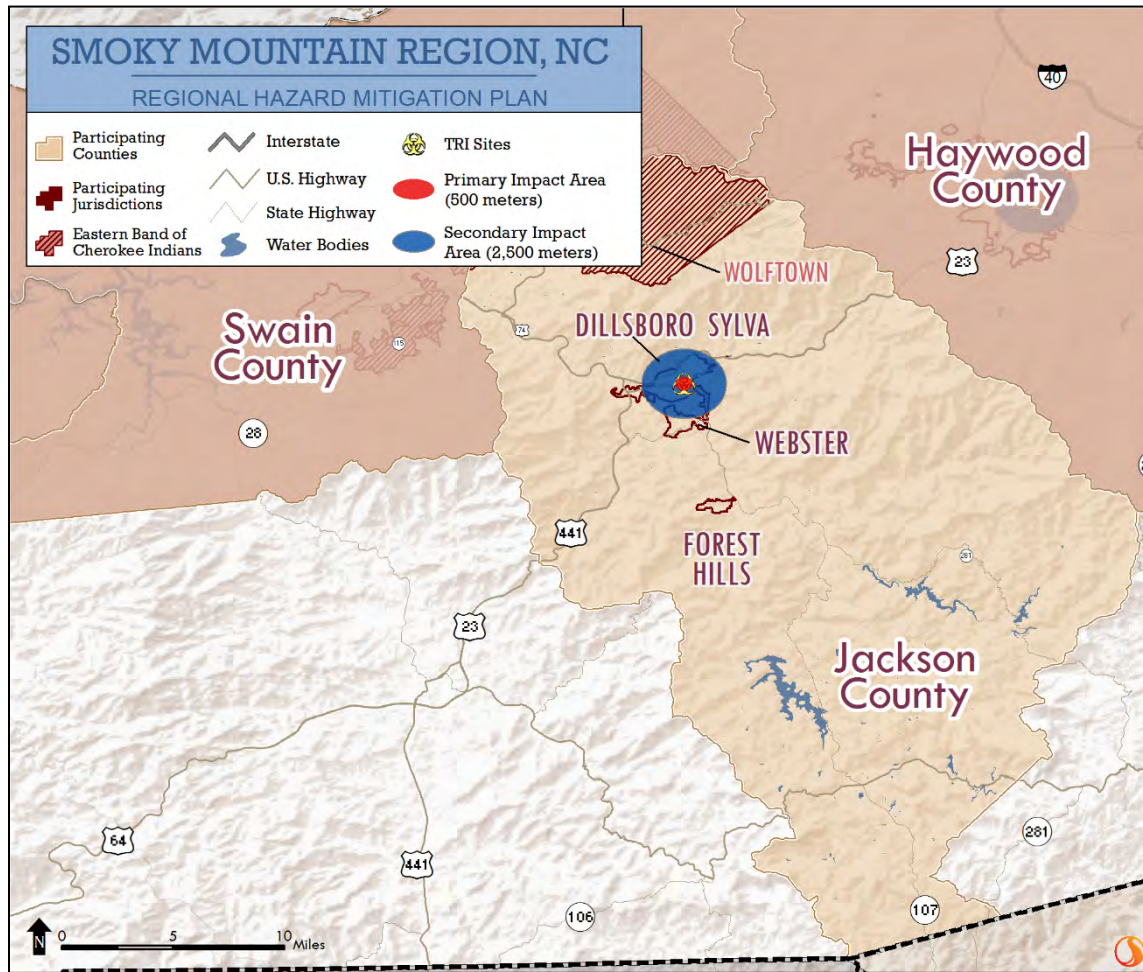
Most hazardous materials incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause multiple deaths, completely shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. In a hazardous materials 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.²⁰ In both scenarios, two sizes of buffers—500 and 2,500 meters—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 Jackson County, along with buffers, were used for analysis as shown in **Figure D.11**. 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 D.12** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table D.40** (fixed sites), **Table D.41** (mobile road sites) and **Table D.42** (mobile railroad sites).²¹

²⁰ This type of analysis will likely yield conservative results (typically an overestimation of what is typically reported).

²¹ Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE D.11 : TRI SITES WITH BUFFERS IN JACKSON COUNTY



Source: EPA

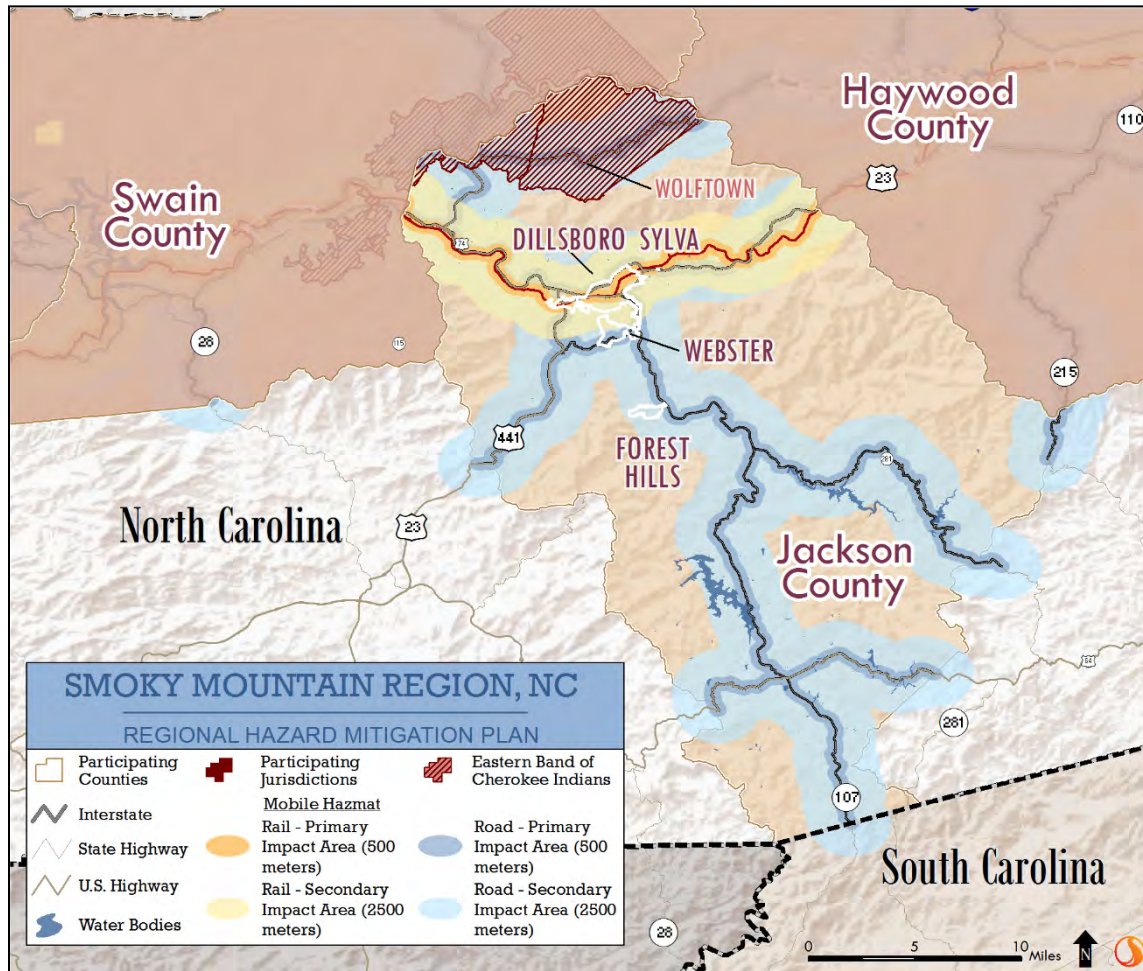
TABLE D.40: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (FIXED SITES)

Location	500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	188	0%	144	1%	\$21,102,000	0%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	188	13%	144	13%	\$21,102,000	9%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	0	0%	0	0%	\$0	0%
EBCI	0	0%	0	0%	\$0	0%

Location	2,500-meter Buffer – Fixed Sites					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	2,347	6%	1,705	8%	\$297,969,620	6%
Dillsboro	0	0%	0	0%	\$0	0%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	1,473	99%	1,128	99%	\$219,233,820	95%
Webster	55	23%	25	15%	\$3,048,470	5%
Unincorporated Area	819	2%	552	3%	\$75,687,330	2%
EBCI	0	0%	0	0%	\$0	0%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

FIGURE D.12 : MOBILE HAZMAT BUFFERS IN JACKSON COUNTY



**TABLE D.41: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - ROAD)**

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	11,976	30%	7,538	35%	\$1,857,828,950	35%
Dillsboro	144	86%	106	87%	\$18,156,800	79%
Forest Hills	30	14%	24	18%	\$2,833,440	14%
Sylva	1,157	78%	903	79%	\$201,155,290	87%
Webster	165	68%	132	78%	\$54,582,450	91%
Unincorporated Area	10,477	28%	6,371	32%	\$1,580,679,920	31%
EBCI	3	50%	2	50%	\$421,050	17%

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	31,366	80%	18,026	83%	\$4,625,487,570	86%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	216	100%	132	100%	\$20,556,040	100%
Sylva	1,491	100%	1,143	100%	\$230,088,520	100%
Webster	244	100%	170	100%	\$60,049,220	100%
Unincorporated Area	29,242	79%	16,455	82%	\$4,289,211,350	85%
EBCI	6	100%	4	100%	\$2,478,510	100%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

**TABLE D.42: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	3,101	8%	2,112	10%	\$321,863,250	6%
Dillsboro	163	98%	120	98%	\$22,624,340	98%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	982	66%	763	67%	\$147,063,470	64%
Webster	0	0%	0	0%	\$0	0%
Unincorporated Area	1,956	5%	1,229	6%	\$152,175,440	3%
EBCI	0	0%	0	0%	\$0	0%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	10,378	26%	6,479	30%	\$944,849,580	18%
Dillsboro	167	100%	122	100%	\$23,103,930	100%
Forest Hills	0	0%	0	0%	\$0	0%
Sylva	1,475	99%	1,129	99%	\$218,444,500	95%
Webster	67	27%	32	19%	\$4,829,210	8%
Unincorporated Area	8,664	23%	5,193	26%	\$696,001,930	14%
EBCI	5	83%	3	75%	\$2,470,010	100%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk to a hazardous materials incident. 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 13 Jackson County facilities located in a HAZMAT risk zone. All but two of the facilities are located in the secondary, 2,500 meter zone. The number of critical facilities within HAZMAT risk zones for each jurisdiction in Jackson County are detailed in **Table D.43**. A list of specific critical facilities and their associated risk can be found in **Table D.48** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors in Jackson County revealed that there are 45 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 21 critical facilities located in the railroad HAZMAT buffer areas. A list of specific critical facilities and their associated risk can be found in **Table D.48** at the end of this section.

TABLE D.43: CRITICAL FACILITIES IN HAZMAT RISK ZONES

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
Jackson County	2	13	37	45	10	21
Dillsboro	0	0	0	0	0	0
Forest Hills	0	0	0	0	0	0
Sylva	2	11	10	11	7	11
Webster	0	0	2	2	0	0
Unincorporated Area	0	2	25	32	3	10
EBCI	0	0	0	0	0	0

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in Jackson County. Those areas in a primary buffer area 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. Further, incidents in neighboring counties could also the county.

D.2.16 Wildfire

Location

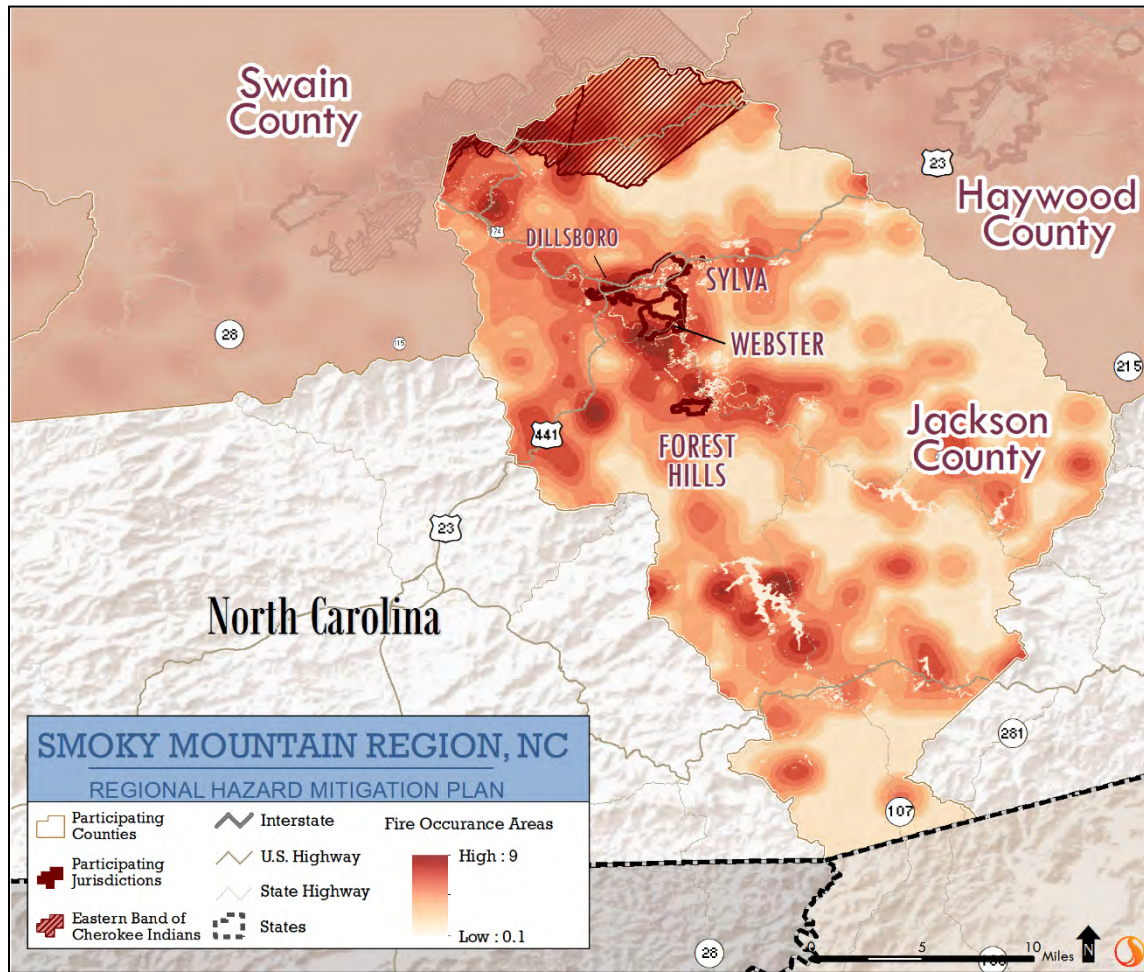
The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic locations impacted.

Historical Occurrences

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county.

Figure D.13 shows the Fire Occurrence Areas (FOA) in Jackson County based on data from the Southern Wildfire Risk Assessment.

FIGURE D.13: HISTORIC WILDFIRE EVENTS IN JACKSON COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, Jackson County experiences an average of 41 wildfires annually which burn an average of 206 acres per year. The data indicates that most of these fires are small, averaging five acres per fire. **Table D.44** lists the number of reported wildfire occurrences in the county between the years 2002 and 2016.

TABLE D.44: HISTORICAL WILDFIRE OCCURRENCES IN JACKSON COUNTY

Year	Number of Fires	Number of Acres Burned
2002	41	156.9
2003	27	40.7
2004	60	128.1
2005	33	185
2006	57	540.1
2007	75	367
2008	53	95

Year	Number of Fires	Number of Acres Burned
2009	44	76
2010	30	147
2011	20	46
2012	15	76
2013	14	10
2014	34	130
2015	16	28
2016	77	1064

Source: North Carolina Division of Forest Resources

2016 Wildfires

In the late October through November of 2016, western North Carolina suffered from historic wildfires. In November alone, western North Carolina experienced an outbreak of wildfires that burned over 55,000 acres in the wake of an extreme drought.²² Within the Smoky Mountain Region, Swain and Graham Counties experienced fires of historic extent. Jackson County also experienced a substantial increase in acres burned, with 1,064 acres burned in 2016 compared to 203 acres burned per year on average.

Firefighting and rescue crews from all over the state traveled to western North Carolina to aid in relief efforts.²³ According to the USDA's Joint Information Center Western NC Wildfires, by November 25, 2016, nine incident management teams and over 6,000 state and federal personnel from all over the country were deployed to assist the Southeast with fire suppression, in addition to hundreds of state volunteer firefighters and emergency personnel. At the time, North Carolina alone was in use of seven airplanes, eight single engine air tankers (SEATs), six type 1 (large) helicopters, five type 2 (medium) helicopters, and three type 3 (large helicopters) to aid in fire suppression.²⁴ The USDA estimates that suppression costs from October through December in western North Carolina totaled \$36.8 million.²⁵ Aside from the impacts to human and environmental health and safety, the fires had a significant impact on the region's economy, which relies heavily on tourism during the fall and winter months.²⁶

Extent

Wildfire extent can be measured in terms of number of fires and number of acres burned. Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2002 to 2016. The greatest number of fires to occur in Jackson County in any year was 77 in 2016. The greatest number of acres to burn in the county in a single year also occurred in 2016 when 1,064 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

²² <http://www.charlotteobserver.com/news/local/article114911183.html>

²³ <http://myfox8.com/2016/11/22/new-wildfire-sparks-evacuations-in-blowing-rock/>

²⁴ UDA Forest Services Joint Information Center Western NC Wildfires. Evening Summary (2016, November 25). Retrieved from <https://www.fs.usda.gov/detail/nfsnc/alerts-notices/?cid=fseprd525902>

²⁵ <http://www.citizen-times.com/story/news/local/2017/03/31/wnc-wildfires-yield-hefty-price-tag/99736410/>

²⁶ <http://www.citizen-times.com/story/news/local/2016/11/18/outbreak-wnc-wildfires-takes-toll-wildlife-environment/93788956/>

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Jackson County. 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. This is the case for participating jurisdictions where historical fire events appear to be higher than some of the surrounding areas. 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 Jackson County for future wildfire events is highly likely (greater than percent annual probability).

Vulnerability Assessment

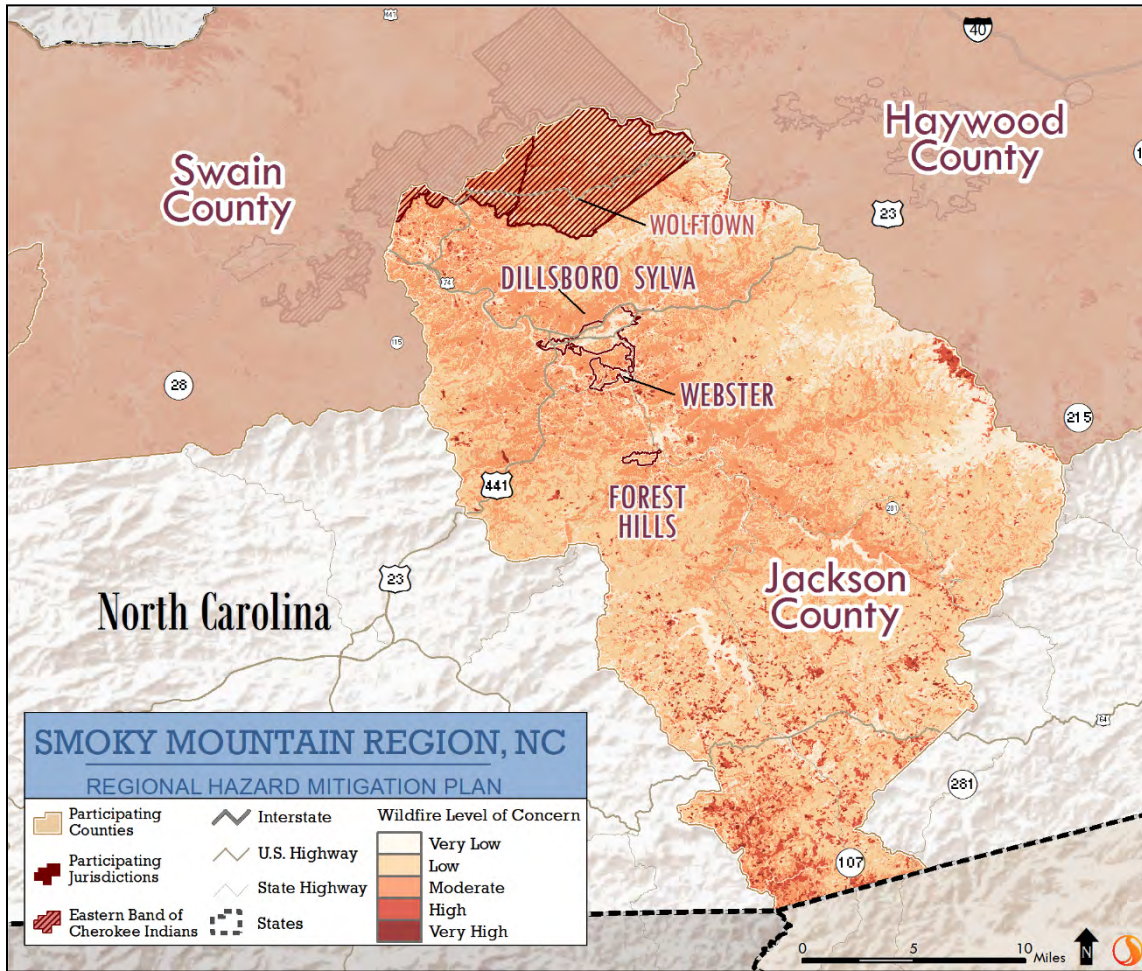
Although historical evidence indicates that Jackson County is susceptible to wildfire events, there are few reports of damage. It should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non- specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

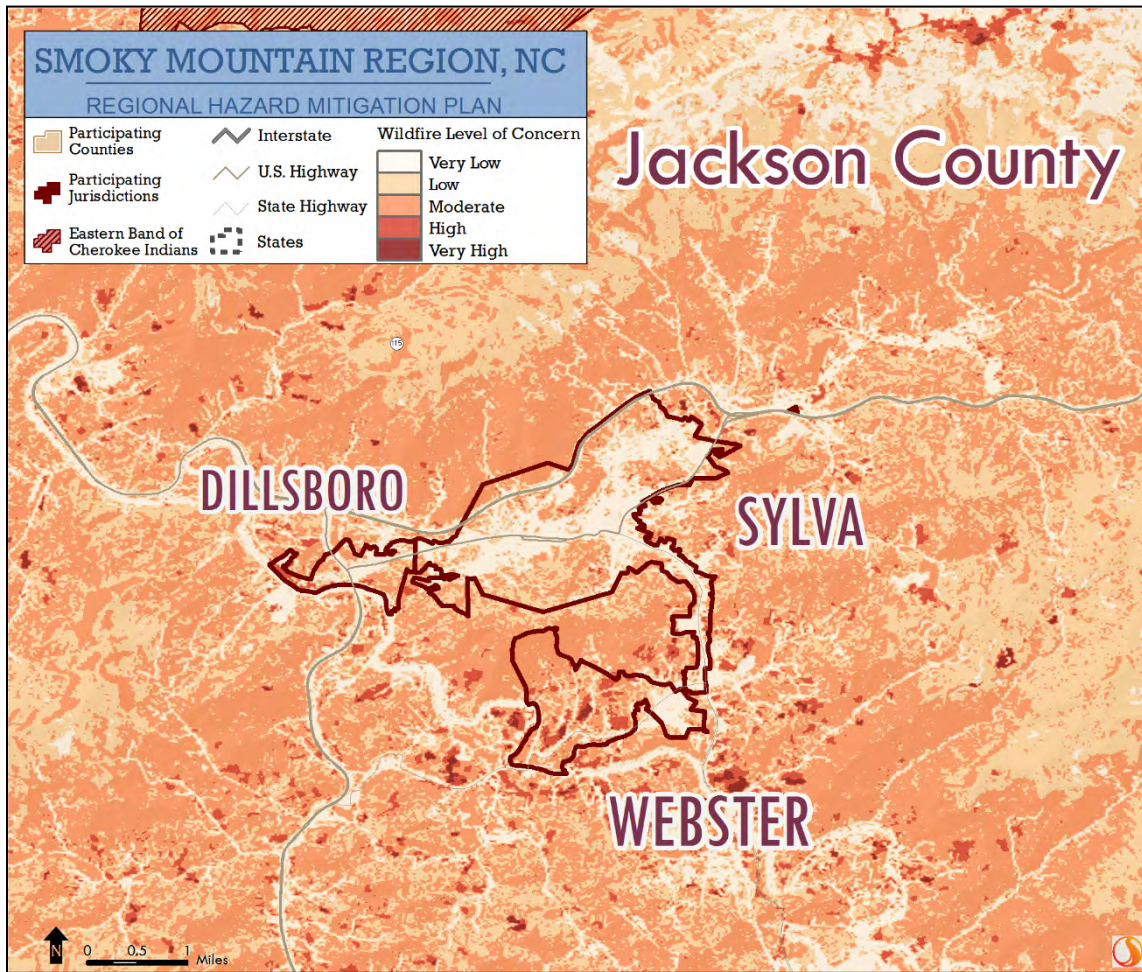
Figure D.14, Figure D.15, and Figure D.16 show the wildfire risk areas for Cherokee County and participating jurisdictions. Initially provided as raster data, it was converted to a polygon for analysis. Jackson County has the highest number (but not percentage) of parcels and improved parcels in areas of high to very high risk when compared to the region, as detailed in **Table D.45**. However, there is considerable risk overall when viewed outside of just high risk areas.

FIGURE D.14: WILDFIRE RISK AREAS IN JACKSON COUNTY



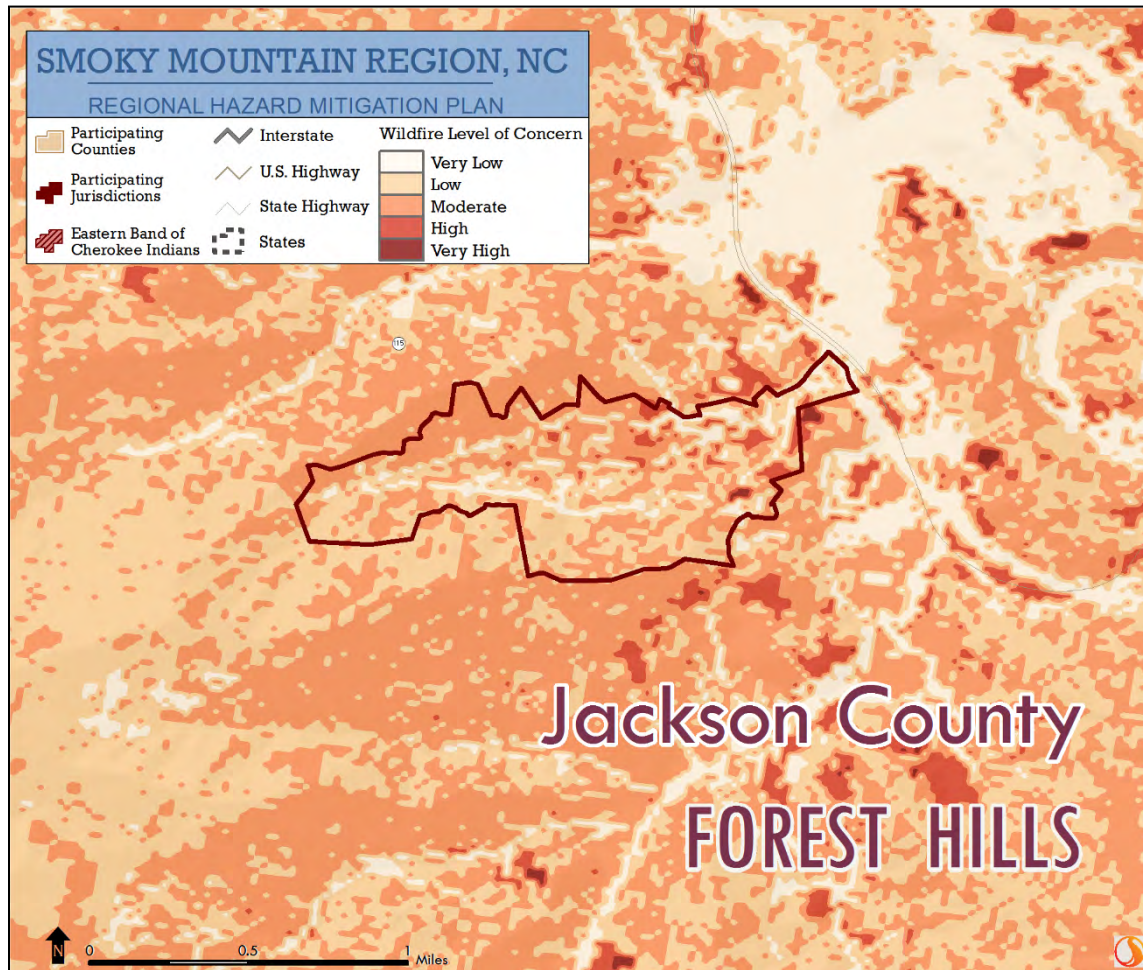
Source: Southern Wildfire Risk Assessment Data

FIGURE D.15: WILDFIRE RISK AREAS IN DILLSBORO, SYLVA, AND WEBSTER



Source: Southern Wildfire Risk Assessment Data

FIGURE D.16: WILDFIRE RISK AREAS IN FOREST HILLS



Source: Southern Wildfire Risk Assessment Data

TABLE D.45: EXPOSURE OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Jackson County	11,654	30%	7,173	33%	\$2,218,575,680	41%
Dillsboro	42	25%	29	24%	\$8,791,060	38%
Forest Hills	55	25%	43	33%	\$7,856,260	38%
Sylva	166	11%	140	12%	\$66,234,930	29%
Webster	162	66%	119	70%	\$36,406,090	61%
Unincorporated Area	11,226	30%	6,840	34%	\$2,096,886,130	42%
EBCI	3	50%	2	50%	\$2,401,210	97%

Looking at jurisdictional level, unincorporated areas of the county face the highest level of wildfire risk. While the jurisdictions report a fairly low number of parcels and improvements in high or very high risk

areas, each should be mindful that they are on the urban-wildland boundary and fire may quickly spread to those lower areas of concern. In general, densely developed areas that are not in the wildland urban interface, which are present in some jurisdictional areas, are at a lower risk to wildfire.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. 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

The critical facility analysis revealed that there are two critical facilities, both fire stations, located in high to very high wildfire risk areas. These facilities include the Balsam Main Fire Station and the Canada Fire Station. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in Table D.48 at the end of this section.

D.2.17 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Jackson County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table D.46 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE D.46: SUMMARY OF PRI RESULTS FOR JACKSON COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Highly Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.6
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Limited	Negligible	Less than 6 hours	Less than 6 hours	2.5
Thunderstorm/High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 6 hours	3.0
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.0
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.5
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	1.8
Flood	Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3.0
Other Hazards						
Hazardous Materials Incident	Possible	Limited	Small	Less than 6 hours	Less than 24 hours	2.2
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

D.2.18 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Jackson County, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table D.47**). 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 Jackson County. A more quantitative

analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section D.4. 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.

TABLE D.47: CONCLUSIONS ON HAZARD RISK FOR JACKSON COUNTY

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire
MODERATE RISK	Hurricane and Coastal Storm Lightning Landslide/Drought Hailstorm
LOW RISK	Hazardous Material Incident Tornado/Dam and Levee Failure Erosion Earthquake

Conclusions on Hazard Vulnerability

The results of this vulnerability assessment are useful in at least three ways:

- ◆ Informed decision-making based on improved understanding of risk.
- ◆ Baseline measure on which to reduce risk.
- ◆ Relative comparison of risk among the natural hazards addressed to prioritize greatest needs.

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 atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table D.48** 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”).

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TABLE D.48: AT-RISK CRITICAL FACILITIES IN JACKSON COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC			OTHER					
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
JACKSON COUNTY																				
Glenville Cashiers EMS	EMS/EOC	X	X	X	X	X	X	X	X	X						X	X			
Glenville Cashiers Rescue Squad	EMS/EOC	X	X	X	X	X	X	X	X	X		X	X			X	X			
Harris Regional Hospital EMS Base	EMS/EOC	X	X	X	X	X	X	X	X		X			X	X	X			X	
Jackson County Emergency Mgmt	EMS/EOC	X	X	X	X	X	X	X	X		X				X	X			X	
Qualla Volunteer Fire Rescue	EMS/EOC	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
SR 1340 EMS Base	EMS/EOC	X	X	X	X	X	X	X	X		X						X			
Webster Complex JC Rescue Squad	EMS/EOC	X	X	X	X	X	X	X	X		X			X	X	X			X	
Balsam Main Station	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	X
Balsam Woodfin	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	
Canada	Fire Station	X	X	X	X	X	X	X	X		X				X	X				X
Cashiers Catfish Run	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Cashiers Flat Creek	Fire Station	X	X	X	X	X	X	X	X		X									
Cashiers Main Station	Fire Station	X	X	X	X	X	X	X	X	X					X	X				
Cashiers US 65	Fire Station	X	X	X	X	X	X	X	X	X					X	X				
Cashiers Yellow Mountain Fire Station	Fire Station	X	X	X	X	X	X	X	X		X									
Cullowhee Caney Fork	Fire Station	X	X	X	X	X	X	X	X		X	X	X							

ANNEX D: JACKSON COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Cullowhee Main	Fire Station	X	X	X	X	X	X	X	X		X						X			
Cullowhee Tuckasegee	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Qualla Main Station	Fire Station	X	X	X	X	X	X	X	X		X				X	X			X	
Qualla Substation	Fire Station	X	X	X	X	X	X	X	X		X				X	X	X	X		
Savannah Main	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Savannah Pumpkintown Rd	Fire Station	X	X	X	X	X	X	X	X		X					X				
Sylva County Services Substation	Fire Station	X	X	X	X	X	X	X	X		X				X	X				
Sylva Main Station	Fire Station	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Cashiers County Office Bldg	Government Office	X	X	X	X	X	X	X	X	X					X	X				
Community Services Center	Government Office	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Justice & Administration Center	Government Office	X	X	X	X	X	X	X	X		X				X	X	X		X	
Old Dillsboro Rd	Government Office	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Skyland Services Center	Government Office	X	X	X	X	X	X	X	X		X				X		X	X	X	
Webster Complex	Government Office	X	X	X	X	X	X	X	X		X				X	X	X			
Sylva Dialysis	Health Center	X	X	X	X	X	X	X	X		X				X	X	X		X	
Highway Patrol	Highway Patrol	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	
Harris Regional Hospital	Hospital	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Sylva Police Department	Police Station	X	X	X	X	X	X	X	X		X				X	X	X	X	X	
Cashiers Recreation Center	Recreation Center	X	X	X	X	X	X	X	X	X						X	X			
Cullowhee Recreation Center	Recreation Center	X	X	X	X	X	X	X	X		X					X	X			

ANNEX D: JACKSON COUNTY

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Blue Ridge School	School	X	X	X	X	X	X	X	X	X					X	X				
Cullowhee Valley School	School	X	X	X	X	X	X	X	X		X		X		X	X				
Fairview School	School	X	X	X	X	X	X	X	X		X					X				
Scotts Creek Elementary School	School	X	X	X	X	X	X	X	X		X					X		X		
Smokey Mountain Elementary School	School	X	X	X	X	X	X	X	X		X				X	X		X		
Smoky Mountain High School	School	X	X	X	X	X	X	X	X		X				X	X				
Southwestern Community College Campus	School	X	X	X	X	X	X	X	X		X				X	X				
Summit Charter School	School	X	X	X	X	X	X	X	X	X						X				
WCU Albright / Benton Residence Halls	School	X	X	X	X	X	X	X	X		X					X				
Sheriff Office	Sheriff's Office	X	X	X	X	X	X	X	X		X				X	X	X		X	
Sheriff Substation Cashiers Glenville	Sheriff's Office	X	X	X	X	X	X	X	X	X					X	X				
Sheriff Substation Qualla	Sheriff's Office	X	X	X	X	X	X	X	X		X				X	X	X	X		

D.3 JACKSON COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of Jackson County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

D.3.1 Planning and Regulatory Capability

Table D.49 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the jurisdictions in the Smoky Mountain Region. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE D.49: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool																							
	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
Jackson County	✓	✓		✓	✓		✓	✓			✓	✓	✓	✓	✓	✓			✓	✓	✓		
Dillsboro	✓	✓	✓		✓		✓								✓	✓	✓			✓		✓	
Forest Hills	✓	✓	✓		✓		✓				✓			✓	✓	✓				✓		✓	
Sylva	✓	✓			✓		✓							✓	✓	✓			✓		✓	✓	
Webster	✓	✓	✓		✓		✓				✓			✓	✓	✓			✓			✓	

A more detailed discussion on the county’s planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan

Jackson County has previously adopted a hazard mitigation plan. The Towns of Dillsboro, Sylva, and Webster and the Village of Forest Hills were also included in this plan.

Emergency Operations Plan

Jackson County maintains an emergency operations plan through its Emergency Management Department. The plan is a countywide plan that covers all of its municipalities (Dillsboro, Forest Hills, Sylva, and Webster).

Continuity of Operations Plan

Jackson County is the only county in the Smoky Mountain Region that has adopted a continuity of operations plan.

General Planning

Comprehensive Land Use Plan

Jackson County and all of its participating jurisdictions have adopted comprehensive land use plans.

Capital Improvements Plan

Jackson County, Forest Hills, and Webster have capital improvement plans in place to guide the schedule of spending on public improvements.

Historic Preservation Plan

Jackson County is the only participating jurisdiction in the Smoky Mountain region that has a historic preservation plan.

Zoning Ordinance

Jackson County and all four of its jurisdictions have adopted and enforce zoning ordinances. These ordinances are intended to promote and enhance the unique community atmosphere and preserve the social, economic, cultural, historic, and aesthetic conditions.

Subdivision Ordinance

Jackson County's Code of Ordinances includes subdivision regulations which address steep slope and flood hazard. All of the participating jurisdictions in Jackson County have also adopted subdivision ordinances.

Building Codes, fire Codes, Permitting, and Inspections

North Carolina has a state compulsory building code which applies throughout the state. Jackson County and all of its participating jurisdictions have adopted a building code. The building code is enforced throughout the county by the county building inspector. Jackson County and Sylva have adopted fire codes.

Floodplain Management

Table D.50 provides NFIP policy and claim information for each participating jurisdiction in Jackson County.

TABLE D.50: 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
Jackson County	5/17/89	4/19/10	238	\$56,339,800	18	\$274,698
Dillsboro	5/15/86	4/19/10	9	\$2,635,000	4	\$262,079
Forest Hills	5/10/10	4/19/10	2	\$273,500	--	--
Sylva	7/3/86	4/19/10	33	\$8,425,800	4	\$121,213
Webster	4/19/10	4/19/10	5	\$761,000	--	--

(M) – No Elevation Determined, all Zone A, C and X

(S) – Suspended Community

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Jackson County, Dillsboro, Forest Hills, Sylva, and Webster all participate in the NFIP and have adopted flood damage prevention regulations.

Floodplain Management Plan

The Towns of Dillsboro and Webster and the Village of Forest Hills have adopted floodplain management plans.

Stormwater Management Plan

Jackson County and all of its participating jurisdictions have adopted stormwater management plans.

Open Space Management Plan

Jackson County has adopted an open space management plan since the last hazard mitigation plan update occurred.

D.3.2 Administrative and Technical Capability

Table D.51 provides a summary of the capability assessment results for the Smoky Mountain Region with regard to relevant staff and personnel resources. A symbol was used to indicate the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A “C” indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (since the 2017 plan).

TABLE D.51: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Jackson County	✓	✓	✓	✓	✓		✓	✓	✓	✓
Dillsboro										
Forest Hills										
Sylva								✓		
Webster										

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.

D.4.3 Fiscal Capability

Table D.52 provides a summary of the results for Cherokee County with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A "C" indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE D.52: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Jackson County	✓	✓							✓
Dillsboro	✓								✓
Forest Hills	✓								✓
Sylva									✓
Webster	✓								✓

D.3.4 Political Capability

Jackson County feels that the majority of citizens will accept the implementation of a hazard mitigation plan. However, the county does feel that the plan will face some resistance and that the public will need to be educated about the mitigation plan. Many residents are opposed to zoning or land use plans of any kind and it is believed that a mitigation plan will be seen as a form of zoning. Issues such as this will need to be clarified and resolved before the public will accept a mitigation plan.

Damage caused by past disasters will prove helpful in educating the public as to why a mitigation plan is needed. The county and towns plan on holding public meetings and implementing school programs so that community members will be well informed. Well informed citizens can increase the effectiveness of a hazard mitigation plan and will aid in overcoming political obstacles that may face implementation.

D.3.5 Conclusions on Local Capability

The county and its jurisdictions lack a disaster recovery plan. With the results of this plan’s risk assessment, Jackson County and its jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction’s economic development goals.

Jackson County, Forest Hills, and Webster have adopted capital improvement plans. A capital improvement plan can be used to direct capital funds to public improvements located out of high-risk

areas. Additionally, a capital improvement plan can be cross-referenced with this plan to identify public improvements located in at-risk areas and allocate funds for safeguarding those improvements.

Jackson County and its participating jurisdictions benefit from having general land development plans and ordinances. The county and all participating jurisdictions have adopted comprehensive land use plans, zoning ordinances, and subdivision ordinances. These plans and ordinances can be used to guide growth and development out of high-risk areas.

Jackson County also benefits from a high technical and staffing capability, and responded to having all staffing resources listed in the survey, except for a land surveyor. Participating jurisdictions could benefit from partnering with the county or forming an intergovernmental agreement to share these resources.

It is recognized that Jackson County has well over 200 homes each in the NFIP. Participation in the Community Rating System could be worthwhile as having a CRS rating of 8 or better will result in significant dollars remaining in the community. However, this decision must be carefully considered and committed to at the local level given the need for program administration.

D.4 JACKSON COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Jackson County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the SMRHMP and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

D.4.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Jackson County developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table D.53**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE A.53: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards.

	Goal
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

D.4.2 Mitigation Action Plan

The mitigation actions proposed by Jackson County, the Town of Dillsboro, the Village of Forest Hills, the Town of Sylva, and the Town of Webster are listed in the following individual Mitigation Action Plans.

Jackson County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Emergency Management	Unknown	General revenue	Completed	Completed. New floodplain maps have been placed into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Erosion Control Officer	Unknown	General revenue	Completed	Completed. The County continues to actively enforce codes and ordinances that apply to hazards and public safety.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	Completed. Annual reviews	Jackson County Emergency Management reviews the Emergency Operations Plan on an annual basis and amends the plan as necessary.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Erosion Control Officer	Unknown	General revenue	2022	In progress. The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	County Fire Marshal	Unknown	General revenue	Completed	The County Fire Marshal reviews the County's fire management plan and amends the plan as necessary.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	County Planning	Unknown	General revenue	Completed	Completed. The County has an adopted Subdivision Ordinance that include standards for roadway design. The Planning Department maintains the ordinance and recommends amendments as necessary.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Flood; Landslide; Severe Thunderstorm	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	Completed. The County's land use plan supports the Mountain and Hillside Development Ordinance which includes regulations regarding development on steep slopes.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Emergency Management	Unknown	General revenue	Completed	Completed. The County has acquired a small GPS system to assist with the documentation of hazard location for local and state use.
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Landslide; Wind	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The County Building Inspections department continues to enforce all building code requirements for manufactured homes.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	County Emergency Management	Unknown	General revenue	2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	Unknown	General revenue	2022	The County continues to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. Currently no critical public structures require relocation or elevation.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. Will continue to enforce new building codes which prohibit building in floodplain.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	County Emergency Management	Unknown	Grants for acquisition funds	2022	The County has and will continue to seek funding, as appropriate, to purchase non-residential property that has been damaged during a prior disaster.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain stream maintenance throughout the community to the fullest extent possible.	Flood; Dam Failure	High	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County continues to actively improve and maintain stream maintenance through the Erosion and Sedimentation Control Ordinance.
NRP-2	Preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County has and continues to identify conservation opportunities that preserve natural wetlands and other significant natural resources.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022	The County continues to evaluate funding opportunities to purchase stream monitoring equipment. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	County Emergency Management	Unknown	General revenue	2022	The Emergency Management Department is engaged with surrounding communities and counties to coordinate resources during response and recovery events.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Erosion Control Officer	Unknown	General revenue	2022-2030	The County has and continues to educate contractors, developers and homeowners regarding best management practices but no formal program is in place.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	County Emergency Management	Unknown	General revenue	2022	The Emergency Management Department has a dedicated webpage that includes updated information regarding potential hazards in the County. The website also includes the ability to participate in the CodeRED notification program. Additional updates may be required.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	In progress. The Emergency Management Department is active in the local school system teaching students how to prepare for hazards. They also offer classes to the general public as requested.
PES-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	County Emergency Management	Unknown	General revenue	Completed	Completed. Effective FIRM maps and FIS are available to the public. The FIRM Maps can also be accessed on the County's online GIS system.

Town of Dillsboro Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Update zoning ordinance in floodplain.	Flood	High	County Planning	Unknown	General revenue	Completed	Completed. Zoning ordinance updated.
P-2	Appoint a council member as community coordinator to work with other towns and counties in the area.	All	High	Town Mayor	Unknown	General revenue	Completed	Completed. Council member appointed and will be replaced when elected officials leave their post.
P-3	Continued consistency in enforcing codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Planning	Unknown	General revenue	Completed	Completed. The Town of Dillsboro contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-4	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	Ensure that manufactured homes are installed and secured properly.	Flood; Tornado; Landslide; Wind; Earthquake; Lightning	High	County Building Inspections	Unknown	General revenue	2022-2030	Through inter-local agreement with the Town, the Jackson County Building Inspection Department ensures that all new manufactured homes are installed and secured as required by state building codes.
Property Protection								
PP-1	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Emergency Services								
ES-1	Coordinate all hazardous responses with Jackson County Emergency Management Coordinator.	All	High	Town Mayor	Unknown	General revenue	2022-2030	The Town of Dillsboro continues to coordinate hazardous response with the Jackson County Emergency Management Coordinator.
ES-2	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2022-2030	The Town of Dillsboro collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response. Additional education may be requires
PEA-2	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Dillsboro	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Village of Forest Hills Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County GIS and Tax	Unknown	General revenue	Completed	Completed. New floodplain maps have been implemented into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	The Village of Forest Hills contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	2017-2022	The Jackson County Emergency Management Department assists the Village with reviewing the EOP on an annual basis and recommends any necessary amendments to the plan.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	2022-2030	The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	High	Cullowhee Fire; County Fire Marshal	Unknown	General revenue	Completed	Completed. The Fire management plan is monitored and maintained by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Village Mayor; County Planning; County Building Inspections	Unknown	General revenue	Completed	Completed. Enforcement is by the Jackson County Building Inspections Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Village Mayor	Unknown	General revenue	Completed	Completed. Accomplished with Hillside and Steep Slope Development Ordinance.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	Village Mayor; County Planning	Unknown	General revenue	Completed	Jackson County's Emergency Management Department assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Wind; Lightning; Earthquake	High	Village Mayor; County Building Inspections	Unknown	General revenue	Completed	Through and interlocal agreement with the Village, the Jackson County Building Inspections Department ensures that all new manufactured homes are installed and secured as required by state building codes.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	Village Mayor; County Emergency Management	Unknown	General revenue	2017-2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Village of Forest Hills	Unknown	General revenue	2022-2030	The Village continues to seek opportunities to enhance the capacity for critical facilities and public buildings to be equipped with second sources of power.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	2017-2030	The Village, with assistance from the County, continues to evaluate and implement strategies to floodproof and potentially relocate critical services located within the floodplain. Limited political will to advance further over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	2017-2030	The Village, with assistance from the County will minimize the placement of critical facilities within the floodplain. If a critical facility is located within the floodplain the Town will comply with the County's floodplain ordinance. Limited political will to advance further over the last 5 years.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	County Planning	Unknown	General revenue	2030	The Village continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. Limited political will and opportunity to advance further over the last 5 years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	High	Village Mayor; County Erosion Control Department	Unknown	General revenue	2022-2030	The Village continues to monitor and maintain streams within its jurisdiction. Limited political will to advance further over the last 5 years.
NRP-2	Preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Department	Unknown	General revenue	2022-2030	The Village remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements. Additional actions may be required.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022-2030	Jackson County's Emergency Management Department, in coordination with the municipality, continues to seek funding sources to acquire additional monitoring equipment. There was no political will to advance this action further over the last five years.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Village Mayor; County Emergency Management	Unknown	General revenue	2022-2030	The Village of Forest Hills, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Building Inspections	Unknown	General revenue	2022-2030	The Village contracts, through an interlocal agreement, with the Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	Village Mayor	Unknown	General revenue	Completed	Completed. The Village's website links to the County page that includes CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County's Emergency Management website also provides general information about emergency preparedness.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	Village Fire Department; County Emergency Management	Unknown	General revenue	2022	Completed. The Village collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response. Additional education may be required.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Village of Forest Hills	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Town of Sylva Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	Completed. New floodplain maps have been implemented into the Jackson County GIS System.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town of Sylva contracts with Jackson County to provide consistent code administration for building inspections, floodplain enforcement, and zoning code enforcements that includes steep slopes.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	2022	Jackson County's Emergency Management Department annually reviews the Town's EOP and recommends any necessary amendments.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	2022	The County continues to collect and maintain data related to occupancy and use but there was limited political to advance this over the last 5 years.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	The Fire management plan is monitored and maintained by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town of Sylva has a Subdivision Ordinance that specifies road construction standards. This is enforced through interlocal agreement by the Jackson County Planning Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town has adopted zoning regulations including steep slope regulations that are enforced through an interlocal agreement by the Jackson County Planning Department.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Planning	Unknown	General revenue	Completed	Completed. Jackson County's Emergency Management Department assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-9	Integrate county and municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Erosion Control Officer	Unknown	General revenue	Completed	The County and municipality continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and nay amendments necessary to ensure continued integration will be completed.
P-10	Adopt and implement stormwater management ordinance.	Flood; Severe Thunderstorm	High	County Planning	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
P-11	Adopt and implement hillside development ordinance.	Landslide	High	Town Mayor	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
P-12	Ensure that manufactured homes are installed and secured properly.	Flood; Tornado; Hail; Landslide; Wind; Lightning; Earthquake	High	County Building Inspections	Unknown	General revenue	Completed	Through an interlocal agreement with the Town, the Jackson County Building Inspections Department ensures that all new manufactured homes are installed and secured as required by state building codes.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-13	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Town of Sylva	Unknown	General revenue	2022-2030	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power. There was limited opportunity to advance over the last year years.
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	Town Mayor; County Building Inspections	Unknown	General revenue	2030	The Town continues to evaluate and implement strategies to floodproof and potentially relocate critical services located within the floodplain. It has developed a plan of action for vehicle parking/storage in flood events and has relocated storage from the Town's Police Department basement to minimize flood damage. There was limited opportunity and political will to advance over the last year years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	High	County Building Inspections	Unknown	General revenue	2030	The Town will minimize the placement of critical facilities within the floodplain.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	Moderate	Town Mayor	Unknown	General revenue	2022-2030	The Town continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. There was limited opportunity and political will to advance over the last year years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible by surveying for debris on a quarterly basis.	Flood	High	County Erosion Department	Unknown	General revenue	2022	There has been limited political will to complete this action over the last 5 years. However, the Town continues to monitor and maintain streams within its jurisdiction.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	Town Mayor	Unknown	General Revenue	2022-2030	The Town remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements.
NRP-3	Adopt and implement sedimentation and erosion control ordinance.	Severe Winter Storm; Flood; Landslide; Severe Thunderstorm	High	County Erosion Control Department	Unknown	General revenue	Completed	Completed. The Town's authority and regulations have been implemented and is implemented through the Inter-Local Agreement with Jackson County.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022	Jackson County Emergency Management Department, in coordination with the municipality, continues to seek funding resources to acquire additional monitoring equipment. There has been limited political will and opportunity to complete this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Town Mayor; Town Manager	Unknown	General revenue	2022	The Town of Sylva, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
Structural Projects								
S-1	Improve existing stormwater management systems and construct new system.	Flood	Moderate	Town Mayor	Unknown	General revenue	2022	There has been limited political will to complete this action over the last 5 years. The Town has previously (2005) conducted a study to improve the stormwater system and continues to seek funding sources to implement the plan.
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	High	County Building Inspections	Unknown	General revenue	Completed	Completed/ongoing The Town contracts, through an interlocal agreement, with Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	Town Manager	Unknown	General revenue	Completed	Completed. The Town of Sylva's website links to the County page that includes CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County Emergency Management site also provides general information about emergency preparedness.
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	County Emergency Management	Unknown	General revenue	2030	The Town of Sylva collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Sylva	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Town of Webster Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with larger scale detailed maps in order to provide detailed flood hazard information.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	Completed. New flood maps have been implemented into the Jackson County GIS System. This is being administered by the Inter-Local Agreement between the Town and County.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintaining adequate public safety to continue compliance with NFIP. Constant vigilance regarding construction in flood prone areas is imperative to ensure all construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	High	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town of Webster contracts with the Jackson County Building Inspections Department to administer the State building codes and the County's floodplain ordinance. This arrangement provides consistency in enforcement and helps ensure compliance with NFIP.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	High	County Emergency Management	Unknown	General revenue	Completed	The Jackson County Emergency Management Department assists the Town with reviewing the EOP on an annual basis and recommends any necessary amendments to the plan.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand the floodplain and tax data to include residential-commercial distinction and occupied-unoccupied distinction.	Flood	High	County Tax and GIS	Unknown	General revenue	Completed	The County continues to collect and maintain data related to occupancy and use.
P-5	Develop a fire management plan that includes a clear statement of objectives and which incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Fire Department	Unknown	General revenue	Completed	Completed/ongoing. The Fire management plan is developed and maintained by interlocal agreement by the County Fire Marshal.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	High	Town Mayor; Town Council	Unknown	General revenue	Completed	Completed. The Town of Webster has adopted the County's Subdivision Ordinance that specifies road construction standards. This is enforced through interlocal agreement by the Jackson County Planning Department.
P-7	Expand the Land Use Plan to address grade of banks on residential and commercial property.	Landslide	High	Town Mayor; Town Council	Unknown	General revenue	Completed	Completed. The Town has adopted the County's Mountain and Hillside Development Ordinance that addresses development on steep slopes. The County Planning Department administers the ordinance through an interlocal agreement.
P-8	Acquire small GPS system to document hazard locations for local and state use.	All	High	County Planning	Unknown	General revenue	Completed	Completed. Jackson County's Emergency Management Departments assists with the acquiring and maintaining GPS data to document hazard locations for local and state use.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-9	Ensure that manufactured homes are properly installed and secured properly.	Flood; Tornado; Wind; Lightning; Earthquake	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed. Through an interlocal agreement with the Town, the Jackson County Building Inspection Department ensures that all new manufactured homes are installed and secured as required by state building codes.
P-10	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	High	County Emergency Management	Unknown	General revenue	2022	The County and municipalities continue to integrate their EOPs with the Regional Hazard Mitigation Plan. An updated Regional HMP is currently being undertaken and any amendments necessary to ensure continued integration will be completed.
P-11	Obtain and install a second source of power for critical facilities and other public buildings to operate despite the negative effects of hazards on the main power source.	All	High	Town of Webster	Unknown	General revenue	2022	The Town continues to seek opportunities to enhance our capacity for critical facilities and public buildings to be equipped with second sources of power. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Evaluate the relocation, elevation, and floodproofing needs of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	High	County Building Inspections	Unknown	General revenue	2022	The Town, with assistance from the County, continues to evaluate and implement strategies to floodproof and potentially relocate critical services located with the floodplain. There was no political will to complete this action over the last five years.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed/ongoing. The Town will minimize the placement of critical facilities within the floodplain. If a critical facility is located within the floodplain the Town will comply with the County's floodplain ordinance.
PP-3	As additional funding sources become available, the County will apply for acquisition funds to purchase nonresidential properties that were damaged during any previous disaster.	Flood	High	County Emergency Management	Unknown	General revenue	2030	The Town continues to work in conjunction with the County to identify sources to acquire non-residential properties that were damaged during a previous disaster. There has been limited political will to complete this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2022-2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community.	Flood	High	County Erosion Control Department	Unknown	General revenue	2022-2030	The Town, with assistance from the County, continues to monitor and maintain streams within its jurisdiction. There was limited political will to complete this action over the last five years.
NRP-2	Wherever possible, preserve natural wetlands, especially along streams, through acquisition or conservation easements.	Flood	Moderate	County Erosion Control Officer	Unknown	General Revenue	2022-2030	The town remains committed to preserve natural wetlands and evaluates opportunities to conserve those areas through conservation easements. There was limited political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of flood problems.	Flood	High	County Emergency Management	Unknown	General revenue	2022-2030	Jackson County Emergency Management Department, in coordination with the four municipalities, continues to seek funding sources to acquire additional monitoring equipment. There was limited political will to complete this action over the last five years.
ES-2	Coordinate response and recovery efforts with other communities and counties.	All	High	Town Mayor	Unknown	General revenue	2022-2030	The Town of Webster, through the Jackson County Emergency Management Department, continues to cooperate and coordinate with neighboring jurisdictions during response and recovery efforts.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness								
PEA-1	By providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impact of flooding. Local inspectors can help encourage construction that is more resilient to these hazards.	All	Moderate	County Building Inspections	Unknown	General revenue	Completed	Completed. The Town contracts through an interlocal agreement with the Jackson County Building Inspections to administer the Floodplain Ordinance. They work with property owners to ensure that any construction within the floodplain meet all ordinance requirements.
PEA-2	Update the internet-based emergency information website to inform and educate citizens about potential risks from hazards and opportunities to mitigate them.	All	High	County Emergency Management; County Fire	Unknown	General revenue	Completed	Completed/ongoing. The Town of Webster's website links to the County page that includes the CodeRED warning information that is used by Jackson County Emergency Management to inform the public during disasters. The County Emergency Management site also provides general information about emergency preparedness.
PEA-3	Conduct a series of public classes on potential risks from hazards and potential ways to mitigate them as well as safety measures to be conducted during a hazard event.	All	High	Town Mayor	Unknown	General revenue	2022	The Town collaborates with the local emergency response stakeholders to offer opportunities for the public to learn more about hazard mitigation and response.
PEA-4	Maintain a publicly accessible copy of effective FIRM maps and FIS and support local requests of map updates to continue compliance with NFIP.	Flood	High	Town of Webster	Unknown	General revenue	Completed	Completed. FIRM maps and FIS are accessible at the Jackson County Building Inspections Department and also available on the County's public web-based GIS system.

Annex E

Swain County

This annex includes jurisdiction-specific information for Swain County and its participating municipalities. It consists of the following five subsections:

- ◆ E.1 Swain County Community Profile
- ◆ E.2 Swain County Risk Assessment and Vulnerability Assessment
- ◆ E.3 Swain County Capability Assessment
- ◆ E.4 Swain County Mitigation Strategy

E.1 SWAIN COUNTY COMMUNITY PROFILE

E.1.1 Geography and the Environment

Swain County is located in Western North Carolina in the Great Smoky Mountains. It is comprised of one incorporated community, the Town of Bryson City, and several smaller unincorporated communities, including Cherokee and Whittier.

Much of the county lies within the Great Smoky Mountains National park, including its highest peak Clingmans Dome and Nantahala National Forest. Four scenic rivers flow through the county and form the sprawling Lake Fontana, including the Nantahala River which is one of the most popular whitewater rafting rivers in the nation. The county also encompasses much of the Eastern Band of Cherokee Indian lands. Elevations in the county range from 1,085 to 6,643 feet. The total area of the county is 541 square miles, 13 square miles of which is water area.

The climate in Swain County lacks seasonal extremes and it is known for its cool summer nights. July temperatures reflect an average daily high of 84°F and an average daily low of 62°F. Winter temperatures, while cool, are not uncomfortable and the average daily high in January is 48°F while the average daily low is 26°F. Winter always brings some snow to the mountains with average annual snowfall of around 11 inches. Annual precipitation averages around 48 inches.

E.1.2 Population and Demographics

According to the U.S. Census 2015 American Community Survey 5-year Population Estimate, Swain County has a population of 14,163 people. The county has seen approximately 1.3% growth between 2010 and 2015, and the population density is 27 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the county and participating jurisdictions are presented in **Table E.1**.

TABLE E.1: POPULATION COUNTS FOR SWAIN COUNTY

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
SWAIN COUNTY	11,268	12,968	13,981	14,163	1.3%

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2015 ACS Population	% Change 2010-2015
Town of Bryson City	1,145	1,411	1,424	1,748	22.8%

Source: US Census Bureau

Based on the 2015 American Community Survey, the median age of residents of Swain County is 40.7 years. The racial characteristics of the county are presented in **Table E.2**. Whites make up the majority of the population in the county, accounting for over 64 percent of the population; however there is a sizable American Indian population, totaling approximately 27 percent.

TABLE E.2: DEMOGRAPHICS OF SWAIN COUNTY

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
SWAIN COUNTY	64.6%	1.5%	26.9%	7.0%	2.4%
Town of Bryson City	84.5%	0.0%	5.8%	9.7%	0.2%

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

Source: US Census Bureau

E.1.3 Housing

According to the 2015 American Community Survey, there are 8,769 housing units in Swain County, the majority of which are single family homes or mobile homes. Housing information for the county and town is presented in **Table E.3**. As shown in the table, the county has a significantly higher percentage of seasonal housing units compared to the incorporated town.

TABLE E.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2006-2010)
SWAIN COUNTY	7,105	8,723	8,769	22.3%	\$126,700
Town of Bryson City	713	833	823	7.7%	\$115,000

Source: US Census Bureau

E.1.4 Infrastructure

Transportation

Swain County is served by several main highways. US 441 runs north to south across the northeastern portion of the county from the Tennessee state line in the Great Smoky Mountains Nation Park to the Georgia state line. US 74 is a major four-lane highway that travels northeast to southwest through the southern portion of Swain County and connects Chattanooga, Tennessee; Asheville, North Carolina; Charlotte, North Carolina; and Wilmington North Carolina. NC 28 also traverses the southern part of the county and runs north to south through the Nantahala National Forest. This highway is part of the Indian Lake Scenic Byway.

Although passenger and freight traffic is no longer operated on the rail line in Swain County, a scenic line known as the Great Smoky Mountains Railroad was established with the existing depot and departure point in Bryson City. The line also has two historic railroad depots located in Dillsboro (Jackson County) and Andrews (Cherokee County) but departures are not currently offered at these locations. This line is privately operated as part of the American Heritage Railroad Company.

Utilities

Electrical power in Swain County is provided Duke Energy Progress, a public utility. Water and sewer service is not provided by the county or town, and residents rely on private or shared wells and septic systems.

Community Facilities

Swain County did not provide data on critical and community facilities located within the county or its jurisdictions.

E.1.5 Land Use

Land use regulations are limited and land ownership is the strongest driving force behind land use in Swain County. The Federal government and other entities; including the National Park Service, the US Forest Service, the Tennessee Valley Authority, and the Eastern Band of Cherokee Indians; own or otherwise control approximately 75% of the land area in the county. The majority of future growth in the area is likely to be residential in nature. With the expansion of residences in Swain County, the Board of Commissioners is faced with land use issues on a regular basis; however, in the current political setting, there are no plans to adopt any land use laws in the near future. There are some ordinances that address land use issues, such as the Mobile Home Ordinance and the Erosion Control Ordinance.

E.1.6 Employment and Industry

Swain County had a 2015 average annual employment of 9,591 workers. In 2015, according to the North Carolina Employment Security Commission, the Leisure and Hospitality industry employed 44.3 percent of the workforce followed by Public Administration (21.6%); Education and Health Services (12.3%); and Trade, Transportation, and Utilities (8.6%). In 2015, the annual median income for the County was \$25,921, compared to \$32,510 for the state of North Carolina.

E.2 SWAIN COUNTY RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to Swain County. Each hazard profile includes a description of the hazard's location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of Swain County to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

E.2.1 Asset Inventory

Table E.4 lists the number of parcels, total value of parcels, total number of parcels with improvements, and the total assessed value of improvements for Swain County and its participating jurisdictions (study area of vulnerability assessment).¹

TABLE E.4: IMPROVED PROPERTY IN SWAIN COUNTY

Location	Number of Parcels	Estimated Number of Buildings	Total Assessed Value of Improvements
Bryson City	978	760	\$143,213,256
Unincorporated Area	11,636	6,054	\$735,070,902
EBCI ²	23	7	\$1,645,240
SWAIN COUNTY TOTAL³	12,637	81,674	\$13,331,944,157

It is likely that Swain County has critical facilities, such as fire stations, police stations, schools, and medical centers, within its boundaries. Critical facility information was not provided by the county for this plan update.

E.2.2 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 Swain County that are potentially at risk to these hazards.

Table E.5 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to county-wide estimates. The total population in Swain County according to Census data is 14,163 persons. Additional population estimates are presented above in Section E.1.

TABLE E.5: TOTAL POPULATION IN SWAIN COUNTY

Location	Total 2015 Population
Bryson City	1,748
Unincorporated Area	12,415
SWAIN COUNTY TOTAL	14,163

Source: U.S. Census 2015 American Community Survey

In addition, **Figure E.1** illustrates the population density by census tract as it was reported by the Census Bureau American Community Survey in 2015.⁴

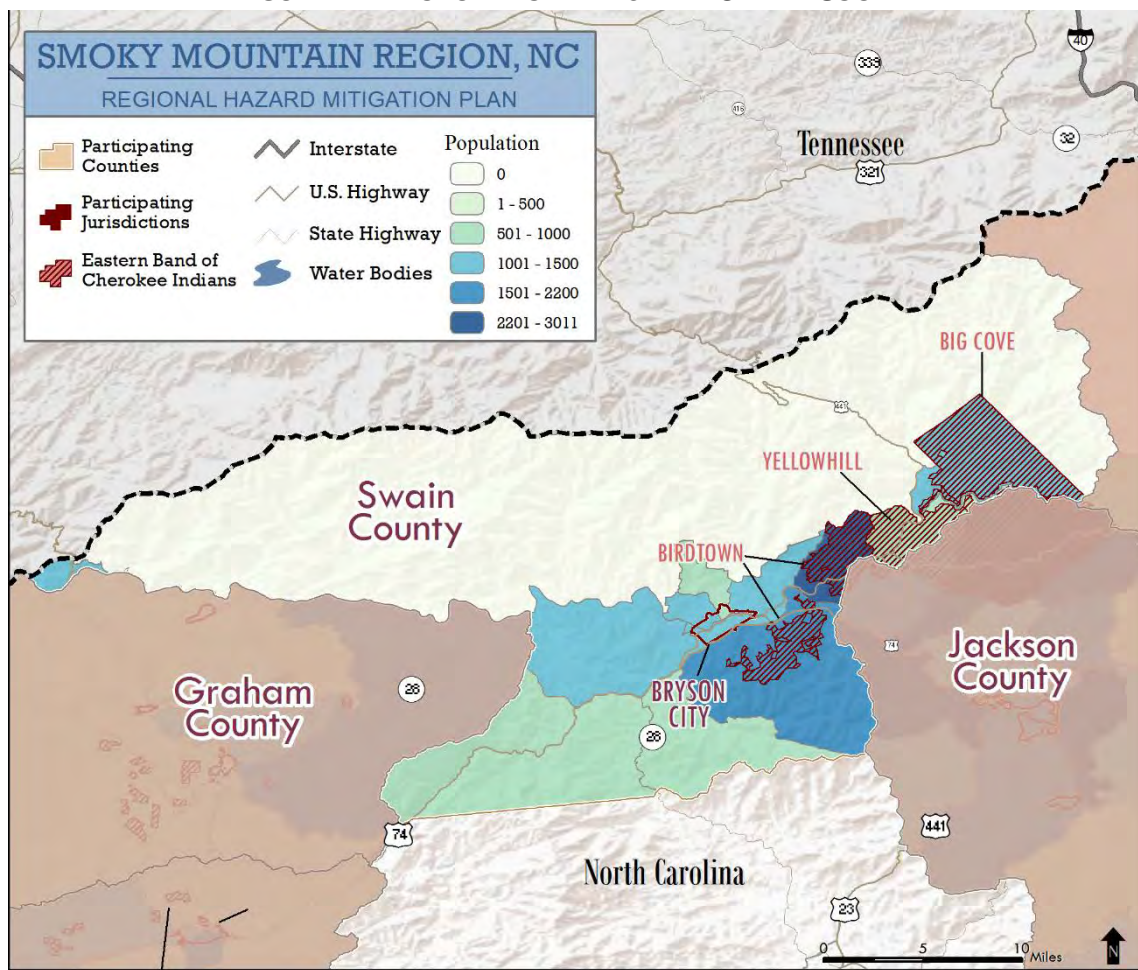
¹ Total assessed values for improvements is based on tax assessor records as joined to digital parcel data. This data does not include dollar figures for tax-exempt improvements such as publicly-owned buildings and facilities. It should also be noted that, due to record keeping, some duplication is possible thus potentially resulting in an inflated value exposure for an area.

² EBCI data indicated for Cherokee, Graham, and Swain Counties are derived from that county’s parcel data and falls within the EBCI jurisdictional boundary and/or is indicated as part of the EBCI by the parcel attribute data.

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

⁴ Population by census block was not available at the time this plan was completed.

FIGURE E.1: POPULATION DENSITY IN SWAIN COUNTY



Source: U.S. Census Bureau, 2015 American Community Survey

HAZARD PROFILES

E.2.1 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Swain County 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 county would be uniformly exposed to drought, making the spatial extent potentially widespread.

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Swain County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

According to the North Carolina Drought Monitor, Swain County has had drought occurrences sixteen of the last seventeen years (2000-2016). **Table E.6** shows the most severe drought classification for each year, according to North Carolina Drought Monitor classifications.

TABLE E. 6: HISTORICAL DROUGHT OCCURRENCES IN SWAIN COUNTY

Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
Swain County				
				EXCEPTIONAL
				EXTREME
				EXTREME
				NORMAL
				ABNORMAL
				ABNORMAL
				SEVERE
				EXCEPTIONAL
				EXCEPTIONAL
				SEVERE
				MODERATE
				MODERATE
				ABNORMAL
				ABNORMAL
				ABNORMAL
				MODERATE
				EXCEPTIONAL

Source: North Carolina Drought Monitor

Extent

The most severe drought condition is Exceptional. Swain County has received this ranking four times over the sixteen-year reporting period.

Probability of Future Occurrences

According to the North Carolina Drought Monitor’s historical data, sixteen of the last seventeen years has resulted in drought in Swain County, resulting in an average annual drought occurrence rate of 94-percent for those years. Therefore, annual probability of future drought events is considered “highly likely” (greater than 90% annual probability). This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices
 - Increased wildfires
 - Loss of incomes
 - Loss of hydroelectric power
- ◆ Environmental

- Crop damage
- Stress on wildlife
- Increased wildfires
- Wind erosion
- Loss of wetlands
- Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

E.2.2 Hailstorm

Location

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

Historical Occurrences

According to the National Centers for Environmental Information’s (NCEI) Storm Events Database, 19 recorded hailstorm events affected Swain County from 1970 to 2016.⁵ **Table E.7** is a summary of the hail events in Swain County. **Table E.8** provides detailed information about each event that occurred in the county. Hail occurrences in the county did not result in property damages. 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. Therefore, it is likely that damages are greater than the reported value.

TABLE E.7: SUMMARY OF HAIL OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017)
Bryson City	10	\$0
Unincorporated Area	9	\$0
SWAIN COUNTY TOTAL	19	\$0

Source: National Centers for Environmental Information

TABLE E.8: HISTORICAL HAIL OCCURRENCES IN SWAIN COUNTY

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Bryson City	4/16/1998	1.00	0/0	\$0
Bryson City	5/7/1999	0.75	0/0	\$0

⁵ These hail events are only inclusive of those reported by the National Centers for Environmental Information’s (NCEI) Storm Events Database. It is likely that additional hail events have affected Cherokee County. 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.

Location	Date	Magnitude (Inches)	Death/Injuries	Property Damage (2017 dollars)
Bryson City	6/4/2002	0.75	0/0	\$0
Cherokee	6/20/2002	0.75	0/0	\$0
Bryson City	7/2/2002	0.75	0/0	\$0
Cherokee	7/22/2002	0.75	0/0	\$0
Bryson City	2/21/2005	0.88	0/0	\$0
Cherokee	4/19/2006	0.75	0/0	\$0
Alarka	5/20/2008	0.75	0/0	\$0
Bryson City	6/9/2008	0.75	0/0	\$0
Bryson City	6/18/2011	0.88	0/0	\$0
Proctor	6/24/2011	1.00	0/0	\$0
Needmore	4/3/2012	0.88	0/0	\$0
Almond	4/3/2012	0.75	0/0	\$0
Bryson City	4/26/2012	1.25	0/0	\$0
Bryson City	4/26/2012	0.88	0/0	\$0
Ela	5/22/2013	1.00	0/0	\$0
Almond	7/14/2015	1.00	0/0	\$0
Bryson City	9/5/2015	1.00	0/0	\$0

Source: National Centers for Environmental Information

Extent

Hail extent can be defined by the size of the hail stone. Hail ranged in diameter from 0.75 inches to 1.25 inches. However, larger hailstones are possible as indicated in the Torro Scale (Section 5).

Probability of Future Occurrences

A total of 19 events are recorded in the NCEI’s Storm Events Database between 1970 and 2016, resulting in an annual occurrence rate of 41-percent for that period. Based on historical occurrences, hail events are considered “likely” (10 to 90% annual chance) in Swain County. Since hail is an atmospheric hazard (coinciding with thunderstorms), it is assumed that Graham County 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 county.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. While no deaths or injuries were reported in the county due to hail, they are possible.

E.2.3 Hurricane and Tropical Storm

Location

Hurricanes 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 Swain County. The entire county is equally susceptible to hurricane and tropical storms.

Historical Occurrences

According to the National Hurricane Center’s historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region between 1850 and 2015. This includes nine tropical storms and nineteen tropical depressions. **Table E.9** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE E.9: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2015)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

The National Centers for Environmental Information did not report any events associated with a hurricane or tropical storm in Swain County between 1950 and 2015. Of the recorded storm events, one tropical storm and four tropical depressions have traversed directly through Swain County. This includes the remnants of Hurricanes Danny (1985) Bill (2003), Ivan (2004), Frances (2004), and an Unnamed 1916 storm which entered the county as a tropical storm.

Federal records also indicate that one disaster declaration was made in 2004 (Hurricane Ivan) for the county.⁶

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Extent

Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (Chapter 5, **Table 5.8**). The greatest classification of hurricane to traverse directly through Swain County was a tropical depression (Unnamed 1916 Storm) which carried tropical force winds of 35 knots upon arrival in the county. It should be noted that stronger storms could impact the county without a direct hit.

Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but still remains a real threat to Swain County due to induced events like flooding and landsliding. A total of 28 tropical depressions, storms or hurricanes have passed within 75 miles of the Smoky Mountain Region between 1851 and 2015, resulting in a historic annual rate of occurrence of 17-percent. Therefore, a probability of “likely” (between 10 and 90% annual probability) was assigned.

⁶ A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

Vulnerability Assessment

Historical evidence indicates that Swain County has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the county, as shown and discussed in the section above.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. This represents the total exposure; the sum of all building and content asset replacement values within a county. Hazus-MH 3.1 was used to determine potential losses for the region as shown below in **Table E.10**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining an accurate loss estimate specific to participating jurisdictions was not feasible.

TABLE E.10: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Swain County	\$2,734,027,126	0	0%	\$175,853	0.006432%	\$13,088	0.000478%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

Given equal susceptibility across the county, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Swain County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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.

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

E.2.4 Lightning

Location

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

Historical Occurrences

According to the National Centers for Environmental Information, there has been one recorded lightning event in Swain County between 1950 and 2016, which resulted in \$115,927 (2017 dollars) of damage, as listed in summary **Table E.11**.⁷ Detailed information on historical lightning events can be found in **Table E.12**.

It is likely that additional lightning events have in fact impacted the county. 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 E.11: SUMMARY OF LIGHTNING OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017)
Bryson City	1	\$115,927
Unincorporated Area	0	\$0
SWAIN COUNTY TOTAL	1	\$115,927

Source: NCEI Storm Events Database

TABLE E.12: HISTORICAL LIGHTNING OCCURRENCES IN SWAIN COUNTY

Location	Date	Death/Injuries	Property Damage (2017 dollars)	Details
Swain County				
Whittier	5/29/2012	0/0	\$115,927	Lightning started a fire at a home on Conley Mountain Association Rd. The home was destroyed.

Source: NCEI Storm Events Database

Extent

Aside from damages, lightning extent can be defined using Vaisala, Inc.'s U.S. National Lightning Detection Network (NLDN) (Chapter 5, **Figure 5.6**). Although the Smoky Mountain Region experienced an average of 3 to 12 flashes per square mile per year, the majority of Swain County appears to have an average of 3 to 6 flashes.

Probability of Future Occurrences

Although there was only one historical lightning event reported in Swain County via NCEI data, it is a regular occurrence accompanied by 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[®]), Swain County is located in an area of the country that experienced an average of 3 to 6 lightning flashes per square mile per year between 2005 and 2014. Therefore, the probability of future events is highly

⁷ These lightning events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional lightning events have occurred in Swain County. 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.

likely (greater than 90% annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

Vulnerability Assessment

All current and future buildings and populations within Swain County are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

E.2.5 Thunderstorm Wind/High Wind

Location

A 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, Swain County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Swain County has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

Severe storms resulted in one disaster declaration in Swain County in 1995.⁸ According to NCEI, there have been 27 reported high or strong wind events since 1994 and 54 reported thunderstorm wind events since 1950 in Swain County.⁹ These events caused over \$800,000 (2017 dollars) in damages. **Table E.13** and **Table E.14** summarize this information. **Table E.15** and presents detailed high/strong wind and thunderstorm wind event reports including date, magnitude, and associated damages for each event.¹⁰

TABLE E.13: SUMMARY OF HIGH/STRONG WIND OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Bryson City	0	\$0	\$0
Unincorporated Area	27	\$743,879	\$0
SWAIN COUNTY TOTAL	27	\$743,879	\$0

Source: National Centers for Environmental Information

TABLE E.14: SUMMARY OF THUNDERSTORM (WIND) OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Bryson City	24	\$15,580	\$0
Unincorporated Area	30	\$40,507	\$0

⁸A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

⁹ These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional thunderstorm events have occurred in Swain County. As additional local data becomes available, this hazard profile will be amended.

¹⁰ The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY TOTAL	54	\$56,087	\$0

Source: National Centers for Environmental Information

TABLE E.15: HISTORICAL WIND OCCURRENCES IN SWAIN COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	7/11/1986	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	5/26/1989	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	8/21/1990	Thunderstorm Wind	--	0/0	\$0	--
Fontana	4/15/1993	Thunderstorm Wind	--	0/0	\$0	--
Swain Co.	1/18/1996	High Wind	--	0/0	\$0	--
Bryson City	4/20/1996	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	12/17/1996	High Wind	50	0/0	\$0	--
Whittier	1/5/1997	Thunderstorm Wind	52	0/0	\$0	--
Swain Co.	3/5/1997	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/4/1997	Thunderstorm Wind	50	0/1	\$0	--
Swain Co.	11/10/1998	Strong Wind	--	0/0	\$0	--
Swain Co.	3/16/1999	Strong Wind	--	0/0	\$0	--
Bryson City	5/6/1999	Thunderstorm Wind	50	0/0	\$0	--
Wesser	5/7/1999	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/13/2000	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	8/10/2000	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	11/9/2000	Strong Wind	--	0/0	\$0	--
Swain Co.	12/16/2000	High Wind	55	0/0	\$0	--
Swain Co.	3/6/2001	High Wind	55	0/0	\$0	--
Bryson City	7/9/2001	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	10/13/2001	High Wind	50	0/0	\$0	--
Bryson City	10/24/2001	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	10/25/2001	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	11/24/2001	High Wind	50	0/0	\$0	--
Swain Co.	11/29/2001	High Wind	50	0/0	\$0	--
Lauada	1/24/2002	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/4/2002	High Wind	50	0/0	\$0	--
Bryson City	5/2/2002	Thunderstorm Wind	60	0/0	\$0	--
Smokemont	5/2/2002	Thunderstorm Wind	60	0/0	\$38,949	Numerous trees were downed. A tree and a power pole were blown down onto a house.
Bryson City	5/13/2002	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	7/2/2002	Thunderstorm Wind	60	0/0	\$15,580	Numerous trees were blown down. The roof of a commercial building received damage.

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	9/26/2002	Strong Wind	--	0/0	\$0	--
Swain Co.	9/27/2002	High Wind	50	0/0	\$0	--
Nantahala	11/11/2002	Thunderstorm Wind	50	0/0	\$1,558	Trees were downed in Nantahala gorge. Scattered tree damage reported countywide.
Swain Co.	2/4/2003	High Wind	60	0/0	\$0	--
Needmore	5/2/2003	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/10/2003	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	10/14/2003	High Wind	50	0/0	\$1,513	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.
Swain Co.	11/18/2003	High Wind	50	0/0	\$4,538	High winds developed ahead of a cold front, mainly across the higher elevations of the North Carolina mountains. Scattered trees and power lines were blown down in most counties. However, damage was most extensive in Madison, Swain, and Macon counties. Numerous downed trees and power outages occurred in these counties.
Swain Co.	3/7/2004	High Wind	50	0/0	\$7,343	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.
Alarka	5/31/2004	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/5/2004	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/14/2004	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	9/16/2004	High Wind	55	0/0	\$36,713	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.
Swain Co.	9/17/2004	High Wind	50	0/0	\$14,685	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.
Swain Co.	12/1/2004	High Wind	50	0/0	\$0	--
Swain Co.	1/22/2005	High Wind	50	0/0	\$0	--

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain Co.	8/30/2005	High Wind	50	0/0	\$7,129	As the remnants of hurricane Katrina moved across middle and west Tennessee, high winds developed over the mountains of North Carolina. Numerous trees and power lines were blown down, with damage being most concentrated in the southwest mountains, and in Avery County of the northern mountains. At least 2 trees fell on and damaged structures.
Swain Co.	1/25/2006	High Wind	55	0/0	\$0	--
Bryson City	4/8/2006	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2006	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/21/2006	Thunderstorm Wind	55	0/0	\$0	--
Swain Co.	4/15/2007	High Wind	55	0/0	\$0	--
Swain Co.	4/16/2007	High Wind	60	0/0	\$671,958	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.
Bryson City	7/19/2007	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	8/21/2007	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	5/20/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	6/28/2008	Thunderstorm Wind	50	0/0	\$0	--
Bryson City	7/21/2008	Thunderstorm Wind	50	0/0	\$0	--
Proctor	6/11/2009	Thunderstorm Wind	55	0/0	\$0	--
Swain Co.	12/9/2009	High Wind	55	0/0	\$0	--
Ela	7/26/2010	Thunderstorm Wind	50	0/0	\$0	--
Unahala	7/31/2010	Thunderstorm Wind	50	0/0	\$0	--
Almond	10/25/2010	Thunderstorm Wind	55	0/0	\$0	--
Almond	2/28/2011	Thunderstorm Wind	50	0/0	\$0	--
Almond	4/4/2011	Thunderstorm Wind	55	0/0	\$0	--
Proctor	6/15/2011	Thunderstorm Wind	60	0/0	\$0	--
Wesser	4/26/2012	Thunderstorm Wind	55	0/0	\$0	--
Ravensford	7/5/2012	Thunderstorm Wind	50	0/0	\$0	--
Solola Valley	7/5/2012	Thunderstorm Wind	60	0/0	\$0	--
Roundhill	1/30/2013	Thunderstorm Wind	50	0/0	\$0	--

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY						
Almond	5/21/2013	Thunderstorm Wind	50	0/0	\$0	--
Hewitt	6/10/2014	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	6/10/2014	Thunderstorm Wind	55	0/0	\$0	--
Bryson City	7/14/2015	Thunderstorm Wind	50	0/0	\$0	--
Swain Co.	2/24/2016	High Wind	50	0/0	\$0	--
Unahala	6/26/2016	Thunderstorm Wind	50	0/0	\$0	--
Proctor	7/7/2016	Thunderstorm Wind	50	0/0	\$0	--
Proctor	7/8/2016	Thunderstorm Wind	50	0/0	\$0	--

Source: National Centers for Environmental Information

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind speed in Swain County was 60 knots (approximately 70 mph). This speed was the maximum recorded for seven separate events. It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

Given the high number of previous events (81 total wind events reported by NCEI), it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. The reported events result in more than one event per year on average. Therefore, a probability of highly likely (greater than 90 percent annual probability) is assigned for future wind events for the entire county.

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

E.2.6 Tornado

Location

Tornadoes occur throughout the state of North Carolina, and thus in Swain County. 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 Swain County is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they do occur in Swain County. According to the National Centers for Environmental Information, there have been a total of three recorded tornado events in Swain County since 1973 (**Table E.16**), resulting in over \$1.2 million (2017 dollars) in property

damages.¹¹ No deaths or injuries were reported (Table E.17). 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 40 years.

TABLE E.16: SUMMARY OF TORNADO OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2012)
Bryson City	0	\$0
Unincorporated Area	3	\$1,265,157
SWAIN COUNTY TOTAL	3	\$1,265,157

Source: National Centers for Environmental Information

TABLE E.17: HISTORICAL TORNADO IMPACTS IN SWAIN COUNTY

Location	Date	Magnitude	Death/Injuries	Property Damage (2017 dollars)	Details
SWAIN COUNTY					
Swain County	4/3/1974	F2	0/0	\$14,419	n/a
Swain County	2/18/1976	F1	0/0	\$1,250,737	n/a
Solola Valley	3/2/2012	EF0	0/0	\$0	A NWS Storm Survey found a short damage path of a weak tornado in a remote section of the Great Smoky Mountains. Several small trees were snapped and a large tree uprooted along the 100-yard path.

*Property Damage is reported in 2017 dollars.

Source: NCEI

Extent

The greatest extent of tornado is an EF5 (over 200 miles per hour). The greatest magnitude of tornado that has impacted Swain County is an F2 (113 to 157 miles per hour), during an event that occurred on April 3, 1974. The National Weather Service reports that this tornado was part of the largest outbreak of tornadoes in the nation’s history, referred to by meteorologists as the Super Outbreak, in which 148 tornadoes swept across 13 states in an estimated 24 hours. Although the greatest magnitude of tornado to impact Swain County is an F2, stronger events are possible.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county (three reported events in 43 years). Furthermore, the mountainous terrain of the county makes tornadoes a rare occurrence. While the majority of the reported tornado events are small in terms of size, intensity, and

¹¹ These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is likely that additional tornadoes have occurred in Swain County. As additional local data becomes available, this hazard profile will be amended.

duration, they do pose a significant threat should Swain County experience a direct tornado strike. The probability of future tornado occurrences affecting Swain County is possible (1 to 10 percent annual probability).

Vulnerability Assessment

All current and future buildings and populations should be considered at risk to tornadoes. Tornadoes are capable of causing catastrophic damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption and downed trees and debris.

E.2.7 Winter Storm and Freeze

Location

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. Swain County is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in two disaster declarations in Swain County. This includes the Blizzard of 1996 and an ice storm in 2003.¹² According to the National Centers for Environmental Information, there have been a total of 216 recorded winter storm events in Swain County since 1993 (Table E.18).¹³ These events resulted in over \$1.3 million (2017 dollars) in damages. Reported crop damage occurred during an April 2007 freeze event. Those events with reported damages and fatalities are presented in Table E.19.¹⁴

TABLE E.18: SUMMARY OF WINTER STORM EVENTS IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
Bryson City	0	\$0	\$0
Unincorporated Area	216	\$0	\$1,343,916
SWAIN COUNTY TOTAL	216	\$0	\$1,343,916

Source: National Centers for Environmental Information

TABLE E.19: HISTORICAL WINTER STORM IMPACTS IN SWAIN COUNTY

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/6/1996	Winter Storm	0/0	\$0	\$0

¹² A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.

¹³ These ice and winter storm events are only inclusive of those reported by the National Climatic Data Center (NCDC). It is certain that additional winter storm conditions have affected Swain County.

¹⁴ The dollar amount of damages provided by NCDC is divided by the number of affected counties to reflect a damage estimate for the county.

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/11/1996	Winter Storm	0/0	\$0	\$0
Swain County	1/26/1996	Ice Storm	0/0	\$0	\$0
Swain County	2/1/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/2/1996	Ice Storm	0/0	\$0	\$0
Swain County	2/7/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/11/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/12/1996	Heavy Snow	0/0	\$0	\$0
Swain County	2/16/1996	Winter Weather	0/0	\$0	\$0
Swain County	2/16/1996	Heavy Snow	0/0	\$0	\$0
Swain County	3/8/1996	Heavy Snow	0/0	\$0	\$0
Swain County	3/20/1996	Heavy Snow	0/0	\$0	\$0
Swain County	4/1/1996	Winter Weather	0/0	\$0	\$0
Swain County	4/8/1996	Winter Weather	0/0	\$0	\$0
Swain County	11/9/1996	Winter Weather	0/0	\$0	\$0
Swain County	11/10/1996	Winter Weather	0/0	\$0	\$0
Swain County	12/5/1996	Winter Weather	0/0	\$0	\$0
Swain County	1/9/1997	Ice Storm	0/0	\$0	\$0
Swain County	1/10/1997	Heavy Snow	0/0	\$0	\$0
Swain County	4/1/1997	Cold/Wind Chill	0/0	\$0	\$0
Swain County	12/5/1997	Winter Weather	0/0	\$0	\$0
Swain County	12/27/1997	Heavy Snow	0/0	\$0	\$0
Swain County	12/29/1997	Heavy Snow	0/0	\$0	\$0
Swain County	12/30/1997	Heavy Snow	0/0	\$0	\$0
Swain County	1/18/1998	Winter Weather	0/0	\$0	\$0
Swain County	1/27/1998	Heavy Snow	0/0	\$0	\$0
Swain County	3/2/1998	Winter Weather	0/0	\$0	\$0
Swain County	3/10/1998	Winter Weather	0/0	\$0	\$0
Swain County	2/13/1999	Heavy Snow	0/0	\$0	\$0
Swain County	2/19/1999	Winter Weather	0/0	\$0	\$0
Swain County	2/24/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/3/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/3/1999	Heavy Snow	0/0	\$0	\$0
Swain County	3/9/1999	Winter Storm	0/0	\$0	\$0
Swain County	3/15/1999	Winter Weather	0/0	\$0	\$0
Swain County	3/26/1999	Heavy Snow	0/0	\$0	\$0
Swain County	11/2/1999	Winter Weather	0/0	\$0	\$0
Swain County	12/24/1999	Winter Weather	0/0	\$0	\$0
Swain County	1/4/2000	Heavy Snow	0/0	\$0	\$0

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/16/2000	Winter Weather	0/0	\$0	\$0
Swain County	1/20/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/22/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/25/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/29/2000	Ice Storm	0/0	\$0	\$0
Swain County	1/31/2000	Heavy Snow	0/0	\$0	\$0
Swain County	2/4/2000	Heavy Snow	0/0	\$0	\$0
Swain County	4/8/2000	Heavy Snow	0/0	\$0	\$0
Swain County	11/19/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/1/2000	Extreme Cold/Wind Chill	0/0	\$0	\$0
Swain County	12/3/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/17/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/19/2000	Heavy Snow	0/0	\$0	\$0
Swain County	12/30/2000	Heavy Snow	0/0	\$0	\$0
Swain County	1/1/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/8/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/20/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/6/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/15/2001	Heavy Snow	0/0	\$0	\$0
Swain County	3/20/2001	Heavy Snow	0/0	\$0	\$0
Swain County	1/6/2002	Heavy Snow	0/0	\$0	\$0
Swain County	2/3/2002	Heavy Snow	0/0	\$0	\$0
Swain County	2/6/2002	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2002	Heavy Snow	0/0	\$0	\$0
Swain County	12/4/2002	Winter Weather	0/0	\$0	\$0
Swain County	12/22/2002	Winter Weather	0/0	\$0	\$0
Swain County	12/25/2002	Winter Weather	0/0	\$0	\$0
Swain County	1/6/2003	Winter Weather	0/0	\$0	\$0
Swain County	1/16/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/19/2003	Winter Weather	0/0	\$0	\$0
Swain County	1/23/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/26/2003	Winter Weather	0/0	\$0	\$0
Swain County	2/6/2003	Heavy Snow	0/0	\$0	\$0
Swain County	2/9/2003	Winter Weather	0/0	\$0	\$0
Swain County	2/23/2003	Winter Weather	0/0	\$0	\$0
Swain County	3/30/2003	Winter Weather	0/0	\$0	\$0
Swain County	3/30/2003	Heavy Snow	0/0	\$0	\$0
Swain County	3/30/2003	Winter Weather	0/0	\$0	\$0

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	4/10/2003	Heavy Snow	0/0	\$0	\$0
Swain County	11/28/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/3/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/4/2003	Winter Storm	0/0	\$0	\$0
Swain County	12/5/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/10/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/17/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2003	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2003	Heavy Snow	0/0	\$0	\$0
Swain County	1/9/2004	Winter Weather	0/0	\$0	\$0
Swain County	1/27/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/2/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/7/2004	Heavy Snow	0/0	\$0	\$0
Swain County	2/12/2004	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2004	Heavy Snow	0/0	\$0	\$0
Swain County	3/30/2004	Winter Weather	0/0	\$0	\$0
Swain County	4/13/2004	Winter Weather	0/0	\$0	\$0
Swain County	12/11/2004	Heavy Snow	0/0	\$0	\$0
Swain County	12/14/2004	Winter Weather	0/0	\$0	\$0
Swain County	12/19/2004	Heavy Snow	0/0	\$0	\$0
Swain County	1/22/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/27/2005	Winter Weather	0/0	\$0	\$0
Swain County	2/28/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/8/2005	Winter Weather	0/0	\$0	\$0
Swain County	3/11/2005	Winter Weather	0/0	\$0	\$0
Swain County	4/2/2005	Winter Weather	0/0	\$0	\$0
Swain County	4/23/2005	Winter Weather	0/0	\$0	\$0
Swain County	11/21/2005	Winter Weather	0/0	\$0	\$0
Swain County	12/26/2005	Winter Weather	0/0	\$0	\$0
Swain County	1/14/2006	Winter Weather	0/0	\$0	\$0
Swain County	1/30/2006	Winter Weather	0/0	\$0	\$0
Swain County	2/8/2006	Winter Weather	0/0	\$0	\$0
Swain County	2/9/2006	Heavy Snow	0/0	\$0	\$0
Swain County	2/11/2006	Winter Weather	0/0	\$0	\$0
Swain County	2/11/2006	Heavy Snow	0/0	\$0	\$0
Swain County	2/18/2006	Winter Weather	0/0	\$0	\$0

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	3/22/2006	Winter Weather	0/0	\$0	\$0
Swain County	11/19/2006	Winter Weather	0/0	\$0	\$0
Swain County	12/7/2006	Winter Weather	0/0	\$0	\$0
Swain County	12/26/2006	Winter Weather	0/0	\$0	\$0
Swain County	1/9/2007	Heavy Snow	0/0	\$0	\$0
Swain County	1/21/2007	Winter Weather	0/0	\$0	\$0
Swain County	1/28/2007	Winter Weather	0/0	\$0	\$0
Swain County	2/1/2007	Heavy Snow	0/0	\$0	\$0
Swain County	2/17/2007	Heavy Snow	0/0	\$0	\$0
Swain County	4/6/2007	Winter Weather	0/0	\$0	\$0
Swain County	4/8/2007	Frost/Freeze	0/0	\$0	\$1,343,916
Swain County	1/1/2008	Winter Weather	0/0	\$0	\$0
Swain County	1/22/2008	Winter Weather	0/0	\$0	\$0
Swain County	2/26/2008	Heavy Snow	0/0	\$0	\$0
Swain County	10/27/2008	Winter Weather	0/0	\$0	\$0
Swain County	11/16/2008	Winter Weather	0/0	\$0	\$0
Swain County	11/21/2008	Winter Weather	0/0	\$0	\$0
Swain County	12/1/2008	Heavy Snow	0/0	\$0	\$0
Swain County	1/8/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/13/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/17/2009	Winter Weather	0/0	\$0	\$0
Swain County	1/18/2009	Heavy Snow	0/0	\$0	\$0
Swain County	2/2/2009	Winter Weather	0/0	\$0	\$0
Swain County	2/22/2009	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2009	Winter Weather	0/0	\$0	\$0
Swain County	4/7/2009	Heavy Snow	0/0	\$0	\$0
Swain County	10/17/2009	Winter Weather	0/0	\$0	\$0
Swain County	12/18/2009	Winter Storm	0/0	\$0	\$0
Swain County	1/2/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/9/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/12/2010	Winter Weather	0/0	\$0	\$0
Swain County	1/29/2010	Heavy Snow	0/0	\$0	\$0
Swain County	2/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/12/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/15/2010	Winter Weather	0/0	\$0	\$0

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	2/15/2010	Winter Weather	0/0	\$0	\$0
Swain County	2/24/2010	Heavy Snow	0/0	\$0	\$0
Swain County	3/2/2010	Heavy Snow	0/0	\$0	\$0
Swain County	3/3/2010	Winter Weather	0/0	\$0	\$0
Swain County	3/22/2010	Winter Weather	0/0	\$0	\$0
Swain County	11/5/2010	Heavy Snow	0/0	\$0	\$0
Swain County	12/4/2010	Winter Weather	0/0	\$0	\$0
Swain County	12/12/2010	Heavy Snow	0/0	\$0	\$0
Swain County	12/15/2010	Winter Weather	0/0	\$0	\$0
Swain County	12/25/2010	Heavy Snow	0/0	\$0	\$0
Swain County	1/5/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2011	Heavy Snow	0/0	\$0	\$0
Swain County	1/10/2011	Heavy Snow	0/0	\$0	\$0
Swain County	1/11/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/24/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/26/2011	Winter Weather	0/0	\$0	\$0
Swain County	2/9/2011	Winter Weather	0/0	\$0	\$0
Swain County	3/6/2011	Winter Weather	0/0	\$0	\$0
Swain County	3/11/2011	Winter Weather	0/0	\$0	\$0
Swain County	11/29/2011	Winter Weather	0/0	\$0	\$0
Swain County	12/7/2011	Winter Weather	0/0	\$0	\$0
Swain County	1/2/2012	Winter Weather	0/0	\$0	\$0
Swain County	2/11/2012	Winter Weather	0/0	\$0	\$0
Swain County	10/29/2012	Winter Storm	0/0	\$0	\$0
Swain County	11/5/2012	Winter Weather	0/0	\$0	\$0
Swain County	12/29/2012	Winter Weather	0/0	\$0	\$0
Swain County	1/17/2013	Winter Weather	0/0	\$0	\$0
Swain County	1/25/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/1/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/2/2013	Heavy Snow	0/0	\$0	\$0
Swain County	2/15/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/19/2013	Winter Weather	0/0	\$0	\$0
Swain County	2/27/2013	Winter Weather	0/0	\$0	\$0
Swain County	3/1/2013	Winter Weather	0/0	\$0	\$0
Swain County	3/5/2013	Winter Storm	0/0	\$0	\$0
Swain County	3/20/2013	Winter Weather	0/0	\$0	\$0
Swain County	3/25/2013	Winter Storm	0/0	\$0	\$0
Swain County	11/26/2013	Winter Weather	0/0	\$0	\$0

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)
SWAIN COUNTY					
Swain County	1/2/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/6/2014	Extreme Cold/Wind Chill	0/0	\$0	\$0
Swain County	1/21/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/28/2014	Winter Weather	0/0	\$0	\$0
Swain County	2/10/2014	Winter Weather	0/0	\$0	\$0
Swain County	2/12/2014	Winter Storm	0/0	\$0	\$0
Swain County	3/24/2014	Winter Weather	0/0	\$0	\$0
Swain County	3/29/2014	Winter Weather	0/0	\$0	\$0
Swain County	10/31/2014	Winter Weather	0/0	\$0	\$0
Swain County	11/1/2014	Heavy Snow	0/0	\$0	\$0
Swain County	11/26/2014	Winter Weather	0/0	\$0	\$0
Swain County	1/7/2015	Cold/Wind Chill	0/0	\$0	\$0
Swain County	1/26/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/16/2015	Winter Storm	0/0	\$0	\$0
Swain County	2/18/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/18/2015	Cold/Wind Chill	0/0	\$0	\$0
Swain County	2/20/2015	Winter Weather	0/0	\$0	\$0
Swain County	2/23/2015	Winter Storm	0/0	\$0	\$0
Swain County	2/25/2015	Winter Storm	0/0	\$0	\$0
Swain County	3/27/2015	Winter Weather	0/0	\$0	\$0
Swain County	1/20/2016	Winter Weather	0/0	\$0	\$0
Swain County	1/22/2016	Winter Storm	0/0	\$0	\$0
Swain County	2/8/2016	Winter Weather	0/0	\$0	\$0
Swain County	3/20/2016	Winter Weather	0/0	\$0	\$0
Swain County	5/5/2016	Winter Weather	0/0	\$0	\$0

Source: National Centers for Environmental Information

There have been several severe winter weather events in Swain County. The text below describes one of the major events and associated impacts on the county. Similar impacted 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.

Winter storms throughout the planning area have several negative externalities including hypothermia, 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 to fire or an accumulation of toxic fumes.

Extent

The extent of winter storms can be measured by the amount of snowfall or ice accumulation received (in inches). Due to extreme variations in elevation throughout the county, extent totals will vary. Twenty-four inches of snow accumulation was reported in the 1993 event. However, more accumulation is possible. Several inches of ice accumulation is also possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Swain County due to location and elevation. According to historical information, Swain County experiences an average of nine winter storm events each year. Therefore, the annual probability is highly likely (greater than 90 percent).

Vulnerability Assessment

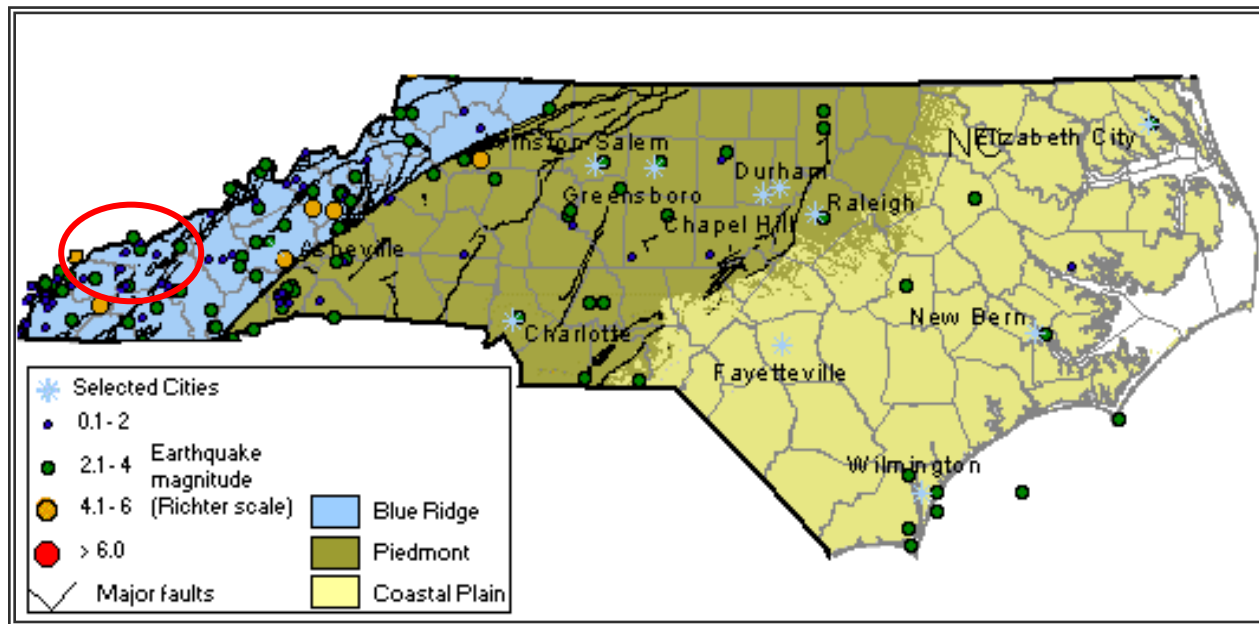
All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack). However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

E.2.8 Earthquake

Location

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 E.2** is a map showing geological and seismic information for North Carolina.

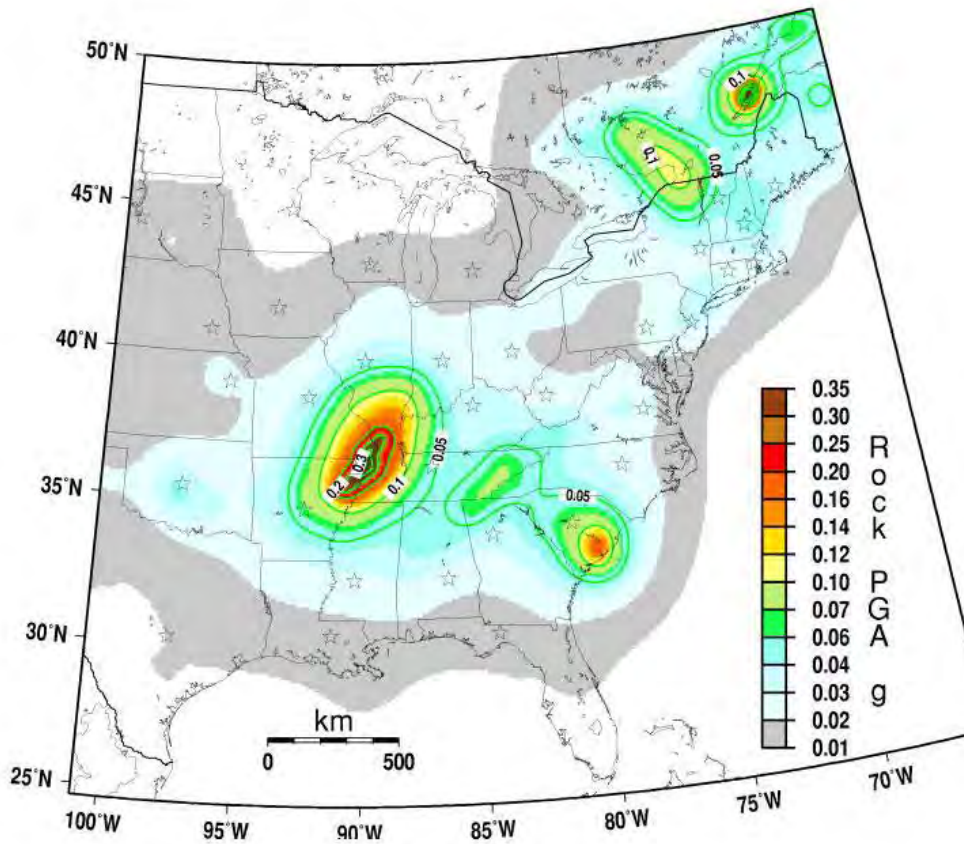
FIGURE E.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



Source: North Carolina Geological Survey

Figure E.3 shows the intensity level associated with Swain County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Swain County lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the county exists within an area of moderate seismic risk.

FIGURE E.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2008

Historical Occurrences

At least seven earthquakes are known to have affected Swain County since 1874. The strongest of these measured a V on the Modified Mercalli Intensity (MMI) scale. **Table E.20** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table E.21** presents a detailed occurrence of each event including the date, distance for the epicenter, and Modified Mercalli Intensity (if known).¹⁵

TABLE E.20: SUMMARY OF SEISMIC ACTIVITY IN SWAIN COUNTY

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Bryson City	7	V	-
Unincorporated Area	0	-	-
SWAIN COUNTY TOTAL	7	V (slightly strong)	< 4.8

Source: National Geophysical Data Center

¹⁵ Due to reporting mechanisms, not all earthquakes events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of “unknown” is reported.

TABLE E.21: SIGNIFICANT SEISMIC EVENTS IN SWAIN COUNTY (1638 -1985)

Location	Date	MMI (magnitude)
Swain County		
Bryson City	11/3/1928	V
Bryson City	1/1/1935	IV
Bryson City	9/7/1956	III
Bryson City	11/24/1957	V
Bryson City	11/20/1969	III
Bryson City	11/30/1973	IV
Bryson City	7/27/1980	IV

Source: National Geophysical Data Center

In addition to those earthquakes specifically affecting Swain County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table E.22**.

TABLE E.22: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

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

*This event is accounted for in the Swain County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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)*.

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. The strongest intensity of earthquake to occur in Swain County is an MMI of V (slightly strong; less than 4.8 on the Richter scale), which has occurred during four separate earthquake events. However, stronger events are possible in the county and beyond. In general, earthquakes greater than 5.0, which typically result in damage, are not common (or likely) in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Swain County is unlikely, given seven recorded events in 347 years. However, it is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the potential dollar loss for Swain County. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table E.23** summarizes the findings.

TABLE E.23: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	100 Year Event Loss	100 Year Event Ratio	500 Year Event Loss	500 Year Event Ratio	Annualized Loss	Annualized Loss Ratio ¹
Swain County	\$2,734,027,126	\$128,739	0.004708%	\$2,059,775	0.075338%	\$21,941	0.000802%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

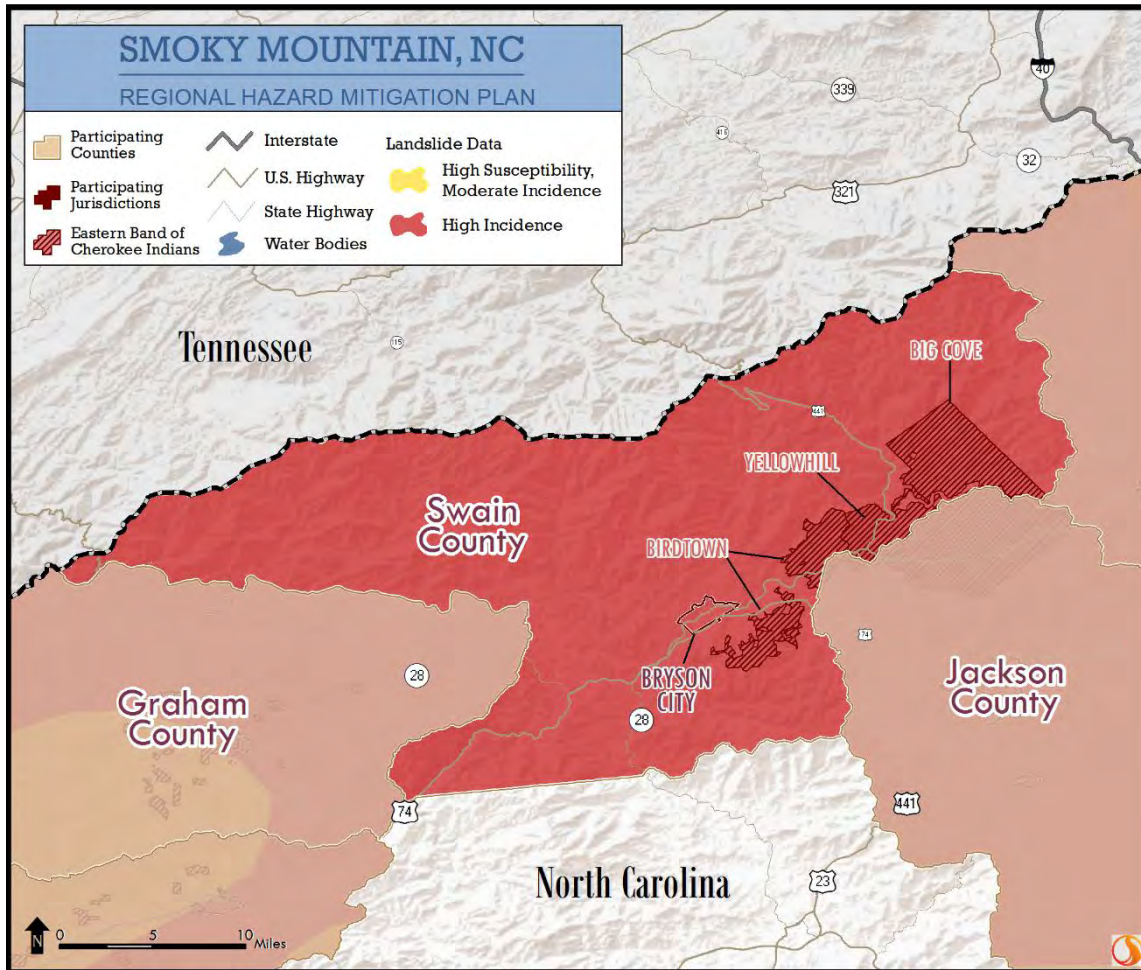
E.2.9 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 Swain County.

According to **Figure E.4** below, which leverages USGS landslide information, the entire county has high landslide activity. There is also high susceptibility throughout the county.

FIGURE E.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF SWAIN COUNTY



Source: USGS

Location

Landslide extent can be measured in terms of tons of debris or damage or frequency, for example. The entire county resides in an area of high incidence (10-15% of area involved in landsliding). While limited information exists on debris generated from past events, millions of dollars in damages is possible. The most severe events may result in loss of life.

Historical Occurrences

Steep topography throughout Swain County 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. **Table E.24** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey¹⁶. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure E.5**. Some incidence mapping has also been completed

¹⁶ 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.

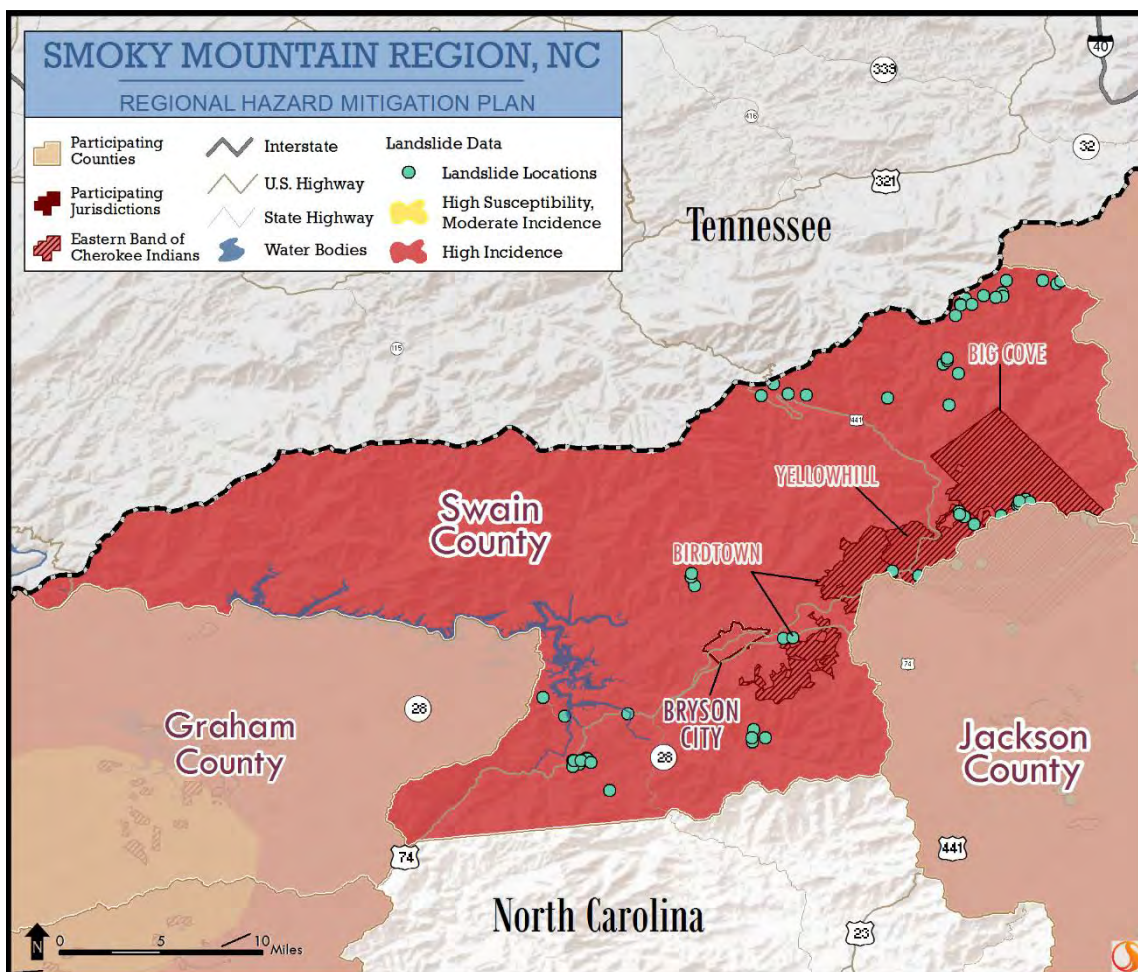
throughout the western portion of North Carolina though it is not complete. Therefore, it should be noted that many more incidents than what is reported are likely to have occurred in Swain County.

TABLE E.24: SUMMARY OF LANDSLIDE ACTIVITY IN SWAIN COUNTY

Location	Number of Occurrences
Bryson City	-
Unincorporated Area	58
SWAIN COUNTY TOTAL	58

Source: North Carolina Geological Survey

FIGURE E.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES IN SWAIN COUNTY



Source: North Carolina Geological Survey

The following information identifies additional historical information reported in the previous hazard mitigation plan:

There is no serious history of landslides in Swain County though some incidents have been reported. NCDEM classification suggests that the probability of a landslide event having a minor effect on the county is highly likely to occur.

Probability of Future Occurrences

Based on historical information (58 reported landslides) and the USGS susceptibility index, an annual probability of likely (10 to 100 percent probability) was assigned to future landslide events. The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as having a lower, “moderate” incidence ranking. All of Swain County is located in the high incidence area. It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas in Swain County have greater risk than others given factors such as steepness on slope and modification of slopes (i.e., greater slope or modification of slope may increase risk and occurrence).

Vulnerability Assessment

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. All areas of Swain County are classified as high incidence (more than 15% of the area is involved in landsliding). Table E.25 presents the potential vulnerability in high incidence areas.

TABLE E.25: ESTIMATED PARCELS AND IMPROVED PROPERTY IN HIGH INCIDENCE LANDSLIDE HAZARDS AREAS

Location	Landslide Vulnerability: High Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	12,637	100%	6,821	100%	\$879,929,398	100%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	11,636	100%	6,054	100%	\$735,070,902	100%
EBCI	23	100%	7	100%	\$1,645,240	100%

Source: USGS

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk.

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations in Swain County, 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 county 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.

E.2.10 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table E.26** explains these classifications.

TABLE E.26: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

According to the North Carolina Division of Land Management there are 18 dams in Swain County.¹⁷ Of these dams, nine are classified as high hazard potential, four are classified as intermediate hazard potential, and five are classified as low hazard. High hazard dams are listed in **Table E.27**.

TABLE E.27: SWAIN COUNTY HIGH HAZARD DAMS

Dam Name	Hazard Potential	Surface Area (acres)	Max Capacity (ac-ft)	Owner Type
SWAIN COUNTY				
Bryson City Water Supply Dam	High	2.0	78	Local Government
Bryson Dam	High	43.0	530	Utility
Cheoah Valley Dam	High	5.0	96	Private
Crimmins Dam	High	-	1	Private
Frischholz Dam	High	0.7	5	Private
Lott Dam	High	0.3	3	Private
Schmehl Dam	High	0	14	Private
Whitney Dam	High	0.7	10	Private
Widenhouse Dam	High	0.5	7	Private

Source: North Carolina Division of Land Resources

It should also be noted that the North Carolina dam classification regulations were recently updated. As a result of the change, more dams are generally classified as high hazard.

(Taken from previous Swain County hazard mitigation plan.) There are three river basins within Swain County. Swain County has one Tennessee Valley Authority reservoir. If this dam were to fail, the economic impact to Swain County would be substantial and could affect the entire far western section of Swain County. There are

¹⁷ From the March 16, 2017 list of high hazard dams obtained from the North Carolina Division of Energy, Mineral, and Land Resources (<https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety>).

eight Duke Power reservoirs located in Jackson and Macon County. If seven of these dams were to fail, the economic impact to Swain County would also be substantial and would severely impact Bryson City. The remaining dam located in Macon County would have a severe impact on the Nantahala Gorge. This dam failure would result in the most impact of life and property within Swain County. Based on historical information as well as dam failure inundation maps, we estimate that flood waters from a dam failure would never exceed 30 feet above the 500-year floodplain.

Historical Occurrences

No dam breaches were reported in Swain County. However, several breach scenarios in the county could be catastrophic.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria. Of the 18 dams in Cherokee County, nine are classified as high-hazard, which could result in fatalities if breached.

Probability of Future Occurrences

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 was completed in a *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.

E.2.11 Erosion

Location

Erosion in Swain County is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, Swain County's mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs in the county, particularly along the banks of rivers and streams, but it is not an extreme threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion in Swain County. This includes searching local newspapers, obtaining input from the planning team, and reviewing the previous hazard mitigation plan. Prior to joining the regional planning effort, Swain County recognized erosion as hazard and included mitigation actions to address the hazard. Little information could be found beyond the hazard mitigation plan.

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs (e.g., inches per year). There are no erosion rate records located in Swain County, but it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for the Swain County, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent annually).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

E.2.12 Flood

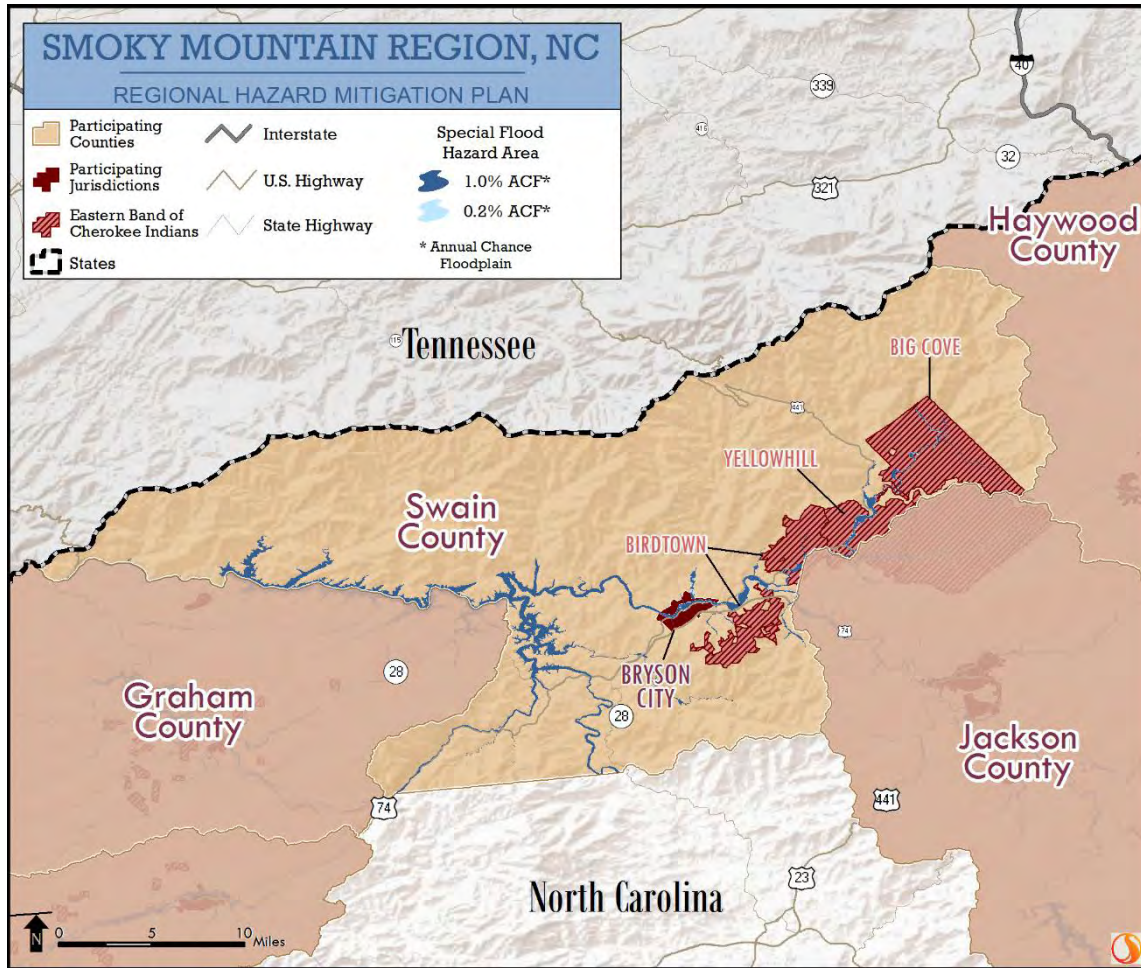
Location

There are areas in Swain County that are susceptible to flood events. Special flood hazard areas in the county were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).¹⁸ 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 540 square miles that make up Swain County, there are 4.97 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain), 0.91 square miles in the floodway, and 0.35 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). In total, there is 6.23 square miles of land in floodplain areas in Swain County.

These flood zone values account for 1.2 percent of the total land area in Swain County. 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 E.6** and **Figure E.7** illustrate the location and extent of currently mapped special flood hazard areas for Swain County and the Town of Bryson City based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

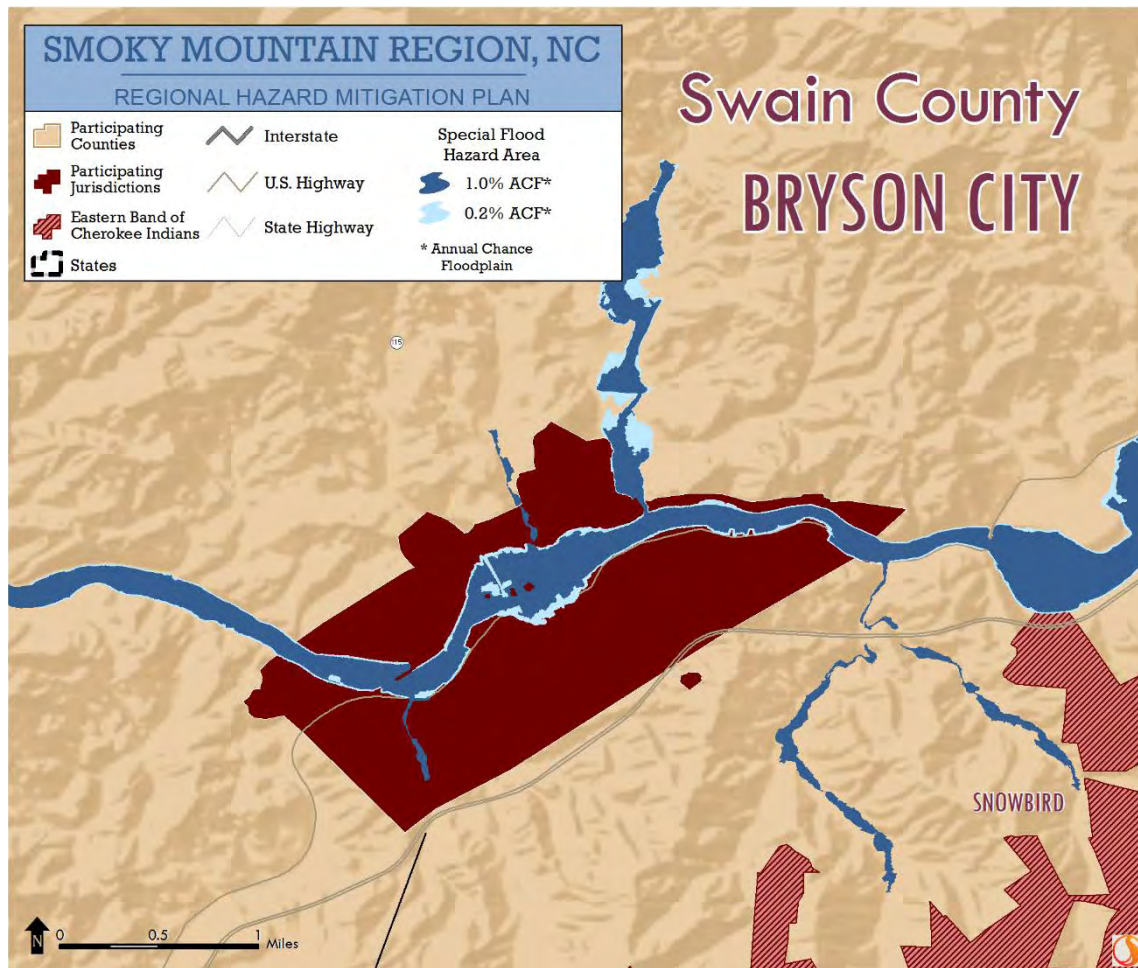
¹⁸ The county-level DFIRM data used for Swain County were updated in 2010.

FIGURE E.6: SPECIAL FLOOD HAZARD AREAS IN SWAIN COUNTY



Source: Federal Emergency Management Agency

FIGURE E.7: SPECIAL FLOOD HAZARD AREAS IN BRYSON CITY



Source: Federal Emergency Management Agency

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 20 events in Swain County since 1996.¹⁹ A summary of these events is presented in **Table E.28**. These events accounted for over \$1,087,000 (2017 dollars) in property and crop damage in the county.²⁰ Specific information on flood events, including date, type of flooding, and deaths and injuries, can be found in **Table E.29**.

TABLE E.28: SUMMARY OF FLOOD OCCURRENCES IN SWAIN COUNTY

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
SWAIN COUNTY	20	\$1,069,421	\$17,622
Bryson City	8	\$96,721.05	\$0

¹⁹ These events are only inclusive of those reported by NCDC. It is likely that additional occurrences have occurred and have gone unreported.

²⁰ The total damage amount was averaged over the number of affected counties when multiple counties were involved in the flood event.

Unincorporated	12	\$972,699	\$17,622
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Source: NOAA National Centers Environmental Information

TABLE E.29: HISTORICAL FLOOD EVENTS IN SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain County	1/26/1996	Flood	0/0	\$0	\$0	--
Smokemont	9/24/1997	Flash Flood	0/0	\$0	\$0	--
Swain County	1/7/1998	Flash Flood	0/0	\$0	\$0	--
Bryson City	4/4/2000	Flash Flood	0/0	\$0	\$0	--
Swain County	5/5/2003	Flood	0/0	\$0	\$0	--
East Portion	5/6/2003	Flash Flood	0/0	\$151,259	\$0	Numerous thunderstorms producing very heavy rainfall resulted in rapid rises and flash flooding along creeks and streams in area in and around the Cherokee Indian Reservation. Most creeks around the reservation flooded. The high water caused damage to numerous homes. Many bridges and campgrounds were washed away. Several rock slides and mudslides resulted in closure of major highways as well as side roads.
South Portion	5/7/2003	Flash Flood	0/0	\$453,777	\$0	For the second day in a row, flash flooding developed across southern portions of the county after a series of thunderstorms produced very heavy rainfall. Some of the same campgrounds that flooded on the 6th flooded again on the morning of the 7th. Mud and rock slides developed, causing some houses and trailers to be swept away. A portion of highway 19 was also washed away.
Swain County	5/7/2003	Flood	0/0	\$0	\$0	--
Swain County	11/19/2003	Flood	0/0	\$0	\$0	--
Swain County	9/7/2004	Flood	0/0	\$0	\$17,622	Flooding developed in the early evening in areas near the Blue Ridge, from Highlands to Cashiers, then quickly spread to include locations such as Cullowhee, Bryson City, and Cherokee. Jackson and southern Macon counties were the hardest hit, as numerous creeks and streams flooded, including the Little Tennessee River. Several homes and businesses were damaged and a few private dams were breached or damaged in Macon County. Several sections of highway 281 were washed out in Jackson County. By early morning of the 8th, flood gates were open on all Jackson County dams, and numerous rescues and evacuations were underway.

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
SWAIN COUNTY						
Swain County	9/16/2004	Flood	0/0	\$367,133	\$0	In response to persistent moderate to heavy rainfall associated with the remnants of Hurricane Ivan, severe flooding developed across the mountains for the second time in 9 days. Flooding first developed across the southwest mountains, when several small streams and creeks overflowed their banks, including Toot Hollow Creek near Bryson City. Several rescues were required during the evening in Macon County, as creeks and streams began to threaten homes. Flooding became more widespread, with Macon County enduring the worst of it. The Little Tennessee River overflowed its banks during the early morning of the 17th, and continued to flood through much of the day. The river flooded an industrial park in Macon County, causing extensive damage. In Swain County, 500,000 gallons of raw sewage and numerous natural gas tanks were swept down the river. Hundreds of structures were damaged or destroyed, and several private bridges were swept away. Portions of highways 105, 64, and 28 were all closed in Macon County, some due to major damage that was estimated to take several months to repair. In addition, a trout farm lost 60,000 pounds of fish.
Bryson City	6/9/2005	Flash Flood	0/0	\$28,515	\$0	A very small, but persistent rain shower produced 5 inches of rain in 2 hours, resulting in flash flooding in a small area in the Wesser community. Wesser Creek flooded near its confluence with the Nantahala River, covering several roads with water. Water entered several homes in this area as well.
Bryson City	11/11/2009	Flash Flood	0/0	\$0	\$0	--
Bryson City	11/11/2009	Flood	0/0	\$0	\$0	--
Bryson City	12/9/2009	Flood	0/0	\$0	\$0	--
Bryson City	1/24/2010	Flash Flood	0/0	\$0	\$0	--
Bryson City	4/26/2012	Flash Flood	0/0	\$23,185	\$0	Strong storms dropped 2 to 3 inches of rain in a couple hours over central Swain County. This caused streams in and around Bryson City to leave their banks. Bryson Branch flooded the intersection of Bryson Walk and Slope Street and Veterans Blvd. Jenkins Branch flooded parts of Jenkins Branch Road, causing some property damage

ANNEX D: SWAIN COUNTY

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
SWAIN COUNTY						
Bryson City	1/15/2013	Flood	0/0	\$45,020	\$0	Flooded locations in and near the Cherokee Indian reservation included the Parkway entrance (US441), the Saunooke Bridge, which connects Big Cove Road to Newfound Gap Road, Meetinghouse Road and Whitewater Drive. Big Cove Road was also flooded in the Piney Grove area along Rabun Fork. Mt. Noble Road was damaged by mudslide. Oconaluftee Island Park was flooded for a while by the Oconaluftee River in Cherokee, though damage to the park was minimal. Several roads were damaged by flash flooding and landslides. Federal disaster declaration.
Needmore	1/17/2013	Flood	0/0	\$0	\$0	--
Lauada	12/24/2015	Flood	0/0	\$530	\$0	After as much as 4 inches of rain fell in about 36 hours across southern Swain County, a stream gauge on the Little Tennessee near Needmore exceeded its established flood stage, indicating flooding of multiple side roads across the southern part of the county, including Needmore Rd near the Franklin Co. border.

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 1,519 parcels (12 percent of the total) and 999 improved properties (15 percent of the total) located in the 1.0-percent annual chance floodplain or 0.2-percent annual chance floodplain within Swain County.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. Three gauges currently exist in Swain County, as presented in **Table E.30**. The maximum discharge recorded at a gauge in Swain County was 27,600 cubic feet per second in 2013 at the Tuckasegee River.

TABLE E.30: SUMMARY OF DISCHARGE RATES IN SWAIN COUNTY

Water Feature	Gage Location	Median Discharge (ft ³ /s)	Max Discharge (ft ³ /s – yr)	Drainage Area (sq miles)	Max Gage Height (ft/yr)
Nantahala River	Near Hewitt, Swain County	478	3,940 (2013)	145	5.58 (2013)
Little Tennessee River	at Needmore, Swain County	656	15,800 (2015)	436	10.21 (2015)
Tuckasegee River	at Bryson City, Swain County	1,150	27,600 (2013)	655	12.67 (2013)
Oconaluftee River	Birdtown, Swain County	372	10,900 (2013)	372	9.37 (2013)

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been 15 flood losses reported in Swain County through the National Flood Insurance Program (NFIP) since 1970, totaling over \$432,000 in claims payments. A summary of these figures for the county is provided in **Table E.31**. 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 Swain County were either uninsured, denied claims payment, or not reported.

TABLE E.31: SUMMARY OF INSURED FLOOD LOSSES IN SWAIN COUNTY

Location	Flood Losses	Claims Payments
SWAIN COUNTY	15	\$432,173
Bryson City	11	\$405,822
Unincorporated Area	4	\$26,351

Source: FEMA, NFIP

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.

As of February 2017, there are two non-mitigated repetitive loss properties located in Swain County, which accounted for eight losses and more than \$306,000 in claims payments under the NFIP. The average claim amount for this property is \$45,821. Both properties are a nonresidential. Without mitigation, these properties will likely continue to experience flood losses. **Table E.32** presents detailed information on repetitive loss properties and NFIP claims and policies for Swain County.

TABLE E.32: SUMMARY OF REPETITIVE LOSS PROPERTIES IN SWAIN COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
SWAIN COUNTY	2		8	\$306,198	\$60,371	\$366,569	\$45,821
Bryson City	2	2 nonresidential	8	\$306,198	\$60,371	\$366,569	\$45,821
Unincorporated Area	0	-	0	\$0	\$0	\$0	\$0

Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat in Swain County. NCEI’s Storm Events Database indicated 20 flood events in Swain County between 1996 and 2016. This results in an approximate annual occurrence rate of one flood each year. Information on previous NFIP losses also indicates ongoing flood risk. Therefore, flood was assigned a probability of “highly likely” (greater than 90 percent annual probability).

The participating jurisdictions and unincorporated areas of the county have risk to flooding, though not all areas will experience flood. 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 county and participating jurisdictions. Flood is not the greatest hazard of concern but will continue occur and cause damage. Therefore, mitigation actions may be warranted, particularly for repetitive loss properties.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 E.33** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and **Table E.34** presents potential at-risk property susceptible to either the 1.0-percent or 0.2-percent annual chance flood in Swain County. Both the number of parcels and the approximate value are presented.

TABLE A.33: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF)

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	1,358	11%	882	13%	\$137,962,502	16%
Bryson City	269	28%	220	29%	\$38,539,400	27%
Unincorporated Area	1,077	9%	656	11%	\$98,608,092	13%
EBCI	12	52%	6	50%	\$815,010	50%

Source: FEMA DFIRM

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

TABLE A.34: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 0.2-PERCENT ACF FLOOD HAZARD (COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS)

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	1,519	12%	999	15%	\$160,252,552	18%
Bryson City	342	35%	278	36%	\$49,679,990	35%
Unincorporated Area	1,164	10%	1,077	12%	\$109,757,552	15%
EBCI	13	57%	7	58%	\$815,010	50%

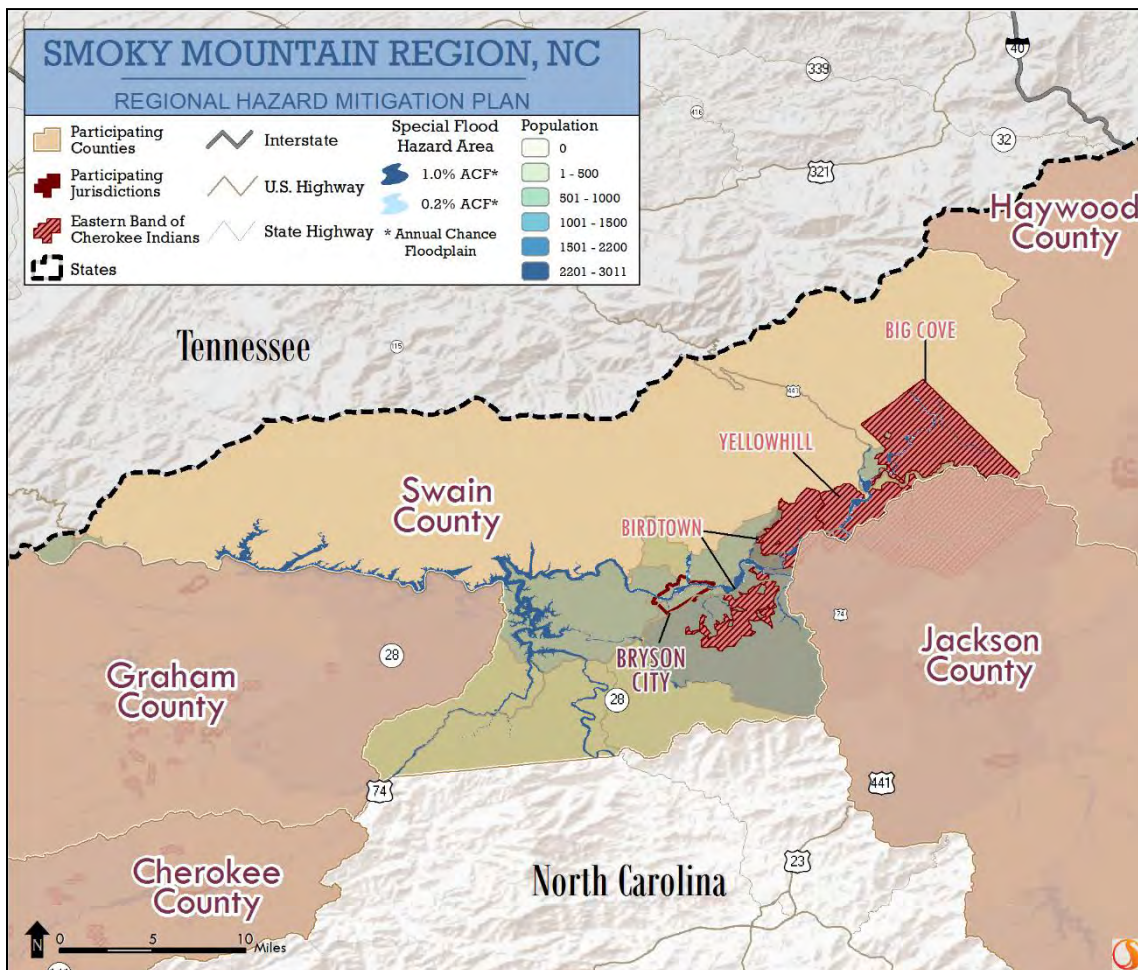
Source: FEMA DFIRM

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure E.8** is presented to gain a better understanding of at risk population.

FIGURE E.8 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census 2015

E.2.13 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Swain County has no TRI sites.

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

Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A “serious incident” (highlighted in yellow in **Table E.35** below) 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 materials “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 persons due to the presence of hazardous material, or
- ◆ a vehicle accident or derailment resulting in the release of a hazardous material.

Table E.35 presents detailed information on historic HAZMAT incidents reported in Swain County.

TABLE E.35: SUMMARY OF HAZMAT INCIDENTS IN SWAIN COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities/ Injuries	Damages (\$)	Quantity Released
Swain County							
I-1977090461	09/01/1977	Bryson City	Highway	No	0/0	\$0	0
I-1977111031	11/16/1977	Bryson City	Highway	No	0/0	\$0	0
I-1978080563	08/07/1978	Bryson City	Highway	No	0/0	\$0	1 LGA
I-1992091038	08/25/1992	Cherokee	Highway	No	0/0	\$6	6 LGA
I-1996100595	7/12/1996	Whittier	Highway	No	0/0	\$5	5 LGA
E-2006070211	7/10/2006	Whittier	Highway	No	0/0	\$2,110	40 LGA

Source: USDOT PHMSA

Extent

Hazardous Materials Incidence extent can be defined into terms of amount of material released or associated impacts.. According to USDOT PHMSA, the largest hazardous materials incident reported in the county is 40 LGA released on the highway in Whittier. It should be noted that larger events are possible.

Probability of Future Occurrences

Given the curvy, mountainous roads in Swain County, it is possible that a hazardous material incident may occur in the county, though it is unlikely (less than one percent annual probability). County and town 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.

Although there are no TRI sites and no record of previous events in the county, hazardous materials incidents will continue to be a threat. The county may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

Vulnerability Assessment

There are no reports of damage from hazardous materials incidents in Swain County. It is assumed that one major event could result in significant losses for Swain County.

Most hazardous materials 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 materials 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.²¹ In both scenarios, two sizes of buffers—500 and 2,500 meters—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. An analysis was not performed for fixed sites, as no TRI sites were reported in Swain County. 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 E.9** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table E.36** (mobile road sites) and **Table E.37** (mobile railroad sites).²²

²¹ This type of analysis will likely yield conservative results that are higher than those actually reported following an event.

²² Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE E.9 : MOBILE HAZMAT BUFFERS IN SWAIN COUNTY

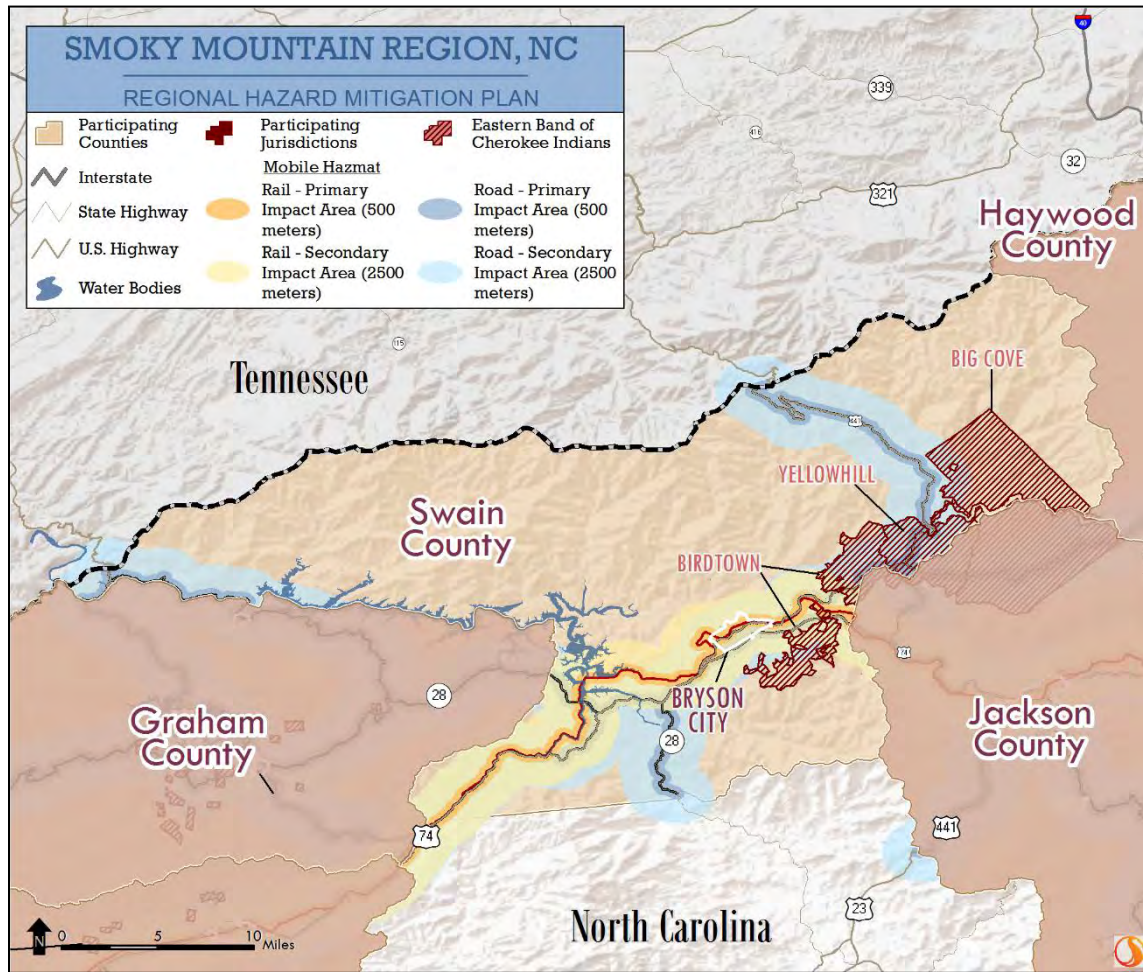


TABLE E.36: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - ROAD)

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	3,295	26%	2,079	30%	\$326,096,584	37%
Bryson City	843	86%	653	86%	\$125,540,864	88%
Unincorporated Area	2,441	21%	1,421	23%	\$199,060,500	27%
EBCI	11	48%	5	71%	\$1,495,220	91%

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	8,898	70%	5,125	75%	\$712,285,578	81%

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	7,897	68%	4,358	72%	\$567,427,082	77%
EBCI	23	100%	7	100%	\$1,645,240	100%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

**TABLE E.37: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	2,338	19%	1,493	22%	\$260,696,274	30%
Bryson City	691	71%	552	73%	\$101,926,934	71%
Unincorporated Area	1,640	14%	936	15%	\$157,274,120	21%
EBCI	7	30%	5	71%	\$1,495,220	91%

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	8,222	65%	4,799	70%	\$687,724,938	78%
Bryson City	978	100%	760	100%	\$143,213,256	100%
Unincorporated Area	7,225	62%	4,032	67%	\$542,866,442	74%
EBCI	19	83%	7	100%	\$1,645,240	100%

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire county, it is assumed that the total population is at risk to a hazardous materials incident. It should be noted that areas of population concentration may be at an elevated risk due to a greater burden to evacuate population quickly.

E.2.14 Wildfire

Location

The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations about

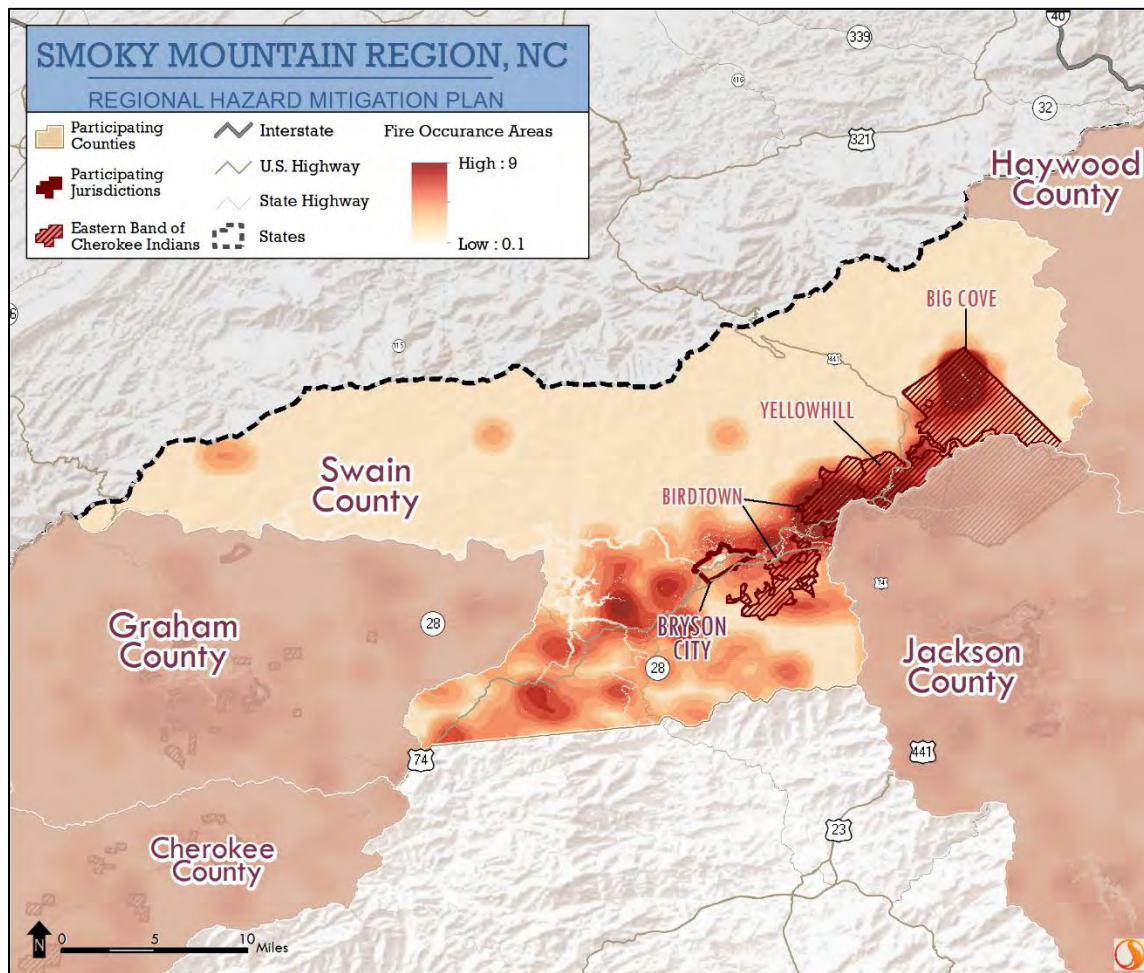
formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic locations impacted.

Historical Occurrences and Extent

Information from the Southern Wildfire Risk Assessment and from North Carolina Forest Services was used to ascertain historic wildfire occurrences for the Smoky Mountain Region. The Southern Wildfire Risk Assessment provides Fire Occurrence Areas (FOA) based on historical fire ignitions. Data is reported as the number of fires that occur per 1,000 acres each year, and is displayed spatially. The North Carolina Forest Service provided data on the annual number of fires and annual number of acres burned per county.

Figure E.10 shows the Fire Occurrence Areas (FOA) in Swain County based on data from the Southern Wildfire Risk Assessment.

FIGURE E.10: HISTORIC WILDFIRE EVENTS IN SWAIN COUNTY



Source: Southern Wildfire Risk Assessment

Based on data from the North Carolina Division of Forest Resources from 2002 to 2016, Swain County experiences an average of 21 wildfires annually which burn an average of 703 acres per year. This 15-year average is higher than that for the previous 10-year period used in the last plan update (163 average acres per year from 2002 to 2011). This increase is in part attributed to a much larger than average number of

acres burned in 2016 (8,863 acres). The data indicates that these fires average 33 acres per fire. **Table E.38** lists the number of reported wildfire occurrences in the county between the years 2002 and 2016.

TABLE E.38: HISTORICAL WILDFIRE OCCURRENCES IN SWAIN COUNTY

Year	Number of Fires	Number of Acres Burned
2002	19	23.6
2003	10	29.1
2004	22	152.9
2005	24	149.2
2006	24	163.1
2007	23	405
2008	28	257
2009	7	27
2010	24	285
2011	18	50
2012	8	50
2013	12	25
2014	10	28
2015	8	43
2016	81	8863

Source: North Carolina Division of Forest Resources

2016 Wildfires

In the late October through November of 2016, western North Carolina suffered from what are considered to be wildfires of historic extent. In November alone, western North Carolina experienced an outbreak of wildfires that burned over 55,000 acres in the wake of an extreme drought.²³ Graham County and Swain County were particularly hard hit. In Swain County, residents of six streets were forced to evacuate after a fire burned over 6,800 acres.²⁴ The Tellico Fire (**Figure E.11**²⁵), which burned on the Swain County-Macon County border, burned over 13,600 acres before being contained.

Homes in the Tellico and Queen Creek communities were only several hundred feet from the fire, and faced a voluntary evacuation. This prompted a state of emergency to be declared for the county.



Figure E.11: A heavy air tanker drops fire retardant ahead of the Tellico Fire

Source: The US Forest Service, North Carolina

²³ <http://www.charlotteobserver.com/news/local/article114911183.html>

²⁴ <http://wlos.com/news/local/mandatory-evacuations-issued-in-swain-county-because-of-wildfires>

²⁵ <https://inciweb.nwcg.gov/incident/photograph/5084/19/61188/>

Firefighting and rescue crews from all over the state traveled to western North Carolina to aid in relief efforts.²⁶ According to the USDA's Joint Information Center Western NC Wildfires, by November 25, 2016, nine incident management teams and over 6,000 state and federal personnel from all over the country were deployed to assist the Southeast with fire suppression, in addition to hundreds of state volunteer firefighters and emergency personnel. At the time, North Carolina alone was in use of seven airplanes, eight single engine air tankers (SEATs), six type 1 (large) helicopters, five type 2 (medium) helicopters, and three type 3 (large helicopters) to aid in fire suppression.²⁷ The USDA estimates that suppression costs from October through December in western North Carolina totaled \$36.8 million.²⁸ Aside from the impacts to human and environmental health and safety, the fires had a significant impact on the region's economy, which relies heavily on tourism during the fall and winter months.²⁹

Extent

Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2002 to 2016. The greatest number of fires to occur in Swain County in any year was 81 in 2016, and the greatest number of acres burned in a given year was also in 2016 (8,863 acres). See below for more information on the 2016 wildfires. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence in Swain County. The likelihood of wildfires increases during drought cycles and abnormally dry conditions. Fires are likely to stay small in size but could increase due to 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 Swain County for future wildfire events is highly likely (greater than 90% annual probability).

Vulnerability Assessment

Although historical evidence indicates that Swain County is susceptible to wildfire events, there are few reports of damage. It should be noted that a single event could result in significant damages throughout the county.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

²⁶ <http://myfox8.com/2016/11/22/new-wildfire-sparks-evacuations-in-blowing-rock/>

²⁷ UDA Forest Services Joint Information Center Western NC Wildfires. Evening Summary (2016, November 25). Retrieved from <https://www.fs.usda.gov/detail/nfsnc/alerts-notices/?cid=fseprd525902>

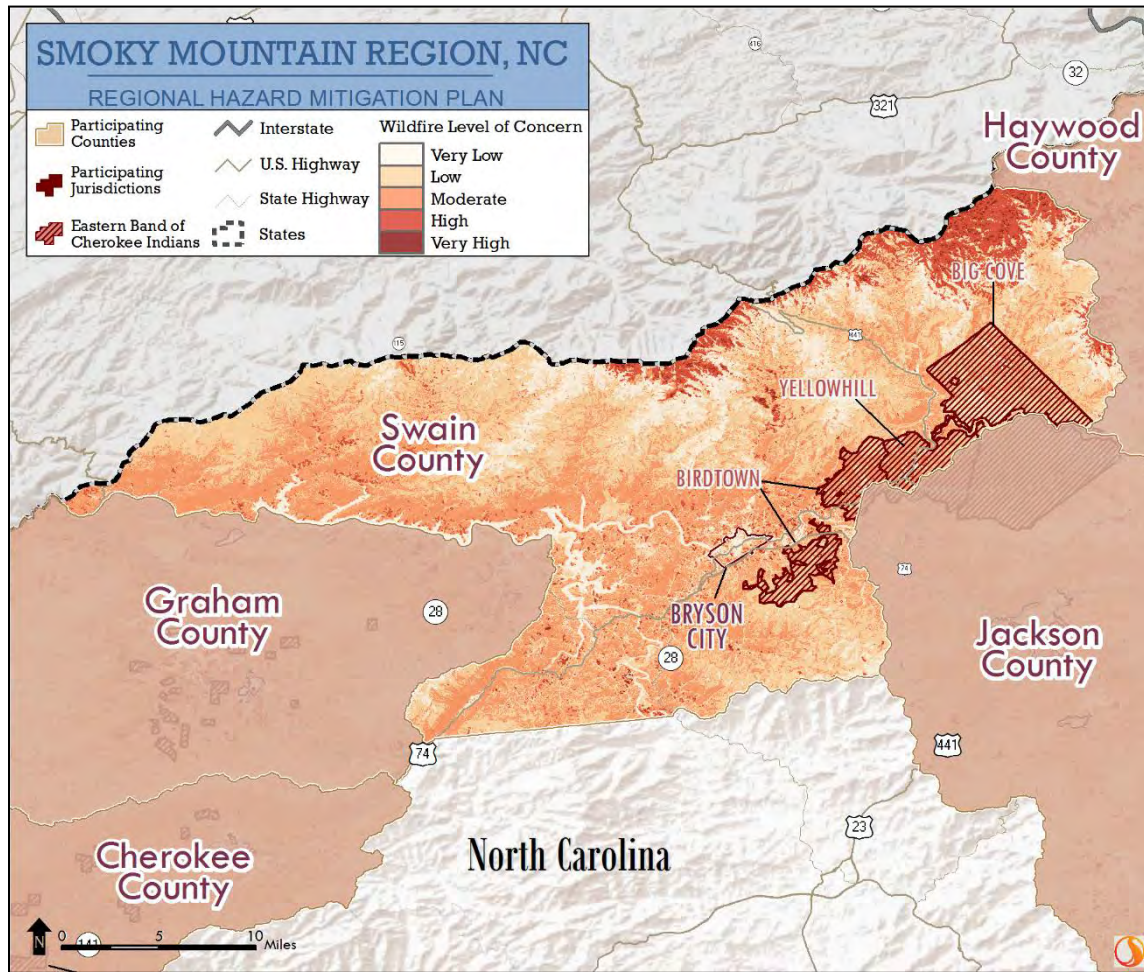
²⁸ <http://www.citizen-times.com/story/news/local/2017/03/31/wnc-wildfires-yield-hefty-price-tag/99736410/>

²⁹ <http://www.citizen-times.com/story/news/local/2016/11/18/outbreak-wnc-wildfires-takes-toll-wildlife-environment/93788956/>

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non- specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

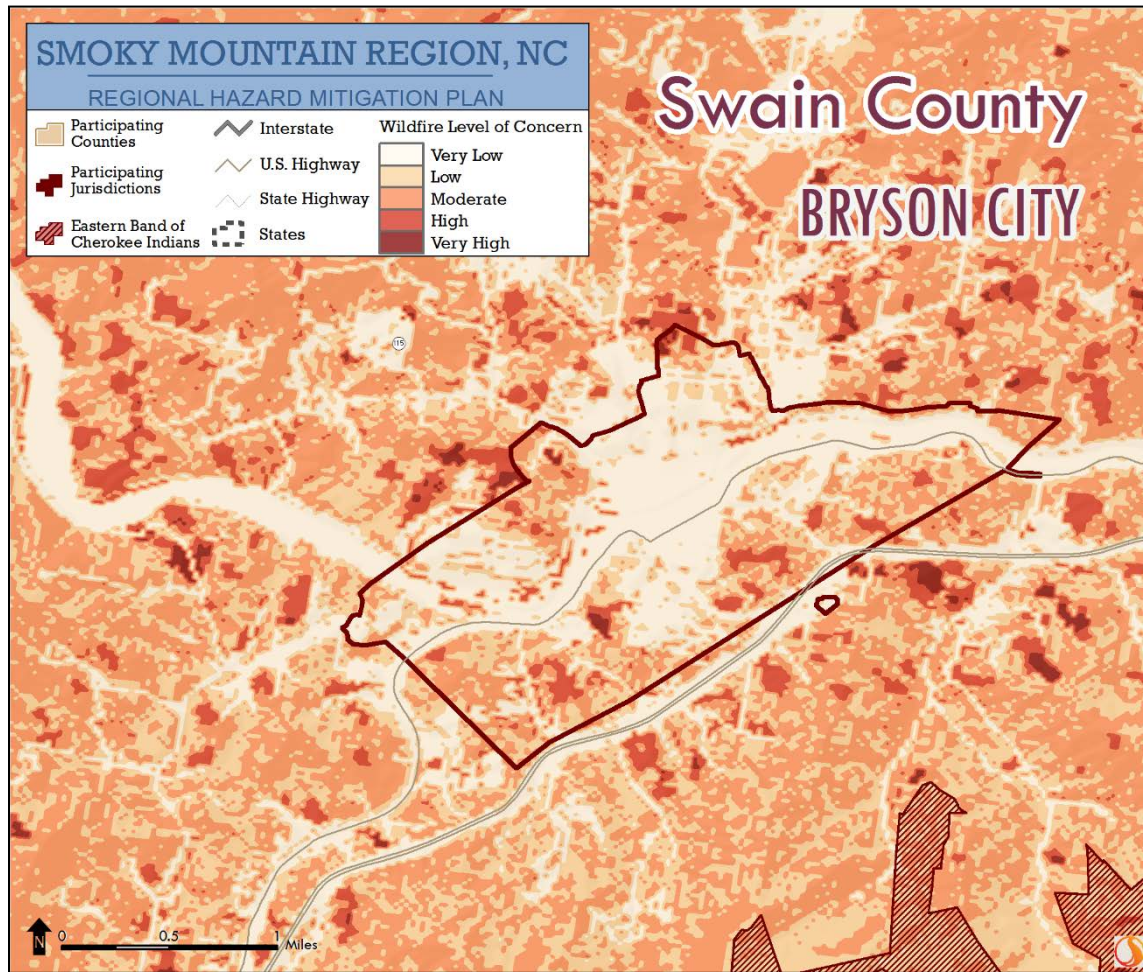
Figure E.12 and **Figure E.13** show the wildfire risk areas for Swain County and participating jurisdictions. Initially provided as raster data, it was converted to a polygon for analysis. Thirty-seven percent of parcels and 38 percent of improved parcels in Graham County are in areas of high to very high wildfire risk, as detailed in **Table E.39**. However, there is considerable risk overall when viewed outside of just high risk areas.

FIGURE E.12: WILDFIRE RISK AREAS IN SWAIN COUNTY



Source: Southern Wildfire Risk Assessment Data

FIGURE E.13: WILDFIRE RISK AREAS IN BRYSON CITY



Source: Southern Wildfire Risk Assessment Data

TABLE E.39: EXPOSURE OF IMPROVED PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Swain County	3,407	27%	2,128	31%	\$310,796,923	35%
Bryson City	170	17%	125	16%	\$23,261,562	16%
Unincorporated Area	3,220	28%	1,999	33%	\$286,400,541	39%
EBCI	17	74%	4	57%	\$1,134,820	69%

*Parcel counts for data provided by the Eastern Band of Cherokee Indians are included in regional totals. Improved parcel counts and values are not represented in regional totals.

Looking at jurisdictional level, unincorporated areas of the county face the highest level of wildfire risk. While the jurisdictions report a fairly low number of parcels and improvements in high or very high risk areas, each should be mindful that they are on the urban-wildland boundary and fire may quickly spread to

those lower areas of concern. In general, densely developed areas that are not in the wildland urban interface, which are present in some jurisdictional areas, are at a lower risk to wildfire.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. 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.

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in Swain County. Wildfires present significant risk to the county and jurisdictions within. These wildfires impact the economy by potentially causing widespread destruction of homes and critical facilities and interrupting businesses.

E.2.15 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for Swain County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table E.40 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 Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE E.40: SUMMARY OF PRI RESULTS FOR SWAIN COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	2.6
Lightning	Highly Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	2.2

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Thunderstorm/High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 6 hours	3.0
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.5
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	1.8
Flood	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	3.0
Other Hazards						
Hazardous Materials Incident	Unlikely	Limited	Small	Less than 6 hours	Less than 24 hours	1.9
Wildfire	Likely	Limited	Small	Less than 6 hours	Less than 1 week	3.5

E.2.16 Final Determinations on Hazard Risk

The conclusions drawn from the hazard profiling process for Swain County, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table E.41**). 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 Swain County. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section E.4. 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.

TABLE E.41: CONCLUSIONS ON HAZARD RISK FOR SWAIN COUNTY

HIGH RISK	<p>Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire Drought</p>
MODERATE RISK	<p>Tornado Hurricane and Coastal Storm Earthquake Landslide Hailstorm</p>
LOW RISK	<p>Hazardous Material Incident Lightning Dam and Levee Failure Erosion</p>

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E.3 SWAIN COUNTY CAPABILITY ASSESSMENT

This subsection discusses the capability of Swain County to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

E.3.1 Planning and Regulatory Capability

Table E.42 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Swain County and its participating jurisdictions. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE E.42: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	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
Swain County	✓	✓		*				✓							✓		✓			✓	✓	✓	
Bryson City	✓	✓						✓							✓					✓	✓	✓	

A more detailed discussion on the county’s planning and regulatory capabilities follows.

Emergency Management

Hazard Mitigation Plan

Swain County has previously adopted a hazard mitigation plan. The Town of Bryson City was also included in this plan.

Emergency Operations Plan

Swain County maintains an emergency operations plan through its Emergency Management Department. Bryson City is covered under the Swain County plan.

General Planning

Comprehensive Land Use Plan

Swain County completed a land use plan in 2012. Bryson City adopted its first land development plan in 2008.

Zoning Ordinance

Neither Swain County nor Bryson City has adopted zoning ordinances.

Subdivision Ordinance

Swain County has a subdivision ordinance that was adopted by the County Board of Commissioners and applies to all areas of unincorporated Swain County. The Town of Bryson City has not adopted a subdivision ordinance.

Building Codes, Permitting, and Inspections

North Carolina has a state compulsory building code which applies throughout the state. Swain County and Bryson City have adopted a building code. The building code is enforced throughout the county by the county building inspector.

Floodplain Management

Table E.43 provides NFIP policy and claim information for each participating jurisdiction in Swain County.

TABLE E.43: 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
SWAIN COUNTY	7/17/86	4/19/10	69	\$14,752,600	4	\$26,351
Bryson City	12/4/84	4/19/10	34	\$8,185,400	11	\$405,822

(M) – No Elevation Determined, all Zone A, C and X

(S) – Suspended Community

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Swain County and Bryson city both participate in the NFIP and have adopted flood damage prevention regulations.

E.3.2 Administrative and Technical Capability

Table E.44 provides a summary of the capability assessment results for Swain County with regard to relevant staff and personnel resources. A symbol was used to indicate the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A “C” indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (since the 2017 plan).

TABLE E.44: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Swain County	✓	✓	✓	✓	✓		✓	✓	✓	
Bryson City								✓		

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.

E.3.3 Fiscal Capability

Table E.45 provides a summary of the results for Swain County with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A “C” indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE E.45: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Swain County	✓								✓
Bryson City									✓

E.3.4 Political Capability

Swain County has a positive overall expectation for the acceptance of a hazard mitigation plan. The county and Bryson City do, however, feel that the public will need to be educated about hazard mitigation and the county plan. Many residents in the area are opposed to zoning or land use plans of any kind. The county feels that issues such as this will need to be clarified and resolved before a mitigation plan will be accepted by the public.

The county feels that damage caused by past disasters will prove helpful in educating the public as to why a mitigation plan is needed. Swain County, along with Bryson City, plans on holding public meetings and implementing school programs so that all community members will be well informed. It is the opinion of both the county and the town that well informed citizens can increase the effectiveness of a hazard mitigation plan.

E.3.5 Conclusions on Local Capability

In addition to this regional hazard mitigation plan, Swain County has adopted an emergency operations plan, both of which increase the county’s capability in an emergency situation. Both Swain County and Bryson City lack a Disaster Recovery Plan and an Economic Development Plan. With the results of this plan’s risk assessment, both jurisdictions will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that complements the economic development strategy is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction’s economic development goals.

Both Swain County and Bryson City may want to consider employing fiscal resources that are not currently being utilized, such as applying for funding through Community Development Block Grants (CDBG). In the absence of a zoning ordinance, the jurisdictions could use their comprehensive plans to discourage growth in high-risk areas. Continuing to educate citizens about the importance of pre-disaster mitigation will also grow political capability for future planning efforts.

E.4 SWAIN COUNTY MITIGATION STRATEGY

This subsection provides the blueprint for Swain County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Hazard Mitigation Planning Committee and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

E.4.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Cherokee County developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table E.46**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE A.46: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards.

Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

E.4.2 Mitigation Action Plan

The mitigation actions proposed by Swain County and the Town of Bryson City are listed in the following individual Mitigation Action Plans.

Swain County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with large scale detailed maps in order to provide detailed flood hazard information.	Flood	Moderate	County Emergency Management; County Mapping; Town Council NCDEM	Unknown	Federal	Completed	Completed. New flood maps were adopted in 2010.
P-2	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintain adequate public safety. Constant vigilance regarding construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Staff time only	Completed	Completed/Ongoing. Requires continued funding and staff time to enforce codes for new and existing development.
P-3	Review the Emergency Operations Plan on an annual basis to ensure that it is kept current.	All	Moderate	County Emergency Management	Unknown	Staff time only	Completed	Ongoing annually.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Expand floodplain/tax data to include residential/commercial distinction and occupied/unoccupied distinction.	Flood	Moderate	County Mapping	Unknown	Local	2022	There was no political will to complete this action over the last five years.
P-5	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Town Council; NCDFS	Unknown	Local and State	2030	Recent fires have increased awareness of this need. There was limited political will to complete this action over the last five years.
P-6	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	Moderate	County Emergency Management; County Fire Marshal; County Inspections Office; Town Council	Unknown	Local	2030	Not likely to be instituted over the next few years, Local gov't has no interest in the subdivision plan. There was limited political will to complete this action over the last five years.
P-7	Acquire a small GPS system to document hazard locations for local and state use.	All	Moderate	County Emergency Management	Unknown	Local	Completed	Completed.
P-8	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management; Town Council	Unknown	Local	Completed	Completed. In 2005.
Property Protection								
PP-1	Evaluate the relocation/elevation/floodproofing of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	Moderate	County Emergency Management; County Inspections Office; Town Council	Unknown	HMGP	2030	There was limited political will to complete this action over the last five years.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Emergency Management; County Inspections Office; Town Council	Unknown	Staff time	Completed	Completed/Ongoing. Requires continuous action as new facilities are constructed.
PP-3	As additional grants become available, the County should apply for acquisition funds to purchase nonresidential properties that were damaged during a previous disaster when practical.	Flood	Moderate	County Emergency Management; Town Council	Unknown	State, Federal	Completed	There was limited political will to complete this action over the last five years.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	Moderate	County Government; Town Council	Unknown	US Army Corps of Engineers	2030	There was limited political will to complete this action over the last five years.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of food problems.	Flood/All	Moderate	County Government; Town Council	Unknown	National Weather Service	2030	There was no political will to complete this action over the last five years.
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	Moderate	County Emergency Management; Town Council	Unknown	Staff time only	Completed	Completed/Ongoing. Requires continuous action and staff time.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Public Education and Awareness								
PEA-1	Continue providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Local	2030	Completed/ongoing. This action is ongoing as funding and staff time becomes available.
PEA-2	Explore the possibility of developing an internet-based emergency information website.	All	Moderate	County Emergency Management	Unknown	Local	Completed.	Completed in 2008.
PEA-3	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, or at the office.	All	Moderate	County Emergency Management; Town Council	Unknown	Local	2030	There was no political will to complete this action over the last five years.

Town of Bryson City Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Ensure that manufactured homes are installed and secured properly.	Flood; Wind	Moderate	County Inspections Office, Town Council	Unknown	Staff time only	Currently in place	Completed. This action is currently in place and will continue as staff time allows.
P-2	Floodplain maps are over 20 years old and areas of intense urbanization are currently unmapped. The existing maps are at scales that do not align with current detailed tax maps. Remapping the entire floodplain is recommended to properly align existing small scale FIRM maps that approximate floodplain boundaries with large scale detailed maps in order to provide detailed flood hazard information.	Flood	Moderate	County Emergency Management; County Mapping; Town Council; NCDEM	Unknown	Federal funding	Completed	New flood maps were adopted in 2010.
P-3	Continued consistency in enforcing the codes as they apply to protection from hazards is essential to maintain adequate public safety. Constant vigilance regarding construction meets required flood protection measures. Enforcement of all floodplain requirements, including building and other codes, must be coordinated and systematically applied with adequate follow-up to ensure compliance.	Flood	Moderate	County Inspections Office, Town Council	Unknown	Staff time only	Currently in place	Completed. This action is currently in place and requires continued staff time dedicated to code enforcement.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Develop a fire management plan that includes a clear statement of objectives and that incorporates information on land, threatened structures, degree of fire risk, fire history, and fire management measures.	Wildfire	Moderate	County Fire Marshal; Town Council; NCDPS	Unknown	Local, State, Federal	In progress; 2018	Recent fires have increased the awareness of this need but it was not completed over the last five years given limited political will.
P-5	Create a subdivision ordinance that would specify a width and grade for entrance and exit routes to ensure the accessibility of emergency vehicles.	All	Moderate	County Emergency Management; County Fire Marshal; County Inspections Office; Town Council	Unknown	Staff time only	N/A	Delete. This action is no longer politically feasible for the county.
P-6	Integrate county/municipality EOP with Hazard Mitigation Plan as a way to mitigate unforeseeable hazard events.	All	Moderate	County Emergency Management; Town Council	Unknown	Staff time only	2022	Completed/ongoing with new hazard mitigation plan updates.
Property Protection								
PP-1	Evaluate the relocation/elevation/floodproofing of all critical public structures or facilities within the floodplain and implement the necessary improvements.	Flood	Moderate	County Emergency Management; Town Inspections Office	Unknown	HMGP	2030	This action is dependent on political will and receipt of funding.
PP-2	Minimize placing new critical public facilities within the floodplain unless they promote an overriding public benefit, will not worsen hazard risk, will not directly promote development in floodplains, and are designed to withstand flood damage.	Flood	Moderate	County Emergency Management; Town Inspections Office	Unknown	Staff time	Currently in place	Completed. This action is currently in place and requires continued staff time to review the site of critical facilities.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-3	As additional grants become available, the County should apply for acquisition funds to purchase nonresidential properties that were damaged during a previous disaster when practical.	Flood	Moderate	County Emergency Management, Town Council	Unknown	State, Federal	funding currently being sought, 2022	This action is ongoing until staff time can be dedicated toward grant applications and funding is acquired.
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.
Natural Resource Protection								
NRP-1	Improve and maintain streams throughout the community to the fullest extent possible.	Flood	Moderate	County Government, Town Council	Unknown	US Army Corps of Engineers	2030	There was limited political will to complete this action over the last five years.
Emergency Services								
ES-1	Flood monitoring facilities are needed on the other streams and should be coupled with a disaster warning system to give early warning of food problems. Also needed for abandoned City water impoundment.	Flood/All	Moderate	County Emergency Management, Town Council	Unknown	National Weather Service	2030	There was limited political will to complete this action over the last five years.

ANNEX E: SWAIN COUNTY

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-2	Coordinate response/recovery efforts with other communities and counties.	All	Moderate	County Emergency Management, Town Council	Unknown	Staff time only	Currently in place	Completed/ongoing. This action requires continued action and funding, and is therefore ongoing.
ES-3	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2022-2030	New Action.
ES-4	Evaluate need for Dam safety plan.	Flood	Moderate	Emergency Management	Varies/low	State, FEMA. Local staff hours for administration	2022-2030	New Action
Public Education and Awareness								
PEA-1	Continue providing opportunities through meetings and special programs for contractors and property owners to become more informed as to appropriate building materials, equipment, and techniques to use in order to mitigate the impacts of flooding.	Flood	Moderate	County Inspections Office; Town Council	Unknown	Local	2022	This action requires continued action and funding. There was limited political will to formalize this action over the last five years.
PEA-2	Conduct a series of public classes on how to protect yourself during a hazard event in case you are at home, in a car, or at the office.	All	Moderate	County Emergency Management, Town Council	Unknown	Local	2022	This action is pending funding, political will, and staff time.

Annex F

Eastern Band of Cherokee Indians

This annex includes jurisdiction-specific information for the Eastern Band of Cherokee Indians (EBCI) and describes how the Tribe meets the requirements identified in 44 CFR 201.7 that are specific to Indian Tribal governments participating in a multi-jurisdictional plan. It consists of the following nine subsections:

- ◆ F.1 EBCI Planning Process
- ◆ F.2 EBCI Community Profile
- ◆ F.3 EBCI Risk Assessment
- ◆ F.4 EBCI Vulnerability Assessment
- ◆ F.5 EBCI Capability Assessment
- ◆ F.6 EBCI Mitigation Strategy
- ◆ F.7 EBCI Plan Maintenance
- ◆ F.8 EBCI Repetitive Loss Strategy
- ◆ F.9 EBCI Plan Review and Adoption

F.1 EBCI PLANNING PROCESS

F.1.1 Documentation of the Planning Process

44 CFR Requirement
44 CFR Part201.7(c)(1)(i): The plan shall document an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval, including a description of how the Indian Tribal government defined “public.”

For the purposes of this planning effort, the EBCI defined the “public” as tribal members, tribal employees, neighboring jurisdictions, and all other interested parties. Detailed information on the planning process undertaken to develop this plan and the opportunity for public comment can be found in Section2: *Planning Process*.

F.1.2 Program Integration

44 CFR Requirement
44 CFR Part201.7(c)(1)(iv): The plan shall be integrated to the extent possible with other ongoing tribal planning efforts as well as other FEMA programs and initiatives.

Overall, EBCI has indirectly referenced mitigation and hazard reduction principles throughout many of the Tribe’s aforementioned documents, plans, and policies (Section 7: *Capability Assessment* and Section F.4). The following is a list of examples of integration:

- ◆ Several policies exist that have hazard mitigation elements or effects such as development and building code regulations, the floodplain code, Cherokee Business District Master Plan, and other codes and plans discussed in more detail in Section F.5.
- ◆ Existing codes will ensure that new development (including tear down and rebuild projects) will be built to modern standards, including the floodplain code, which exceeds minimum standards. With the current trend of replacing existing substandard buildings with new ones, through attrition a safer community will be constructed.
- ◆ Housing improvement funds and programs exist, furthering the strength of the preceding statement.
- ◆ GIS, communication technology and trained staff are all increasing and will strengthen a mitigation program.
- ◆ Better mapping of floodplains and other hazard areas are now available.
- ◆ EBCI was a highly successful Project Impact participant, promoting concepts of disaster resistance and preparedness.
- ◆ EBCI has implemented applied for and received funding for two mitigation projects since the 2012 hazard mitigation plan.

As EBCI continues to grow economically, there are trends toward more comprehensive planning (e.g. the GIS system and coordinator, Capital Improvement). The committee will ensure that hazard mitigation is a vital element of future planning and growth.

Developing a Capital Improvement Plan can serve as an important mechanism to guide future developments away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local government.

EBCI was the first and only Tribal government selected by FEMA as a Project Impact community. The program was a nationwide initiative dedicated to making communities disaster-resistant through a partnership of government officials, citizens, private sector companies, professional and civic associations, learning institutions, volunteer and community organizations, and the media. Representatives from each of these community stakeholder groups formed a Project Impact Steering Committee to develop disaster prevention and preparedness programs to reduce the impact of natural and manmade disasters. The Eastern Band was also selected by the National Congress of American Indians (NCAI) to be the pilot tribe for developing a multi-hazard mitigation plan.

This plan will also be integrated into FEMA programs and initiatives that the Tribe is involved in, such as participation in the National Flood Insurance Program. EBCI is a participant in good standing with the National Flood Insurance Program (NFIP) and enforces standards that exceed the minimum NFIP Requirements. EBCI is also a Cooperating Technical Partner (CTP) in FEMA's Risk MAP program and has an ongoing floodplain mapping initiative. EBCI contracted to remap the Oconaluftee River through that initiative. The final effective Flood Insurance Rate Maps (FIRMs) became effective on April 19, 2010.

F.2 EBCI COMMUNITY PROFILE

F.2.1 Geography and the Environment

The EBCI Reservation is located in the Blue Ridge Mountains. The main, and most developed, portion of the reservation is located in Swain and Jackson Counties and is comprised of two large tracts known as the Qualla Boundary and the 3,200 Acre Tract. Additional trust lands are located in Haywood, Graham, and Cherokee Counties. There are six distinct communities within the Qualla Boundary, including Big Cove, Birdtown, Cherokee/Snowbird, Yellowhill, Paint Town, and Wolfetown.

EBCI also has additional small non-trust, fee land holdings. However, these properties are not part of the reservation and are subject to the jurisdiction of the communities in which they reside.

The EBCI Reservation is a mountainous region, rising from an elevation of 2,000 feet to over 5,000 feet. The area is characterized by steep ridges, thin soils, and pronounced valleys with three major waterways and a number of smaller streams and tributaries. Level land suitable for development is limited generally to narrow river valleys. The total area of all EBCI land holdings is 213 square miles; however, the total area of trust land is 84 square miles.

The reservation averages 47 inches of rainfall per year which is generally evenly distributed throughout the year. Winters are relatively mild and short with temperatures seldom falling below 0°F. The average winter high temperature is approximately 48°F with an average winter low of 27°F. Long durations of freezing weather are rare and average annual snowfall is 15 inches. The summers are long and generally mild with temperatures seldom rising above 100°F. The average summer high temperature is 82°F and the average low is 61°F.

F.2.2 Population and Demographics

According to the 2015 American Community Survey, EBCI has a population of 9,796 people. The reservation has seen approximately 8.6% growth between 2010 and 2015, and the population density is 46 people per square mile. Population counts from the US Census Bureau for 1990, 2000, 2010, and 2015 for the reservation are presented in **Table F.1**.

TABLE F.1: POPULATION COUNTS FOR EBCI

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2011-2015 ACS Population	% Change 2010-2015
EASTERN BAND OF CHEROKEE INDIANS	5,968	8,092	9,018	9,796	8.6%

Source: US Census Bureau

Based on the 2015 American Community Survey, the median age of residents of EBCI is 32.6 years. The racial characteristics of the Tribe are presented in **Table F.2**. American Indians make up the majority of the population on the reservation, accounting for almost 74 percent of the population.

TABLE F.2: DEMOGRAPHICS OF EBCI

Jurisdiction	White Persons, Percent (2015)	Black Persons, Percent (2015)	American Indian or Alaska Native, Percent (2015)	Other Race, Percent (2015)	Persons of Hispanic Origin, Percent (2015)*
EASTERN BAND OF CHEROKEE INDIANS	16.6%	0.9%	74.0 %	8.5%	5.7%

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

Source: US Census Bureau

F.2.3 Housing

According to the 2015 US Census American Community Survey, there are 4,310 housing units on the EBCI Reservation. Housing information for the Tribe is presented in **Table F.3**.

TABLE F.3: HOUSING CHARACTERISTICS

Jurisdiction	Housing Units (2010)	Housing Units (2010)	Housing Units (2015)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
EASTERN BAND OF CHEROKEE INDIANS	3,194	4,028	4,310	9.2%	\$110,900

Source: US Census Bureau

F.2.4 Infrastructure

Transportation

Access to the EBCI Reservation is provided by US 441/74 and US 19. Access to the Snowbird and Graham County trust properties is provided by NC 28 and US 129. US 19/129 is the main thoroughfare to the Cherokee County portions of EBCI trust lands.

Currently, there are no airports located on tribal lands nor is there passenger or freight rail serving the reservation.

Utilities

Electrical service is provided to EBCI by Duke Energy Progress, a public utility. Water and sewer service is provided and operated by the EBCI Public Works Division.

Community Facilities

There are a number of buildings and community facilities located throughout the EBCI Reservation. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 3 fire stations, 3 police stations, 1 medical care facility, 1 Tribal Grant School (Cherokee Central Schools), and 1 Independent school located within the reservation.

The Cherokee Indian Hospital is the one hospital located on the Qualla boundary. This hospital is governed by the EBCI Tribal Council appointed board. There is also a rural health center located in the Snowbird community in Graham County. This center is called the Snowbird Health Clinic.

Each of the six communities that comprise the Qualla Boundary has its own community center. These community centers also serve as emergency shelters.

F.2.5 Land Use

The primary land uses on the EBCI Reservation are residential and tourism-related commercial. Government buildings, churches, schools, community centers, and scattered light industry make up the remaining land uses. Land development trends for commercial property include demolition of older building stock and replacement with new buildings. There is also a trend for residential property to replace mobile homes with manufactured wood frame housing. New residential development consists largely of scattered single family residential buildings located on steep terrain.

F.2.6 Employment and Industry

According to the Environmental Health Profile and Priority Projection prepared by the EBCI planning office in 2001, the economic status of the Eastern Band of Cherokee Indians has been one of rapid change in the years since World War II. The economy has changed from a relatively simple and deprived base of subsistence farming and harvesting limited forest products to a considerably diverse economy with commercial tourism, light industry, and a variety of governmental activities.

Data from the US Census 2011-2015 American Community Survey indicates the Eastern Band of Cherokee has a population 16 years and over of approximately 7,191. Of that population, 3,805 people (approximately 53%) were considered to be in the labor force. Of those in the labor force, approximately 5.2% were unemployed. 2,026 were employed in private business and 1,310 were employed as government workers.

F.3 EBCI RISK ASSESSMENT

This subsection includes hazard profiles for each of the significant hazards identified in Section 4: *Hazard Identification* as they pertain to EBCI. Each hazard profile includes a description of the hazard's location and extent, notable historical occurrences, and the probability of future occurrences. Lastly, vulnerability for each hazard is addressed, which identifies and quantifies the vulnerability of EBCI to the significant hazards previously identified. This includes identifying and characterizing an inventory of assets in the county and assessing the potential impact and expected amount of damages caused to these assets by each identified hazard event.

Additional information can be found in Section 5: *Hazard Profiles* and Section 6: *Vulnerability Assessment*.

F.3.1 Asset Inventory

Table F.4 lists the number of parcels, total number of parcels with improvements, and the total assessed value of improvements for EBCI (study area of vulnerability assessment).¹

¹ Total assessed values for improvements is not available for EBCI.

TABLE F.4: IMPROVED PROPERTY FOR EBCI

Location	Estimated Number of Parcels	Estimated Number of Improved Parcels	Total Estimated Value of Improvements
Eastern Band of Cherokee Indians	5,046	N/A	N/A

Table F.5 lists the fire stations, police stations, emergency operations centers (EOCs), medical care facilities, and schools and other critical facilities located on the EBCI Reservation. Critical facility data was obtained from the county and municipal leads. **Table F.28**, near 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 EBCI.

TABLE F.5: CRITICAL FACILITY INVENTORY FOR EBCI

EASTERN BAND CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	6
Fire Station	3
Police Station	3
Government Facilities	116
Office	66
Community Building	14
Visitor Center	2
School	34
Medical Facilities	11
Hospital	11
Public Works/Utilities	49
Communication Tower	7
Water and Wastewater Systems	38
Other Utility Facility	4
Other	3
Casino	3
TOTAL	185

F.3.2 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 of EBCI that are potentially at risk to these hazards.

Table F.6 lists the population by jurisdiction according to U.S. Census 2015 American Community Survey population estimates. Unfortunately, estimates were not available at the census block level, limited the results to reservation-wide estimates. The total population for EBCI according to Census data is 9,018 persons. Additional population estimates are presented above in Section F.1.

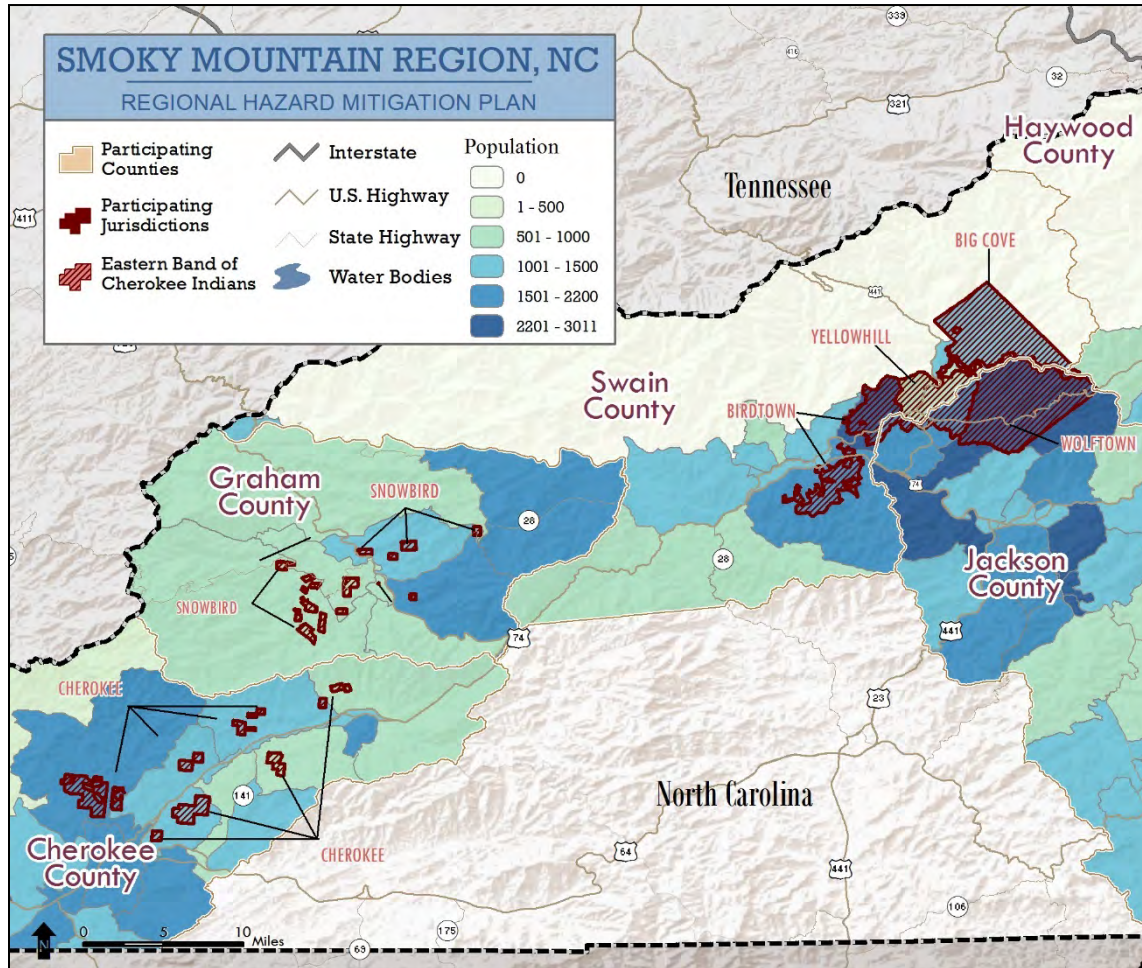
TABLE F.6: TOTAL POPULATION FOR EBCI

Location	Total 2015 Population
Eastern Band of Cherokee Indians	9,796

Source: U.S. Census 2015 American Community Survey

In addition, **Figure F.1** illustrates the population density by census tract as it was reported by the U.S. Census Bureau in 2010.²

FIGURE F.1: POPULATION DENSITY FOR EBCI



Source: U.S. Census Bureau, 2010

² Population by census block was not available at the time this plan was completed.

HAZARD PROFILES

F.3.3 Drought

Location

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, EBCI 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 are exposed to drought, making the spatial extent potentially widespread.

Historical Occurrences

Data from the North Carolina Drought Management Advisory Council and National Centers for Environmental Information (NCEI) were used to ascertain historical drought events in Cherokee County. The North Carolina Drought Management Advisory Council reports data on North Carolina drought conditions from 2000 to 2016 through the North Carolina Drought Monitor. It classifies drought conditions by county on a scale of D0 to D4:

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

Data from the North Carolina Drought Monitor was not available to ascertain historical drought events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.3.3. The participating counties have experienced D0 through D4 droughts. Therefore, it is assumed that EBCI has also experienced drought at these scales.

Beginning in April 2016, all five counties (and presumably reservation lands) began having abnormal levels of drought. Drought continued to build throughout the year, severe drought levels by the first week of October. By mid-November, all counties, including those with reservation lands, maintained levels of exceptional drought for at least two-to-four weeks. These droughts also contributed to a severe band of wildfires in the area.

Extent

According to the tribal point of contact, drought plagued the region from 1998 to 2002. This period saw rainfall levels well below normal and caused communities to institute water restrictions. Furthermore, the EBCI “Environmental Health Profile and Priority Projection” dated April 16, 2001 notes a serious drought in the 1930’s and conditions of drought in 1985 and 1986. While the U.S. Drought Monitor does not report conditions specific to the tribal areas, the tribe does have reservation lands in all counties except Haywood. The majority of tribal land is in Swain and Jackson Counties. Thus, U.S. Drought Monitor results can be used to deduct previous drought conditions in tribal areas. Both Jackson and Swain Counties experienced drought 16 out of 17 years from 2000 to 2016. The greatest magnitude of drought

experienced at the county level during this time was the highest magnitude of drought that is recorded (“Exceptional”).

Probability of Future Occurrences

Based on historical occurrence information, it is assumed that EBCI has a probability level of highly likely (greater than 90 percent annual probability) for future drought events. (This is an increase from the 2012 plan estimated probability.) This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions.

Vulnerability Assessment

Drought is an atmospheric hazard so it has the potential to impact all existing and future assets, essential facilities, and populations. As previously noted, drought tends to have greater economic, environment, and social impacts than impacts to the built environment. Drought may result in the following impacts:

- ◆ Economic
 - Temporary closure of business and essential facilities (restaurants cannot operate safely without water)
 - Increase in food prices
 - Increased wildfires
 - Loss of incomes
 - Loss of hydroelectric power
- ◆ Environmental
 - Crop damage
 - Stress on wildlife
 - Increased wildfires
 - Wind erosion
 - Loss of wetlands
 - Drying ponds/lakes
- ◆ Social
 - Water conservation requirements
 - Reduced quality of life
 - Food shortages
 - Political conflicts over water rights
 - Stress

F.3.4 Hailstorm

Location

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

Historical Occurrences

The Nations Centers for Environmental Information provides county-level data, and data was not available to ascertain historical flood events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information indicates that 3 hail events

reported in Swain County occurred on EBCI land.³ Hail diameter was recorded as 0.75 inches, but no damages were reported for these events. Specific information on hail events for EBCI, including date, magnitude, and deaths and injuries, can be found in **Table F.4**. 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 Nations Centers for Environmental Information. Therefore, it is likely that damages are greater than the reported value.

TABLE F.7: HISTORICAL HAIL OCCURRENCES IN THE SMOKY MOUNTAIN REGION

	Date	Magnitude	Deaths/Injuries	Property Damage*
Swain County				
Cherokee	6/20/2002	0.75 in.	0/0	\$0
Cherokee	7/22/2002	0.75 in.	0/0	\$0
Cherokee	4/19/2006	0.75 in.	0/0	\$0

*Property damage is reported in 2017 dollars; All damage may not have been reported.

Source: Nations Centers for Environmental Information

No additional information on historical hail events was available in the previous hazard mitigation plan or local newspapers.

Extent

The greatest diameter of hail reported was .75 inches. However, as defined by the TORRO scale in Section 5, larger hail stones are possible. Further, no damage was reported but significant damage is possible with hail.

Probability of Future Occurrences

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 EBCI 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 reservation.

Vulnerability Assessment

All current and future buildings and populations are at risk to the hail hazard. Hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. While no deaths or injuries were reported in the county due to hail, they are possible.

F.3.5 Hurricane and Tropical Storm

Location

Hurricanes 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 EBCI. The entire reservation is equally susceptible to hurricane and tropical storms.

³ These events are only inclusive of those reported by NCEI. It is certain that additional occurrences have occurred and have gone unreported.

Historical Occurrences

According to the National Hurricane Center’s historical storm track records, 28 hurricane or tropical storm tracks have passed within 75 miles of Smoky Mountain Region since 1850.⁴ This includes nine tropical storms and nineteen tropical depressions.

Of the recorded storm events, one tropical depression (remnants of the 1906 unnamed storm) has traversed directly through the EBCI Reservation as shown in Chapter 5, **Figure 5.5**. **Table F.8** provides for each event the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of the Smoky Mountain Region) and Category of the storm based on the Saffir-Simpson Scale.

TABLE F.8: HISTORICAL STORM TRACKS WITHIN 75 MILES OF THE SMOKY MOUNTAIN REGION (1850–2016)

Date of Occurrence	Storm Name	Maximum Wind Speed (miles per hour)	Storm Category
9/11/1882	Not Named	46	Tropical Storm
7/8/1896	Not Named	40	Tropical Storm
9/15/1900	Not Named	29	Tropical Depression
9/16/1903	Not Named	35	Tropical Depression
9/18/1906	Not Named	46	Tropical Storm
8/30/1911	Not Named	35	Tropical Depression
9/4/1913	Not Named	29	Tropical Depression
9/5/1915	Not Named	40	Tropical Storm
7/15/1916	Not Named	52	Tropical Storm
8/15/1928	Not Named	40	Tropical Storm
10/17/1932	Not Named	23	Tropical Depression
5/30/1934	Not Named	35	Tropical Depression
8/18/1939	Not Named	29	Tropical Depression
8/13/1940	Not Named	40	Tropical Storm
8/28/1949	Not Named	46	Tropical Storm
6/8/1968	Abby	29	Tropical Depression
6/9/1968	Abby	29	Tropical Depression
9/18/1971	Edith	29	Tropical Depression
9/23/1975	Eloise	63	Tropical Storm
9/7/1977	Babe	29	Tropical Depression
8/17/1985	Danny	35	Tropical Depression
8/28/1992	Andrew	23	Tropical Depression
8/17/1994	Beryl	23	Tropical Depression
7/23/1997	Danny	23	Tropical Depression
7/2/2003	Bill	23	Tropical Depression
9/8/2004	Frances	29	Tropical Depression
9/17/2004	Ivan	23	Tropical Depression
8/27/2008	Fay	17	Tropical Depression

Source: National Hurricane Center

⁴ 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.

The Nations Centers for Environmental Information provides county-level data, and data was not available to ascertain historical hurricane events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.5.3.

Federal records also indicate that one disaster declaration was made in 2003 (Hurricane Isabel) for EBCI.⁵

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

Tropical Storm Frances – September 7-8, 2004

Tropical Storm Frances was a slow-moving, relatively large storm that dumped heavy rains over the eastern United States. The remnants of Frances produced a swath of 5 to 15 inches of rain across the North Carolina Mountains with reports of 12 to 15 inches of rain along the higher terrain and isolated reports in excess of 18 inches. Wind gusts reached between 40 and 60 mph along the Appalachian Mountains and numerous trees were downed. 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 broke the standing flood stage record for the Pigeon River near Canton. It had previously stood since 1940. Hurricane Frances drove the river up to 20.7 feet and Hurricane Ivan raised it further to 22.8 feet.

Probability of Future Occurrences

Given the inland location of the EBCI Reservation, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but still remains a real threat to EBCI due to induced events like flooding and landsliding. Based on historical evidence, the probability level of future occurrence is possible (annual probability between 1 and 10 percent). Given the regional nature of the hazard, all areas of the reservation are equally exposed to this hazard. However, when the reservation is impacted, the damage could be catastrophic, threatening lives and property throughout the planning area.

⁵ 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*.

Extent

The highest wind speed recorded within 75 miles of the reservation was 63 miles per hour (Tropical Storm Eloise, 1975). However, as defined by the Saffir Simpson scale in Section 5, strong wind events are possible.

Vulnerability Assessment

Historical evidence indicates that EBCI has a significant risk to the hurricane and tropical storm hazard, particularly due to strong wind. Several tracks have come near or traversed through the reservation, as shown and discussed in Section F.3.3.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, and high winds, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds; therefore only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. Hazus-MH 3.1 was used to determine annualized losses for the reservation as shown below in **Table F.9**. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Only losses to buildings are reported, in order to best match annualized losses reported for other hazards. Hazus-MH reports losses at the U.S. Census tract level, so determining an accurate loss estimate specific to participating jurisdictions was not feasible.

TABLE F.9: POTENTIAL DOLLAR LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD TO IMPROVED PROPERTY

Location	Total Exposure	1% (100yr) Loss	1% Loss Ratio ¹	0.2% (500yr) Loss	0.2% Loss Ratio ¹	Annualized Loss	Annualized Loss Ratio ¹
Eastern Band of Cherokee Indians	\$838,781,436	\$1,606	0.000191%	\$54,645	0.006514%	\$5,298	0.000631%

Source: Hazus-MH 3.1

¹Loss Ratio = (Dollar Losses ÷ Total Exposure) x 100

Social Vulnerability

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

Critical Facilities

Given equal vulnerability across EBCI, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among 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 F.30** 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 on the EBCI Reservation. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

F.3.4 Lightning

Location

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

Historical Occurrences

The Nations Centers for Environmental Information provides county-level data, and data was not available to ascertain historical lightning events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.6.3.

Information on historical lightning occurrences was found in the EBCI Fire Management Plan and the local newspaper, *Cherokee One Feather*. According to the 2001 EBCI Fire Management Plan, 5 lightning strikes occurred over a 10-year period from 1986 to 1997, causing fires that burned 33.5 acres. The *Cherokee One Feather* also reported that storms with high winds and lightning caused massive power outages on June 15, 2011. After an extensive news and internet search, no additional reports (occurring since the 2012 plan update) of damaging lightning strikes were found.

Extent

Lightning extent can be defined by strikes per year or damages, for example. The Smoky Mountain Region, including EBCI, receives 3 to 12 lightning flashes per square mile per year (Section 5, Figure 5.5). However, not all these flashes result in lightning strikes.

Probability of Future Occurrences

Although there were not a high number of historical lightning events reported for EBCI, it is a regular occurrence accompanied by 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®), EBCI is located in an area of the country that experienced an average of 3 to 12 lightning flashes per square kilometer per year between 2005 and 2014. Therefore, the probability of future events is highly likely (greater than 90 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the reservation.

Vulnerability Assessment

All current and future buildings and populations within EBCI are at risk to the lightning hazards. Lightning may result in structures fire, electrical system failure, injuries, or deaths.

F.3.5 Thunderstorm Wind/High Wind

Location

A 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, EBCI typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that EBCI has uniform exposure to an event and the spatial extent of an impact could be large.

Historical Occurrences

The Nations Centers for Environmental Information provides county-level data, and data was not available to ascertain historical high wind and thunderstorm wind events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information indicates that 8 thunderstorm wind events reported in Graham and Swain Counties occurred on EBCI land.⁶ These events caused over \$22,000 (2017 dollars) in damages. Specific information on thunderstorm wind events for EBCI, including date, type of flooding, and deaths and injuries, can be found in **Table F.10**.

TABLE F.10: HISTORICAL THUNDERSTORM WIND OCCURRENCES FOR EBCI

Location	Date	Event Type	Magnitude (Knots)	Death/Injuries	Property Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS						
Snowbird	5/18/1995	Thunderstorm Wind	--	0/0	\$0	--
Cherokee	5/27/1996	Thunderstorm Wind	50	0/0	\$0	--
Cherokee	6/20/2002	Thunderstorm Wind	55	0/0	\$15,580	A few trees were blown down, some onto homes.
Cherokee	5/31/2004	Thunderstorm Wind	50	0/0	\$1,469	Trees and power lines were blown down.
Cherokee	4/3/2006	Thunderstorm Wind	50	0/0	\$0	--
Cherokee	12/10/2008	Thunderstorm Wind	50	0/0	\$0	--
Birdtown	6/22/2011	Thunderstorm Wind	50	0/0	\$0	--
Birdtown	7/27/2014	Thunderstorm Wind	50	1/0	\$5,464	Broadcast media reported a 53-year-old man was extricated from his vehicle then later died from injuries suffered after a tree fell on his vehicle as he was traveling along Old Number 4/Jess Nations Rd. Other trees were reported down in the area as well.

Source: NCEI Storm Events database

Records of the impacts of high wind events on the EBCI Reservation are limited. Damaging wind events from severe thunderstorms have occurred somewhat regularly throughout Western North Carolina. Wind damages have typically been localized throughout the region and have included broken tree limbs, downed trees, damage to power lines, and moderate building damage.

Several records of wind damage on reservation land were found in local newspapers, including *Cherokee One Feather* and *Macon County News*. These events included:

- ◆ December 8-9, 2009: Heavy rains and high winds on the evening of December 8 and morning of December 9 caused parts of the Oconaluftee River to flood. The storm also caused downed trees and a mudslide in the Big Cove area. A windspeed of 101 mph was recorded at the Cove Mountain Air Quality Station. (Source: *Cherokee One Feather*)
- ◆ April 4-5, 2011: A severe weather system caused widespread power outages and significant structural damage in the mountain region. Sixty to seventy mile-per-hour wind gusts and rain uprooted large trees and downed electric poles and power lines. Duke Energy estimated that more than 18,000 customers were without power in the area, mostly in Swain and Jackson

⁶ These events are only inclusive of those reported by NCEI. It is likely that additional occurrences have occurred and have gone unreported.

Counties. Cherokee on the Qualla Boundary was also left almost entirely without power, after a bulk power line was severed. (*Source: Macon County News*)

- ◆ June 15, 2011: Storms with high winds and lightning moved through the area causing power outages throughout Jackson and Swain Counties. Duke Energy estimates 18,000 homes were without power. Snapped limbs and downed trees caused damages. There were no major injuries or fatalities that EBCI Emergency Management was aware of following the event. (*Source: Cherokee One Feather*)
- ◆ July 5, 2012: A severe thunderstorm with high winds moved through the area, causing downed trees and debris. The Great Smoky Mountains National Park confirmed two fatalities and several other injuries. (*Source: Cherokee One Feather*)
- ◆ Undated (reported July 16, 2012): Severe thunderstorms caused damage in Swain and Jackson Counties. Some farms and ranches suffered severe damage, and were eligible to receive Federal assistance for restoration measures. (*Source: Cherokee One Feather*)

Extent

Thunderstorm extent can be defined by wind speeds reported. According to a 66-year history from the National Centers for Environmental Information, the strongest recorded wind event in EBCI was reported on June 20, 2002 at 55 knots (approximately 63 mph). It should be noted that future events may exceed these historical occurrences.

Probability of Future Occurrences

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. Therefore, a probability of highly likely (greater than 90 percent annual probability) for future wind events was assigned for the entire reservation.

Vulnerability Assessment

All current and future buildings and populations are at risk to future wind events. Wind events can result in downed trees or blown off shutters and roofs. Thunderstorm systems that stall and produce heavy rain can increase the severity of flooding; these impacts are best reviewed under the flood section.

F.3.6 Tornado

Location

Tornadoes occur throughout the state of North Carolina, and thus are possible on the EBCI Reservation. 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 EBCI is uniformly exposed to this hazard.

Historical Occurrences

Tornadoes are a fairly rare occurrence in such a mountainous area. However, they do occur on the EBCI Reservation. The National Centers for Environmental Information provides county-level data, and data was not available to ascertain historical tornado events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.8.3.

According to the previous hazard mitigation plan, two tornadoes reportedly touched down on the reservation lands; although, there is no indication of where these events occurred or what damage they

caused. *Cherokee One Feather* also reported a severe storm and a tornado caused severe damage in Swain and Jackson County in August 2011.

The following tornado events were reported by the Tornado History Project to have paths that traveled on lands neighboring EBCI and may have also impacted the reservation:

- ◆ April 2, 1974, 12:01 AM: F1, 0 deaths, 1 injuries (near Murphy)
- ◆ April 3, 1974, 6:05 PM: F2, 3 deaths, 11 injuries (near Robbinsville)
- ◆ April 3, 1974, 7:20 PM: F4, 4 deaths, 26 injuries (near Murphy)
- ◆ April 4, 1974, 7:00 AM: F0, 0 deaths, 0 injuries (between Murphy and Robbinsville)

Additionally, on March 2, 2012, an F2 tornado devastated a corridor across Cherokee County near the Tennessee boarder. The Town of Murphy was hardest hit and damage was reported in 5 additional communities. The approximate path of the storm posted by the Cherokee County Extension Service indicates that the storm may have also impacted EBCI.

After an extensive search of local news sources, no records of tornadoes occurring since the last plan update were found.

Extent

The greatest extent of tornado is an EF5 (over 200 miles per hour). The greatest magnitude of tornado that has impacted EBCI was likely an F4 (207 to 260 miles per hour), during an event that occurred on April 3, 1974, though stronger events are possible. According to NCEI, the 1974 tornado resulted in 4 fatalities and 26 injuries, and caused \$144 million in property damage. The National Weather Service reports that this tornado was part of the largest outbreak of tornadoes in the nation's history, referred to by meteorologists as the Super Outbreak, in which 148 tornadoes swept across 13 states in an estimated 24 hours.

Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for EBCI. Furthermore, the mountainous terrain of the region makes tornadoes a rare occurrence. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should EBCI experience a direct tornado strike. The probability of future tornado occurrences affecting EBCI is possible (1 to 10 percent annual probability).

F.3.7 Winter Storm and Freeze

Location

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. EBCI is accustomed to severe winter weather conditions and frequently receives severe winter weather during the winter months. Given the atmospheric nature of the hazard, the entire reservation has uniform exposure to a winter storm.

Historical Occurrences

Severe winter weather has resulted in four disaster declarations for EBCI. This includes a blizzard in 1993, a severe ice storm in 2003, and two severe winter storms in 2009 and 2010.⁷ The National Centers for Environmental Information provides county-level data, and data was not available to ascertain historical winter storm events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.9.3.

Ten winter storm events were reported in the previous hazard mitigation plan. However, it is likely that many more have impacted reservation lands. The most significant storm to affect EBCI was the Blizzard of 1993. This storm occurred between March 12 and March 15 and snowfall ranged from 12 inches to over 26 inches depending on elevation. Additional memorable storms in recent history include the ice storms of 1994, 1996, and 2003.

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. Considerable disruption to business, industry, schools, and government services occurred.

Winter storms throughout the planning area have several negative externalities including hypothermia, 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 to fire or an accumulation of toxic fumes.

Cherokee One Feather reported three additional winter storm events for EBCI:

- ◆ January 30, 2010: A severe winter storm brought snow and ice to the area, downed trees, and left thousands without power.
- ◆ January 7-12, 2011: More than a foot of snow fell in the Cherokee area causing the closure of Cherokee Central Schools and the EBCI.
- ◆ January 20-22, 2016: Winter Storm Jonas resulted in several inches to over one foot of snowfall in the area, causing EBCI governmental programs to close. Duke Energy reported 4,500 outages in Swain and Jackson Counties.

Extent

The extent of winter storms can be measured by the amount of snowfall or ice accumulation received (in inches). Due to variations in elevation throughout EBCI lands, extent totals will vary. The 1993 storm resulted in 12-26 inches of snow; however, greater snowfall events are possible.

Probability of Future Occurrences

Winter storm events will remain a regular occurrence on the reservation due to location and elevation. According to historical information, EBCI experiences an average of nine winter storm events each year. Therefore, the annual probability is highly likely (greater than 90-percent).

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

Vulnerability Assessment

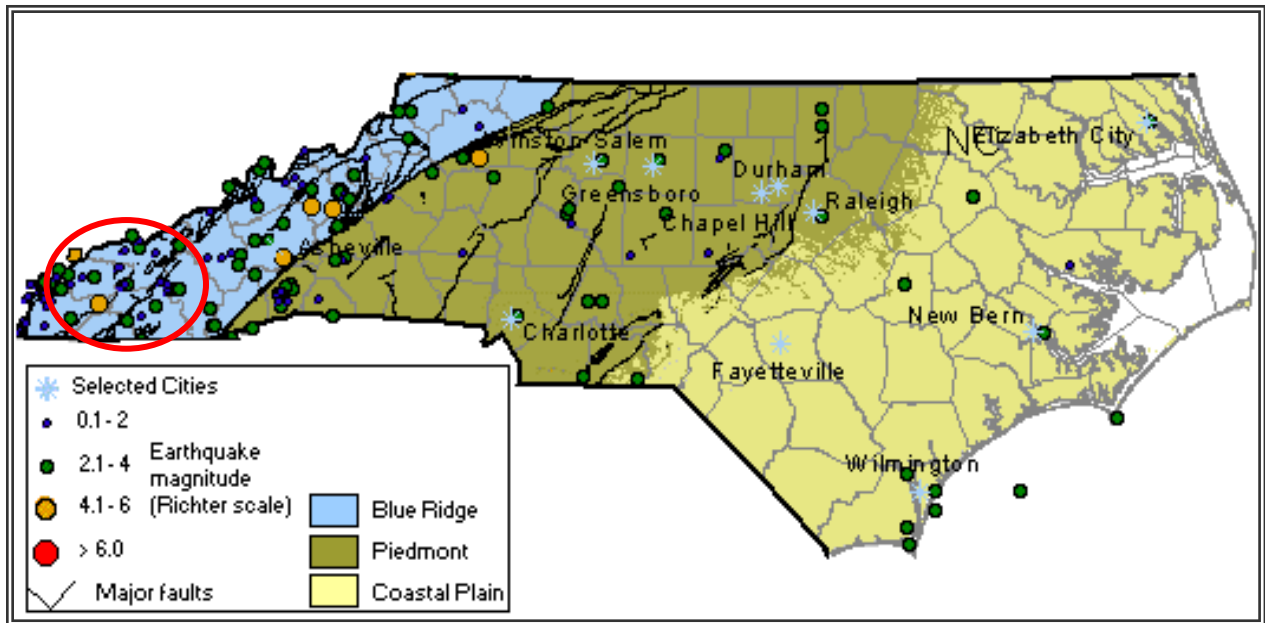
All current and future buildings and populations should be considered at risk to winter storm events. Ensuring roads remain accessible and passable are among the greatest concerns with this hazard. However, structural damage may also be associated with this hazard. For example, heavy snow loads that can cause roofs and trees to collapse. Deaths and injury are also possible due to exposure, falls, and vehicular accidents. Additional impacts include road closures, power outages, business interruption, hazardous driving conditions, frozen pipes, fires due to improper heating, and second health impacts caused by shoveling (such as a heart attack). However, in general, the impacts are minimized due to the high capacity of the County and jurisdictions within to manage this hazard.

F.3.8 Earthquake

Location

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 F.2** is a map showing geological and seismic information for North Carolina.

FIGURE F.2: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA

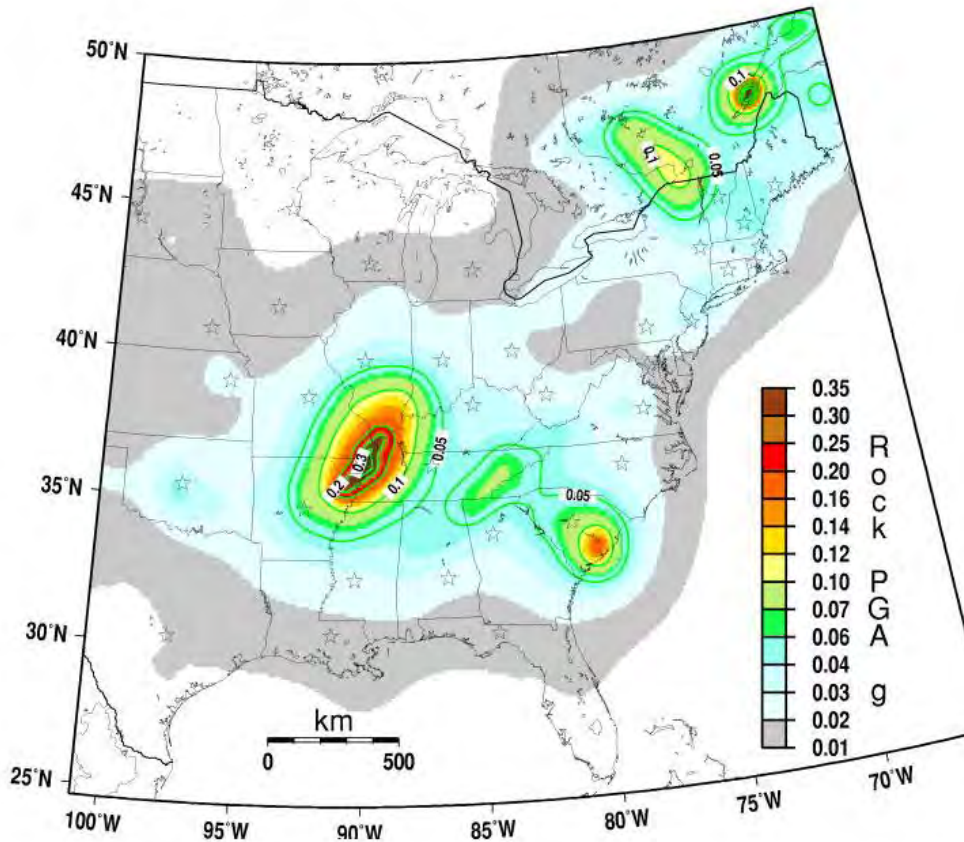


Source: North Carolina Geological Survey

Figure F.3 shows the intensity level associated with EBCCI, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was

compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, EBCI lies within an approximate zone of level “5” to “7” ground acceleration. This indicates that the reservation exists within an area of moderate seismic risk.

FIGURE F.3: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Source: USGS, 2008

Historical Occurrence

The National Geophysical Data Center did not provide an event specific to EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.10.3. It is assumed that many of the earthquakes occurring in the region would be felt on EBCI lands.

The previous hazard mitigation plan includes earthquake information pertinent to Western North Carolina that has been collected by the University of Tennessee Regional Seismic Network and the US Geological Survey’s National Seismic Network. This information is presented below in **Table F.11**.

TABLE F.11: RECENT EARTHQUAKE ACTIVITY IN WESTERN NORTH CAROLINA

Date	Location	Richter Scale (Magnitude)	Description
July 7, 2001	Swain County (2 miles SW of Cherokee)	2.4	Shaking felt, no damage recorded.
July 9, 2001	Swain County (4 miles SW of Cherokee – between Cherokee & Bryson City)	2.4	Shaking felt, no damage recorded.
July 9, 2001	Swain County (4 miles SW of Cherokee)	1.5	Shaking felt, no damage recorded.
July 10, 2001	Swain County (4 miles SW of Cherokee)	2.3	Shaking felt, no damage recorded.
May 8, 2002	Swain County (7 miles WSW of Bryson City)	2.0	No damage recorded.
July 10, 2002	Swain County (7 miles WSW of Bryson City)	2.0	No damage recorded.
September 8, 2002	Madison County (4 miles north of Marshall)	2.2	No damage recorded.
April 29, 2003	Alabama (4 miles S of Mentone, AL/41 miles SSW of Chattanooga, TN)	2.4	Shaking felt as far east as Caldwell County.

Source: University of Tennessee Regional Seismic Network and USGS National Seismic Network

Updated information for the region (since the last plan update) could not be located from University of Tennessee Regional Seismic Network and USGS National Seismic Network.

Additionally, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table F.12**.

TABLE F.12: EARTHQUAKES WHICH HAVE CAUSED DAMAGE IN NORTH CAROLINA

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

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
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

** Conflicting reports on this event, intensity in North Carolina could have been either V or 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).

Extent

There are several ways to measure the extent of an earthquake, including magnitude and intensity experienced. This information is not available specifically for EBCI, but the strongest magnitude of earthquake to occur near EBCI is a magnitude of 2.4 on the Richter Scale. However, stronger events are possible. In general, earthquakes greater than 5.0, which typically result in damage, although such event are not common in the area.

Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting EBCI is unlikely. However, with eight recorded earthquakes over 16 years, it is likely that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the reservation. The annual probability for the reservation is possible (between 1 and 10 percent).

Vulnerability Assessment

For the earthquake hazard vulnerability assessment, a probabilistic scenario was run using Hazus-MH to estimate the annualized loss for EBCI. These losses were compared to the total exposure. Total exposure is the sum of all building and content asset replacement values within the county based on Hazus-MH default inventory. The results of the analysis reported at the U.S. Census tract level deeming a jurisdictional-level results infeasible. Estimated losses include building damage, content damage, inventory loss and business interruption. **Table F.13** summarizes the findings.

TABLE F.13: ANNUALIZED LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Total Exposure	1100 Year Event Loss	1100 Year Event Loss Ratio	0500 Year Event Loss	0500 Year Event Loss Ratio	Annualized Loss	Annualized Loss Ratio ¹
Eastern Band of Cherokee Indians	\$838,781,436	\$33,806	0.004030%	\$551,579	0.065759%	\$5,735	0.000683%

Source: Hazus-MH 3.1

¹Loss Ratio = Dollar Losses ÷ Total Exposure

Social Vulnerability

It can be assumed that all existing future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table F.30**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations on the EBCI Reservation. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. 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.

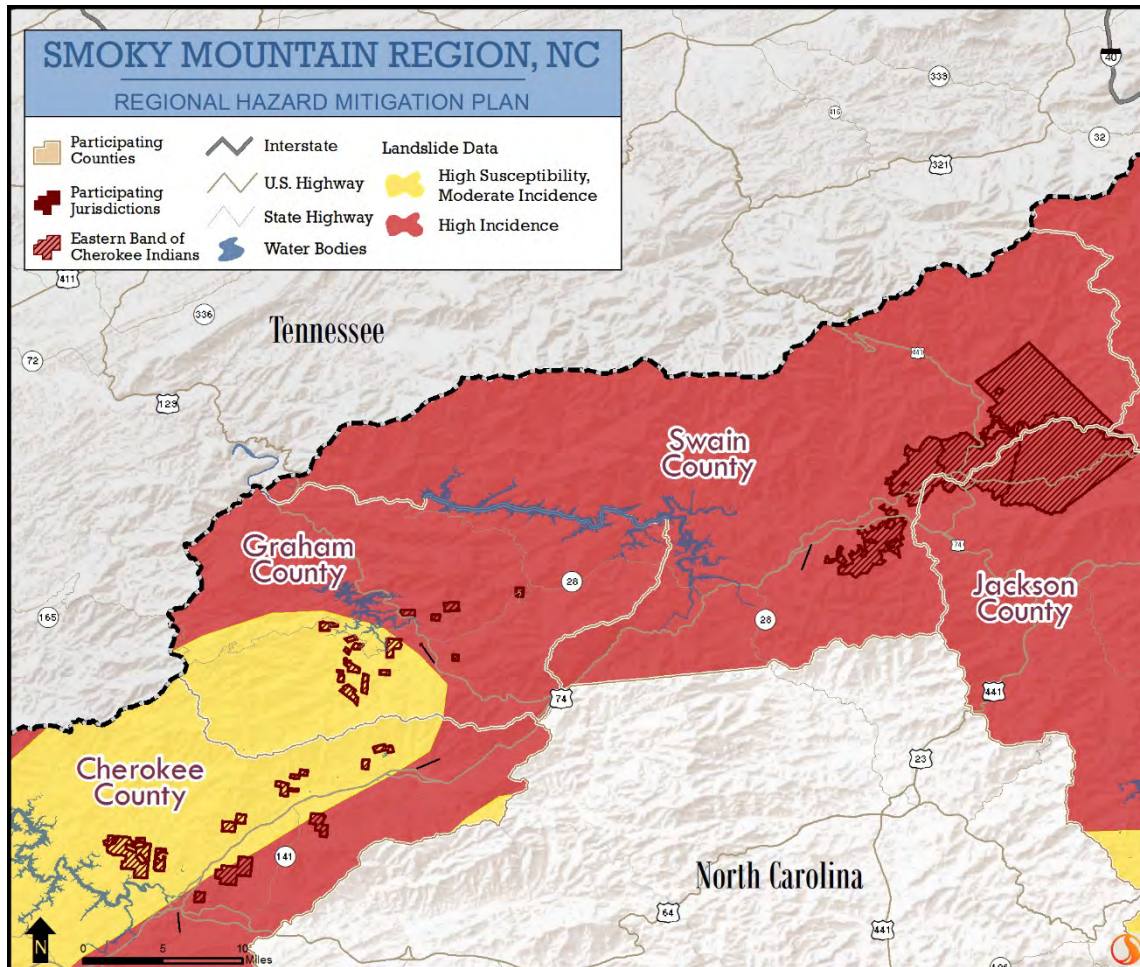
F.3.9 Landslide

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted (often due to heavy rain throughout the Appalachian Mountain 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 EBCI.

According to **Figure F.4** below, which leverages USGS landslide information, the majority of the reservation, located in Swain and Jackson Counties, has high landslide activity. The remaining portion, in parts of Graham and Cherokee Counties, has a moderate incidence (1.5% - 15% of the area is involved in landsliding) occurrence rate. There is high susceptibility (more than 15% of the area is involved in landsliding) throughout the reservation.

FIGURE F.4: LANDSLIDE SUSCEPTIBILITY AND INCIDENCE MAP OF EBCI



Source: USGS

Historical Occurrences

Steep topography throughout EBCI 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. **Table F.14** presents a summary of the landslide occurrence events as provided by the North Carolina Geological Survey⁸. The georeferenced locations of the landslide events presented in the aforementioned tables are presented in **Figure F.5**. Some incidence mapping has also been 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 on the EBCI Reservation.

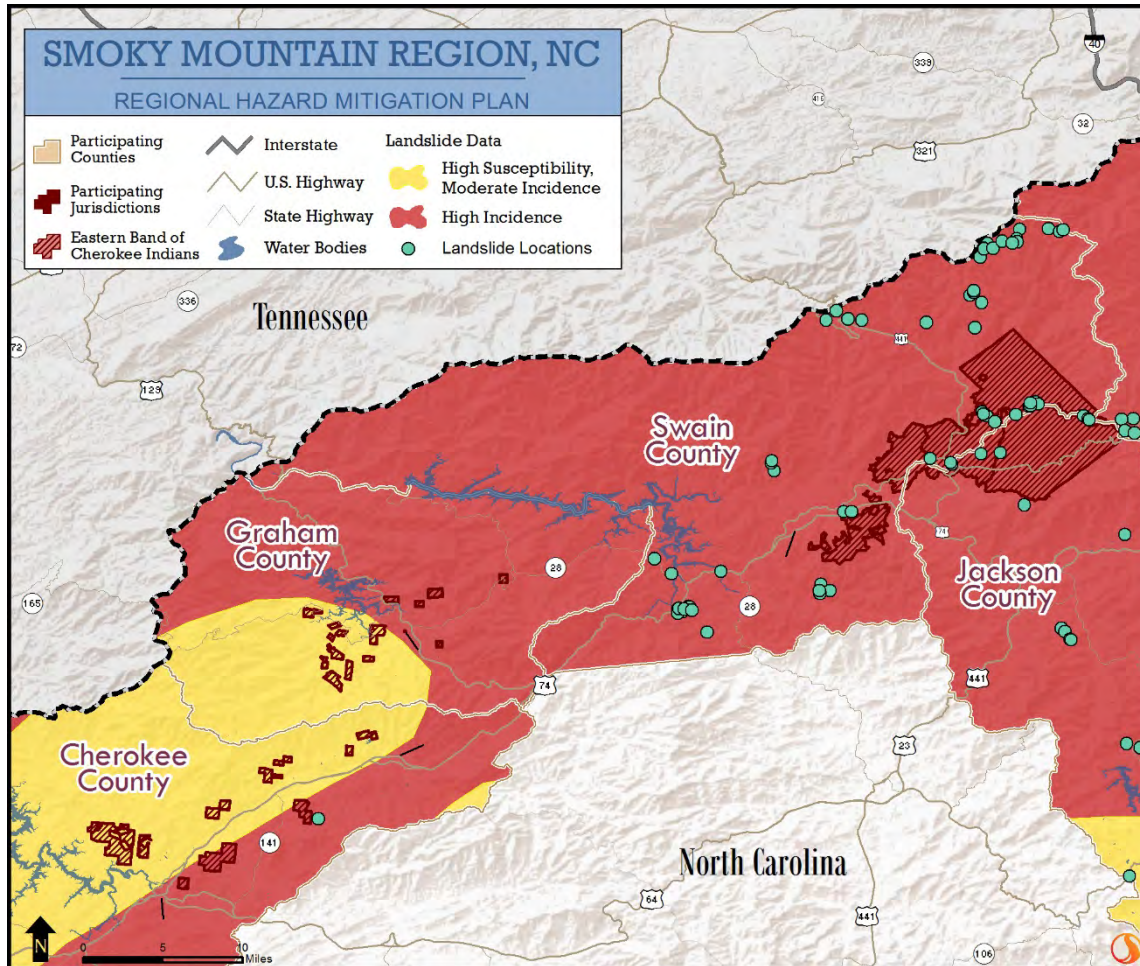
⁸ It should be noted that the North Carolina Geological Survey (NCGS) emphasized the dataset provided was incomplete. Therefore, there may be additional historical landslide occurrences. Furthermore, dates were not included for every event. The earliest date reported was 1940. No damage information was provided by NCGS.

TABLE F.14: SUMMARY OF LANDSLIDE ACTIVITY FOR EBCI

Location	Number of Occurrences
Eastern Band of Cherokee Indians	5

Source: North Carolina Geological Survey

FIGURE F.5: LOCATION OF PREVIOUS LANDSLIDE OCCURRENCES FOR EBCI



Source: North Carolina Geological Survey

The following information identifies additional historical information reported in the previous hazard mitigation plan and by FEMA.

- ◆ May 5-7, 2003: Heavy rains moved through the area causing flooding along all the major waterways. Over 40 landslides of varying sizes were triggered by heavy rain. The total damage from these events was estimated by Cherokee and State Emergency Management agencies to be just under \$1.2 million. This included damage to residential structures, commercial structures, and roadways throughout the EBCI Reservation. The individual landslide with the highest damage occurred along Route 19, closing the roadway completely, and caused an estimated \$500,000 in damages.

- ◆ In May 2013, a Disaster Declaration was declared for the Eastern Band of Cherokee Indians for severe flooding, landslides, and mudslides. This was the first Disaster Declaration to be issued to a tribal nation. Public assistance grants for the declaration reached almost \$3.4 million.

Extent

Landslide extent can be measured in terms of tons of debris or damage, for example. While limited information exists on debris generated from past events, nearly \$3.4 in damages was reported. Significant events could result in greater damages. The most severe events may result in loss of life.

Probability of Future Occurrences

Based on historical information and the USGS susceptibility index, the probability of future landslide events is likely (10 to 100 percent probability). The USGS data indicates that all areas in the Smoky Mountain Region have high susceptibility to landsliding occurrence. However, some areas are reported as having a lower, “moderate” incidence ranking. This applies to EBCI lands in Graham and Cherokee Counties. It should be noted that the wildfires of 2016 cleared many mountainsides; when coupled with heavy rain, this could lead to unstable ground conditions. This would increase the likelihood of occurrence. It should also be noted that some areas on the EBCI Reservation have greater risk than others given factors such as steepness on slope and modification of slopes (i.e., greater slope or modification of slope may increase risk and occurrence). However, this hazard is significant throughout the EBCI planning area.

Vulnerability Assessment

In order to complete the vulnerability assessment for landslides on the EBCI Reservation, GIS analysis was used. The potential dollar value of exposed land and property total can be determined using the USGS Landslide Susceptibility Index (detailed in Section F.3.9), parcel data, and GIS analysis. **Table F.15** presents the potential at-risk property where available. All areas of EBCI are identified as moderate or high incidence areas by the USGS landslide data. All areas are also of high landslide susceptibility. The incidence levels (high and moderate) were used to identify different areas of concern for the analysis below.

Table F.15: Total Potential At-Risk Parcels for the Landslide Hazard (High Incidence)

Location	Landslide Vulnerability: High Susceptibility, Moderate Incidence Areas					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
EBCI in Cherokee County	60	91%	22	92%	\$2,739,540	92%
ECBI in Graham County	37	71%	5	50%	\$527,340	62%
Landslide Vulnerability: High Incidence Areas						
EBCI in Cherokee County	6	9%	2	8%	\$244,750	8%

EBCI in Graham County	15	29%	5	50%	\$324,220	38%
EBCI in Jackson County	6	100%	4	100%	\$2,478,510	100%
EBCI in Swain County	23	100%	7	100%	\$1,645,240	100%
Eastern Band of Cherokee Indians*	5,046	100%	N/A	N/A	N/A	N/A

Hazard Data Source: USGS

*“Parcels at risk” data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire reservation, it is assumed that the total population is at risk.

Critical Facilities

All critical facilities are located in the high landslide/susceptibility area. A list of specific critical facilities and their associated risk can be found in **Table F.30** at the end of this section.

In conclusion, a landslide has the potential to impact all existing and future buildings, facilities, and populations on the EBCI Reservation, 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 EBCI 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.

F.3.10 Dam and Levee Failure

Location

The North Carolina Division of Land Resources provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table F.16** explains these classifications.

TABLE F.16: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	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 Land Resources

The North Carolina Division of Energy, Mineral, and Land Resources did not report any dams on the EBCI Reservation. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and information on the location of dams within these jurisdictions is available in Section 5.12.2.

Historical Occurrences

No dam breaches were reported on the EBCI Reservation.

Extent

Dam failure extent is defined using the North Carolina Division of Land Resources criteria defined above. A high hazard dam failure could result in loss of human life.

Probability of Future Occurrences

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.

F.3.11 Erosion

Location

Erosion on the EBCI Reservation is typically caused by flash flooding events. Unlike coastal areas, where the soil is mainly composed of fine grained particles such as sand, EBCI's mountainous soils have much greater organic matter content. Furthermore, extensive vegetation also helps to prevent erosion in the area. Erosion occurs on the Reservation, particularly along the banks of rivers and streams, but it is not a significant threat. No areas of concern were reported by the planning committee.

Historical Occurrences

Several sources were vetted to identify areas of erosion on the EBCI Reservation. This includes searching local newspapers, obtaining input from the planning team, and reviewing the previous hazard mitigation plan. The previous plan recognized erosion as a significant hazard and EBCI has completed an erosion control project in 1995 to address road washout. A Tennessee Valley Authority report produced in 1957 also includes anecdotal reports of roadway scour and erosion during two flood events in November of

1906 and March of 1913, but no further data is available. Little information could be found beyond the hazard mitigation plan.

Extent

The extent of erosion can be defined by the measurable rate of erosion that occurs such as inches per year. There are no erosion rate records located in EBCI however it is possible.

Probability of Future Occurrences

Erosion remains a natural, dynamic, and continuous process for EBCI, and it will continue to occur. The annual probability level assigned for erosion is possible (between 1 and 10 percent annually).

Vulnerability Assessment

Erosion can impact structure foundation and even result in the total compromise of a structure. However, data limitation prevents such an analysis. Given the lack of historical events, data, and threat to current and future life or property, no further analysis was conducted for the *Vulnerability Assessment*.

F.3.12 Flood

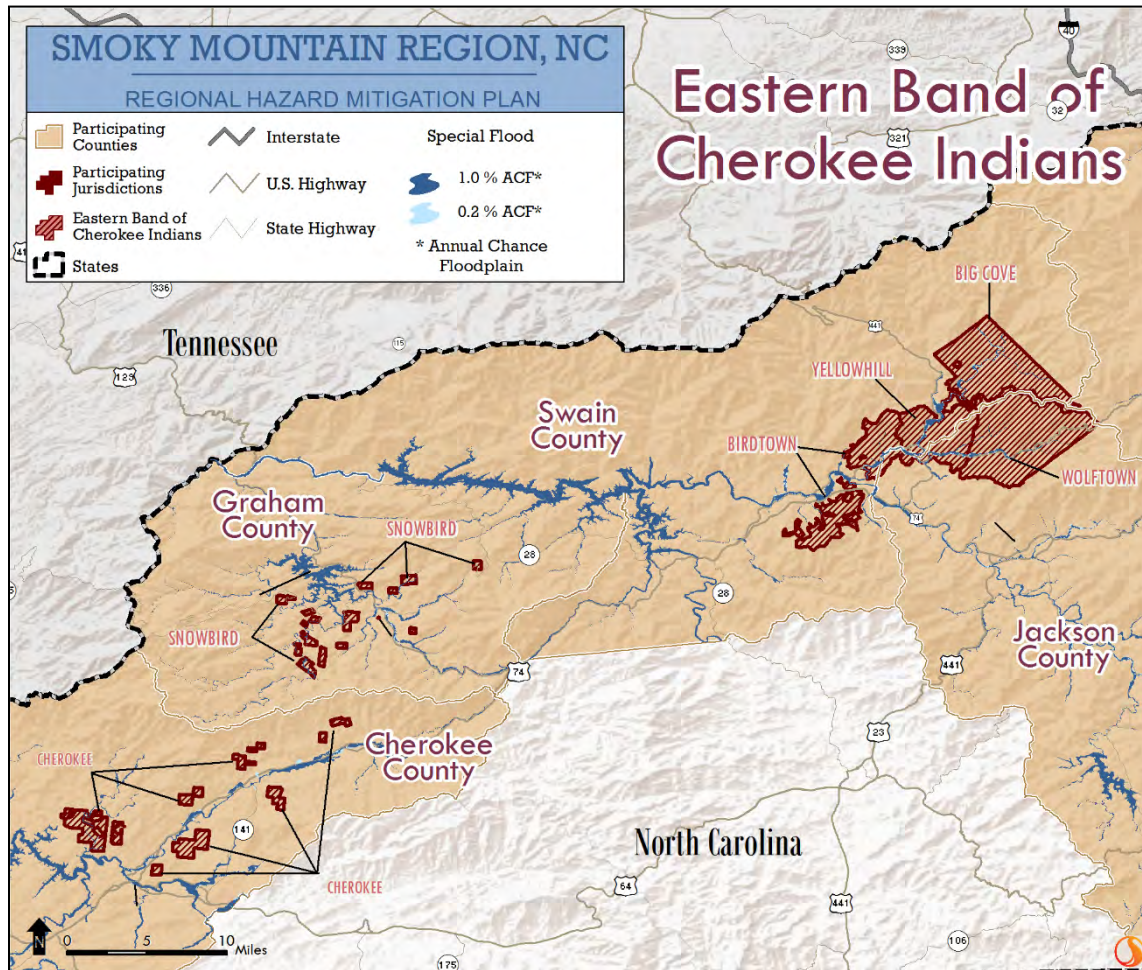
Location

There are areas on the EBCI Reservation that are susceptible to flood events. Special flood hazard areas on the reservation were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).⁹ 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 84 square miles that make up EBCI, there are 1.89 square miles of land in zones A and AE (1-percent annual chance floodplain/100-year floodplain), 0.77 square miles in floodways, and 0.47 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). There is a total of 3.13 square miles of land in floodplain areas.

These flood zone values account for 3.7 percent of the total land area on the EBCI Reservation. 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 F.6** illustrate the location and extent of currently mapped special flood hazard areas for EBCI based on best available FEMA Digital Flood Insurance Rate Map (DFIRM) data.

⁹ The DFIRM data used in this analysis for EBCI is current as of 2008.

FIGURE F.6: SPECIAL FLOOD HAZARD AREAS FOR EBCI



Source: Federal Emergency Management Agency

Historical Occurrences

The Nations Centers for Environmental Information provides county-level data, and data was not available to ascertain historical flood events for EBCI. However, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information indicates that 5 flood events reported in Swain County occurred on EBCI land that resulted in nearly \$4 million in damages.¹⁰ Specific information on flood events for EBCI, including date, type of flooding, and deaths and injuries, can be found in **Table F.17**.

TABLE F.17: HISTORICAL FLOOD EVENTS IN THE SMOKY MOUNTAIN REGION

Location	Date	Event Type	Death/Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS						
Snowbird	3/3/1997	Flash Flood	0/0	\$0	\$0	--
Cherokee	7/4/2006	Flash Flood	0/0	\$0	\$0	--

¹⁰ These events are only inclusive of those reported by NCEI. It is certain that additional occurrences have occurred and have gone unreported.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Location	Date	Event Type	Death/ Injuries	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
EASTERN BAND OF CHEROKEE INDIANS						
Cherokee	12/9/2009	Flood	0/0	\$6,334	\$0	Several trailers were flooded along the Oconaluftee River just off highway 441 in Cherokee.
Big Cove	7/14/2011	Flash Flood	0/0	\$47,762	\$0	Very heavy rainfall in the headwaters of Raven Fork over northern Haywood County sent a wall of water down the stream into Swain County. As the water reached the Cherokee Tribal Trout Hatchery at the end of Big Cove Rd, hundreds of fish were swept out of the hatchery's raceway, with many of them dying after the waters receded.
Big Cove	1/15/2013	Flood	0/0	\$3,939,281	\$0	Flooded locations in and near the Cherokee Indian reservation included the Parkway entrance (US441), the Saunooke Bridge, which connects Big Cove Road to Newfound Gap Road, Meetinghouse Road and Whitewater Drive. Big Cove Road was also flooded in the Piney Grove area along Rabun Fork. Mt. Noble Road was damaged by mudslide. Oconaluftee Island Park was flooded for a while by the Oconaluftee River in Cherokee, though damage to the park was minimal. Several roads were damaged by flash flooding and landslides, resulting in a federal disaster declaration.

Source: Nations Centers for Environmental Information

According to the previous hazard mitigation plan, records of historical flood events on the EBCI Reservation are sparse; however, numerous floods on the Oconaluftee River, Rave Fork, and Soco Creek have been documented. There have been approximately 16 recorded flood events since 1840 that have crested above flood stage (10 feet) on the Oconaluftee River and many other events have exceeded 9 feet. The two largest recorded floods occurred in November 1906 and March 1913 with the river cresting at approximately 13 feet at Cherokee. Little information is available regarding damages due to these events. Limited records also indicate a flood occurred in December 1969 that was nearly equal to those in 1906 and 1913 in which several buildings were inundated with floodwaters, roadways were blocked, and the site of a new community center was flooded.

More recently, in 1993, a flooding event of similar magnitude occurred. Anecdotal accounts in local newspapers describe a wall of water through the EBCI Reservation and significant damage to buildings and road infrastructure. Another recent flood event occurred between May 5 and May 7, 2003. Heavy rains moved through the area causing flooding along all the major waterways in the area. Extensive roadway damage occurred throughout the reservation and 6 businesses and 8 residences were reportedly damaged with 4 structures being completely destroyed. Preliminary estimates calculated the total damage from this event to be approximately \$1.8 million.

Several more records of recent flood events were found in the local newspaper, *Cherokee One Feather*. These events included:

- ◆ December 8, 2009: High rains caused parts of the Oconaluftee River to flood. The rains also

- caused downed trees and a mudslide in the Big Cove area.
- ◆ July 14-15, 2011: A flash flood occurred along Straight Fork Creek in the Qualla Boundary. No injuries or deaths were reported, but there was considerable damage at the Cherokee Tribal Fish Hatchery. Hatchery officials said a wall of water 8 to 10 feet high raced through the complex and damage estimates ranged from \$30,000 to \$50,000.

Extent

Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity based on gage data.

There are 1,049 parcels located in the 1.0-percent annual chance floodplain or 0.2-percent annual chance floodplain within EBCI.

Flood depth and velocity are recorded via United States Geological Survey by stream gages throughout the region. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. A gauge currently exists in on EBCI land at Birdtown, at the Oconaluftee River. The maximum discharge at this gauge was 10,900 cubic feet per second in 2013.

Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of February 2017, there have been four flood losses reported for EBCI through the National Flood Insurance Program (NFIP) since 1970, totaling over \$244,600 in claims payments. A summary of these figures for the reservation is provided in **Table F.18**. 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 on the EBCI Reservation were either uninsured, denied claims payment, or not reported.

TABLE F.18: SUMMARY OF INSURED FLOOD LOSSES FOR EBCI

Location	Flood Losses	Claims Payments
Eastern Band of Cherokee Indians	4	\$244,607

Source: FEMA, NFIP

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.

As of February 2017, there is 1 non-mitigated repetitive loss properties located on the EBCI Reservation, which accounted for 3 losses and more than \$236,000 in claims payments under the NFIP. The average claim amount for this property is \$78,766. This property is a commercial building. Without mitigation this property will likely continue to experience flood losses. **Table F.19** presents detailed information on repetitive loss properties and NFIP claims and policies for EBCI.

TABLE F.19: SUMMARY OF REPETITIVE LOSS PROPERTIES FOR EBCI

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Eastern Band of Cherokee Indians	1	commercial	3	\$0	\$236,298	\$236,298	\$78,766

Source: National Flood Insurance Program

Probability of Future Occurrences

Flood events will remain a threat for EBCI, and the probability of future occurrences will remain likely (between 10 and 100 percent annual probability). Information on previous NFIP losses indicates ongoing flood risk. EBCI lands have risk to flooding, though not all areas will experience flood. 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 EBCI. Flood 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.

Vulnerability Assessment

In order to assess flood vulnerability, 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 the county. 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 F.20** presents the potential at-risk property susceptible to the 1.0-percent annual flood chance and potential at-risk property susceptible to either the 1.0-percent or 0.2-percent annual chance flood in EBCI. Both the number of parcels and the approximate value are presented.

TABLE F.20: ESTIMATED RISK TO PARCELS AND IMPROVED PROPERTY TO THE 1.0-PERCENT ANNUAL CHANCE FLOOD (ACF)

Location	1.0-percent ACF					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	845	17%	N/A	N/A	N/A	N/A

Location	Combined 1.0-Percent and 0.2-Percent					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	1,049	21%	N/A	N/A	N/A	N/A

Source: FEMA DFIRM

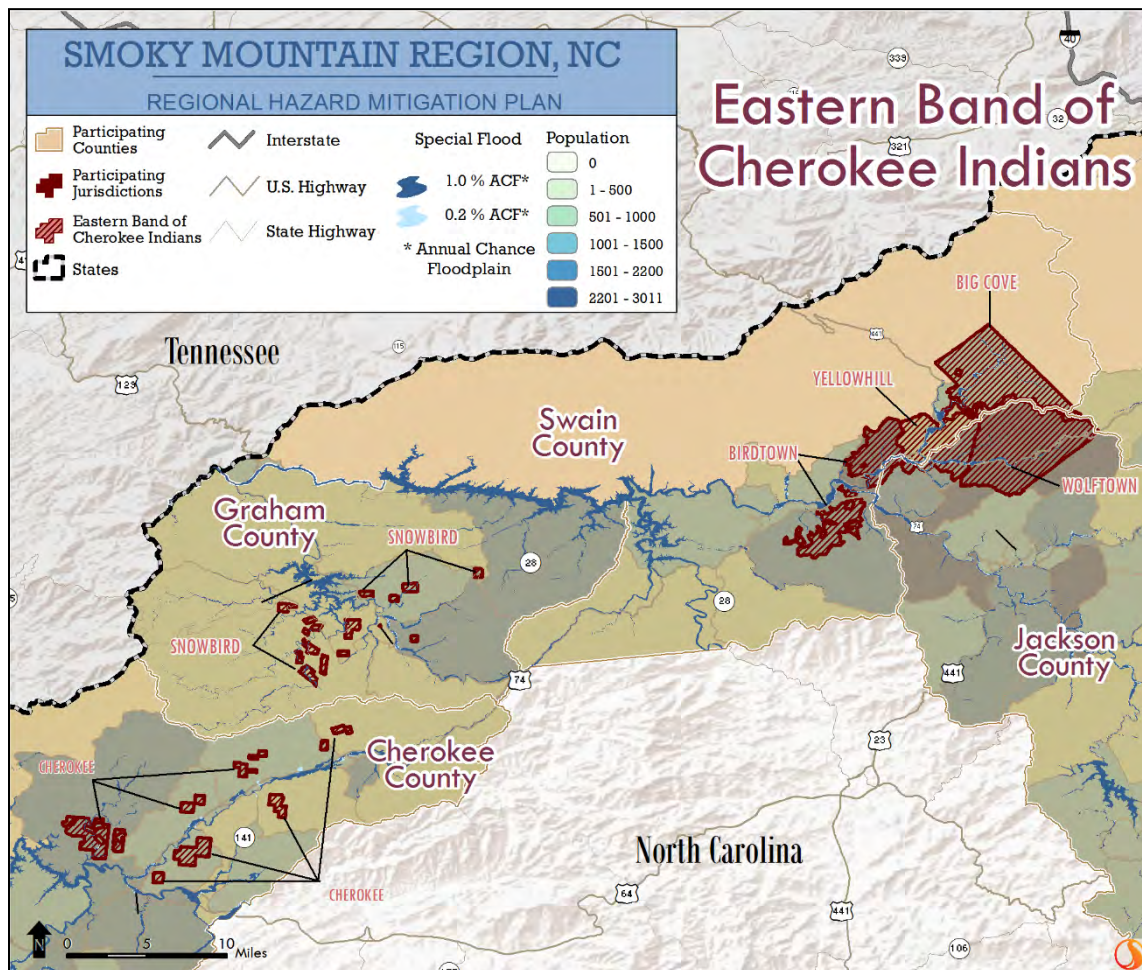
*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

In addition, the Eastern Band of Cherokee Indians has conducted a detailed study of specific buildings located in the floodplain. This study includes information on building type, condition, and approximate value, as well as the potential damage (in dollars) to various levels of flooding. A total of 745 structures were identified in the floodplain area. For additional information please contact EBCI Emergency Management.

Social Vulnerability

Since 2015 population was available at the tract level, it was difficult to determine a reliable figure on population at-risk to flood due to tract level population data. **Figure F.7** is presented to gain a better understanding of at risk population.

FIGURE F.7: POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, U.S. Census 2015

Critical Facilities

The critical facility analysis revealed that there are 90 critical facilities located in the EBCI 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain based on FEMA DFIRM boundaries and GIS analysis. Critical facilities located in the EBCI 1.0-percent annual chance floodplain are presented in **Table F.21**, and critical facilities located in the 1.0-percent annual chance floodplain and 0.2-percent annual chance floodplain are detailed in **Table F.22**. A list of specific critical facilities and their associated risk can be found in **Table F.30** at the end of this section.

TABLE F.21: CRITICAL FACILITIES LOCATED IN 1.0-PERCENT FLOOD HAZARD AREAS

EASTERN BAND CHEROKEE INDIANS	
CATEGORY AND TYPE	TOTAL
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	25
Office	11
Community Building	5
Visitor Center	1
School	8
Medical Facilities	0
Hospital	0
Public Works/Utilities	10
Communication Tower	0
Water and Wastewater Systems	9
Other Utility Facility	1
Other	2
Casino	2
Total	37

TABLE F.22: CRITICAL FACILITIES LOCATED IN COMBINED 1.0-PERCENT AND 0.2-PERCENT FLOOD HAZARD AREAS

EASTERN BAND CHEROKEE INDIANS	
CATEGORY AND TYPE	TOTAL
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	38
Office	19
Community Building	5
Visitor Center	1
School	13
Medical Facilities	0
Hospital	0
Public Works/Utilities	13
Communication Tower	0
Water and Wastewater Systems	12
Other Utility Facility	1
Other	2
Casino	2
TOTAL	53

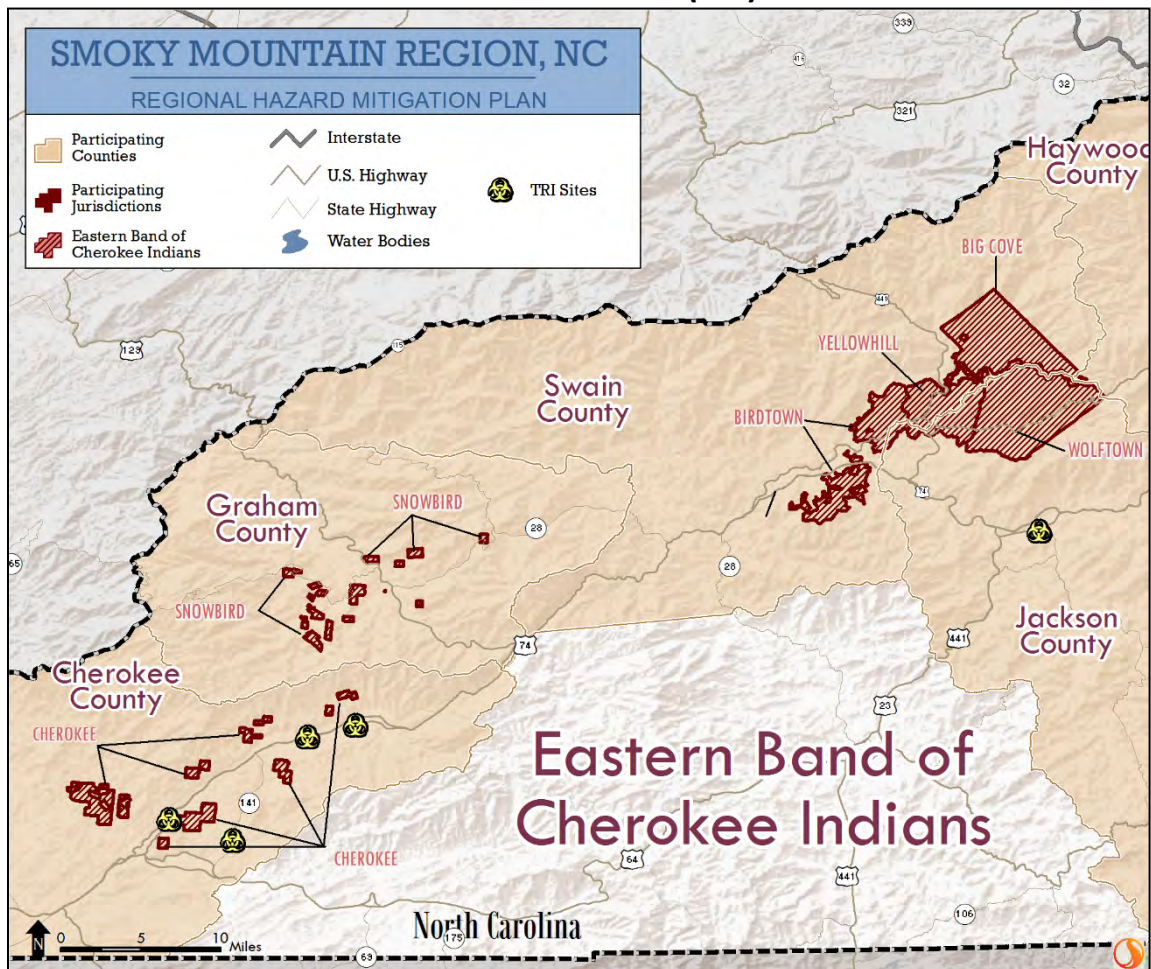
In conclusion, a flood has the potential to impact many existing and future buildings and populations on the EBCI Reservation, though some areas are at a higher risk than others. All types of structures in a floodplain are at-risk, though elevated structures will have a reduced risk. As noted, the floodplains 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 are outside the scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

F.3.13 Hazardous Materials Incidents

Location

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 agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. There are four TRI sites located adjacent to the EBCI Reservation. These sites are shown in **Figure F.8**.

FIGURE F.8: TOXIC RELEASE INVENTORY (TRI) SITES NEAR EBCI



Source: EPA

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

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 materials “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 persons due to the presence of hazardous material, or
- ◆ a vehicle accident or derailment resulting in the release of a hazardous material.

There have been no hazardous materials incidents reported on EBCI lands according to the USDOT PHMSA. However, it should be noted that large incidents are possible.

Extent

Hazardous Materials Incidence extent can be defined into terms of amount of material released or associated impacts. While no events have been reported, the bulk release (over 199 gallons) would classify the event as a hazardous material. However, greater releases are possible.

Probability of Future Occurrences

Given the location of four toxic release inventory sites near EBCI, it is possible that a hazardous material incident may occur on the reservation. With the lack of historic incidents, the annual probability for hazardous materials incidents is unlikely (less than one percent annual probability). Tribe 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.

It should be assumed that hazardous materials incidents will continue to be a threat to the EBCI lands. The Tribe may also be impacted by neighboring counties which also face risk due to TRI sites and curvy, mountain roadways.

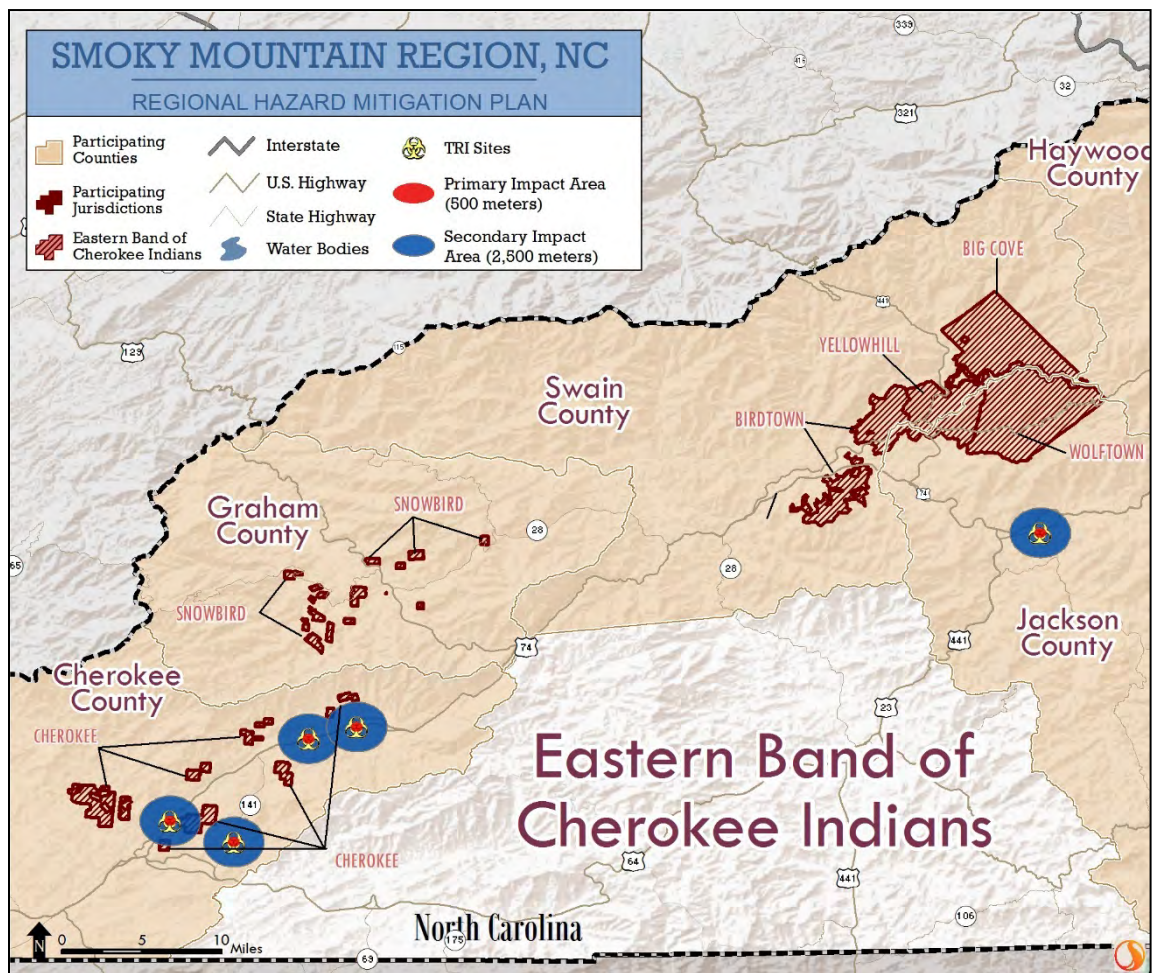
Vulnerability Assessment

Although existing Toxic Release Inventory sites indicate that EBCI is susceptible to hazardous materials events, there are few reports of damage. It is assumed that one major event could result in significant losses for EBCI.

Most hazardous materials 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 materials 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.¹¹ In both scenarios, two sizes of buffers—500 and 2,500 meters—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 for EBCU, along with buffers, were used for analysis as shown in **Figure F.9**. 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 F.10** shows the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels, improved value, as shown in **Table F.22** (mobile road sites) and **Table F.23** (mobile railroad sites).¹² There were no parcels identified within the fixed site buffer areas.

FIGURE F.9: TRI SITES WITH BUFFERS FOR EBCI



¹¹ This type of analysis will likely yield conservative results (higher than what is likely reported following an actual event).

¹² Note that parcels included in the 2,500 meter analysis are also included in the 500 meter analysis.

FIGURE F.10: MOBILE HAZMAT BUFFERS FOR EBCI

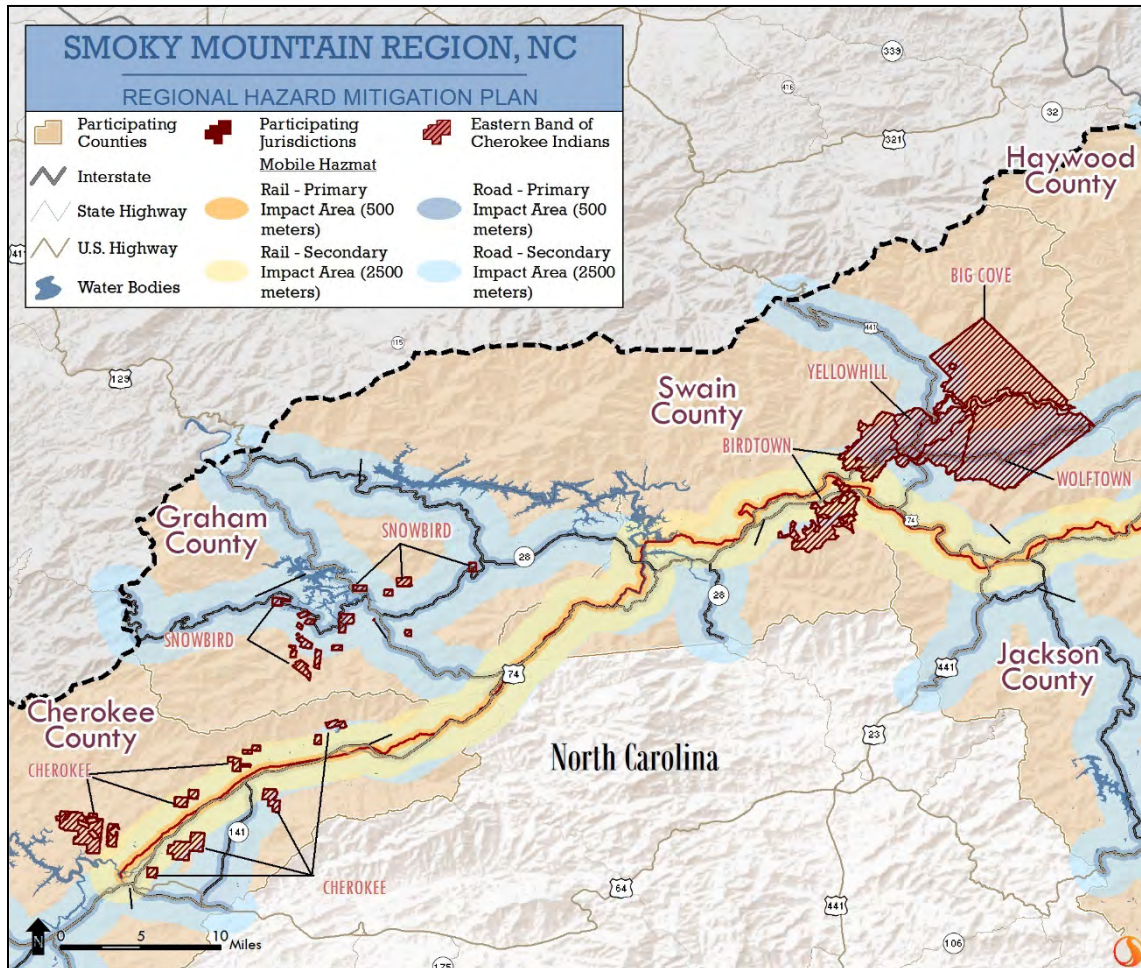


TABLE F.23: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - ROAD)

Location	500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	2,496	49%	N/A	N/A	N/A	N/A

Location	2,500-meter Buffer – Roads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	4,392	87%	N/A	N/A	N/A	N/A

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

**TABLE F.24: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL
(MOBILE ANALYSIS - RAILROAD)**

Location	500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	11	0%	N/A	N/A	N/A	N/A

Location	2,500-meter Buffer – Railroads					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	503	10%	N/A	N/A	N/A	N/A

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Given high susceptibility across the entire reservation, it is assumed that the total population is at risk to a hazardous materials incident. 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 no EBCI facilities located in a HAZMAT risk zone. **Table F.25** shows the number of critical facilities located HAZMAT risk zones. A list of specific critical facilities and their associated risk can be found in **Table F.30** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors in EBCI revealed that there are 176 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 11 critical facilities located in the railroad HAZMAT buffer areas. A list of specific critical facilities and their associated risk can be found in **Table F.30** at the end of this section.

TABLE F.25: CRITICAL FACILITIES IN HAZMAT RISK ZONES

Location	500m buffer Fixed Sites	2,500m buffer Fixed Sites	500m buffer Roads	2,500m buffer Roads	500m buffer Rail	2,500m buffer Rail
Eastern Band of Cherokee Indians	0	0	120	176	1	11

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations on the EBCI Reservation. Those areas in a primary buffer area 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. Further, incidents from neighboring counties could also impact the county and participating jurisdictions.

F.3.14 Wildfire

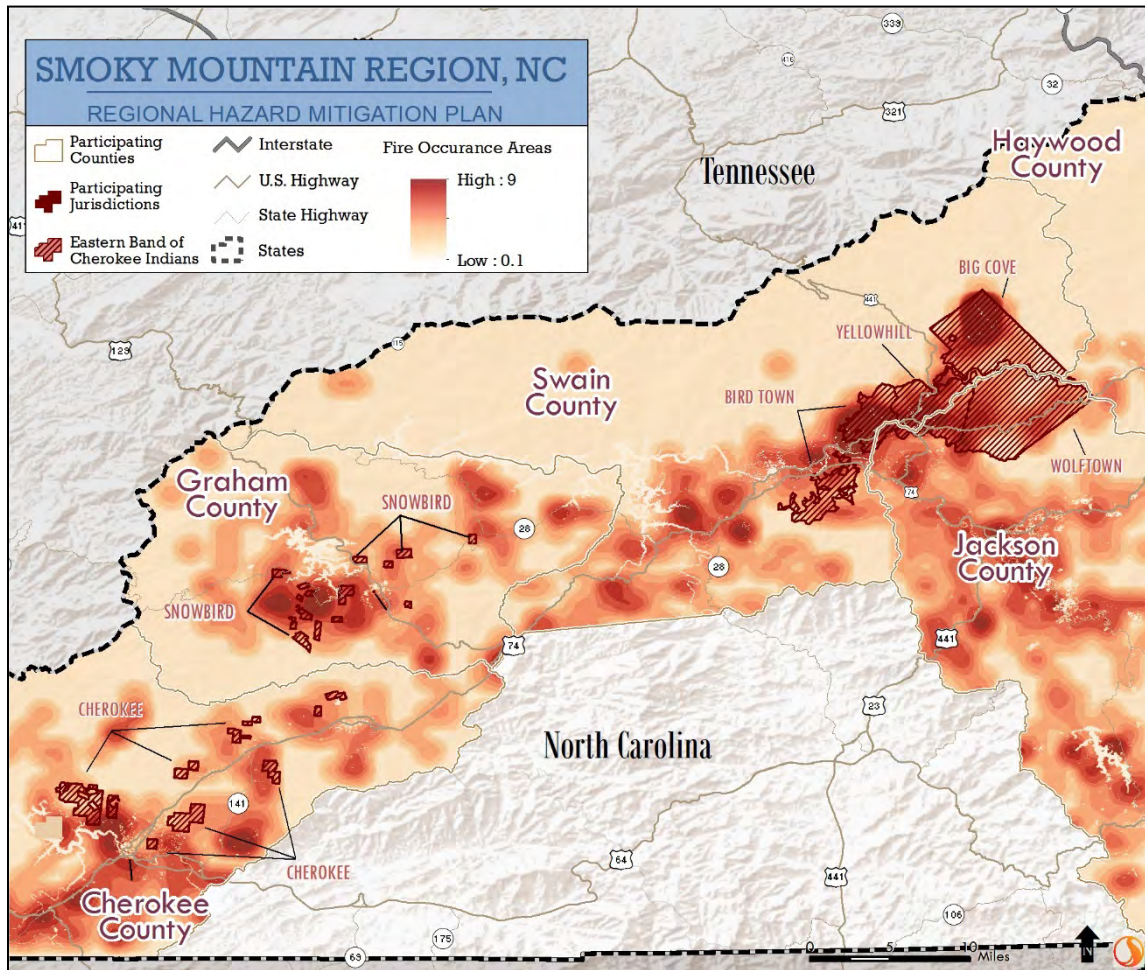
Location

The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, and wildland urban interface area may make a wildfire more likely. Areas in the wildland-urban interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Fire Occurrence Areas in the figure below give an indication of historic locations impacted.

Historical Occurrences

Figure F.11 shows the Fire Occurrence Areas (FOA) for EBCI based on data from the Southern Wildfire Risk Assessment. This data is based on historical fire ignitions and is reported as the number of fires that occur per 1,000 acres each year.

FIGURE F.11: HISTORIC WILDFIRE EVENTS FOR EBCI



Data from the North Carolina Division of Forest Resources does not include EBCI; however, EBCI has land in each of the participating counties (with a majority in Jackson and Swain Counties) and historical information for these jurisdictions is available in Section 5.16.3.

(Taken from the 2011 EBCI plan) According to the 2001 Fire Management Plan, there were a total of 174 fires reported on the EBCI Reservation between 1986 and 1997, burning a total of 906.9 acres. Of these fires 71% have been caused by debris burning, although other causes include smoking, children, as well as miscellaneous causes.

In addition to the detail provided above, two events were reported in local newspapers for the EBCI Reservation lands, one in 2001 and one in 2009. No additional information about the size, severity, extent, or damages was provided.

- ◆ March 26, 2001: A forest fire on Qualla Boundary burned about 110 acres but did not threaten any structures. (Source: Star News).
- ◆ April 27, 2009: A downed power line in the Big Cove community of the Qualla Boundary sparked dry vegetation. In total, 2,200 acres were burned with a small number of those being within Great Smoky Mountains Park. Most of the fire was in the Big Cove community and at one point

the fire approached several homes but did not continue into that area. The fire circled the mountain and zigzagged upward along the peak and down the other side. This fire is known as the Stony Ridge Fire. (Source: *National Park Service*).

- ◆ February 25, 2014: A wildfire burned 85 acres in the Yellowhill Community. No injuries or structural damage was reported. According to the BIA Cherokee Agency, the cause of the wildfire was arson. (Source: *Cherokee One Feather*)
- ◆ April 17-21, 2016: Three wildfires burned over 300 acres. Fires started in the Yellowhill, Big Cove, and Birdtown communities. The EBCI Secretary of Public Safety reported no injuries or damages. (Source: *Cherokee One Feather*)
- ◆ Fall 2016 – wildfires burned across much of the region, including EBCI lands, particularly on the Qualla Boundary. See below for details.

2016 Wildfires

In November of 2016, western North Carolina experienced an outbreak of wildfires that burned over 55,000 acres in the wake of an extreme drought. Graham County and Swain County, both of which contain EBCI lands, were particularly hard hit (See Section 5.16.3). In addition, dozens of fires were reported on the Qualla Boundary, totaling over 480 acres burned.¹³

Firefighting and rescue crews from all over the state traveled to western North Carolina to aid in relief efforts.¹⁴ According to the USDA's Joint Information Center Western NC Wildfires, by November 25, 2016, nine incident management teams and over 6,000 state and federal personnel from all over the country were deployed to assist the Southeast with fire suppression, in addition to hundreds of state volunteer firefighters and emergency personnel. At the time, North Carolina alone was in use of seven airplanes, eight single engine air tankers (SEATs), six type 1 (large) helicopters, five type 2 (medium) helicopters, and three type 3 (large helicopters) to aid in fire suppression.¹⁵ The USDA estimates that suppression costs from October through December in western North Carolina totaled \$36.8 million.¹⁶ Aside from the impacts to human and environmental health and safety, the fires had a significant impact on the region's economy, which relies heavily on tourism during the fall and winter months.¹⁷

Extent

Wildfire extent can be defined in terms of acres burned. The 2016 wildfires resulted in nearly 500 acres on the reservation burned, but overall totals are over 55,000 acres. Larger events are possible.

Probability of Future Occurrences

Wildfire events will be an ongoing occurrence on the EBCI Reservation. The likelihood of wildfires increases during drought cycles and abnormally dry conditions. Fires are likely to stay small in size but could increase due to 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. There are concentrations of historical fire occurrences in the EBCI lands adjacent to Swain and Jackson Counties.

¹³ <http://wlos.com/news/local/fire-updates-dires-greater-than-6000-acres-burn-in-swain-and-graham-counties>

¹⁴ <http://myfox8.com/2016/11/22/new-wildfire-sparks-evacuations-in-blowing-rock/>

¹⁵ UDA Forest Services Joint Information Center Western NC Wildfires. Evening Summary (2016, November 25). Retrieved from <https://www.fs.usda.gov/detail/nfsnc/alerts-notices/?cid=fseprd525902>

¹⁶ <http://www.citizen-times.com/story/news/local/2017/03/31/wnc-wildfires-yield-hefty-price-tag/99736410/>

¹⁷ <http://www.citizen-times.com/story/news/local/2016/11/18/outbreak-wnc-wildfires-takes-toll-wildlife-environment/93788956/>

This could be an indication of elevated future risk if no proactive measures have been taken. Further, it also indicates nearby land is at risk as wildfires can spread quickly. The vulnerability 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 EBCI for future wildfire events is highly likely (greater than 90 percent annual probability).

Vulnerability Assessment

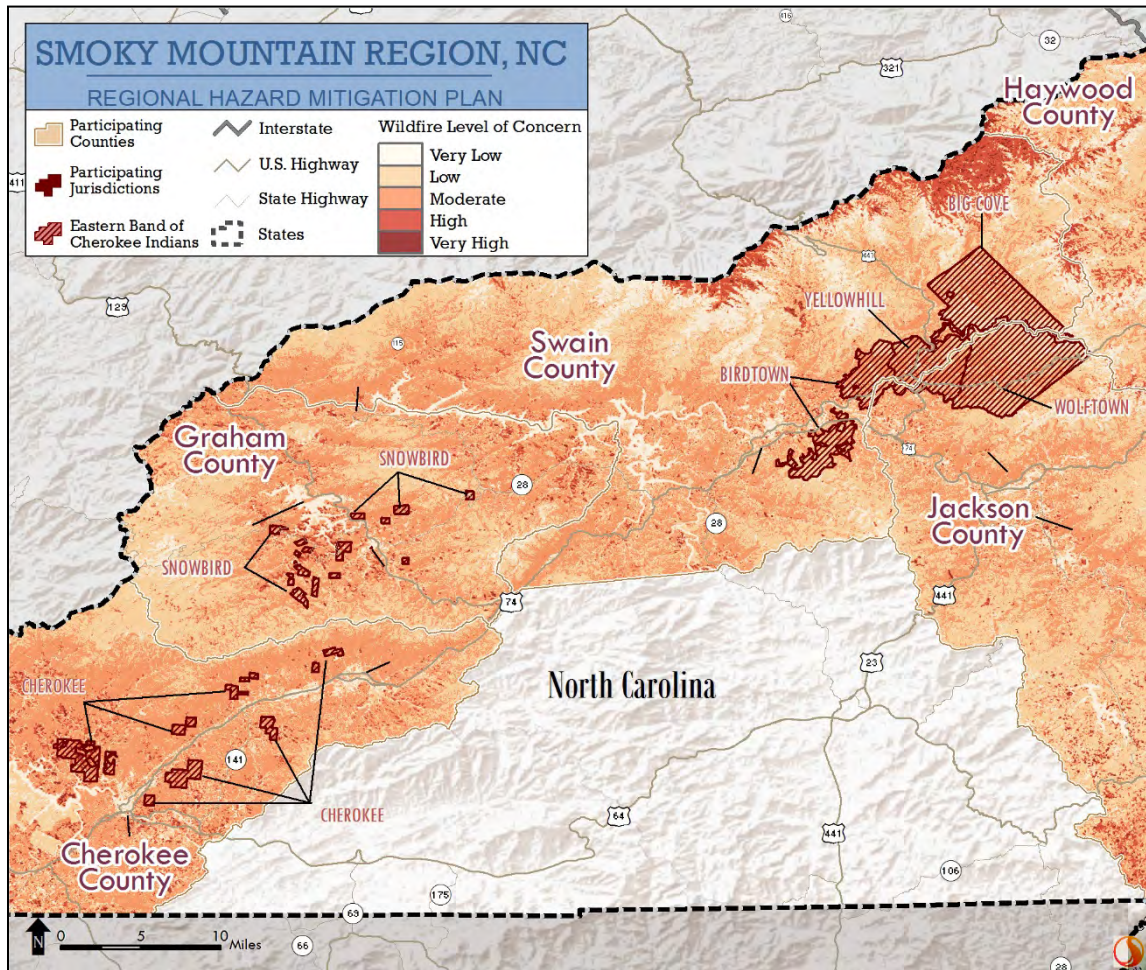
Although historical evidence indicates that EBCI is susceptible to wildfire events, there are few reports of damage. It should be noted that a single event could result in significant damages throughout the reservation.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of concern (i.e. areas with high risk to wildfires) were intersected with critical facility locations. The data used to identify high risk areas was obtained from the Southern Wildfire Risk Assessment's Fire Intensity Scale. The Fire Intensity Scale combines areas of significant fuel hazards and associated dangerous fire behavior potential. The potential wildfire intensity is classified as follows:

- **Class 1, Very Low:** Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
- **Class 2, Low:** Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:** Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:** Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:** Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Figure F.12 shows the wildfire risk areas for EBCI. Initially provided as raster data, it was converted to a polygon for analysis. **Table F.26** shows the number of parcels at risk to wildfire on EBCI lands.

FIGURE F.12: WILDFIRE RISK AREAS FOR EBCI



Source: Southern Wildfire Risk Assessment Data

TABLE F.26: EXPOSURE OF PROPERTY TO WILDFIRE AREAS OF CONCERN

Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels* (i.e., buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Eastern Band of Cherokee Indians*	330	7%	N/A	N/A	N/A	N/A

*"Parcels at risk" data provided by the Eastern Band of Cherokee Indians and included in regional totals. Improved parcels and values were not provided and are not represented in regional totals.

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire reservation. 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

The critical facility analysis revealed that there are 16 critical facilities located in wildfire areas of high to very high risk, as detailed in **Table F.27**. It should be noted, however, that several factors could impact the spread of a wildfire putting all facilities at risk. A list of specific critical facilities and their associated risk can be found in **Table F.30** at the end of this section.

TABLE F.27: CRITICAL FACILITIES IN HIGH TO VERY HIGH WILDFIRE RISK AREAS IN EBCI

EASTERN BAND OF CHEROKEE INDIANS	
Category and Type	Total
Emergency Services	0
Fire Station	0
Police Station	0
Government Facilities	6
Office	5
Community Building	1
Visitor Center	0
School	0
Medical Facilities	7
Hospital	7
Public Works/Utilities	3
Communication Tower	1
Water and Wastewater Systems	1
Other Utility Facility	1
Other	0
Casino	0
Total	16

In conclusion, a wildfire event has the potential to impact many existing and future buildings, critical facilities, and populations in EBCI. Wildfires present significant risk to the county and jurisdictions within. These wildfires impact the economy by potentially causing widespread destruction of homes and critical facilities and interrupting businesses.

F.3.15 Conclusions on Hazard Risk

The hazard profiles presented above 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.

Priority Risk Index Results

In order to draw some meaningful planning conclusions on hazard risk for EBCI, the results of the hazard profiling process were used to generate reservation-wide hazard classifications according to a “Priority Risk Index” (PRI). More information on the PRI and how it was calculated can be found in Section 5.17.2.

Table F.28 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 Planning Committee. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE F.28: SUMMARY OF PRI RESULTS FOR EBCI

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Atmospheric Hazards						
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week	2.6
Hailstorm	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Hurricane and Tropical Storm	Possible	Limited	Large	More than 24 hours	Less than 24 hours	2.3
Lightning	Highly Likely	Minor	Negligible	Less than 6 hours	Less than 6 hours	2.2
Thunderstorm/High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 6 hours	3.0
Tornado	Possible	Critical	Small	Less than 6 hours	Less than 6 hours	2.4
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week	3.3
Geologic Hazards						
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	2.3
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	2.5
Hydrologic Hazards						
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours	2.0
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week	1.8
Flood	Likely	Limited	Moderate	6 to 12 hours	Less than 1 week	2.8
Other Hazards						
Hazardous Materials Incident	Unlikely	Limited	Small	Less than 6 hours	Less than 24 hours	1.9
Wildfire	Highly Likely	Critical	Moderate	Less than 6 hours	More than 1 week	3.5

The conclusions drawn from the hazard profiling process for EBCI, including the PRI results and input from the Regional Hazard Mitigation Planning Committee, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table F.29**). 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 EBCI Reservation. A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment* and below in Section F.4. 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.

TABLE F.29: CONCLUSIONS ON HAZARD RISK FOR EBCI

HIGH RISK	Winter Storm and Freeze Thunderstorm Wind/High Wind Flood Wildfire Landslide Drought
MODERATE RISK	Tornado Hurricane and Coastal Storm Earthquake Lightning Hailstorm
LOW RISK	Hazardous Material Incident Dam and Levee Failure Erosion

Conclusion of Hazard Vulnerability

As noted in Section 6: *Vulnerability Assessment*, only hazards with a specific geographic boundary, modeling tool, or sufficient historical data allow for further analysis. Those results, specific to EBCI, are presented here. All other hazards are assumed to impact the entire planning region (drought, hailstorm, lightning, thunderstorm wind, tornado, and winter storm and freeze) or, due to lack of data, analysis would not lead to credible results (erosion, dam and levee failure). The total reservation exposure, and thus risk, was presented in **Table F.27**.

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to atmospheric hazards including drought, hailstorm, hurricane and tropical storm, lightning, thunderstorm wind, tornado, and winter storm and freeze. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type. **Table F.30** 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”).

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TABLE F.30: AT-RISK CRITICAL FACILITIES FOR EBCI

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
EASTERN BAND CHEROKEE INDIANS																				
Casino Hotel - Loading Dock	Casino	X	X	X	X	X	X	X	X		X	X	X			X	X			
Casino Hotel - Main Hotel Entrance	Casino	X	X	X	X	X	X	X	X		X	X	X			X	X			
Casino Parking Deck / Bus Entrance	Casino	X	X	X	X	X	X	X	X		X					X	X			
Access to Broadband & Verizon Cell Tower	Communication Tower	X	X	X	X	X	X	X	X		X					X	X			
Barnett Knob Firetower	Communication Tower	X	X	X	X	X	X	X	X		X									
Broadband & Verizon Cell Tower at 607 Barnett Knob Firetower Rd	Communication Tower	X	X	X	X	X	X	X	X		X									
Broadband & Verizon Cell Tower at 683 Jim Bowman Dr	Communication Tower	X	X	X	X	X	X	X	X		X						X		X	X
Broadband & Verizon Cell Tower at 759 Old Salt Mine Dr	Communication Tower	X	X	X	X	X	X	X	X		X						X			
Broadband & Verizon Cell Tower at 76 Long View Ln	Communication Tower	X	X	X	X	X	X	X	X		X					X	X			
Mt. Noble Fire Tower	Communication Tower	X	X	X	X	X	X	X	X		X						X			
3200 Acre Tract Community Building	Community Building	X	X	X	X	X	X	X	X		X					X	X		X	
Big Cove Community Rec. Center	Community Building	X	X	X	X	X	X	X	X		X									

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER							
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire	
Big Y Community Bldg	Community Building	X	X	X	X	X	X	X	X		X	X	X				X				
Birdtown Community Center	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Birdtown Recreation	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Paint Town Comm Bldg at 10 Old Gap Rd	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Paint Town Comm Bldg at 59 Paint Town Community Building Rd	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Paint Town Gymnasium	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Rough Branch Community Building	Community Building	X	X	X	X	X	X	X	X		X					X	X				X
Soco Community Club Building	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Wolfetown Community Center & Gym	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Yellow Hill Community Club	Community Building	X	X	X	X	X	X	X	X		X	X	X			X	X				
Yellowhill Community Building	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Yellowhill Outdoor Recreation Building	Community Building	X	X	X	X	X	X	X	X		X					X	X				
Fire Station 1	Fire Station	X	X	X	X	X	X	X	X		X					X	X				
Substation #2, Metal Building	Fire Station	X	X	X	X	X	X	X	X		X					X	X				
Substation #3, Red Concrete Block Bldg	Fire Station	X	X	X	X	X	X	X	X		X										

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

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Ambulance Emergency Entrance	Hospital	X	X	X	X	X	X	X	X		X					X				
Delivery Entrance	Hospital	X	X	X	X	X	X	X	X		X				X	X				X
Emergency Helicopter Landing Pad	Hospital	X	X	X	X	X	X	X	X		X					X				
Pharmacy Drive Thru Window	Hospital	X	X	X	X	X	X	X	X		X				X	X				X
Primary Care Entrance	Hospital	X	X	X	X	X	X	X	X		X				X	X				X
Public Emergency Entrance	Hospital	X	X	X	X	X	X	X	X		X					X				X
Rotunda Entrance	Hospital	X	X	X	X	X	X	X	X		X				X	X				X
Staff Entrance A	Hospital	X	X	X	X	X	X	X	X		X					X				X
Staff Entrance B	Hospital	X	X	X	X	X	X	X	X		X					X				X
Urgent Care Medical Center	Hospital	X	X	X	X	X	X	X	X		X				X	X				
Urgent Care Pharmacy	Hospital	X	X	X	X	X	X	X	X		X				X	X				
Admin Office (Children’s Res.Services) Bldg #13	Office	X	X	X	X	X	X	X	X		X				X	X				
Admin. Office (Development Office) Bldg #14	Office	X	X	X	X	X	X	X	X		X				X	X				
After School Program	Office	X	X	X	X	X	X	X	X		X				X	X				X
American Legion Post #143	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Animal Shelter	Office	X	X	X	X	X	X	X	X		X				X	X				
Bureau of Indian Affairs	Office	X	X	X	X	X	X	X	X		X		X		X	X				

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

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Cherokee Animal Shelter	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Cherokee Department of Transportation & Transit	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Cherokee Family Safety Building	Office	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Home Health Services	Office	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Preservation	Office	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Technical Support Center	Office	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Tribal Natural Resource Enforcement	Office	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Youth Center	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Children's Center - Agelink Building	Office	X	X	X	X	X	X	X	X		X					X	X			X
Council House	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Davita Dialysis Center	Office	X	X	X	X	X	X	X	X		X					X	X			X
Dora Reed Center - Cherokee Tribal Daycare Center	Office	X	X	X	X	X	X	X	X		X					X	X			
EBCI Legal Department	Office	X	X	X	X	X	X	X	X		X					X	X			
EBCI PHS Administration Building	Office	X	X	X	X	X	X	X	X		X					X	X			
Emergency Operations Center	Office	X	X	X	X	X	X	X	X		X					X	X			

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Employee Entrance & Costume Shop for Village	Office	X	X	X	X	X	X	X	X		X						X			
Employees Entrance Bingo Hall	Office	X	X	X	X	X	X	X	X		X				X	X				
EMS Base	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Entrance Bingo Building	Office	X	X	X	X	X	X	X	X		X				X	X				
Facility Management	Office	X	X	X	X	X	X	X	X		X				X	X				
Facility Mgt. Garage	Office	X	X	X	X	X	X	X	X		X	X	X		X	X			X	
Finance - Maggie Wachacha Building	Office	X	X	X	X	X	X	X	X		X		X		X	X				
Forestry Department	Office	X	X	X	X	X	X	X	X		X				X	X				
GLW Complex - Cherokee Choices	Office	X	X	X	X	X	X	X	X		X				X	X				
GLW Complex - Enrollment Office	Office	X	X	X	X	X	X	X	X		X				X	X				
GLW Complex - Main Entrance	Office	X	X	X	X	X	X	X	X		X				X	X				
GLW Complex - Tribal Education Computer Center	Office	X	X	X	X	X	X	X	X		X				X	X				
Housekeeping - Warehouse	Office	X	X	X	X	X	X	X	X		X				X	X				
Internal Audit / ALE	Office	X	X	X	X	X	X	X	X		X	X	X		X	X				
Juvenile Services	Office	X	X	X	X	X	X	X	X		X				X	X				
Kituwah Immersion Academy	Office	X	X	X	X	X	X	X	X		X				X	X				
Kituwah Immersion Academy	Office	X	X	X	X	X	X	X	X		X				X	X				

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Main Entrance, Wastewater Treatment Plant	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
NC Cooperative Extension	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 238 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 264 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Offices at 296 Childrens Home Rd	Office	X	X	X	X	X	X	X	X		X					X	X			
Owner: EBCI at 508 Goose Creek Rd	Office	X	X	X	X	X	X	X	X		X						X			
Plant Management Site	Office	X	X	X	X	X	X	X	X		X					X	X			
Qualla Housing Authority	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Rock Bldg - Tribal Office	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Services	Office	X	X	X	X	X	X	X	X		X					X	X			
Sewage Pumping Station	Office	X	X	X	X	X	X	X	X		X					X	X		X	
Side Outlet of Bingo	Office	X	X	X	X	X	X	X	X		X					X	X			
Supply - Tribal Warehouse	Office	X	X	X	X	X	X	X	X		X					X	X			
Teen Health Center	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
The Beloved Women's and Children's Health Center	Office	X	X	X	X	X	X	X	X		X					X	X			
Top	Office	X	X	X	X	X	X	X	X		X					X	X			

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Tribal Child Support Enforcement	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			
Tribal Construction Inventory Shop	Office	X	X	X	X	X	X	X	X		X					X	X			
Tribal Gaming Commission Building	Office	X	X	X	X	X	X	X	X		X					X	X			
Tribal Housing	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Tribal Motor Pool - Building Behind Tribal Utilities	Office	X	X	X	X	X	X	X	X		X					X	X			
Tribal Utilities "Brad" Building	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Tsali Care Center - Nursing Home	Office	X	X	X	X	X	X	X	X		X					X	X			X
Tsali Manor - Senior Citizens Center	Office	X	X	X	X	X	X	X	X		X					X	X			
U.N.I.T.Y.	Office	X	X	X	X	X	X	X	X		X					X	X			
U.S. Post Office	Office	X	X	X	X	X	X	X	X		X		X			X	X			
Vacant at 75 John Crowe Hill Dr	Office	X	X	X	X	X	X	X	X		X					X	X			
WCU Cherokee Center	Office	X	X	X	X	X	X	X	X		X	X	X			X	X			X
Building at 246 Joshua Toineeta Rd	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			
Cherokee Fire & Safety	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			
Environmental Air Shelter	Other Utility Facility	X	X	X	X	X	X	X	X		X	X	X			X	X			X
Salt Shed Facility	Other Utility Facility	X	X	X	X	X	X	X	X		X					X	X			

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Evidence Control	Police Station	X	X	X	X	X	X	X	X		X				X	X				
Justice Center	Police Station	X	X	X	X	X	X	X	X		X				X	X				
New Police Sub-Station	Police Station	X	X	X	X	X	X	X	X		X									
Cherokee Central Schools - Auto Mechanics Building	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Ball Diamond Access	School	X	X	X	X	X	X	X	X		X	X	X			X	X			
Cherokee Central Schools - Facility Management / Field House	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Gathering Place	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Greenhouse	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Janitorial Warehouse	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Office	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Central Schools - Storage Building	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Back Entrance / Cafeteria	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Elementary School - Classrooms at 130B Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X			

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Cherokee Elementary School - Classrooms at 130C Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X				
Cherokee Elementary School - Classrooms at 130D(S) Ravensford Dr	School	X	X	X	X	X	X	X	X		X	X	X				X				
Cherokee Elementary School - Classrooms at 130E Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X				
Cherokee Elementary School - Classrooms at 130F Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X				
Cherokee Elementary School - Hope Center	School	X	X	X	X	X	X	X	X		X		X				X				
Cherokee Elementary School - Main Entrance	School	X	X	X	X	X	X	X	X		X	X	X				X				
Cherokee Elementary School - Playground Across from Bldg. F	School	X	X	X	X	X	X	X	X		X						X				
Cherokee Elementary School - Playground at Ball Diamonds	School	X	X	X	X	X	X	X	X		X	X	X				X				
Cherokee Elementary School - Playground Behind Bldg. A	School	X	X	X	X	X	X	X	X		X		X				X				
Cherokee High School - Back Entrance	School	X	X	X	X	X	X	X	X		X						X				
Cherokee High School - Classrooms at 200J Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X				

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Cherokee High School - Classrooms at 200K Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200L Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Classrooms at 200N Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Gymnasium	School	X	X	X	X	X	X	X	X		X						X			
Cherokee High School - Main Entrance	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Middle School - Back Entrance / Cafeteria	School	X	X	X	X	X	X	X	X		X						X			
Cherokee Middle School - Classrooms at 150D(N) Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Middle School - Classrooms at 150G Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Middle School - Classrooms at 150H Ravensford Dr	School	X	X	X	X	X	X	X	X		X		X				X			
Cherokee Middle School - Classrooms at 150M Ravensford Dr	School	X	X	X	X	X	X	X	X		X						X			

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Cherokee Middle School - Main Entrance	School	X	X	X	X	X	X	X	X		X	X	X				X				
Kituwah Academy - Storage Building	School	X	X	X	X	X	X	X	X		X					X	X				
Noah Powell Education Center	School	X	X	X	X	X	X	X	X		X	X	X			X	X				
Cherokee Visitor's Center	Visitor Center	X	X	X	X	X	X	X	X		X					X	X				
New Cherokee Visitors Center Site	Visitor Center	X	X	X	X	X	X	X	X		X	X	X			X	X				
2 Water Storage Tanks	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X				
Cherokee Tribal Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X				
Cherokee Water & Sewer Storage Site Bldg	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X				
Pump Station at 2003 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			X	
Pump Station at 5 Old Salt Mine Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X				
Sewage Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			X	
Stream Gauge Station at 10725 Big Cove Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X										
Stream Gauge Station at 1144 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X				
Stream Gauge Station at 1980 Big Cove Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X				

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Stream Gauge Station at 2286 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Stream Gauge Station at 2601 Birdtown Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X		X	
Stream Gauge Station at 42 Tsali Blvd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Stream Gauge Station at 63 Wrights Creek Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Stream Gauge Station at 79 Bunches Creek Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X							
Stream Gauge Station at 960 Straight Fork Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X									
Tribal Water Storage Tank at 1055 Old No 4 Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Tribal Water Storage Tank at 243 Joshua Toineeta Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Waste Water Treatment Plant	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X				X			
Water & Sewer - O&M Shop	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Blue Wing Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Water Department - Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X	X	X	
Water Department - Maintenance Building	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			X

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Water Department - Pump Station at 2353 Old Mission Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Pump Station at 458 Paint Town Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X	X	X			X	X			
Water Department - Pumping Site	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X			X	X			
Water Department - Sim Taylor Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Department - Stillwell Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Department - Water Booster Pump	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Department - Water Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X		X				X			
Water Storage Tank at 218 Kiowa Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Storage Tank at 268 Eagles Nest Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Storage Tank at 333 Soggy Hill Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X									
Water Tank & Pump Station	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Tank at 201 Water Dam Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X			
Water Tank at 711 Rough Branch Housing Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

FACILITY NAME	FACILITY TYPE	ATMOSPHERIC							GEOLOGIC			HYDROLOGIC		OTHER						
		Drought	Hailstorm	Hurricane and Tropical Storm	Lightning	Thunderstorm	Tornado	Winter Storm and Freeze	Earthquake	Landslide – High Susceptibility / Moderate	Landslide- High Incidence	Flood – 100 yr	Flood – 100 yr and 500 yr Combined	Fixed HAZMAT 500m	Fixed HAZMAT 2,500m	Mobile HZMT 500 METER (road)	Mobile HZMT 2,500 meter (road)	Mobile HZMT 500 METER (rail)	Mobile HZMT 2,500 METER (rail)	Wildfire
Water Treatment Plant - Water Storage Tank	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X					X	X		X	
Water Treatment Plant - Water Tank at 234 Junior Wright Rd	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X			
Water Treatment Plant - Water Tank at 738 Jim Bowman Dr	Water and Wastewater Systems	X	X	X	X	X	X	X	X		X						X		X	

F.4 EBCI CAPABILITY ASSESSMENT

This subsection discusses the capability of EBCI to implement hazard mitigation activities. More information on the purpose and methodology used to conduct the assessment can be found in Section 7: *Capability Assessment*.

F.4.1 Planning and Regulatory Capability

Table F.31 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the Eastern Band of Cherokee Indians. The status of each capability item is indicated with a symbol:

- ◆ 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;
- ◆ A “C” indicates the item is covered by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan;

Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Smoky Mountain Regional Hazard Mitigation Plan.

TABLE F.31: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning Tool/Regulatory Tool	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
Eastern Band of Cherokee Indians	✓					✓		✓					✓		✓	✓				✓	✓	✓	

A more detailed discussion on the Tribe’s planning and regulatory capabilities follows.

Emergency Management

Pre-disaster plans and policies reviewed include: hazard mitigation plans, Flood Damage Prevention Ordinance, floodplain, stormwater management, and a post-disaster development plan.

Post-disaster plans include: flood response, EOP, Continuity of Operations Plan, Evacuation Plan, Disaster Recovery Plan, and a post disaster redevelopment ordinance.

Hazard Mitigation Plan

EBCI has previously adopted a hazard mitigation plan.

Emergency Operations Plan (EOP)

EBCI maintains an emergency operations plan through its Emergency Management Department.

General Planning

Comprehensive Land Use Plan

Although EBCI does not have an official land use plan in place, as the Tribe continues to grow economically, there are trends toward more comprehensive planning.

Natural Resource Protection Plan

EBCI maintains a Forest Management Plan prepared by the Bureau of Indian Affairs.

Economic Development Plan

The EBCI economic development plan identifies 20 development needs, 5 of particular interest to mitigation: existing and future land use planning/development, recreational opportunities, expanded water/sewer systems, and new fire and police stations.

Zoning Ordinance

EBCI has very limited zoning. The code established the Cherokee Business Zone and prohibits certain events and activities within that zone, but no other zones are established or addressed and no specific uses are prohibited or encouraged.

Building Codes, Permitting, and Inspections

North Carolina has a state compulsory building code which applies throughout the state. EBCI has adopted a building code. The building code is enforced throughout the reservation by the tribal building inspector.

Floodplain Management

Table F.32 provides NFIP policy and claim information for EBCI.

TABLE F.32: 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
Eastern Band of Cherokee Indians	5/17/89	4/19/10	47	\$10,739,300	4	\$244,607

(M) – No Elevation Determined, all Zone A, C and X

(S) – Suspended Community

Source: NFIP claims and policy information as of 3/31/2017; NFIP Community Status information as of 3/31/2017

Flood Damage Prevention Ordinance

All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. EBCI participates in the NFIP and has adopted flood damage prevention regulations.

F.4.2 Administrative and Technical Capability

Table F.33 provides a summary of the capability assessment results for EBCI with regard to relevant staff and personnel resources. A symbol was used to indicate the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

- ◆ A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction;
- ◆ An asterisk (*) indicates that the resource is currently being considered;
- ◆ A “C” indicates the resource or skillset is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the resource is new or now available (to the 2017 plan).

TABLE F.33: RELEVANT STAFF / PERSONNEL RESOURCES

Staff / Personnel Resource	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
Eastern Band of Cherokee Indians	✓	✓	✓	✓	✓		✓	✓	✓	✓

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.

F.4.3 Fiscal Capability

Table F.34 provides a summary of the results for EBCI with regard to relevant fiscal resources. The status of each capability item is indicated with a symbol that indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds):

- ◆ A checkmark (✓) indicates that the given item is currently available and being used;
- ◆ An asterisk (*) indicates that the given item is currently under consideration;
- ◆ A “C” indicates the item is provided by the county; and
- ◆ A red symbol (✓, *, C) indicates that the given item is new to the 2017 plan.

TABLE F.34: RELEVANT FISCAL RESOURCES

Fiscal Tool / Resource	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
Eastern Band of Cherokee Indians	✓								

F.4.4 Political Capability

EBCI was the first Native American Nation to participate in the FEMA Project Impact Initiative. It also is a Cooperating Technical Partner (CTP) and as such has an ongoing floodplain mapping initiative. EBCI is making continuous and costly improvements to its Emergency Management program, including investments in equipment and technology. As witnessed by these facts and by the direct participation of the Principal Chief, Vice Chief and some Council members in the previous mitigation planning process, Cherokee elected officials have demonstrated a serious commitment to Emergency Management and specifically hazard mitigation; arguably a commitment that surpasses that of many local and County governments in absence of a recent major disaster.

With the development and redevelopment that is resulting from the addition of casino gaming to the Reservation during the 90s, EBCI is at a critical juncture that in its growth policy planning overall, providing many unique opportunities and challenges. As infrastructure, housing, and commercial development continue to expand, EBCI is in a great position to ensure that future construction, siting and policy are developed in ways that will minimize exposure to future disaster loss. Overall, EBCI has indirectly referenced mitigation and hazard reduction principles throughout many of the Tribes documents, plans, and policies. As EBCI continues to grow economically, there are trends toward more comprehensive planning.

F.4.5 Conclusions on Local Capability

In addition to this regional hazard mitigation plan, EBCI has adopted an emergency operations plan, which increases the tribe's capability in an emergency situation. However, the EBCI lacks a disaster recovery plan. With the results of this plan's risk assessment, EBCI will know where disasters are likely to occur and what is at risk. Preparing a plan pre-disaster for how to recover and rebuild in those areas that is a small investment with potentially large rewards. Recovery will be smarter and faster with a recovery plan in place and can further the jurisdiction's economic development goals.

The EBCI should continue leveraging its political support for hazard mitigation and staffing capabilities with existing plans and ordinances to guide growth out of high-risk areas and minimize exposure to natural hazards. A comprehensive land use plan and a capital improvement plan would aid in implementation of such policies.

F.5 EBCI MITIGATION STRATEGY

This subsection provides the blueprint for EBCI to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Regional Hazard Mitigation Planning Committee and the findings and conclusions of the capability assessment and risk assessment. Additional Information can be found in Section 8: *Mitigation Strategy* and Section 9: *Mitigation Action Plan*.

F.5.1 Mitigation Goals

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, EBCI developed six mitigation goals in coordination with the other participating Smoky Mountain Region jurisdictions during the 2012 plan development process. During the previous plan development process, existing goals from each local hazard mitigation plan were reviewed and combined. During the 2017 plan update process, these goals were reviewed at the kickoff and mitigation strategy meetings. The proposed regional goals were presented, reviewed, and ultimately amended by the Planning Committee at the second Regional Hazard Mitigation Planning Committee meeting (March 2017). Specifically, goals #2 and #4 were amended as shown in red below. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing more mitigation actions. The Smoky Mountain Regional Mitigation Goals are presented in **Table F.35**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE F.35: SMOKY MOUNTAIN REGIONAL MITIGATION GOALS

	Goal
Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of all hazards including natural, man-made and technological hazards .
Goal #3	Increase capabilities to support and implement effective mitigation measures.

Goal #4	Identify and mitigate development and infrastructure in known hazard areas and consider the risks, impacts, and potential mitigation measures to incorporate if proposing to build new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

F.5.2 Mitigation Action Plan

The mitigation actions proposed by EBCI are listed in the following individual Mitigation Action Plan.

Eastern Band of Cherokee Indians Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention								
P-1	Formal recognition of Local Emergency Planning Committee (LEPC). Having an LEPC will further the coordination of multiple agency programs toward institutionalizing mitigation into routine operations.	All	High	EBCI Emergency Management; EBCI Tribal Council; EBCI LEPC	Unknown	N/A	Completed	Resolution No. 373 was passed on March 4, 1993 to the Tribal Council requesting the formal recognition of the LEPC and defining its role in implementing the Emergency Operations Plan.
P-2	Create a fund for mitigation projects identified in this plan and in the future from gaming revenues to ensure the long term sustainability of the Tribe by reducing exposure to disasters.	All	High	EBCI Emergency Management	Unknown	Annual Tribe Budget Request	2022	Emergency Management will budget for two mitigation projects each year but it was not politically feasible over the last 5 years.
P-3	Institutionalize mitigation into housing infrastructure, capital improvement, and housing improvement funds. Develop guidelines for projects designed or completed with these funds established in Section 16 of the Cherokee Code. Guidelines would require that when tribal dollars are dispersed from the fund for projects in identified hazard areas, mitigation measures will be constructed into the design/project. Draft Guidelines and Sample Mitigation Measures for infrastructure and buildings, for each type of hazard. Modify Sections 16-33, 16-35 and 16-38 of the Cherokee Code to include this provision.	All	High	EBCI Emergency Management; EBCI Tribal Council	Unknown	Capital Budget	Within 5 years	Additional education and training is needed in order to develop guidelines for project designs. There was limited political will to advance this action over the last 5 years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-4	Develop hazard and damage data tracking system. Using GIS, develop a centralized system to track hazard related data to provide tribal officials with essential information required to focus hazard mitigation, disaster response and disaster recovery efforts in the future.	All	High	EBCI Emergency Management; EBCI Tribal Planning; EBCI GIS	Unknown	Capital Budget	Completed	Completed/Ongoing: At new EOC we now have an onsite, part-time GIS person on staff to assist collecting data to develop a database to store the information.
P-5	Improve the effectiveness of inspections by building and environmental staff in enforcing current local codes to increase the resistance of new development to the effects of natural hazards. While inspection effectiveness has improved significantly in recent years, the rural and private nature of the Reservation still presents challenges of construction without permits.	All	High	EBCI Tribal Construction; EBCI Environmental Planning; EBCI Construction Inspection; EBCI Environmental Inspection; EBCI Building Inspections	Unknown	Capital Budget	2022	Assess the current capacity of all inspectional services on the EBCI Reservation as they relate potential hazards. Ensure adequate resources to existing inspectional services and provide additional hazard related training to inspectional staff to ensure codes are enforced properly. Develop a system of weekly tracking of inspection activities, across disciplines and track with one central organized system. More education and training is needed to justify before presenting to the tribal government. There was no political will to complete this action over the last five years.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-6	Develop a comprehensive plan for all Tribal trust and fee land holdings, addressing economic development, housing, land use, historic/cultural preservation, transportation and other typical planning elements.	All	Moderate	EBCI Business Committee; EBCI Tribal Planning; EBCI Emergency Management	Unknown	BIA; HUD; Capital Budget; PDM	2030	There was no political will to complete this action over the last five years.
P-7	The Cherokee Business District Master Plan lists a potential long-term goal of relocating fire, police and other services outside of the downtown area and the Comprehensive Economic Development Plan identifies the need for new police and fire stations. Section 61 of the Cherokee Code, Zoning, should be modified to preclude construction of critical emergency service facilities in hazard prone areas when feasible alternatives are available.	All	Moderate	EBCI Tribal Council; EBCI Business Committee; EBCI Tribal Planning/ Emergency Management/ Police/Fire	Unknown	BIA; HUD; Capital Budget; PDM	2030	Deferred until funding is allocated for the Cherokee Business District Plan to be updated or modified.
P-8	Conduct a risk analysis for Information Technology and Enrollment Records to include Business Continuity Planning, Facilities Management, Security and other Emergency Management Issues.	All	High	EBCI Finance; EBCI Enrollment; EBCI Emergency Management	Unknown	NC EMPG	2030	Deferred until funding is identified to implement the action.
p-9	Develop a Capital Improvement Plan to guide the scheduling of spending on public improvements.	Flood	High	EBCI Executive; EBCI Tribal Council; EBCI Finance; EBCI Emergency Management	Unknown	NC EMPG	2030	Deferred until funding is identified to implement the action.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-10	Continue remapping currently underway on Raven Fork and the Oconaluftee to complete the Oconaluftee River and Soco Creek, and other major tributaries on the Qualla Boundary. Inventory all mapped and unmapped rivers in the Snowbird and Cherokee County Communities and prioritize remapping based on existing and anticipated development.	Flood	High	EBCI Environmental Planning	Unknown	CTP agreement; NCDEM Mapping Funds	2022	This project has been ongoing for 5 years; however the tribe is waiting for the state to map the Western North Carolina Area. Amend existing FEMA Cooperating Technical Partner agreement and prepare Mapping Activity Statements for prioritized work. If successful in obtaining funds, solicit for contractors to complete mapping, adopt and update Chapter 143, Article II of the Cherokee Code, Flood Damage Prevention, to incorporate the new mapping.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-11	Prevent production chemical releases from fish hatchery by studying the problem and identifying solutions. There is frequent flooding of a fish hatchery located on the upstream portion of Raven’s Fork. Although the fish hatchery is not shown as in the floodplain, it reportedly floods frequently, perhaps due to water diverted from the Fork for use in the processes at the facility. During significant flood events, the hatchery is flooded and the chemicals used in the breeding process are washed into the main river channel. This contamination has the potential to have significant negative effects on the water quality of the river, impacting the habitat of a number of aquatic species. Negative recreational impacts reportedly occur, as well, due to odor. There is not enough available information to calculate monetary losses in this analysis. Secondary impacts however can be significant. Study the problem and identify solutions.	Flood	Moderate	EBCI Emergency Management; EBCI Police; EBCI Fire	Unknown	USEPA; USACE	2022	<p>There has been no political will to complete this action over the last 5 years except with the exception of further defining an approach:</p> <p>The Tribe will meet with the owner of the facility to develop a solution to the problem. Determine whether process currently follows environmental standards or whether process can be modified. Determine whether chemicals can be stored in locations above typical flooding levels and not used during times of flooding threat. Seek assistance from the USACE in identifying potential structural solutions if feasible. Identify who should be responsible for associated costs and how to fund them.</p>

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-12	Increase enforcement of sound construction practices in landslide hazard areas.	Landslide	High	EBCI Environmental Planning	Unknown	Capital Budget	2022	Chapter 113 D of the Cherokee Code addresses sedimentation and erosion control for land disturbances exceeding more than one acre and requires permits and preparation of a plan to control erosion. The tribal environmental inspectors will coordinate with other inspectors and department personnel in the field to ensure monitoring and enforcement of the standards is occurring and will examine ways of increasing site inspection frequency during construction. Increased emphasis on enforcement and monitoring should also focus heavily on Cherokee DOT road projects. Completion of the plan will be contingent on budgetary or grant funding.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-13	Modify Chapter 113 D, <i>Soil Erosion and Sedimentation Control</i> , to require, at minimum, a permit for disturbances not related to agriculture. While it may not be necessary to require a plan for these smaller disturbances, by issuing permits, there will be an opportunity to build in management practices as permit conditions and monitor and enforce those conditions. Gather example regulations and codes from similar jurisdictions, develop code language and submit for consideration to Tribal Council. If approved, develop a permitting program and identify ways to address additional staffing needs for enforcement. Notify the public of the code change.	Landslide	High	EBCI Environmental Planning	Unknown	Capital Budget	2022	No change given limited political will to further this action over the last 5 years. More education and awareness is needed to justify this action.
P-14	Develop a monitoring program for landslide activity on selected locations through the EBCI Reservation. Identify areas of historic landslides where the potential loss of life and impact to the community is greatest and develop a simple monitoring program to evaluate slope movement over time in order to identify areas where landslides activity is greatest, and the risk to residents and property is greatest. Use collected data to analyze the need for potential need for structural protective measures, or continuously assess the risk to adjacent property	Landslide	Moderate	EBCI Public Works	Unknown	Capital Budget	2022	Limited political will to further this action over the last 5 years. Additional and ongoing education and training is necessary.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-15	<p>Train Cherokee and BIA Staff in Firewise community planning and prevention techniques, shifting the focus from suppression to prevention. The BIA Fire Management Plan focuses heavily on suppression of wildfires. While that is of critical importance, there are many very simple measures communities can take to protect existing development from being destroyed by wildfire and to design future developments in a way that minimizes their vulnerability associated with wildfire.</p> <p>Contact the National Fire Protection Association about opportunities to participate in its Firewise Communities training program. Identify funding to train not only Fire Department and Forrest Managers, but planning and environmental staff as well. Identify ways of incorporating techniques learned in training into existing mitigation related programs.</p>	Wildfire	High	EBCI Emergency Management; EBCI Fire; BIA Cherokee Agency	Unknown	Tribal Training Funds; BIA; NFPA	Completed	Completed/ongoing. Coordination between Fire Department prevention team and BIA Training Coordinator will provide ongoing training and education.
P-16	Implement a requirement for appropriate defensible space for new construction in the Urban Wildland Interface areas.	Wildfire	High	EBCI Fire, EBCI Planning, BIA	Unknown	Capital Budget	2022	In progress - Working with Fire Management to determine appropriate level of defensible space for structures located in the UWI depending on the slope and fuel type present.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-17	<p>Expand Regulation of Open Debris Burning: Under Chapter 113 C of the Cherokee Code, open burning of leaves, brush and yard trimmings are allowed without a permit if the material to be burned originates on the property and no public pick up services are available. Research for the Risk Assessment portion of Section IV of this plan demonstrated that the overwhelming majority of wildfires are caused by debris burning. Modify Chapter 113 C so that permits are required for all debris burning, thereby giving tribal government the opportunity to establish permit conditions and, when necessary perform site visits, to ensure that precautions are taken to prevent the spread of fire.</p> <p>Draft revised code language, review with BIA and Fire Department management and propose to Council. Develop permitting mechanism and best management practice conditions.</p>	Wildfire	High	EBCI Environmental Planning	Unknown	Capital Budget; BIA	Completed	This is an important part of the Fire Department and Environmental Planning Process review.

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Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-18	Encourage the use of fire resistant building materials in high risk areas. While issuing permits for new construction in high UWI areas, provide information to builders and home owners on fire resistant roofing and siding materials, fire resistant landscaping materials and defensible space. Consider waiving fees and developing other incentives of owners willing to incorporate these materials/techniques into new construction.	Wildfire	Moderate	EBCI Building Inspections; EBCI Emergency Management; EBCI Fire; BIA	Unknown	Capital Budget	2022	There has been limited political will to further this action over the last 5 years. This project will be ongoing all parties involved need more education and training.
P-19	Identify areas vulnerable to having access cutoff due to the impacts of severe winter storms and develop a plan to ensure continuity of critical services to these areas.	Winter Storm	High	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	Capital Budget	Completed	COMPLETED in October 2006. Will work with the communities on shelters and Emergency Disaster Kits.
P-19a	Work with the vulnerable communities identified (P-19) on shelters and Emergency Disaster Kits.	Winter Storm	Moderate	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	Capital Budget	2030	New Action
P-20	Develop a program to clear overhanging limbs from utility lines to critical facilities annually. Meet with the responsible departments and other appropriate parties, possibly including the Cherokee Boys Club and identify a systematic approach to annual trimming of overhanging limbs from utility lines annually during the fall.	Winter Storm	High	EBCI Emergency Management; EBCI Public Works; Utility companies	Unknown	Public Works Budget; Private utility companies	2022	Deferred due to cost constraints and limited political will the project has been put on hold.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-21	<p>Collect data regarding seismic design of all critical facilities and infrastructure to identify vulnerabilities to damage due to a significant earthquake event. At minimum include schools, government buildings, fire and police facilities and emergency shelters.</p> <p>With input from all local departments develop a list of critical facilities and infrastructure with the potential to cause large scale injury or loss of life if damaged during an earthquake. Perform a structural evaluation on these facilities to determine how they would be expected to perform during different level earthquakes and to make specific structural retrofit recommendations.</p> <p>In addition to structural mitigation measures, also investigate the potential implementation of non-structural measures in facilities with high occupancy rates (similar to the program used for day care centers with FEMA Project Impact grant). Such measures can include securing loose items such as book shelves, overhead fixtures, shatter proof glass, etc. Many such measures can be accomplished with donated labor and minimal materials cost.</p>	Earthquake	Moderate	EBCI Building Department; EBCI Emergency Management	Unknown	Capital Budget; PDM; HMGP; Donated labor; USDOE	<p>Within 1 year: identify structures;</p> <p>Within 2 years: design program to implement minor non-structural measures;</p> <p>Within 5 years; Fund and complete a full structural evaluation</p>	There has been limited political will to further this action over the last 5 years.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-22	<p>Develop Drought Management Plan and Protocols</p> <p>Evaluate the need for a drought management plan and protocol to be implemented throughout the Reservation in the event a drought should occur.</p> <p>Review and analysis current regional, and State drought management plans and procedures to determine what potential measures can be under taken at the local level.</p>	Drought	Low	EBCI Emergency Management	Unknown	Capital Budget; BIA; Dept. of Agriculture	2020	In the process of developing a drought management plan.
P-23	<p>Utility Line Maintenance Program: Develop a program to protect key portions of utility systems from damage due to a high wind event.</p> <p>Working with local utility companies, analyze key portions of utility networks and assess the vulnerability to damages due to high winds. Investigate the potential of developing a program to harden identified vulnerabilities including removing overhanging limbs and trees from key utility lines.</p>	Wind	Low	EBCI Emergency Management; EBCI Public Works; Utility companies	Unknown	Capital Budget; Local utility company funds	2022	There has been limited political will to further this action over the last 5 years.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-24	<p>Form a working subcommittee of the HMPC along with security personnel from Harrah's Casino to work with the Federal and state government to further evaluate security needs.</p> <p>Some hazard prone sites should not be published in a public document such as this plan. Working with the subcommittee retain the services of a security expert to identify other potential sites that may be at risk and to determine appropriate security measures to protect those sites.</p>	Manmade	Moderate	EBCI Emergency Management; EBCI Police; Harrah's Casino	Unknown	Capital Budget; Harrah's Casino; DHS grants	2030	Deferred: Potential sites have been determined however due to cost containment the purchase of security systems has been placed on hold.
P-25	<p>Increase Security at Ceremonial Fairgrounds</p> <p>Develop a plan to address security during large events at Ceremonial Fairgrounds.</p> <p>Working with the subcommittee established in MM-1, develop an operational plan to define increased security measures during large and publicized events. Measures may include limiting access and egress points and patrolling them, surveillance monitoring and other activities.</p>	Manmade	High	EBCI Emergency Management; EBCI Police	Unknown	Capital Budget	Completed	Completed/ongoing. Incident Action plans and increased security measures are implemented during large and publicized events.
P-26	<p>Monitor and audit security performance at Harrah's Casino.</p> <p>Evaluate at least annually the Casino's ongoing security efforts and conduct periodic audits to ensure that security continues functioning at high levels.</p>	Manmade	High	EBCI Office of Principal Chief	Unknown	N/A	2030	Deferred until a funding source is identified.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Property Protection								
PP-1	Perform an all-hazard site specific audit on critical facilities (schools, hospitals, shelters, fire and police facilities, etc.) to assess their specific vulnerability to all natural hazards and develop recommendations for potential mitigation measures.	All	High	EBCI Emergency Management	Unknown	PDM; HMGP; DOE DHS School Safety Funds; Capital Budget	2022	There has been limited political will to further this action over the last 5 years. Due to limited staff and staff turnover has affected the timely completion of this objective. New staff is currently attending training to become more familiar with accessing critical facilities
PP-2	Implement technically feasible and cost beneficial retrofit mitigation measures identified through the Critical Facility Audit. Working with departments responsible for each facility, develop an implementation strategy including funding sources, scope of work, project schedule, and project budget.	All	High	EBCI Emergency Management	Unknown	PDM; HMGP; FMA; Capital Budget	2022	There has been limited political will to further this action over the last 5 years. Due to limited staff and staff turnover has affected the timely completion of this objective. New staff is currently attending training to become more familiar with accessing critical facilities
PP-3	Protect communications equipment behind police department and propane fuel tank behind casino. Install increased fencing around communications equipment and surveillance cameras which will feed to the Police Department. Install increased fencing around the large propane tank behind Harrah's casino to completely encapsulate the tank.	Manmade	High	EBCI Emergency Management; EBCI Police	Unknown	Capital Budget; Homeland Security Grant; Harrah's Casino	Completed	The fencing was COMPLETED in 2006 and the propane tank was removed and placed underground in 2007.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PP-4	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 application. Projects could 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, wind retrofits to critical facilities, storm shelters and other activities that reduce to the loss of life and property.	All hazards	Moderate	Emergency Management, Engineering and/or Planning Department	Project Cost, Staff Hours, and applicable cost share	Federal and State Grants, Local Operating Budget	2030	New Action.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Natural Resource Protection								

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
NRP-1	<p>Create a riparian buffer zone along less developed waterways.</p> <p>Stream bank erosion is a serious problem on the EBCI reservation from both a water quality perspective and a property protection perspective. Riparian Buffers serve as natural boundaries between local waterways and existing development and help protect resources by filtering pollutants, providing flood control, alleviating stream bank erosion and providing lateral room for movement of a stream channel. While it may be difficult to create a buffer zone along the developed portions of Raven Fork, the Oconaluftee River and Soco Creek, other watercourses where development pressure may eventually exist will be examined.</p> <p>Identify areas where stream bank erosion has historically caused problems and areas where existing development patterns would allow for a riparian corridor to work. Propose language to modify Chapter 113 D of the Cherokee Code and a program to administer the new restriction. Consider exempting certain agricultural and recreational operations from buffer regulations to promote passive recreational use of these areas as is consistent with other tribal goals.</p>	Landslide	Moderate	EBCI Environmental Planning	Unknown	EPA Clean Water Management Trust Fund	2030	There has been limited political will to further this action over the last 5 years. This project will be ongoing as time and funding permits.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Emergency Services								
ES-1	Continue to develop reverse 911 capabilities as part of an Emergency Notification System to contact many homeowners with pre-recorded messages in the event of an emergency.	All	High	EBCI Emergency Management	Unknown	DHS/FEMA; NCDEM; HMGP; PDM	2030	The system has been purchased and installed. Updating the data will be ongoing for future use.
ES-2	Many of the identified emergency shelters are located in flood-prone locations. Identify and equip backup shelter for flooding disasters. Identify back up shelters for flooding disasters in anticipation of losing standard emergency shelters during flooding. Consider transportation access to the shelters and work with local churches outside of flood prone areas. Identify funding to equip alternate shelters with generators, cots and other essential needs.	Flood	High	EBCI Emergency Management	Unknown	Capital Budget; DHS/FEMA	COMPLETED	This action was COMPLETED prior to October 1, 2009. A new shelter was facility was built in the Big Y and Birdtown communities, and generators were purchased in the FY2011 budgets for these locations. The State EM will assist in purchasing a Transfer switch for the Birdtown Facility.
ES-3	Install flood evacuations signs in Yellowhill community (an area of high transient visits) to guide visitors to safety during flooding events and to raise awareness of flooding potential.	Flood	Moderate	EBCI Emergency Management; EBCI Fire; EBCI Police	Unknown	FEMA; NCDEM; Capital Budget	2022	The signs have been purchased due to construction of sidewalks installation of signs has been put on hold.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

<p>ES-4</p>	<p>Develop a flood warning system for Soco Creek and the Oconaluftee River. The system will increase the ability to locally and specifically forecast flood events and flood depths. Focus efforts on areas with high concentrations of residential and recreational properties where risk of injury and loss of life is high. Adding a voluntary building flood audit will provide building occupants with a strategy to employ in conjunction with the warnings to protect themselves.</p> <p>Work with state of North Carolina, NOAA, USGS, and NRCS to identify on-going efforts in the region as well as develop a specific action plan for the development and implementation of a system. There is a stream gauge on the Oconaluftee. Additional gauges will need to be added. The gauges send information through a repeater back to a central computer that would be in the emergency management office. Stream levels during flooding would be monitored and with assistance of the National Weather Service, flood level predictions would be made. The voluntary audit portion of the program will build upon the flood prone building inventory generated for this plan. Voluntary participants will have their homes surveyed for elevation and a simple one or two page audit completed providing instructions on what specific actions to take for certain predicted floods (e.g. move valuables to second story, disconnect electricity, bag furnaces, etc.). When a flood level is predicted, those property owners who participated in the audit would be contacted, possibly via the reverse 911 system and notified to activate their plan.</p>	<p>Flood</p>	<p>High</p>	<p>EBCI Emergency Management</p>	<p>Unknown</p>	<p>NRCS; USGS; NCDEM; PDM</p>	<p>2022</p>	<p>There has been limited political will to further this action over the last 5 years. March 2008 Water & Earth Technologies, Inc was contracted to develop a Flood Hazard Mitigation and Response plan. During the process of developing the plan a feasibility study was conducted to research for the most appropriate locations for two warning systems.</p>
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ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-5	Install generator or generator hook-ups for critical facilities as budget and need arise.	Winter Storm, Hurricane, Severe Storm, Flood, Wildfire, Earthquake	Moderate	Emergency Management	Varies	FEMA HMA funding; local; state	2030	New Action.
Structural Projects								
S-1	Replacement of culverts to alleviate the potential for flooding of the existing homes.	Flood	High	EBCI Transportation; EBCI Tribal Construction	Unknown	NCDEM Hazard Mitigation Section	2022	There has been limited political will to further this action over the last 5 years.
Public Education and Awareness								
PEA-1	Develop and implement a comprehensive community education program to inform the public of risk of potential hazards, potential mitigation measures, as well as what actions they can take to protect themselves and their property.	All	High	EBCI Emergency Management	Unknown	Capital Budget	2022	The Emergency Staff along with the Health & Medical Division have been conducting Disaster Preparedness in the Communities. Some Education Materials have been distributed when available. Additional work is needed to further education and formalize the program.
PEA-2	Promote early warning of the onset of natural hazard by encouraging residents to utilize NOAA Weather Warning System Radios. Provide information on the use and function of the system as well as information on purchasing receivers. Place receivers in key public facilities and educate occupants. Advertise information through public education program. Work with vendors to assist residents and business owners to obtain receivers.	All	High	EBCI Emergency Management	Unknown	Resident/business funding; FEMA; Capital Budget	2022	Some progress has been made including Radios have been placed in key public facilities. However, it is not fully completed.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	<p>Expand the purchase of NFIP flood insurance on the EBCI Reservation by education home owners and business owners located in the 100 year floodplain of the benefits of carrying flood insurance.</p> <p>Utilize the educational program. Mail educational materials to homeowners, targeting all structures estimated to be in the 100 flood plain, based on the Hazard Mapping and associated Flood Prone Structures Worksheet. Conduct an evening seminar where interested homeowners can learn of the principles of the NFIP, as well as other floodplain management techniques. Obtain NFIP materials from FEMA and mail to each flood prone property with an offer to meet and explain the details of the program. Use FEMA and NCDDEM staff to support/provide the training.</p>	Flood	High	EBCI Building Inspections; EBCI Emergency Management	Unknown	Capital Budget	2022	<p>There has been limited political will to further this action over the last 5 years.</p> <p>Legislation to be introduced to Tribal Council by resolution.</p>

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-4	<p>Develop an education and mitigation program to remove unsecured propane and oil tanks from the floodplain or to strap down and secure tanks.</p> <p>The primary source of heating on the EBCI Reservation is bottled propane. A majority of the buildings located in flood prone areas have exterior propane tanks, which are many times located in the rear of the property closest to the river, often in the floodway. Most of the tanks are not secured in place to prevent floatation during a flooding event. Using the hazard maps from this plan, inventory all propane tanks in flood prone areas. Identify existing strap down devises on the market and identify a vendor to work with to educate the inventoried building owners on the risks of storing propane and oil in the floodplain in unsecured tanks. Provide guidance on measures to secure these tanks and, when possible, provide incentives for implementing these potential measures. If enough interest is generated in the program, identify funding mechanisms so owners could apply to a pool for matching grants to install the protection.</p>	Flood	High	EBCI Emergency Management ; EBCI Public Works	Unknown	Capital Budget; PDM; FMA	2022	The Emergency Management, Public Safety and Environmental Department have been discussing this issue but it has not been advanced to date.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-5	<p>Develop a flood assistance program to offer homeowners and business owners located in the floodplain advice on how to identify, implement and fund effective mitigation measures.</p> <p>Assemble a team of experts from within Cherokee government and outside. Send direct mailings to the flood prone properties inventoried through this plan. Specifically look at the community of mobile homes along Grape Creek in Cherokee County that experiences frequent flooding. Encourage these homeowners to obtain flood insurance as a first step. Explain the importance of having flood insurance as it pertains not only to their own financial recovery, but to their chances of being eligible for grant funding to help mitigate the problem. Offer assistance to perform flood audits identifying specific mitigation measures considering the full range of potential options including structural elevation, relocation, acquisition and demolition, flood proofing or minor retrofitting, such as strapping down oil or gas tanks. Once measures have been identified, apply for state and federal assistance to aid homeowners in acquiring assistance with the cost of implementing measures. Give priority to NFIP repetitive loss properties and develop selection criteria based on factors such as historic levels of damages and benefit cost ratio.</p>	Flood	High	EBCI Emergency Management; EBCI Building Inspections; EBCI Environmental Planning	Unknown	Capital Budget; PDM; FMA; HMGP	2022	Activity has occurred but the action is not fully completed. The EM and Environmental Planning have been attending meeting in the Big Cove Community to conduct education on flood assistance. Big Cove Community was selected due to the high concentration of residential and business located along the Raven Fork and Oconaluftee River.

ANNEX F: EASTERN BAND OF CHEROKEE INDIANS

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Estimated Cost	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-6	<p>Educate property owners located in the UWI on wildfire mitigation techniques.</p> <p>Target owners of structures located in the designated wildfire hazard areas identified by this plan by direct mailing and other outreach techniques to educate them on the potential wildfire risks facing their property as well as the potential mitigation measures including defensible space, fire resistant materials, adequate property access, and additional structural measures. Offer to send experienced professionals to audit properties and offer wildfire damage prevention techniques at low costs. Hold outreach sessions as interest warrants.</p>	Wildfire	High	EBCI Emergency Management; EBCI Fire; BIA Cherokee Agency	Unknown	Local Funding	2022	<p>There has been limited political will to further this action over the last 5 years.</p> <p>In the summer of 2008 students from the Student Conservation Foundations went door to door conducting fire prevention education and a wildfire fire study around the residents. In the fall of 2008 a follow up was conduct with EM, Fire Dept, and Healthy Cherokee to install smoke detectors, remove debris from around the residents and conduct further education.</p>

F.5.3 Tribal Funding Sources

44 CFR Requirement

44 CFR Part 201.7(c)(3)(v):

The mitigation strategy shall include an identification of current and potential sources of Federal, tribal, or private funding to implement mitigation activities.

EBCI's major economic drivers for its revenue base are from gaming and tourism oriented enterprises. Despite the economic uncertainties being faced by several municipalities in North Carolina, overall the Cherokee economy is growing and the Tribe continues to do better financially.

Federal, state, tribal, and private funding sources are identified for each of the proposed mitigation actions found in Section 9: *Mitigation Action Plan*, as well as *Section F.5.3* above.

Additionally, the Tribe intends to pursue Federal grants in the future to implement mitigation activities. **Table F.36**, below, identifies programs administered by FEMA that provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages.

TABLE F.36: POTENTIAL GRANT OPPORTUNITIES

Program	Enabling Legislation	Funding Authorization	Hazard Mitigation Plan Required?	
			Grantee Status	Subgrantee Status
Public Assistance (PA) (Categories A, B: e.g., debris removal, emergency protective measures)	Stafford Act	Presidential Disaster Declaration	No Plan Required	No Plan Required
Public Assistance (Categories C-G: e.g., repairs to damaged infrastructure, publicly owned buildings)	Stafford Act	Presidential Disaster Declaration	✓	No Plan Required
Individual Assistance (IA)	Stafford Act	Presidential Disaster Declaration	No Plan Required	No Plan Required
Fire Management Assistance Grants	Stafford Act	Fire Management Assistance Declaration	✓	No Plan Required
Hazard Mitigation Grant Program (HMGP) Planning Grant	Stafford Act	Presidential Disaster Declaration	✓	No Plan Required
HMGP Project Grant	Stafford Act	Presidential Disaster Declaration	✓	✓
Pre-Disaster Mitigation (PDM) Planning Grant	Stafford Act	Annual Appropriation	No Plan Required	No Plan Required
PDM Project Grant	Stafford Act	Annual Appropriation	✓	✓

Program	Enabling Legislation	Funding Authorization	Hazard Mitigation Plan Required?	
			Grantee Status	Subgrantee Status
Flood Mitigation Assistance (FMA)	National Flood Insurance Act	Annual Appropriation	✓	✓

Source: FEMA Tribal Multi-Hazard Mitigation Planning Guidance; FEMA.gov (2017)

F.6 EBCI PLAN MAINTENANCE

F.6.1 Monitoring Progress of Mitigation Activities

44 CFR Requirement

44 CFR Part201.7(c)(4)(ii):

The plan maintenance process shall include a system for monitoring implementation of mitigation measures and project closeouts.

44 CFR Part201.7(c)(4)(v):

The plan maintenance process shall include a system for reviewing progress on achieving goals as well as activities and projects outlined in the mitigation strategy.

The EBCI Department of Emergency Management will frequently review progress on the implementation of mitigation actions. The Department of Emergency Management will also meet with representatives from Tribal Departments, as the Mitigation Planning Team, to discuss progress of mitigation activities. The implementation of all short-term mitigation actions will be monitored by the EBCI Department of Emergency Management on an ongoing basis until implementation is complete. Long-term actions being actively implemented will be monitored on an ongoing basis, or at least annually as needed. Long-term actions planned for the future will be reviewed during plan updates every five years. The system for reviewing progress on achieving goals, objectives, and specific actions included in the mitigation strategy will be based on a checklist of all objectives and actions. This checklist will be reviewed annually by the Department of Emergency Management. As described in the Section 10: *Plan Maintenance*, progress on mitigation actions will be described in an annual report that can be shared with Tribal Council and in the five-year update of the Hazard Mitigation Plan.

In addition to the work products described in approved work plans for projects funded by the Pre-Disaster Mitigation Program, the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, or other grant programs, quarterly or semi-annual (depending on reporting requirements of funding agencies) performance reports that identify accomplishments toward completing the work plan commitments, a discussion of the work performed for all work plan components, a discussion of any existing or potential problem areas that could affect project completion, budget status, and planned activities for the subsequent quarter will be submitted to the funding agency by the assigned EBCI Project Officer. The agency-specific final grant closeout documents will also be prepared by the EBCI Project Officer at the conclusion of the performance period and submitted to the funding agency.

F.7 EBCI REPETITIVE LOSS STRATEGY

44 CFR Requirement

44 CFR Part 201.7(c)(3)(vi):

An Indian Tribal government applying to FEMA as a grantee may request the reduced cost share authorized under §79.4(c)(2) of this chapter of the FMA and SRL programs if they have an approved Tribal Mitigation Plan meeting the requirements of 201.7 that also identifies actions the Indian Tribal government has taken to reduce the number of repetitive loss properties (which must include properties identified as severe repetitive loss properties), and specifies how the Indian Tribal government intends to reduce the number of such repetitive loss properties.

The plan addresses repetitive loss structures in Section 5: *Hazard Profiles* and Section F.3.12. Additionally, the goals included in Section 8: *Mitigation Strategy* support the selection of activities to mitigate and reduce potential losses to structures that are susceptible to flood damage, including repetitive loss properties.

F.8 EBCI PLAN REVIEW AND ADOPTION

F.8.1 Assurances by the Indian Tribal Government

44 CFR Requirement

44 CFR Part 201.7(c)(6):

The plan must include assurances that the Indian Tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR parts 200 and 3002. The Indian Tribal government will amend its plan whenever necessary to reflect changes in tribal or Federal laws and statutes.

EBCI will comply with all applicable federal statutes and regulations in effect with respect to the periods for which the Tribe receives grant funding, including 2 CFR parts 200 and 3002. Whenever necessary, EBCI will amend the plan to reflect new or revised Federal regulations or statutes, or changes in Tribal law, organization, policy, or tribal agency operation, in compliance with 44 CFR 13.11(d). It is understood that the Tribe will submit those amendments for review and approval in coordination with FEMA Region IV and the State of North Carolina Emergency Management Division.

Appendix A

Plan Adoption

This Appendix includes the local adoption resolutions for each of the participating jurisdictions.

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Appendix B

Planning Tools

This Appendix includes the following:

1. A Blank Public Participation Survey
2. GIS Data Inventory Spreadsheet
3. Capability Assessment Review Form
4. A Blank Mitigation Action Worksheet

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PUBLIC SURVEY FOR HAZARD MITIGATION PLANNING

We need your help!

The Counties of Cherokee, Graham, Haywood, Jackson, Swain, and the Eastern Band of Cherokee Indians are currently engaged in a planning process to become less vulnerable to natural disasters, and your participation is important to us!

The counties and Eastern Band of Cherokee Indians, along with participating local jurisdictions and other participating partners, are now working to update the region's multi-jurisdictional *Hazard Mitigation Plan*. The purpose of this Plan is to identify and assess our community's natural hazard risks and determine how to best minimize or manage those risks. Upon completion, the Plan will represent a comprehensive multi-jurisdictional *Hazard Mitigation Plan* for the region.

This survey questionnaire provides 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 impact of future hazard events.

Please help us by completing this survey by February 28, 2017 and returning it to:

Caroline Cunningham, Stantec
801 Jones Franklin Rd, Suite 300
Raleigh, NC 27606

Surveys can also be emailed to caroline.cunningham@stantec.com

If you have any questions regarding this survey or would like to learn about more ways you can participate in the development of the *Smoky Mountain Regional Hazard Mitigation Plan*, please contact Caroline Cunningham (Stantec), planning consultant for the project. You may reach Ms. Cunningham at 919-475-9171 or by email at caroline.cunningham@stantec.com

This survey is also available online at: <http://www.questionpro.com/t/AJ8IIZYAqh>

1. Where do you live?

- | | |
|---|--|
| <input type="checkbox"/> Unincorporated Cherokee County | <input type="checkbox"/> Dillsboro |
| <input type="checkbox"/> Unincorporated Graham County | <input type="checkbox"/> Fontana |
| <input type="checkbox"/> Unincorporated Haywood County | <input type="checkbox"/> Forest Hills |
| <input type="checkbox"/> Unincorporated Jackson County | <input type="checkbox"/> Lake Santeetlah |
| <input type="checkbox"/> Unincorporated Swain County | <input type="checkbox"/> Maggie Valley |
| <input type="checkbox"/> Eastern Band of Cherokee Indians | <input type="checkbox"/> Murphy |
| <input type="checkbox"/> Andrews | <input type="checkbox"/> Robbinsville |
| <input type="checkbox"/> Bryson City | <input type="checkbox"/> Sylva |
| <input type="checkbox"/> Canton | <input type="checkbox"/> Waynesville |
| <input type="checkbox"/> Clyde | <input type="checkbox"/> Webster |

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 our community being impacted by a disaster?

- Extremely concerned
- Somewhat concerned
- Not concerned

4. Please select the one hazard you think is the *highest threat* to your neighborhood:

- | | |
|--|--|
| <input type="checkbox"/> Acts of Terror | <input type="checkbox"/> Hurricane Remnants |
| <input type="checkbox"/> Dam / Levee Failure | <input type="checkbox"/> Land Subsidence |
| <input type="checkbox"/> Drought | <input type="checkbox"/> Landslide |
| <input type="checkbox"/> Earthquake | <input type="checkbox"/> Lightning |
| <input type="checkbox"/> Expansive Soils | <input type="checkbox"/> Severe Winter/Ice Storm |
| <input type="checkbox"/> Extreme Heat | <input type="checkbox"/> Severe Thunderstorm / High Wind |
| <input type="checkbox"/> Flood | <input type="checkbox"/> Tornado |
| <input type="checkbox"/> Hailstorm | <input type="checkbox"/> Wildland Fire |

5. Please select the one hazard you think is the *second highest threat* to your neighborhood:

- | | |
|--|--|
| <input type="checkbox"/> Acts of Terror | <input type="checkbox"/> Hurricane Remnants |
| <input type="checkbox"/> Dam / Levee Failure | <input type="checkbox"/> Land Subsidence |
| <input type="checkbox"/> Drought | <input type="checkbox"/> Landslide |
| <input type="checkbox"/> Earthquake | <input type="checkbox"/> Lightning |
| <input type="checkbox"/> Expansive Soils | <input type="checkbox"/> Severe Winter/Ice Storm |
| <input type="checkbox"/> Extreme Heat | <input type="checkbox"/> Severe Thunderstorm / High Wind |
| <input type="checkbox"/> Flood | <input type="checkbox"/> Tornado |
| <input type="checkbox"/> Hailstorm | <input type="checkbox"/> Wildland Fire |

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 floodplain?

- Yes
- No
- I don't know

8. Do you have flood insurance?

- Yes
- No
- I don't know

a. If "No," why not?

- Not located in floodplain
- Too expensive
- Not necessary because it never floods
- Not necessary because I'm elevated or otherwise protected
- Never really considered it
- Other (please explain): _____

9. Have you taken any actions to make your home or neighborhood more resistant to hazards?

- Yes
- No

b. If "Yes," please explain:

10. Are you interested in making your home or neighborhood more resistant to hazards?

- Yes
- No

11. Do you know what office to contact regarding reducing your risks to hazards in your area?

- Yes
- No

12. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

- Newspaper
- Television
- Radio
- Internet (including social media)
- Mail
- Phone
- Public workshops/meetings
- School meetings
- Other (please explain): _____

13. In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?

14. Are there any other issues regarding the reduction of risk and loss associated with hazards or disasters in the community that you think are important?

15. A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.

Category	Very Important	Somewhat Important	Not Important
<p><u>1. Prevention</u> Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><u>2. Property Protection</u> Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><u>3. Natural Resource Protection</u> Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include: floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><u>4. Structural Projects</u> Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, detention/retention basins, channel modification, retaining walls and storm sewers.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><u>5. Emergency Services</u> Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p><u>6. Public Education and Awareness</u> Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials and demonstration events.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

THANK YOU FOR YOUR PARTICIPATION!

This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (optional):

Name: _____

Address: _____

Phone: _____ **E-Mail:** _____

GIS DATA INVENTORY

DATA DESCRIPTION	AVAILABLE?	RECEIVED?	SOURCE(S)
Administrative / Political Boundaries			
County boundaries			
Municipal boundaries			
Tax parcels *			
<i>* At a minimum, attribute data for tax parcels should include address, building type, square footage, building value and year built.</i>			
Population and Demographics			
Census block data *			
<i>* Anything better than Census 2000 data?</i>			
Buildings and Facilities			
Building footprints			
Existing building stock, by occupancy class			
Government buildings			
County offices, city/town halls, etc.			
Police stations			
Fire/Rescue stations			
Emergency Operations Centers			
Public works facilities			
Communication facilities			
Hazardous materials facilities			
Hospitals			
Schools			
Shelters			
Senior care facilities			
Day care facilities			
Historic properties			
Power generation facilities / transmission lines			
Water/wastewater facilities / distribution lines			
Pipelines			
Repetitive loss properties (NFIP)			
Topography, Hydrology, Geology			
Contour data (two foot)			
Digital Elevation Model			
Watershed boundaries			
Rivers and streams			
Lakes and ponds			
Ocean / shoreline			
Wetlands			
Geology			
Soils			
Transportation			
Highways and roads (center lines)			
Bridges			
Railways			
Airports			
Ports			
Land Use			
Land Use / Land Cover			
Zoning / Future Land Use			
Parks / Open Space			
Preserved Farmland			
Acquired properties (HMGP buyouts, etc.)			

GIS DATA INVENTORY

DATA DESCRIPTION	AVAILABLE?	RECEIVED?	SOURCE(S)
Aerial Imagery			
High-resolution digital orthophotography			
Hazards			
DROUGHT			
Palmer Drought Severity Index (PDSI)			
FLOOD			
FEMA Digital Flood Data (DFIRMs)			
Location of dams, levees and any inundation zones			
HURRICANE AND TROPICAL STORM			
Historical storm tracks			
THUNDERSTORM			
Thunderstorm frequency			
Lightning frequency			
Hail frequency			
TORNADO			
Historical tornado locations			
WILDFIRE			
Wildfire hazard areas, fuel maps, etc.			
Urban/wildland interface communities			
WINTER STORM			
Annual snow/ice precipitation			
OTHER			
Any other data on historic events/ damages			

SMOKY MOUNTAIN REGION CAPABILITY ASSESSMENT REVIEW

Jurisdiction Name: _____

Instructions:

Review the capabilities listed for your community. Red checks indicate that a plan/capability was updated for the 2017 Smoky Mountain Regional Hazard Mitigation Plan Update as found via cursory web searches.

- Add a red check if the capability is new for this plan update.
- Add a “C” is the jurisdiction is covered under a county plan.
- Delete the check if it is not current to this version of the Smoky Mountain Regional Hazard Mitigation Plan.

Table 1: PLANNING AND REGULATORY CAPABILITY (RELEVANT PLANS, ORDINANCES, AND PROGRAMS)

Planning / Regulatory Tool	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD	Canton	Clyde	Maggie Valley	Waynesville	JACKSON	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND	
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									✓				✓								✓

Planning / Regulatory Tool	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD	Canton	Clyde	Maggie Valley	Waynesville	JACKSON	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND	
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																					

*Waynesville: Historic Preservation – “Waynesville Design Review Guidelines”

*Cherokee County Subdivision Ordinance: Shown as underway during previous plan update. It this now completed?

**Table 2: ADMINISTRATIVE AND TECHNICAL CAPABILITY
(RELEVANT STAFF / PERSONNEL RESOURCES)**

Staff / Personnel Resource	CHEROKEE COUNTY	Andrews	Murphy	GRAHAM	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD	Canton	Clyde	Maggie Valley	Waynesville	JACKSON	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND
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																			✓

TABLE 3: FISCAL CAPABILITY (RELEVANT FISCAL RESOURCES)

Fiscal Tool / Resource	CHEROKEE	Andrews	Murphy	GRAHAM	Fontana Dam	Lake Santeetlah	Robbinsville	HAYWOOD	Canton	Clyde	Maggie Valley	Waynesville	JACKSON	Dillsboro	Forest Hills	Sylva	Webster	SWAIN COUNTY	Bryson City	EASTERN BAND
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	✓	✓	✓										✓	✓	✓	✓	✓	✓	✓	

TABLE 4: POLITICAL CAPABILITY

The political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events.

Comments:

TABLE 5: ADDITIONAL COMMENTS ON CAPABILITY

Comments:



MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in the Smoky Mountain 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.

Please return all completed worksheets no later than May 5, 2017 to:

Caroline A. Cunningham, Project Manager
caroline.cunningham@stantec.com

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

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Appendix D

Planning Process Documentation

This Appendix includes the following:

D1. Kickoff Meeting Documentation

- a. Kickoff Meeting
 - Agenda
 - Meeting Presentation
 - Meeting Minutes
 - Sign-In Sheets

D2. Mitigation Strategy Workshop Documentation

- a. Mitigation Strategy
 - Agenda
 - Meeting Presentation
 - Meeting Minutes
 - Sign-In Sheets
 - Meeting Announcement
 - Follow-up Email

D3. Public Survey Documentation

- a. Public Survey Announcements/Posting
- b. Public Survey Summary Results

D4. Neighboring Jurisdiction Coordination Documentation

- a. Emails
- b. Contact List

D5. Plan Review Documentation

- a. Emails
- b. Contact List

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D1. Kickoff Meeting Documentation

AGENDA

Smoky Mountain Regional Hazard Mitigation Plan Update
Project Kickoff Meeting
November 29, 2016
1:00 PM

1) Introductions

2) Mitigation Refresher

3) Icebreaker Exercise

4) Project Overview

- a) Key Objectives
- b) Project Tasks
- c) Project Schedule

5) Roles & Responsibilities

- a) Stantec
- b) County Leads
- c) Participating Jurisdictions

6) Next Steps

- a) Identify Additional Members for Hazard Mitigation Planning Team
- b) Initiate data collection efforts
- c) Begin public outreach
- d) Discuss Next Hazard Mitigation Planning Team meeting

7) Questions, Issues or Concerns





Smoky Mountain Regional Hazard Mitigation Plan Update

Kickoff Meeting
November 29, 2016

Agenda

- Introductions**
- Mitigation Refresher**
- Icebreaker Exercise**
- Project Overview**
 - Key Objectives
 - Project Tasks
 - Project Schedule
- Roles & Responsibilities**
 - Hawksley Consulting
 - County Leads
 - Participating Jurisdictions
- Next Steps**
 - Identify Additional Members for Hazard Mitigation Planning Team
 - Initiate data collection efforts
 - Begin public outreach
 - Discuss Next Hazard Mitigation Planning Team meeting
- Questions, Issues or Concerns**

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Introductions

Hawksley Consulting (Stantec)


- Nathan Slaughter, AICP, CFM
- Caroline Cunningham, AICP, CFM, ABCP

County Leads

Participating Municipalities


Other Stakeholders

NCEM




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Mitigation Refresher

 **“mit-i-gate”**

- 1: to cause to become less harsh or hostile.
- 2: to make less severe or painful.

 **Hazard Mitigation**

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



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Disaster Mitigation Act of 2000

Revitalized Federal Planning Requirements

- State and Local Hazard Mitigation Plan


Federal Grant Funding Eligibility

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)



DMA 2000 is intended to facilitate cooperation between state and local authorities on risk reduction measures and to expedite funding allocation

FEMA Mitigation Planning Resources
<http://www.fema.gov/hazard-mitigation-planning-resources>




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NC Senate Bill 300

Passed in June of 2001, amends the North Carolina Emergency Management Act (166A)

- Requires local hazard mitigation plans in order to remain eligible for Public Assistance (PA) for state-declared disasters



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Project Information

Funded with a Federal PDM Grant

Hired Hawksley Consulting to manage the update

Same Project Manager as last time

Match requirement – will be met with “in-kind” services



Think of Mitigation in This Way


- 1) We want to mitigate hazard impacts on the existing development in our communities
 - Houses, businesses, infrastructure, critical facilities, etc
- 2) We want to ensure that future development is conducted in a way that doesn't increase our vulnerability
 - Best done by having good plans, policies and procedures in place



Icebreaker Exercise

Hazard Mitigation Techniques

- Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Public Education and Awareness



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Prevention



- Planning and Zoning
- Building codes
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvements programming
- Setbacks



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Property Protection



- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Retrofitting
- Safe rooms, shutters, shatter-resistant glass
- Insurance



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Natural Resource Protection



- Floodplain protection
- Watershed management
- Riparian buffers
- Forest management
- Erosion and sediment control
- Wetland preservation and restoration
- Habitat preservation





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Structural Projects



- Reservoirs
- Dams, levees, dikes
- Floodwalls
- Stormwater diversions
- Detention/retention basins
- Channel modification
- Storm sewers

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Emergency Services




- Warning systems
- Emergency response equipment
- Shelter Operations
- Evacuation planning and management
- Emergency response training and exercises
- Sandbagging for flood protection
- Installing temporary shutters






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Public Education and Awareness



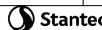

- Outreach projects
- Speaker series/ demonstration events
- Hazard map information
- Real estate disclosure
- Library materials
- School children educational programs
- Hazard expositions

Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Icebreaker Exercise

Prevention	Property Protection	Natural Resource Protection	Structural Projects	Emergency Services	Public Education/Awareness
Planning and zoning Building codes Open space preservation Floodplain regulations Stormwater management regulations Drainage system maintenance Capital improvements programming Setbacks	Acquisition Relocation Building elevation Critical facilities protection Retrofitting Safe rooms, shutters, shatter-resistant glass Insurance	Floodplain protection Watershed management Riparian buffers Forest management Erosion and sediment control Wetland preservation and restoration Habitat preservation	Reservoirs Dams, levees, dikes Floodwalls Stormwater diversions Detention/retention basins Channel modification Storm sewers	Warning systems Emergency response equipment Shelter Operations Evacuation planning and management Emergency response training and exercises Sandbagging for flood protection Temporary shutters	Outreach projects Speaker series/ demonstration events Hazard map information Real estate disclosure Library materials School children educational programs Hazard expositions

Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Project Overview

Key Objectives

- Complete update of existing plans to demonstrate progress and reflect current conditions
- Current plan expires 5/20/18
- Public awareness and education
- Maintain grant eligibility for participating jurisdictions
- Maintain compliance with State and Federal requirements






Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Participating Jurisdictions

Cherokee County
Andrews
Murphy


Graham County
Fontana Dam
Lake Santeliah
Robbinsville



Haywood County
Canton
Clyde
Maggie Valley
Waynesville

Jackson County
Dillsboro
Forest Hills
Sylva
Webster

Swain County
Bryson City

Eastern Band of Cherokee Indians



Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Project Tasks

1. Planning Process
2. Risk Assessment
3. Capability Assessment
4. Mitigation Strategy
5. Plan Maintenance
6. Documentation

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HAWKSLEY

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Planning Process

Reconvene Hazard Mitigation Planning Team (HMPT)

Widespread public participation and outreach to key stakeholders

Data collection and analysis

Plan Preparation and submission to HMPT, public, NCEM and FEMA

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Risk Assessment

Hazard Identification and Analysis

- Detailed profiles for all natural hazards
 - Hazard description
 - Historical occurrences
 - Known hazard boundaries
- Priority Risk Index (PRI)

Vulnerability Assessment

- Asset inventory (exposure)
- Loss estimates

Development Trends and Implications

GIS Data Inventory

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Hazard Identification

ATMOSPHERIC HAZARDS	GEOLOGIC HAZARDS
<input type="checkbox"/> Avalanche	<input checked="" type="checkbox"/> Earthquake
<input checked="" type="checkbox"/> Drought	<input type="checkbox"/> Expansive Soils
<input checked="" type="checkbox"/> Hailstorm	<input checked="" type="checkbox"/> Landslide
<input type="checkbox"/> Heat Wave	<input type="checkbox"/> Land Subsidence
<input checked="" type="checkbox"/> Hurricane and Tropical Storm	<input type="checkbox"/> Tsunami
<input checked="" type="checkbox"/> Lightning	<input type="checkbox"/> Volcano
<input type="checkbox"/> Nor'easter	OTHER HAZARDS
<input checked="" type="checkbox"/> Tornado	<input checked="" type="checkbox"/> Hazardous Materials Incident
<input checked="" type="checkbox"/> Severe Thunderstorm	<input type="checkbox"/> Terror Threat
<input checked="" type="checkbox"/> Winter Storm and Freeze	<input checked="" type="checkbox"/> Wildfire
HYDROLOGIC HAZARDS	
<input checked="" type="checkbox"/> Dam and Levee Failure	
<input checked="" type="checkbox"/> Erosion	
<input checked="" type="checkbox"/> Flood	
<input type="checkbox"/> Storm Surge	

= Hazard considered significant enough for further evaluation in the Smoky Mountain Region hazard risk assessment.

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Vulnerability Assessment

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Capability Assessment

Measures community capability to implement hazard mitigation activities

Identifies and targets gaps, conflicts and opportunities with existing local plans, programs, policies, etc

Identifies mitigation measures already in place or underway


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Capability Assessment

Capability Assessment Survey

- Measures existing capabilities
 - Planning and regulatory
 - Administrative and technical
 - Fiscal
 - Political



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Mitigation Strategy

Mitigation Goals

- Based on the findings of the risk and capability assessments

Identification and analysis of mitigation measures

- Prevention
- Property Protection
- Natural Resources Protection
- Structural Projects
- Emergency Services
- Public Education and Awareness




Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Mitigation Actions Plan

ACTION #13
Amend the county's Manufactured Housing and Travel Trailer Park Ordinance to require tornado shelters for any new major manufactured/mobile home park with more than 30 mobile home spaces.

Category	Property Protection
Hazard	Tornadoes
Objectives Addressed	2.3
Background	Mobile homes are particularly vulnerable to damage from high winds. Residents are more likely to be injured than with the streets, should seek safe shelter when a tornado threatens. Tornado shelters should be constructed in major mobile home parks to ensure safe shelter for residents to get during a tornado event. The action discussion should be amended to be enhanced a minimum of 1200sq yards. Local parks would be an alternate option. Local city or community center, library facility, etc. Tornado shelters should be to be built in parks to provide for high school events but also serve as alternate shelter for other events such as hurricanes and tropical storms.
Priority	Medium
Funding Sources	SL
Responsibility Assigned to	Planner
Target Completion Date	June 1, 2018

Labels on the right side of the table:
 Action (points to ACTION #13)
 Category (points to Property Protection)
 Hazard (points to Tornadoes)
 Objective(s) Addressed (points to 2.3)
 Background (points to Background text)
 Priority (points to Medium)
 Funding Sources (points to SL)
 Responsibility (points to Planner)
 Completion Date (points to June 1, 2018)




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Plain Maintenance Procedures

Evaluate and update procedures for:

- Monitoring the plan and reporting on the plan's progress
- Evaluating and updating the plan
- Implementation mechanisms
- Continued public involvement



Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Documentation


Full description of the planning process

- Use of best available data

Plan adoption

- Local adoption resolution required from each jurisdiction for final FEMA approval


Local Hazard Mitigation Plan Review Tool



Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Project Schedule


Project Tasks	Month										
	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept-May 2018
Planning Process											
Risk Assessment											
Mitigation Strategy											
Plan Maintenance and Adoption											
Meetings											
Regional Planning Committee Meetings	✓				✓				✓		
Milestones											
Submission of Draft Risk Assessment to Regional Planning Committee					✓						
Submission of Draft Plan to Regional Planning Committee							✓				
Submission of Draft Plan to NCEM/FEMA								✓			
Completion of Final Plan/Conditional FEMA Approval											✓
Local Adoption of Final Plan											✓
Submission of Final Plan to NCEM/FEMA											✓



Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

Data Collection


- GIS Data Inventory
- Capability Assessment Revisions
- Public Participation Survey
- Update Existing Mitigation Actions



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Roles and Responsibilities

- Hawksley Consulting (Stantec)
- County Leads
- Participating Jurisdictions
- Public and Other Stakeholders




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Roles and Responsibilities

Hawksley Consulting (Stantec)

- **Technical Assistance**
 - Planning guidance
 - State and Federal compliance
- **Data Collection and Analysis**
 - Risk Assessment
 - Capability Assessment
 - Summarize results / Report findings
- **Facilitate HMPT meetings**
- **Plan Preparation**




Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16 33

Roles and Responsibilities

County Leads

- **Active participation in planning process**
 - Data collection and exchange
 - Public awareness and stakeholder involvement
 - Arrange and host HMPT meetings
 - Mitigation strategy development
 - Plan review & feedback
- **Plan Adoption**




Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16 34

Roles and Responsibilities

County Leads (cont'd)

- **Project management**
 - Central point of contact (Robin Caldwell – Cherokee County)
 - Communication and coordination with participating jurisdictions, NCEM and FEMA




Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16 35

Roles and Responsibilities

Participating Jurisdictions

- **Active participation in planning process**
 - Data collection and exchange
 - Public awareness and stakeholder involvement
 - Attend HMPT meetings
 - Mitigation strategy development
 - Plan review & feedback
- **Plan Adoption**



Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16 36


Public Survey

Used to collect input from citizens and other stakeholders that aren't able to actively participate in the planning process. The survey is available in hard copy and online formats.

<http://www.questionpro.com/t/AJ8lIZYAqh>


Survey is live! Will email everyone the link after the meeting.

Please advertise on County and/or Municipal websites, Facebook, Twitter, etc so we can ensure good participation (283 responses last time)



 **Stantec**
HAWKSLEY CONSULTING 37

Next Steps

- Initiate data collection efforts
- Begin public outreach
- Discuss next HMPT meeting

 **Stantec**
HAWKSLEY CONSULTING 38

Smoky Mountain Regional Hazard Mitigation Plan Update – Kickoff Meeting 11/29/16

**Smoky Mountain Regional
Hazard Mitigation Plan Update**
Kickoff Meeting
November 29, 2016

Smoky Mountain Region Hazard Mitigation Plan Update Kick-off Meeting

Date: November 29, 2017

Location: Eastern Band of Cherokee Indian EOC, Cherokee, NC

Attendees: See Sign-in Sheet

Summary of Meeting:

This meeting was facilitated by Caroline Cunningham (Stantec) and Nathan Slaughter (ESP). The purpose of the meeting was to provide an overview of hazard mitigation including possible techniques, and review proposed project tasks, roles and responsibilities, project schedule with the planning team. The meeting served as a kick-off point to begin the planning process.

The meeting began with introductions, and this was followed by an overview of hazard mitigation planning.

Mr. Slaughter began by reviewing the definition of mitigation as a hazard mitigation refresher. This followed by an explanation of the need for a hazard mitigation plan including state and federal funding, blue print for damage reduction and safety, and a pre-disaster planning exercise among key county and city employees, officials, and other stakeholders. He also explained that hazard mitigation plans are subject to a set of regulations from the Disaster Mitigation Act of 2000 and also undergo a review by the state (NCEM) and FEMA upon completion. Next, Mr. Slaughter provided key details on the project including funding and the project team.

Mr. Slaughter then transitioned into hazard mitigation categories set up the ice breaker exercise. He explained that the categories are examples of mitigation activities they may want to implement. The categories of mitigation actions included prevention, natural resource management, property protection, public education and awareness, emergency services, and structural projects.

Following a review of mitigation strategy categories, an ice breaker exercise was conducted. Attendees were given an equal amount of fictitious money (1- \$10, 1- \$5, 5-\$1's) and asked to spend according to the desires or assumed county needs. The goal of the exercise is to determine what people may grant money spent on in terms of mitigation or what the needs in the county are. The results were as follows:

- Emergency Services - \$94
- Prevention - \$60
- Public Education and Awareness - \$59
- Natural Resource Management - \$47
- Structural Projects - \$34
- Property Projection- \$28

After the money was spent, Mr. Slaughter asked the planning team to share what they had in mind when they “spent” their money. Examples included:

- Town of Andrews – Emergency Services resource, public awareness, and stream restoration
- Haywood County- Watershed Management Planning, Forest Management (due to the drought)

Mr. Slaughter also explained that the amounts would be presented at the next meeting, the mitigation strategy workshop.

Following the ice breaker exercise, Mr. Slaughter moved into the plan overview development tasks. First, the project objectives were reviewed followed by the tasks. There are 6 main tasks: planning process, risk assessment, capability assessment, mitigation strategy, plan maintenance, and documentation. Each task was reviewed in detail.

Next, Mr. Slaughter presented the existing hazards for the planning team to review. He also provided a list of hazards in the state hazard mitigation plan. Following this section, the Ms. Cunningham facilitated the remainder of the meeting.

Ms. Cunningham began by reviewing the project schedule and then moved into the data collection needs. Then, the roles and responsibilities for the consultants, county leads, jurisdictions, and public were reviewed. No questions were raised with this information.

Next, Ms. Cunningham presented next steps. The first was the public survey and associated link. It was noted that they were in “competition” with the High Country Region HMP to get the most votes. In addition, the data collection needs were reviewed with attendees.

Following this question, the show of hands was requested for anyone who wanted to make changes (0 hands) and anyone who wanted to make changes (majority of hands raised). Ms. Cunningham noted that the existing goals would remain as is in the update.

Lastly, Ms. Cunningham ensured there were no additional questions from the attendees. None were raised. Mr. Slaughter then reviewed the totals from the ice breaker exercise with the group and the meeting was adjourned.

Smoky Mountain Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

November 29, 2016
1:00 PM

Name	Agency	City	Phone Number	E-mail Address
Caroline Cunningham	Stantec	Raleigh	919-475-9171	CarolineCunningham@stantec.com
Todd Dillard	Jackson	Sylva	828-586-7508	todd@dillard.com jackson@jackson.com
Rejoice Caldwell	CCCA	Cherokee County	828-837-7352	rejoice.caldwell@cherokee-county-nc.gov
Sam Davis	CCEM	Cherokee County	828-837-3450	sam.davis@cherokee-county-nc.gov
Ann Payne	Town of Murphy	Murphy	828-837-2510	town-of-murphy@townofmurphy.com
Al Lovingood	Murphy Fire	Murphy	828-837-2212	alovingood@murphyfire.org
Ed Burckins	Town of Andrews	Andrews	828-557-8398	edburckins@andrewsnc.com
Chris Hebenstreit	EBCI	Cherokee	828-359-6444	chrihebe@nc-cherokee.com
Robbie Farther	EBCI EM	Cherokee	828-359-6449	roberfant@nc-cherokee.com

Smoky Mountain Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

November 29, 2016
1:00 PM

Name	Agency	City	Phone Number	E-mail Address
DAVID BREYKOVIC	SWAIN EM	Bryson City	828 736-1294	davidb @ swaincountync.gov
JOSH WARD	BRYSON CITY	" "	828 488 3335	JWARD @ DIST.NET
Bob Dunbar	Tribal EMS/EM	Cherokee	888-736-4819	bobdunl@nc-cherokee.com
Abby Holmes	Public Health Cherokee	Cherokee	888-359-1500	mh-cherkee.com abbyholme@nc-
Jason Webb	EMRI PHHS	Cherokee	828-355-1529	jwebb@nc-cherkee.com
Joey Webb Sr.	Town of Waynesville	Waynesville	888-456-6151	jwebb@waynesvillenc.gov
Joy Garland	Town of Clyde	Clyde	828-627-2566	joy.garland@townofclyde.com
Greg Shuping	Haywood County EM	Waynesville	828-508-8387	gshuping@haywoodnc.net
Nathan Staughter				

Smoky Mountain Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

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Sam Davis	CCEM	Cherokee County	828-837-3450	sam.davis@cherokee-county-nc.gov
Ann Payne	Town of Murphy	Murphy	828-837-2510	town-of-murphy@frontier.com
Al Lovingood	Murphy Fire	Murphy	828-837-2212	alovingood@murphyfire.org
Ed Burkins	Town of Andrews	Andrews	828-557-8398	edburkins@andrewsnc.com
Chris Hebenstreit	EBCI	Cherokee	828-359-6444	chrihebe@nc-cherokee.com
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Smoky Mountain Regional Hazard Mitigation Plan Update
Project Kickoff Meeting

November 29, 2016
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DAVID BREYKOVE	SWAIN EM	Bryson City	828 736-1294	davidb@swaincountync.gov
JOSH WARD	BRYSON CITY	" "	828 488 3335	JWARD@DUST.NET
Bob Dunbar	Tribal EMS/EM	Cherokee	888-736-4819	bobdun1@nc-cherokee.com
Abby Holmes	Public Health Cherokee	Cherokee	888-359-1500	ne-cherokee.com abbyholme@nc-cherokee.com
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Greg Shuping	Haywood County EM	Waynesville	828-508-8387	gshuping@haywoodnc.net
Nathan Staughter				

D2. Mitigation Strategy Workshop Documentation

AGENDA

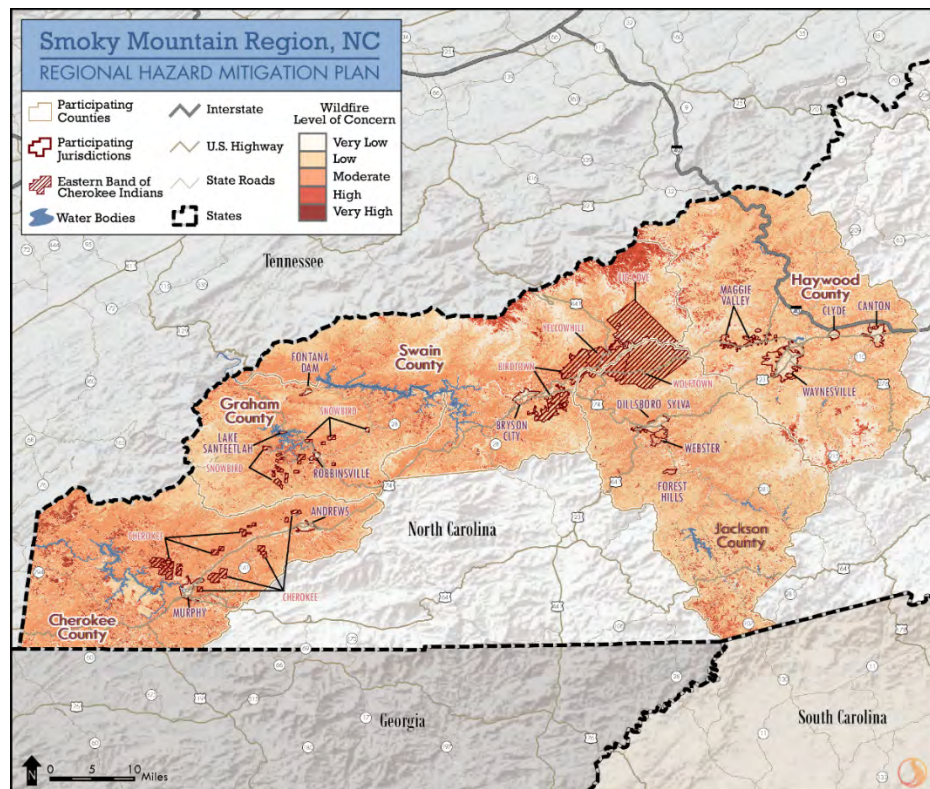
Smoky Mountain Regional Hazard Mitigation Plan Update

Mitigation Strategy Meeting

March 29, 2017

9:00 AM

- 1) Introductions
- 2) Public Survey
- 3) Risk Assessment Results
- 4) Mitigation Strategy
- 5) Schedule/Next Steps
- 6) Breakout Groups



SMOKY MOUNTAIN REGION HAZARD MITIGATION GOALS (FOR REVIEW)

Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of natural all hazards including natural, man-made and technological hazards.
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and avoid consider the risks, impacts, and potential mitigation measures to incorporate if proposing to building new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands wetlands , floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

2017 Smoky Mountain Regional Hazard Mitigation Plan Update Mitigation Strategy Meeting




Photo: iStockphoto.com, Getty Images/istockphoto.com

March 29, 2017



Agenda


- 1** Introductions
- 2** Public Survey
- 3** Risk Assessment Results
- 4** Mitigation Strategy
- 5** Schedule/Next Steps
- 6** Breakout Groups by Jurisdictions



Introductions





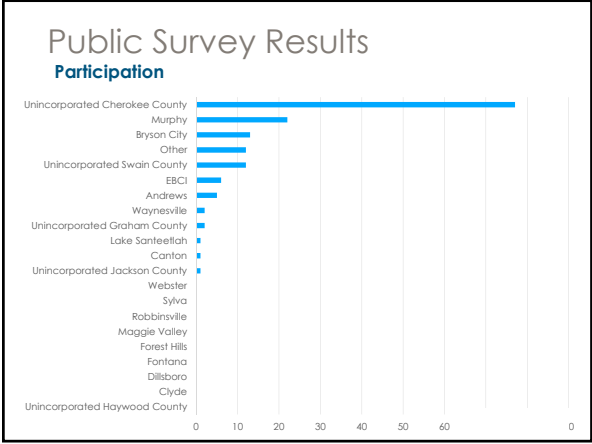

Public Survey Results

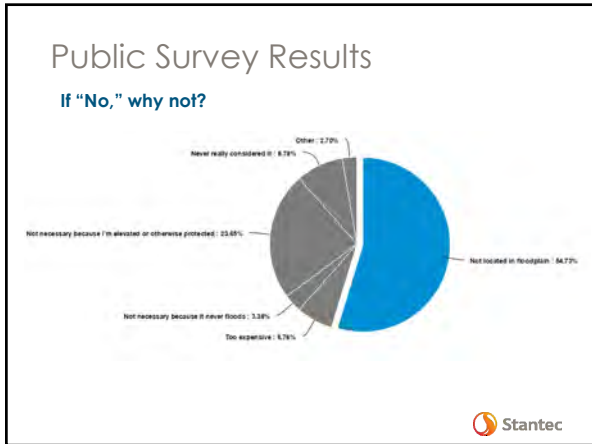
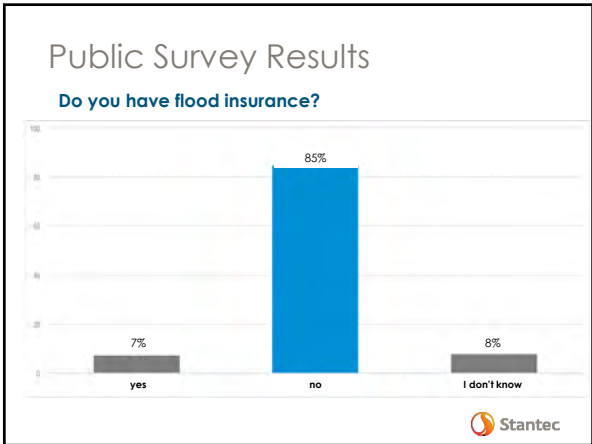
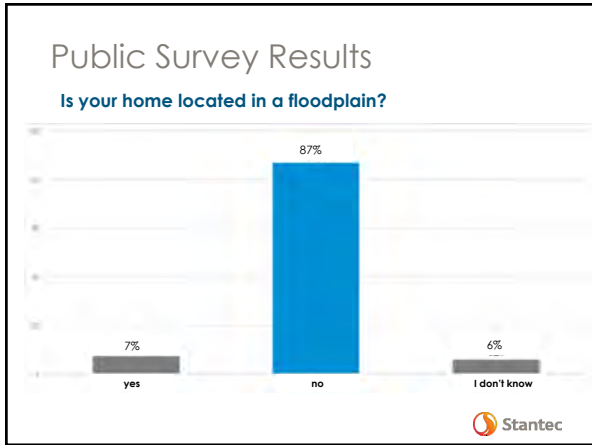
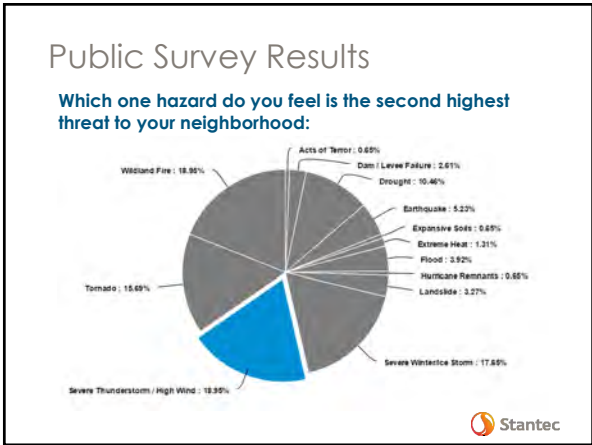
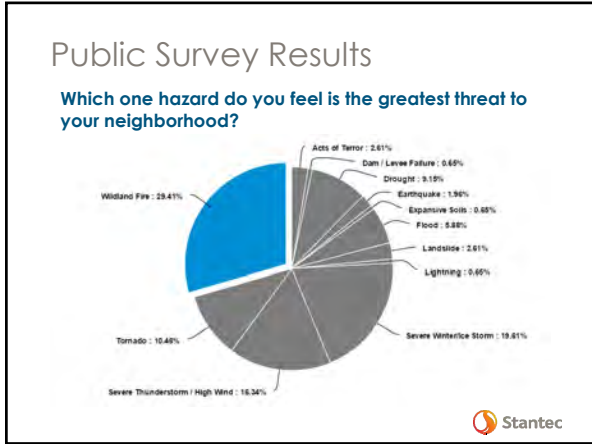
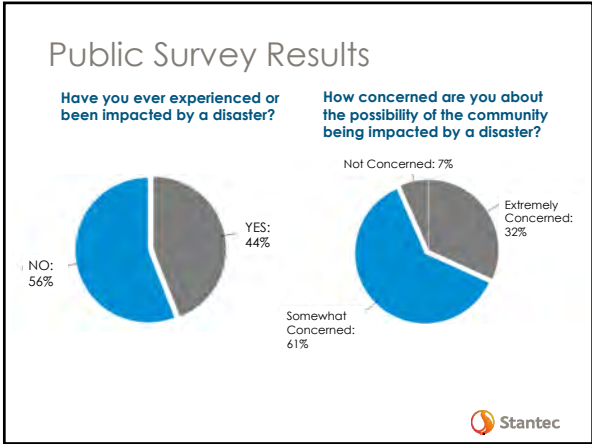


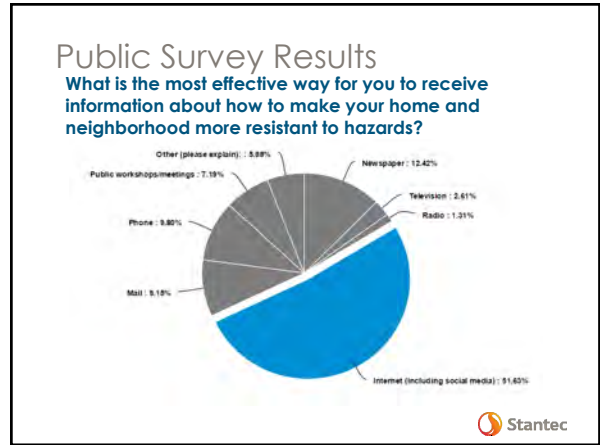
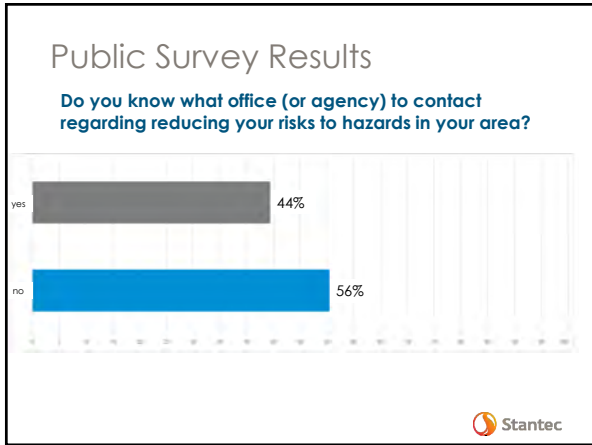
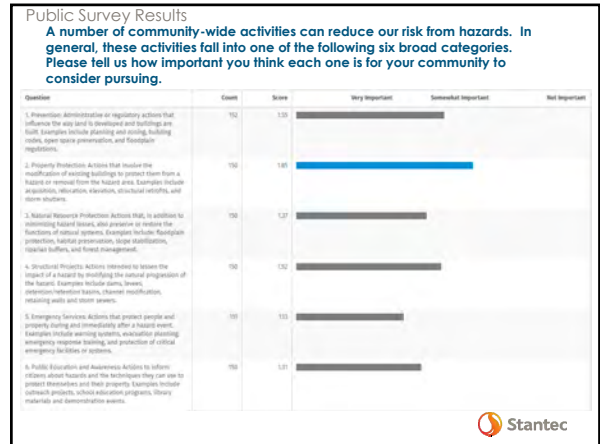
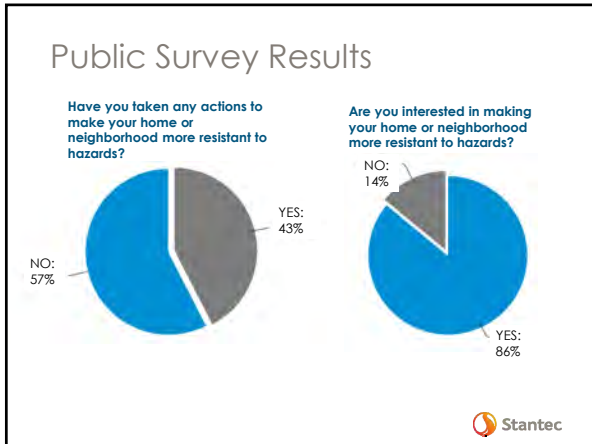
Public Survey Results

Metrics

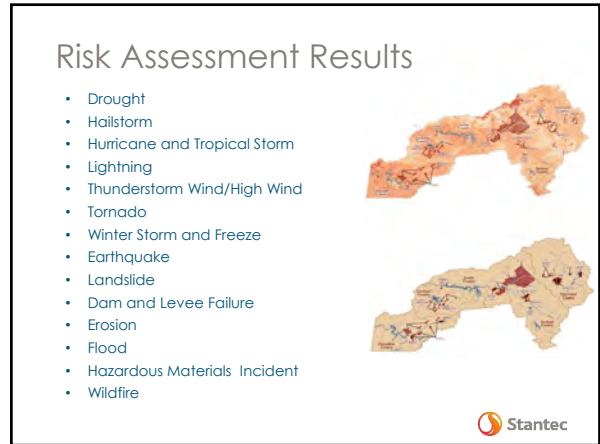
- **Number of Respondents:**
 - 154
- **Time:**
 - Dec. 2, 2016 – Feb. 28, 2017





Risk Assessment Results



Drought

Previous Occurrences

- 2000-2002
- 2016

Location

- Countywide/regional

Probability

- Highly likely

Potential Damage

- None reported

Potential Impacts

- Water conservation
- Economic impacts

Category	Category Name	Weeks of Drought Level
None	None	596
D0	Abnormally Dry	99
D1	Moderate Drought	53
D2	Severe Drought	41
D3	Extreme Drought	41
D4	Exceptional Drought	1

Category	Category Name	Category Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures, streams, reservoirs, or wells; low, some water shortages developing or imminent; voluntary water-use restrictions requested.
D2	Severe Drought	Crop or pasture losses 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 in reservoirs, streams, and wells creating water emergencies.



Year	Drought Level				
	Abnormally Dry	Moderate Drought	Severe Drought	Extreme Drought	Exceptional Drought
	Cherokee County	Graham County	Haywood County	Jackson County	Swain County
2000	EXTREME (up to 7 weeks)	EXTREME (up to 4 weeks)	EXTREME (up to 1 week)	EXTREME (up to 1 week)	EXTREME (up to 1 week)
2001	EXTREME (up to 3 weeks)	EXTREME (up to 3 weeks)	EXTREME (up to 3 weeks)	EXTREME (up to 3 weeks)	EXTREME (up to 3 weeks)
2002	EXTREME (up to 2 weeks)	EXTREME (up to 2 weeks)	EXTREME (up to 2 weeks)	EXTREME (up to 2 weeks)	EXTREME (up to 2 weeks)
2003	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)	NORMAL (52 weeks)
2004	ABNORMAL (up to 3 weeks)	ABNORMAL (up to 3 weeks)	ABNORMAL (up to 3 weeks)	ABNORMAL (up to 3 weeks)	ABNORMAL (up to 3 weeks)
2005	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 11 weeks)	ABNORMAL (up to 11 weeks)
2006	MODERATE (up to 14 weeks)	MODERATE (up to 14 weeks)	SEVERE (up to 1 week)	SEVERE (up to 1 week)	SEVERE (up to 1 week)
2007	EXTREME (up to 13 weeks)	EXTREME (up to 13 weeks)	EXTREME (up to 13 weeks)	EXTREME (up to 13 weeks)	EXTREME (up to 13 weeks)
2008	EXTREME (up to 7 weeks)	EXTREME (up to 7 weeks)	EXTREME (up to 7 weeks)	EXTREME (up to 7 weeks)	EXTREME (up to 7 weeks)
2009	SEVERE (up to 7 weeks)	SEVERE (up to 7 weeks)	SEVERE (up to 7 weeks)	SEVERE (up to 7 weeks)	SEVERE (up to 7 weeks)
2010	MODERATE (up to 9 weeks)	MODERATE (up to 9 weeks)	MODERATE (up to 9 weeks)	MODERATE (up to 9 weeks)	MODERATE (up to 9 weeks)
2011	MODERATE (up to 1 week)	MODERATE (up to 1 week)	ABNORMAL (up to 1 week)	SEVERE (up to 1 week)	SEVERE (up to 1 week)
2012	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)
2013	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)
2014	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)	ABNORMAL (up to 1 week)
2015	ABNORMAL (up to 29 weeks)	ABNORMAL (up to 29 weeks)	SEVERE (up to 3 weeks)	SEVERE (up to 3 weeks)	SEVERE (up to 3 weeks)
2016	EXTREME (up to 4 weeks)	EXTREME (up to 4 weeks)	EXTREME (up to 4 weeks)	EXTREME (up to 4 weeks)	EXTREME (up to 4 weeks)

Exceptional Drought

Source: North Carolina Drought Atlas

Thunderstorm Wind

Previous Occurrences

- 582 reported

Location

- Countywide/regional

Probability

- Highly likely

Previous Damage

- \$6.5M

Potential Impacts

- Property damage (roofs)
- Crop



Source: FEMA

Hailstorm

Previous Occurrences

- 217 reported
- ~5/year

Location

- Countywide/regional

Probability

- Highly likely

Previous Damage

- \$1.9M

Potential Impacts

- Property damage (roofs)
- Cars

Lightning

Previous Occurrences

- 29 reported
- 1 fatality/12 injuries

Location

- Countywide/regional

Probability

- Likely

Previous Damage

- \$3.5M

Potential Impacts

- Property damage (Fire)
- Death/Injury



Hurricane and Tropical Storm

Previous Occurrences

- 28 within 75 miles

Location

- Countywide/regional

Probability

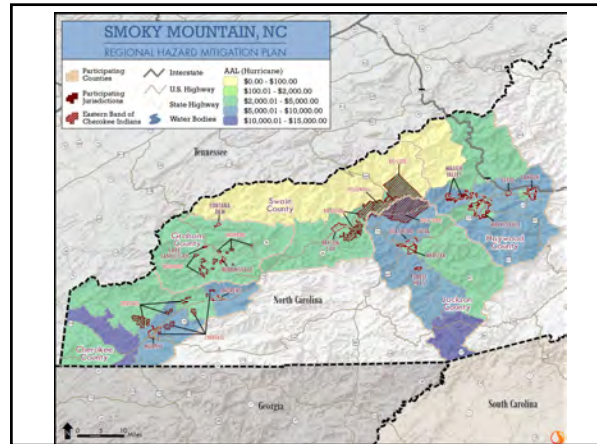
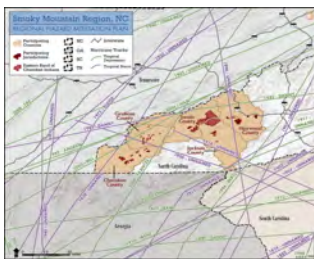
- Possible

Previous Damage

- \$1.9M

Potential Impacts

- Property damage
- Death/Injuries
- Flooding



Tornado

Previous Occurrences

- 17 reported

Location

- Countywide/regional

Probability

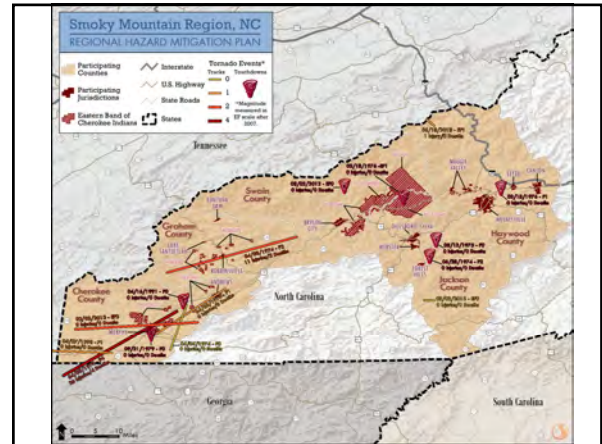
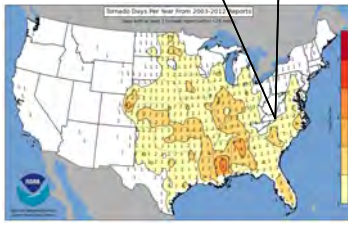
- Likely" (10-90% annual chance)

Previous Damage

- \$152M

Potential Impacts

- Varies based on magnitude/location
- Death/injury
- Property damage



Flood

Previous Occurrences

- 117 events (reported)

Location

- Regional

Probability

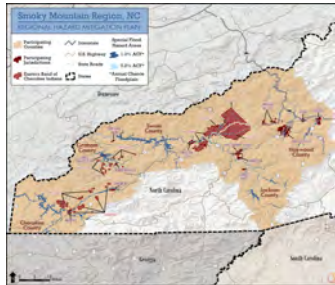
- Highly likely (annually)

Property Damage

- ~\$45M+ (2017 dollars)

Potential Impacts

- Varies based on magnitude/location
- Death/injury
- Road closures



Location	Parcels at Risk		Improved Parcels (i.e., buildings)		Value of Improvements	
	Number	%	Number	%	Value	%
Cherokee County	2,699	8%	1,397	8%	\$242,453,714	13%
Andrews	83	10%	54	9%	\$13,739,810	17%
Murphy	129	11%	92	11%	\$32,513,574	20%
Unincorporated Area	2,475	8%	1,188	8%	\$195,754,730	12%
ECBI	6	21%	3	38%	\$445,600	26%
Watauga County	2,312	29%	1,214	29%	\$162,310,976	33%
Fontana Dam	6	11%	2	7%	\$101,060	8%
Lake Santorlah	86	28%	68	34%	\$20,534,960	48%
Robbinsville	62	19%	51	20%	\$14,941,570	32%
Unincorporated Area	2,242	23%	1,093	25%	\$115,732,580	29%
ECBI	15	33%	0	0%	\$0	0%
Haywood County	5,666	11%	4,143	13%	\$685,369,900	15%
Canton	363	13%	239	11%	\$71,117,700	25%
Clepe	452	22%	294	20%	\$44,646,900	21%
Maggie Valley	468	14%	337	16%	\$73,962,000	21%
Waynesville	1,779	23%	1,513	25%	\$257,682,100	25%
Unincorporated Area	2,604	8%	1,760	9%	\$237,961,200	9%
Jackson County	4,082	10%	2,539	12%	\$916,599,010	17%
Gilchison	72	43%	63	41%	\$12,214,900	53%
Forest Hills	24	11%	18	14%	\$2,655,310	13%
Sylve	226	15%	187	16%	\$38,089,880	17%
Webster	48	20%	35	21%	\$14,369,960	17%
Unincorporated Area	3,712	10%	2,246	11%	\$829,250,160	16%
Swain County	1,319	12%	999	15%	\$160,252,552	18%
Bryson City	342	35%	278	36%	\$49,679,990	35%
Unincorporated Area	1,164	10%	1,077	12%	\$109,757,552	15%
ECBI	13	57%	7	58%	\$815,010	50%
Eastern Band of Cherokee Indians*	1,049	21%	N/A	N/A	N/A	N/A
SMOKY MOUNTAIN REGION TOTAL	17,320	11%	10,232	13%	\$2,165,985,746	16%

Severe Winter Storm (snow, ice, winter storms)

Previous Occurrences

- 997

Location

- Countywide

Probability

- Highly likely (annually)

Previous Damage

- \$4.6M

Potential Impacts

- Power outages
- Death/injuries (exposure, physical activity)
- Road closures
- Business closures

Location	Number of Occurrences	Property Damage (2017 Dollars)	Crop Damage (2017 Dollars)
Cherokee County	29	\$1,811	\$0
Graham County	190	\$0	\$1,343,916
Haywood County	239	\$0	\$2,687,833
Jackson County	313	\$4,673,902	\$537,567
Swain County	216	\$0	\$1,343,916
ECBI	10	-	-
SMOKY MOUNTAIN REGION TOTAL	997	\$4,675,713	\$5,913,232

Earthquake

Previous Occurrences

- 82

Location

- Regional

Probability

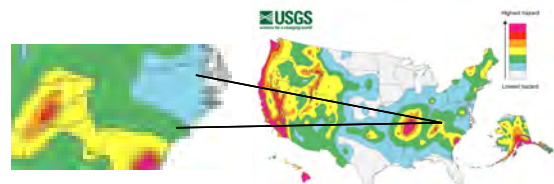
- Likely (30%: light to moderate shaking)

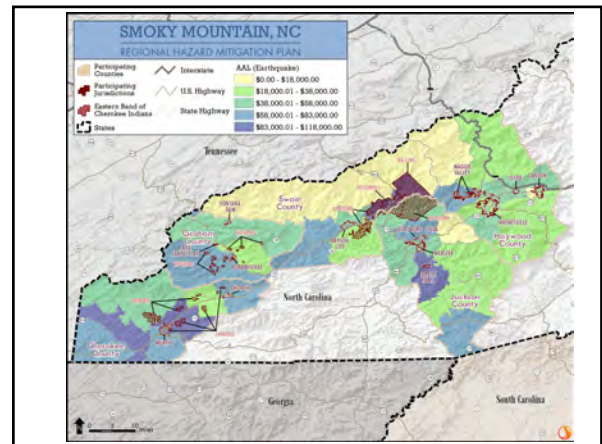
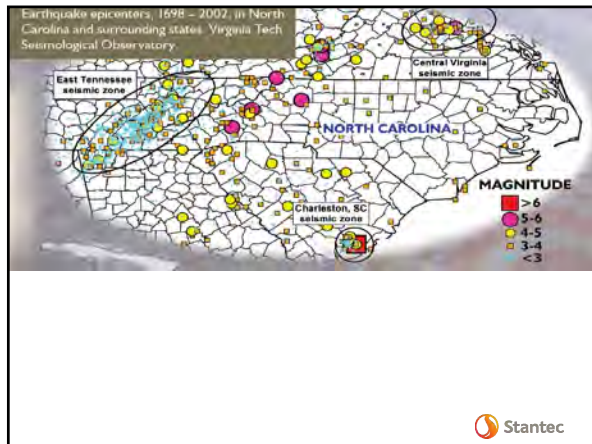
Previous Damage

- None reported

Potential Impacts

- Power/phone outages





Erosion

Previous Occurrences

- None reported

Location

- Hillside, streamside

Probability

- Unlikely

Previous Damage

- None reported

Potential Impacts

- Varies based on magnitude/location
- Death/injury
- Property Damage

Landslide

Previous Occurrences

- 240

Location

- Localized

Probability

- Highly Likely (90%+)

Previous Damage

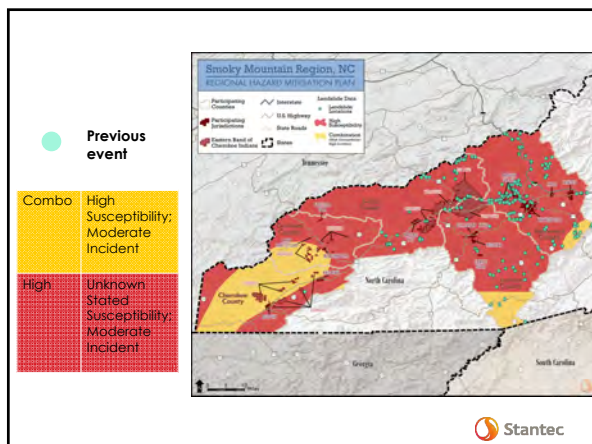
- None reported

Potential Impacts

- Varies based on magnitude/location
- Death/injury
- Property Damage
- Road Closure

Location	Number of Occurrences
Cherokee County	9
Andrews	-
Murphy	4
Unincorporated Area	5
Graham County	1
Fontana	-
Lake Santestlah	-
Robbinsville	-
Unincorporated Area	1
Haywood County	131
Canton	-
Clyde	-
Maggie Valley	9
Waynesville	3
Unincorporated Area	119
Jackson County	33
Dillsboro	-
Forest Hills	-
Sylva	-
Webster	-
Unincorporated Area	33
Swain County	61
Bryson City	-
Unincorporated Area	61
Eastern Band of Cherokee Indians	5
Regional Total	240

Source: NCGS



Dam Failure

Previous Occurrences

- 2 events (Jackson Co)

Location

- various

Probability

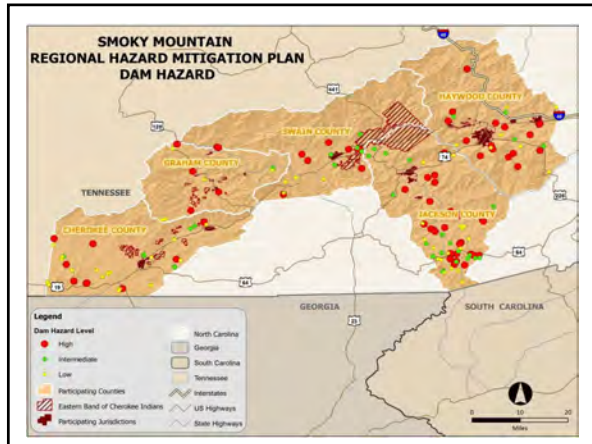
- Unlikely

Previous Damage

- None reported

Potential Impacts

- Varies based on magnitude/location
- Death/injury
- Property Damage



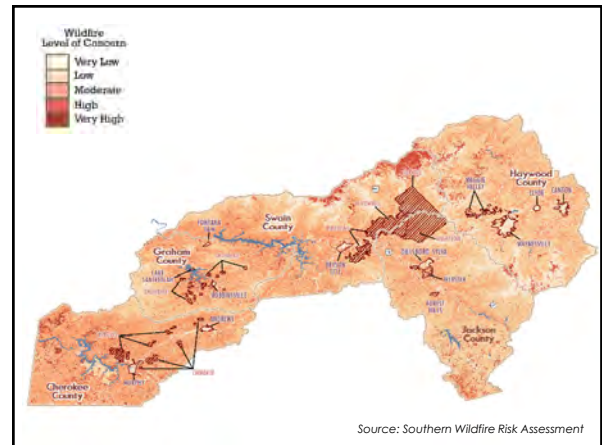
Hazardous Materials

- Previous Occurrences**
 - 44 (mobile)
- Location**
 - Various
- Probability**
 - Unlikely
- Previous Damage**
 - \$98,061
- Potential Impacts**
 - Varies based on magnitude/location
 - Death/injury
 - Property Damage

Wildfire

	Cherokee County	Graham County	Haywood County	Jackson County	Swain County	Region
Average Number of Fires per year	54	11	46	44	21	176
Average Number of Acres Burned per year	158	68	201	178	163	768
Average Number of Acres Burned per fire	3	6	4	4	8	4

- Previous Occurrences**
 - 176/year (avg)
- Location**
 - Regional
- Probability**
 - Highly likely (annually)
- Property Damage**
 - None reported
- Potential Impacts**
 - Varies based on magnitude/location
 - Death/injury
 - Road closures



Location	HIGH TO VERY HIGH WILDFIRE RISK AREAS					
	Parcels at Risk*		Improved Parcels (i.e. buildings)		Value of Improvements*	
	Number	%	Number	%	Value	%
Cherokee County	14,124	42%	7,092	43%	\$86,818,265	46%
Andrews	71	8%	43	7%	\$11,844,746	14%
Murphy	228	19%	147	17%	\$37,389,310	23%
Unincorporated Area	13,785	43%	6,891	46%	\$835,241,799	50%
EBCI	40	61%	17	71%	\$2,338,410	78%
Graham County	3,958	31%	3,076	38%	\$49,795,369	46%
Fontana Dam	0	0%	0	0%	\$0	0%
Lake Santeetlah	47	15%	41	21%	\$9,382,570	22%
Robbinsville	45	14%	31	12%	\$13,170,490	27%
Unincorporated Area	3,633	38%	1,797	40%	\$172,607,650	44%
EBCI	34	65%	7	70%	\$634,650	75%
Haywood County	4,441	9%	2,774	9%	\$701,320,400	15%
Canton	88	4%	66	3%	\$55,966,900	22%
Clyde	12	2%	8	2%	\$5,154,900	9%
Maggie Valley	172	7%	133	8%	\$36,383,500	14%
Waynesville	180	3%	138	3%	\$78,964,600	9%
Unincorporated Area	3,989	10%	2,429	11%	\$524,850,500	16%
Jackson County	11,684	30%	7,179	33%	\$2,218,375,880	41%
Dillsboro	42	25%	29	24%	\$8,791,060	38%
Forest Hills	55	25%	43	33%	\$7,856,260	38%
Sylva	166	11%	140	12%	\$66,234,990	29%
Webster	162	65%	119	70%	\$2,400,090	61%
Unincorporated Area	11,229	30%	6,842	24%	\$2,099,287,340	42%
Swain County	3,407	27%	2,128	31%	\$310,796,923	35%
Bryson City	170	17%	125	16%	\$23,261,562	16%
Unincorporated Area	3,220	28%	1,999	33%	\$286,400,541	39%
EBCI	17	74%	4	57%	\$1,134,820	69%
Eastern Band of Cherokee Indians*	330	7%	N/A	N/A	N/A	N/A
TOTAL	37,715	25%	21,049	26%	\$4,313,302,628	32%

Priority Risk Index

Hazard	Category/Degree of Risk						PRI Score
	Probability	Impact	Spatial Extent	Warning Time	Duration		
Atmospheric Hazards							
Drought	Highly Likely	Minor	Moderate	More than 24 hours	More than 1 week		2.6
Hailstorm	Highly Likely	Limited	Moderate	Less than 6 hours	Less than 6 hours		2.9
Hurricane and Tropical Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours		2.6
Lightning	Highly Likely	Critical	Negligible	Less than 6 hours	Less than 6 hours		2.8
Thunderstorm/High Wind	Highly Likely	Critical	Large	12 to 24 hours	Less than 24 hours		3.3
Tornado	Likely	Catastrophic	Small	Less than 6 hours	Less than 6 hours		3
Winter Storm and Freeze	Highly Likely	Critical	Large	More than 24 hours	Less than 1 week		3.3
Geologic Hazards							
Earthquake	Likely	Minor	Moderate	Less than 6 hours	Less than 6 hours		2
Landslide	Likely	Critical	Small	Less than 6 hours	Less than 6 hours		2.7
Hydrologic Hazards							
Dam and Levee Failure	Unlikely	Critical	Moderate	More than 24 hours	Less than 6 hours		2
Erosion	Possible	Minor	Small	More than 24 hours	More than 1 week		1.8
Flood	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 1 week		3
Other Hazards							
Hazardous Materials Incident	Possible	Limited	Small	Less than 6 hours	Less than 24 hours		2.2
Wildfire	Likely	Limited	Small	Less than 6 hours	Less than 1 week		2.6

Hazard Ranking

Ranking	Hazard
HIGH	Thunderstorm/High Wind Winter Storm and Freeze Flood Tornado Hailstorm Lightning Landslide
MODERATE	Drought Hurricane and Tropical Storm Wildfire
LOW	HAZMAT Dam and Levee Failure Earthquake Erosion



Update the Mitigation Strategy



Mitigation Strategy



Existing Goals (see handout)

Goal #1	Increase public awareness of hazard mitigation and hazard risk.
Goal #2	Enhance or create new policies that will help reduce the damaging effects of natural hazards.
Goal #3	Increase capabilities to support and implement effective mitigation measures.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and avoid building new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wet lands, floodplains, and stream corridors.
Goal #6	Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

Actions (see handout)

Defined: A specific action, project, activity or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts.

Requirements

- Update existing actions (handout)
- Add new actions (if desired)
- Address new and existing buildings and infrastructure
- Prioritized
- Including benefit cost review
- Specific to each jurisdiction
- Responsible Department/Agency
- Timeline
- Cost Estimate
- Funding Source
- Review a comprehensive range of actions



Mitigation Action Tasks

1. Review and Update Existing Actions
2. Evaluate Alternatives
3. Develop New Actions
4. Prioritize Actions



1. Review and Update Existing Actions

- **See Handout**
- **Provide Status of:**
 - "In progress", "completed," "deleted," or "deferred"
 - Include an explanation
- **Complete TODAY if possible**



2. Evaluate Alternatives

- **Evaluate based on a range of factors**
 - Life Safety
 - Community goals and objectives
 - STAPLEE
 - Social concerns
 - Technical feasibility
 - Administrative capabilities
 - Political feasibility (public support)
 - Legal authority
 - Economic (cost)
 - Environmental issues
- **Begin TODAY if possible**



3. Develop New Actions

- **New Actions**
 - Optional but encouraged
 - Your wish list
 - FEMA's go-by for funding
- **Complete Using the:** Mitigation Action Worksheet (handout)
- **Resources:**
 - FEMA Mitigation Ideas: <http://www.fema.gov/media-library/assets/documents/30627>
 - Call us!



4. Prioritize Actions

- **Prioritize all actions (high, moderate, low)**
 - Effect on overall risk to life and property
 - Ease of implementation
 - Political and community support
 - A general economic cost/benefit review
 - Funding availability
 - Continued compliance with the NFIP

RETURN ACTIONS (updated and new) to Caroline by:

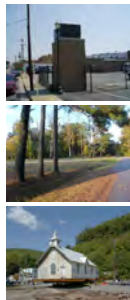
- May 5, 2017
- Caroline.Cunningham@stantec.com



Ice Breaker Exercise Results

Hazard Mitigation Planning Techniques

1. Emergency Services: \$94
2. Prevention: \$60
3. Public Education and Awareness: \$59
4. Natural Resource Protection: \$47
5. Structural Projects: \$34
6. Property Protection: \$28



Action Examples

Prevention	Property Protection	Natural Resource Protection	Structural Projects	Emergency Services	Public Education/Awareness
Planning and zoning	Acquisition	Floodplain protection	Reservoirs	Warning systems	Outreach projects
Building codes	Relocation	Watershed management	Dams, levees, dikes	Emergency response equipment	Speaker series/demonstration events
Open space preservation	Building elevation	Riparian buffers	Floodwalls	Shelter	Hazard map information
Floodplain regulations	Critical facilities protection	Forest management	Stormwater diversions	Operations	Real estate disclosure
Stormwater management regulations	Retrofitting	Erosion and sediment control	Detention/retention basins	Evacuation planning and management	Library materials
Capital improvements programming	Safe rooms, shutters, shatter-resistant glass	Wetland preservation and restoration	Channel modification	Emergency response training and exercises	School children educational programs
Setbacks	Insurance	Habitat preservation	Storm sewers	Sandbagging for flood protection	Hazard expositions
			Drainage system maintenance	Temporary shutters	Social Media



Update Capabilities



Review Capabilities

- **Handout**
 - Planning and regulatory
 - Administrative
 - Fiscal
 - Political



NEXT STEPS



Project Schedule

PROJECT TASKS	Month										
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept-May 2018
Planning Process											
Risk Assessment											
Mitigation Strategy											
Plan Maintenance and Adoption											
MEETINGS											
Regional Planning Committee Meeting	✓				✓						
MILESTONES											
Submission of Draft Risk Assessment to Regional Planning Committee					✓						
Submission of Draft Plan to Regional Planning Committee									✓		
Submission of Draft Plan to NCEM/FEMA											
Completion of Final Plan/Conditional FEMA Approval											✓
Local Adoption of the Plan											✓
Submission of Final Plan to NCEM/FEMA											✓

Today: Breakout Groups
Tomorrow: Homework

1. **Existing Actions:** Review/Update Existing Actions
2. **New Actions:** Mitigation Action Worksheet
3. **Review Capabilities**

RETURN ACTIONS (updated and new) to Caroline by:
May 5, 2017
Caroline.Cunningham@stantec.com



Reminders

- **Jurisdictional Participation is a must!**
 - Attend meetings
 - Provide comments on draft plan
 - Update your mitigation actions
- **Provide Critical Facility Data**
 - If you want it analyzed



Questions?

Caroline A. Cunningham, AICP, CFM, ABCP
Senior Hazard Mitigation Planner
caroline.cunningham@stantec.com



2017 Smoky Mountain Regional Hazard Mitigation Plan Update Mitigation Strategy Workshop

Date/Time: March 29, 2017 / 9:00 AM
Place: EBCI EOC
Cherokee, NC

Attendees: See Sign-In Sheet

Handouts:

1. 2015 Goals
2. 2015 Mitigation Actions
3. New Mitigation Action Worksheet
4. Capability Assessment Review

Items:

Caroline Cunningham (Stantec) facilitated the Smoky Mountain Regional Hazard Mitigation Plan Mitigation Strategy Workshop. The purpose of the meeting was to provide an overview of hazard mitigation, plan progress to date (including risk assessment and public survey results), review jurisdiction capabilities, and update and develop mitigation actions. It began with a round-robin of introductions. Following introductions Ms. Cunningham presented a PowerPoint presentation covering the following items:

- Public Survey Results
- Risk Assessment Results
- Mitigation Strategy
- Schedule/Next Steps
- Breakout Groups/Plan Update Workshop

Public Survey Results

Ms. Cunningham presented select results from the public survey. This began with an overview of the methods used to advertise the survey and the types of devices used to complete the survey. The survey was active for approximately 3-months and received over 150 responses.

Risk Assessment Results

Next, the risk assessment results were presented. It was emphasized that the presented material was a high level approach compared to what could be found in the draft plan. Each hazard highlighted profile items such as previous occurrences, probability, potential impacts and losses.

Comments were made on the following hazards:

Flood

- Lake Santeetlah will be joining the NFIP by the time this plan is complete (all communities now it)

Erosion

- Applicable in Haywood County and especially Maggie Valley

The results of the risk assessment 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 ranking of hazards was presented and attendees were asked to review and comment on the list if anything seemed out of place with perceived risks. High ranking hazards were Winter Storm, Thunderstorm/high wind, Hailstorm, Tornado, Lightning, and Flood.

The planning team opted to move the following hazards:

- Wildfire – move from moderate to high
- HAZMAT – move to moderate (high in Haywood)

Considerations of hurricane and tornado were also made but no changes were made.

It was also determined that the PRI would be done for each county.

Mitigation Strategy

Ms. Cunningham then gave an overview of the mitigation strategy, explaining that it includes goals, actions, and the action plan. First, the goals were presented for review. The following changes to goals were made by the planning team as shown in red.

- Goal #1: Increase public awareness of hazard mitigation and hazard risk.
- Goal #2: Enhance or create new policies that will help reduce the damaging effects of ~~natural~~ all hazards including natural, man-made and technological hazards.
- Goal #3: Increase capabilities to support and implement effective mitigation measures.
- Goal #4: Identify and mitigate development and infrastructure in known hazard areas and ~~avoid~~ consider the risks, impacts, and potential mitigation measures to incorporate if proposing to building new structures in known hazard areas.
- Goal #5: Encourage conservation of natural environments including forests, surface waters, ~~wetlands~~ wetlands, floodplains, and stream corridors.
- Goal #6: Improve emergency service capabilities by identifying and seeking funding for necessary equipment as well as fostering regional cooperation for response and recovery.

Next, she explained the 4 step process needed to complete the mitigation action plan updates:

1. Review and update existing actions

2. Evaluate potential hazard mitigation actions
3. Develop new hazard mitigation actions
4. Prioritize actions

Ms. Cunningham asked the planning team to provide a status update for their existing mitigation actions including an explanation for FEMA) by May 5, 2017. She then explained a variety of actions should be considered but all actions considered did not have to be included as actions. Potential actions could come from the public (via the public survey or the public meeting), the risk assessment, or community needs. Ms. Cunningham also explained that potential actions should be evaluated based on several factors using the “STAPLEE” approach, including:

- Social concerns
- Technical feasibility
- Administrative capabilities
- Political feasibility (public support)
- Legal authority
- Economic (cost)
- Environmental issues

Ms. Cunningham explained that the mitigation action worksheet could be used to submit potential new actions. It was emphasized that the action plan should be viewed as the community's wish list for any type of mitigation needs. Further, should a disaster event be declared or a community seek FEMA mitigation funding, FEMA will check to ensure the action is covered via the plan.

Lastly, actions should be prioritized as high, moderate, or low by considered the following:

- Effect on overall risk to life and property
- Ease of implementation
- Political and community support
- A general economic cost/benefit review
- Funding availability
- Continued compliance with the NFIP

Capability Assessment

Next, Ms. Cunningham provided an overview of the Capability Assessment. She explained that this was a FEMA requirement and meant to provide FEMA with an understanding of what capabilities are in place to implement mitigation actions. She explained that during the previous plan update, communities answered an extensive survey about capabilities. For this update, the capabilities just need to be reviewed. The Stantec team took a first look for new plans and capabilities in place, but asked that each jurisdiction verify the information.

Schedule/Next Steps

Ms. Cunningham reviewed the plan schedule, loose ends, and items needed for the plan.

She emphasized that jurisdictional participation is a must for plan approval. State NCEM Planners suggested that jurisdictions with limited capability to attend meetings provide a letter making their County EMA Director their designee for the plan. The letter needs to come from a high ranking official, such as the mayor. Ms. Cunningham offered to follow-up with the state to see if an example letter is available.

The plan is currently on track. A full draft will likely be provided in July/August to be reviewed the planning team and the public. The current plan does not expire until May 2018, so the project is ahead of schedule.

Next, the actions items discussed to be completed were reviewed. Communities are to complete the following by May 5, 2017:

- Review plan goals
- Provide a status on existing actions
- Develop new actions
- Update jurisdiction capabilities
- Ensure you are participating in the planning process

Breakout Groups

Attendees used the remaining hour to review the assignments. Many asked questions and several completed the capability assessment review while there.

**Smoky Mountain Regional Hazard Mitigation Plan Update
Mitigation Strategy Meeting**

March 29, 2017
9:00 AM

Name	Agency	Jurisdiction	Phone Number	E-mail Address
Dianne Remy	NCEM	Area 14	828-712-1587	dremy@ncem.org
Terry Fox	NCEM	Western Branch	828-228-8526	terry.fox@ncem.gov
Tobin Remy	ESCI EIM	ESCI	828-359-6449	tremy@nc-choke.com
Caroline Cummings	Stantec	Stantec	919-475-9171	caroline.cummings@stantec.com
Al Loungard	Murphy Fire		828-837-2212	aloungard@murphyfire.org
Anne Remy	Town of Murphy Cherokee Co.		828-837-2510	town-of-murphy@stantec.com
Tobin Caldwell	ESCI Cherokee Co.	Cherokee Co.	828-837-7352	tobin.caldwell@ncem.gov
Abby Holmes	ESCI Public Health	ESCI	828-359-1800	aholmes@nc-choke.com
Todd Dilard	Jackson Co EM		828-586-7592	tdillard@jacksonco.org

**Smoky Mountain Regional Hazard Mitigation Plan Update
Mitigation Strategy Meeting**

March 29, 2017
9:00 AM

Name	Agency	Jurisdiction	Phone Number	E-mail Address
Larry Henderson	Graham Co EM	Graham Co	828-479-7967	lhenderson@grahamco.org
Joey Webb Sr.	Town of Waynesville Fire Chief	Waynesville Co	828-456-6151	jwebb@waynesville-nc.gov
Greg Shupin	Haywood Co EM	Haywood Co.	828 508 8387	gshupin@haywoodnc.net

From: Cunningham, Caroline
To: ["Robin Caldwell"](mailto:Robin.Caldwell@nc-herokee.com); ["Larry Hembree@grahamcounty.org"](mailto:larry.hembree@grahamcounty.org); ["GShuping@haywoodnc.net"](mailto:GShuping@haywoodnc.net); ["jcemergencymgt@jacksonnc.org"](mailto:jcemergencymgt@jacksonnc.org); [Todd Dillard;](mailto:Todd.Dillard@robepant@nc-herokee.com)
["robepant@nc-herokee.com"](mailto:robepant@nc-herokee.com); ["emergencyservices@swaincountync.gov"](mailto:emergencyservices@swaincountync.gov); ["alovingood@murphyfire.org"](mailto:alovingood@murphyfire.org);
["town_of_murphy@frontier.com"](mailto:town_of_murphy@frontier.com); ["abbyholm@nc-herokee.com"](mailto:abbyholm@nc-herokee.com); ["jwebb@waynesvillenc.gov"](mailto:jwebb@waynesvillenc.gov)
Cc: ["jramsey@ncem.org"](mailto:jramsey@ncem.org); ["Foxx, Terry"](mailto:Foxx.Terry); ["Nathan Slaughter"](mailto:Nathan.Slaughter)
Subject: Action Required: Smoky Mountain Regional Hazard Mitigation Plan - meeting notes and next steps
Date: Wednesday, April 05, 2017 4:42:00 PM
Attachments: [smoky_mtn_mitigation_actions.zip](#)
[mit_strategy_agenda_20170329_post_meeting.pdf](#)
[smoky_sign_sheet_completed.pdf](#)
[meeting_minutes_mit_strategy_smoky_mtn_20170402.pdf](#)
[smoky_mit_strategy_20170318.pdf](#)
[Instructions_for_Mit_Action_Worksheets.docx](#)
[Smoky Mountain Capability Assessment Review.pdf](#)

Good afternoon,

Please find the meeting minutes, presentation, and sign-in sheet from the Mitigation Strategy Workshop attached. We reviewed the risk assessment results, public survey, and next steps in the planning process.

We also reviewed several tasks that need to be completed. All communities are required to provide a status on existing actions and review jurisdictional capabilities. You can also submit new actions if you would like. There was a lot of information presented at the meeting, and we are happy to walk you through these tasks as needed. Please don't hesitate to reach out to us.

County leads, please assist in distributing this information to jurisdictions.

Here is what we need you by May 5th, 2017:

1. Review Plan Goals (Attachment: mit strategy agenda, page 2)

- Changes were made to the existing goals at the meeting as shown in red.

Goal #2	Enhance or create new policies that will help reduce the damaging effects of natural all hazards including natural, man-made and technological hazards.
Goal #4	Identify and mitigate development and infrastructure in known hazard areas and avoid consider the risks, impacts, and potential mitigation measures to incorporate if proposing to building new structures in known hazard areas.
Goal #5	Encourage conservation of natural environments including forests, surface waters, wetlands wetlands , floodplains, and stream corridors.

- If you have comments, suggested changes, or additions, please let me know. If not, no further action is necessary.

2. Update Existing Mitigation Actions (Attachment: mitigation actions plans.zip)

- Review the list of actions specific to your community and provide an explanation for what has been completed in the last 5 years for each community (highlighted column).
- FEMA is looking for a few sentences on this task.
- If the action needs to be deleted, we must explain why.
- All communities must include an action that addresses current and future development and infrastructure.

3. Develop New Mitigation Actions (Attachment: Instructions for Mit Action Worksheets)

If you would like to add actions, please use the New Action Worksheet.

- Note that new actions are not required but are encouraged.
- Think of actions as your "wish list" for mitigation needs within the community.

- Please note - FEMA reviews this list if you are utilizing pre- or post-disaster funding such as PMD or HMGP. Adding broad actions can help ensure FEMA can tie support to an action in the plan (e.g., “Install generators on critical facilities,” or “Mitigate at-risk structures”).

4. Review Capabilities (*Attachment: Smoky Mountain Capability Assessment Review*)

- Update the capabilities specific to your jurisdiction

5. Jurisdictional Participation

- Jurisdictional participation is very important to obtain FEMA approval. Completing the above tasks for your community will help to meet this requirement.

All of the above must be provided by **May 5, 2017**.

Again, if you have questions, please don't hesitate to contact me.

Thank you,

Caroline A. Cunningham, AICP, CFM, ABCP

Senior Associate
Company Lead, Hazard Mitigation Services
Stantec
Phone: (919)-532-2320
Cell: (919)-475-9171
Fax: (919)-851-8393
caroline.cunningham@stantec.com

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D3. Public Survey Documentation



SWAIN COUNTY
NORTH CAROLINA



government

visit













work

live



welcome to
Swain County

Quick Links

-  [Public Tax Records](#)
-  [Social Services](#)
-  [Health Department](#)
-  [Commissioners](#)
-  [History](#)
-  [Heritage Museum](#)
-  [Downloads](#)
-  [Ordinances](#)
-  [Area Maps](#)
-  [Site Map](#)
-  [FAQ](#)
-  [Find County Officials](#)

About Swain County

(LINK) Smoky Mountain Regional Hazard Mitigation Plan Update Public Survey: **Please complete this survey for Disaster Planning updates.**

Swain County is excited to be moving forward with a new History Museum at the old county courthouse. We need your help! We are asking the people of Swain County to donate articles that are relative to local history for display. Make your family part of history. If you have something that you think shows the history of this area please contact Swain County at 828-488-9273 or a member of the Heritage Board.

Museum Flyer (pdf)

Geographically, the county is spectacular. Much of it lies within the Great Smoky Mountains National Park, including its highest peak, Clingmans Dome. Four scenic rivers, the Nantahala, the Tuckasegee, the Oconaluftee and the Little Tennessee flow through the county and form the sprawling Lake Fontana, west of Bryson City, the county seat.

View the Bryson City WebCams

The county also encompasses much of the Cherokee Indian Reservation, with its own independent government.

Formed in 1871 from parts of Jackson County and Macon County, the county was named for David L. Swain, governor of North Carolina from 1832 to 1835. The estimated population in 2010 was

Community Announcements

The Swain County Administration Building will be closed **January 2 for New Years.**

The Swain County Administration Building will be closed **December 23, 26, and 27 for Christmas.**

The **Swain County Board of Commissioners** announce a Special Session Meeting - Organizational Meeting on Monday December 5, following the swearing in ceremony at 9:00 A.M. at the Swain County Administration Building. [Link](#)

Swain County has an opening for a **Building/Mechanical Inspector**. This is a Full time position with benefits. Open until filled. Please contact Elise Bryson in Swain County Human Resources at 828-488-9273 for more

**PUBLIC SURVEY
FOR HAZARD MITIGATION PLANNING**

We need your help!

The Counties of Cherokee, Graham, Haywood, Jackson, Swain, and the Eastern Band of Cherokee Indians are currently engaged in a planning process to become less vulnerable to natural disasters, and your participation is important to us!

The counties and Eastern Band of Cherokee Indians, along with participating local jurisdictions and other participating partners, are now working to update the region's multi-jurisdictional *Hazard Mitigation Plan*. The purpose of this Plan is to identify and assess our community's natural hazard risks and determine how to best minimize or manage those risks. Upon completion, the Plan will represent a comprehensive multi-jurisdictional *Hazard Mitigation Plan* for the region.

This survey questionnaire provides 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 impact of future hazard events.

Please help us by completing this survey by February 28, 2017 and returning it to:

Caroline Cunningham, Stantec
801 Jones Franklin Rd, Suite 300
Raleigh, NC 27606

Surveys can also be emailed to caroline.cunningham@stantec.com

If you have any questions regarding this survey or would like to learn about more ways you can participate in the development of the *Smoky Mountain Regional Hazard Mitigation Plan*, please contact Caroline Cunningham (Stantec), planning consultant for the project. You may reach Me

OWN OF LAKE SANTEETLAH

Marina Drive
Lake Santeetlah, NC 28771

Caroline Cunningham, Stantec
801 Jones Franklin Rd, Suite 300
Raleigh, NC 27606



Q2

Where do you live?

Unincorporated Cherokee County <input type="checkbox"/>	77	50.33%
Unincorporated Graham County <input type="checkbox"/>	2	1.31%
Unincorporated Haywood County <input type="checkbox"/>	0	0.00%
Unincorporated Jackson County <input type="checkbox"/>	1	0.65%
Unincorporated Swain County <input type="checkbox"/>	12	7.84%
Eastern Band of Cherokee Indian Reservation <input type="checkbox"/>	6	3.92%
Andrews <input type="checkbox"/>	5	3.27%
Bryson City <input type="checkbox"/>	13	8.50%
Canton <input type="checkbox"/>	1	0.65%
Clyde	0	0.00%
Dillsboro <input type="checkbox"/>	0	0.00%
Fontana <input type="checkbox"/>	0	0.00%
Forest Hills	0	0.00%
Lake Santeetlah	0	0.00%
Maggie Valley	0	0.00%
Murphy	22	14.38%
Robbinsville	0	0.00%
Sylva	0	0.00%
Waynesville	2	1.31%
Webster <input type="checkbox"/>	0	0.00%
Other	12	7.84%

Total **153**

Mean	6.35
Standard Dev.	6.91
Variance	47.75

Other Option [Other]

Haysville
 Peachtree
 Marble
 MARBLE - are we the adopted town???
 Dillard
 Hayesville
 Brasstow
 Ela
 Cullowhee
 Macon and Bryson City part time

Q3

Have you ever experienced or been impacted by a disaster?

Yes	66	43.71%
No	85	56.29%
Total	151	

Mean	1.56
Standard Dev.	0.50
Variance	0.25

Q5

How concerned are you about the possibility of our community being impacted by a disaster?

Extremely concerned	48	32.00%
Somewhat concerned	92	61.33%
Not concerned	10	6.67%

Total **150**

Mean	1.75
Standard Dev.	0.57
Variance	0.32

Q6

Please select the one hazard you think is the highest threat to your neighborhood:

Acts of Terror	4	2.63%
Dam / Levee Failure	1	0.66%
Drought	14	9.21%
Earthquake	3	1.97%
Expansive Soils	1	0.66%
Extreme Heat	0	0.00%
Flood	9	5.92%
Hailstorm	0	0.00%
Hurricane Remnants	0	0.00%
Land Subsidence	0	0.00%
Landslide	4	2.63%
Lightning	1	0.66%
Severe Winter/Ice Storm	30	19.74%
Severe Thunderstorm / High Wind	24	15.79%
Tornado	16	10.53%
Wildland Fire	45	29.61%

Total **152**

Mean	12.30
Standard Dev.	4.58
Variance	20.95

Q7

Please select the one hazard you think is the second highest threat to your neighborhood:

Acts of Terror	1	0.66%
----------------	---	-------

Dam / Levee Failure	4	2.63%
Drought	16	10.53%
Earthquake	8	5.26%
Expansive Soils	1	0.66%
Extreme Heat	2	1.32%
Flood	6	3.95%
Hailstorm	0	0.00%
Hurricane Remnants	1	0.66%
Land Subsidence	0	0.00%
Landslide	5	3.29%
Lightning	0	0.00%
Severe Winter/Ice Storm	27	17.76%
Severe Thunderstorm / High Wind	29	19.08%
Tornado	24	15.79%
Wildland Fire	28	18.42%

Total **152**

Mean	11.69
Standard Dev.	4.75
Variance	22.56

Q8

Is there another hazard not listed above that you think is a wide-scale threat to your neighborhood?

Yes	19	13.29%
No	124	86.71%

Total **143**

Mean	1.87
Standard Dev.	0.34
Variance	0.12

Q10

Is your home located in a floodplain?

Yes	11	7.24%
No	132	86.84%
I don't know	9	5.92%
Total	152	

Mean	1.99
Standard Dev.	0.36
Variance	0.13

Q11

Do you have flood insurance?

Yes	11	7.33%
No	127	84.67%
I don't know	12	8.00%
Total	150	

Mean	2.01
Standard Dev.	0.39
Variance	0.15

Q12

If "No," why not?

Not located in floodplain	81	54.73%
Too expensive	10	6.76%
Not necessary because it never floods	5	3.38%
Not necessary because I'm elevated or otherwise	35	23.65%
Never really considered it	13	8.78%
Other	4	2.70%
Total	148	

Mean	2.33
Standard Dev.	1.63
Variance	2.66

Other Option [Other]

My barn on flood plain, house higher up
We rent
unable to obtain
I rent my home. Not sure what type of insurance is on it.

Q13

Have you taken any actions to make your home or neighborhood more resistant to hazards?

Yes	64	42.11%
No	88	57.89%

Total **152**

Mean	1.58
Standard Dev.	0.50
Variance	0.25

Q15

Are you interested in making your home or neighborhood more resistant to hazards?

Yes	128	85.91%
No	21	14.09%
Total	149	

Mean	1.14
Standard Dev.	0.35
Variance	0.12

Q16

Do you know what office (or agency) to contact regarding reducing your risks to hazards in your area?

Yes	67	44.08%
No	85	55.92%
Total	152	

Mean	1.56
Standard Dev.	0.50
Variance	0.25

Q17

What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

Newspaper	19	12.50%
Television	4	2.63%
Radio	2	1.32%
Internet (including social media)	79	51.97%
Mail	14	9.21%
Phone	15	9.87%
Public workshops/meetings	10	6.58%
School meetings	0	0.00%
Other (please explain):	9	5.92%
Total	152	

Mean	4.34
Standard Dev.	1.93
Variance	3.71

Other Option [Other (please explain):]

county extension agency, local government

Several of the above

NC Emergency Management, the NC Disaster Information Center, and NC

Contact with individual agencies

Text

social media

Email

Text Messages and Social Media in my opinion are the fastest at getting i

Contact David Breedlove directly since I work with him

C Ready provide great disaster management information.

info out.

Q20

A number of community-wide activities can reduce our risk from hazards. In general, these activities fall into one of the following six broad categories. Please

1. Prevention: Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning.

Very Important	82	54.30%
Somewhat Important	55	36.42%
Not Important	14	9.27%
Total	151	

Mean	1.55
Standard Dev.	0.66
Variance	0.44

2. Property Protection: Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Example

Very Important	44	29.53%
Somewhat Important	83	55.70%
Not Important	22	14.77%
Total	149	

Mean	1.85
Standard Dev.	0.65
Variance	0.42

3. Natural Resource Protection: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include

Very Important	99	66.44%
Somewhat Important	44	29.53%
Not Important	6	4.03%
Total	149	

Mean	1.38
Standard Dev.	0.56
Variance	0.32

4. Structural Projects: Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees,

Very Important	80	53.69%
Somewhat Important	60	40.27%
Not Important	9	6.04%
Total	149	

Mean	1.52
Standard Dev.	0.61
Variance	0.37

5. Emergency Services: Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuat

Very Important	132	88.00%
Somewhat Important	17	11.33%
Not Important	1	0.67%
Total	150	

Mean	1.13
Standard Dev.	0.35
Variance	0.12

6. Public Education and Awareness: Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Ex:

Very Important	107	71.81%
Somewhat Important	37	24.83%
Not Important	5	3.36%
Total	149	

Mean	1.32
Standard Dev.	0.53
Variance	0.28

D4. Neighboring Jurisdiction Coordination Documentation

From: Cunningham, Caroline
Cc: [Cunningham, Caroline](mailto:Caroline.Cunningham@stantec.com)
Bcc: "rlancaster@claync.org"; "Kevin.shook@transylvaniacounty.org"; "jerry.vehaun@buncombecounty.org"; "fgilliam@madisoncountync.gov"; "jerry.vehaun@buncombecounty.org"; "polktnema@yahoo.com"; "mc.ema@monroetn.com"; "coleman@blounttn.org"; "jmathews@seviercountyttn.gov"; "ccema.benton@gmail.com"; "rgraham@fannincountyga.org"; "ucfd@uniongov.com"; "khulsey@oconee.ga.us"; "robin.caldwell@cherokeecounty-nc.gov"; "swyatt@hendersoncountync.org"
Subject: Notification - Smoky Mountain Regional Hazard Mitigation Plan
Date: Monday, August 14, 2017 12:41:00 PM

Good afternoon,

You are receiving this email because a jurisdiction in a neighboring North Carolina county or tribe (Cherokee County, Graham County, Haywood County, Jackson County, Swain County, and the Eastern Band of Cherokee Indians), along with the participating local jurisdictions, are in the process of updating the region's Smoky Mountain 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 risk 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 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 this planning effort.

I am the project manager for plan update, and I would be happy to discuss any input you may have. In addition, please let me know if you would like receive a copy of the draft plan once it is complete.

No further action is required. However, should you have any questions or input regarding the Smoky Country Regional Hazard Mitigation Plan, please free feel to contact me.

Thank you,

Caroline A. Cunningham, AICP, CFM, ABCP

Senior Associate
Company Lead, Hazard Mitigation Services
Stantec
Phone: (919)-532-2320
Cell: (919)-475-9171
Fax: (919)-851-8393
caroline.cunningham@stantec.com

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 Please consider the environment before printing this email.

NEIGHBORING JURISDICTIONS

State	Neighboring Jurisdiction	Name	Position
NC	Clay County	Ricky Lancaster	Emergency Management Coordinator
NC	Macon County	Warren Cade	Emergency Management Coordinator
NC	Transylvania County	Kevin Shock	Emergency Management Coordinator
		Scott Greer/Forrest	Emergency Management
NC	Madison County	Gilliam	Coordinator/County Manager
NC	Buncombe County	Jerry Vehaun	Emergency Management Coordinator
NC	Henderson County	Steve Wyatt	County Administrator
TN	Polk County	Stephen Lofty	Emergency Management Coordinator
TN	Monroe County	David Chambers	Emergency Management Coordinator
TN	Blount County	Lance Coleman	Emergency Management Coordinator
TN	Sevier County	John Mathews	Emergency Management Coordinator
TN	Cocke County	David Breeding	Emergency Management Coordinator
GA	Fannin	Rick Graham	Emergency Management Coordinator
GA	Union	David Dyer	Emergency Management Coordinator
SC	Oconee	Karla Hulsey	Emergency Management Coordinator

D5. Plan Review Documentation



Important Notice

NOTICE OF REVIEW AND COMMENT PERIOD FOR THE 2017 HAZARD MITIGATION PLAN UPDATE. CLICK ON THE LINK BELOW FOR MORE INFORMATION:

[Draft-2017 Regional Hazard Mitigation Plan Update for Review and Comment](#)

In the Spotlight

Nixle

If you are a resident or business owner of Cherokee County we encourage you to sign up for our Nixle Emergency Notification System. This system will allow us to send you critical information in the event of an emergency situation.

[Sign up Now!](#)



[Online Mapping](#)



[Meetings & Agendas](#)



[Bids / Quotes](#)



[Pay Taxes](#)



[Economic Development](#)

Upcoming Events

No events at the moment.

[More »](#)

Today's Poll

There are no polls available right now.



SWAIN COUNTY NORTH CAROLINA



- government
- visit
- work
- live



Quick Links

- GIS Data
- Public Tax Records
- Register of Deeds
- Employment
- Sheriff Department
- Social Services
- Health Department
- Commissioners

About Swain County

Watch the **CBS Sunday Morning** coverage of "Decoration Day" at the **bottom of this page**. You must have the Flash Player to see or watch the embedded video. Google Chrome has Flash natively.

This Home page is now friendly to mobile devices. Other pages will be converted soon. Feel free to submit issues or suggestions during this conversion. Various phone browsers react differently in how they display this page. [email](#)

Geographically, the county is spectacular. Much of it lies within the Great Smoky Mountains National Park, including its highest peak, Clingmans Dome. Four scenic rivers, the Nantahala, the Tuckasegee, the Oconaluftee and the Little Tennessee flow through the county and form the sprawling Lake Fontana, west of Bryson City, the county seat.

[View the Bryson City WebCams](#)

The county also encompasses much of the Cherokee Indian Reservation, with its own independent government. Formed in 1871 from parts of Jackson County and Macon County, the county was named for David L. Swain, governor of North Carolina from 1832 to 1835.

Community Announcements

Swain County Emergency Management is seeking public comment regarding the [Regional Hazard Mitigation Plan](#)

Swain County has an opening for a [District Director with the Soil and Water Department](#). Please contact Elise Bryson in Swain County Human Resources at 828-488-9273 [☎](#) for more information.

Swain County DSS Department has an opening for a [Income Maintenance Worker](#). Please contact Elise Bryson in Swain County Human Resources at 828-488-9273 [☎](#) for more information.

Appendix E

CRS Prevention Activities

This Appendix includes prevention strategies assessment undertaken by CRS communities.

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APPENDIX E

COMMUNITY RATING SYSTEM

This section of the Plan provides a summary of mitigation measures that were considered by the two communities in the Smoky Mountain Regional Hazard Mitigation Plan to reduce their risk to the flood hazard specifically, thereby achieving the requirements set forth in Section 510 of the Community Rating System (specifically Step 7). These flood mitigation measures are based on suggested activities that have been shown to significantly reduce flood risk and have been analyzed by each of the respective CRS communities that participate in the Smoky Mountain Regional Hazard Mitigation Plan. The measures are broken down into one of the following six categories of activities that fall within the sphere of prevention activities:

PREVENTION ACTIVITIES

- ◆ Floodplain Management
- ◆ Comprehensive or Land Use Planning
- ◆ Zoning
- ◆ Subdivision Regulations
- ◆ Stormwater Management
- ◆ Building Codes

E.1 INTRODUCTION

This appendix to the Hazard Mitigation Plan was developed in order to enhance each jurisdiction's overall resilience to the flood hazard by documenting the steps taken, and those that need to be taken to help improve each jurisdiction's regulatory environment through preventative actions. In order to maximize points that can be awarded to reduce flood insurance rates through the Community Rating System, communities must thoroughly evaluate preventative mitigation measures.

These measures are often considered the most exemplary type of mitigation actions that can be implemented because their purpose is to prevent issues related to flooding from occurring at all. For instance, if a community were to prohibit any construction within the floodplain, this would prevent any structures that might have been built in that area from being flooded because they won't be located in a high risk area.

Preventative measures are often associated with planning and regulatory activities such as zoning and building codes. The six main categories of prevention activities are outlined above and each of these types of activities are assessed in greater detail below. For each community that participated in this plan that is an active CRS community, an evaluation of several measures for each category was carried out to determine the community's willingness to implement preventative measures and outline a plan for reducing flood risk.

Within this evaluation, current standards and regulations are identified along with an explanation of local implementation of the specific standard or regulation. In addition, recommendations for future implementation have been discussed and any changes that were considered but discounted as not feasible have been identified along with an explanation concerning why that determination was made.

E.1.1 Floodplain Management

Floodplain Management is a broad category that generally overlaps many of the other prevention-related categories identified herein. However, while other categories of prevention activities such as zoning often exist for purposes beyond mitigation and risk reduction, floodplain management is the primary activity designed to reduce flood risk. Each of the jurisdictions that participated in the hazard mitigation planning process considered several activities that attempt to reduce flood risk through better management of identified floodplain areas.

As described in **Table E.1**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to enact these measures. In general, communities were either already implementing floodplain management activities or were working towards implementing these activities in the near future. However, some activities that were considered for implementation could not be incorporated into the local government's implementation structure. In cases where activities were considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.1: FLOODPLAIN MANAGEMENT ACTIVITIES

Preventative Activities				
Floodplain Management Regulations — There are a number of regulations that a local government can put into place that can be considered under the category of floodplain management regulations. For example, a jurisdiction could adopt a flood damage prevention ordinance, develop a floodplain management plan, or participate in the National Flood Insurance Program. Each of these activities may help reduce the impact of flooding by providing regulatory guidance aimed at the specific areas within the jurisdiction that are most vulnerable to flooding. Floodplain management regulations are an appropriate activity jurisdictions can use to reduce future flood losses since each community has some type of floodplain management regulation in place.				
Jurisdiction	Current Standards/Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	Cherokee County Flood Damage Prevention Ordinance ⁱ	The Cherokee County Flood Damage Prevention Ordinance includes a number of requirements for obtaining a permit prior to any construction in areas designated as a floodplain. Requirements include delineating the floodplain, providing floodproofing measures, and determining base flood elevation	<ul style="list-style-type: none"> • The county should continue to implement its higher freeboard requirements for properties located in the floodplain • The county should continue to implement its “no-rise” in base flood elevation clause 	<ul style="list-style-type: none"> • The county has considered a number of options regarding floodplain management regulations as is evident in previous columns. It is at least considering implementation of several options that were considered. • The county considered prohibiting fill in floodplain areas, but it was recognized as politically, legally, and technically infeasible for the county at this time

E.1.2 Comprehensive or Land Use Planning

Comprehensive or Land Use Planning is one of the most impactful means of reducing flood risk because it can provide an overall plan for the community in terms of where development takes place. As a result, comprehensive/land use planning can help direct people and property out of known flood prone areas and reduce the threat of future flood losses. Each of the jurisdictions that participated in the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through better either a comprehensive or land use plan.

As described in **Table E.2**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to enact these measures. In general, communities were either already implementing comprehensive or land use planning activities or were working towards implementing these activities in the near future. However, some activities that were considered for implementation could not be incorporated into the local government’s implementation structure. In cases where activities were considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.2: COMPREHENSIVE/LAND USE PLANNING ACTIVITIES

Preventative Activities				
<p>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. For example, the comprehensive plan can help reduce future flood risk by including a policy to prohibit new development within the 100-year floodplain or by including a goal to maximize open space in the floodplain. Comprehensive planning is an appropriate activity jurisdictions can use to reduce future flood losses since each community already has a comprehensive plan in place.</p>				
Jurisdiction	Current Standards/Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	No Comprehensive Land Use Plan in place. The County Flood Damage Protection Ordinance does include a purpose statement and objectives (Sections C and D).	Objectives include protecting human life and safety, minimizing costly flood control projects and relief efforts, minimizing business interruptions and damages, and increasing awareness of flood-prone areas.	<ul style="list-style-type: none"> The county should continue increasing the amount of its land area classified as open space. 	<ul style="list-style-type: none"> The county considered classifying all areas delineated as floodplain as open space but it was determined to be not administratively, legally, technically, economically, or politically feasible. The county considered preventing infrastructure expansion in areas exposed to flood hazards but it was determined to not administratively, legally, technically, politically, or economically feasible.

E.1.3 Zoning

Zoning is often considered an arm of land use planning and is generally designed to regulate certain functions or characteristics of development that are allowed in an area of the jurisdiction. Much like land use planning, zoning can help direct development outside of high risk areas and also regulate the density of development that is allowed in those areas. Each of the jurisdictions that participated in the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through some form of zoning.

As described in **Table E.3**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to enact these measures. In general, communities were either already implementing zoning activities or were working towards implementing these activities in the near future. However, some activities that were considered for implementation could not be incorporated into the local government’s implementation structure. In cases where activities were considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.3: ZONING ACTIVITIES

Preventative Activities				
<p>Zoning— 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. For example, the comprehensive plan can help reduce future flood risk by prohibit or limit future construction in the 100-year floodplain or by limiting the density of development in the floodplain.</p>				
Jurisdiction	Current Standards/ Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	<p>Watershed Protection Ordinanceⁱⁱ</p> <p>Floodplain Damage Prevention Ordinance</p>	<p>The watershed protection ordinances include a number of protections for including “build-upon area” limits, buffers areas around perennial waters, density restrictions, and run-off provisions for cluster development.</p> <p>Requires any development in Special Flood Hazard Areas to obtain permit</p>	<ul style="list-style-type: none"> The county has considered a number of options for zoning, and found them to be infeasible at this time, as evident in the following column 	<ul style="list-style-type: none"> The county considered requiring a higher ration than in currently in place of permeable to impermeable surface area in new commercial construction, but it was determined to not to be administratively, legally, technically, politically, or economically feasible. The county considered prohibiting or limiting future construction in the floodplain but found it to be administratively, legally, technically, politically, and economically infeasible. The county considered limiting the density of development in the floodplain but found it to be administratively, legally, technically, politically, and economically infeasible.

E.1.4 Subdivision Regulations

Subdivision ordinances are typically enacted on a much smaller scale than any of the previously discussed types of prevention activities. Often, subdivision regulations address specific neighborhoods and the types of activities that might be carried out there. Many subdivision ordinances govern standards that must be put in to place when a new development is being designed, but subdivision ordinances also often provide incentives for the inclusion of best practices in flood management into development. Each of the jurisdictions that participated in the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through subdivision ordinances.

As described in **Table E.4**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to

enact these measures. In general, communities were either already implementing subdivision ordinance activities or were working towards implementing these activities in the near future. However, some activities that were considered for implementation could not be incorporated into the local government’s implementation structure. In cases where activities were considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.4: SUBDIVISION ORDINANCE ACTIVITIES

Preventative Activities				
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. For example, a subdivision ordinance can help reduce future flood risk by including risk reducing actions on a lot level such as tree planting requirements or encouraging the use of rain barrels. These ordinances are an appropriate activity that jurisdictions can use to reduce future flood losses since each community already has a form of subdivision ordinance in place.				
Jurisdiction	Current Standards/ Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	Watershed Protection Ordinance, Article 200 Floodplain Damage Prevention Ordinance	Article 200 of the Watershed Protection Ordinance requires subdivision applications to be filed with the Watershed Administrator; applications must address stormwater drainage. Requires any development in Special Flood Hazard Areas to obtain permit	<ul style="list-style-type: none"> • The county is willing to consider possibly incentivizing the use of rain barrels or rain gardens • The county is willing to consider possibly requiring more trees be preserved and planted in landscape designs to reduce stormwater runoff • The county is willing to consider possibly requiring a drainage study with new development 	<ul style="list-style-type: none"> • The county has considered a number of options regarding subdivision ordinances as is evident in previous columns. It is at least considering implementation of all options that were considered.

E.1.5 Stormwater Management

Somewhat distinct from many of the other categories of prevention activities, stormwater management encompasses activities that deal with water runoff during storm events that is managed and directed by the local government entity. Stormwater management issues have become an especially prominent discussion point in the arena of flood risk reduction for local governments because of this responsibility. Each of the jurisdictions that participated in the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through stormwater management.

As described in **Table E.5**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to enact these measures. However, some activities that were considered for implementation could not be incorporated into the local government’s implementation structure. In cases where activities were

considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.5: STORMWATER MANAGEMENT ACTIVITIES

Preventative Activities				
Stormwater Management — 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. For example, stormwater management regulations or plans can help reduce future flood risk by requiring restrictions on development in upland areas to reduce stormwater run-off or adopting Phase II stormwater regulations. Stormwater management plans are an appropriate activity jurisdictions can use to reduce future flood losses since each community is working to develop or already has a form of stormwater management in place.				
Jurisdiction	Current Standards/Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	Watershed Protection Ordinance (separate stormwater plan is not in place)	Drainage must be addressed in subdivision applications. Stormwater control requirements apply in watershed areas depending on density and built-upon area; restrictions to built-upon area apply depending on use and density. Buffer areas required for perennial waters.	<ul style="list-style-type: none"> The county will consider possibly linking flood hazard mitigation objectives with EPA Stormwater Phase II 	<ul style="list-style-type: none"> The county considered setting compensatory water storage requirements for new construction, but found it to be politically and economically infeasible The county considered regulating development in upland areas in order to reduce stormwater runoff, but found it to be politically and economically infeasible

E.1.6 Building Codes

Building Codes are can help in the reduction of risk to flooding events in a number of ways. For instance, stronger building codes can help to ensure that structures are built to a standard which will allow them to resist the hydrostatic and hydrodynamic forces of flood waters. Building codes are often implemented at the local level, but in many cases, states set the actual provisions of the building code through minimum standards that communities must adopt. Each of the jurisdictions that participated in the Hazard Mitigation Planning process considered several activities that attempt to reduce flood risk through better management of identified floodplain areas.

As described in **Table E.6**, in some cases, it was determined that local governments were already implementing risk reducing activities and merely needed to formalize their commitment to continue to enact these measures. In general, communities were either already implementing building code activities or were working towards implementing these activities in the near future. However, some activities that were considered for implementation could not be incorporated into the local government’s implementation structure. In cases where activities were considered, but could not be moved forward, the activity has been identified and an explanation of why it would not be feasible has been included.

TABLE E.6: BUILDING CODE ACTIVITIES

Preventative Activities				
Building Code —Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (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. An example of how building codes can reduce flood risk is by implementing a code that requires that new buildings constructed in the floodplain are built with materials that are resistant to the anticipated velocity of floodwaters.				
Jurisdiction	Current Standards/ Regulations	Local Implementation	Recommendations for Future Implementation	Changes Considered but Discounted as Not Feasible
Cherokee County	Enforces North Carolina State Building Code ⁱⁱⁱ	The NC State Building Code outlines regulations for flood resistant construction. Among other regulations, the code states that all permit applications for construction or substantial improvement to structures in the floodplain must be designed and constructed with methods, practices, and materials that minimize flood damage.	<ul style="list-style-type: none"> The county has considered a number of options for building codes, and found them to n be infeasible at this time, as evident in the following column 	<ul style="list-style-type: none"> The county considered enforcing higher building codes such as the International Building Code or International Residential Code, but found it to not be administratively, legally, technically, or politically feasible The county considered implementing ASCE 24-05 which specifies minimum requirement and expected performance for the design and construction of buildings and structures in flood hazard areas to make them more resistant to flood loads and flood damage, but found it to not be politically or economically feasible

ⁱ Cherokee County Flood Damage Prevention Ordinance. Adopted July 3, 2007. <http://www.cherokee-county-nc.gov/Modules/ShowDocument.aspx?documentid=34>. Accessed July 20, 2017.

ⁱⁱ Watershed Protection Ordinance of Cherokee County. Adopted December , 1993; Amended August 7, 2000. Retrieved from <http://www.cherokee-county-nc.gov/Modules/ShowDocument.aspx?documentid=35>

ⁱⁱⁱ North Carolina Building Code http://www.ncdoi.com/OSFM/Engineering_and_Codes/Default.aspx?field1=State_Building_Codes_USER&user=State_Building_Codes